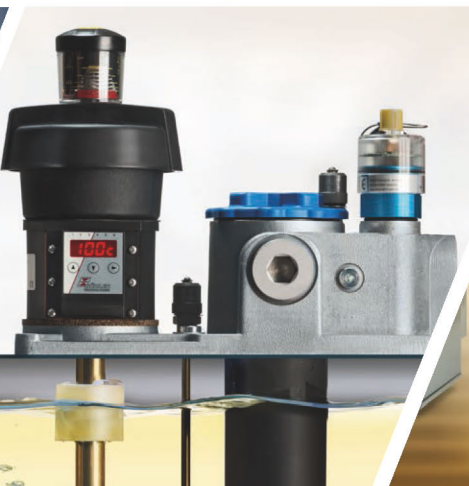
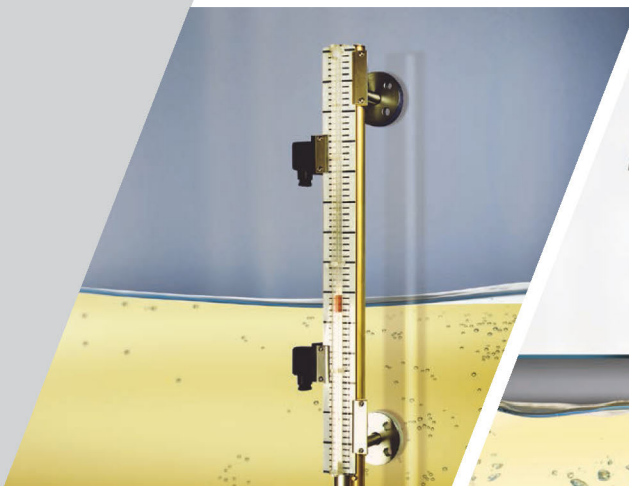
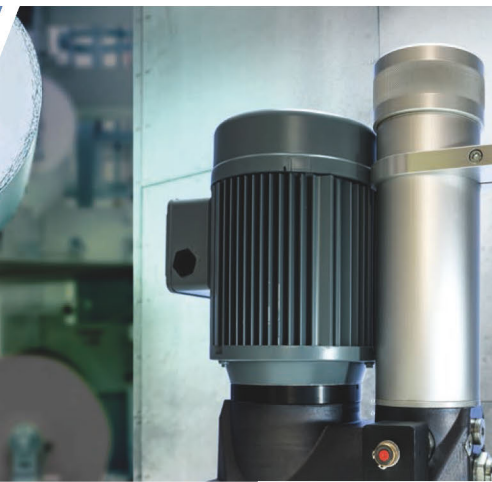
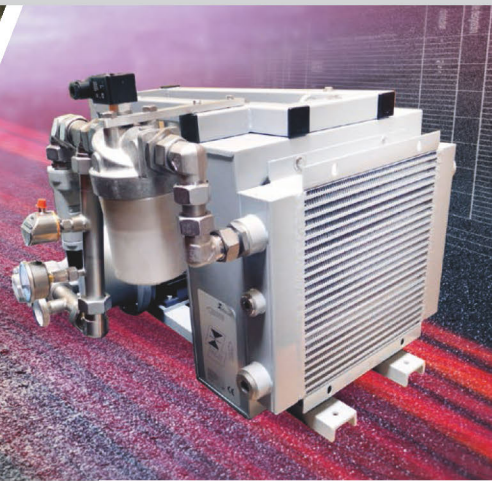
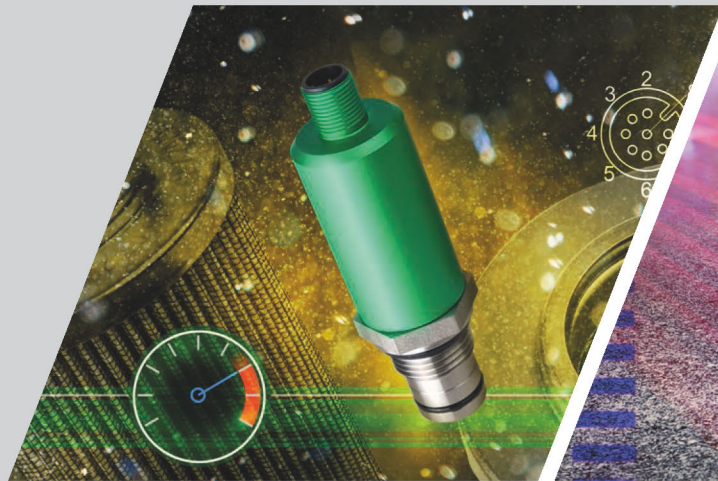


US



FLUIDCONTROL

COMPONENTS FOR OIL HYDRAULICS & LUBRICATION TECHNOLOGY





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Document information

Document No.....
Version.....03/2024

Contents

1	General Information.....	2
2	Controls	13
2.1	Liquid Level and Temperature -	16
2.2	Liquid Level -	119
2.3	Liquid Level -	126
2.4	Temperature Measurement.....	158
2.5	Pressure Measurement	185
2.6	Empty	202
2.7	Standard Controller	204
2.8	Water Alarms.....	209
2.9	Filter Monitoring	219
2.10	Empty.....	228
2.11	Customized Products	230
2.12	Approved Devices	259
2.13	Oil Condition Sensors.....	295
3	Tempering	320
3.1	Oil- Water Cooling.....	323
3.2	Oil- Air Cooling	343
3.3	Off-line Filter / Cooler Devices.....	373
3.4	Empty.....	394
4	Filtration	396
4.1	Off- line Filter Devices	399
4.2	Filter	410
5	Circulation Pumps.....	419
6	Empty.....	427
7	Subsystems.....	429
8	Approvals and Customer’s Specifications.....	431
9	Empty.....	433
10	Technical articles and certificates	435
11	Charts and design tools	440



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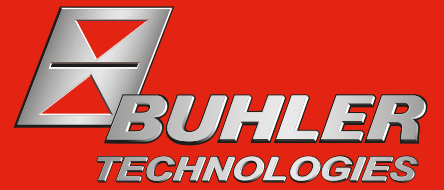
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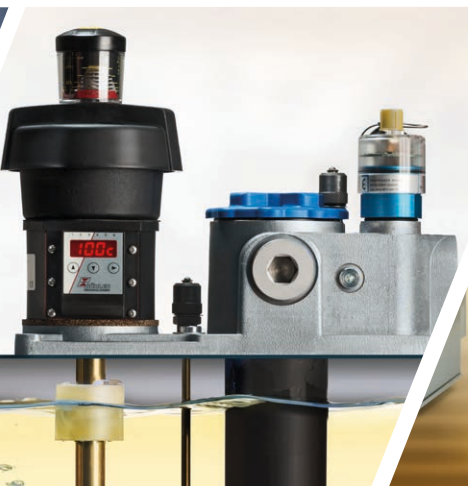
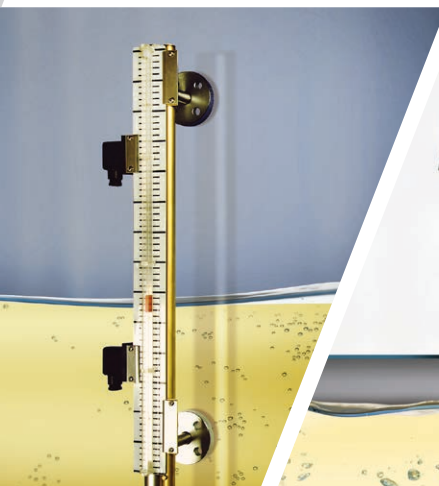
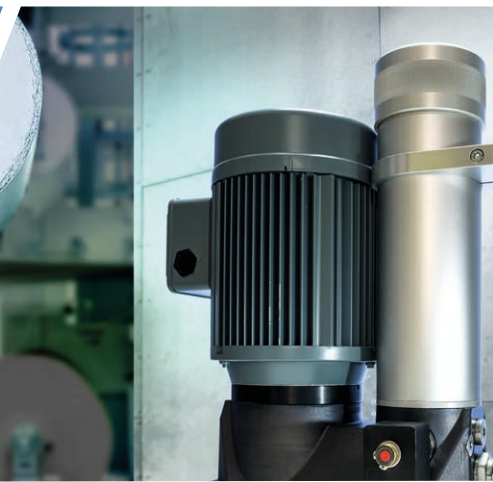
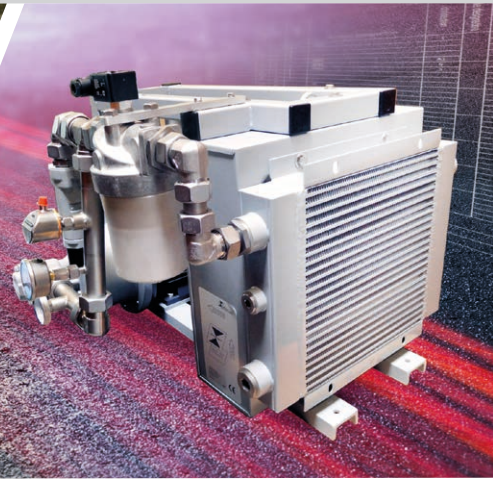
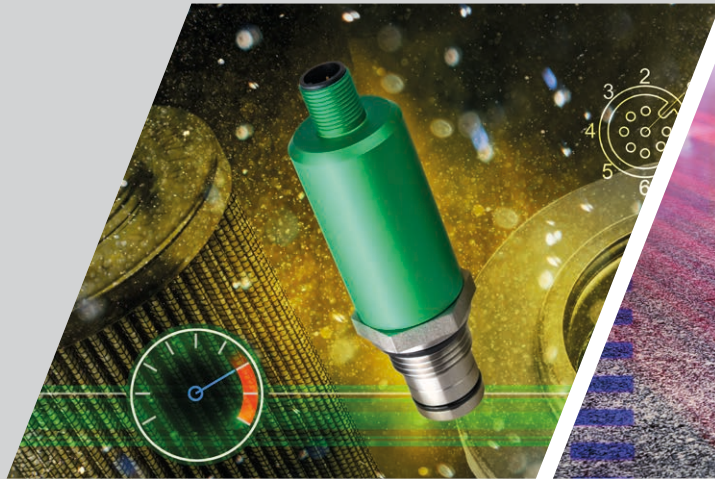


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FLUIDCONTROL

COMPONENTS FOR OIL HYDRAULICS & LUBRICATION TECHNOLOGY



FLUIDCONTROL

WHAT DOES FLUIDCONTROL STAND FOR?



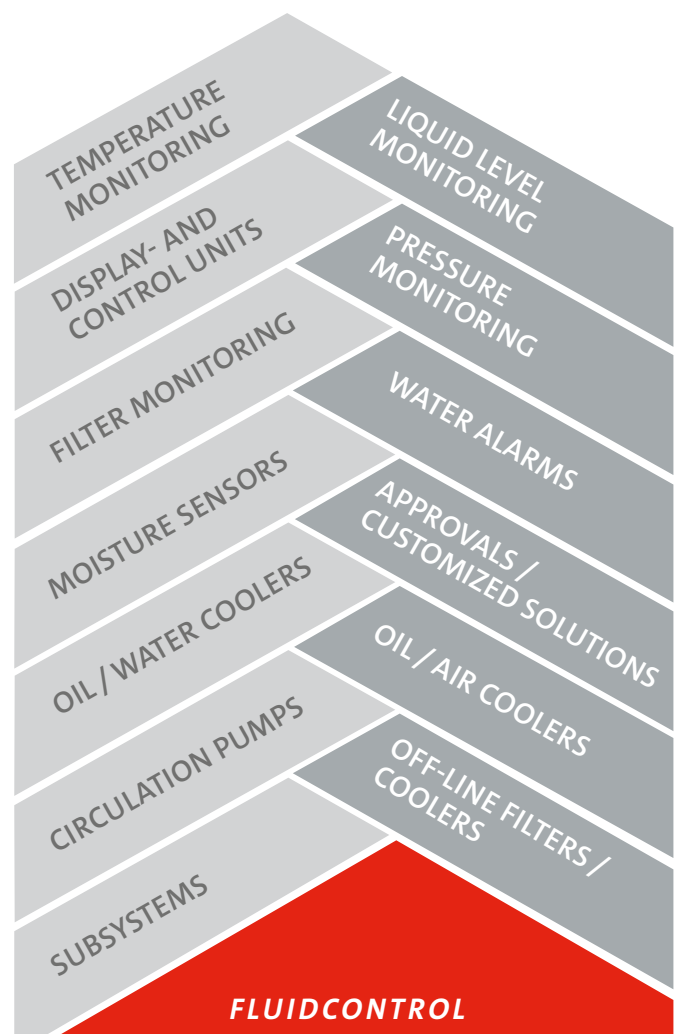
Since the foundation of the company in 1969, we have specialized in applications for oil hydraulics and lubrication technology with specific products and processes. By operating this business division under the heading of Fluidcontrol, we express this specific bond to the market.

Our consistent concentration on specific requirements of the OEMs as well as the end users has made us one of the leading global providers. Our innovative products with their unique logical functional density – but without bells and whistles – set the standards for accessories in the international market for oil hydraulics and lubrication technology.

We offer flexible, system-compatible sensors and devices with state-of-the-art output signals for liquid level, temperature and pressure monitoring as well as for filter and moisture monitoring. With the oil/water and oil/air coolers, filtering units and customer-specific subsystems, we meet today's requirements in terms of a cost-effective and reliable operation of oil installations, even in hazardous areas.

The Fluidcontrol product line from Buhler Technologies extends the service life of oil and components, provides connectivity for automated

operation, facilitates condition monitoring and helps reduce operating and maintenance costs.



SENSORS

FLUIDCONTROL

INNOVATIVE WAY TO USE
OIL LONGER – SMART.
CONNECTIVE. EFFICIENT.

LIQUID LEVEL



TANK TOP INSTALLATION MULTIFUNCTIONAL

Our multifunctional devices reduce space requirements and facilitate routine maintenance.



TANK TOP INSTALLATION LIQUID LEVEL

These devices equipped with dynamic floats serve liquid level monitoring as multifunctional devices for the simultaneous monitoring of liquid level, temperature and ventilation in oil tanks for hydraulic and lubrication systems.



TANK TOP

Combinations of visual liquid level displays and electrical contact/sensors for installation on tank tops, also suitable for contaminated media.



EXTERNAL TANK INSTALLATION BYPASS

A combination of visual liquid level displays and electrical contact/sensors, also for applications in pressurised tanks/accumulators. Available in various pressure ratings.

SENSORS

TEMPERATURE / PRESSURE / FILTER MONITORING / MOISTURE



TEMPERATURE MONITORING

Temperature switches and sensors for the measurement and monitoring of the operating temperature. Local or remote display with programmable outputs.



PRESSURE MONITORING

Pressure monitoring in hydraulic systems is a parameter for the transmitted power. Bühler's pressure measurement technology reduces the risk of leakage and the installation costs decrease significantly.



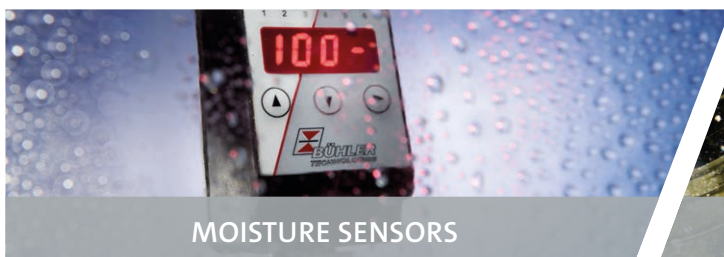
DISPLAY- AND CONTROL UNITS

Multitronik is a universal device to display and control the measured variables required in fluid technology. It was developed following the VDMA (German Mechanical Engineering Industry Association) standard specification 245741.



WATER ALARMS

Physical dividing layer monitoring free water in the bottom of the vessel. Reliable function regardless of the chemical composition of the oil. Mounting kits optional.



MOISTURE SENSORS

These sensors can be used to measure the relative moisture in oil before the saturation point of the oil is reached and free water is formed. They're available as pure transmitters as well as with a local display.



FILTER MONITORING

Continuously monitoring the dirt holding capacity of the filter element. Parameterizable, various connection configurations for different pressure filters.

COMPONENTS

COOLERS / FILTRATION / PUMPS / SUBSYSTEMS



BWT PLATE HEAT EXCHANGERS

The BWT plate heat exchangers provide a very effective heat transfer. Thanks to the compact plate connection and the sensible profiles of the plates we achieve better exchange capacities with significantly smaller dimensions.



OIL-/ AIR COOLERS

A complete product line for efficient temperature stabilization using ambient air in oil systems. Robust cooling matrices and energy-efficient low noise fans are the key components of these low-maintenance designs.



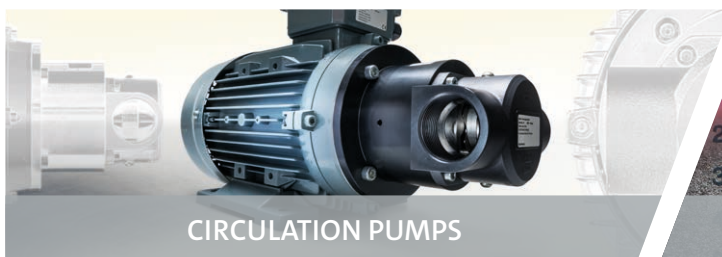
OFF-LINE FILTERS / COOLERS

The advantage of this arrangement is that as a result of the constant flow rates in such off-line units, the required cooler size can be determined more precisely and can often be designed smaller.



OFF-LINE FILTRATION

The product line includes small compact standard units as well as subsystems arranged according to customer specifications.



CIRCULATION PUMPS

This design principle combines low noise emission of Gerotor pumps with limited susceptibility to solid contamination.



SUBSYSTEMS

We design and manufacture subsystems, to complete your systems.

FLUIDCONTROL

INNOVATIVE WAY TO USE OIL LONGER –
SMART. CONNECTIVE. EFFICIENT.



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2 Controls

2.1	Liquid Level and Temperature -	16
2.2	Liquid Level -	119
2.3	Liquid Level -	126
2.4	Temperature Measurement	158
2.5	Pressure Measurement	185
2.6	Empty.....	202
2.7	Standard Controller.....	204
2.8	Water Alarms	209
2.9	Filter Monitoring	219
2.10	Empty.....	228
2.11	Customized Products.....	230
2.12	Approved Devices.....	259
2.13	Oil Condition Sensors	295

Chap. 3. Tank top installation - Liquid level or temperature and liquid level

Multifunction

All about DIN flange....

- switch and/ or analogue signals
- breather filter
- and more...

Basis functions ...

- switch and/ or analogue signals

Compact ...

- switch and analogue signals



Chap. 4. Liquid level tank top installation

Visual and electric

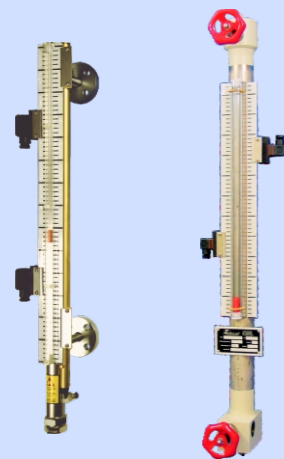
- scale
- switch and analogue signals



Chap. 5. External installation liquid level

Visual und electric ...

- scale
- switch and/ or analogue signals



Chap. 6. Temperature

Surveillance and limitation ...

- switch and/ or analogue signals



Chap. 7. Pressure

For limitation ...

- switch and analogue signals



Chap. 9. The standard controller

One unit for all applications clipped on rail mounting ...

- °C / °F
- bar / Pas / kPas / MPas / psi
- %
- L / gal
- cm / inch



And more ...

Chap. 10. Water alarms



Chap. 11. Filter monitor



Chap. 13. Controls according customers specification

Chap. 14. Controls with approval



Controls

Liquid level, temperature, pressure...

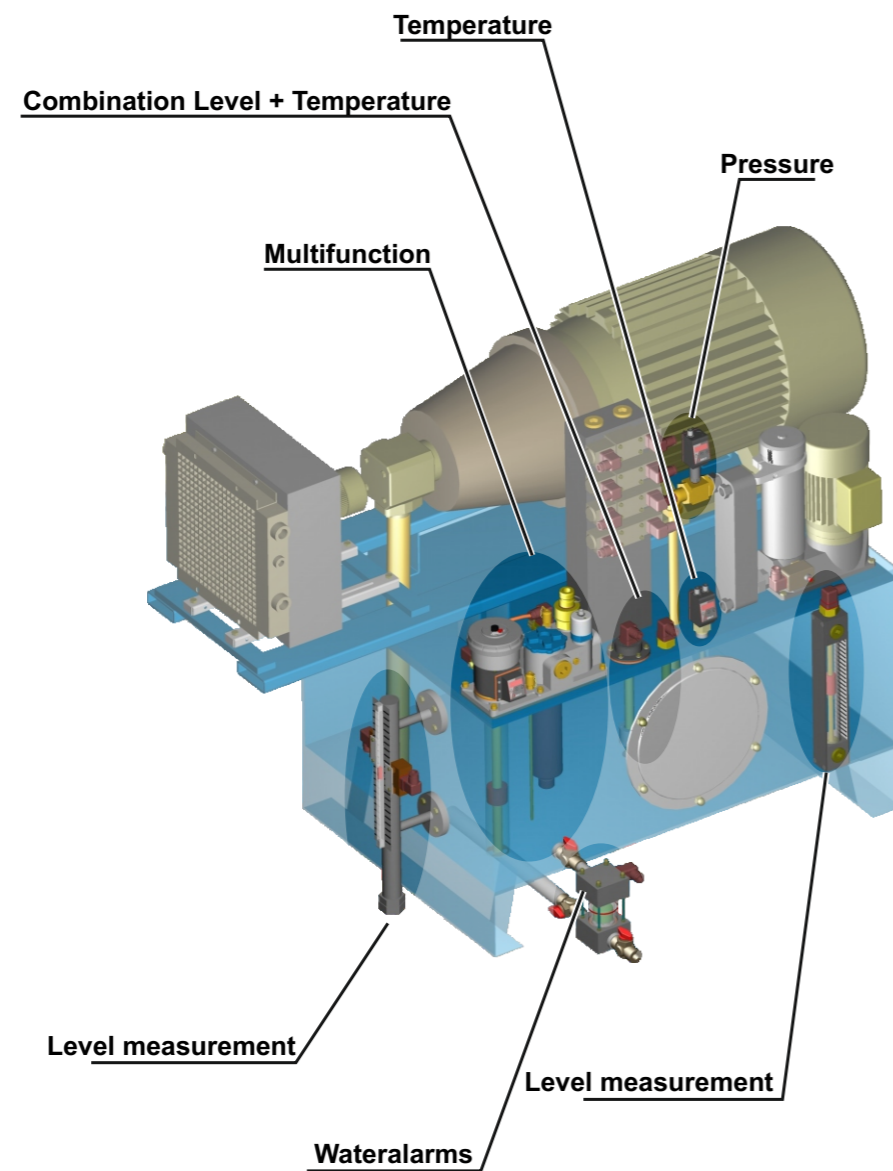
...the standard measurement categories of the fluid technology.

Bühlers Fluidcontrol division develops and manufactures equipment and accessories for hydraulic and lubrication systems for more than 40 years.

It is our ambition to provide on the market asked products which increase the systems' reliability and have a high customer benefit, too.

The following overview outlines our comprehensive range of application oriented instruments and combinations. Connecting dimensions and function volume open to aggregate manufacturer the system- compatible choice of function, signal generation or -form as well as an economic installation and combination.

The high degree of standardised components and common software offers both, the OEM and the end user, advantages in many aspects such as logistics, maintenance and cost saving.





2.1 Liquid Level and Temperature -

Liquid level or temperature and liquid level

Global competition requires the manufacturers of hydraulic and lubrication systems to offer advanced products at competitive pricing.

Efficient system designs employing components with high integration of functions and good accessibility for easy maintenance are the keys to a highly competitive position.

If the physical size of the reservoir allows, it is common practice to install all controls for level and temperature at the tank top. Good visibility and easy access are the benefits.

The integration of relevant functions into one installation unit reduces space requirements and costs for development, logistics and work.

Multiterminal

Compact combination of return line filter, filling port and breather filter with integrated level and temperature controls. Binary and/ or analogue signals, adjustable or programmable.

Fluidcontrolterminal

Combination of filling port, sample port and breather filter with integrated level and temperature controls. Flange pattern according to DIN 24557 T2. Binary and/ or analogue signals, adjustable or programmable.

Nivovent series

Breather filter with integrated level and temperature controls. Flange pattern according to DIN 24557 T2. Binary and/ or analogue signals, fixed, adjustable or programmable:

- **Nivovent 77-XP** the new power pack standard
- **Nivovent 74 easy just**
- **Nivovent 73** analogue signals only
- **Nivovent 71** the flexible basis

Nivotemp series

Level and temperature controls. Flange pattern according to DIN 24557 T2. Binary and/ or analogue signals, fixed, adjustable or programmable:

- **Nivotemp 67-XP** the new power pack standard
- **Nivotemp 64 easy just**
- **Nivotemp 63** analogue signals only
- **Nivotemp 61** the flexible basis

Nivotemp-M / MD series

Level and temperature controls. Male 3/4" BSP boss. Binary signals for level, programmable binary or analog signals for temperature surveillance.

Level switch for operation in hazardous areas

see chapter 14: Controls with approval



Multiterminal MT

Global competition demands standardized basic functions from hydraulic systems with a flow volume of up to 100 l/min and tank sizes up to 150 liters. National and international standards also require minimum maintenance and monitoring requirements. The Multiterminal ideally fulfills these tasks in the performance class mentioned. In a compact basic housing it combines essential functions such as filling, ventilation and return filtration, offers the monitoring functions temperature and level as well as the safe taking of oil samples from tank and return line. The Multiterminal can be installed easily accessible on just one opening on the tank top, making maintenance considerably easier. The filter elements are standardized according to DIN 24550, temperature and level are communicable via IO-Link.

Return filter for DIN elements up to NG 100

Three connections for return line

Filling port with quick coupling

Filling control optional

Electronic return filter monitoring

Sampling ports in tank and return line

Air breather with integrated liquid level and temperature monitoring



Technical Data

Multiterminal

Material

Multiterminal block	GK-ALSi12
Block seal	GI cork
Filter cover and bell cover	Plastic

Filter data (return filter)

Bypass opening pressure	Δp 3.5 bar (50.8 psi) $\pm 10\%$
Filter sizes	NG 40/NG 63/NG 100
for filter elements per	DIN 24550

Weight

Multiterminal base version (NG 40, NG 63 or NG 100)	~ 3.5 kg (7.7 lb)
---	-------------------

Dimensions

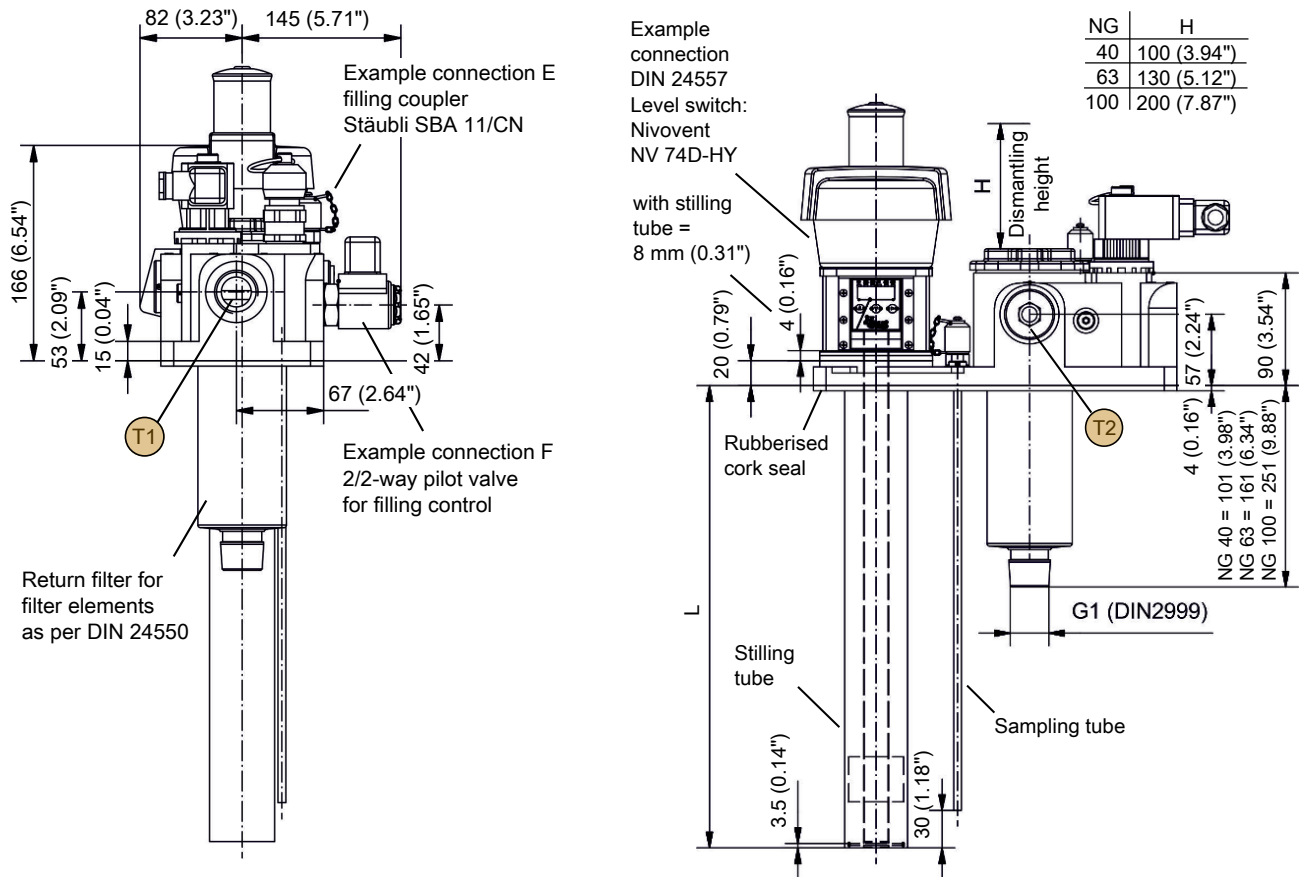
NOTICE



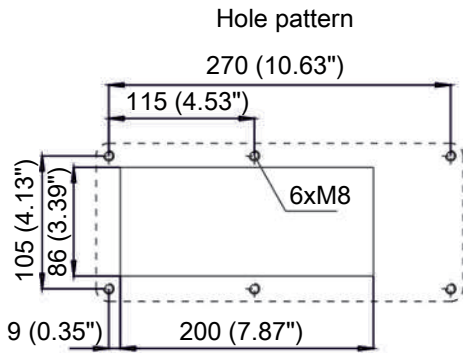
Sample multiterminal equipment

The drawing shows the sample equipment of the multiterminal. The hole pattern as per DIN 24557 and the connections D, E, F can optionally be equipped as specified below. The connections T1, T2, T3, X1, X2 and X3 are prefixed as specified. The built-in return filter (without filter element) is available in three different nominal sizes and is part of the basic multiterminal.

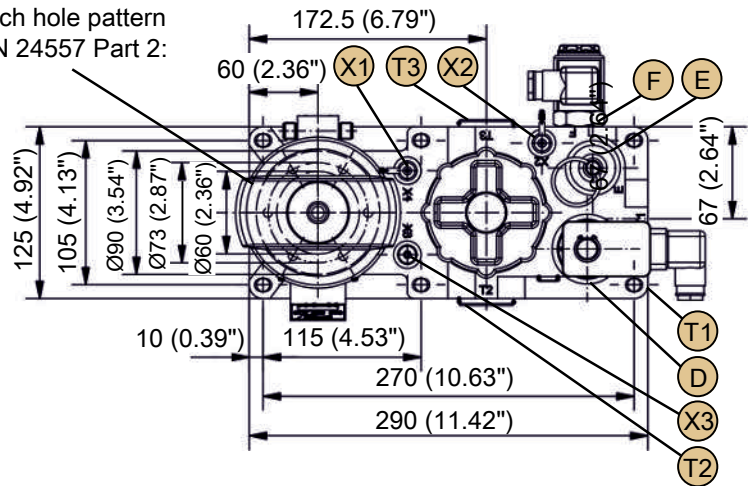
Dimensions



Hole pattern



Level switch hole pattern
as per DIN 24557 Part 2:
6xM5



Optional connections:

- D = back pressure sensor or sealing plug M30x1.5
- E = G1/2 filling coupler
- F = Flutec 2/2-way pilot valve or M27x2 sealing plug
- DIN 24557/T2 = Nivovent 7 series level- and temperature switch (others on request), as desired

Prefixed connections:

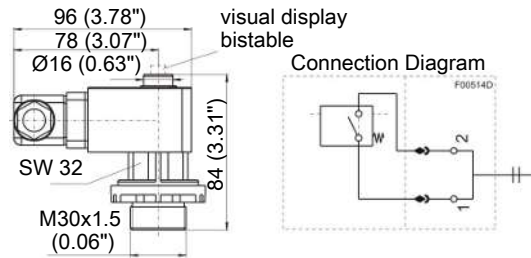
- T1 = available G1 connection to return filter
- T2/T3 = G1 sealing plug (alternative connections for return filter - connection T1)
- X1 = G1/8 Minimes screw connection with attached tube for sampling from the tank
- X2 = G1/8 Minimes screw connection for sampling upstream from the return filter
- X3 = G1/8 sealing plug (alternative connection for X1)

(The equipment on connection T1, T2 and T3 as well as connections X1 and X3 can be interchanged by the customer.)

Connection D - Back Pressure Sensor Or Sealing Plug

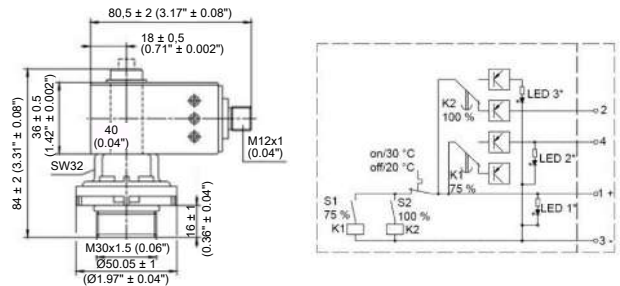
Type Filtration Group PIS 3085/2.2

Max. operating voltage	250 VAC / 200 VDC
Max. switching current	1 A
Max. switching output	70 W
Rated pressure/temperature	10 bar (145 psi)/ -10 to +80°C (14 °F to 176 °F)
Gauge pressure	2.2 bar (32 psi)
Display type	Visual / electric
IP rating	IP65 (mated)
Contact type:	NO contact / NC contact
Electrical connection	DIN EN 175301-803, PG11
Material	PA 66 / PA 6



Type Filtration Group PIS 3153/1.7/2.2

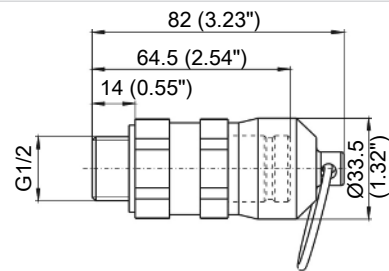
Max. operating voltage	10-30 V
Max. switching current	1 A
Max. switching output	20 W
Rated pressure / temperature	10 bar (145 psi)/ -10 to +80°C (14 °F to 176 °F)
Gauge pressure	1.7 / 2.2 bar (25/32 psi)
Display type	Visual / electric
IP rating	IP65 (mated)
Contact type:	NO contact / NC contact
Electrical Connection	M12x1
Material	PA 66 / PA 6



Connection E - Filling Coupler Or Sealing Plug

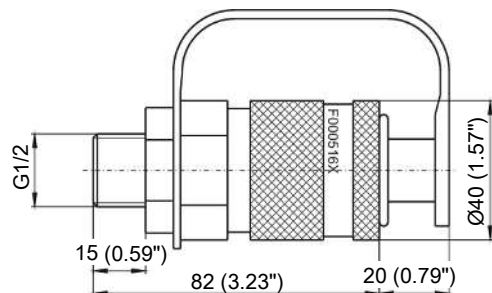
Type Stäubli SBA 11/CN

	(receptacle)
Nominal width	11
Thread	G 1/2
Material	Chromium steel / tempered steel



Type Walther MD-012

	(filling coupler)
Nominal width	12
Thread	G 1/2
Material	Galvanised / bronzed steel



Connection F - Filling Control Or Sealing Plug

Function description of the filling control:

The filling control is used to automatically stop tank filling once the maximum level is reached. The valve is controlled using the top level contact Lx.

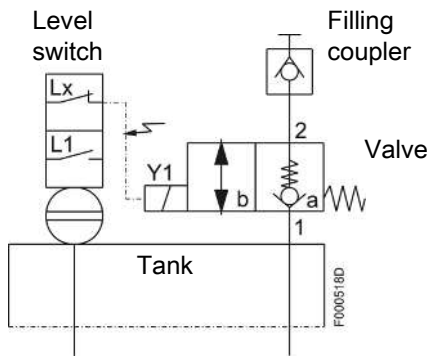
When the system is switched on, the valve switches to position "b", i.e. the valve is flowing freely from 2 to 1, oil can be added using the filling coupler.

When the top level contact (NC contact on Lx) is reached, the valve returns to position "a". The valve is closed from 2 to 1 and oil cannot enter the tank through the filling coupler.

During operation, a second level contact (NO contact on L1) emits an alert when the oil level is low. In the case of external control, the tank can now automatically be filled via the filling coupler or service staff be prompted to add oil.

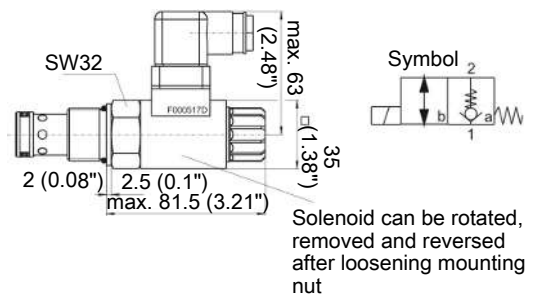
In both cases, when the top level contact Lx is reached, the valve is switched back to position "a" and filling stops.

The entire control unit for automatic filling with NV 7x series level switch (except NV73 K/KN) of your choice is also available from Bühler Technologies GmbH.



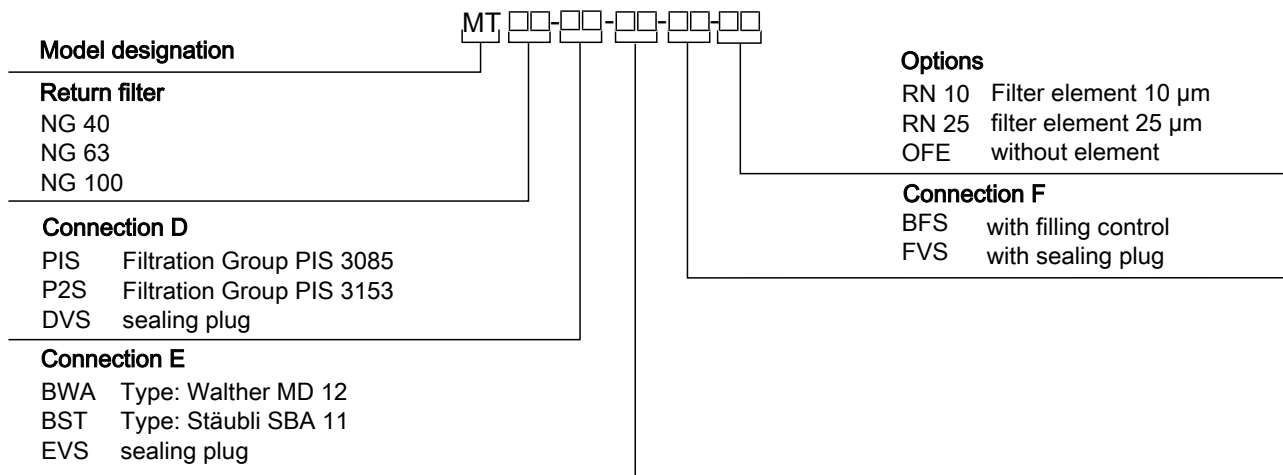
Type Flutec (2/2-way pilot valve)

Q max.	100 L/min.
p max.	280 bar (4060 psi)
Nominal voltage	24 VDC (-5/+10%)
Nominal current	1.04 A
IP rating	IP65
Hydraulic fluid temperature range	min. -20 °C (-4 °F), max. +80 °C (176 °F)
Viscosity range	min. 10 mm ² /s, max. 380 mm ² /s
Connector	DIN EN 175301-803, PG11



For hydraulics as per DIN 51524 Part 1 and 2
 Max. operating fluid contamination as per NAS 1638 Class 10.

Multiterminal Model Key



Ordering example:

You require:

Basic NG 63 multiterminal optional connections equipped as follows:

Connection:

D (back pressure sensor)	Filtration Group PIS 3085
E (filling coupler)	Walther MD-012
F (filling control)	Sealing plug M27x2
Accessories	Filter element N 0063 RN 10, filter fineness 10 µm

Order:

MT NG 63-PIS-BWA-FVS-RN10

Connection DIN 24557 Part 2 (Level-/temperature switch with vent filter)

Example:

Level switch type Nivovent NV 74 for multiterminal, brass, length L= 370 mm (14.57 in) (measured from multiterminal block bottom edge), M12 plug, one level contact at L=190 mm (7.48 in) as falling NO contact (NO), one temperature contact 60 °C (140 °F) as NC contact (NC) and vent filter with visual contamination indicator.

Order:

NV 74-HY-MS-M12-370-1K-TK60NC-MT-VS

L1=190 mm f.S.

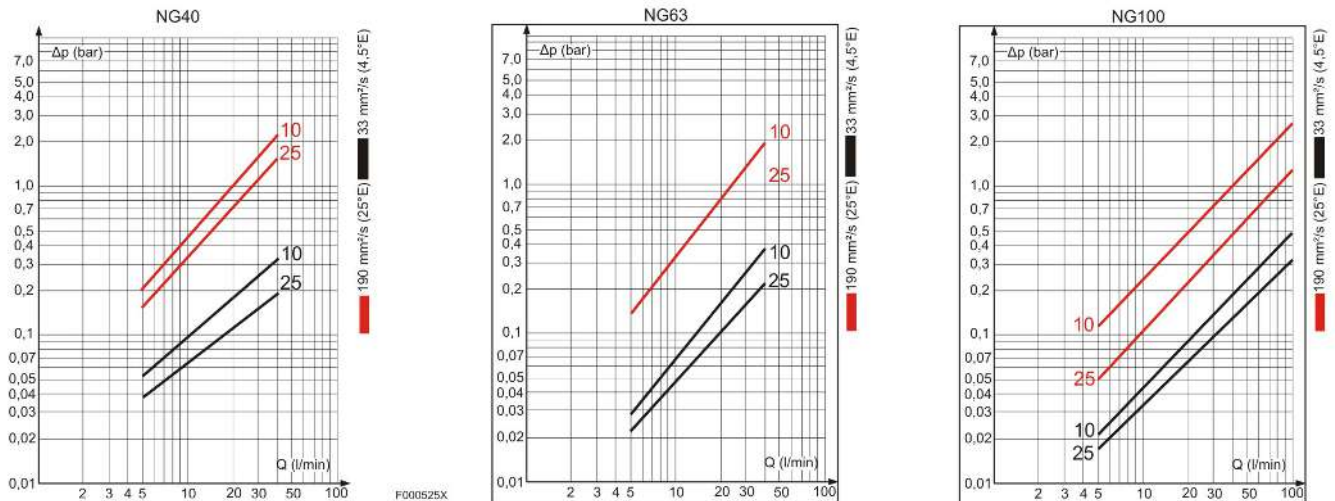
Spare Parts And Consumables

Return filter replacement elements:

Filter	Filter unit	Filter element	Item no.
NG 40	10 µm	N0040RN2010	76910962
	25 µm	N0040RN2025	76911127
NG 63	10 µm	N0063RN2010	76910970
	25 µm	N0063RN2025	76911135
NG 100	10 µm	N0100RN2010	76910988
	25 µm	N0100RN2025	76911143

For air filter elements, please refer to the respective operating and installation instructions for the level switch or the documentation from the air filter manufacturer.

Return filter performance curves:



Connection DIN 24557

NOTICE

Multiterminal MT equipment



With the DIN 24557 Part 2 connection equipped with a level/temperature switch, the multiterminal always consists of two parts. The first part being the multiterminal MT from this data sheet, and the second part being a Nivovent NV 7x series level switch (see ordering example). This also shows a list of the NV Nivovent models which can be used. Please refer to the respective data sheet for the exact configuration of the level switch. (Please contact us regarding built-in filling control.)

Multiterminal base unit consists of:

Multiterminal block, block seal, connections T1-T3, X1-X3 pre-equipped as specified.

Level Switch Overview

Level switch

NV 74 for multiterminal

For technical data, please see data sheet no. 10 0205

- Hydac vent filter
- Easy and quick to adjust level contacts
- Plug and play system
- Up to 4 contacts
- Bi-metal contacts, Pt 100 or 4-20 mA output signal for temperature
- **NV 74D plus display and control unit**
- Easy to operate via three keys
- Bevelled LED display for optimal visibility
- Up to 4 programmable temperature switching outputs
- Optional continuous temperature output signal, programmable 4-20 mA, 0-10 V or 2-10 V



Level switch

NV 71 for multiterminal

For technical data, please see data sheet no. 10 0204

- Hydac vent filter
- Easy and/or adjustable level contacts
- Up to 4 contacts
- 230 V supply voltage possible
- Bi-metal contacts, Pt 100 or 4-20 mA output signal for temperature
- **NV 71D plus display and control unit**
- Easy to operate via three keys
- Bevelled LED display for optimal visibility
- Up to 4 programmable temperature switching outputs
- Optional continuous temperature output signal, programmable 4-20 mA, 0-10 V or 2-10 V



Level switch

NV 73 for multiterminal

For technical data, please see data sheet no. 10 0206

- **Continuous liquid level measurement**
- Hydac vent filter
- Alternatively with continuous temperature measurement 4-20 mA output
- Resolution 5 mm (0.2 in)
- Various plug options



Level switch

NV 77-XP for multiterminal

For technical data, please see data sheet no. 10 0203

- **Continuous liquid level measurement**
- Hydac vent filter
- 4-20 mA
- Resolution 5 mm (0.2 in)
- Sensor length up to 1420 mm (55.91 in)
- **Display and control unit**
- 4 switching outputs programmable as level- and temperature alarm output
- Alternatively 2 switching outputs programmable as level- and temperature alarm outputs + 1 analog output each for continuous level- and temperature analysis
- Analog output programmable 4-20 mA, 0-10 V, 2-10 V or 0-5 V



Fluidcontrolterminal FCT

The ventilation filtration, filling, liquid level monitoring and temperature monitoring as well as safe oil sampling are among the basic functions of an oil tank. In the circuit diagram for the ventilation filter as per DIN 24557 T2, the FCT fluid control terminal offers these functions in a single, compact device. This considerably reduces the space required on the tank cover.

The high functional density in a single unit reduces installation and procurement costs as well as logistics efforts considerably. Good access improves maintenance, the filling coupler prevents secondary contamination during filling.

Temperature and liquid level monitor are able to communicate via commIO link.

Flange dimensions as per DIN 24557 T2

Air breather with integrated liquid level and temperature monitoring

Filling port with quick coupling

Sampling port with quick coupling

Visual air breather monitoring optional



Technical Data

Basic data

Operating pressure:	max. 1 bar (14.5 psi)
Operating temperature:	max. +80 °C (176 °F)
Weight at L = 500 mm (19.7"):	approx. 5 kg (11 lb)
Dimensions L*:	280 (11"), 370 (14.6"), 500 (19.7") (Standard) variable to max. 1420 mm (55.9")

* Please note, the dimension L of the filling port and the selected level switch must be identical!

Material

Stilling tube	Brass
Flange:	Galvanised steel

Option 1 Sampling

Hose coupling (DN 5):	PSK
Minimess coupler (M16):	PMM

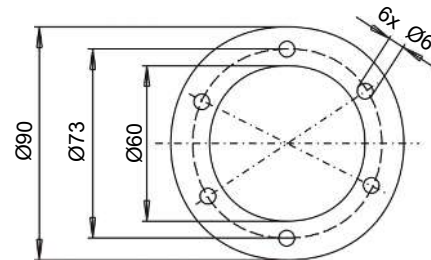
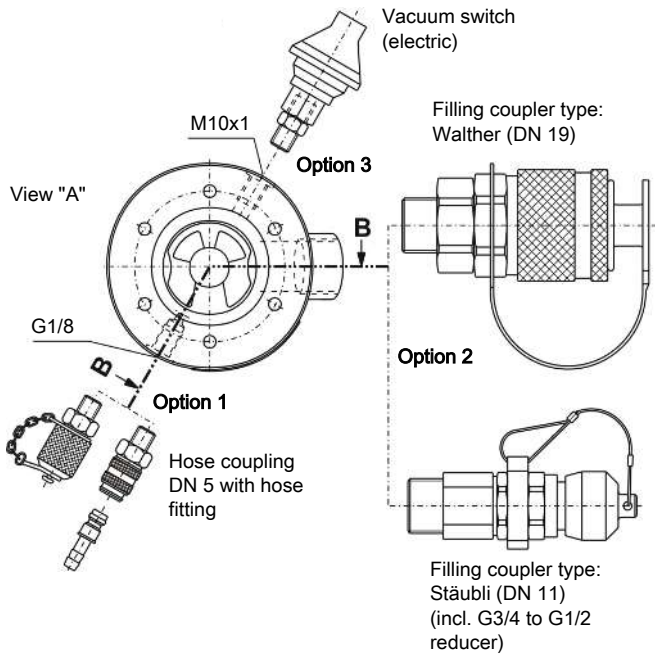
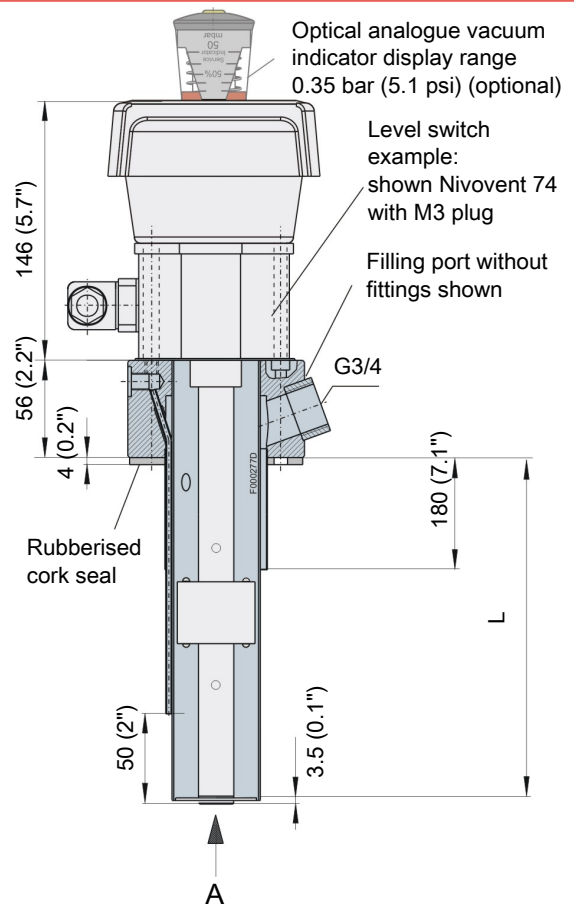
Option 2 Filling coupler

Type: Walther (DN 19):	BWA
Type: Stäubli (DN 11):	BST
Dummy plug:	BBS

Option 3 Contamination indicator

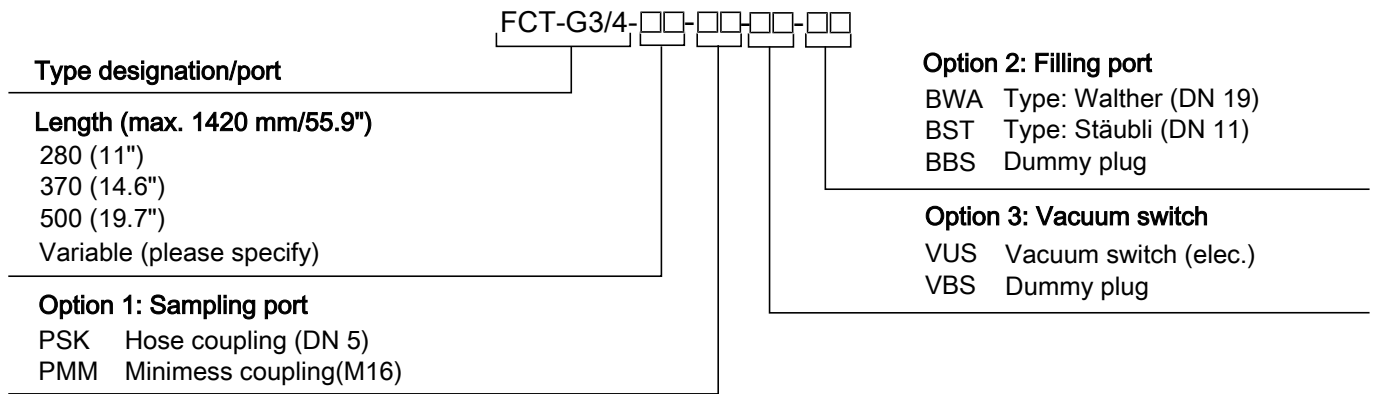
Vacuum switch (elec.):	VUS
Dummy plug:	VBS

Dimensions



Installation opening as per DIN 24557/Part 2

Model Key



General note:

The fluid control terminal always consists of a filling port and a level switch. You will find a list of compatible Nivovent types in this data sheet. For the exact level switch configuration, please refer to the respective separate data sheet.

Ordering example:

You require: A **filling port** L=370 mm (14.6") in length, with Minimes coupler, filling coupler type Walther and electric vacuum switch.

The **level switch** should be type Nivovent 74, brass, length L = 370 mm (14.6"), M12 plug, one level contact for L1 = 190 mm (7.5") as NO contact, one temperature contact 60 °C (140 °F) as NC contact, and vent filter with optical contamination indicator.

Order: **Filling port**
 FCT-G3/4-370-PMM-BWA-VUS

Level switch
 NV 74-HY-MS-M12/370-1K-TK60NC-FCT-VS
 L1 = 190 mm (7.5") f.S.

Level Switch Overview

Level switch

NV 71-FCT for fluid control terminal

For technical data, please see data sheet no. 10 0204

- Hydac vent filter
- Level and/or temperature control
- Up to 4 contacts
- 230 V supply voltage possible
- Bimetal contacts, Pt100 or 4-20 mA output signal for temperature
- **NV 71D plus display and control unit**
- Easy to operate via three keys
- Bevelled LED display for optimal visibility
- Up to 4 programmable temperature switching outputs
- Optional continuous temperature output signal, programmable 4-20 mA, 0-10 V or 2-10 V



Level switch

NV 73-FCT for fluid control terminal

For technical data, please see data sheet no. 10 0206

- **Continuous liquid level measurement**
- Hydac vent filter
- Alternatively with continuous temperature measurement 4-20 mA output
- Resolution 5 mm (0.2")
- Various plug options
- Sensor length up to 1420 mm (55.9") (other lengths on request)



Level switch

NV 74-FCT for fluid control terminal

For technical data, please see data sheet no. 10 0205

- Hydac vent filter
- Easy and quick to adjust level contacts
- Plug-in plug
- Up to 4 contacts
- Bimetal contacts, Pt100 or 4-20 mA output signal for temperature
- **NV 74D plus display and control unit**
- Easy to operate via three keys
- Bevelled LED display for optimal visibility
- Up to 4 programmable temperature switching outputs
- Optional continuous temperature output signal, programmable 4-20 mA, 0-10 V or 2-10 V



Level switch

NV 77-XP-FCT for fluid control terminal

For technical data, please see data sheet no. 10 0203

- **Continuous liquid level measurement**
- Hydac vent filter
- 4-20 mA output
- Resolution 5 mm (0.2")
- Tried and tested float system
- Sensor length up to 1420 mm (55.9")
- **Display and control unit**
- 4 switching outputs programmable as level- and temperature alarm output
- Alternatively 2 switching outputs programmable as level- and temperature alarm outputs + 1 analog output each for continuous level- and temperature analysis
- Analog output programmable 4-20 mA, 0-10 V, 2-10 V or 0-5 V
- Switchable level- or temperature actual value display



Level- and temperature sensor

Nivovent NV 77-XP

The oil tank is the key component of hydraulic and lubrication systems. The operating oil is removed from the tank and then returned to it. Depending on what the system is used for, the levels in the oil tank can fluctuate to varying degrees. In most applications, the level fluctuations result in an exchange of the vapour phase above the oil level with the ambient air. Therefore, virtually all oil tanks are equipped with a so-called air breather, to prevent contaminants in the ambient air from entering the system.

To reduce costs and space requirements, a number of other system-related functions such as liquid level and temperature monitoring are also combined in the air breather in the Nivovent series.

NV 77-XP

Connecting flange as per DIN 24557 Part 2

Combined, continuous liquid level and oil temperature monitoring

6 programmable switching outputs assignable as level or temperature signal

Alternatively with IO-Link and 1 x programmable switching output

Alternatively with one analog output each (current/voltage setting) for level and temperature plus 2 or up to 6 freely programmable switching outputs

In normal mode the LED display shows the actual temperature, with status of the switching outputs

Standard menu structure based on VDMA standard sheet 24574 ff.

Characteristics of switching outputs configurable as window or hysteresis

Switching output configurable as frequency output (1-100 Hz)

Min/max memory, logbook function

Proven and tested highly dynamic float system

Immersion tube in matched lengths to max. 1420 mm (55.9 in), other lengths available upon request



Technical Data NV 77-XP
Basic unit

Version	MS	VA
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 604	SK 221
Min. fluid density	0.80 kg/dm ³ (0,029 lb/in ²)	0.85 kg/dm ³ (0,029 lb/in ²)
Lengths (all versions)	280 (11 in), 370 (14.6 in), 500 (19.7 in), 670 (26.4 in), 820 (32.3 in), 970 (38.2 in), 1120 (44.1 in), 1270 (50 in), and 1420 (55.9 in) mm (other lengths available upon request)	

Material/Version

Display housing	PA	PA
Float	rigid PU	1.4571
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm	approx. 850 g (1.873 lb)	approx. 950 g (2.094 lb)
Each 100 mm add	approx. 30 g (0.066 lb)	approx. 50 g (0.110 lb)
Degree of protection	IP65	IP65

Options

Stilling tube (SSR)	Brass	VA
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Vent filter
All versions HY type Hydac BF 7

Filter fineness	3 µm
Additional equipment	Filler cap – n/a with filling adapter

Analysis Display Electronics

Display	4 character 7 segment LED	
Operation	Via 3 keys	
Memory	Min. / Max. Data memory	
Starting current input	approx. 100 mA for 100 ms	
Current input during operation	approx. 50 mA (without current- and switching outputs)	
Supply voltage (U _b)	10 – 30 V DC (nominal voltage 24 V DC) / with IO-Link 18 – 30 V DC	
Ambient temperature	-20 °C to +70°C (-4 °F to 158 °F)	
Display units	Level %, cm, L, i, Gal	Temperature °C / °F
Display range	adjustable	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	e.g. 0 – 100 %	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value	± 1 % from end value

Input values

	Level	Temperature
Principle of measurement	Reed-contact	Pt100 Cl. B, DIN EN 60751
	Resolution 5 mm (0.197 in)	Tolerance ± 0.8 °C (1.44 °F)

Optional switching outputs

	1D1S	4S	6S
Plug (base)	1 x M12 – 4-pin	2 x M12 – 4-pin	1 x M12 – 8-pin
Switching outputs	IO-Link and 1 x freely programmable with level or temperature assignment options	4 x freely programmable with assignment options, e.g. 2 x level/ 2 x temperature*	6 x freely programmable with assignment options, e.g. 4 x level/ 2 x temperature*
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current**	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total

*also programmable as frequency output

**Output 1 max. 0.2 A.

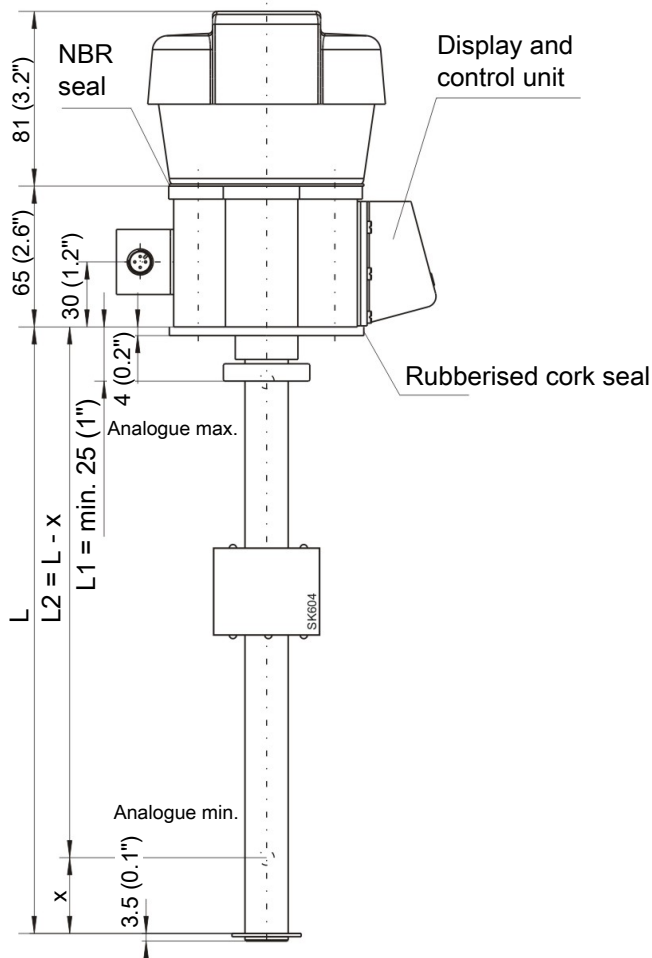
	2S-KN-KT	4S-KN-KT	6S-KN-KT
Plug (base)	2 x M12 – 4-pin	1 x M12 – 8-pin	2 x M12 – 4-pin / 8-pin
Switching outputs	2 x freely programmable with level or temperature assignment options	4 x freely programmable with level or temperature assignment options	6 x freely programmable with level or temperature assignment options
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current*	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analogue outputs	1x level 1x temperature	1x level 1x temperature	1x level 1x temperature
Programmable as	4 – 20 mA, 2 - 10 V, 0 - 10 V, 0 - 5 V	4 – 20 mA, 2 - 10 V, 0 - 10 V, 0 - 5 V	4 – 20 mA, 2 - 10 V, 0 - 10 V, 0 - 5 V
Max. burden Ω as current output	$(U_B - 8 V) / 0.02 A$	$(U_B - 8 V) / 0.02 A$	$(U_B - 8 V) / 0.02 A$
Min. input load as voltage output	10 k Ω	10 k Ω	10 k Ω

**Output 1 max. 0.2 A.

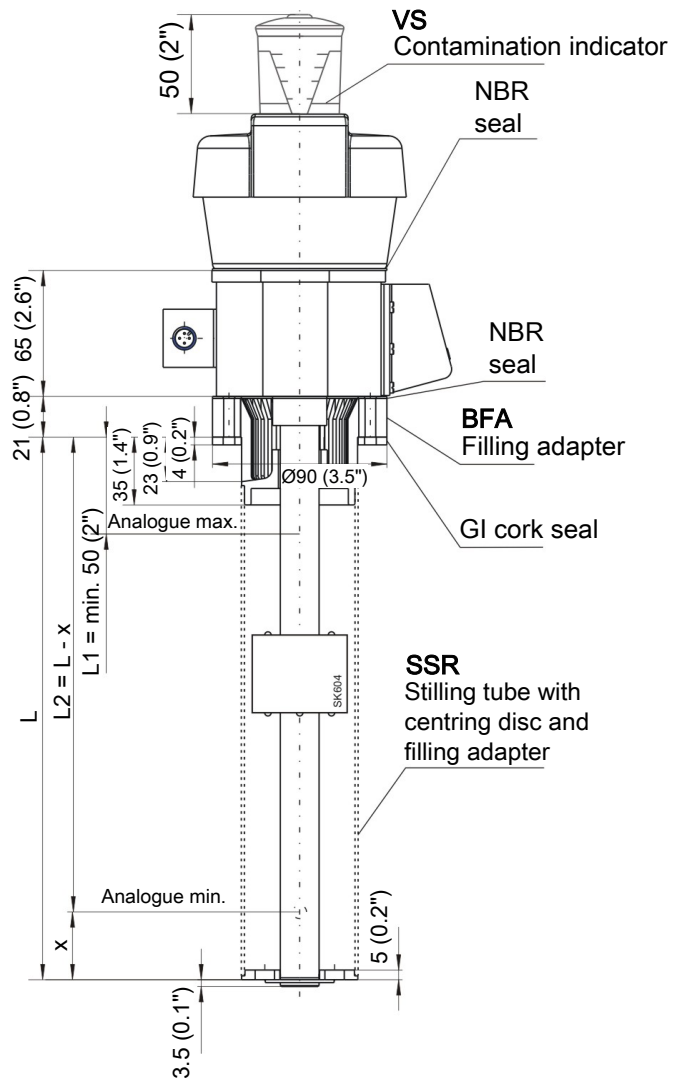
Other output cards available upon request.

Dimensions NV 77-XP

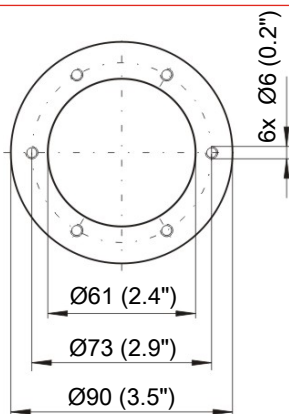
Basic version



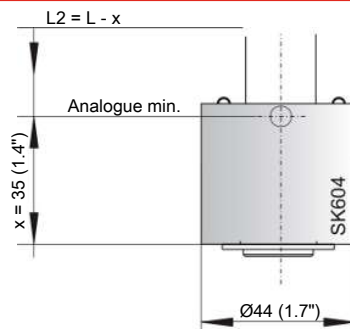
With options



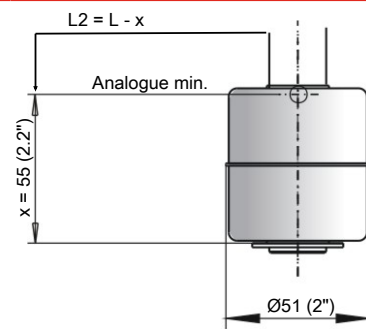
Flange drawing



SK 604 float for
NV 77-XP-MS



SK 221 float for
NV 77-XP-VA



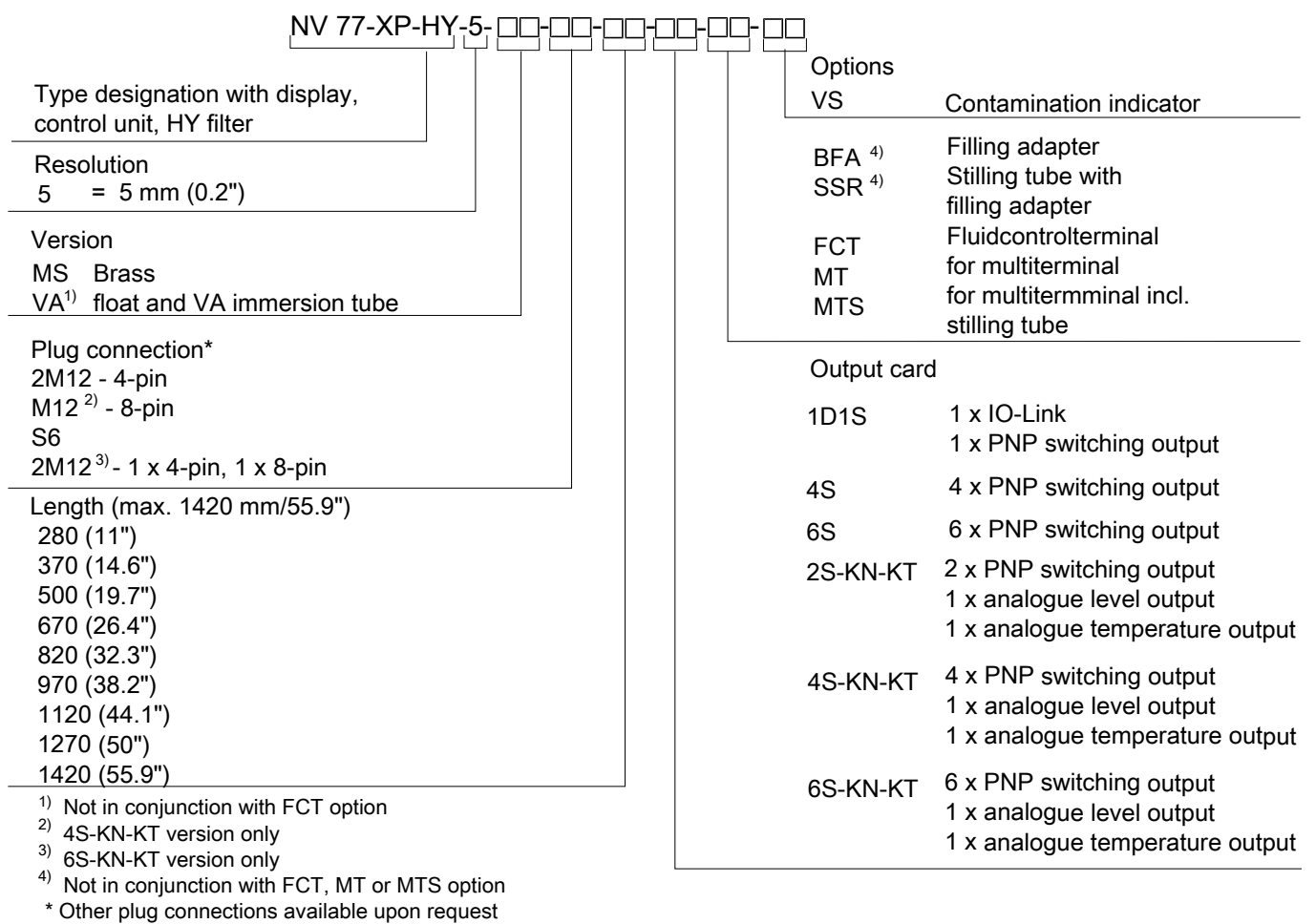
Ordering Instructions NV 77-XP

Options / Accessories

- VS** Visual air breather **clogging indicator**: Analogue underpressure indicator, display range 0.35 bar (5.1 psi).
- BFA*** **Filling adapter** incl. ribbed flange: This option allows adding small oil quantities via the air breather housing. The corresponding housing is therefore equipped with that version.
- SSR*** **Stilling tube** with support ring and filling adapter: This includes the optional stilling tube as well as the same filling option as the BFA. The stilling tube is made of the same material as the requested immersion tube (MS/VS).
- MT** For integration in **Multiterminal**: The basic unit will be mounted to the Multiterminal (MT). For specification please refer to the Multiterminal data sheet.
- MTS** For integration in **Multiterminal including stilling tube**: In addition to the basic unit, a stilling tube with centring rod is installed in the Multiterminal.
- FCT** **Fluid control terminal**: Here the fluid control terminal (FCT) mounts directly onto the basic version. For details please refer to the fluid control terminal data sheet.

* not available in conjunction with FCT and MT/MTS option.

Model key



Accessories

Item no. 4-pin	Item no. 8-pin	Description
9144050010	9144050048	Connecting cable M12x1, 1.5 m (4,92 ft), angular coupling and straight plug
9144050046	9144050049	Connecting cable M12x1, 3.0 m (9,84 ft), angular coupling and straight plug
9144050047	9144050033	Connecting cable M12x1, 5.0 m (16,40 ft), angular coupling and strands

Ordering example

You require: Level and temperature measurement with 5 mm (0.2") resolution, MS version, 2xM12 connector, L=670 mm (26.4"), clogging indicator, display and control unit with 2 PNP switching points and analogue output for level and temperature.

Order: NV 77-XP-HY-5-MS-2M12 / 670-2S-KN-KT-VS

Standard pin assignment NV 77-XP

Plug connection

	S6	M12 (EBS)	2 x M12 (EBS) (galvanically isolated)
Dimensions			
Number of pins	6 pin + PE	8 pin	4 pin / 4 pin 4 pin / 8 pin
DIN EN	175201-804	61076-2-101	61076-2-101
Voltage max.	30 V AC / V DC	30 V DC	30 V DC
Contact load max.	0,5 A per output	0,5 A per output	0,5 A per output
total max.	1 A	1 A	1 A
Cable fitting	M20x1,5		

Version	1D1S	4S		6S	2S-KN-KT		4S-KN-KT	6S-KN-KT	
Plug	M12 4-pin	2x M12 4-pin		M12 8-pin	2xM12 4-pin		M12 8-pin	2x M12 4-pin/8-pin	
Connection schematic		Plug A 	Plug B 		Plug A 	Plug B 		Plug A 	Plug B
Pin		Display			Display			Display	
1	+24 V DC	+24 V DC*	+24 V DC*	+24 V DC	+24 V DC*	+24 V DC*	+24 V DC	+24 V DC	+24 V DC
2	S2 (PNP)	S2 (PNP)	S4 (PNP)	S2 (PNP)	Temp (analog)	S2 (PNP)	S2 (PNP)	Temp (analog)	S2 (PNP)
3	GND	GND	GND	GND	GND	GND	GND	GND	GND
4	C/Q (IO-Link)	S1 (PNP)	S3 (PNP)	S1 (PNP)	Level (analog)	S1 (PNP)	S1 (PNP)	Level (analog)	S1 (PNP)
5				S3 (PNP)			S3 (PNP)		S3 (PNP)
6				S4 (PNP)			S4 (PNP)		S4 (PNP)
7				S5 (PNP)			Level (analog)		S5 (PNP)
8				S6 (PNP)			Temp (analog)		S6 (PNP)

*Plugs A & B must be connected to ensure proper function! It is important to note here that the plug for the display should be connected last, otherwise an error will occur (error 1024).

Plug	S6	S6
Anschlussbild		
Pin		
1	+24 V DC	+24 V DC
2	GND	GND
3	S1 (PNP)	Level (analog)
4	S2 (PNP)	Temp (analog)
5	S3 (PNP)	S1 (PNP)
6	S4 (PNP)	S2 (PNP)

Level- and temperature switch

Nivovent NV 74, NV 74D

The oil tank is the key component of hydraulic and lubrication systems. The operating oil is removed from the tank and then returned to it. Depending on what the system is used for, the levels in the oil tank can fluctuate to varying degrees. In most applications, the level fluctuations result in an exchange of the vapour phase above the oil level with the ambient air. Therefore, virtually all oil tanks are equipped with a so-called air breather, to prevent contaminants in the ambient air from entering the system.

To reduce costs and space requirements, a number of other system-related functions such as liquid level and temperature monitoring are also combined in the air breather in the Nivovent series.

NV 74

Connecting flange as per DIN 24557 Part 2

Wireless, adjustable level contacts

Qualified vent filter with replaceable element

Visual air breather monitoring optional

Various plug options

Up to 4 switching outputs or 2 switching outputs for liquid level plus bi-metal, Pt 100 or analog output for temperature

Proven and tested highly dynamic float system

24 V DC standard, 230 V DC upon request

NV 74D

LED display with switching output status

Standard menu structure based on VDMA standard sheet 24574 ff.

Two wireless, adjustable level contacts

Up to 4 programmable temperature switching outputs

Alternatively, continuous temperature output signal (configurable to current or voltage) plus one freely programmable switching output

Characteristics of switching output configurable as window or hysteresis

Two switching outputs configurable as frequency output (1-100 Hz)

Min/max memory, logbook function



Technical Data NV 74
Basic unit

Version	MS	VA*
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 610	SK 221
Min. fluid density	0.80 kg/dm ³ with float (0.029 lb/in ³)	0.85 kg/dm ³ with float (0.031 lb/in ³)
Lengths	280 mm (11.02 in), 370 mm(14.57 in), 500 mm(19.69 in) (standard)	

*Not available in conjunction with FCT option

Material/Version

Float	rigid PU (SK 610)	1.4571 (SK 221)
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm	approx. 800 g (1.76 lb)	approx. 900 g (1.98 lb)
Each 100 mm add	approx. 30 g (0.06 lb)	approx. 50 g (0.11 lb)

Includes:

Mounting screws (quantity 6) and rubberised cork seal.

Options

Stilling tube (SSR)	Brass	VA
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Vent filter

All versions HY type Hydac BF 7

Filter fineness	3 µm
Additional equipment	Filler cap – n/a with filling adapter

Level switching output

K101-104

W101/102

Max. number	4	2
Function	NO / NC*	Change-over contact
Voltage max.	30 V DC	30 V DC
Switching current max.	0.5 A	0.5 A
Contact load max.	10 V AC	20 V AC
Min. contact spacing	40 mm (1.57 in)	40 mm (1.57 in)

*NO= falling NC contact / NC = falling NO contact

Temperature contact

TK

Voltage max.	30 V DC
Switching current max.	2.5 A
Contact load max.	100 VA

Function

NC*

NO*

Switching point °C	50 / 60 / 70 / 80 (122/140/158/176 °F)	50 / 60 / 70 / 80 (122/140/158/176 °F)
Switching point tolerance	± 3 K (±5.4 °RA)	± 3 K (±5.4 °RA)
Max. hysteresis	10 K ± 3 K (18 °RA ±5.4 °RA)	10 K ± 3 K (18 °RA ±5.4 °RA)

*NC NC contact / NO NO contact. All data for rising temperature)

Temperature sensor

Pt 100 Class B, DIN EN 60 751

Tolerance	± 0.8 °C (1.44 °F)
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Temperature transmitter

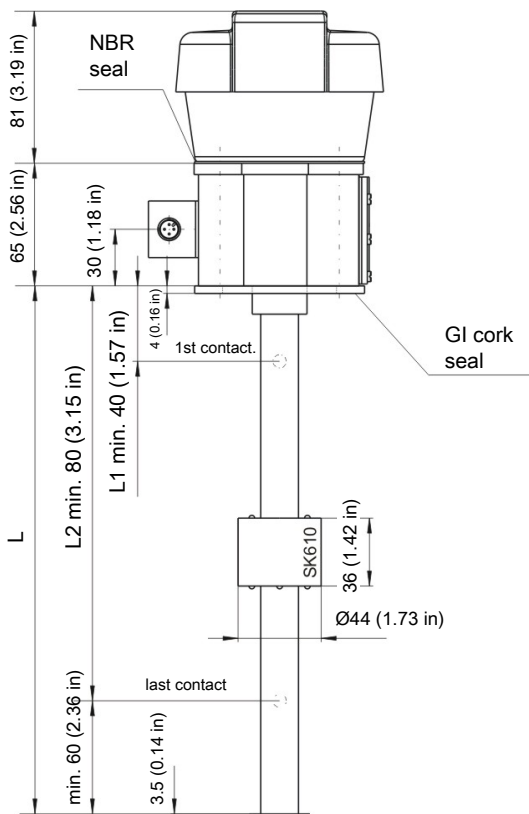
KT

Temperature sensor	Pt 100 Class B, DIN EN 60 751
Measuring range	0 °C to +100 °C (32 °F to 212 °F)
Supply voltage (U _B)	10 - 30 V DC
Output	4 - 20 mA
Max. burden Ω	=(U _B -7.5 V) / 0.02 A
Accuracy	± 1 % from end value

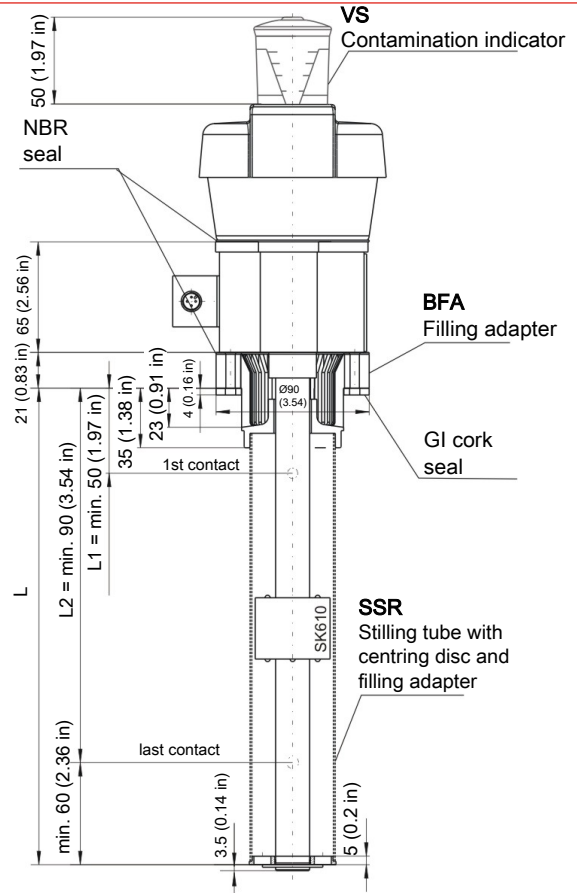
Other measuring ranges available upon request

Dimensions NV 74

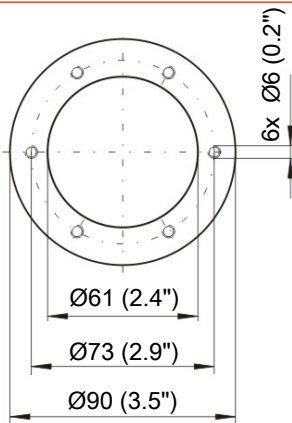
Basic version



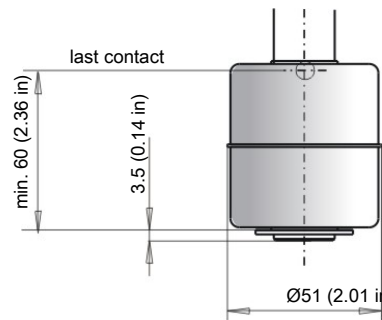
With options



Flange drawing



SK 221 float for NV 74-VA



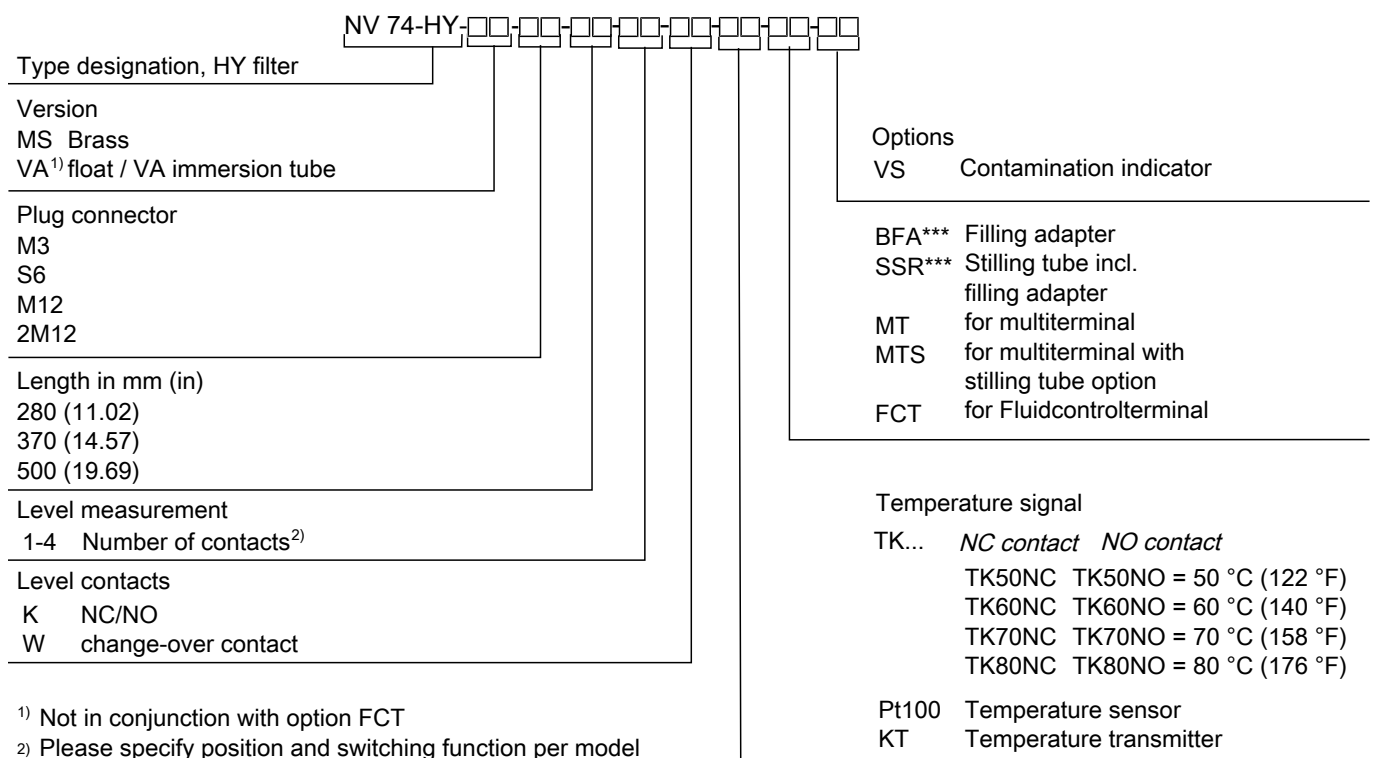
Ordering instructions NV 74

Options / Accessories

- VS** Visual air breather **clogging indicator**: Analogue underpressure indicator, display range 0.35 bar (5.1 psi).
- BFA*** **Filling adapter** incl. ribbed flange: This option allows adding small oil quantities via the air breather housing. The corresponding housing is therefore equipped with that version.
- SSR*** **Stilling tube** with support ring and filling adapter: This includes the optional stilling tube as well as the same filling option as the BFA. The stilling tube is made of the same material as the requested immersion tube (MS/VS).
- MT** For integration in **Multiterminal**: The basic unit will be mounted to the Multiterminal (MT). For specification please refer to the Multiterminal data sheet.
- MTS** For integration in **Multiterminal including stilling tube**: In addition to the basic unit, a stilling tube with centring rod is installed in the Multiterminal.
- FCT** **Fluid control terminal**: Here the fluid control terminal (FCT) mounts directly onto the basic version. For details please refer to the fluid control terminal data sheet.

* not available in conjunction with FCT and MT/MTS option.

Model key



¹⁾ Not in conjunction with option FCT
²⁾ Please specify position and switching function per model key, Example: L1 = nnn mm NC
³⁾ Not in conjunction with FCT, MT or MTS option

Accessories

Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

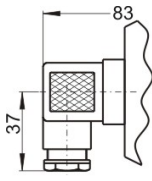
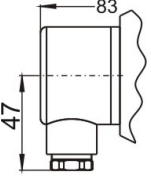
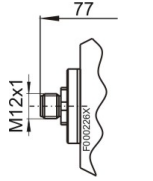
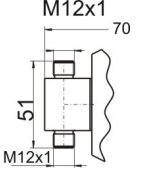
Ordering example

You require: Level switch with vent filter, contamination indicator, length L = 500 mm (19.69 in), 2 level contacts and temperature contact TK 80 °C (TK176 °F) as NC contact, 1st contact 100 mm NC, 2nd contact 420 mm (16.54 in) NO

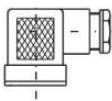
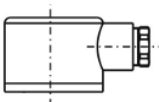
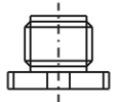
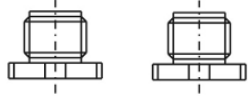
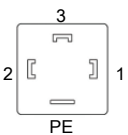
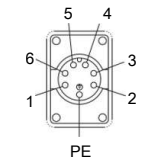
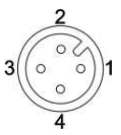
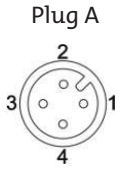
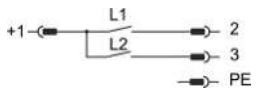
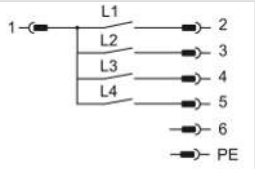
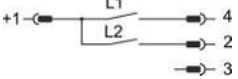
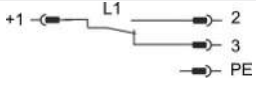
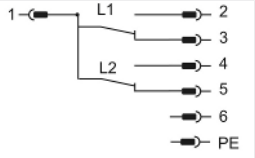
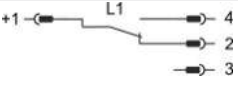
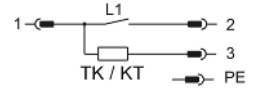
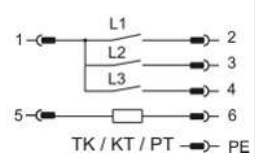
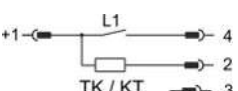
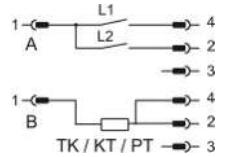
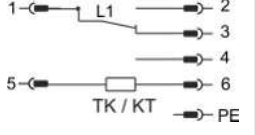
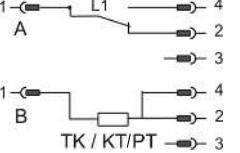
Order: NV 74-HY-MS-S6 500-2-K-TK80NC-VS, 100 NC, 420 NO

Standard pin assignment NV 74

Plug connection

	M3	S6	M12 (base)	2M12 (base)
Dimensions				
Number of pins	3-pin + PE	6-pin + PE	4-pin	4-pin / 4-pin
DIN EN	175301-803	175201-804	61076-2-101	61076-2-101
Voltage max.	30 V AC / V DC	30 V AC / V DC	30 V DC	30 V DC
Contact load max.	0.5 A per output	0.5 A per output	0.5 A per output	0.5 A per output
Degree of protection	IP65	IP65	IP67*	IP67*
Cable fitting	PG11	M20x1.5		
Max. number of contacts				
Level/temp. contacts	1 x K101-104 / 1 x TK - / -	3 x K101-104 / 1 x TK 1 x W101/102 / 1 x TK	1 x K101-104 / 1 x TK - / -	3 x K101-102 / 1 x TK 1 x W101 / 1 x TK
Level contacts only	2 x K101-104 1 x W101/102	4 x K101-104 2 x W101/102	4 x K101-104 2 x W101/102	4 x K101-104 1 x W101/102

* with IP67 cable box attached. Other plug connections available upon request.

	M3	S6	M12 (base)	2 x M12 (base)
				
Connection schematic				
K101-104 Level contact(s)				
W101/102 Level contact(s)				
K101-104 Level contact(s) and Pt100				
W101/102 Level- and temperature contact(s)				

The standard assignment specified here applies to the max. number of contacts possible and contact function NO.

Technical Data NV 74D
Basic unit

Version	MS	VA
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 610	SK 221
Min. fluid density	0.80 kg/dm ³ (0.029 lb/in ³)	0.85 kg/dm ³ (0.031 lb/in ³)
Lengths	280 mm (11.02 in), 370 mm (14.57 in), 500 mm (19.69 in)(standard)	

Material/Version

Display housing	PA	PA
Float	rigid PU (SK 610)	1.4571 (SK 221)
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm (11.02 in)	approx. 850 g (1.87 lb)	approx. 950 g (2.09 lb)
Each 100 mm (3.94 in) add	approx. 30 g (0.06 lb)	approx. 50 g (0.11 lb)

Includes:

Mounting screws (quantity 6) and rubberised cork seal.

Options

Stilling tube (SSR)	Brass	VA
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Vent filter
All versions HY type Hydac BF 7

Filter fineness	3 µm
Additional equipment	Filler cap – n/a with filling adapter

Temperature display electronics

Display	4 character 7 segment LED
Operation	Via 3 keys
Memory	Min. / Max. Data memory
Starting current input	approx. 100 mA for 100 ms
Current input during operation	approx. 50 mA (without current- and switching outputs)
Supply voltage (U _B)	10 – 30 V DC (nominal voltage 24 V DC)
Ambient temperature	-20 °C to +70 °C (-4 °F to 158 °F)
Display units	Temperature °C / °F
Display range	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	0 °C to +100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value

Temperature sensor

Pt 100 Class B, DIN EN 60751
Resolution 0.5 °C (0.9 °F)

Level switching output
K101-104

Max. number	2
Function	NC / NC*
Voltage max.	30 V DC
Switching current max.	0.5 A
Contact load max.	10 VA
Min. contact spacing	40 mm (1.57 in)

*NO= falling NC contact / NC = falling NO contact

Temperature outputs

Choose from the following temperature outputs

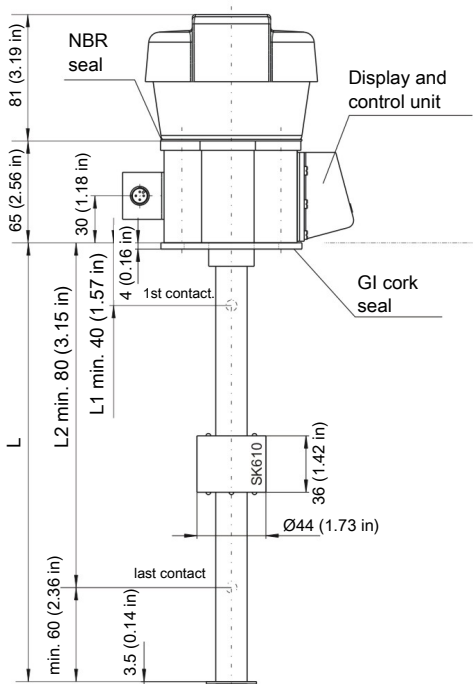
	-2T	-1T-KT	-4T
Plug (base)	2 x M12 – 4-pin	2 x M12 – 4-pin	1 x M12 – 4-pin 1 x M12 – 8-pin
Switching outputs	2 x freely programmable*	1 x freely programmable*	4 x freely programmable
max. switching current**	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analogue output		1 x 4 – 20 mA, 2- 10 V 0-10 V, 0-5 V	
Max. burden Ω as current output		$= (U_B - 8 V) / 0.02 A$	
Min. input load as voltage output		10 k Ω	

*also programmable as frequency output

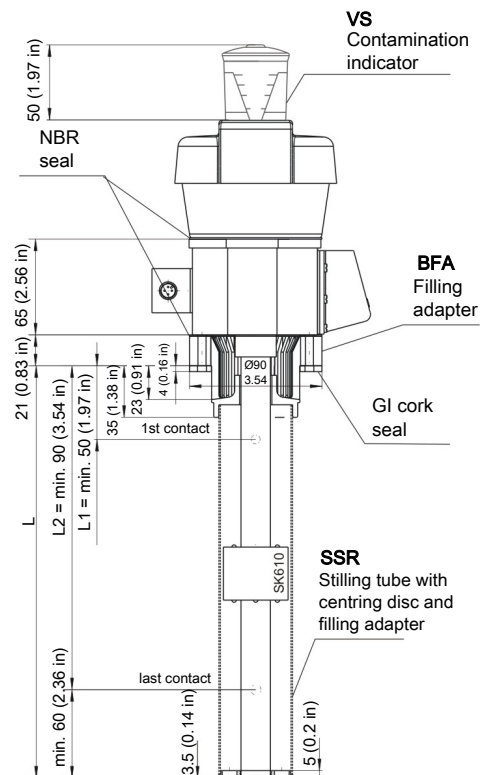
**Output 1 max. 0.2 A.

Dimensions NV 74D

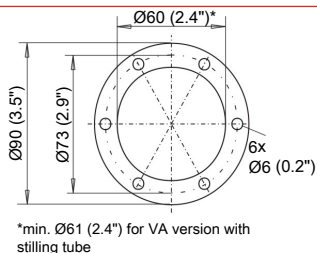
Basic version



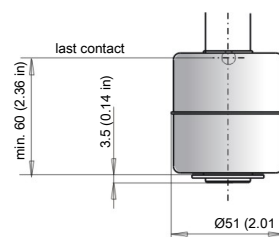
With options



Flange drawing

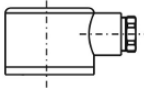
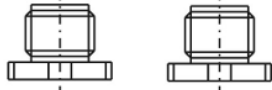
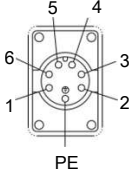
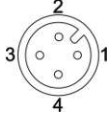
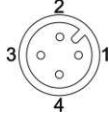
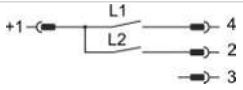
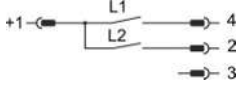
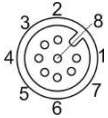
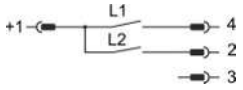


SK 221 float for NV 74-VA

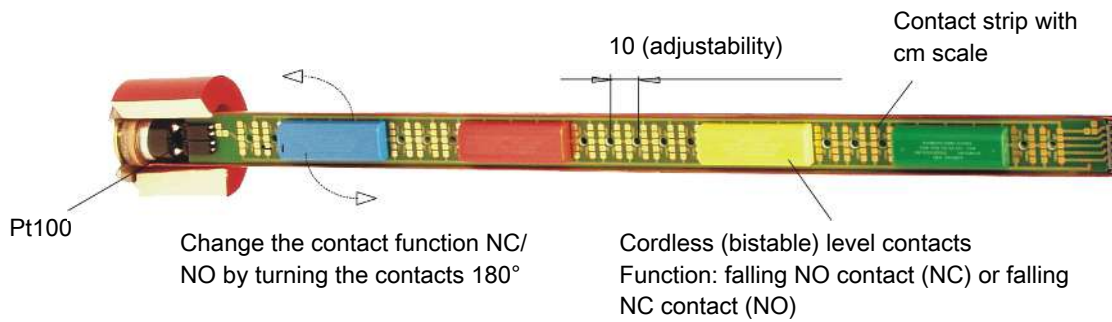


Standard pin assignment NV 74D

Plug connection

		S6	2 x M12 (base)	
				
Connection schematic			Plug A (level) 	Plug B (temperature) 
2T	Pin			Pin
2 x temperature output	1 +24 V DC 2 GND 3 T1 (PNP) 4 T2 (PNP) 5 L1 6 (L2)			1 +24 V DC 2 S2 (PNP) 3 GND 4 S1 (PNP)
1T-KT	Pin			Pin
1 x Temperature output, 1 x Analogue output	1 +24 V DC 2 GND 3 T1 (PNP) 4 Temp 4-20 mA 5 L1 6 (L2)			1 +24 V DC 2 Analogue (out) 3 GND 4 S1 (PNP)
Connection schematic				
4T	Pin			Pin
4 x Temperature output				1 +24 V DC 2 S2 (PNP) 3 GND 4 S1 (PNP) 5 S3 (PNP) 6 S4 (PNP)

easyjust System



Using adjustable level contacts allows the use of standardised immersion tube lengths for different size and shape oil tanks. The switching points can always be configured to the specific system requirements without first having to purchase a specific level switch.

This aids original equipment manufacturers and operators with project planning and logistics.

Since the level contacts are electric components, they require a connection to the respective circuits. This is typically achieved using cables which however, particularly in the case of multiple contacts, makes adjustments more difficult.

The Easy Just System is based on a wireless contact arrangement.

These are enclosed by different coloured housings and are arranged on a carrier board with gold contact points.

The different colours aid with coding the various contacts and ensure the terminal configuration matches the connectors.

The switching function of the contacts (NO or NC) is determined by turning the contact sleeve 180° on the carrier board.

Depending on the option selected, a fixed temperature switch (bi-metal, NO or NC), Pt 100 or 4-20 mA transmitter will be fixed to the bottom end of the board for temperature monitoring.

Multiterminal MT

Global competition demands standardized basic functions from hydraulic systems with a flow volume of up to 100 l/min and tank sizes up to 150 liters. National and international standards also require minimum maintenance and monitoring requirements. The Multiterminal ideally fulfills these tasks in the performance class mentioned. In a compact basic housing it combines essential functions such as filling, ventilation and return filtration, offers the monitoring functions temperature and level as well as the safe taking of oil samples from tank and return line. The Multiterminal can be installed easily accessible on just one opening on the tank top, making maintenance considerably easier. The filter elements are standardized according to DIN 24550, temperature and level are communicable via IO-Link.

Return filter for DIN elements up to NG 100

Three connections for return line

Filling port with quick coupling

Filling control optional

Electronic return filter monitoring

Sampling ports in tank and return line

Air breather with integrated liquid level and temperature monitoring



Technical Data

Multiterminal

Material

Multiterminal block	GK-ALSi12
Block seal	GI cork
Filter cover and bell cover	Plastic

Filter data (return filter)

Bypass opening pressure	Δp 3.5 bar (50.8 psi) $\pm 10\%$
Filter sizes	NG 40/NG 63/NG 100
for filter elements per	DIN 24550

Weight

Multiterminal base version (NG 40, NG 63 or NG 100)	~ 3.5 kg (7.7 lb)
---	-------------------

Dimensions

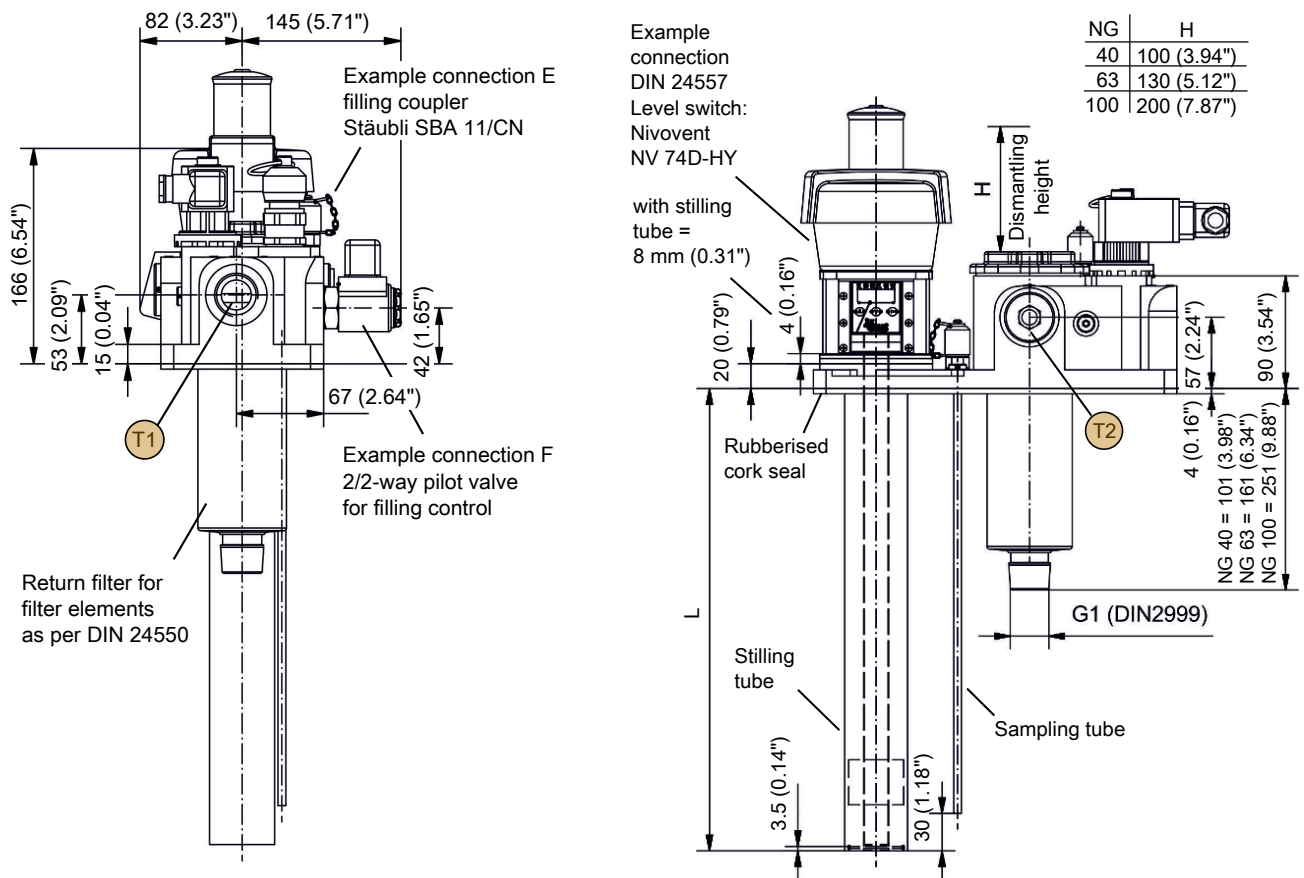
NOTICE



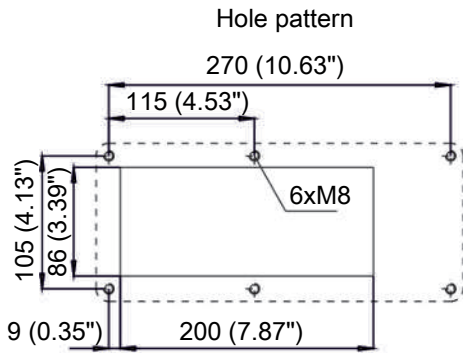
Sample multiterminal equipment

The drawing shows the sample equipment of the multiterminal. The hole pattern as per DIN 24557 and the connections D, E, F can optionally be equipped as specified below. The connections T1, T2, T3, X1, X2 and X3 are prefixed as specified. The built-in return filter (without filter element) is available in three different nominal sizes and is part of the basic multiterminal.

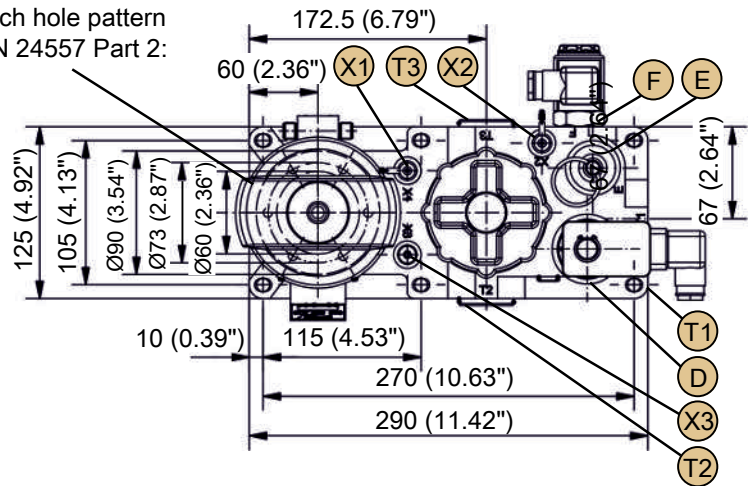
Dimensions



Hole pattern



Level switch hole pattern
as per DIN 24557 Part 2:
6xM5



Optional connections:

- D = back pressure sensor or sealing plug M30x1.5
- E = G1/2 filling coupler
- F = Flutec 2/2-way pilot valve or M27x2 sealing plug
- DIN 24557/T2 = Nivovent 7 series level- and temperature switch (others on request), as desired

Prefixed connections:

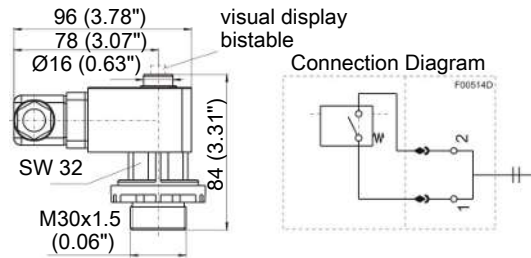
- T1 = available G1 connection to return filter
- T2/T3 = G1 sealing plug (alternative connections for return filter - connection T1)
- X1 = G1/8 Minimes screw connection with attached tube for sampling from the tank
- X2 = G1/8 Minimes screw connection for sampling upstream from the return filter
- X3 = G1/8 sealing plug (alternative connection for X1)

(The equipment on connection T1, T2 and T3 as well as connections X1 and X3 can be interchanged by the customer.)

Connection D - Back Pressure Sensor Or Sealing Plug

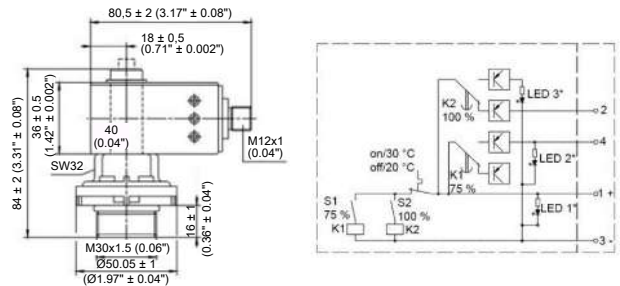
Type Filtration Group PIS 3085/2.2

Max. operating voltage	250 VAC / 200 VDC
Max. switching current	1 A
Max. switching output	70 W
Rated pressure/temperature	10 bar (145 psi)/ -10 to +80°C (14 °F to 176 °F)
Gauge pressure	2.2 bar (32 psi)
Display type	Visual / electric
IP rating	IP65 (mated)
Contact type:	NO contact / NC contact
Electrical connection	DIN EN 175301-803, PG11
Material	PA 66 / PA 6



Type Filtration Group PIS 3153/1.7/2.2

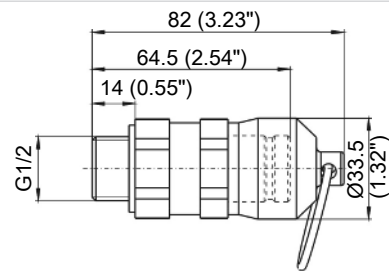
Max. operating voltage	10-30 V
Max. switching current	1 A
Max. switching output	20 W
Rated pressure / temperature	10 bar (145 psi)/ -10 to +80°C (14 °F to 176 °F)
Gauge pressure	1.7 / 2.2 bar (25/32 psi)
Display type	Visual / electric
IP rating	IP65 (mated)
Contact type:	NO contact / NC contact
Electrical Connection	M12x1
Material	PA 66 / PA 6



Connection E - Filling Coupler Or Sealing Plug

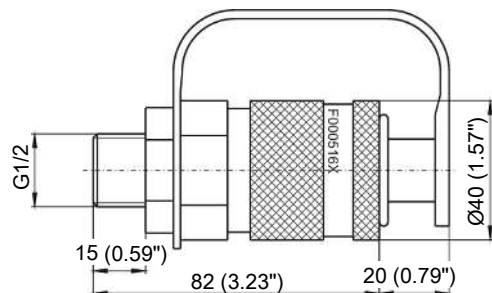
Type Stäubli SBA 11/CN

	(receptacle)
Nominal width	11
Thread	G 1/2
Material	Chromium steel / tempered steel



Type Walther MD-012

	(filling coupler)
Nominal width	12
Thread	G 1/2
Material	Galvanised / bronzed steel



Connection F - Filling Control Or Sealing Plug

Function description of the filling control:

The filling control is used to automatically stop tank filling once the maximum level is reached. The valve is controlled using the top level contact Lx.

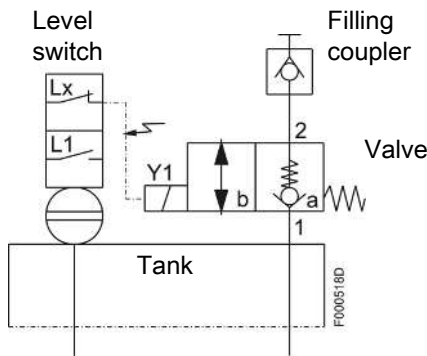
When the system is switched on, the valve switches to position "b", i.e. the valve is flowing freely from 2 to 1, oil can be added using the filling coupler.

When the top level contact (NC contact on Lx) is reached, the valve returns to position "a". The valve is closed from 2 to 1 and oil cannot enter the tank through the filling coupler.

During operation, a second level contact (NO contact on L1) emits an alert when the oil level is low. In the case of external control, the tank can now automatically be filled via the filling coupler or service staff be prompted to add oil.

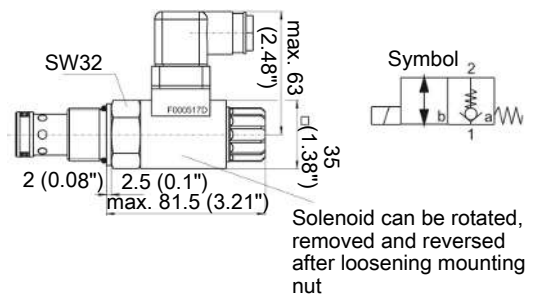
In both cases, when the top level contact Lx is reached, the valve is switched back to position "a" and filling stops.

The entire control unit for automatic filling with NV 7x series level switch (except NV73 K/KN) of your choice is also available from Bühler Technologies GmbH.



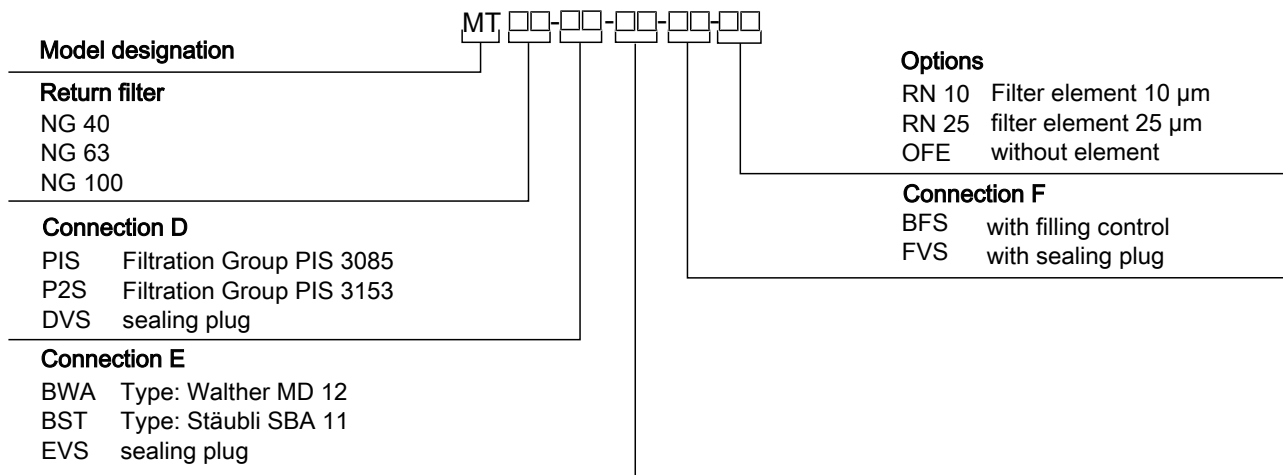
Type Flutec (2/2-way pilot valve)

Q max.	100 L/min.
p max.	280 bar (4060 psi)
Nominal voltage	24 VDC (-5/+10%)
Nominal current	1.04 A
IP rating	IP65
Hydraulic fluid temperature range	min. -20 °C (-4 °F), max. +80 °C (176 °F)
Viscosity range	min. 10 mm ² /s, max. 380 mm ² /s
Connector	DIN EN 175301-803, PG11



For hydraulics as per DIN 51524 Part 1 and 2
 Max. operating fluid contamination as per NAS 1638 Class 10.

Multiterminal Model Key



Ordering example:

You require:

Basic NG 63 multiterminal optional connections equipped as follows:

Connection:

D (back pressure sensor)	Filtration Group PIS 3085
E (filling coupler)	Walther MD-012
F (filling control)	Sealing plug M27x2
Accessories	Filter element N 0063 RN 10, filter fineness 10 µm

Order:

MT NG 63-PIS-BWA-FVS-RN10

Connection DIN 24557 Part 2 (Level-/temperature switch with vent filter)

Example:

Level switch type Nivovent NV 74 for multiterminal, brass, length L= 370 mm (14.57 in) (measured from multiterminal block bottom edge), M12 plug, one level contact at L=190 mm (7.48 in) as falling NO contact (NO), one temperature contact 60 °C (140 °F) as NC contact (NC) and vent filter with visual contamination indicator.

Order:

NV 74-HY-MS-M12-370-1K-TK60NC-MT-VS

L1=190 mm f.S.

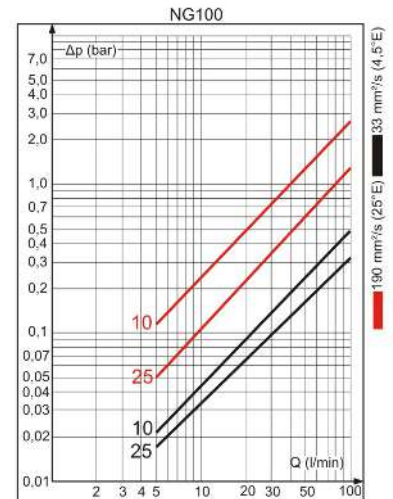
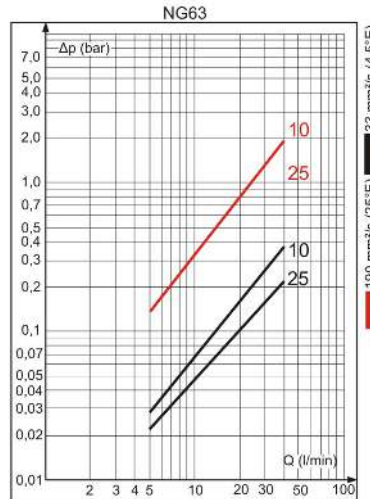
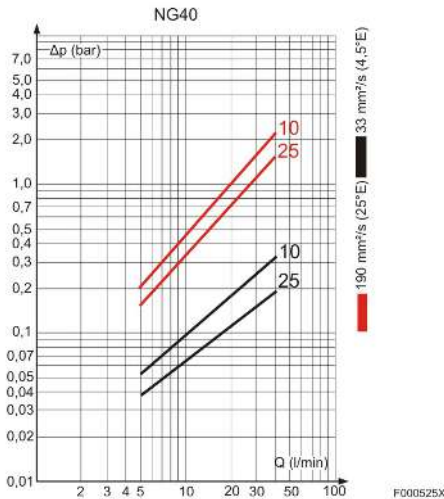
Spare Parts And Consumables

Return filter replacement elements:

Filter	Filter unit	Filter element	Item no.
NG 40	10 µm	N0040RN2010	76910962
	25 µm	N0040RN2025	76911127
NG 63	10 µm	N0063RN2010	76910970
	25 µm	N0063RN2025	76911135
NG 100	10 µm	N0100RN2010	76910988
	25 µm	N0100RN2025	76911143

For air filter elements, please refer to the respective operating and installation instructions for the level switch or the documentation from the air filter manufacturer.

Return filter performance curves:



Connection DIN 24557

NOTICE

Multiterminal MT equipment



With the DIN 24557 Part 2 connection equipped with a level/temperature switch, the multiterminal always consists of two parts. The first part being the multiterminal MT from this data sheet, and the second part being a Nivovent NV 7x series level switch (see ordering example). This also shows a list of the NV Nivovent models which can be used. Please refer to the respective data sheet for the exact configuration of the level switch. (Please contact us regarding built-in filling control.)

Multiterminal base unit consists of:

Multiterminal block, block seal, connections T1-T3, X1-X3 pre-equipped as specified.

Level Switch Overview

Level switch

NV 74 for multiterminal

For technical data, please see data sheet no. 10 0205

- Hydac vent filter
- Easy and quick to adjust level contacts
- Plug and play system
- Up to 4 contacts
- Bi-metal contacts, Pt 100 or 4-20 mA output signal for temperature
- **NV 74D plus display and control unit**
- Easy to operate via three keys
- Bevelled LED display for optimal visibility
- Up to 4 programmable temperature switching outputs
- Optional continuous temperature output signal, programmable 4-20 mA, 0-10 V or 2-10 V



Level switch

NV 71 for multiterminal

For technical data, please see data sheet no. 10 0204

- Hydac vent filter
- Easy and/or adjustable level contacts
- Up to 4 contacts
- 230 V supply voltage possible
- Bi-metal contacts, Pt 100 or 4-20 mA output signal for temperature
- **NV 71D plus display and control unit**
- Easy to operate via three keys
- Bevelled LED display for optimal visibility
- Up to 4 programmable temperature switching outputs
- Optional continuous temperature output signal, programmable 4-20 mA, 0-10 V or 2-10 V



Level switch

NV 73 for multiterminal

For technical data, please see data sheet no. 10 0206

- **Continuous liquid level measurement**
- Hydac vent filter
- Alternatively with continuous temperature measurement 4-20 mA output
- Resolution 5 mm (0.2 in)
- Various plug options



Level switch

NV 77-XP for multiterminal

For technical data, please see data sheet no. 10 0203

- **Continuous liquid level measurement**
- Hydac vent filter
- 4-20 mA
- Resolution 5 mm (0.2 in)
- Sensor length up to 1420 mm (55.91 in)
- **Display and control unit**
- 4 switching outputs programmable as level- and temperature alarm output
- Alternatively 2 switching outputs programmable as level- and temperature alarm outputs + 1 analog output each for continuous level- and temperature analysis
- Analog output programmable 4-20 mA, 0-10 V, 2-10 V or 0-5 V



Level- and temperature switch

Nivovent NV 71, NV 71D

The oil tank is the key component of hydraulic and lubrication systems. The operating oil is removed from the tank and then returned to it. Depending on what the system is used for, the levels in the oil tank can fluctuate to varying degrees. In most applications, the level fluctuations result in an exchange of the vapour phase above the oil level with the ambient air. Therefore, virtually all oil tanks are equipped with a so-called air breather, to prevent contaminants in the ambient air from entering the system.

To reduce costs and space requirements, a number of other system-related functions such as liquid level and temperature monitoring are also combined in the air breather in the Nivovent series.

NV 71

Connecting flange as per DIN 24557 Part 2

Qualified vent filter with replaceable element

Various plug options

Up to 4 switching outputs or 2 switching outputs for liquid level plus Pt100 or analog output for temperature

Proven and tested highly dynamic float system

Sensor length up to 1.5 m (4.92 ft) (longer upon request)

Suitable for up to 230 V DC

NV 71D

LED display with switching output status

Qualified vent filter with replaceable element

Visual air breather monitoring optional

Alternatively, continuous temperature output signal (configurable to current or voltage) plus one freely programmable switching output

Characteristics of switching outputs configurable as window or hysteresis

Two switching outputs configurable as frequency output (1-100 Hz)

Standard menu structure based on VDMA standard specification 24574 ff

Min/max value memory, logbook function



Technical Data NV 71
Basic unit

Version	MS	VA
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 610	SK 221
Min. fluid density	0.80 kg/dm ³ (0.029 lb/in ³)	0.85 kg/dm ³ (0.031 lb/in ³)
Lengths (all versions)	280 mm (11.02 in), 370 mm (14.57 in), 500 mm (19.69 in) (standard), variable to max. 1500 mm (59.06 in) in 10 mm (0.39 in) increments	

Material/Version

Float	rigid PU	1.4571
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm (11.02 in)	approx. 790 g (1.74 lb)	approx. 870 g (1.92 lb)
Each 100 mm (3.94 in) add	approx. 30 g (0.06 lb)	approx. 50 g (0.11 lb)

Options

Stilling tube (SSR)	Brass	VA
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Vent filter **All versions HY type Hydac BF 7**

Filter fineness	3 µm
Additional equipment	Filler cap – n/a with filling adapter

Level switching output

	K10	W11
Function	NO / NC*	Change-over contact
Voltage max.	230 V DC	48 V DC
Switching current max.	0.5 A	0.5 A
Contact load max.	10 VA	20 VA
Min. contact spacing	40 mm (1.57 in)	40 mm (1.57 in)
Contact position in 10 mm (0.39 in) increments		

*NO = falling NC contact / NC = falling NO contact

Optional temperature switching outputs TK

	TK		TM	
Number of temp. contacts	1		2	
Voltage max.	230 V DC		230 V DC	
Switching current max.	2.5 A		2 A	
Contact load max.	100 VA		100 VA	
Function	NO*	NC*	NO	NC
Switching point °C	50/60/70/80 °C (122/140/158/176 °F)	50/60/70/80 °C (122/140/158/176 °F)	50/60/70/80 °C (122/140/158/176 °F)	50/60/70/80 °C (122/140/158/176 °F)
Switching point - tolerance	± 3 K	± 3 K	± 5 K	± 5 K
Hysteresis max.	10 K ± 3 K	10 K ± 3 K	26/35/40/45 K ± 5 K	18 K ± 5 K

*NO = NO contact / NC = NC contact

Data for rising temperature. Other temperatures and versions with 2 x TK contact available upon request

Temperature sensor

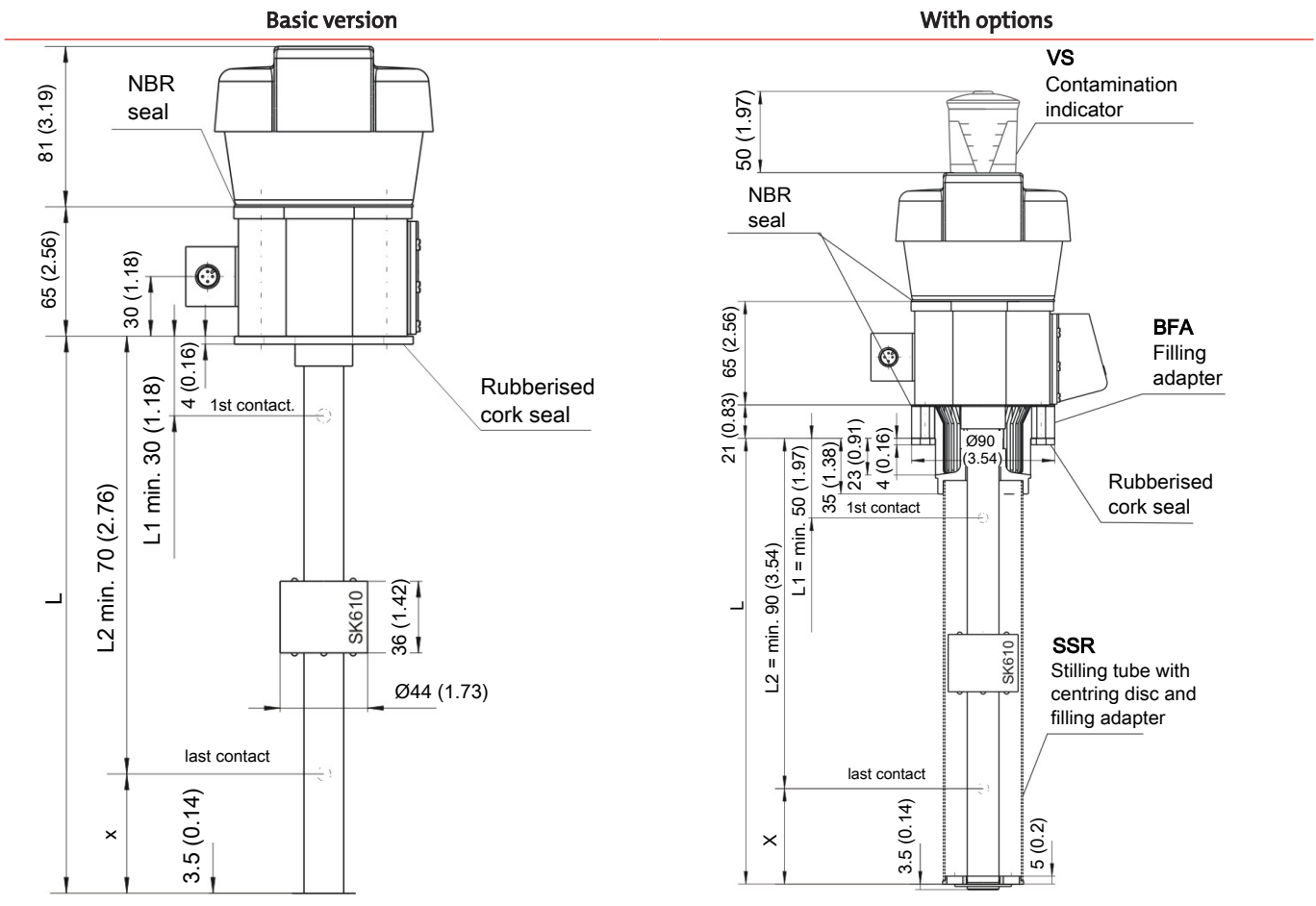
Temperature sensor	Pt 100 Class B, DIN EN 60 751 Tolerance $\pm 0.8\text{ }^{\circ}\text{C}$ (1.44 $^{\circ}\text{F}$)
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Temperature transmitter

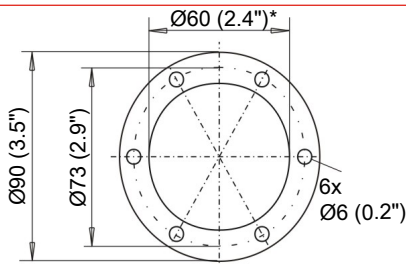
Temperature sensor	Pt100 Class B, DIN EN 60 751
Measuring range	0 $^{\circ}\text{C}$ to +100 $^{\circ}\text{C}$ (32 $^{\circ}\text{F}$ to 212 $^{\circ}\text{F}$)
Operating voltage (U_B)	10 - 30 V DC
Output	4 - 20 mA
Burden Ω max.	$= (U_B - 7.5\text{ V}) / 0.02\text{ A}$
Accuracy	$\pm 1\%$ from end value

Other measuring ranges available upon request

Dimensions NV 71

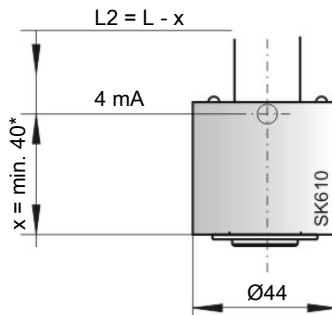


Flange drawing



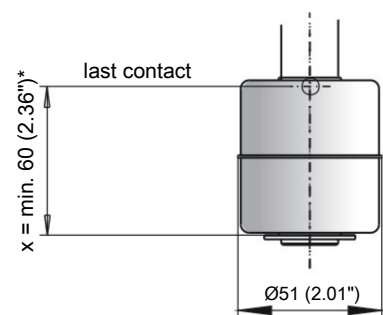
*min. Ø61 (2.4'') for VA version with stilling tube

SK 610 float for NV 71-MS



* min. 80 with temperature

SK 221 float for NV 71-VA



* min. 80 (3.14'') with temperature

Ordering instructions NV 71

Options / Accessories

- VS** Visual air breather **clogging indicator**: Analogue underpressure indicator, display range 0.35 bar (5.1 psi).
- BFA*** **Filling adapter** incl. ribbed flange with sieve insert: This option allows adding small oil quantities via the air breather housing. The corresponding housing is therefore equipped with that version.
- SSR*** **Stilling tube** with support ring and filling adapter: This includes the optional stilling tube as well as the same filling option as the BFA. The stilling tube is made of the same material as the requested immersion tube (MS/VS).
- MT** For integration in **Multiterminal**: The basic unit will be mounted to the Multiterminal (MT). For specification please refer to the Multiterminal data sheet.
- MTS** For integration in **Multiterminal including stilling tube**: In addition to the basic unit, a stilling tube with centring rod is installed in the Multiterminal.
- FCT** **Fluid control terminal**: Here the fluid control terminal (FCT) mounts directly onto the basic version. For details please refer to the fluid control terminal data sheet.

* not available in conjunction with FCT and MT/MTS option.

Type plate

<p>Type designation, NV 71-HY <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> nn <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>HY filter</p> <p>Version MS Brass VA¹⁾ float / VA immersion tube</p> <p>Plug connector M3 S6 M12 2M12</p> <p>Length in mm (in) (max. 1500/(59.06)) 280 (11.02) Standard lengths 370 (14.57) 500 (19.69) nnn variable, please specify value</p> <p>Level measurement 1-4 Number of contacts²⁾</p> <p>Level contacts K Model K10 (NC/NO) W Model W11 (change-over contact)</p>	<p>Options</p> <p>VS Contamination indicator</p> <p>BFA³⁾ Filling adapter</p> <p>SSR³⁾ Stilling tube incl. filling adapter</p> <p>MT for multiterminal</p> <p>MTS for multiterminal with stilling tube option</p> <p>FCT for Fluidcontrolterminal</p> <p>2nd temperature contact (TM... only) <i>NC contact NO contact</i></p> <p>TM... TM50NC TM50NO = 50 °C (122 °F) TM60NC TM60NO = 60 °C (140 °F) TM70NC TM70NO = 70 °C (158 °F) TM80NC TM80NO = 80 °C (176 °F)</p> <p>1st temperature signal <i>NC contact NO contact</i></p> <p>TK... TK50NC TK50NO = 50 °C (122 °F) TK60NC TK60NO = 60 °C (140 °F) TK70NC TK70NO = 70 °C (158 °F) TK80NC TK80NO = 80 °C (176 °F)</p> <p>TM⁶⁾... TM50NC TM50NO = 50 °C (122 °F) TM60NC TM60NO = 60 °C (140 °F) TM70NC TM70NO = 70 °C (158 °F) TM80NC TM80NO = 80 °C (176 °F)</p> <p>Pt100 Temperature sensor⁴⁾</p> <p>KT Temperature transmitter^{4) 5)}</p>
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¹⁾ Not in conjunction with option FCT
²⁾ Please specify position and switching function per model key, Example: L1 = nnn mm NC
³⁾ not in conjunction with FCT, MT or MTS option
⁴⁾ Cannot be combined with temperature contact
⁵⁾ With KT only 10 - 30 V DC
⁶⁾ For version with two temperature contacts

Accessories

Item no.	Description
9144050010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144050046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144050047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

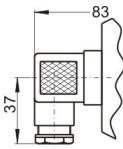
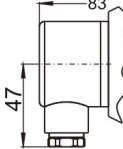
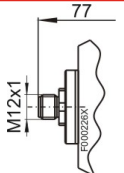
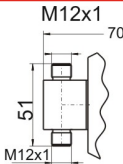
Ordering example

You require: Brass level switch with vent filter and contamination indicator, L=500 mm (19.69 in), 2 level contacts and temperature contact TK80 °C (TK176 °F) as NC contact, 1st contact: 100 mm (3.94 in) falling NO contact. 2nd contact: 420 mm (16.54 in) falling NC contact.

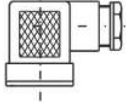
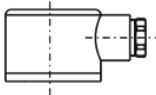


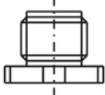
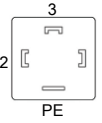
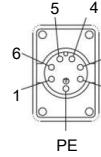
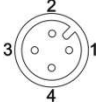
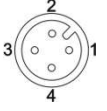
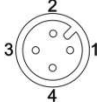
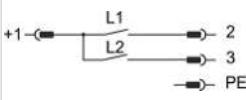
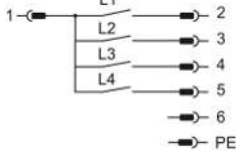
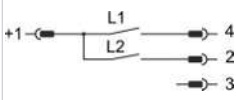
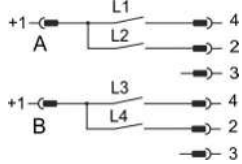
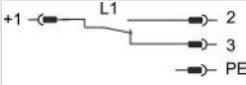
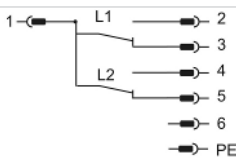
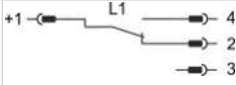
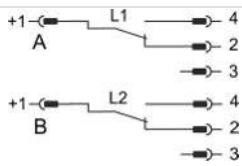
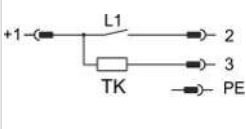
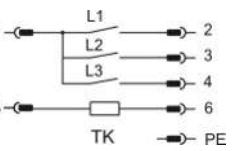
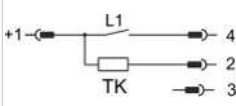
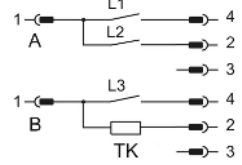
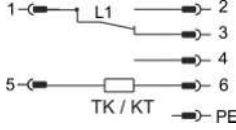
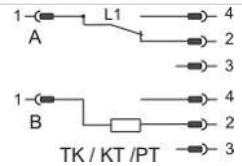
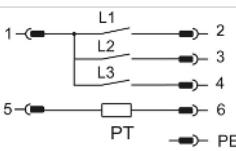
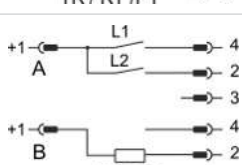
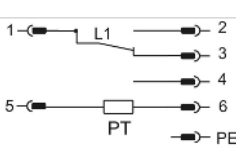
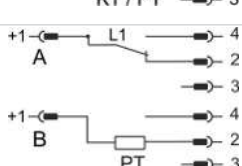
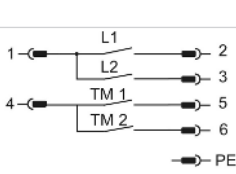
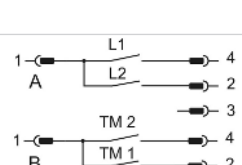
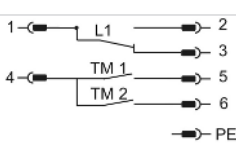
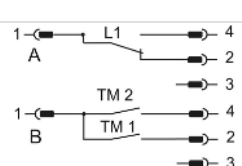
Order: NV 71-HY-MS-S6-500-2K-TK80NC-VA, L1=100 NC, L2=420 NO

Standard pin assignment NV 71

Plug connection

	M3	S6	M12 (base)	2xM12 (base)
Dimensions				
Number of pins	3-pin + PE	6-pin + PE	4-pin	4-pin / 4-pin
DIN EN	175301-803	175201-804	61076-2-101	61076-2-101
Max. voltage	230 VAC/DC*	230 V AC/DC*	30 VDC	30 VDC
IP rating	IP65	IP65	IP67**	IP67**
Cable fitting	PG 11	M20 x 1.5		
Max. Number of contacts				
Level/temp. contacts	1 x K10 / 1 x TK - / - - / -	3 x K10 / 1 x TK 2 x K10 / 2 x TM 1 x W11 / 1 x TK 1 x W11 / 2 x TM	1 x K10 / 1 x TK - / - - / -	3 x K10 / 1 x TK 2 x K10 / 2 x TM 1 x W11 / 1 x TK 1 x W11 / 2 x TM
Level contacts only	2 x K10 1 x W11	4 x K10 2 x W11	2 x K10 1 x W11	4 x K10 2 x W11

*Max. 48 V AC/DC for change-over contact. **with IP67 cable box attached. Other plug connections available upon request.

	M3	S6	M12 (base)	2 x M12 (base)	
					
Connection schematic				Plug A 	Plug B 
K10 Level contact(s)					
W11 Level contact(s)					
K10 Level- and temperature contact					
W11 Level- and temperature contact(s)					
K10 / Pt100 Level- and temperature contact(s)					
W11 / Pt100 Level- and temperature contact(s)					
K10 Level and 2 x temperature contact(s)					
W11 Level and 2 x temperature contact(s)					

The standard assignment specified here refers to the max. number of contacts possible and contact function NO (contact type K10).

Technical Data NV 71D
Basic unit

Version	MS	VA
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 610	SK 221
Min. fluid density	0.80 kg/dm ³ (0.029 lb/in ³)	0.85 kg/dm ³ (0.031 lb/in ³)
Lengths (all versions)	280 mm (11.02 in), 370 mm (14.57 in), 500 mm (19.69 in) (Standard), variable to max. 1500 mm (59.06 in) in 10 mm (0.39 in) increments	

Material/Version

Display housing	PA	PA
Float	rigid PU (SK 601)	1.4571 (SK 221)
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm	approx. 825 g (1.82 lb)	approx. 910 g (2.01 lb)
Each 100 mm add	approx. 30 g (0.06 lb)	approx. 50 g (0.11 lb)
Degree of protection	IP65	IP65

Includes:

Mounting screws (quantity 6) and rubberised cork seal

Options

Stilling tube (SSR)	Brass	VA
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Vent filter

All versions HY type Hydac BF 7

Filter fineness	3 µm
Additional equipment	Filler cap – n/a with filling adapter

Temperature display electronics

Display	4 character 7 segment LED
Operation	Via 3 keys
Memory	Min. / Max. Data memory
Starting current input	approx. 100 mA for 100 ms
Current input during operation	approx. 50 mA (without current- and switching outputs)
Supply voltage (U _B)	10 – 30 V DC (nominal voltage 24 V DC)
Ambient temperature	-20 °C to +70 °C (-4 °F to 158 °F)
Display units	Temperature °C / °F
Display range	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	0 °C to +100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value

Temperature sensor

Pt 100 Class B, DIN EN 60751
Resolution 0.5 °C (0.9 °F)

Level switching output

K10

Max. number	2
Function	NC / NC*
Function	NC / NC*
Switching current max.	0.5 A
Contact load max.	10 VA
Min. contact spacing	40 mm (1.57 in)
Contact position in 10 mm (0.39 in) increments	

*NO= falling NC contact / NC = falling NO contact

Temperature outputs

Choose from the following temperature outputs

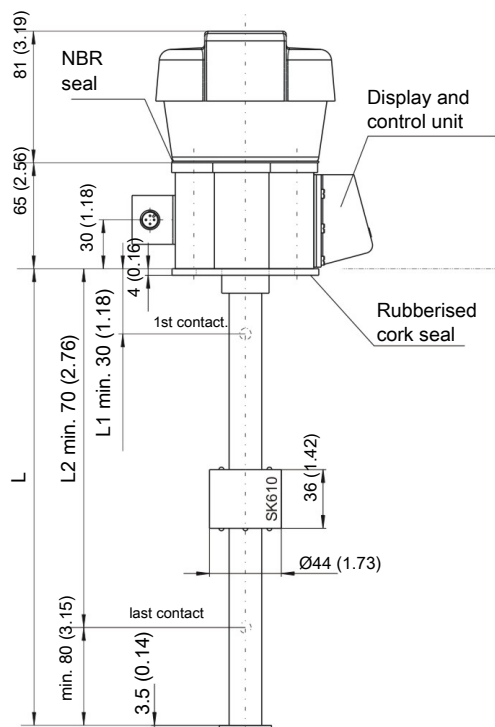
	-2T	-1T-KT	-4T
Plug (base)	2 x M12 – 4-pin	2 x M12 – 4-pin	1 x M12 – 4-pin 1 x M12 – 8-pin
Switching outputs	2 x freely programmable*	1 x freely programmable*	4 x freely programmable
Alarm memory		with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current**	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analogue output		Analogue output	
Max. burden Ω as current output		$= (U_B - 8 V) / 0.02 A$	
Min. input load as voltage output		10 k Ω	

*also programmable as frequency output

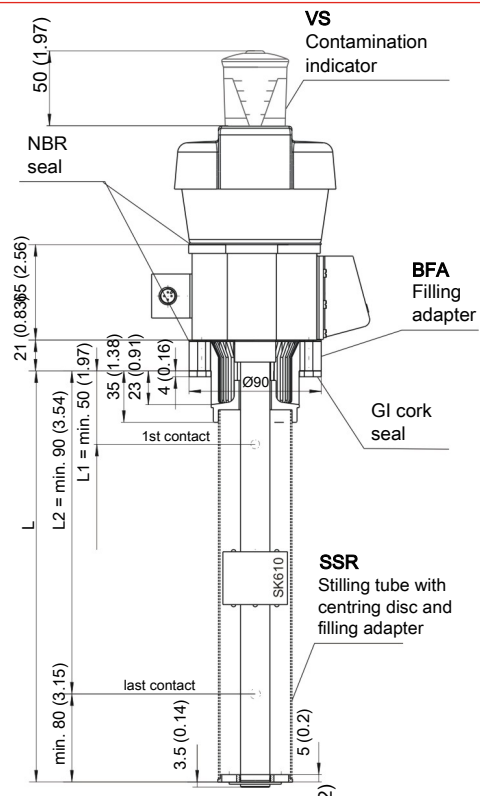
**Output 1 max. 0.2 A.

Dimensions NV 71D

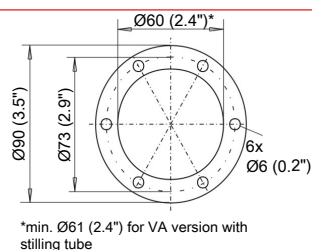
Basic version



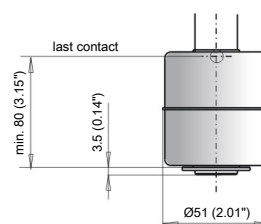
With options



Flange drawing



Float for NV 71D-VA



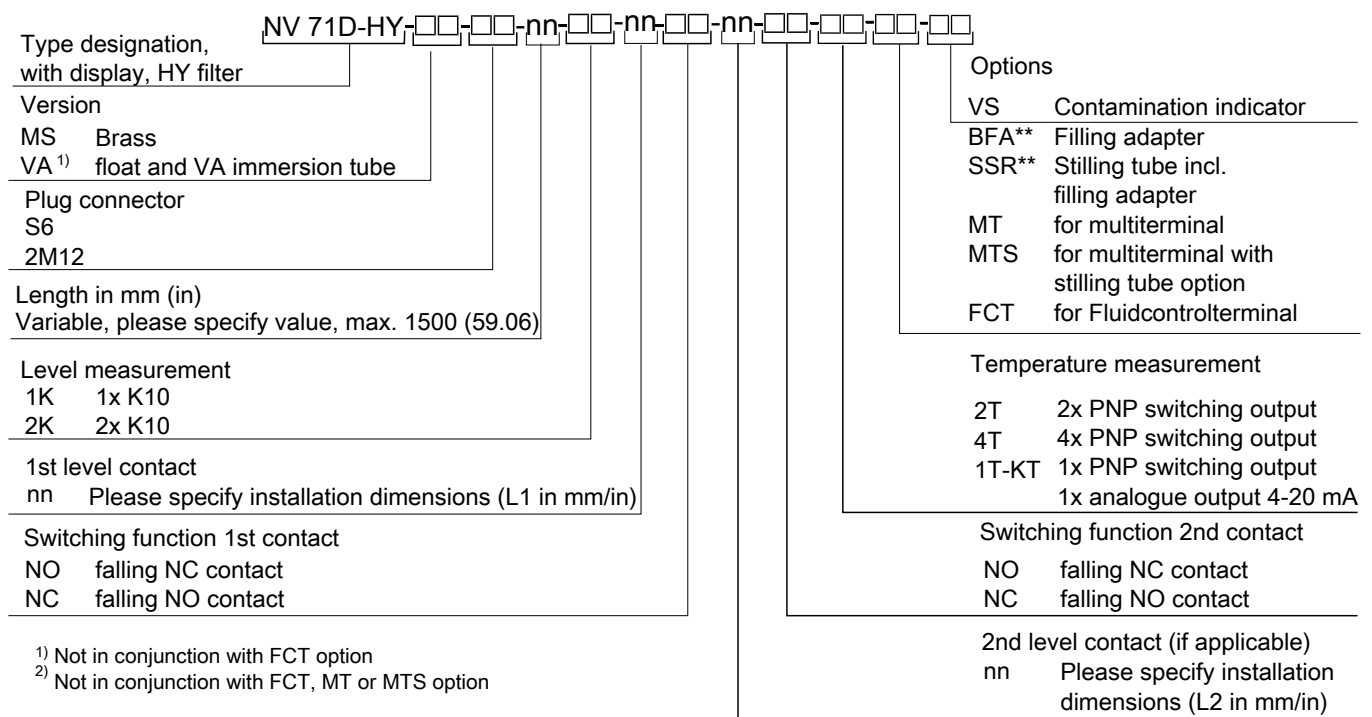
Ordering instructions NV 71D

Options / Accessories

- VS** Visual air breather **clogging indicator**: Analogue underpressure indicator, display range 0.35 bar (5.1 psi).
- BFA*** **Filling adapter** incl. ribbed flange with sieve insert: This option allows adding small oil quantities via the air breather housing. The corresponding housing is therefore equipped with that version.
- SSR*** **Stilling tube** with support ring and filling adapter: This includes the optional stilling tube as well as the same filling option as the BFA. The stilling tube is made of the same material as the requested immersion tube (MS/VS).
- MT** For integration in **Multiterminal**: The basic unit will be mounted to the Multiterminal (MT). For specification please refer to the Multiterminal data sheet.
- MTS** For integration in **Multiterminal including stilling tube**: In addition to the basic unit, a stilling tube with centring rod is installed in the Multiterminal.
- FCT** **Fluid control terminal**: Here the fluid control terminal (FCT) mounts directly onto the basic version. For details please refer to the fluid control terminal data sheet.

* not available in conjunction with FCT and MT/MTS option.

Model key



Accessories

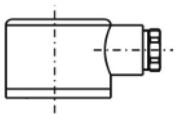
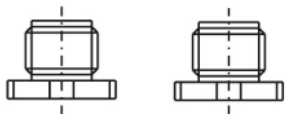
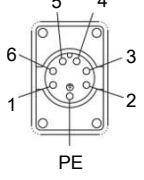
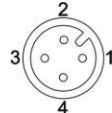
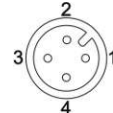
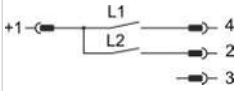
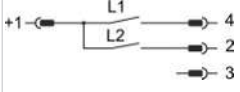
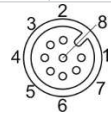
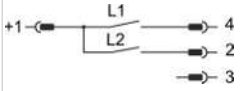
Item no. 4-pin	Item no. 8-pin	Description
9144050010	9144050048	Connecting cable M12x1, 1.5 m (4,92 ft), angular coupling and straight plug
9144050046	9144050049	Connecting cable M12x1, 3.0 m (9,84 ft), angular coupling and straight plug
9144050047	9144050033	Connecting cable M12x1, 5.0 m (16,40 ft), angular coupling and strands

Ordering example

You require: Stainless steel level switch with vent filter and contamination indicator, length L = 500 mm (19.69 in), 2 level contacts, 1st contact: 100 mm (3.94 in) falling NO contact, 2nd contact: 420 mm (16.54 in) falling NC contact, 2 temperature outputs

Order: NV 71D-HY-VA-2M12-500-2K-100 NC-420 NO-2T-VS

Standard pin assignment NV 71D

Plug connection		S6	2xM12	
				
Connection schematic			Plug A (level) 	Plug B (temperature) 
2T	Pin			Pin
2 x temperature output	1 +24 V DC 2 2 GND 3 S1 (PNP) 4 S2 (PNP) 5 L1 6 (L2)			1 +24 V DC 2 2 Analogue (out) 3 GND 4 S1 (PNP)
1T-KT	Pin			Pin
1 x temperature output, 1 x analogue output	1 +24 V DC 2 2 GND 3 S1 (PNP) 4 Temp (analogue) 5 L1 6 (L2)			1 +24 V DC 2 2 Analogue (out) 3 GND 4 S1 (PNP)
Connection schematic				
4T	Pin			Pin
4 x temperature output				1 +24 V DC 2 S2 (PNP) 3 GND 4 S1 (PNP) 5 S3 (PNP) 6 S4 (PNP)

When measuring the switching output with high-load measuring device inputs or when used as a frequency output, the load must be set to 10 kΩ between the output and earth (GND) to avoid faulty measurements.

Level- and temperature sensor

Nivotemp NT 67-XP

In hydraulics and lubrication technology the fill level of oil tanks needs to be monitored continuously. Here, modern factory automation requires compatible signals. Despite central system control, visualising the current level on the actual tanks is often desired. To minimise production costs and the space required on containers, it makes sense to use one monitor for both e.g. the fill level and oil temperature. The Nivotemp series meets virtually all requirements arising in this area of application.

NT 67-XP

Connecting flange as per DIN 24557 Part 2

Combined, continuous liquid level and oil temperature monitoring

LED display swivels 270°

Menu structure based on VDMA standard sheet 24574 ff.

6 programmable switching outputs assignable as level or temperature signal

Alternatively with IO-Link and 1 x programmable switching output

Alternatively with one analog output each for level and temperature plus 2 or up to 6 freely programmable switching outputs

Characteristics of switching outputs configurable as window or hysteresis

Switching output configurable as frequency output (1-100 Hz)

Min/max memory, logbook function

M12 plug base

Proven and tested highly dynamic float system

Immersion tube in matched lengths to max. 1420 mm (55.90 in), other lengths available upon request



Technical Data NT 67-XP
Basic unit

Version	MS	VA
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 604	SK 221
Min. fluid density	0.80 kg/dm ³ (0.029 lb/in ³)	0.85 kg/dm ³ (0.031 lb/in ³)
Lengths (all versions)	280 (11.02 in), 370 (14.57 in), 500 (19.69 in), 670 (26.38 in), 820 (32.28 in), 970 (38.19 in), 1120 (44.09 in), 1270 (50 in), and 1420 mm (55.90 in) (other lengths available upon request)	

Material/Version

Display housing	PA	PA
Float	rigid PU	1.4571
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm (11.02 in)	approx. 850 g (1.87 lb)	approx. 950 g (2.09 lb)
Each 100 mm (3.94 in) add	approx. 30 g (0.06 lb)	approx. 50 g (0.11 lb)
Degree of protection	IP65	IP65

Options

Stilling tube (SSR)	Brass	VA
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Analysis Display Electronics

Display	4 character 7 segment LED	
Operation	Via 3 keys	
Memory	Min. / Max. Data memory	
Starting current input	approx. 100 mA for 100 ms	
Current input during operation	approx. 50 mA (without current- and switching outputs)	
Supply voltage (U _b)	10 – 30 V DC (nominal voltage 24 V DC) / with IO-Link 18 – 30 V DC	
Ambient temperature	-20 °C to +70 °C (-4 °F to 158 °F)	
Display units	Level	Temperature
	% , cm, L, i, Gal	°C / °F
Display range	adjustable	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	e.g. 0 – 100 %	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value	± 1 % from end value

Input values	Level	Temperature
Principle of measurement	Reed-contact	Pt100 Cl. B, DIN EN 60751
	Resolution 5 mm (0.2 in)	Tolerance ± 0.8 °C (1.44 °F)

Optional switching outputs

	1D1S	4S	6S
Plug (base)	1 x M12 – 4-pin	2 x M12 – 4-pin	1 x M12 – 8-pin
Switching outputs	IO-Link and 1 x freely programmable with level or temperature assignment options	4 x freely programmable with assignment options, e.g. 2 x level/ 2 x temperature*	6 x freely programmable with assignment options, e.g. 4 x level/ 2 x temperature*
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current**	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total

*also programmable as frequency output

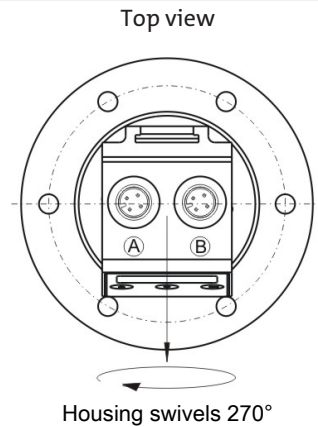
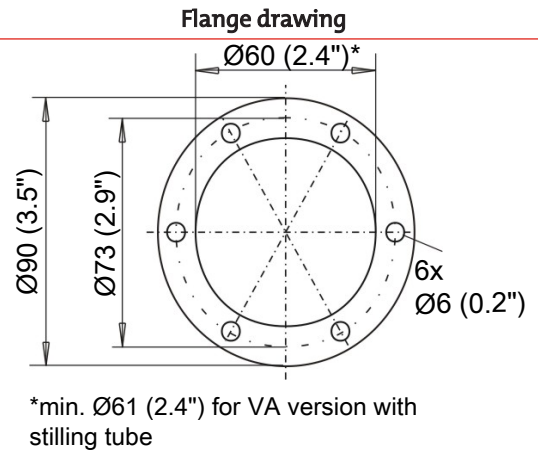
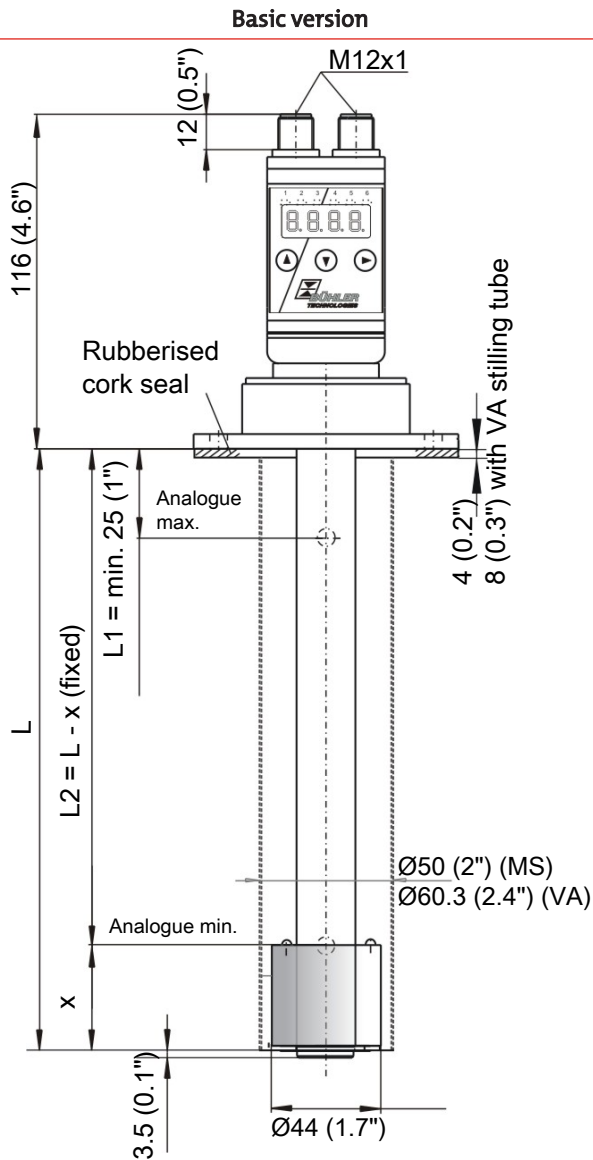
**Output 1 max. 0.2 A.

	2S-KN-KT	4S-KN-KT	6S-KN-KT
Plug (base)	2 x M12 – 4-pin	1 x M12 – 8-pin	2 x M12 – 4-pin / 8-pin
Switching outputs	2 x freely programmable with level or temperature assignment options	4 x freely programmable with level or temperature assignment options	6 x freely programmable with level or temperature assignment options
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current*	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analogue outputs	1x level 1x temperature	1x level 1x temperature	1x level 1x temperature
Programmable as	4 – 20 mA, 2 - 10 V DC, 0 - 10 V DC, 0 - 5 V DC	4 – 20 mA, 2 - 10 V DC, 0 - 10 V DC, 0 - 5 V DC	4 – 20 mA, 2 - 10 V DC, 0 - 10 V DC, 0 - 5 V DC
Max. burden Ω as current output	$(U_B - 8 V) / 0.02 A$	$(U_B - 8 V) / 0.02 A$	$(U_B - 8 V) / 0.02 A$
Min. input load as voltage output	10 k Ω	10 k Ω	10 k Ω

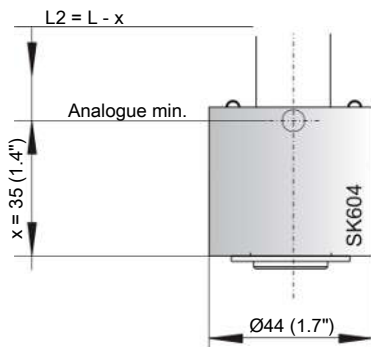
**Output 1 max. 0.2 A.

Other output cards available upon request.

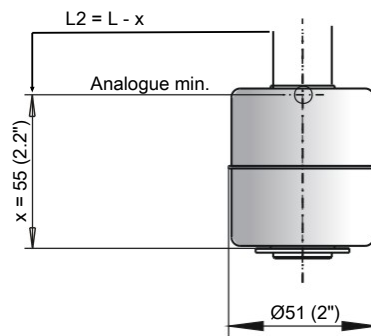
Dimensions NT 67-XP



SK 604 float for NT67-XP-MS



SK 221 float for NT67-XP-VA



Ordering Instructions NT 67-XP

Model key

NT67-XP-□□-□□-□□-□□-□□	
Type designation with display, control unit	Optional SSR
Version	Stilling tube
MS Brass	Output card
VA float and VA immersion tube	1D1S 1 x IO-Link 1 x PNP switching output
Plug connection	4S 4 x PNP switching output
2M12 - 4-pin	6S 6 x PNP switching output
M12 ¹⁾ - 8-pin	2S-KN-KT 2 x PNP switching output 1 x analogue level output 1 x analogue temperature output
2M12 ²⁾ - 1 x 4-pin, 1 x 8-pin	4S-KN-KT 4 x PNP switching output 1 x analogue level output 1 x analogue temperature output
Length (max. 1420 mm/55.9")	6S-KN-KT 6 x PNP switching output 1 x analogue level output 1 x analogue temperature output
280 (11")	
370 (14.6")	
500 (19.7")	
670 (26.4")	
820 (32.3")	
970 (38.2")	
1120 (44.1")	
1270 (50")	
1420 (55.9")	

¹⁾ for version 4S-KN_KT and 6S only

²⁾ for 6S-KN-KT version only

Accessories

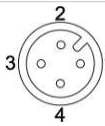
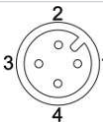
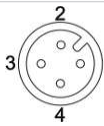
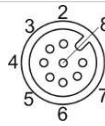
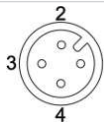
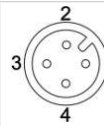
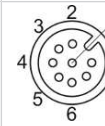
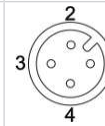

Item no. 4-pin	Item no. 8-pin	Description
9144050010	9144050048	Connecting cable M12x1, 1.5 m (4,92 ft), angular coupling and straight plug
9144050046	9144050049	Connecting cable M12x1, 3.0 m (9,84 ft), angular coupling and straight plug
9144050047	9144050033	Connecting cable M12x1, 5.0 m (16,40 ft), angular coupling and strands

Ordering example

You require:	Level and temperature measurement with 5 mm (0.2") resolution, MS version, 2xM12 connector, L=670 mm (26.4") with 2 programmable PNP switching points and analogue output for level and temperature.
Order:	NT 67-XP- MS-2M12 / 670-2S-KN-KT

Standard pin assignment NT 67-XP

Plug connections

Version	1D1S	4S		6S	2S-KN-KT		4S-KN-KT	6S-KN-KT	
Plug	M12 4-pin	2xM12 4-pin		M12 8-pin	2xM12 4-pin		M12 8-pin	2xM12 4-pin/8-pin	
		Plug A	Plug B		Plug A	Plug B		Plug A	Plug B
Connection schematic									
		Display			Display			Display	
Pin									
1	+24 V DC	+24 V DC*	+24 V DC*	+24 V DC	+24 V DC*	+24 V DC*	+24 V DC	+24 V DC	+24 V DC
2	S2 (PNP)	S2 (PNP)	S4 (PNP)	S2 (PNP)	Temp (analog)	S2 (PNP)	S2 (PNP)	Temp (analog)	S2 (PNP)
3	GND	GND	GND	GND	GND	GND	GND	GND	GND
4	C/Q (IO-Link)	S1 (PNP)	S3 (PNP)	S1 (PNP)	Level (analog)	S1 (PNP)	S1 (PNP)	Level (analog)	S1 (PNP)
5				S3 (PNP)			S3 (PNP)		S3 (PNP)
6				S4 (PNP)			S4 (PNP)		S4 (PNP)
7				S5 (PNP)			Level (analog)		S5 (PNP)
8				S6 (PNP)			Temp (analog)		S6 (PNP)

*Plugs A & B must be connected to ensure proper function! It is important to note here that the plug for the display should be connected last, otherwise an error will occur (error 1024).

Level- and temperature switch

Nivotemp NT 64, NT 64D

In hydraulics and lubrication technology the fill level of oil tanks needs to be monitored continuously. Here, modern factory automation requires compatible signals. Despite central system control, visualising the current level on the actual tanks is often desired. To minimise production costs and the space required on containers, it makes sense to use one monitor for both e.g. the fill level and oil temperature. The Nivotemp series meets virtually all requirements arising in this area of application.

NT 64

Connecting flange as per DIN 24557 Part 2

Wireless, adjustable level contacts

Various plug options

Up to 4 switching outputs for liquid level or 2 switching outputs for liquid level plus Pt100 or analog output for temperature

Proven and tested highly dynamic float system

24 V DC standard, 230 V DC upon request

NT 64D

LED display with status of switching outputs, 270° swivel

Standard menu structure based on VDMA standard sheet 24574 ff.

2 wireless, adjustable level contacts

Up to 4 programmable temperature switching outputs

Alternatively, continuous temperature output signal plus one freely programmable switching output

Characteristics of switching output configurable as window or hysteresis

Two switching outputs configurable as frequency output (1-100 Hz)

Min/max memory, logbook function



Technical Data NT 64

Basic unit

Version	MS	VA
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 610	SK 221
Min. fluid density	0.80 kg/dm ³ (0.029 lb/in ³)	0.85 kg/dm ³ (0.031 lb/in ³)
Lengths	280, 370, 500 mm (11, 14.6, 19.7 in) (standard)	

Material/Version

Float	rigid PU (SK 610)	1.4571 (SK 221)
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm (11 in)	approx. 200 g (0.4 lb)	approx. 300 g (0.7 lb)
Each 100 mm (3.9 in) add	approx. 30 g (0.07 lb)	approx. 50 g (0.1 lb)

Includes:

Mounting screws (quantity 6) and rubberised cork seal.

Options

Stilling tube (SSR)	Brass	VA
Level switching output	K101-104	W101/102
Function	NO/NC*	Change-over contact
Max. number	4	2
Voltage max.	30 V DC	30 V DC
Switching current max.	0.5 A	0.5 A
Contact load max.	10 VA	20 VA
Min. contact spacing	40 mm (1.6 in)	40 mm (1.6 in)

*NO= falling NC contact/NC = falling NO contact

Optional temperature output

Temperature contact	TK
Voltage max.	30 V DC
Switching current max.	2.5 A
Contact load max.	100 VA

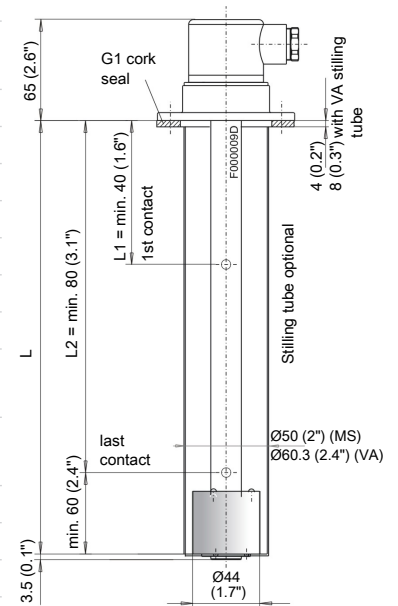
Function	NC*	NO*
Switching point °C (°F)	50/60/70/80 (122/140/158/176)	50/60/70/80 (122/140/158/176)
Switching point tolerance	± 3 K (± 5.4 °Ra)	± 3 K (± 5.4 °Ra)
Hysteresis max.	10 K ± 3 K (18 ± 5.4 °Ra)	10 K ± 3 K (18 ± 5.4 °Ra)

* NC = NC contact/NO = NO contact, data for rising temperature

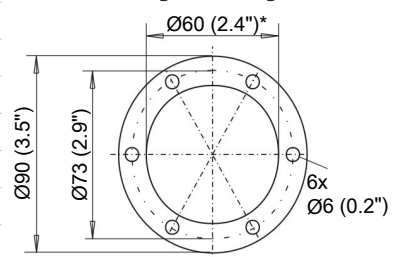
Temperature sensor	Pt 100 Class B, DIN EN 60 751
Tolerance	±0.8 °C (±1.4 °F)
Temperature transmitter	KT
Temperature sensor	Pt 100 Class B, DIN EN 60 751
Measuring range	0 °C to +100 °C (32 °F to 212 °F)
Supply voltage (U _b)	10 - 30 V DC
Output	4 - 20 mA
Burden Ω max.	=(U _b -7.5 V) / 0.02 A
Accuracy	± 1 % from end value

Other measuring ranges available upon request

Basic model

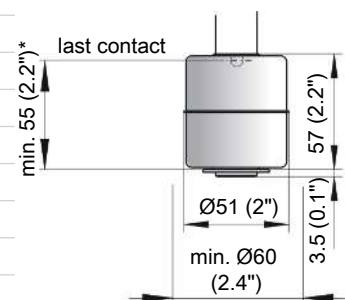


Flange drawing



*min. Ø61 (2.4") for VA version with stilling tube

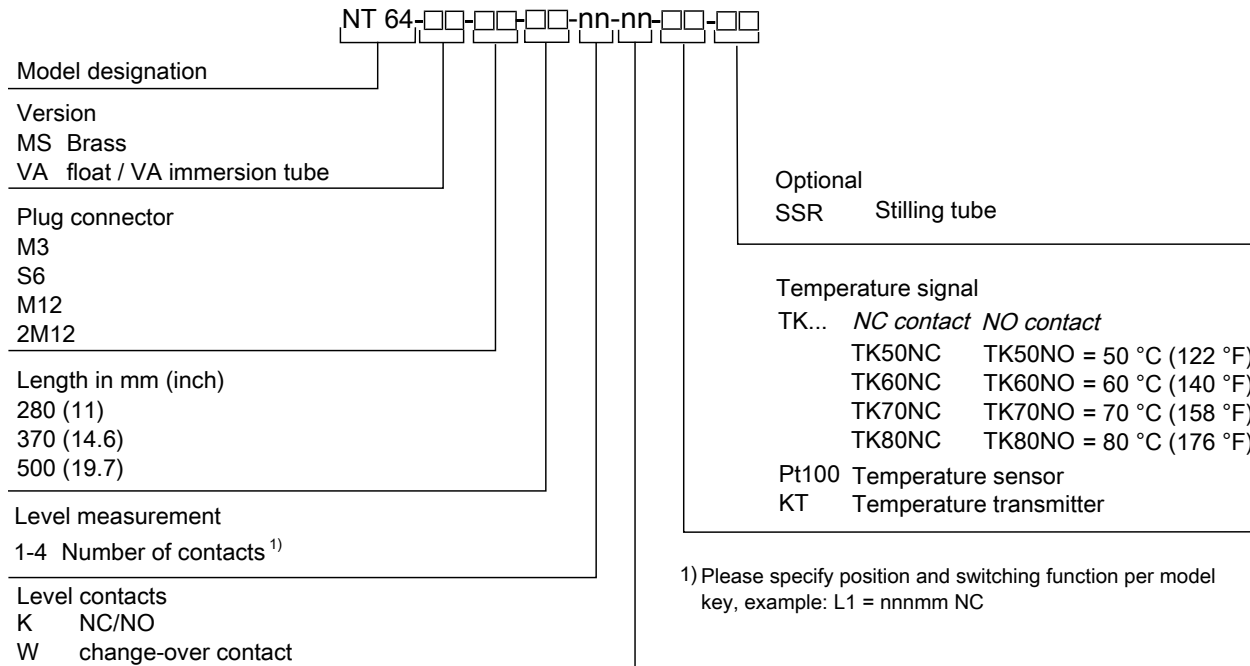
SK 221 Float



min. Ø61 (2.4") with stilling tube
* min. 80 (3.1") with temperature

Ordering instructions NT 64

Model key



Accessories

Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

Ordering example

You require: Level switch with flange, brass, plug connector S6, length L = 500 mm (19.7 in), 2 level contacts and temperature contact TK 80 as NC contact, 1st contact 100 mm (3.9 in) NC, 2nd contact 420 mm (16.5 in) NO

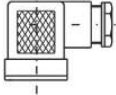
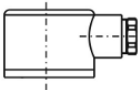
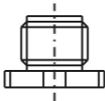
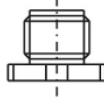
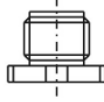
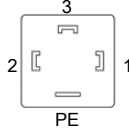
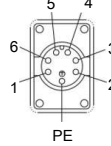
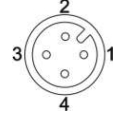
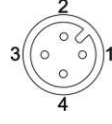
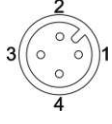
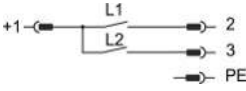
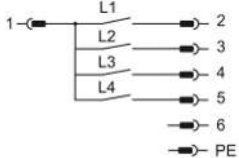
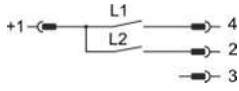
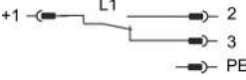
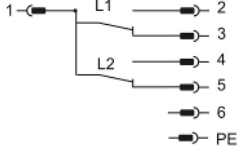

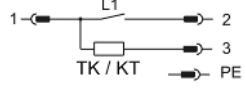
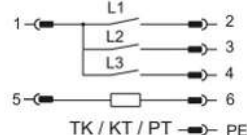
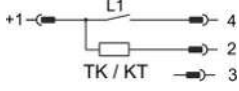
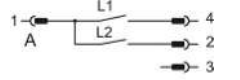
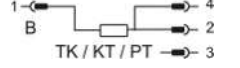
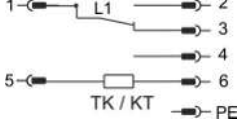
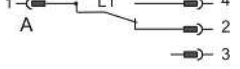
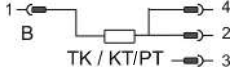
Order: NT 64-MS-S6-500-2K-TK80NC, L1=100 NC, L2=420 NO

Standard pin assignment NT 64

Plug connection

	M3	S6	M12 (base)	2M12 (base)
Dimensions				
Number of pins	3-pin + PE	6-pin + PE	4-pin	4-pin / 4-pin
DIN EN	175301-803	175201-804	61076-2-101	61076-2-101
Voltage max.	30 V AC / V DC	30 V AC / V DC	30 V DC	30 V DC
Contact load max.	0.5 A per output	0.5 A per output	0.5 A per output	0.5 A per output
Degree of protection	IP65	IP65	IP67*	IP67*
Cable fitting	PG11	M20x1.5		
Max. number of contacts				
Level/temp. contacts	1 x K101 / 1 x TK - / -	3 x K101-104 / 1 x TK 1 x W101/102 / 1 x TK	1 x K101 / 1 x TK - / -	3 x K101-104 / 1 x TK 1 x W101/102 / 1 x TK
Level contacts only	2 x K101-102 1 x W101	4 x K101-104 2 x W101/102	4 x K101-102 2 x W101	4 x K101-104 1 x W101/102

* with IP67 cable box attached. Other plug connections available upon request.

	M3	S6	M12 (base)	2 x M12 (base)	
					
Connection schematic					
K101-104 Level contact(s)					
W101/102 Level contact(s)					
K101-104 Level contact(s) and Pt100					
W101/102 Level- and temperature contact(s)					

The standard assignment specified here applies to the max. number of contacts possible and contact function NO.

Technical Data NT 64D

Basic unit

Version	MS	VA
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 610	SK 221
Min. fluid density	0.80 kg/dm ³ (0.029 lb/in ³) with float	0.85 kg/dm ³ (0.031 lb/in ³) with float
Lengths	280, 370, 500 mm (11, 14.6, 19.7 in) (standard)	

Material/Version

Display housing	PA	PA
Float	rigid PU	1.4571
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm (11 in)	approx. 300 g (0.7 lb)	approx. 400 g (0.9 lb)
Each 100 mm (3.9 in) add	approx. 30 g (0.07 lb)	approx. 50 g (0.1 lb)
Degree of protection	IP65	IP65

Includes:

Mounting screws (quantity 6) and rubberised cork seal.

Options

Stilling tube (SSR)	Brass	VA
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Temperature display electronics

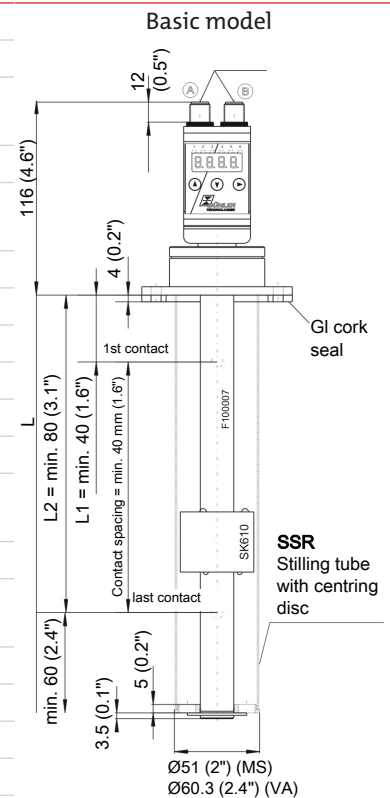
Display	4 character 7 segment LED
Operation	Via 3 keys
Memory	Min. / Max. Data memory
Starting current input	approx. 100 mA for 100 ms
Current input during operation	approx. 50 mA (without current- and switching outputs)
Supply voltage (U _B)	10 – 30 V DC (nominal voltage 24 V DC)
Ambient temperature	-20 °C to +70 °C (-4 °F to 158 °F)
Display units	Temperature °C / °F
Display range	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value

Temperature sensor	Pt100 Class B, Din EN 60751
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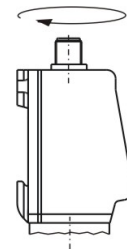
Level switching output

Level switching output	K10
Max. number	2
Function	NC / NC*
Voltage max.	30 V DC
Switching current max.	0.5 A
Contact load max.	10 VA
Min. contact spacing	40 mm (1.6 in)

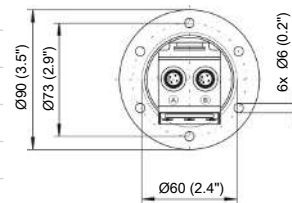
*NO= falling NC contact / NC = falling NO contact



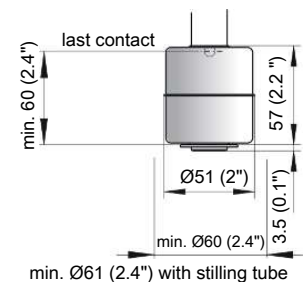
Housing swivels 270°



Flange drawing



SK 221 float for NT 64D-VA



Temperature outputs

Choose from the following temperature outputs

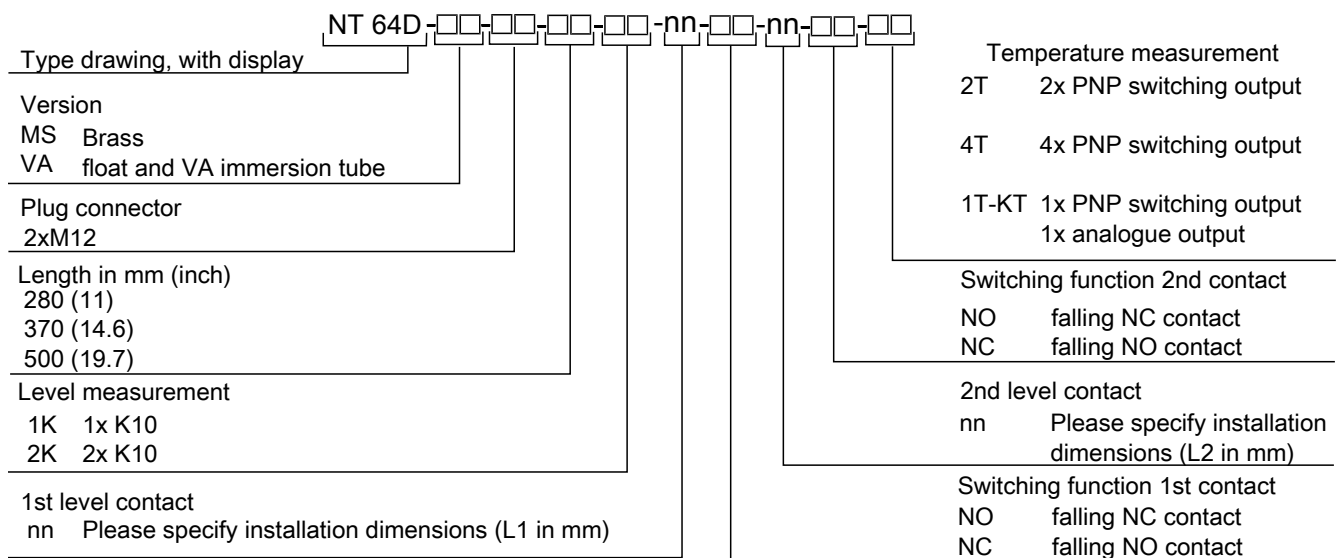
	-2T	-1T-KT	-4T
Plug (base)	2 x M12 – 4-pin	2 x M12 – 4-pin	1 x M12 – 4-pin 1 x M12 – 8-pin
Switching outputs	2 x freely programmable*	1 x freely programmable*	4 x freely programmable
max. switching current**	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analogue output		1 x 4 – 20 mA, 2- 10 V 0-10 V, 0-5 V	
Max. burden Ω as current output		= $(U_b - 8 \text{ V}) / 0.02 \text{ A}$	
Min. input load as voltage output		10 k Ω	
Options			
Stilling tube (SSR)	Same material as immersion tube		

*also programmable as frequency output

**Output 1 max. 0.2 A.

Ordering instructions NT 64D

Model key



Accessories

Item no. 4-pin	Item no. 8-pin	Description
9144 05 0010	9144 05 0048	Connecting cable M12x1, 1.5 m (4,92 ft), angular coupling and straight plug
9144 05 0046	9144 05 0049	Connecting cable M12x1, 3.0 m (9,84 ft), angular coupling and straight plug
9144 05 0047	9144 05 0033	Connecting cable M12x1, 5.0 m (16,40 ft), angular coupling and strands

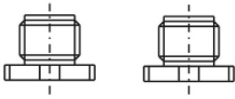
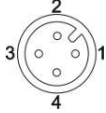
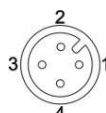
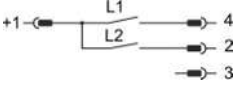
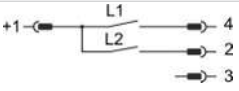
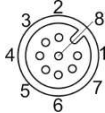
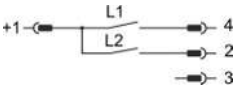
Ordering example

You require: Level switch with flange, brass, plug connector S6, length L = 500 mm (19.7 in), 2 level contacts and temperature contact TK 80 as NC contact, 1st contact 100 mm (3.9 in) NC, 2nd contact 420 mm (16.5 in) NO, with temperature display and 2 x programmable temperature output

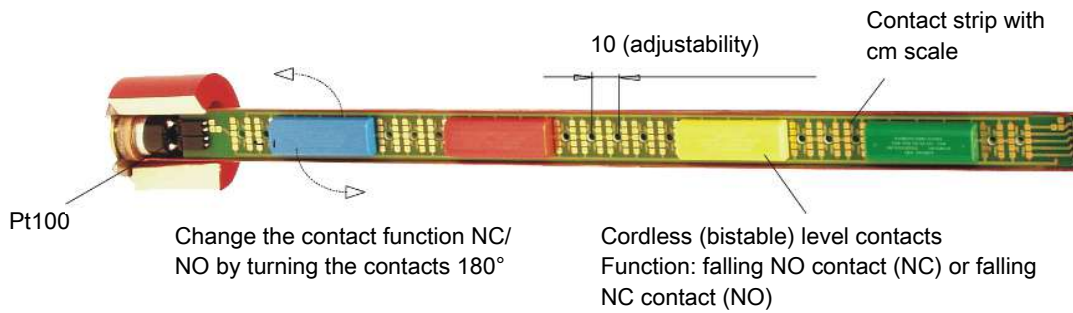
Order: NT 64D-MS-2M12/500-2K-100NC-420NO-2T

Standard pin assignment NT 64D

Plug connection

		2 x M12 (base)	
Panel plug			
Connection schematic	<p>Plug A (level)</p> 	<p>Plug B (Temperature)</p> 	
2T		Pin	
2 x temperature output		<p>1 +24V DC 2 S2 (PNP) 3 GND 4 S1 (PNP)</p>	
1T-KT		Pin	
1 x Temperature output 1 x Analogue output		<p>1 +24 V DC 2 Analogue (out) 3 GND 4 T1 (PNP)</p>	
Connection schematic			
4T		Pin	
4 x Temperature output		<p>1 +24 V DC 2 S2 (PNP) 3 GND 4 S1 (PNP) 5 S3 (PNP) 6 S4 (PNP)</p>	

easyjust System



Using adjustable level contacts allows the use of standardised immersion tube lengths for different size and shape oil tanks. The switching points can always be configured to the specific system requirements without first having to purchase a specific level switch.

This aids original equipment manufacturers and operators with project planning and logistics.

Since the level contacts are electric components, they require a connection to the respective circuits. This is typically achieved using cables which however, particularly in the case of multiple contacts, makes adjustments more difficult.

The Easy Just System is based on a wireless contact arrangement.

These are enclosed by different coloured housings and are arranged on a carrier board with gold contact points.

The different colours aid with coding the various contacts and ensure the terminal configuration matches the connectors.

The switching function of the contacts (NO or NC) is determined by turning the contact sleeve 180° on the carrier board.

Depending on the option selected, a fixed temperature switch (bi-metal, NO or NC), Pt 100 or 4-20 mA transmitter will be fixed to the bottom end of the board for temperature monitoring.

Level- and temperature sensor

Nivotemp NT 63

In hydraulics and lubrication technology the liquid level of oil tanks must be monitored continuously. Here, modern factory automation requires compatible signals. To minimise production costs and the space required on tanks, it makes sense to use one monitoring device for both the monitoring of the liquid level and oil temperature for example. The Nivotemp series meets virtually all requirements arising in this area of application.

The digital, bidirectional communication of these sensors meets the requirements of modern plant automation, reduces acquisition and installation costs, and improves system availability.

NT 63

Connecting flange as per DIN 24557 Part 2

Continuous liquid level measurement

Continuous liquid level and temperature measurement

IO-Link and 1 x programmable switching output

Analog output 4-20 mA (2-10 V DC upon request)

Resolution 5 mm (0.2 in) (liquid level)

Various plug options

Proven and tested highly dynamic float system

Float and immersion tube optionally available in stainless steel

Immersion tube length up to 1420 mm (55.90 in) (longer upon request)



Technical Data NT 63

Basic unit

K = continuous liquid and temperature measurement

KN = continuous level measurement

LTD = level and temperature measurement (IO-Link)

Version	MS	VA
Operating pressure:	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Medium temperature:	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float:	SK604	SK221
Min. fluid density:	0.80 kg/dm ³ (0.029 lb/in ³)	0.85 kg/dm ³ (0.030 lb/in ³)
Lengths (all versions):	280 (11.02 in), 370 (14.57 in), 500 (19.69 in), 670 (26.38 in), 820 (32.28 in), 970 (38.19 in), 1120 (44.09 in), 1270 (50 in) and 1420 mm (55.90 in) (other lengths available upon request)	

Material/Version

Float:	PU	1.4571
Immersion tube:	Brass	1.4571
Flange DIN 24557 Part 2:	PA	PA
Weight at L=280 mm (11.02 in):	approx. 200 g (0.44 lb)	approx. 300 g (0.66 lb)
Each 100 mm (3.94 in) add:	approx. 30 g (0.06 lb)	approx. 50 g (0.11 lb)

Includes:

Mounting screws (quantity 6) and rubberised cork seal.

Options

Stilling tube (SSR):	Brass	VA
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Input values	Level	Temperature
Measuring principle:	Reed-contact	Pt100 Cl. B, DIN EN 60751
Resolution:	5 mm (0.2 in)	
Tolerance:		± 0.8 °C (1.44 °F)

Analogue version

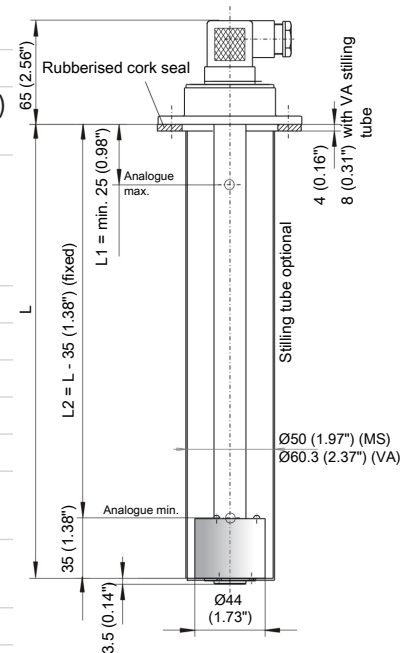
Ambient temperature:	-20 °C to 80 °C (-4 °F to 176 °F)	
Operating voltage (U _B):	10 – 30 V DC	10 – 30 V DC
Analysis display electronics accuracy:	± 1 % from end value	± 1 % from end value
Output:	4-20 mA	4-20 mA (0-100 °C/32-212 °F*) *Other ranges upon request
Max. burden Ω:	$= (U_B - 7.5 V) / 0.02 A$	$= (U_B - 7.5 V) / 0.02 A$

Digital version

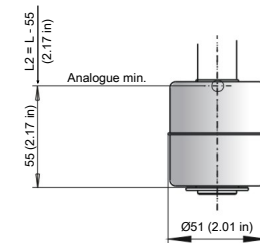
Ambient temperature:	-20 °C to 70 °C (-4 °F to 158 °F)	
Operating voltage (U _B):	18 – 30 V DC	18 – 30 V DC
Analysis display electronics accuracy:	± 1 % from end value	± 1 % from end value
IO-Link version:	Revision 1.1	
Baudrate:	COM3 (230.4 k)	
SIO Mode:	Yes	
min. time period:	10 ms	

Dimensions

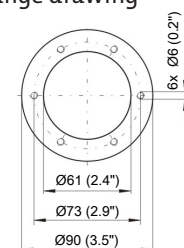
Basic model



SK 221 Float



Flange drawing



Ordering instructions NT 63

Model key

NT 63-□□□□□□□□		Optional SSR Stilling tube
Model designation		Length (max. 1420 mm/55.90 in)
Measuring mode		280 (11.02 in)
K Level and temperature measurement		370 (14.57 in)
KN only level measurement		500 (19.69 in)
LTD Level and temperature measurement (IO-Link)		670 (26.38 in)
Version		820 (32.28 in)
MS Brass		970 (38.19 in)
VA float and VA immersion tube		1120 (44.09 in)
Plug connection		1270 (50 in)
M3 (only K/KN)		1420 (55.90 in)
M12		

Another accessory offered is a programmable display and control unit for displaying and monitoring measured variables, see data sheet no. 180201.

Accessories

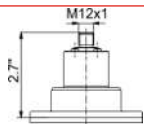
Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

Ordering example

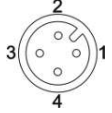
You require:	Level and temperature measurement with 5 mm resolution, brass version with M12 plug connector and length L = 670 mm (26.38 in)
Order:	NT 63- K-MS-M12-670

Standard pin assignment NT 63-LTD

Connector

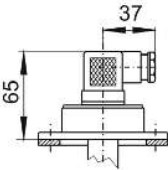
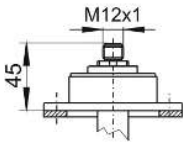
	M12
Dimensions	
Number of pins	4-pin
DIN EN	61076-2-101
IP rating	IP67*

*with IP67 cable box attached

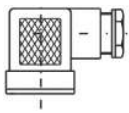
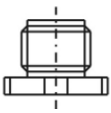
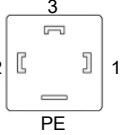
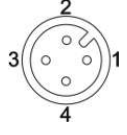
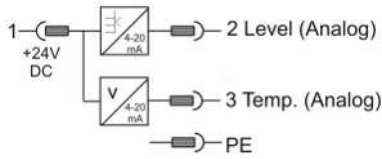
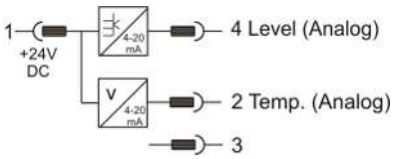
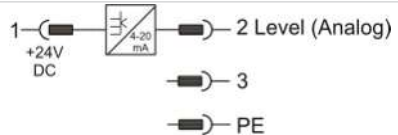
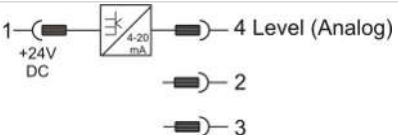
Version	LTD-1D1S
Plug	M12 4-pin
Connection schematic	
Pin	
1	+24VDC
2	S2 (PNP max. 200 mA)
3	GND
4	C/Q (IO-Link)

Standard pin assignment NT 63-K, NT 63-KN

Plug connection

	M3	M12 (base)
Dimensions		
Number of pins	3-pin + PE	4-pin
DIN EN	175301-803	61076-2-101
IP rating	IP65	IP67*
Cable fitting	PG11	

*with IP67 cable box attached

	M3	M12 (base)
		
Connection schematic		
K continuous level and temperature measurement		
KN continuous level measurement		

Level- and temperature switch Nivotemp NT 61, NT 61D, NT 61-HT

In hydraulics and lubrication technology the fill level of oil tanks needs to be monitored continuously. Here, modern factory automation requires compatible signals. Despite central system control, visualising the current level on the actual tanks is often desired. To minimise production costs and the space required on containers, it makes sense to use one monitor for both e.g. the fill level and oil temperature. The Nivotemp series meets virtually all requirements arising in this area of application.

NT 61

Connecting flange as per DIN 24557 Part 2

Various plug options

Up to 4 switching outputs for liquid level or 2 switching outputs for liquid level plus Pt100 or analog output for temperature

Proven and tested highly dynamic float system

Immersion tube length up to 1.5 m (4.92 ft) (longer upon request)

suitable for up to 230 V AC/DC (varies by version)

NT 61-HT (used for HFC+HFA oils) for temperatures up to 150 °C (302 °F)

NT 61D

LED display swivels 270°

Up to 4 programmable temperature switching outputs

Alternatively, continuous temperature signal plus one freely programmable switching output)

Characteristics of switching outputs configurable as frequency output (1-100 Hz)

Standard menu structure based on VDMA standard sheet 24574 ff.

Min/max memory, logbook function



Technical Data NT 61

Basic Unit

Version	MS	VA
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 610	SK 221
Min. fluid density	0.80 kg/dm ³ (0.029 lb/in ³)	0.85 kg/dm ³ (0.029 lb/in ³)
Lengths (all versions)	280 (11.02 in), 370 (14.57 in), 500 mm (19.69 in) (Standard), variable to max. 1500 mm (59.06 in) in 10 mm (0.39 in) increments	

Material/Version	MS	VA
Float	rigid PU	1.4571
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm (11.02 in)	approx. 200 g (0.44 lb)	approx. 300 g (0.66 lb)
Each 100 mm (3.94 in) add	approx. 30 g (0.06 lb)	approx. 50 g (0.11 lb)

Includes: Mounting screws (quantity 6) and rubberised cork seal.

Options

Stilling tube (SSR)	Brass	VA
Level switching output	K10	W11
Function	NO/NC*	Change-over contact
Voltage max.	230 V AC/DC	48 V AC/DC
Switching current max.	0.5 A	0.5 A
Contact load max.	10 VA	20 VA
Min. contact spacing	40 mm (1.57 in)	40 mm (1.57 in)

Contact position in 10 mm (0.39 in) increments

*NO = falling NC contact / NC = falling NO contact

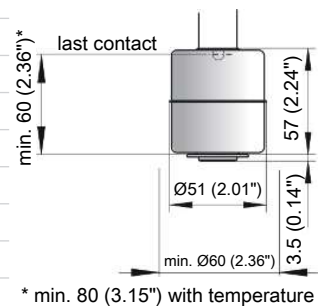
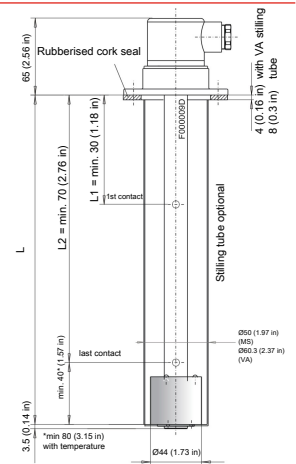
Temperature contact	TK	TM
Number of temp. contacts	1	2
Voltage max.	230 V AC/DC	230 V AC/DC
Switching current max.	2.5 A	2 A
Contact load max.	100 VA	100 VA

Function	NC*	NC*
Switching point °C	50/60/70/80 (122/140/158/176 °F)	50/60/70/80 (122/140/158/176 °F)
Switching point tolerance	± 3 K (± 5.4 °Ra)	± 5 K (± 9 °Ra)
Hysteresis max.	10 K ± 3 K (18 ± 5.4 °Ra)	18 K ± 5 K (32.4 ± 9 °Ra)
Function	NO*	NO*
Switching point °C	50/60/70/80 (122/140/158/176 °F)	50/60/70/80 (122/140/158/176 °F)
Switching point tolerance	± 3 K (± 5.4 °Ra)	± 5 K (± 9 °Ra)
Hysteresis max.	10 K ± 3 K (18 ± 5.4 °Ra)	26/35/40/45 K ± 5 K (47/63/72/81 ± 9 °Ra)

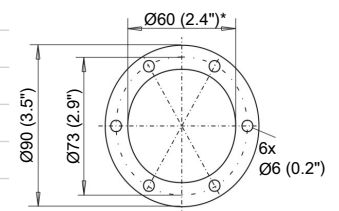
*NO= NO contact / NC = NC contact Other temperatures and versions with 2 x TK contact available upon request

Temperature signal

Temperature sensor	Pt 100 Class B, DIN EN 60 751 Tolerance ±0.8 °C (1.44 °F)
Temperature transmitter	KT
Temperature sensor	Pt100 Class B, DIN EN 60 751
Measuring range	0 °C to +100 °C (32 °F to 212 °F)
Operating voltage (U _B)	10 - 30 V DC
Output	4 - 20 mA
Burden Ω max.	= (U _B - 7.5 V) / 0.02 A
Accuracy	± 1 % from end value
Other measuring ranges available upon request	



* min. 80 (3.15") with temperature



*min. Ø61 (2.4") for VA version with stilling tube

Ordering instructions NT 61

Model key

	NT 61-□□-□□-nn-nn-□□-□□-□□-□□				
Model designation		Options	SSR	Stilling tube	
Version		2nd temperature contacts (TM... only)			
MS Brass		NC contact NO contact			
VA float and immersion tube		TM...	TM50NC TM50NO = 50 °C (122 °F)		
Plug connector			TM60NC TM60NO = 60 °C (140 °F)		
M3			TM70NC TM70NO = 70 °C (158 °F)		
S6			TM80NC TM80NO = 80 °C (176 °F)		
M12		1st temperature signal			
2M12		NC contact NO contact			
C6F		TK...	TK50NC TK50NO = 50 °C (122 °F)		
Length in mm/in (max. 1500 / 59.06)			TK60NC TK60NO = 60 °C (140 °F)		
280 (11.02 in) Standard lengths			TK70NC TK70NO = 70 °C (158 °F)		
370 (14.57 in)			TK80NC TK80NO = 80 °C (176 °F)		
500 (19.69 in)		TM ³⁾	TM50NC TM50NO = 50 °C (122 °F)		
nn variable, please specify value			TM60NC TM60NO = 60 °C (140 °F)		
Level measurement			TM70NC TM70NO = 70 °C (158 °F)		
1-4 Number of contacts			TM80NC TM80NO = 80 °C (176 °F)		
Level contact		Pt100	Temperature sensor ¹⁾		
K Model K10 (NC/NO)		KT	Temperature transmitter ^{1) 2)}		
W Model W11 (change-over contact)					

¹⁾ Cannot be combined with temperature contact
²⁾ With KT only 10 - 30 V DC
³⁾ For version with 2 temperature contacts

Ordering example

You require: Level switch MS version, plug connector S6, length L= 550 mm (21.65 in), 2 level contacts (NO/NC) and temperature contact 80 °C (176 °F) as NC contact, 1st contact 100 mm (3.94 in) NC, 2nd contact 470 mm (6.69 in) NO

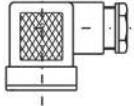
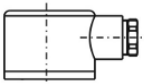
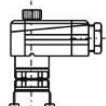

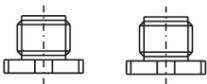
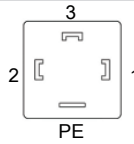
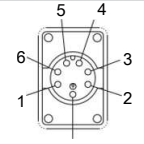
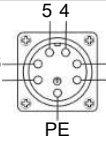

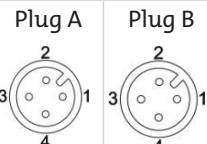
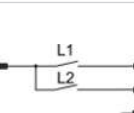
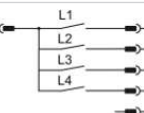
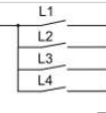
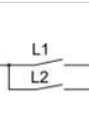
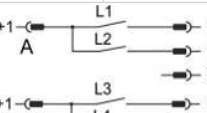
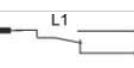



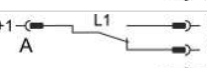
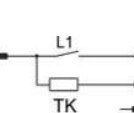
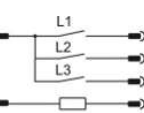
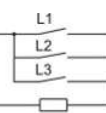
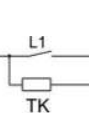
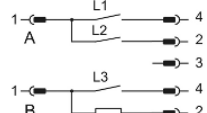
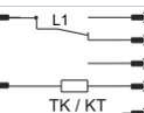
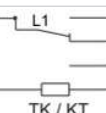
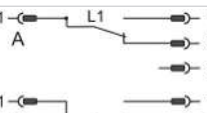
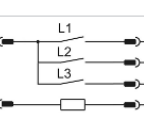
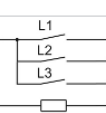
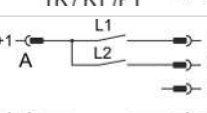
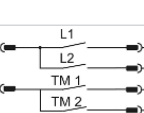
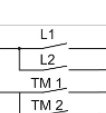
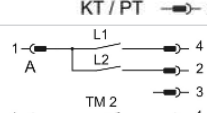
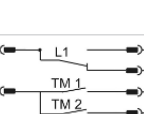
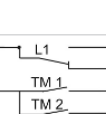

Order NT 61-MS-S6-550-2-K-T80NC, L1=100 (3.94 in) NC L2=470 (6.69 in) NO

Standard pin assignment NT 61

Plug connection

	M3	S6	C6F	M12	2xM12
Dimensions					
Number of pins	3-pin + PE	6-pin + PE	6-pin + PE	4-pin	4-pin / 4-pin
DIN EN	175301-803	175201-804	175301-804	61076-2-101	61076-2-101
Max. voltage	230 VAC / DC*	230 VAC / DC*	230 VAC / DC*	30 VDC	30 VDC
IP rating	IP65	IP65	IP65	IP67**	IP67**
Cable fitting	PG 11	M20 x 1.5	PG 11		
Max. Number of contacts					
Level/temp. contacts	1 x K10 / 1 x TK - / - - / -	3 x K10 / 1 x TK 2 x K10 / 2 x TM 1 x W11 / 1 x TK 1 x W11 / 2 x TM	3 x K10 / 1 x TK 2 x K10 / 2 x TM 1 x W11 / 1 x TK 1 x W11 / 2 x TM	1 x K10 / 1 x TK - / - - / -	3 x K10 / 1 x TK 2 x K10 / 2 x TM 1 x W11 / 1 x TK 1 x W11 / 2 x TM
Level contacts only	2 x K10 1 x W11	4 x K10 2 x W11	4 x K10 2 x W11	2 x K10 1 x W11	4 x K10 2 x W11

*Max. 48 VAC/ VDC for change-over contact. **with IP67 cable box attached. Other plug connections available upon request

	M3	S6	C6F	M12 (base)	2 x M12 (base)
					
Connection schematic					
K10 Level contact(s)					
W11 Level contact(s)					
K10 Level- and tempera- ture contact					
W11 Level- and tempera- ture contact(s)					
K10 / Pt100 Level- and tempera- ture contact(s)					
K10 Level and 2 x temper- ature contact(s)					
W11 Level and 2 x temper- ature contact(s)					

The standard assignment specified here refers to the max. number of contacts possible and contact function NO (contact type K10).

Technical Data NT 61D

Basic Unit

Version	MS	VA
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 610	SK 221
Min. fluid density	0.80 kg/dm ³ (0.029 lb/in ³)	0.85 kg/dm ³ (0.029 lb/in ³)
Lengths (all versions)	280 (11.02 in), 370 (14.57 in), 500 mm (19.69 in) (Standard), variable to max. 1500 mm (59.06 in) in 10 mm (0.39 in) increments	

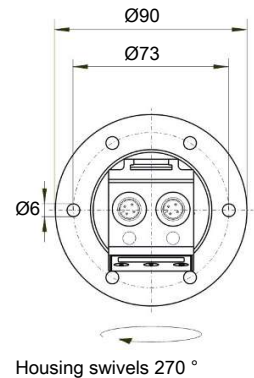
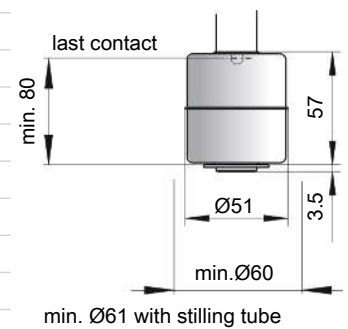
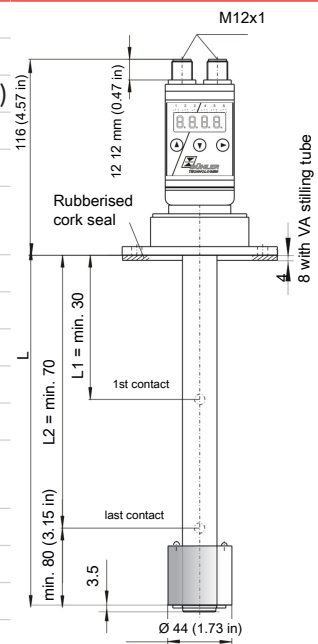
Material/Version	MS	VA
Display housing	PA	PA
Float	rigid PU	1.4571
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm	approx. 200 g (0.44 lb)	approx. 300 g (0.66 lb)
Each 100 mm add	approx. 30 g (0.06 lb)	approx. 50 g (0.11 lb)

Level switching output	K10
Max. number	2
Function	NO/NC*
Voltage max.	30 V DC
Switching current max.	0.5 A
Contact load max.	10 VA
Min. contact spacing	40 mm (1.57 in)
Contact position in 10 mm (0.39 in) increments	
*NO = falling NC contact / NC = falling NO contact	

Temperature display electronics	
Display	4 character 7 segment LED
Operation	Via 3 keys
Memory	Min. / Max. Data memory
Starting current input	approx. 100 mA for 100 ms
Current input during operation	approx. 50 mA (without current- and switching outputs)
Supply voltage (U _b)	10 – 30 V DC (nominal voltage 24 V DC)
Ambient temperature	-20 °C to +70 °C (-4 °F to 158 °F)
Display units	Temperature °C / °F
Display range	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value
Temperature sensor	Pt 100 Class B, DIN EN 60 751 Tolerance ±0.8 °C (1.44 °F)

Includes

Mounting screws (quantity 6), rubberised cork seal



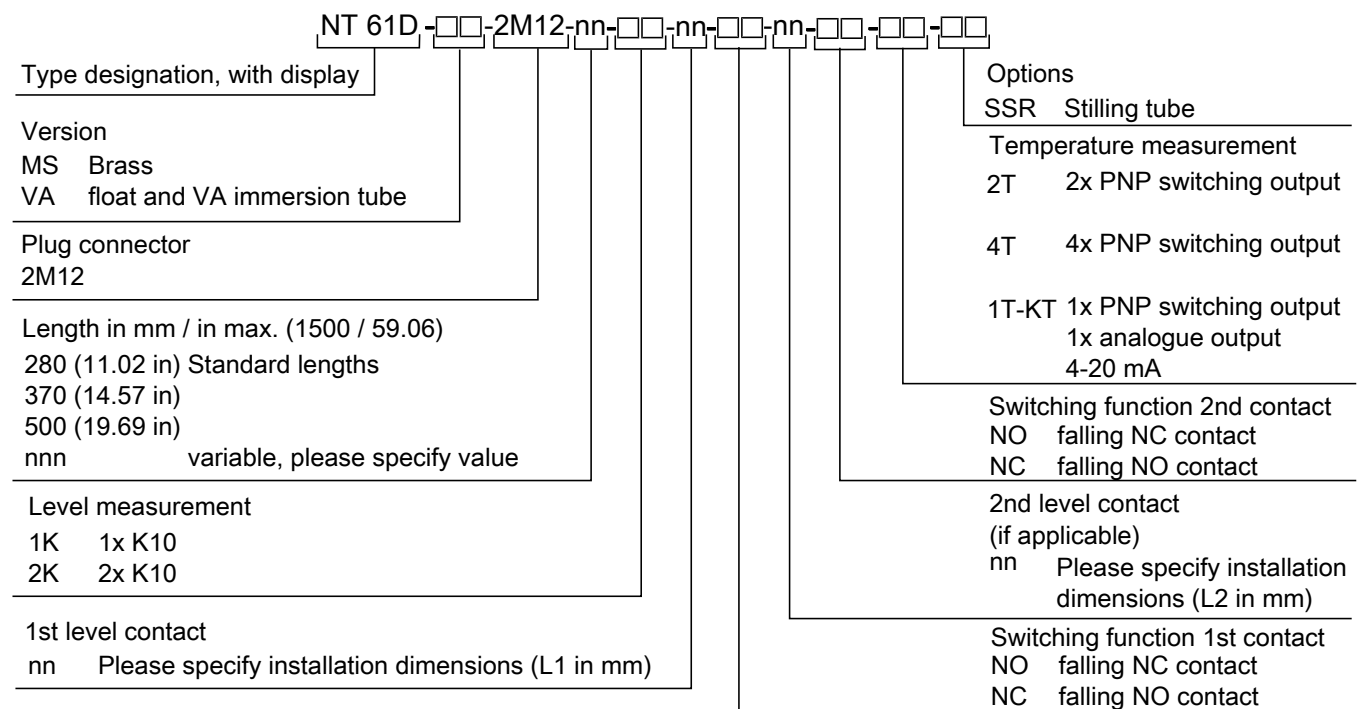
Alternative temperature outputs	-2T	-1T-KT	-4T
Plug (base)	2 x M12 – 4-pin	2 x M12 – 4-pin	1 x M12 – 4-pin 1 x M12 – 8-pin
Switching outputs	2 x freely programmable*	1 x freely programmable*	4 x freely programmable
Alarm memory		with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current**	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analogue output		1 x 4 – 20 mA 2-10 V DC, 0-10 V DC, 0-5 V DC	
Max. burden Ω as current output		$= (U_B - 8 V) / 0.02 A$	
Min. input load as voltage output		10 k Ω	
Options: Stilling tube SSR (same material as immersion tube)			

*also programmable as frequency output

**Output 1 max. 0.2 A.

Ordering instructions NT 61D

Model key



Accessories

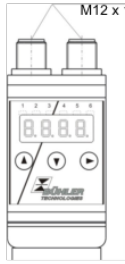
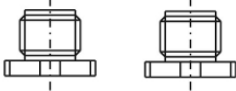
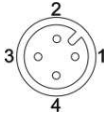
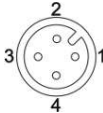
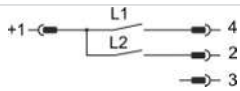
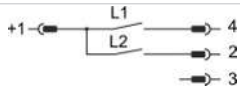
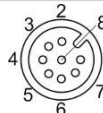
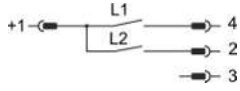
Item no. 4-pin	Item no. 8-pin	Description
9144050010	9144050048	Connecting cable M12x1, 1.5 m (4,92 ft), angular coupling and straight plug
9144050046	9144050049	Connecting cable M12x1, 3.0 m (9,84 ft), angular coupling and straight plug
9144050047	9144050033	Connecting cable M12x1, 5.0 m (16,40 ft), angular coupling and strands

Ordering example

You require:	Level switch VA version, length L= 550 mm (21.65 in), 2 level contacts: 1st contact 100 mm (3.94 in) NC, 2nd contact 470 mm (6.69 in) NO, 1 temperature output, 1 analog output, stilling tube
Order	NT 61D-VA-2M12-550-2K-100- NC-470-NO-1T-KT-SSR

Standard pin assignment NT 61D

Plug connection

	2 x M12 (base)	
Dimensions		
Number of pins	4-pin / 4-pin	
DIN EN	61076-2-101	
Voltage max.	30 V DC	
		
Connection schematic	<p>Plug A (level)</p> 	<p>Plug B (temperature)</p> 
2T		Pin
2 x temperature output		<p>1 +24 V DC 2 S2 (PNP) 3 GND 4 S1 (PNP)</p>
1T-KT		Pin
1 x Temperature output 1 x Analogue output		<p>1 +24 V DC 2 Analogue 3 GND 4 S1 (PNP)</p>
Connection schematic		
4T		Pin
4 x Temperature output		<p>1 +24 V DC 2 S2 (PNP) 3 GND 4 S1 (PNP) 5 S3 (PNP) 6 S4 (PNP)</p>

Technical Data NT 61-HT

Basic Unit

Operating pressure	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 221
Min. fluid density	0.85 kg/dm ³ (0.029 lb/in ³)
Lengths (all versions)	280 (11.02 in), 370 (14.57 in), 500 mm (19.69 in) (Standard), variable to max. 1500 mm (59.06 in) in 10 mm (0.39 in) increments

Material/Version

Float	1.4571
Immersion tube	1.4571
Flange (DIN 24557)	1.4571
Weight at L=280 mm (11.02 in)	approx. 950 g (2.09 lb)
Each 100 mm (3.94 in) add	approx. 50 g (0.11 lb)

Includes:

Mounting screws (quantity 6) and rubberised cork seal.

Options

Stilling tube (SSR)	Same material as immersion tube
---------------------	---------------------------------

Level switching contact

	K10	W11	K10HT**	W11HT**
Function	NO/NC*	Change-over contact	NO/NC*	Change-over contact
Voltage max.	230 V AC/DC	48 V AC/DC	230 V AC/DC	48 V AC/DC
Switching current max.	0.5 A	0.5 A	0.5 A	0.5 A
Contact load max.	10 VA	20 VA	10 VA	20 VA
Min. contact spacing	40 mm (1.57 in)	40 mm (1.57 in)	40 mm (1.57 in)	40 mm (1.57 in)
Operating temperature	105 °C (221 °F)	105 °C (221 °F)	150 °C (302 °F)	150 °C (302 °F)

Contact position in 10 mm (0.39 in) increments

*NO= falling NC contact / NC = falling NO contact **HT= not adjustable

Optional temperature switching outputs

Temperature contact	TK	TM
Number of temp. contacts	1	2
Voltage max.	230 V AC/DC	230 V AC/DC
Switching current max.	2.5 A	2 A
Contact load max.	100 VA	100 VA

Function	NC*	NC*
Switching point °C	50/60/70/80 (122/140/158/176 °F)	50/60/70/80 (122/140/158/176 °F)
Switching point tolerance	± 3 K (± 5.4 °Ra)	± 5 K (± 9 °Ra)
Hysteresis max.	10 K ± 3 K (18 ± 5.4 °Ra)	18 K ± 5 K (32.4 ± 9 °Ra)

Function	NO*	NO*
Switching point °C	50/60/70/80 (122/140/158/176 °F)	50/60/70/80 (122/140/158/176 °F)
Switching point tolerance	± 3 K (± 5.4 °Ra)	± 5 K (± 9 °Ra)
Hysteresis max.	10 K ± 3 K (18 ± 5.4 °Ra)	26/35/40/45 K ± 5 K (47/63/72/81 ± 9 °Ra)

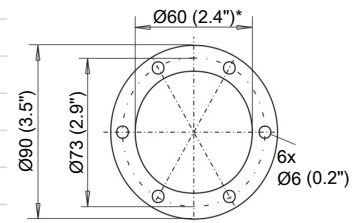
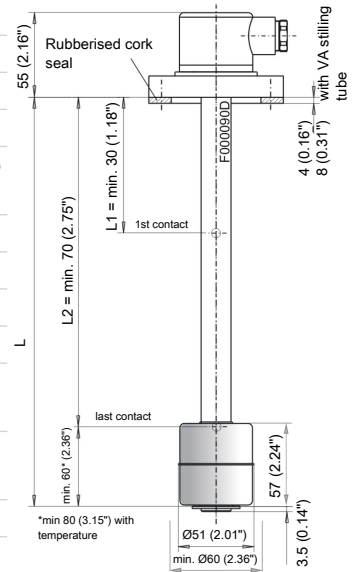
*NO = NO contact / NC = NC contact Data for rising temperature. Other temperatures and version with 2 x TK contact available upon request.

Optional temperature signal

Temperature sensor	Pt 100 Class B, DIN EN 60 751 Tolerance ±0.8 °C (1.44 °F)
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Temperature transmitter KT

Temperature sensor	Pt100 Class B, DIN EN 60 751
Measuring range	0 °C to +100 °C (32 °F to 212 °F)
Operating voltage (U _B)	10 - 30 V DC
Output	4 - 20 mA
Burden Ω max.	= (U _B - 7.5 V) / 0.02 A
Accuracy	± 1 % from end value
Other measuring ranges available upon request	



*min. Ø61 (2.4\") for VA version with stilling tube

Ordering instructions NT 61-HT

Model key

Model designation		Options	
Version	HT Stainless steel	SSR	Stilling tube
Plug connector	M3 S6 M12 2M12 C6F	2nd temperature contacts (TM... only)	NC contact NO contact
Length in mm/in (max. 1500/59.06)	280 (11.02 in) Standard lengths 370 (14.57 in) 500 (19.69 in) nnn variable, please specify value	TM...	TM50NC TM50NO = 50 °C (122 °F) TM60NC TM60NO = 60 °C (140 °F) TM70NC TM70NO = 70 °C (158 °F) TM80NC TM80NO = 80 °C (176 °F)
Level measurement	1-4 Number of contacts ¹⁾	1st temperature signal	NC contact NO contact
Level contact	K Model K10 (NC/NO) K-HT Model K10HT ²⁾ (NC/NO) W Model W11 (change-over contact) W-HT Model W11HT ²⁾ (change-over contact)	TK...	TK50NC TK50NO = 50 °C (122 °F) TK60NC TK60NO = 60 °C (140 °F) TK70NC TK70NO = 70 °C (158 °F) TK80NC TK80NO = 80 °C (176 °F)
		TM ⁵⁾	TM50NC TM50NO = 50 °C (122 °F) TM60NC TM60NO = 60 °C (140 °F) TM70NC TM70NO = 70 °C (158 °F) TM80NC TM80NO = 80 °C (176 °F)
		Pt100	Temperature sensor ³⁾
		KT	Temperature transmitter ³⁾⁴⁾

- 1) Please specify position and switching function per model key
Example: L1 = nnn mm NC
- 2) Not adjustable
- 3) Cannot be combined with temperature contact
- 4) With KT only 10 - 30 V DC
- 5) For version with two temperature contacts

Accessories

Item no.	Description
9144050010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144050046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144050047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

Ordering example

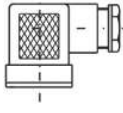
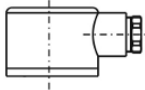
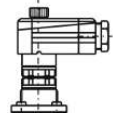

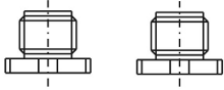
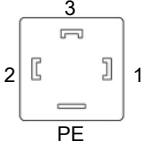
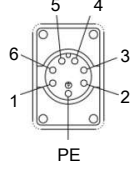
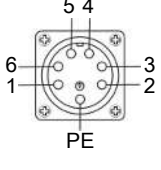
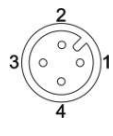
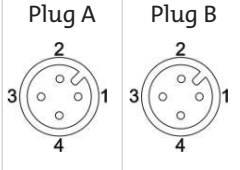
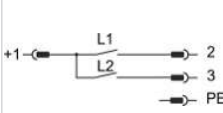
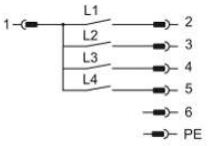
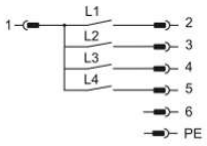
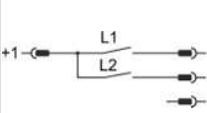
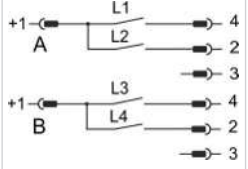
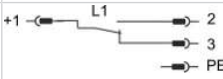
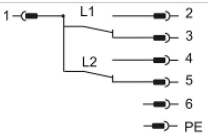
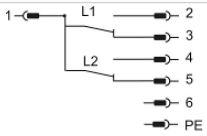
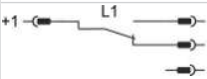
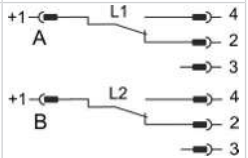
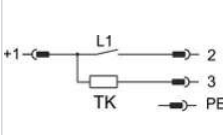
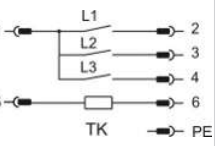
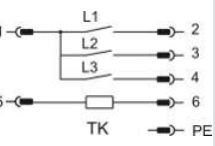
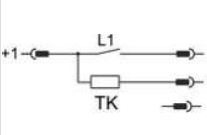
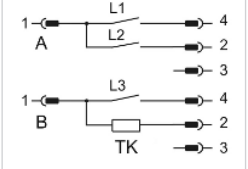
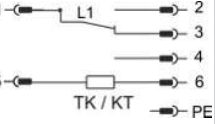
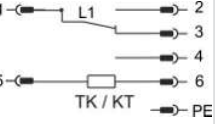
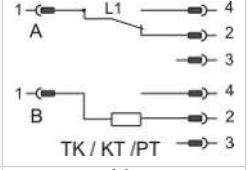
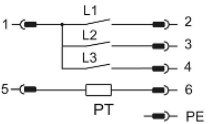
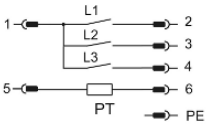
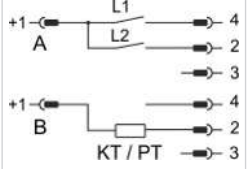
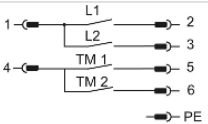
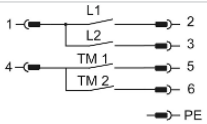
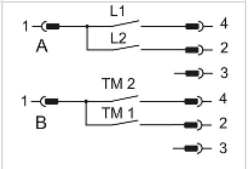
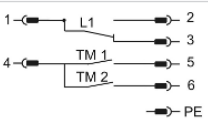
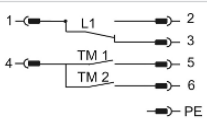
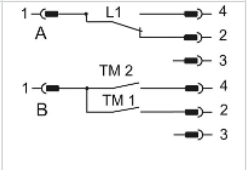
You require:	Level switch MS version, plug connector S6, length L= 550 mm (21.65 in), 2 level contacts (NO/NC) and temperature contact 80 °C (176 °F) as NC contact, 1st contact 100 mm (3.94 in) NC, 2nd contact 470 mm (6.69 in) NO
Order	NT 61HT-M3-550-2-K-HAT-PT100-SSR, L1=100 NC L2=470 NO

Standard pin assignment NT 61-HT

Plug connection

	M3	S6	C6F	M12	2xM12
Dimensions					
Number of pins	3-pin + PE	6-pin + PE	6-pin + PE	4-pin	4-pin / 4-pin
DIN EN	175301-803	175201-804	175301-804	61076-2-101	61076-2-101
Max. voltage	230 V AC / DC*	230 V AC / DC*	230 V AC / DC*	30 V DC	30 V DC
Degree of protection	IP65	IP65	IP65	IP67**	IP67**
Cable fitting	PG 11	M20 x 1.5	PG 11		
Max. Number of contacts					
Level/temp. contacts	1 x K10 / 1 x TK - / - - / -	3 x K10 / 1 x TK 2 x K10 / 2 x TM 1 x W11 / 1 x TK 1 x W11 / 2 x TM	3 x K10 / 1 x TK 2 x K10 / 2 x TM 1 x W11 / 1 x TK 1 x W11 / 2 x TM	1 x K10 / 1 x TK - / - - / -	3 x K10 / 1 x TK 2 x K10 / 2 x TM 1 x W11 / 1 x TK 1 x W11 / 2 x TM
Level contacts only	2 x K10 1 x W11	4 x K10 2 x W11	4 x K10 2 x W11	2 x K10 1 x W11	4 x K10 2 x W11

*max. 48 V AC/V DC for change-over contact. **with IP67 cable box attached. Other plug connections available upon request.

	M3	S6	C6F	M12 (base)	2 x M12 (base)
					
Connection schematic					
K10 Level contact(s)					
W11 Level contact(s)					
K10 Level- and tempera- ture contact					
W11 Level- and tempera- ture contact(s)					
K10 / Pt100 Level- and tempera- ture contact(s)					
K10 Level and 2 x tem- perature contact(s)					
W11 Level and 2 x tem- perature contact(s)					

The standard assignment specified here refers to the max. number of contacts possible and contact function NO (contact type K10).

Level- and temperature sensor

Nivotemp NT M-XP

In hydraulics and lubrication technology the fill level of oil tanks needs to be monitored continuously. Here, modern factory automation requires compatible signals. Despite central system control, visualising the current level on the actual tanks is often desired. The Nivotemp M series was designed to integrate small oil tanks and little space available for add-on units and monitoring equipment in sophisticated system monitors. It combines small installation dimensions with a high functional density and easy operation.

NT M-XP

G3/4 connection thread

Combined, continuous liquid level and oil temperature monitoring

LED display swivels 270°

Menu structure based on VDMA standard sheet 24574 ff.

Up to 6 programmable switching outputs assignable as level or temperature signal

Alternatively with IO-Link and 1 x programmable switching output

Alternatively with one analog output each for level and temperature plus 2 or up to 6 freely programmable switching outputs

Characteristics of switching outputs configurable as window or hysteresis

Switching output configurable as frequency output (1-100 Hz)

Min/max memory, logbook function

M12 plug base

Proven and tested highly dynamic float system

Various immersion tube lengths



Technical Data NT M-XP

Basic unit

Version	MS
Operating pressure	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4°F to 176°F)
Float	SK 171
Min. fluid density	0.80 kg/dm ³ (0.029 lb/in ³)
Lengths (all versions)	200 (7.9), 280 (11), 370 (14.6), 500 (19.7), 650 (25.6), 820 (32.3) mm (inch) (other lengths available upon request) Min. 200 mm (7.9 inch). Shorter versions not available for design reasons.

Material/Version

Float	PU
Immersion tube	Brass
Flange (G3/4)	Brass
Weight at L=280 mm (11 in)	approx. 390 g (0.9 lb)
Each 150 mm (5.9 in) add	approx. 20 g (0.05 lb)
Degree of protection	IP65

Analysis Display Electronics

Display	4 character 7 segment LED
Operation	Via 3 keys
Memory	Min. / Max. Data memory
Starting current input	approx. 100 mA for 100 ms
Current input during operation	approx. 50 mA (without current- and switching outputs)
Supply voltage (U _B)	10 – 30 V DC (nominal voltage 24 V DC) / with IO-Link 18 – 30 V DC
Ambient temperature	-20 °C to +70°C (-4 °F to 158 °F)

Display units	Level	Temperature
	%, cm, L, i, Gal	°C / °F
Display range	adjustable	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	e.g. 0 – 100 %	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value	± 1 % from end value

Input values	Level	Temperature
Principle of measurement	Reed-contact Resolution 10 mm (0.4 in)	Pt100 Cl. B, DIN EN 60751 Tolerance ± 0.8 °C (± 1.4 °F)
Display units	%, cm, L, i, Gal	°C / °F

Optional switching outputs

	1D1S	2S	4S	6S
Plug (base)	1 x M12 – 4-pin	1 x M12 – 4-pin	2 x M12 – 4-pin	1 x M12 – 8-pin
Switching outputs	IO-Link and 1 x freely programmable with level or temperature assignment options	2 x freely programmable with assignment options, e.g. 1 x level / 1 x temperature*	4 x freely programmable with assignment options, e.g. 2 x level / 2 x temperature*	6 x freely programmable with assignment options, e.g. 4 x level / 2 x temperature*
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current**	0.5 A per output	0.5 A per output	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total	max. 1 A total

*also programmable as frequency output

**Output 1 max. 0.2 A.

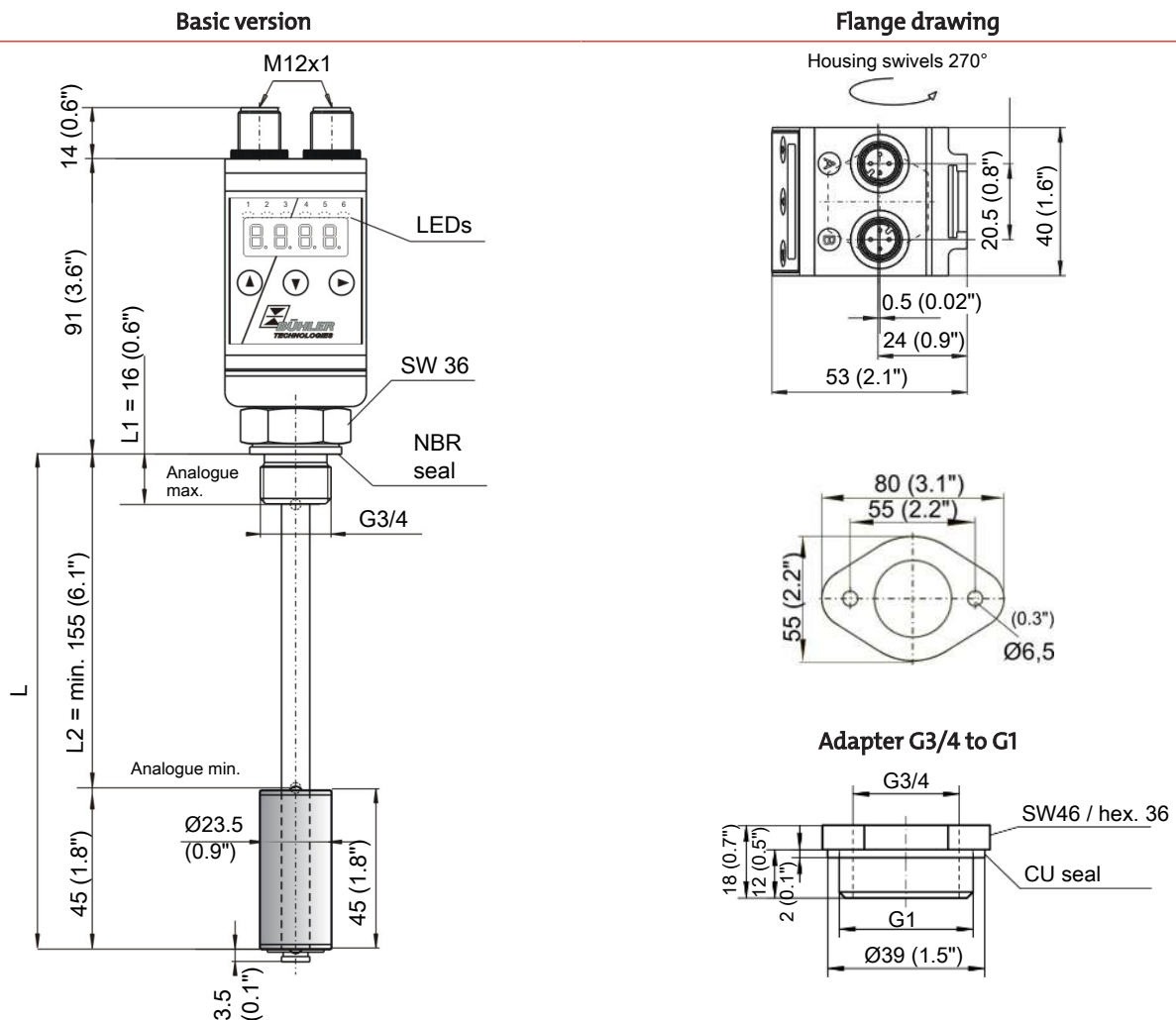
	2S-KN-KT	4S-KN-KT	6S-KN-KT
Plug (base)	2 x M12 – 4-pin	1 x M12 – 8-pin	2 x M12 – 4-pin / 8-pin
Switching outputs	2 x freely programmable with arbitrary assignment	4 x freely programmable with arbitrary assignment	6 x freely programmable with arbitrary assignment
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current**	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analogue outputs	1 x level 1 x temperature	1 x level 1 x temperature	1 x level 1 x temperature
Programmable as	1 x 4 – 20 mA, 2- 10 V DC, 0-10 V DC, 0-5 V DC	1 x 4 – 20 mA, 2- 10 V DC, 0-10 V DC, 0-5 V DC	1 x 4 – 20 mA, 2- 10 V DC, 0-10 V DC, 0-5 V DC
Max. burden Ω as current output	$(U_B - 8V) / 0.02 A$	$(U_B - 8V) / 0.02 A$	$(U_B - 8V) / 0.02 A$
Min. input load as voltage output	10 k Ω	10 k Ω	10 k Ω

*also programmable as frequency output

**Output 1 max. 0.2 A.

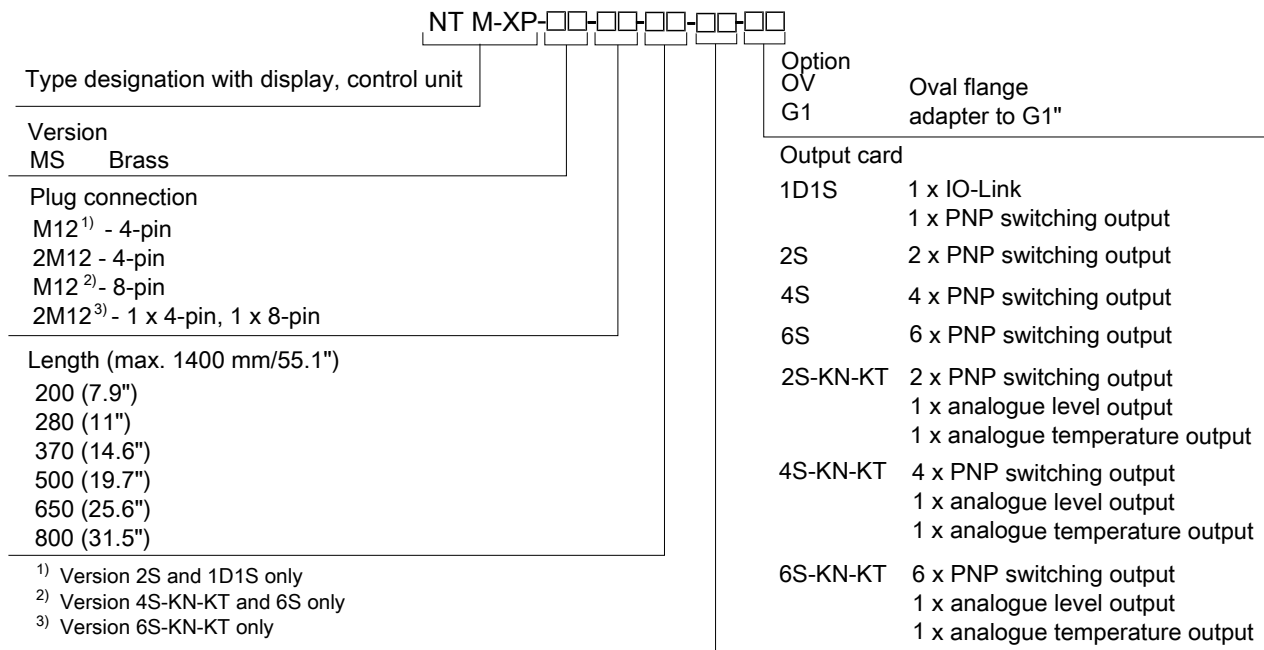
Other output cards available upon request.

Dimensions NT M-XP



Ordering Instructions NT M-XP

Model key



Accessories

Item no. 4-pin	Item no. 8-pin	Description
9144050010	9144050048	Connecting cable M12x1, 1.5 m (4,92 ft), angular coupling and straight plug
9144050046	9144050049	Connecting cable M12x1, 3.0 m (9,84 ft), angular coupling and straight plug
9144050047	9144050033	Connecting cable M12x1, 5.0 m (16,40 ft), angular coupling and strands

Ordering example

You require:	Level and temperature measurement, 2xM12 connector, length L=650 mm (25.6") with 2 programmable PNP switching points and analogue output for level and temperature.
Order:	NT M-XP- MS-2M12 / 650-2S-KN-KT

Standard pin assignment NT M-XP

Version	1D1S	2S	4S		6S
Plug	1x M12 4-pin		2x M12 4-pin		1x M12 8-pin
Connection schematic			Plug A 	Plug B 	
			Display		
Pin					
1	+24 V DC	+24 V DC	+24 V DC*	+24 V DC*	+24 V DC
2	S2 (PNP)	S2 (PNP)	S2 (PNP)	S4 (PNP)	S2 (PNP)
3	GND	GND	GND	GND	GND
4	C/Q (IO-Link)	S1 (PNP)	S1 (PNP)	S3 (PNP)	S1 (PNP)
5					S3 (PNP)
6					S4 (PNP)
7					S5 (PNP)
8					S6 (PNP)

*Plugs A & B must be connected to ensure proper function! It is important to note here that the plug for the display should be connected last, otherwise an error will occur (error 1024).

Version	2S-KN-KT		4S-KN-KT	6S-KN-KT	
Plug	2x M12 4-pin		1x M12 8-pin	2x M12 4-pin/8-pin	
Connection schematic	Plug A 	Plug B 		Plug A 	Plug B
		Display			Display
Pin					
1	+24 V DC*	+24 V DC*	+24 V DC	+24 V DC	+24 V DC
2	Temp (analog)	S2 (PNP)	S2 (PNP)	Temp (analog)	S2 (PNP)
3	GND	GND	GND	GND	GND
4	Level (analog)	S1 (PNP)	S1 (PNP)	Level (analog)	S1 (PNP)
5			S3 (PNP)		S3 (PNP)
6			S4 (PNP)		S4 (PNP)
7			Level (analog)		S5 (PNP)
8			Temp (analog)		S6 (PNP)

*Plugs A & B must be connected to ensure proper function! It is important to note here that the plug for the display should be connected last, otherwise an error will occur (error 1024).

Level- and temperature sensor

Nivotemp NT M-L

The IO-Link compatible combo sensors in the Nivotemp L series are a cost-effective and efficient option for monitoring the liquid level and temperature in oil tanks in hydraulics and lubrication technology. The digital, bidirectional communication of these sensors meets all requirements of modern plant automation, reduces acquisition and installation costs, and improves system availability. Their robust design makes them suitable for virtually any liquid properties, allowing a wide range of applications.

The Nivotemp NT M-L series meets virtually all requirements arising in this area of application.

Connecting flange G3/4 and G1

Continuous liquid level and temperature measurement

Resolution 10 mm (0.4") (liquid level)

IO-Link and 1 x programmable switching output

Proven and tested highly dynamic float system

NBR float, brass immersion tube

Immersion tube length up to 950 mm (37.4") (longer upon request)



Technical Data NT M-L

Basic unit

Version	MS
Operating pressure:	max. 1 bar (14.5 psi)
Medium temperature:	-20 °C to +80 °C (-4 °F to 176 °F)
Ambient temperature:	-20 °C to +70 °C (-4 °F to 158 °F)
Float:	SK 161
Min. fluid density:	0.8 kg/dm ³ (0.029 lb/in ³)
Lengths (all versions):	200, 280, 370, 500, 650, 800 and 950 mm (7.9", 11", 14.6", 19.7", 25.6", 31.5" and 37.4")

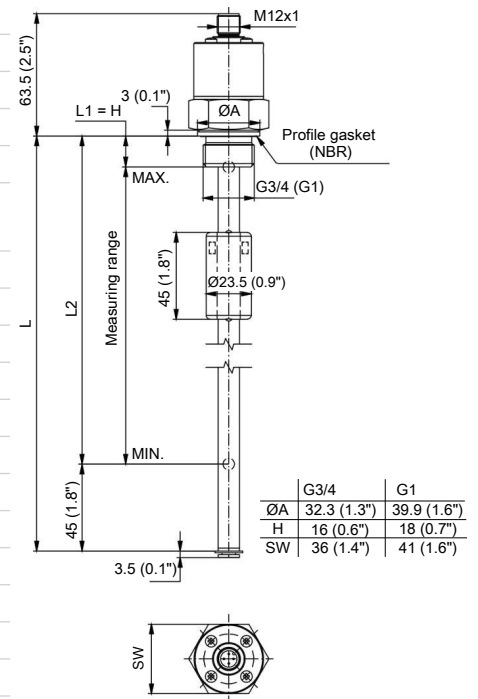
Material/Version

Float:	NBR
Immersion tube:	Brass
Flange G3/4:	Brass
Flange G1:	Brass
Seals:	NBR/FKM
Weight at L=500 mm (19.7"):	G3/4 = approx. 300 g (0.7 lb), G1 = approx. 390 g (0.9 lb)

Input values	Level	Temperature
Measuring principle:	Reed-contact	Pt100 Cl. B, DIN EN 60751
Resolution:	10 mm (0.4")	
Tolerance:		± 0.8 °C (1.4 °F)
Operating voltage:	18 - 30 VDC	
Analysis display electronics accuracy:	± 1 % from end value	± 1 % from end value
Measuring range:	0 to 100 %	-20 °C to +120 °C (-4 °F to 248 °F)

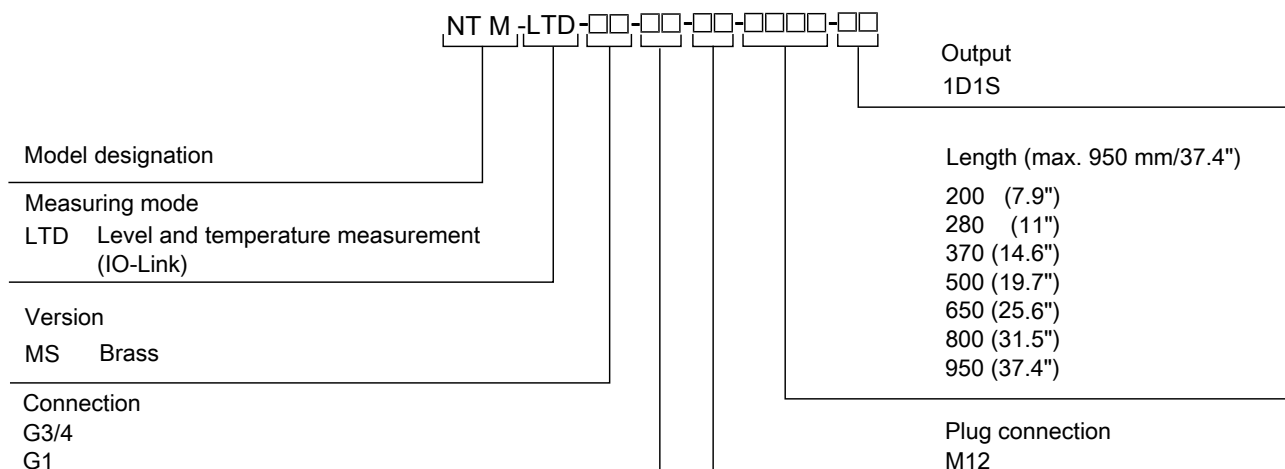
IO-Link	Revision 1.1
Baud rate:	COM3 (230.4 k)
SIO Mode:	Yes
min. time period:	10 ms

Dimensions



NT M-L Ordering Instructions

Model key



Ordering example

You need: Level and temperature measurement with 10 mm (0.39 in) resolution, brass version, G1 plug connector and length L = 500 mm (19.69 in)

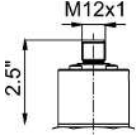
Order: NT M-LTD-MS-G1-M12-500-1D1S

Accessories

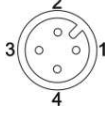
Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

Standard Pin Assignment NT M-L

Connector

	M12 plug A coded
Dimensions	
Number of pins	4-pin
DIN EN	61076-2-101
IP rating	IP67*

*with IP67 cable box attached

Version	LTD-1D1S
Plug	M12 4-pin
Connection schematic	
Pin	
1	+24VDC
2	S2 (PNP max. 200 mA)
3	GND
4	C/Q (IO-Link)

Level and temperature switch

Nivotemp NT M, NT MD

In hydraulics and lubrication technology the fill level of oil tanks needs to be monitored. Here, modern factory automation requires compatible signals. The Nivotemp M series features a group of devices for both monitoring the level as well as the level and temperature in hydraulic or lubrication units.

NT M

Vessel connections G3/4, G1, flange or oval flange

Various plug options

Level and/or temperature control

Up to 4 switching outputs

Small, compact design

Proven and tested highly dynamic float system

Brass or stainless steel housing

NT MD

Vessel connections G3/4, G1 or oval flange

Fixed switching outputs for liquid level monitoring

LED display with status of switching outputs, 270° swivel

Standardised VDMA-based menu structure

Up to four programmable temperature switching outputs

Alternatively, continuous temperature output signal plus freely programmable switching output

Switching output configurable as window or hysteresis

Switching output configurable as frequency output (1-100 Hz)

Min./max. value memory, logbook



Technical Data NT M

Version	MS	VA
Operating pressure:	max. 1 bar (14.5 psi)*	max. 1 bar (14.5 psi)
Operating temperature:	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float:	SK 161	SK 161
Min. fluid density:	0.80 kg/dm ³ (0.029 lb/in ³)	0.80 kg/dm ³ (0.029 lb/in ³)
Lengths (all versions):	280, 370, 500 mm (standard) (11, 14.6, 19.7 in) variable to max. 1000 mm (39.4 in)	
Weight at L=500 mm (19.7 in):	approx. 300 g (0.7 lb)	approx. 350 g (0.8 lb)

* max. atmospheric for PA oval flange

Material

Float:	NBR	NBR
Immersion tube:	Brass	1.4571
G3/4 connection:	Brass	1.4571
G1 connection:	Brass	Brass via adapter
Flange connection:	Aluminium	--
Oval flange:	PA	VA/brass via adapter

Level switching output

	K8	W9
Max. number	4	3
Function:	NO/NC*	Change-over contact
Max. voltage:	230 V AC/DC	48 V AC/DC
Max. switching current:	0.5 A	0.5 A
Max. contact load:	10 VA	20 VA
Min. contact spacing:	40 mm (1.6 in)	40 mm (1.6 in)

*NO = falling open / NC = falling close

Optional temperature

Temperature contact:	TM xx	
Max. voltage:	230 V AC/DC	
Max. switching current:	2 A	
Max. contact load:	100 VA	
Function:	NC	NO
Switching point °C (°F):	50/60/70/80 (122/140/158/176)	50/60/70/80 (122/140/158/176)
Switching point tolerance:	± 5 K (± 9 Ra)	± 5 K (± 9 Ra)
Max. hysteresis:	18 K ± 5 K (32.4 Ra ± 9 Ra)	26/35/40/45 K ± 5 K (47/63/72/81 Ra ± 9 Ra)

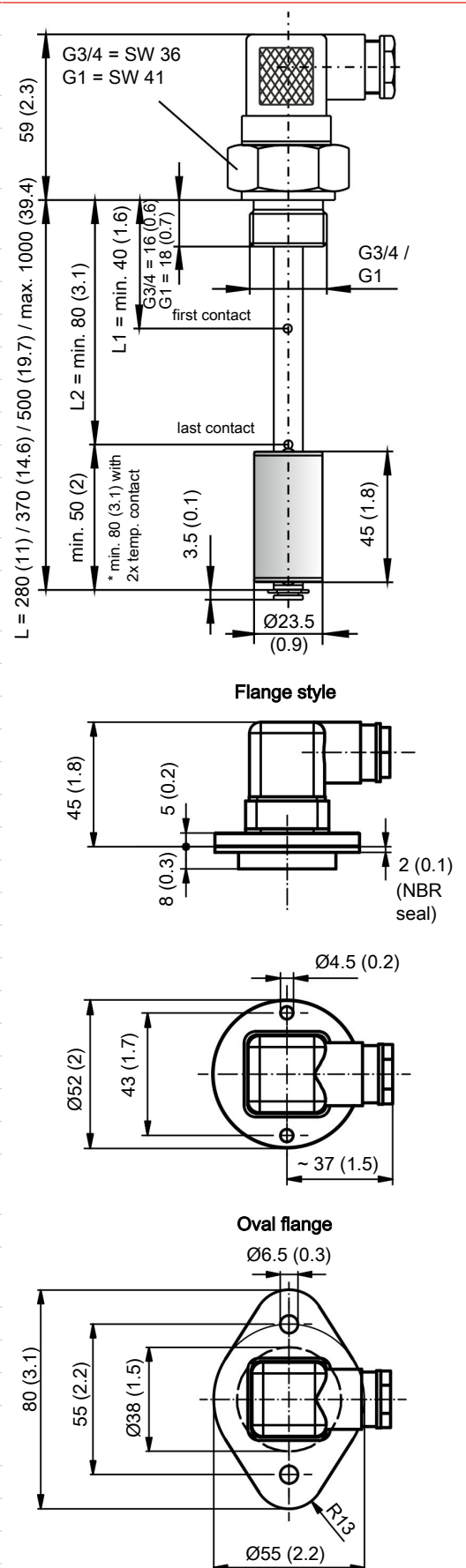
Temperature sensor

Pt100:	DIN EN 60 751 (tolerance ± 0.8 °C/1.4 °F)
Analogue output:	See "Technical Data NT M with Analogue Output for Temperature"

Adapter

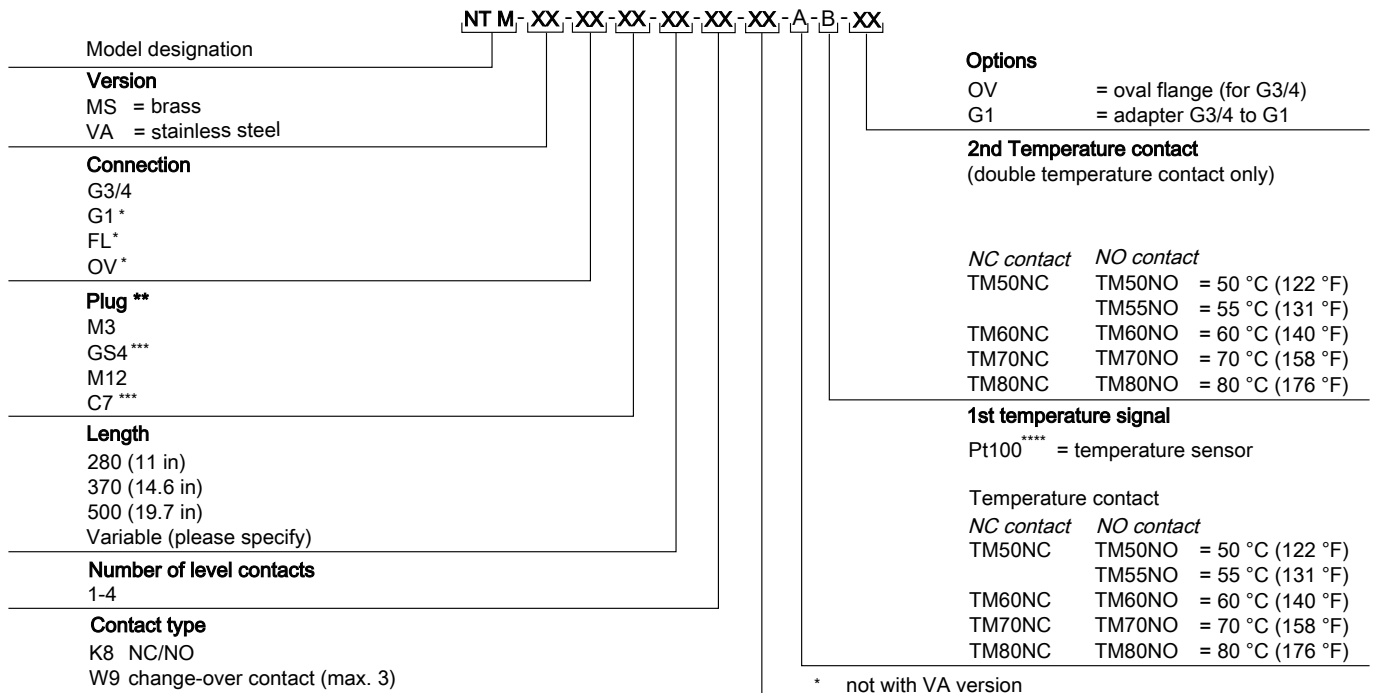
OV:	Adapter to oval flange incl. seal and locking nut
G1:	Adapter G3/4 to G1

Dimensions



NT M ordering instructions

Model key



* not with VA version
 ** see "Connector"
 *** only available with G3/4 connector
 **** Cannot be combined with temperature contact

Ordering example

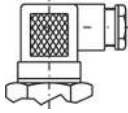
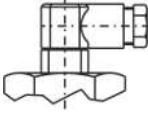


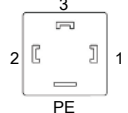
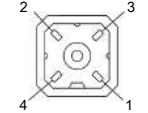
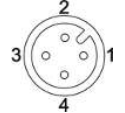
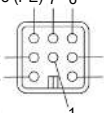
You require: Level switch with G3/4 connection, brass version, length L= 500 mm (19.7 in),
 2 level switches, 1st contact 100 mm (3.9 in) NC, 2nd contact 450 mm (17.7 in) NO

Order NT M-MS-G3/4-M3/500-2K-100NC-450NO

NT M Accessories

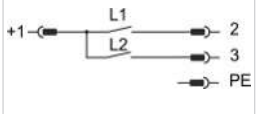
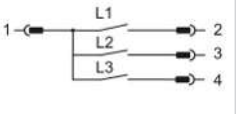
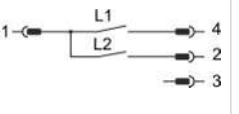
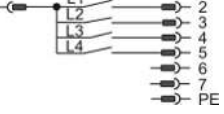
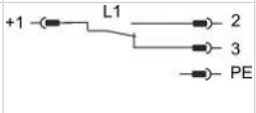
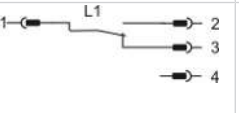
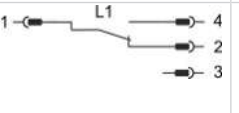
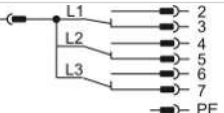
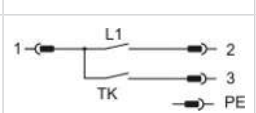
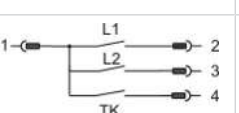
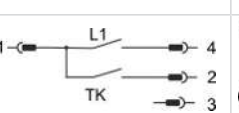
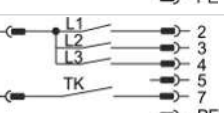
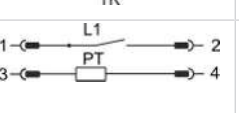
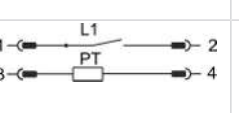
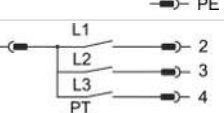
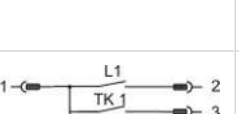
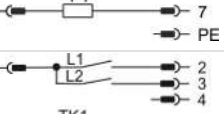
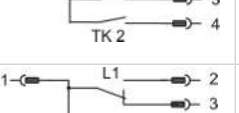
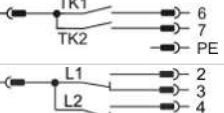
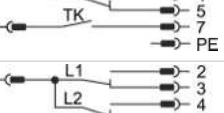
Item no.	Description
9144050010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144050046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144050047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

NT M connector

Plug connection	M3 valve connector	GS4	M12 plug A coded	C7
G3/4	X	X	X	X
G1	X	-*	X	-*
Flange	X	-	X	-
OV	X	-*	X	-*
* G3/4 connection with respective adapter				
Dimensions				
Connection schematic				
Number of pins	3-pin + PE	4-pin	4-pin	7-pin + PE
DIN EN	175301-803		61076-2-101	175301-801
Max. voltage	230 V AC/DC*	30 V DC	30 V DC	230 V AC/DC*
IP rating	IP65	IP65	IP67**	IP65***
Cable fitting	PG 11	PG 7		PG 11
Max. Number of contacts				
Level/temp. contacts	1 x K8, 1 x TK	2 x K8, 1 x TK	1 x K8, 1 x TK	3 x K8, 1 x TK
Level contacts only	2 x K8 1 x W9	3 x K8 1 x W9	2 x K8 1 x W9	4 x K8 3 x W9

*Max. 48 V AC/V DC for change-over contact. **IP67 with cable box attached. ***IP44 with gland/without gasket.

Standard pin assignment NT M

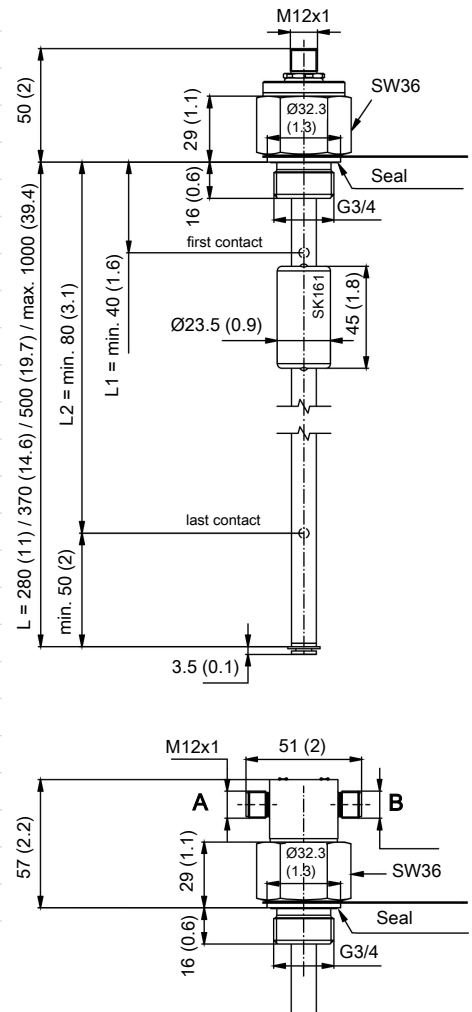
	M3 valve connector	GS4	M12 plug A coded	C7
K8 Level contact(s)				
W9 Level contact(s)				
K8 Level contact(s) and temperature contact				
K8 / Pt100 Level- and temperature sensor				
K8 Level- and temperature contact(s)				
W9 Level contact(s) and temperature contact				
W9 / Pt100 Level- and temperature sensor				

The pin assignments shown always show the max. population possible for the respective plug connection.

Technical Data NT M with analogue output for temperature

Version	MS
Material	
Float:	NBR
Immersion tube:	Brass
G3/4 connection:	Brass
Level switching output	
K8	
Max. number:	2
Function:	NO/NC*
Max. voltage:	30 V DC
Max. switching current:	0.5 A
Max. contact load:	10 VA
Min. contact spacing:	40 mm (1.6 in)
*NO = falling open / NC = falling close	
Optional temperature	
Temperature	
KT	
Detector:	PT100 Class B, DIN EN 60 751
Measuring range*:	0 °C to 100 °C (32 °F to 212 °F)
Operating voltage (UB):	10-30 V DC
Outlet:	4-20 mA
Max. burden Ω:	= (UB-7.5 V)/0.02 A
*Other measuring ranges available upon request	
Adapter	
OV:	Adapter to oval flange incl. seal and locking nut
G1:	Adapter G3/4 to G1

Dimensions

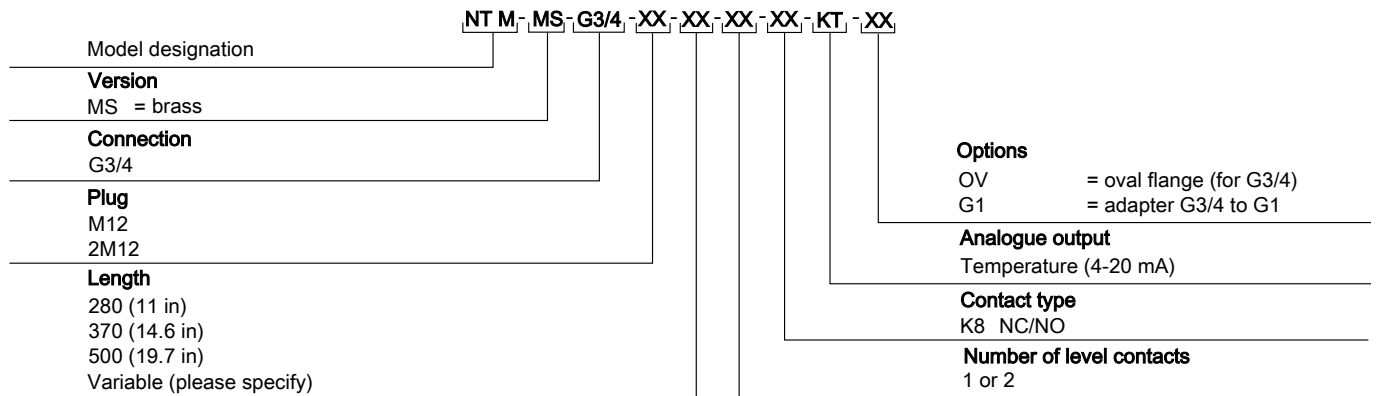


Connector NT M with analogue output for temperature

Plug connection	M12 plug A coded	2 x M12 plug A coded
Number of pins	4-pin	2 x 4-pin
DIN EN	61076-2-101	175201-804
Connection schematic	1 x level contact and analog output	
	2 x level contact and analog output	

Ordering instructions NT M with analogue output for temperature

Model key



Ordering example

You require: Level switch with G3/4 connector, brass version, length 500 mm (19.7 in),
 2 x level contact, 100 mm (3.9 in) NC, 450 mm (17.7 in) NO
 Temperature output 0-100 °C (32-212 °F) = 4-20 mA and 2 x M12 connector

Order NT M-MS-G3/4-2M12/500-2K-KT-100NC-450NO

Technical Data NT MD

Version	MS
Operating pressure:	max. 1 bar (14.5 psi)
Operating temperature:	-20 °C to +80 °C (-4 °F to 176 °F)
Float:	SK 161
Min. fluid density:	0.80 kg/dm ³ (0.029 lb/in ³)
Lengths:	280 (11), 370 (14.6), 500 mm (19.7 in) (standard) variable to max. 1000 mm (39.4 in)
Weight at L=280 mm (11 in):	approx. 500 g (1.1 lb)

Material

Float:	NBR
Immersion tube:	brass
G3/4 connection:	brass

Level switching output

	K8
Number max.:	2 (not adjustable)
Function:	NO/NC*
Max. voltage:	30 V DC
Max. switching current:	0.5 A
Max. contact load:	10 VA
Min. contact spacing:	40 mm (1.6 in)
*NO = falling open / NC = falling close	

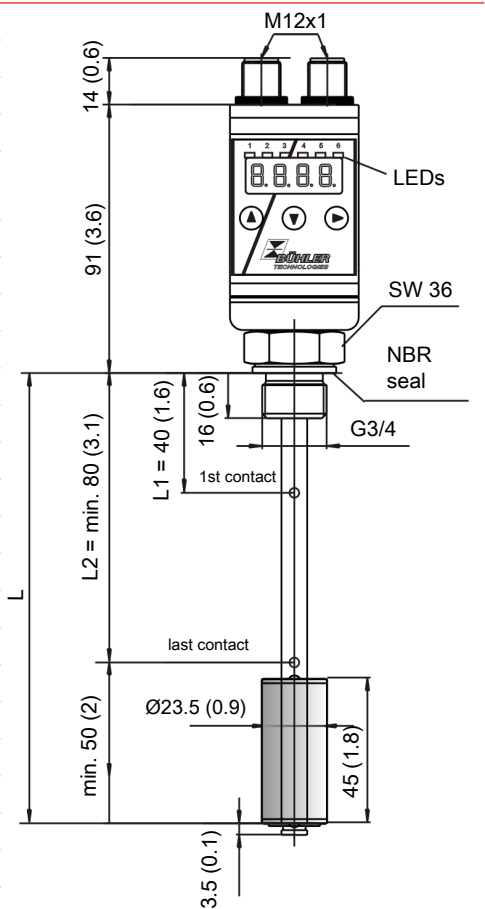
Temperature display electronics

Display:	4 character 7 segment LED
Operation:	via 3 keys
Memory:	min./max. data memory
Starting current input:	approx. 100 mA for 100 ms
Current input during operation:	approx. 50 mA (without current- and switching outputs)
Supply voltage (U _b):	10–30 V DC (nominal voltage 24 V DC)
Ambient temperature:	-20 °C to +70 °C (4 °F to 158 °F)
Temperature display units:	°C/°F
Display range:	-20 °C to +120 °C (4 °F to 248 °F)
Alarm setting range:	0 °C to 100 °C (32 °F to 178 °F)
Display accuracy:	± 1 % from end value
Measuring principle:	Pt 100 Class B, DIN EN 60751, resolution 0.5 °C (1 °F)

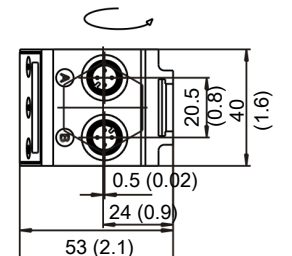
Adapter

OV:	adapter to oval flange incl. seal and locking nut
G1:	adapter G3/4 to G1

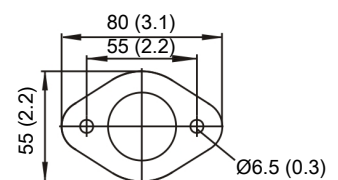
Dimensions



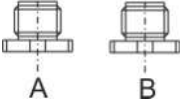
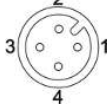
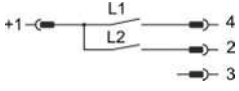
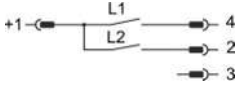
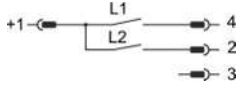
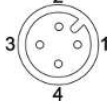
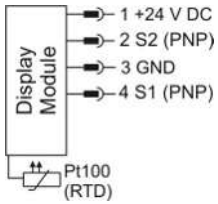
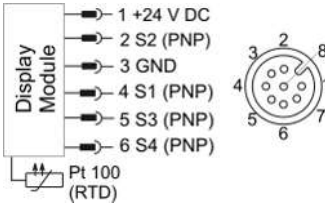
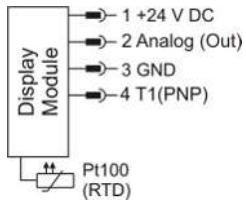
Housing swivels 270°



Oval flange



Standard pin assignment NT MD

Standard pin assignment	2T	4T	1T-KT
 <p>A B</p>	<p>Level contact(s) 2x temperature output</p>	<p>Level contact(s) 4x temperature output</p>	<p>Level contact(s) 1x temperature output 1x analogue output</p>
<p>Plug A level</p> 			
<p>Plug B temperature</p> 			

Level switch

Nivotemp NT-EL, NT-ELD

In hydraulics and lubrication technology the fill level of oil tanks needs to be monitored continuously. Here, modern factory automation requires compatible signals. Despite central system control, visualising the current level on the actual tanks is often desired. To minimise production costs and the space required on containers, it makes sense to use one monitor for both e.g. the fill level and oil temperature. The Nivotemp series meets virtually all requirements arising in this area of application.

NT-EL

Tank connections G1/2, M20x1.5, 7/8-14UNF

M12 plug connection

Level and/or temperature control

Small, compact design

Proven, highly dynamic float system

NT-ELD

Tank connections G1/2, M20x1.5, 7/8-14UNF

Fixed fill level monitor switching outputs

LED display swivels 270°

Standardised VDMA-based menu structure

Two programmable temperature switching output

Alternatively, one continuous temperature output signal plus one freely programmable switching output

Switching output configurable as window or hysteresis

Switching output configurable as frequency output (1-100 Hz)

Min./Max. value memory, logbook



NT-EL Technical Data

Version	MS
Operating pressure:	max. 14.5 PSI
Operating temperature:	-4 °F to 176 °F
Float:	SK 174
Min. fluid density:	0.029 lb/in ³
Lengths (all versions):	280, 370, 500 mm (11, 14.6, 19.7 in) (standard) variable to max. 500 mm (19.7 in)
Weight at L = 500 mm (19.7 in):	approx. 0.4 lb

Material	
Float:	PU
Immersion tube:	Brass
G1/2 connection, M20 x 1,5, 7/8-14UNF:	Aluminium

Level switching output	K40
Number max.:	2 not adjustable
Function:	NO / NC*
Max. voltage:	30 V DC
Max. switching current:	0.5 A
Max. contact load:	5 VA
Min. contact spacing:	30 mm (1.2 in) (in 10 mm / 0.4 in increments)

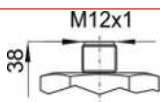
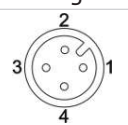
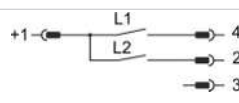
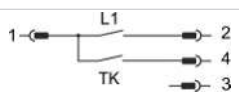
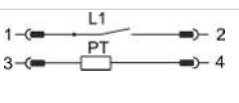
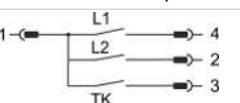
*NO= falling NC contact / NC = falling NO contact

Optional temperature	
Temperature contact:	TEL xx
Max. voltage:	30 V DC
Max. switching current:	1 A
Max. contact load:	10 VA
Function:	NC
Switching point °F:	122 / 140 / 158 / 176
Switching point tolerance:	± 9 °Ra
Max. hysteresis:	20 ± 9 °Ra

Other temperatures and switching function available upon request

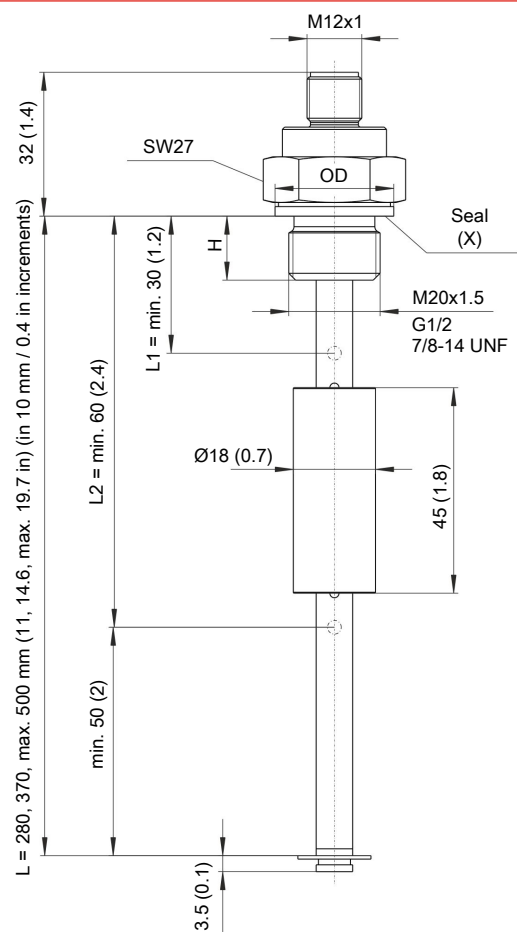
Temperature sensor	
Pt100	DIN EN 60 751 (Tolerance ± 1.4 °F)

NT-EL default pin assignment

 IP rating IP67*	Level contact(s) only	Only level contact K40 and temperature contact (TK)	Level contact K40 and temperature sensor (PT)	Level contacts K40 and temperature contact (TK) with special connection
				

* with IP67 cable box attached

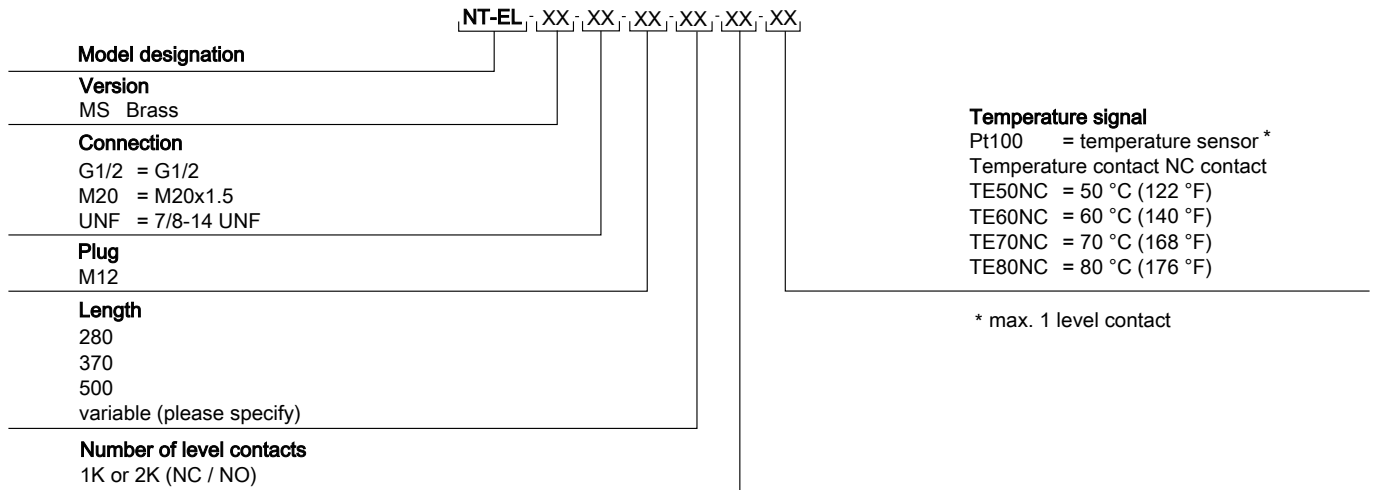
Dimensions given in mm (inch)



	M20 x1.5	G1/2	7/8-14UNF
OD	26 (1)	26.6 (1.05)	26 (1)
H	14 (0.6)	14 (0.6)	12.7 (0.5)
X	Eolastic seal	Eolastic seal	O-ring

Ordering instructions NT-EL

Model key



Ordering example

You require: Level switch with connector M20x1.5, length L= 370 mm (14.6 in),
2 level contacts, L1 = 280 mm (11 in) NC / L2 = 320 mm (12.6 in) NO

Order NT-EL-MS-M20-M12/370-2K-280NC/320NO

Technical Data NT-ELD

Version	MS
Operating pressure:	max. 14.5 PSI
Operating temperature:	-4 °F to 176 °F
Float:	SK 174
Min. fluid density:	0.029 lb/in ³
Lengths (all versions):	280, 370, 500 mm (11, 14.6, 19.7 in) (standard) variable to max. 500 mm (19.7 in)
Weight at L = 500 mm (19.7 in):	approx. 0.7 lb

Material

Float:	PU
Immersion tube:	Brass
G1/2 connection, M20 x 1,5, 7/8-14UNF:	Anodised aluminium

Level switching output K40

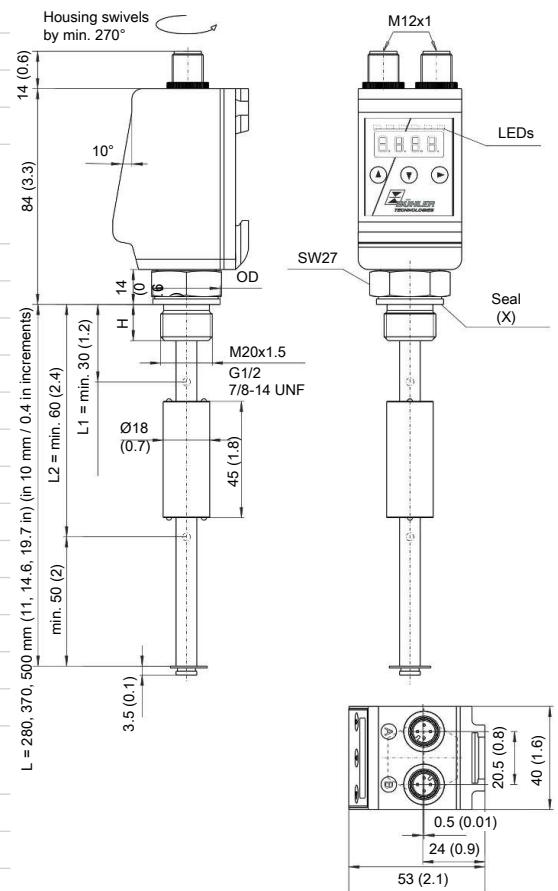
Number max.:	2 not adjustable
Function:	NO / NC*
Max. voltage:	30 V DC
Max. switching current:	0.5 A
Max. contact load:	5 VA
Min. contact spacing:	30 mm (1.2 in) (in 10 mm / 0.4 in increments)

*NO= falling NC contact / NC = falling NO contact

Temperature display electronics

Display:	4 character 7 segment LED
Operation:	Via 3 keys
Memory:	Min. / Max. Data memory
Starting current input:	approx. 100 mA for 100 ms
Current input during operation:	approx. 50 mA (without current- and switching outputs)
Supply voltage (U _b):	10–30 V DC (nominal voltage 24 V DC)
Ambient temperature:	-4 °F to 158 °F
Temperature display units:	°C / °F
Display range:	-4 °F to 248 °F
Alarm setting range:	32 °F to 212 °F
Display accuracy:	± 1 % FS
Measuring principle:	Pt 100 Class B, DIN EN 60751

Dimensions given in mm (inch)



	M20 x1.5	G1/2	7/8-14UNF
OD	26 (1)	26.9 (1.1)	26 (1)
H	14 (0.6)	14 (0.6)	12.7 (0.5)
X	Eolastic seal	Eolastic-seal	O-ring

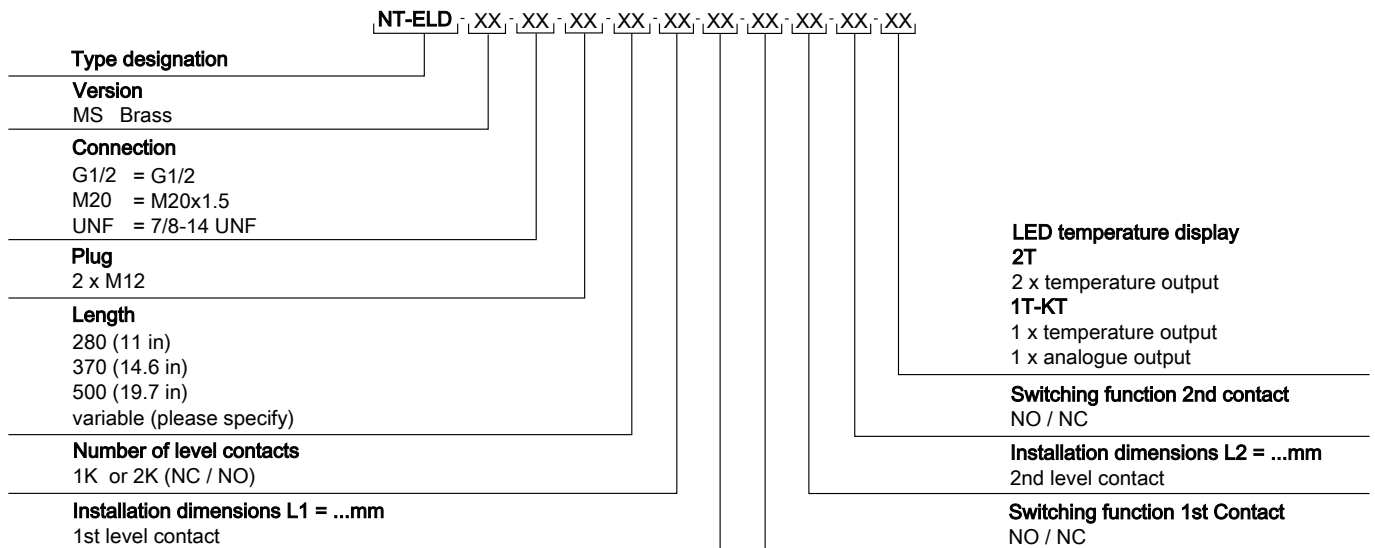
NT-ELD temperature outputs

Choose from the following switching outputs:

Version	2T	1T-KT
Plug (base):	2 x M12 – 4-pin	2 x M12 – 4-pin
Switching outputs:	2 x freely programmable	1 x freely programmable
Alarm memory:	1 switching output assignable to alarm logbook	1 switching output assignable to alarm logbook
max. switching current*	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load:	max. 1 A total	max. 1 A total
1 switching output configurable as frequency output:	0 – 100 Hz	
Analogue output:		1 x 4 – 20 mA, 2-10 V DC, 0-10 V DC or 0-5 V DC
Max. burden Ω as current output:		$= (U_B - 8 V) / 0.02 A$
Min. input load min. as voltage output:		10 k Ω

**Output 1 max. 0.2 A.

Ordering instructions NT-ELD

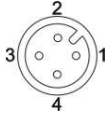
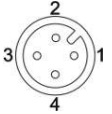
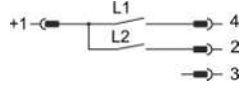
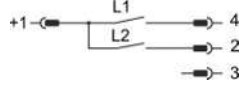


Ordering example

You require: Level switch with G1/2 connection, brass, length L= 500 mm (19.7 in), 2 level contacts, 1st contact 100 mm (3.9 in) NC, 2nd contact 450 mm (17.7 in) NO, temperature analysis with display and 2 programmable outputs.

Order: NT-ELD-MS-G1/2-2M12/500-2K-100NC-450NO-2T

NT-ELD standard pin assignment

	Plug A level M12 (base)		Plug B temperature M12 (base)
Connection schematic:			
Number of poles:	4-pin		4-pin
DIN EN:	61076-2-101		61076-2-101
Max. voltage:	30 VDC		30 VDC
IP rating:	IP65		IP65
2T		PIN	
2 x temperature output		1 2 3 4	+24 V S2 (PNP) GND S1 (PNP)
1T-KT		PIN	
1 x Temperature output 1 x Analog output		1 2 3 4	+24 V Analogue GND S1 (PNP)



2.2 Liquid Level -

Level switch NS-OM

The level switches are used to monitor liquid levels in tanks. They were designed specifically to be installed on tank tops. The liquid level can be read on the scale. Up to four switching contacts or a Reed-contact also enable electronic liquid level monitoring.

Different versions also allow for use in aggressive mediums.

NS-OM 61/63

Visual and electrical liquid level monitoring

max. switching voltage 230 V

Variable lengths

Version NS-OM-63 with 4-20 mA analog output for continuous liquid level monitoring

NS-OM-64

Visual and electric liquid level monitoring

Easy Just System: User-friendly adjustment of the position and function of the level contacts

Fixed lengths of 270, 370, 500 mm (11, 14.6, 19.7")

NS-OM-VA

Visual and electrical liquid level monitoring

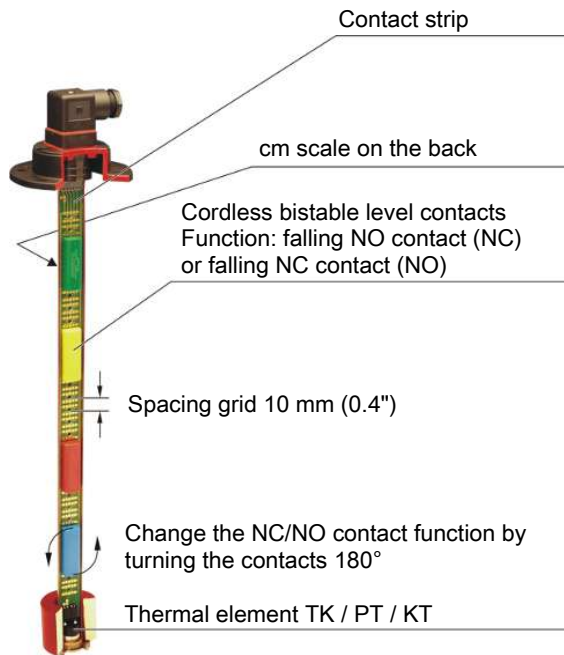
Max. Supply voltage 230 V

Stainless steel model for sophisticated applications

Externally installed level contacts

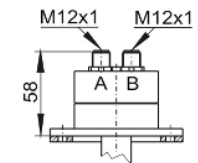
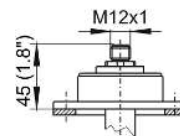
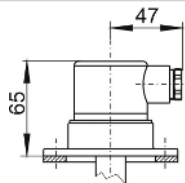
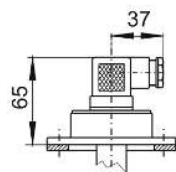


The easyjust system

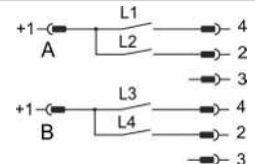
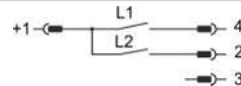
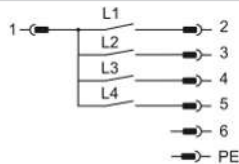
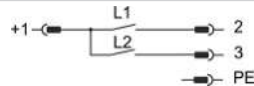


Pin Assignment

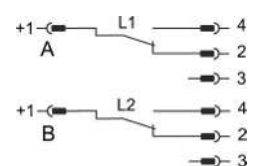
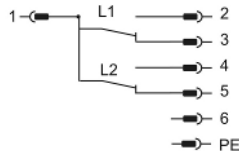
Connector	M3 (DIN EN 175301-801)	S6 (DIN EN 175201-804)	M12 (base)	2 x M12 (base)
	3-pin + PE	6-pin + PE	4-pin	2 x 4-pin
Max. voltage	230 VAC/DC*	230 VAC/DC*	30 V DC	30 V DC
IP rating	IP 65	IP 65	IP 67**	IP 67** IP65
Cable fitting	PG 11	M20 x 1.5		(NS OM-61 only)



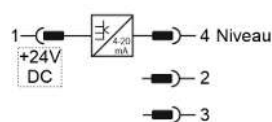
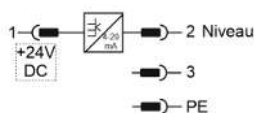
Level contact(s) NO/NC



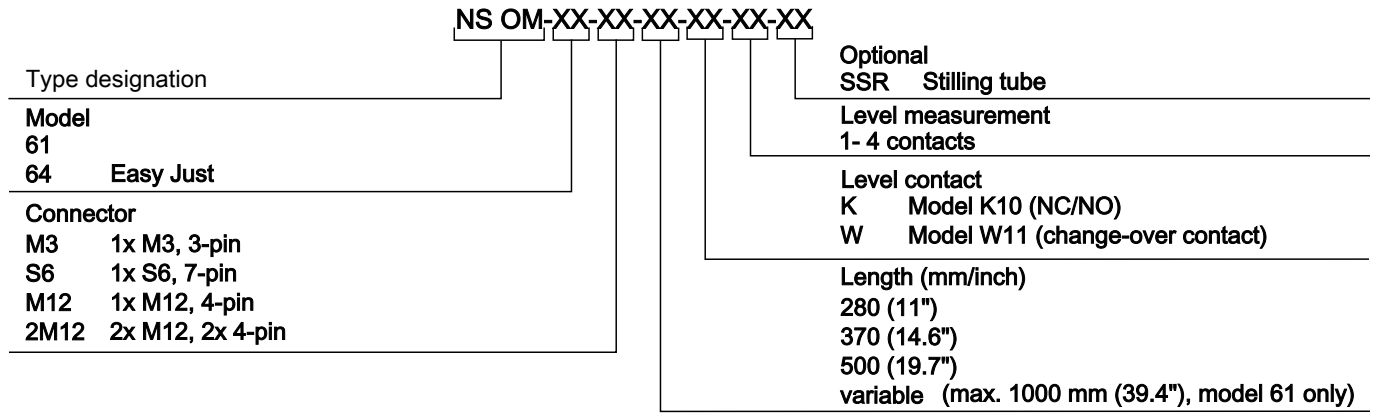
Level contact(s) changeover



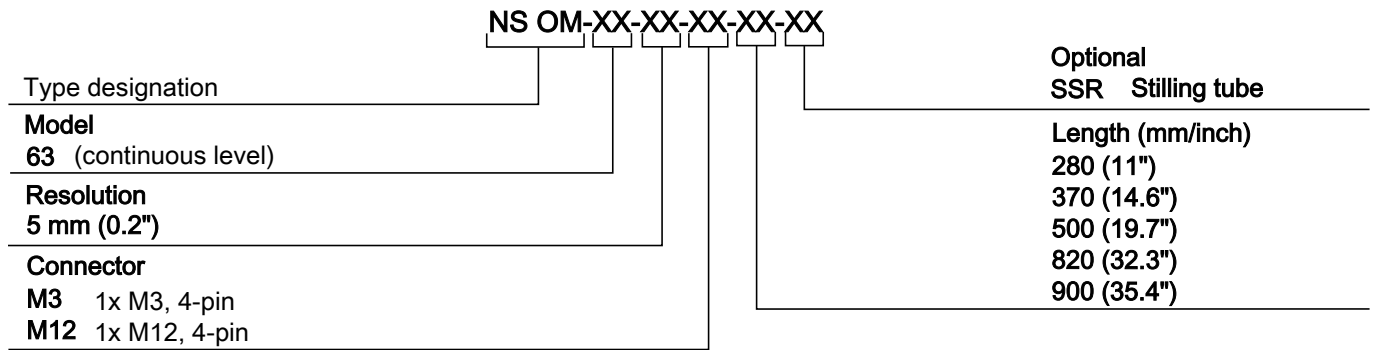
NS OM-63-KN (continuous level)



Model key NS OM-61, 64



Model key NS OM-63



Ordering example

You require: Visual and electric level monitoring length 600 mm (32.6") with 2 contacts K10, 1. Contact 100 mm (3.9") falling NO contact, 2. Contact 420 mm (16.5") falling NC contact.

Order: NS OM 61-S6-/ 600 – 2K L1=100 NC, L2 = 420 NO

Technical Data NS-OM-VA

Basic unit

Operating pressure:	max. 1 bar (14.5 psi)
Operating temperature:	-20 °C to +80 °C (-4 °F to 176 °F)
Min. fluid density:	0.80 kg/dm ³ (0.029 lb/in ³)

Material

SK 903 float:	PU/AI/PP
Immersion tube:	1.4571
Flange:	1.4571
Stilling tube	1.4571 (included)
Sight glass	PC

Model **MKS**

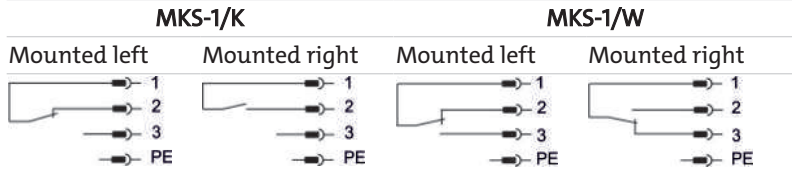
Lengths:	L = 280, 370, 500 (11", 14.6", 19.7"), variable to max. 820 mm (32.3")
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Contacts

Type:	MKS-1/K	MKS-1/W
Function:	NC / NO*	Changeover contact
Max. voltage:	230 V AC/DC	230 V AC/DC
Max. switching current:	1 A	1 A
Max. contact load:	50 VA	40 VA
Connector:	3 pin + PW	3 pin + PW
	M3 (DIN EN 175301-803)	M3 (DIN EN 175301-803)
IP rating:	IP65	IP65
Item number:	288 89 99	288 99 99

Other contacts available upon request

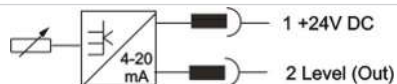
*NO = falling NC / NC = falling NO



Contact position with empty tank

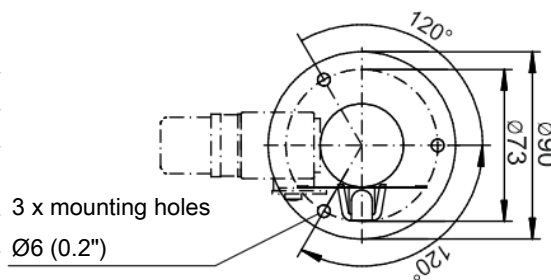
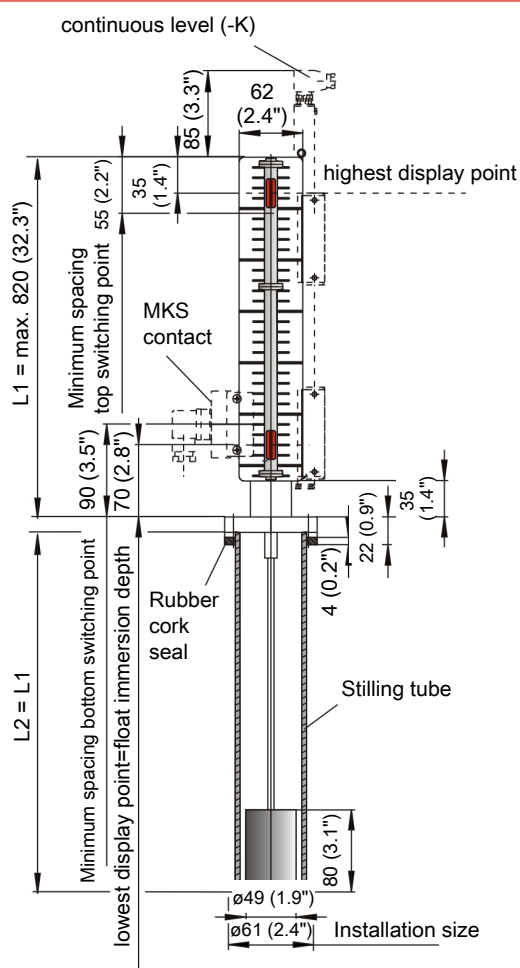
Model	K (continuous level measurement)
Lengths:	L = 280, 370, 500, 670, 820 mm* (11", 14.6", 19.7", 26.4", 32.3")
Measurement principle:	Reed-contact
Resolution:	5 or 10 mm (0.2 or 0.4")
Operating voltage (U _b):	10 – 30 V DC
Output:	4 – 20 mA
Max. burden Ω:	= U _b – 7.5 V (0.02 A)

*Other lengths on request

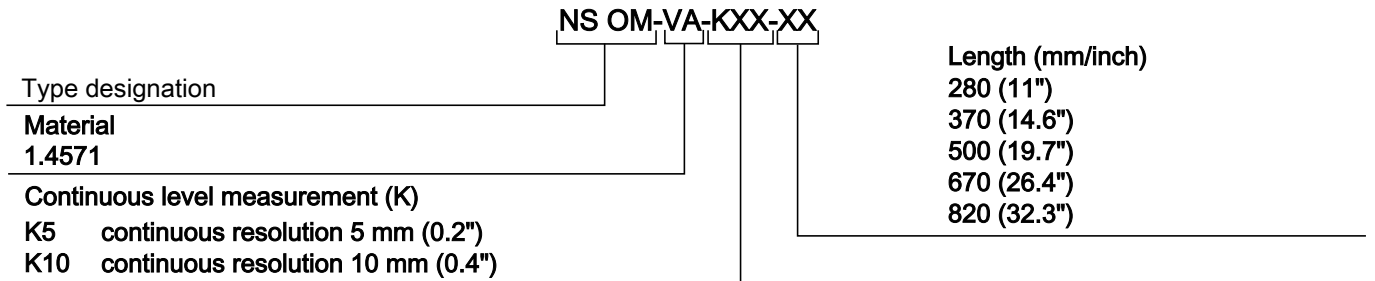
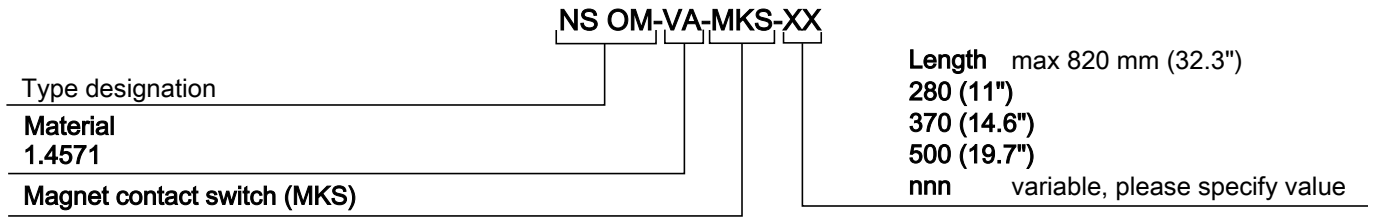


With this type, MKS contacts can additionally be installed to the left of the visual display.

Dimensions



Model key NS OM-VA



Ordering example

You require: Visual and electric level monitoring, VA version length 600 mm (23.6") and 2 x contacts MKS 1/W.

Order: NS OM-VA-MKS / 600 + 2 x contact MKS-1W (item no. 288 99 99)



2.3 Liquid Level -

External installation

Fill Level

Fill level monitoring, particularly in tall oil tanks, pressure tanks or large oil-filled housings requires fill level monitors to be installed to the side. These connect to the lowest level of the vessel to be monitored via pipe fittings or flanges and typically also the head space above the fluid. Alternatively, the top connection must be connected to the atmosphere so the oil can freely interact inside the reservoir and riser. A visual indicator scale with built-in visual display is used to monitor the fill level. Virtually any number of binary contacts can be attached to both sides of the scale for electrical monitoring and/or an analogue signal transmitter.

Fill levels with operating pressures up to 360 bar can be monitored.

NS Level Switch Series

Stainless steel riser with visual indicator scale. Binary, adjustable contacts and/or analogue output signals up to 5 metre riser length.

- NS 1-G1/2- AM, pressure rating 1 bar
- NS 10 / NS 25 -AM, up to 25 bar pressure rating
- NS 64 / NS 100 -AM, up to 100 bar pressure rating
- NS 250 / NS 360 -AM-G1-V, up to 360 bar pressure rating

Accessories for NS level switch

e.g. flanged valves and ball valves



Devices for use in explosive areas

see chapter "Certified Instruments"



DNV · GL certified level switches

see chapter "Certified Instruments"



Level switch NS 1-G1/2-AM

Oil tanks in lubrication and oil supply systems are often under overpressure compared to the ambient atmosphere. All oil moistened parts of devices mounted externally on the tanks or housings for monitoring the liquid level must therefore be pressure-resistant.

Larger oil tanks or gear cases often also require a visual liquid level monitoring option. Since these tanks/housings are often only subject to atmospheric pressure, for functional and economic reasons the visual indication can be combined with electrical monitoring of the varying volume. The sight float indicates the level on the sight glass whilst triggering the switching contacts of the level switch inside. The entire unit connects with threaded couplings. The easy to read sight glass is supported by sturdy side walls. The switching contacts are variable. They connect to power with a DIN plug, which is included.

Level switch NS for external installation

Visual and electric liquid level monitoring

Small, compact design

Easy installation

Adjustable level contacts

Plug connection as a standard

Display with scale

Compact design

Variable installation dimensions



Technical Data

Basic Unit

Operating pressure:	max. 1 bar (14.5 psi)
Operating temperature:	-20 °C to +80 °C (-4 °F to 176 °F)
Min. fluid density:	0.80 kg/dm ³ (0.0029 lb/in ³)
Lengths:	280 (11"), 370 (14.6"), 500 mm (19.7") (standard) variable to max. 800 mm (31.3")
Weight at L = 280 mm (11"):	approx. 2.75 kg (6.1 lb)
Extra per 100 mm (3.9"):	approx. 0.25 kg (0.6 lb)

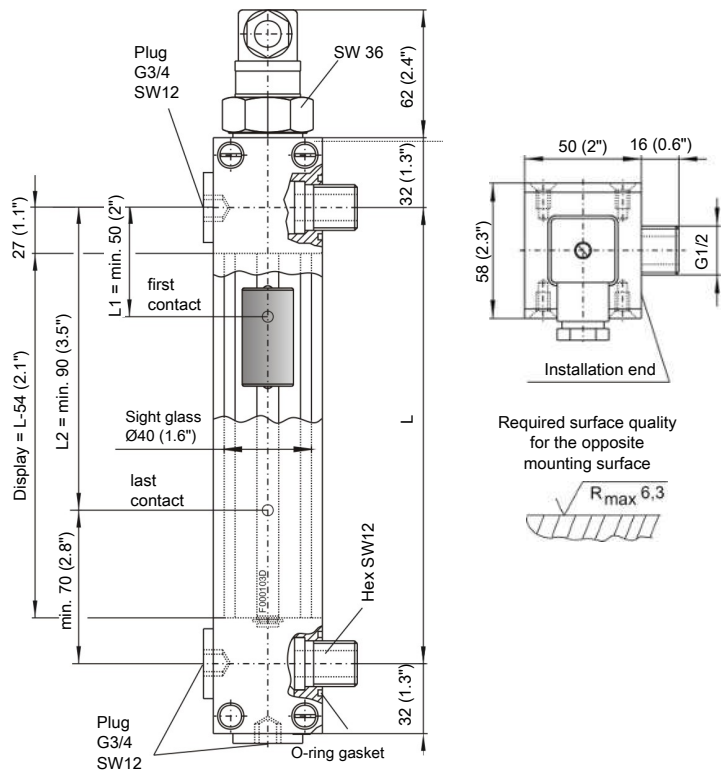
Material

Housing:	Anodised aluminium
Sight glass:	Plexiglas (PMMA)
Fixing screws:	Chromated steel
Seal:	NBR
Level switch	Brass
Float:	NBR

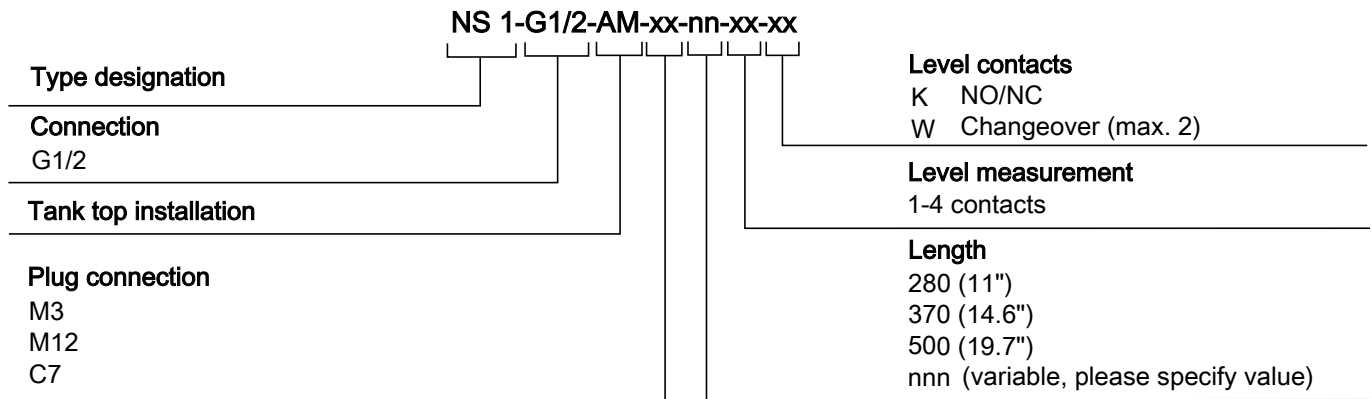
Level contacts	K8	W9
Function:	NO/NC*	Changeover contact
Max. operating voltage:	230 V	48 V
Max. switching current:	0.5 A	0.5 A
Max. contact load:	10 VA	20 VA
Min. contact spacing:	40 mm (1.6")	40 mm (1.6")

*NO= falling NC contact/NC = falling NO contact

Dimensions



Model key

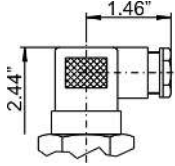
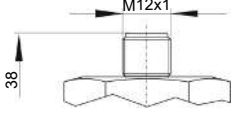
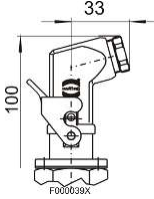
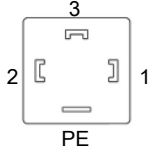
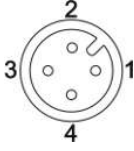
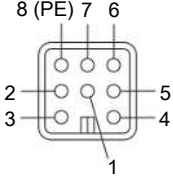
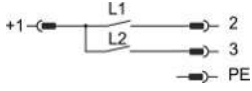
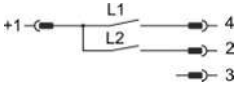
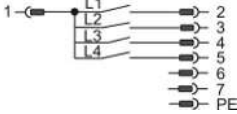
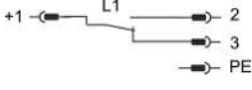
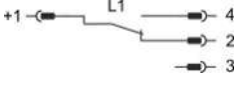
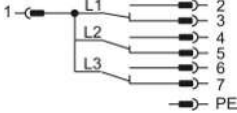


Ordering example:

You require: Level switch for external installation, G1/2 connections, length L= 370 mm (16.6"), M3 plug connection
2 level contacts, 1st contact 100 mm (3.9") NC, 2nd contact 300 mm (11.8") NO

Order NS 1-G1/2-AM-M3/370-2K L1=100 NC, L2 = 300 NO

Standard pin assignment

Connector:	M3 valve connector	M12 plug A-coded	C7 HAN 3 A
Dimensions:			
Connection schematic:			
Number of poles:	3-pin + PE	4-pin	7-pin + PE
DIN EN	175301-803	61076-2-101	175301-801
Max. voltage:	230 V AC/DC*	30 V DC	230 V AC/DC*
IP rating:	IP65	IP67**	IP65***
Cable fitting:	PG 11		PG 11
Max. Number of level contacts:	2 x K8 1 x W9	2 x K8 1 x W9	4 x K8 3 x W9
K8 Level contact(s)			
W9 Level contact(s)			

*Max. 48 V AC/DC for change-over contact. **IP67 with cable box attached. ***IP44 with gland/without gasket.

Level switch NS 10/NS 25 ..-AM

Oil tanks in lubrication and oil supply systems are often under overpressure compared to the ambient atmosphere. All oil moistened parts of devices mounted externally on the tanks or housings for monitoring the liquid level must therefore be pressure-resistant.

The NS 10 and NS 25 series are designed for 10 or 25 bar operating pressures. The separate display float can easily be viewed inside the upstream guide tube and the magnetic field ensures the touchless connection with the interior main float. The variable electric switching contacts and/or the continuous position encoder are located on the scale plate, which also holds the sight glass. On the NS 10 it is standard connected to the tank via pipe sockets and fittings or DIN flange, on the NS 25 via DIN flange.

Level switch NS for external installation

Visual and electric liquid level monitoring

Operating pressure up to 25 bar (363 psi)

Lengths up to 5000 mm (196.9 in)

Adjustable level contacts

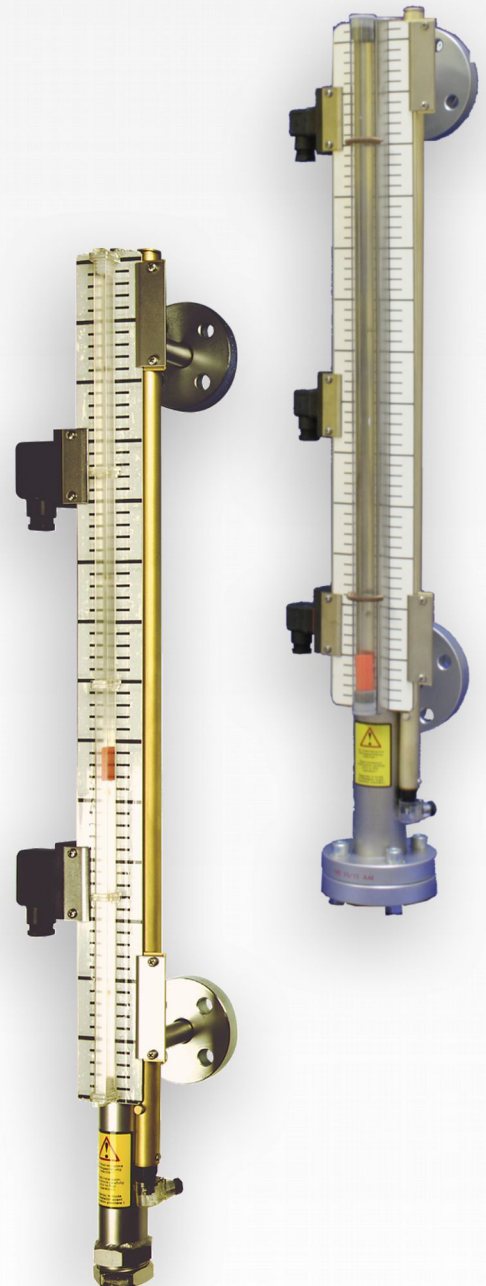
Optional analog output 4-20 mA or IO-Link

Display with scale

Compact design

Particularly buoyant floats

Special versions available upon request



Technical Data NS 10 ..-AM

Basic unit

Max. operating pressure	10 bar (145 psi)
Max. operating temperature	100 °C (212 °F)
spec. min. fluid weight	0.75 kg/dm ³ (0.027 lb/in ³)

Material

Float SK166	NBR
Riser	1.4571
Flange	Galvanised steel
Sight glass	PC
Sealing cap	1.4571

Version	0-AM	15-AM	25-AM
Connection	Tube	Flange	Flange
DIN 2656 flange		DN15	DN25
ØD	20 (0.8")	95 (3.7")	115 (4.5")
Øk		65 (2.6")	85 (3.3")
Ød		14 (0.6")	14 (0.6")
b		16 (0.6")	18 (0.7")
ØA		45 (1.8")	68 (2.7")
h		12	14
Weight at L1=500 mm (19.7")	approx. 7.5 kg (16.5 lb)	approx. 8.0 kg (17.6 lb)	approx. 8.75 kg (19.3 lb)
Weight L1+100 mm (3.9 ")	approx. 0.2 kg (0.4 lb)	approx. 0.2 kg (0.4 lb)	approx. 0.2 kg (0.4 lb)

Other versions available upon request

Options

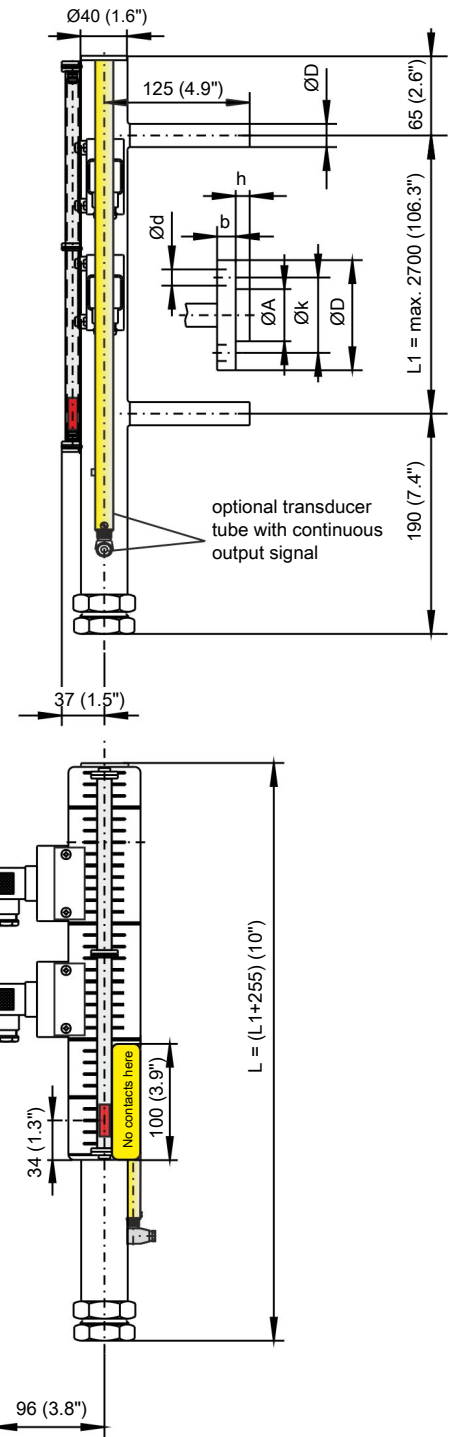
Continuous liquid level measurement BLT or switching contacts, see below

Accessories

Item no.:	Description:
2251000	Flange seal 45/22x2 mm (DN15)
2252000	Flange seal 68/27x2 mm (DN25)
2271999	Mounting bolts 8 x M12x65
9008070	Ball valve, steel DN15 PN16/40
9008002	Ball valve, steel DN25 PN16/40
9008071	Ball valve, stainless steel DN15 PN16/40
9008004	Ball valve, stainless steel DN25 PN16/40

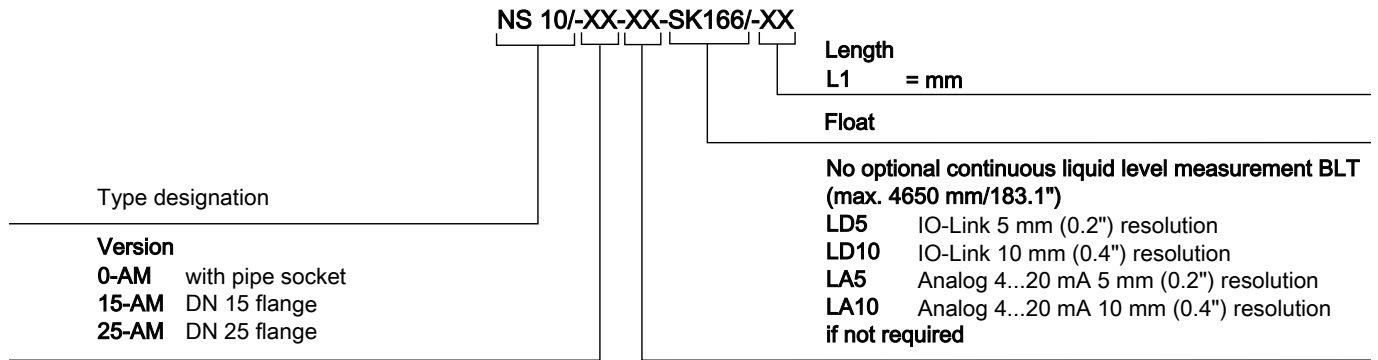
Pressure Equipment Directive information:

The level switches are designed, manufactured and tested to Pressure Equipment Directive 2014/68/EU according to AD-2000 code. The actual category of the level switch achieved is printed on the type plate. Comprehensive quality assurance is performed according to module H.



Model key NS 10

Model key



Ordering example:

You require: Level switch for external installation, max. operating pressure 10 bar (145 psi), with DN15 flange connection, adapter spacing L1 = 1500 mm (59.1"), with 2 changeover contacts

Order NS 10/15-AM-SK166 / 1500
2 x item no. 28 89 999 contact MKS 1/W

Ordering example with continuous liquid level measurement:

You require: Level switch for tank top installation, operating pressure max. 10 bar (145 psi), with DN15 flange connection, transducer tube IO-Link 5 mm (0.2"), adapter spacing L1 = 1500 mm (59.1"), with 2 changeover contacts

Order NS 10/15-AM-LD5-SK166 / 1500
2 x item no. 28 89 999 contact MKS 1/W

Technical Data NS 25 ..-AM

Basic unit

Operating pressure	max. 25 bar (363 psi)	
Operating temperature	max. 120 °C (248 °F)	
spec. min. fluid weight	SK661 0.85 kg/dm ³ (0.031 lb/in ³)	SK662 0.70 kg/dm ³ (0.025 lb/in ³)

Material

Float	1.4571	
Riser	1.4571	
Flange	Galvanised steel	
Sight glass	PC	

Version	15-AM	25-AM
Connection	Flange	Flange
DIN 2656 flange	DN15	DN25
ØD	95 (3.7")	115 (4.5")
Øk	65 (2.6")	85 (3.3")
Ød	14 (0.6")	14 (0.6")
b	16 (0.6")	18 (0.7")
ØA	45 (1.8")	68 (2.7")
h	12 (0.5")	14 (0.6")
S for float SK661	205 (8.1")	205 (8.1")
S for float SK6612	390 (15.4")	390 (15.4")
Weight at L1=500 mm (19.7")	approx. 9.5 kg (20.9 lb)	approx. 10.5 kg (23.1 lb)
Weight L1+100 mm (3.9")	approx. 0.4 kg (0.9 lb)	approx. 0.4 kg (0.9 lb)

Other versions available upon request

Options

Continuous liquid level measurement BLT or switching contacts, see below

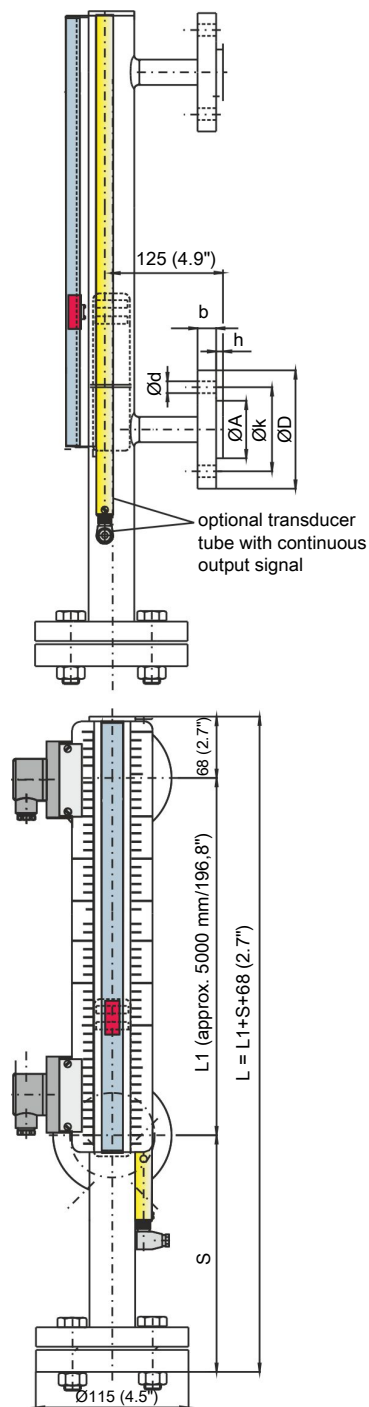
Accessories

Item no.:	Description:
2251000	Flange seal 45/22x2 mm (DN15)
2252000	Flange seal 68/27x2 mm (DN25)
2271999	Mounting bolts 8 x M12x65
9008070	Ball valve, steel DN15 PN16/40
9008002	Ball valve, steel DN25 PN16/40
9008071	Ball valve, stainless steel DN15 PN16/40
9008004	Ball valve, stainless steel DN25 PN16/40

Pressure Equipment Directive information:

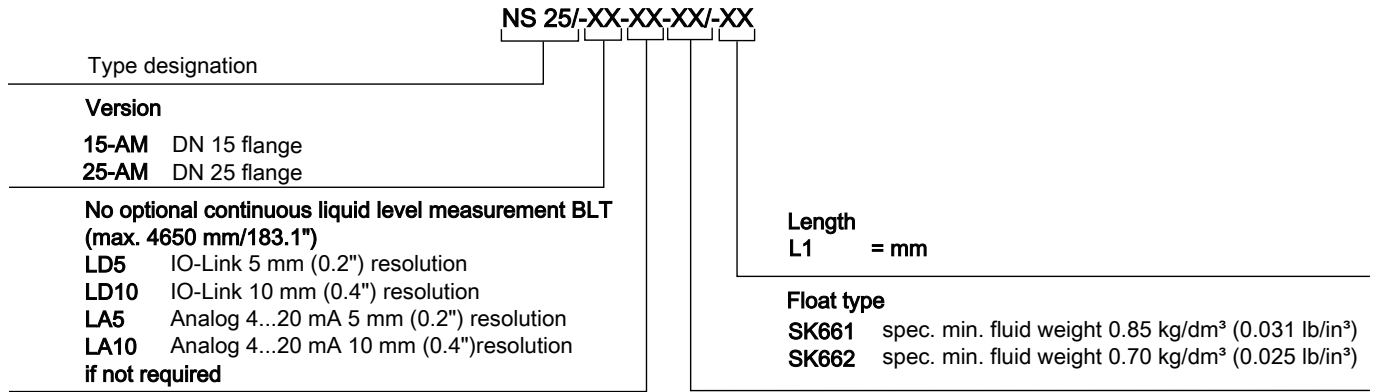
The level switches are designed, manufactured and tested to Pressure Equipment Directive 2014/68/EU according to AD-2000 code.

The actual category of the level switch achieved is printed on the type plate. Comprehensive quality assurance is performed according to module H.



Model key NS 25

Model key



Ordering example:

You require: Level switch for tank top installation, max. operating pressure 25 bar (363 psi), with DN25 flange connection, spec. Fluid weight 0.89 kg/dm³ (0.032 lb/in³), adapter spacing L1 = 1500 mm (59.1"), continuous level output, resolution 10 mm (0.4") with 4...20 mA signal and 2 changeover contacts

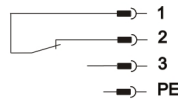
Order NS 25/25-AM-LA10-SK661 / 1500
2 x item no. 28 89 999 contact MKS - 1/W

Contacts for NS ..-AM

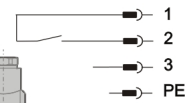
Pin Assignment (Contact position empty tank)

Type	MKS-1/K (-60)
Function	NC contact/NO contact
Max. voltage	230 VAC/DC
Max. switching current	1 A
Max. contact load	50 VA
Connector	M3 (DIN EN 175301-803) 3-pin + PE
IP class	IP 65
Item no.	28 88 999

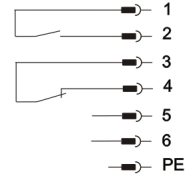
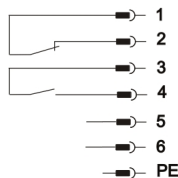
Mounted left



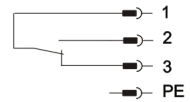
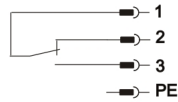
Mounted right



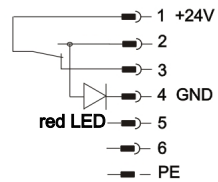
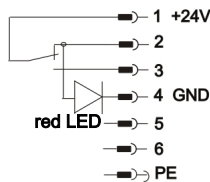
Type	MKS-2/K
Function	2 x NC contact/NO contact
Max. voltage	230 VAC/DC
Max. switching current	1 A
Max. contact load	50 VA
Connector	S6 (DIN EN 175291-804) 6-pin + PE
IP class	IP 65
Item no.	28 91 999



Type	MKS-1/W (-60)
Function	Changeover contact
Max. voltage	230 VAC/DC
Max. switching current	1 A
Max. contact load	50 VA
Connector	M3 (DIN EN 175301-803) 3-pin + PE
IP class	IP 65
Item no.	28 89 999



Type	MKS-1/W-L 24 V (-60)
Function	Changeover contact with LED
Max. voltage	24 VDC
Max. switching current	1 A
Max. contact load	25 VA
Connector	S6 (DIN EN 175291-804) 6-pin + PE
IP class	IP 65
Item no.	28 90 999



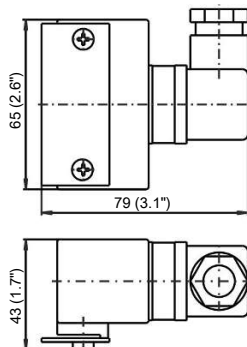
Other contacts available upon request

For applications in high shock and vibration environments we recommend using the MKS-1/K and MKS-2K contacts.

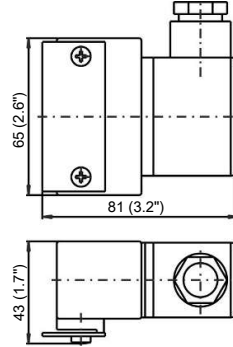
Versions ending in -60 are for switch type NS 3/20 AM and have a pipe clamp for mounting to the level switch tube.

When installing a BLT transducer tube with continuous output signal, the contacts can only be mounted on the left.

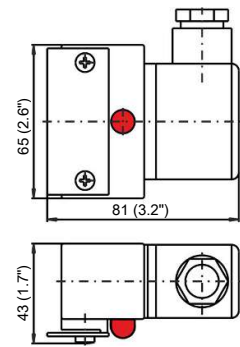
MKS 1/K, MKS 1/W



MKS 2/K



MKS 1/W-L24V



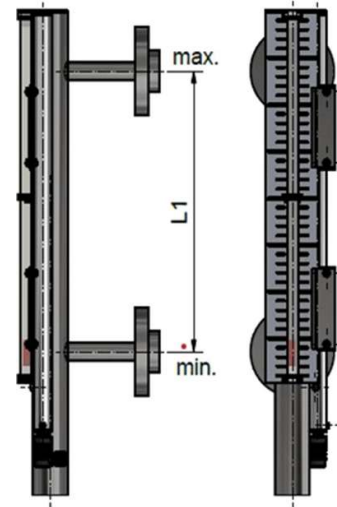
BLT Technical Data

LD-5(10)-1D1S-/VAR with IO-Link interface

LA-5(10)-1A-/VAR with 4-20 mA output

	1D1S	1A
Transducer tube material:	Nickel-plated brass	
Ambient temperature:	-20 °C to +70 °C (-4 °F to 158 °F)	
Lengths:	variable to max. 4650 mm (183.1 in)	
Input value		
Sensor element:	Reed chain 5 or 10 mm (0.2" or 0.4") resolution	
Tolerance:	±1% FS	
Operating voltage (UB):	18 - 30 VDC	10 - 30 VDC
Measuring range:	0 to 100 %	4-20 mA > 0-100 %
Output:	IO-Link	4-20 mA
IO-Link		
	Rev. 1.1	-
Baudrate:	COM3 (230.4k)	-
SIO Mode:	Yes	-
Min. Time Period	10 ms	-
Max. Load:	-	(UB-8V)/0.02 A

Dimensions



BLT Standard Pin Assignment

Connector	M12 (base)	M12 (base)
Number of pins	4-pin	4-pin
DIN EN 61076-2-101	30 VDC	30 VDC
IP rating with IP67 cable box attached	IP67	IP67
Version	1D1S	1A
Connection schematic		
	1D1S (IO-Link)	1A (4-20 mA)
1	+24 VDC	+24 VDC
2	S2 (PNP max. 200 mA)	OUT 4-20 mA
3	GND	GND
4	C/Q (IO-Link)	NC

Level switch

NS 64/NS 100 ..-AM

Forging and press technology require large fluid volumes to be moved very rapidly under high overpressure. For this purpose, hydraulic accumulators are charged with the fluid up to the required operating pressure and pressurised to release the desired volume at the correct pressure at the defined time.

The NS 64 and NS 100 series are suitable for monitoring the variable fill volumes for these systems. Available with up to 64 or 100 bar (928 or 1450 psi) pressure ratings, they indicate the desired liquid level via clearly visible sight glass float, as well as via variable switching contacts and/or continuous output position encoder. A magnetic field generated by the interior unsinkable main float moves the sight glass float. The same magnetic field also triggers the electric contacts and the position encoder.

Level switch NS for external installation

Visual and electric liquid level monitoring

Operating pressure up to 100 bar (1450 psi)

Adjustable level contacts

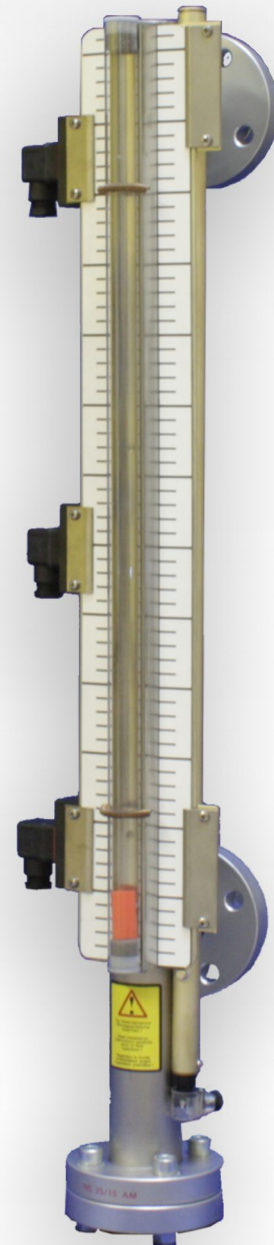
Optional analog output 4-20 mA or IO-Link

Display with scale

Compact design

Particularly buoyant floats

Special versions available upon request



Technical Data NS 64 ..-AM

Basic unit

Max. operating pressure	64 bar (928 psi)
Max. operating temperature	50 °C (122 °F)
spec. min. fluid weight	0.85 kg/dm ³ (0.031 lb/in ³)

Material

Float SK596	Plastic
Riser	1.4571
Flange	1.4541
Sight glass	PC

Connection

DIN 2637 flange	DN 25
ØD	140 (5.5")
Øk	100 (3.9")
Ød	18 (0.7")
b	22 (0.9")
ØA	68 (2.7")
h	2 (0.1")

Weight at L1=500 mm (19.7")	approx. 22 kg (48.5 lb)
Weight L1+100 mm (3.9")	approx. 0.5 kg (1.1 lb)

Other versions available upon request

Options

Continuous liquid level measurement BLT or switching contacts, see below

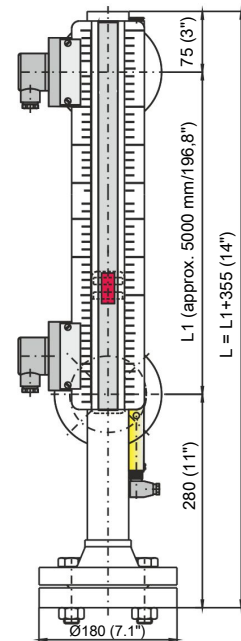
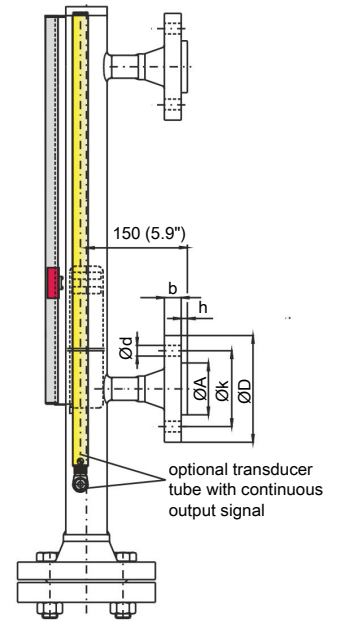
Accessories

Item no.:	Description:
2254000	Flange seal 65/25x2 mm (DN25)
2273999	Mounting bolts 8 x M16x70
9008073	Ball valve, steel DN25 PN64
9008078	Ball valve, stainless steel DN25 PN64

Pressure Equipment Directive information:

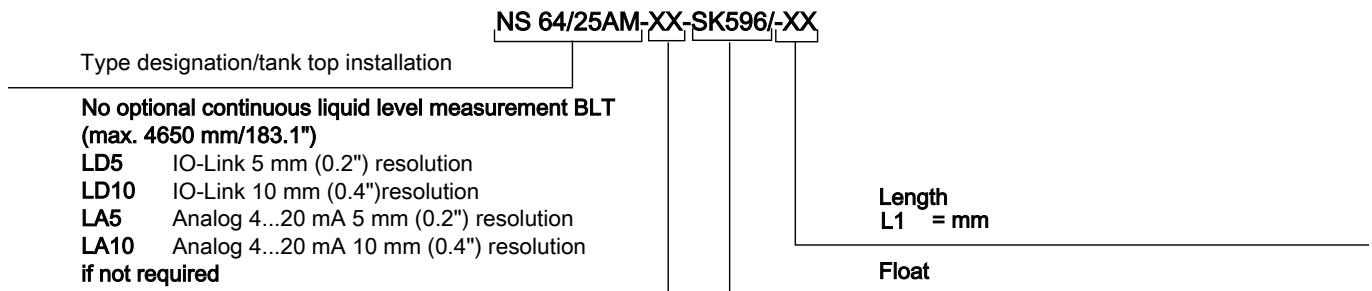
The level switches are designed, manufactured and tested to Pressure Equipment Directive 2014/68/EU according to AD-2000 code.

The actual category of the level switch achieved is printed on the type plate. Comprehensive quality assurance is performed according to module H.



Model key NS 64

Model key



Ordering example:

You require: Level switch for external installation, max. operating pressure 64 bar (928 psi), with DN25 flange connection, adapter spacing L1 = 1400 mm (55.1"), with 2 changeover contacts

Order NS 64/25-AM-SK596 / 1400
2 x item no. 28 89 999; contact MKS - 1/W

Ordering example with continuous liquid level measurement:

You require: Level switch for tank top installation, max. operating pressure 64 bar (928 psi), with DN25 flange connection, transducer tube IO-Link 5 mm (0.2"), adapter spacing L1 = 1400 mm (55.1"), with 2 changeover contacts

Order NS 64/25-AM-LD5-SK596 / 1400
2 x item no. 28 89 999; contact MKS - 1/W

Technical Data NS 100 ..-AM

Basic unit

Max. operating pressure	100 bar (1450 psi)
Max. operating temperature	50 °C (122 °F)
spec. min. fluid weight	0.85 kg/dm ³ (0.031 lb/in ³)

Material

Float SK596	Plastic
Riser	1.4571
Flange	1.4541
Sight glass	PC

Connection

DIN 2637 flange	DN 25
ØD	140 (5.5")
Øk	100 (3.9")
Ød	18 (0.7")
b	22 (0.9")
ØA	68 (2.7")
h	2 (0.1")

Weight at L1=500 mm (19.7")	approx. 25 kg (55.1 lb)
Weight L1+100 mm (3.9")	approx. 0.5 kg (1.1 lb)

Other versions available upon request

Options

Continuous liquid level measurement BLT or switching contacts, see below

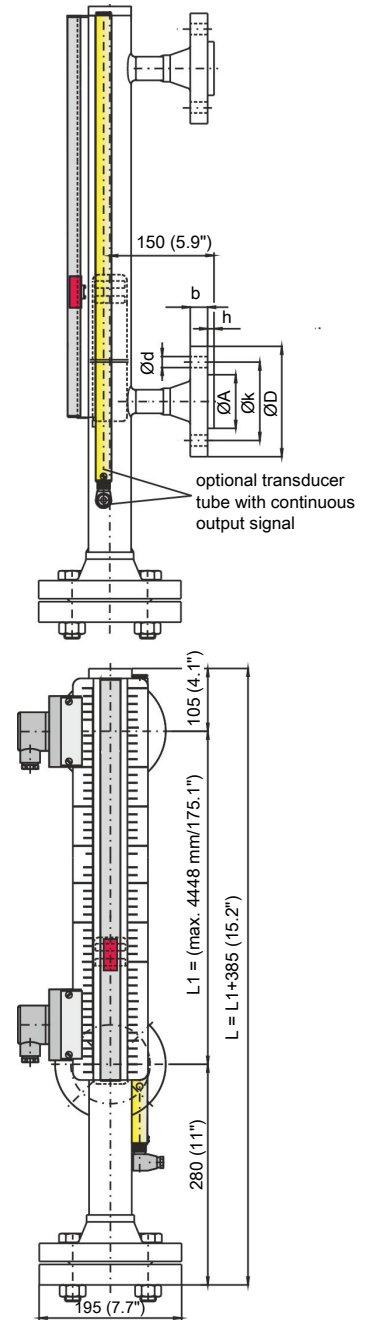
Accessories

Item no.:	Description:
2254000	Flange seal 65/25x2 mm (DN25)
2273999	Mounting bolts 8 x M16x70
9008077	Ball valve, steel DN25 PN100
9008079	Ball valve, stainless steel DN25 PN100

Pressure Equipment Directive information:

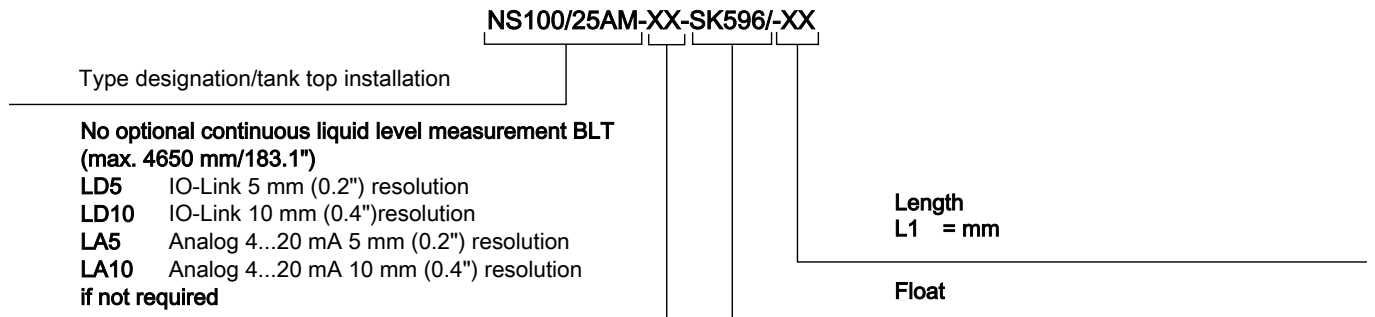
The level switches are designed, manufactured and tested to Pressure Equipment Directive 2014/68/EU according to AD-2000 code.

The actual category of the level switch achieved is printed on the type plate. Comprehensive quality assurance is performed according to module H.



Model key NS 100

Model key



Ordering example:

You require: Level switch for external installation, max. operating pressure 100 bar (1450 psi), with DN25 flange connection, adapter spacing L1 = 1500 mm (59.1"), continuous level output, 5 mm (0.2") resolution and with 2 changeover contacts

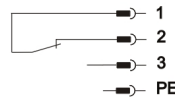
Order	NS 100/25-AM-K5-SK596 / 1500 2 x item no. 28 89 999 contact MKS 1/W
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Contacts for NS ..-AM

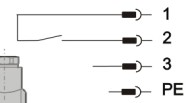
Pin Assignment (Contact position empty tank)

Type	MKS-1/K (-60)
Function	NC contact/NO contact
Max. voltage	230 VAC/DC
Max. switching current	1 A
Max. contact load	50 VA
Connector	M3 (DIN EN 175301-803)
	3-pin + PE
IP class	IP 65
Item no.	28 88 999

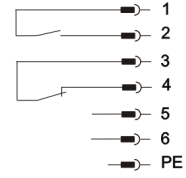
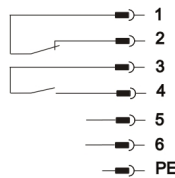
Mounted left



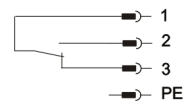
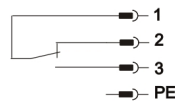
Mounted right



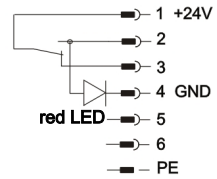
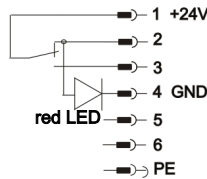
Type	MKS-2/K
Function	2 x NC contact/NO contact
Max. voltage	230 VAC/DC
Max. switching current	1 A
Max. contact load	50 VA
Connector	S6 (DIN EN 175291-804)
	6-pin + PE
IP class	IP 65
Item no.	28 91 999



Type	MKS-1/W (-60)
Function	Changeover contact
Max. voltage	230 VAC/DC
Max. switching current	1 A
Max. contact load	50 VA
Connector	M3 (DIN EN 175301-803)
	3-pin + PE
IP class	IP 65
Item no.	28 89 999



Type	MKS-1/W-L 24 V (-60)
Function	Changeover contact with LED
Max. voltage	24 VDC
Max. switching current	1 A
Max. contact load	25 VA
Connector	S6 (DIN EN 175291-804)
	6-pin + PE
IP class	IP 65
Item no.	28 90 999



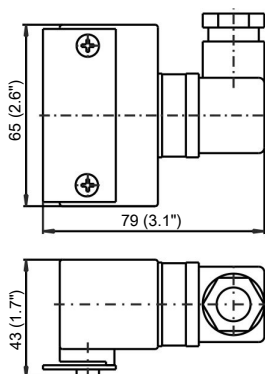
Other contacts available upon request

For applications in high shock and vibration environments we recommend using the MKS-1/K and MKS-2K contacts.

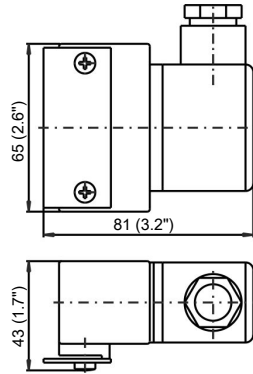
Versions ending in -60 are for switch type NS 3/20 AM and have a pipe clamp for mounting to the level switch tube.

When installing a BLT transducer tube with continuous output signal, the contacts can only be mounted on the left.

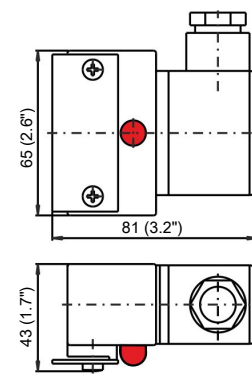
MKS 1/K, MKS 1/W



MKS 2/K



MKS 1/W-L24V



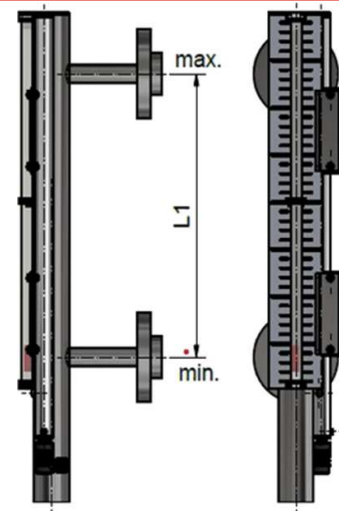
BLT Technical Data

LD-5(10)-1D1S-/VAR with IO-Link interface

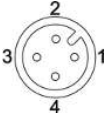
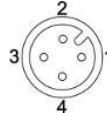
LA-5(10)-1A-/VAR with 4-20 mA output

	1D1S	1A
Transducer tube material:	Nickel-plated brass	
Ambient temperature:	-20 °C to +70 °C (-4 °F to 158 °F)	
Lengths:	variable to max. 4650 mm (183.1 in)	
Input value		
Sensor element:	Reed chain 5 or 10 mm (0.2" or 0.4") resolution	
Tolerance:	±1% FS	
Operating voltage (UB):	18 - 30 VDC	10 - 30 VDC
Measuring range:	0 to 100 %	4-20 mA > 0-100 %
Output:	IO-Link	4-20 mA
IO-Link		
	Rev. 1.1	-
Baudrate:	COM3 (230.4k)	-
SIO Mode:	Yes	-
Min. Time Period	10 ms	-
Max. Load:	-	(UB-8V)/0.02 A

Dimensions



BLT Standard Pin Assignment

Connector	M12 (base)	M12 (base)
Number of pins	4-pin	4-pin
DIN EN 61076-2-101	30 VDC	30 VDC
IP rating with IP67 cable box attached	IP67	IP67
Version	1D1S	1A
Connection schematic		
	1D1S (IO-Link)	1A (4-20 mA)
1	+24 VDC	+24 VDC
2	S2 (PNP max. 200 mA)	OUT 4-20 mA
3	GND	GND
4	C/Q (IO-Link)	NC

Level switch

HD NS 250/HD NS 360-AM-G1-V

Forging and press technology require large fluid volumes to be moved very rapidly under high overpressure. For this purpose, hydraulic accumulators are charged with the fluid up to the required operating pressure and pressurised to release the desired volume at the correct pressure at the defined time.

The NS 250 and NS 360 series are suitable for monitoring variable fill volumes in these types of systems. Available with up to 250 or 360 bar (3626 or 5221 psi) pressure ratings, they indicate the desired liquid level via clearly visible sight glass float, as well as via variable switching contacts and/or continuous output position encoder. A magnetic field generated by the interior unsinkable main float moves the sight glass float. The same magnetic field also triggers the electric contacts and the position encoder.

Level switch HD NS for external installation

Visual and electric liquid level monitoring

Operating pressure up to 360 bar (5221 psi)

TÜV (Technical Inspection Agency) approval

Lengths up to 5000 mm (196.9")

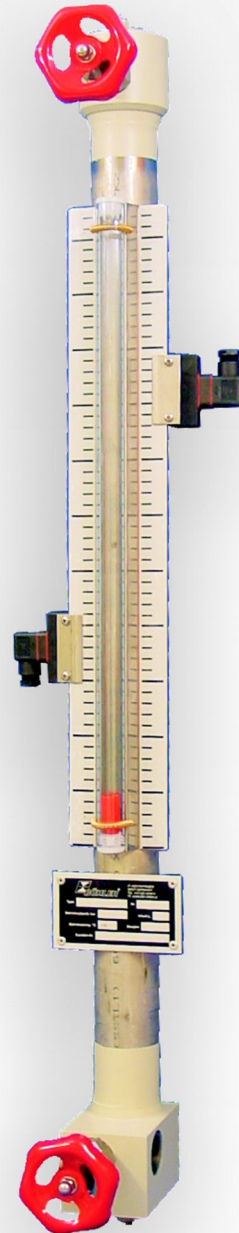
Adjustable level contacts

Optional analog output 4-20 mA or IO-Link

Display with scale

Compact design

Special versions available upon request



Technical Data HD NS 250 ..-AM

Basic unit

Max. operating pressure	250 bar (3626 psi)
Max. operating temperature	50 °C (122 °F)
spec. min. fluid weight	0.80 kg/dm ³ (0.029 lb/in ³)
L1 max.	5000 mm (196.9")
Weight at L1=500 mm (19.7")	approx. 15 kg (33.1 lb)
Weight L1+100 mm (3.9")	approx. 0.65 kg (1.4 lb)

Longer version available upon request

Material

Float SK597	Solid plastic
Riser	1.4571
Upper end piece	Steel
Bottom end piece	Steel
Check valve	1.4571
Bleeder valve	1.4571
Sight glass	PC

Connection

Air end	G1
Water end	G1

Options

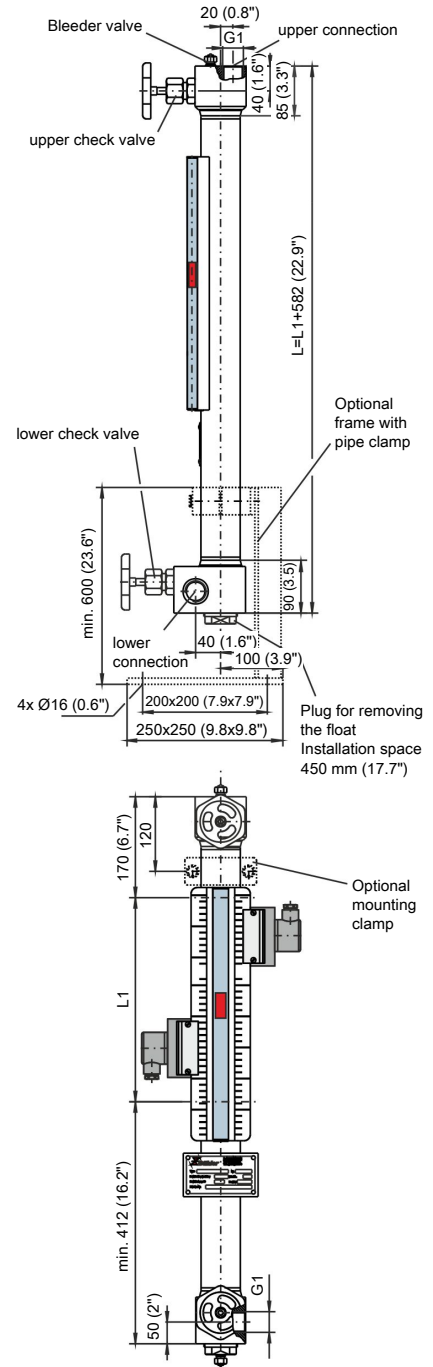
Continuous liquid level measurement BLT or switching contacts, see below

Accessories

Item no.:	Description:
20 51 002	Mounting clamp heavy series SPAL 6060
22 54 999	Frame for ground anchoring the level switch with SPAL 6060 pipe clamp
22 74 999	Masonry screws 4x DIN529-M12x300 with nuts

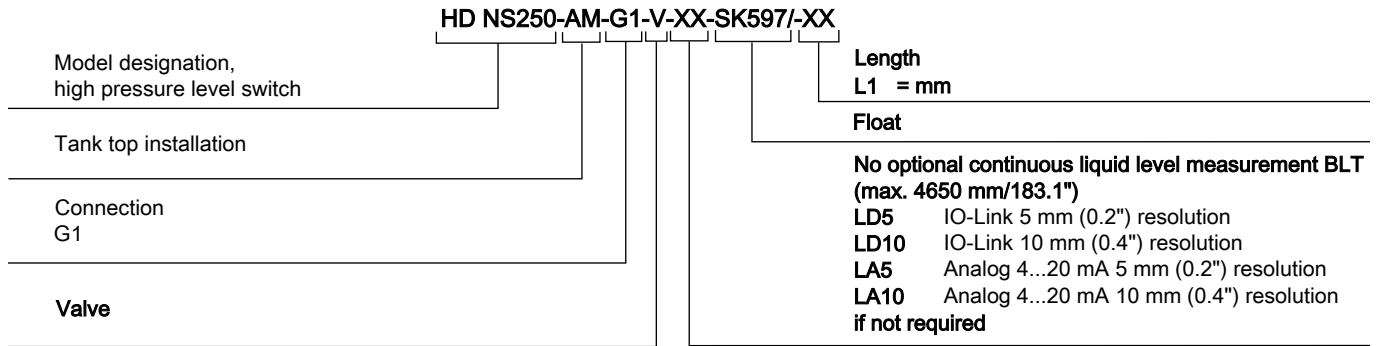
Note!

These level switches include TÜV-approval.
Tested to Pressure Equipment Directive 2014/68/EU (Module G).



Model key HD NS 250

Model key



Ordering example:

You require: Level switch for tank top installation, operating pressure 250 bar (3626 psi), measuring length L1 = 2400 mm (94.5"), with 2 changeover contacts

Order: HD NS 250-AM-G1-V-SK597 / L1 = 2400
2 x item no. 28 89 999 contact MKS 1/W

Ordering example with continuous liquid level measurement:

You require: Level switch for tank top installation, operating pressure 250 bar (3626 psi), measuring length L1 = 2400 mm (94.5"), with continuous level output, transducer tube IO-Link 5 mm (0.2") and 2 changeover contacts

Order: HD NS 250-AM-G1-V-LD5-SK597 / L1 = 2400
2 x item no. 28 89 999 contact MKS 1/W

Technical Data HD NS 360 ..-AM

Basic unit

Max. operating pressure	360 bar (5221 psi)
Max. operating temperature	50 °C (122 °F)
spec. min. fluid weight	0.80 kg/dm ³ (0.029 lb/in ³)
L1 max.	5000 mm (196.9")
Weight at L1=500 mm (19.7")	approx. 20 kg (44.1 lb)
Weight L1+100 mm (3.9")	approx. 1.0 kg (2.2 lb)

Longer version available upon request

Material

Float SK597	Solid plastic
Riser	1.4571
Upper end piece	Steel
Bottom end piece	Steel
Check valve	1.4571
Bleeder valve	1.4571
Sight glass	PC

Connection

Air end	G1
Water end	G1

Options

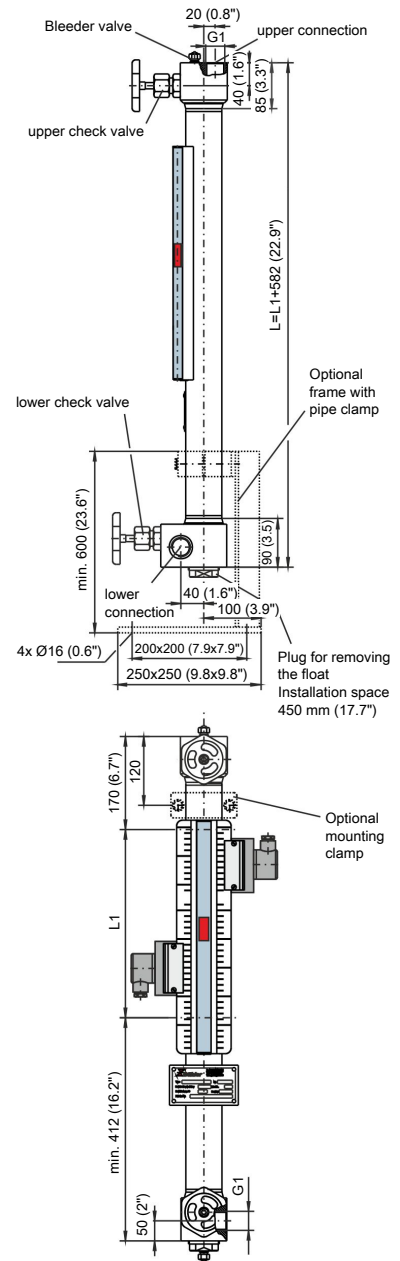
Continuous liquid level measurement BLT or switching contacts, see below

Accessories

Item no.:	Description:
20 51 003	Mounting clamp heavy series SPAL 6063.5
20 55 999	Frame for level switch ground anchoring with pipe clamp SPAL 6063.5
22 74 999	Masonry screws 4x DIN529-M12x300 with nuts

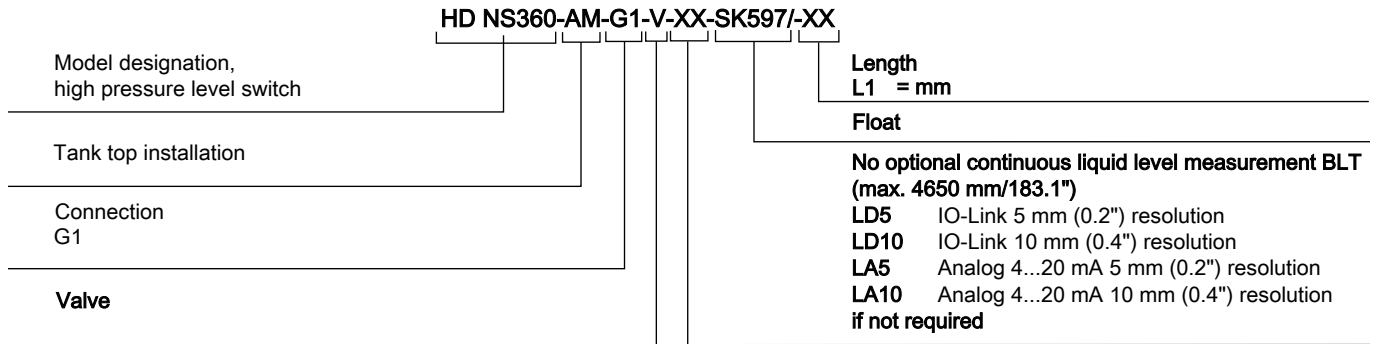
Note!

These level switches include TÜV-approval.
Tested to Pressure Equipment Directive 2014/68/EU (Module G).



Model key HD NS 360

Model key



Ordering example:

You require: Level switch for external installation, max. operating pressure 360 bar (5221 psi), measuring length L1 = 3200 mm (126"), with 2 changeover contacts

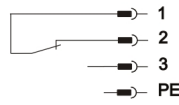
Order: HD NS 360-AM-G1-V-SK597 / L1=3200
2 x item no. 28 89 999 contact MKS 1/W

Contacts for NS ..-AM

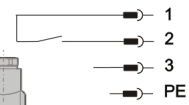
Pin Assignment (Contact position empty tank)

Type	MKS-1/K (-60)
Function	NC contact/NO contact
Max. voltage	230 VAC/DC
Max. switching current	1 A
Max. contact load	50 VA
Connector	M3 (DIN EN 175301-803) 3-pin + PE
IP class	IP 65
Item no.	28 88 999

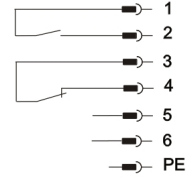
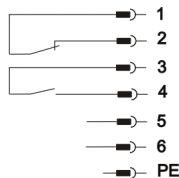
Mounted left



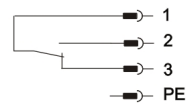
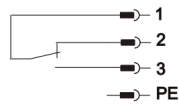
Mounted right



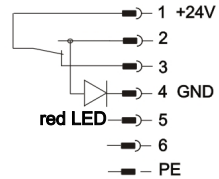
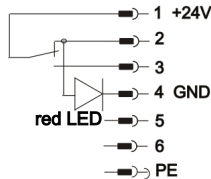
Type	MKS-2/K
Function	2 x NC contact/NO contact
Max. voltage/DC	230 VAC/DC
Max. switching current	1 A
Max. contact load	50 VA
Connector	S6 (DIN EN 175291-804) 6-pin + PE
IP class	IP 65
Item no.	28 91 999



Type	MKS-1/W (-60)
Function	Changeover contact
Max. voltage/DC	230 VAC/DC
Max. switching current	1 A
Max. contact load	50 VA
Connector	M3 (DIN EN 175301-803) 3-pin + PE
IP class	IP 65
Item no.	28 89 999



Type	MKS-1/W-L 24 V (-60)
Function	Changeover contact with LED
Max. voltage	24 VDC
Max. switching current	1 A
Max. contact load	25 VA
Connector	S6 (DIN EN 175291-804) 6-pin + PE
IP class	IP 65
Item no.	28 90 999



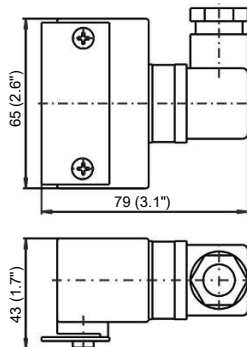
Other contacts available upon request

For applications in high shock and vibration environments we recommend using the MKS-1/K and MKS-2/K contacts.

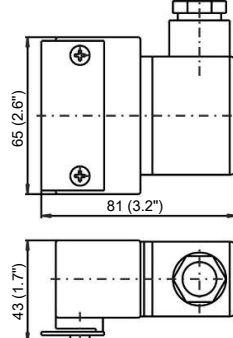
Versions ending in -60 are for switch type NS 3/20 AM and have a pipe clamp for mounting to the level switch tube.

When installing a BLT transducer tube with continuous output signal, the contacts can only be mounted on the left.

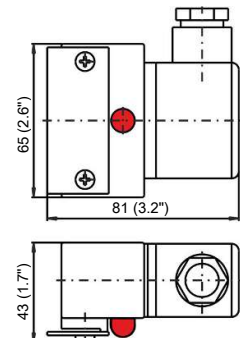
MKS 1/K, MKS 1/W



MKS 2/K



MKS 1/W-L24V

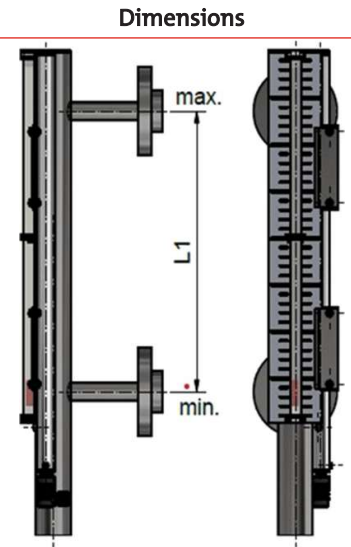


BLT Technical Data

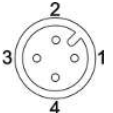

LD-5(10)-1D1S-/VAR with IO-Link interface

LA-5(10)-1A-/VAR with 4-20 mA output

	1D1S	1A
Transducer tube material:	Nickel-plated brass	
Ambient temperature:	-20 °C to +70 °C (-4 °F to 158 °F)	
Lengths:	variable to max. 4650 mm (183.1 in)	
Input value		
Sensor element:	Reed chain 5 or 10 mm (0.2" or 0.4") resolution	
Tolerance:	±1% FS	
Operating voltage (UB):	18 - 30 VDC	10 - 30 VDC
Measuring range:	0 to 100 %	4-20 mA > 0-100 %
Output:	IO-Link	4-20 mA
IO-Link		
	Rev. 1.1	-
Baudrate:	COM3 (230.4k)	-
SIO Mode:	Yes	-
Min. Time Period	10 ms	-
Max. Load:	-	(UB-8V)/0.02 A



BLT Standard Pin Assignment

Connector	M12 (base)	M12 (base)
Number of pins	4-pin	4-pin
DIN EN 61076-2-101	30 VDC	30 VDC
IP rating with IP67 cable box attached	IP67	IP67
Version	1D1S	1A
Connection schematic		
	1D1S (IO-Link)	1A (4-20 mA)
1	+24 VDC	+24 VDC
2	S2 (PNP max. 200 mA)	OUT 4-20 mA
3	GND	GND
4	C/Q (IO-Link)	NC

Transducer tube BLT

for continuous level measurement on
NS AM tank top level switches

The IO-Link compatible BLT series sensors are suitable to ensure cost-effective and efficient liquid level monitoring in IO-Link hydraulic and lubrication oil tanks.

Available with classic output signals 4-20 mA as well as with IO-Link interface.

The digital, bidirectional communication of IO-Link sensors meets all requirements of modern plant automation, reduces acquisition and installation costs, and improves system availability.

Their robust design makes them suitable for virtually any liquid properties, allowing a wide range of applications.

The BLT series meets virtually all requirements arising in this area of application.

BLT-AM1(2)-LD-5(10)-1D1S-/VAR

BLT-AM1(2)-LA-5(10)-1A-/VAR

IO-Link and 1 x programmable switching output or 4-20 mA output

Continuous liquid level detection

Nickel-plated brass housing

Up to 4.65 m (15.3 ft) transducer length

Connection M12x1 plug connector

Customisable M12 plug included



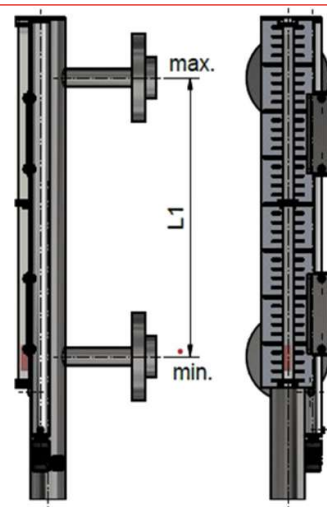
BLT Technical Data

BLT-AM1(2)-LD-5(10)-1D1S-/VAR with IO-Link interface

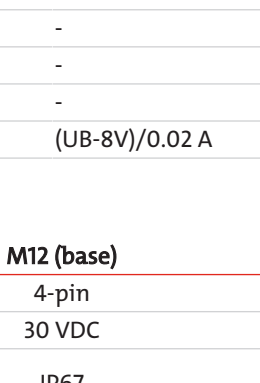
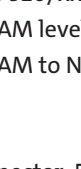
BLT-AM1(2)-LA-5(10)-1A-/VAR with 4-20 mA output

	1D1S	1A
Transducer tube material:	Nickel-plated brass	
Ambient temperature:	-20 °C to +70 °C (-4 °F to 158 °F)	
Lengths:	variable to max. 4650 mm (183.1 in)	
Input value		
Sensor element:	Reed chain 5 or 10 mm (0.2" or 0.4") resolution	
Tolerance:	±1% FS	
Operating voltage (UB):	18 - 30 VDC	10 - 30 VDC
Measuring range:	0 to 100 %	4-20 mA > 0-100 %
Output:	IO-Link	4-20 mA
IO-Link		
	Rev. 1.1	-
Baudrate:	COM3 (230.4k)	-
SIO Mode:	Yes	-
Min. Time Period	10 ms	-
Max. Load:	-	(UB-8V)/0.02 A

Dimensions



BLT Standard Pin Assignment

Connector	M12 (base)	M12 (base)
Number of pins	4-pin	4-pin
DIN EN 61076-2-101	30 VDC	30 VDC
IP rating with IP67 cable box attached	IP67	IP67
Version	1D1S	1A
Connection schematic		
	1D1S (IO-Link)	1A (4-20 mA)
1	+24 VDC	+24 VDC
2	S2 (PNP max. 200 mA)	OUT 4-20 mA
3	GND	GND
4	C/Q (IO-Link)	NC

Model Key BLT-AM1(2)-Lx-yyyy/VAR

- BLT-AM1-LD-5(10)-1D1S-/VAR with IO-LINK for NS 10/xx-AM level switch
- BLT-AM2-LD-5(10)-1D1S-/VAR with IO-LINK for NS 25/xx-AM to NS 320/xx-AM level switch
- BLT-AM1-LA-5(10)-1A-/VAR with 4-20 mA output for NS 10/xx-AM level switch
- BLT-AM2-LA-5(10)-1A-/VAR with 4-20 mA output for NS 25/xx-AM to NS 320/xx-AM level switch

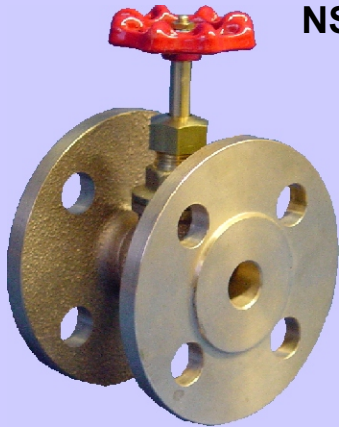
Ordering example

You require: Level sensor style for NS 10/xx AM, with M12 plug connector, 5 mm (0.2") resolution, IO-Link output, adapter spacing L1= 1500 mm (59.1")

Order BLT-AM1-LD-5-1D1S-/1500

NOTICE! BLT is only the transducer tube for continuous liquid level measurement. Requires a NSxxAM level switch!

Accessories for level switches



NS 6/15 AM, NS 6/25 AM, NS 25/15 AM, NS 25/25 AM

NS 10/15 AM - NS 100/25 AM



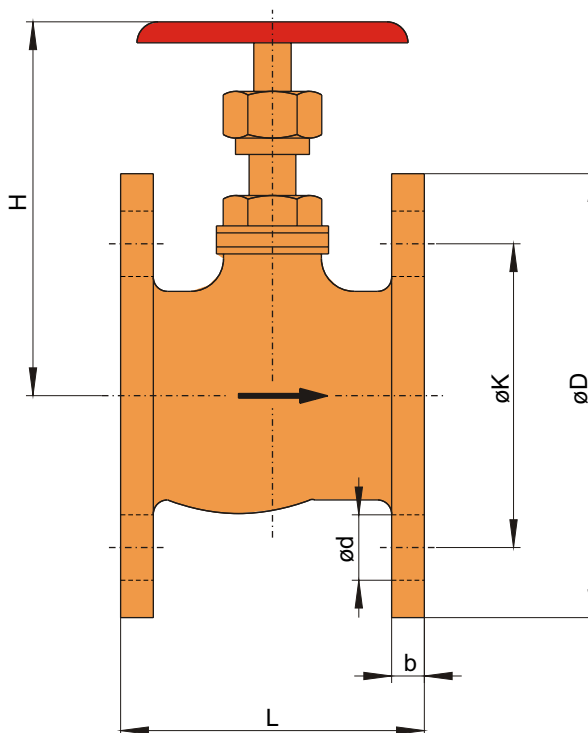
- short length
- different models
- universal use

Technical data NS 6/15 AM, NS 6/25 AM, NS 25/15 AM, NS 25/25 AM

types	DN 15 ; PN 16 DN 25 ; PN 16
max. operating pressure	232 psi (16 bar)
max. operat. temperature	248 °F (120 °C)
material	red bronze and brass
valve seal	metallic packing

Dimensions (inches)

description	DN 15	DN 25
øD	3.72	4.53
øK	2.65	3.35
b	0.28	0.31
H	3.15	4.53
L	2.56	3.35
ød	0.55	0.55
weight	2.2 lb (1 kg)	4 lb (1,8 kg)



Attention! Valves can be mounted at types NS 25/15 AM and NS 25/25 AM but only be used up to a max. operating pressure of 232 psi (16 bar).

Order Information

Part-No.	Description
26 01 000	flange valve DN15 ; PN16
22 51 000	gasket DIN 2690, 45 / 22 x 2 mm
26 02 000	flange valve DN25 ; PN16
22 52 000	gasket DIN 2690, 68 / 27 x 2 mm
22 71 000	mounting screws with nuts, 8 x M12 x 50

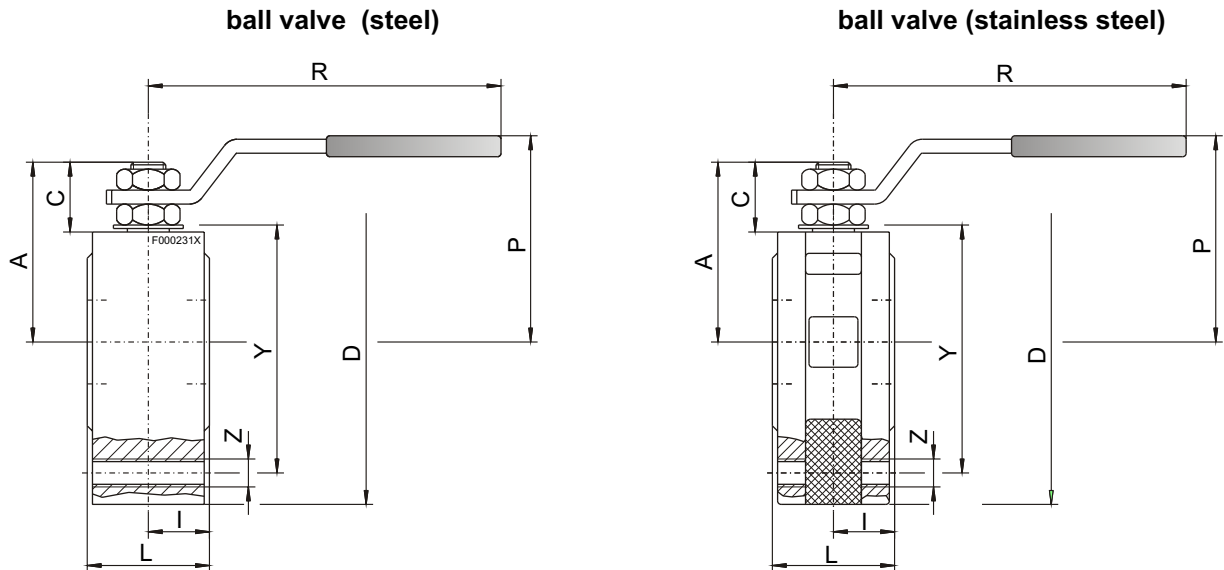
we reserve the right to amend specification

Technical data NS 10/15 AM - NS 100/25 AM

types	ball valve (steel)	ball valve (stainless steel)
nominal pressure (PN)	16/40 (0.63/1.57 in); 65 (2.56 in); 100 (3.94 in)	16/40 (0.63/1.57 in); 65 (2.56 in); 100 (3.94 in)
nominal size (DN)	15 (1/2"); 20 (3/4"); 25 (1")	15 (1/2"); 20 (3/4"); 25 (1")
operating temperature	-4 to 320 °F (-20 to 160 °C)	-22 to 320 °F (-30 to 160 °C)

material:

housing	steel C22.8	1.4408
ball	1.4301	1.4401
ball- and stem-seal	PTFE (Teflon)	PTFE (Teflon)
o-rings	FKM (Viton)	FKM (Viton)
Handle	steel galvanized	steel galvanized



Dimensions in inches

ball valves (steel)												
Part-no.	DN	D	Y	Z	I	L	R	P	A	C	PN	lb
9008070	1/2"	15 mm	3.54	2.56	4xM12	0.75	1.38	5.18	2.54	1.85	0.63/1.57	2.8
9008001	3/4"	20 mm	3.94	2.95	4xM12	0.79	1.57	5.18	2.72	2.03	0.63/1.57	4.2
9008002	1"	25 mm	4.33	3.35	4xM12	0.94	1.81	6.87	3.17	2.4	0.63/1.57	5.9
9008073	1"	25 mm	5.51	3.94	4xM16	1.28	2.65	9.96	4.57	3.19	2.56	10.6
9008077	1"	25 mm	5.51	3.94	4xM16	1.28	2.65	9.96	4.57	3.19	3.94	10.6
ball valves (stainless steel)												
Part-no.	DN	D	Y	Z	I	L	R	P	A	C	PN	lb
9008071	1/2"	15 mm	3.54	2.56	4xM12	0.75	1.38	5.18	2.54	1.85	0.63/1.57	2.8
9008072	3/4"	20 mm	3.94	2.95	4xM12	0.79	1.57	5.18	2.72	2.03	0.63/1.57	4.2
9008004	1"	25 mm	4.33	3.35	4xM12	0.94	1.81	6.87	3.17	2.4	0.63/1.57	5.9
9008078	1"	25 mm	5.51	3.94	4xM16	1.28	2.65	9.96	4.57	3.19	2.56	10.6
9008079	1"	25 mm	5.51	3.94	4xM16	1.28	2.65	9.96	4.57	3.19	3.94	10.6

Order information:

order with: part-no., type, normally pressure PN and normally size DN



2.4 Temperature Measurement

Temperature monitoring / measurement



The reliable function of hydraulic and lubrication systems depend on a stable operating temperature of the oil. Therefore, it is essential that the actual temperature is timely and accurately measured. Normally it is done inside of the tank due to a representative average to be expected.

The cover of the tank is the preferred spot for the installation of the sensors penetrating down into the liquid. The sole measurement of temperature is recommended only if combined sensors with the level controls are not applicable.

Thermotronik TT77 series

Electronic controller with digital LED display, programmable switch points or / and analog output. For installation direct onto the top or remote places. Male G1/2" BSP connection.

Temperature sensor TF.. series

Temperature sensor with Pt 100 signal, male G1/2" BSP connection

Temperature switch TS.. series

Bimetal temperature switch with one or two contacts, male G1/2" BSP or G3/4" BSP connection

Items for the application in hazardous areas

see chapter 14: Controls with approval



Items after DESINA-Standard

see chapter 14: Controls with approval





Display and control unit Thermotronic TT-77

Changes in the viscosity of hydraulic oil and lubricants due to the temperature requires precisely monitoring and stabilising the operating temperature.

Carefully monitoring the temperature further also affects the service life of the oils. The oil tank is generally accepted as the control point for the oil temperature, which will usually provide helpful averages. It may further be helpful to also monitor segments or individual units within a system.

The values determined from the measuring points must be transferred to the system control according to standards. For safety reasons, it is advisable to at a minimum display the current oil temperature on the oil tank.

The Thermotronic TT-77F offers accurate oil temperature measurement and display in one and allows a variety of programming options for the display and signal output.

The Thermotronic TT-77W consists of a temperature sensor and the display unit for remote installation using the Easy Mount System and allows a variety of programming options for the display and signal outputs.

The large range of system-compatible temperature sensors is tailored for use in hydraulic and lubrication technology.

Electronic Temperature Switch

Up to four programmable switching outputs

Alternatively with IO-Link and 1 x programmable switching output

Alternatively continuous temperature signal (configurable to current or voltage) plus one, two or four freely programmable switching outputs

Switching outputs characteristics configurable as window or hysteresis

One switching output configurable as frequency output (1-100 Hz)

Direct-mount display and control

LED display with status of switching outputs, 270° pivot when direct mounted

Standard menu structure based on VDMA standard sheet 24574 ff.

Min/max memory, logbook function

Sensor length up to 1 m (3.3 ft)



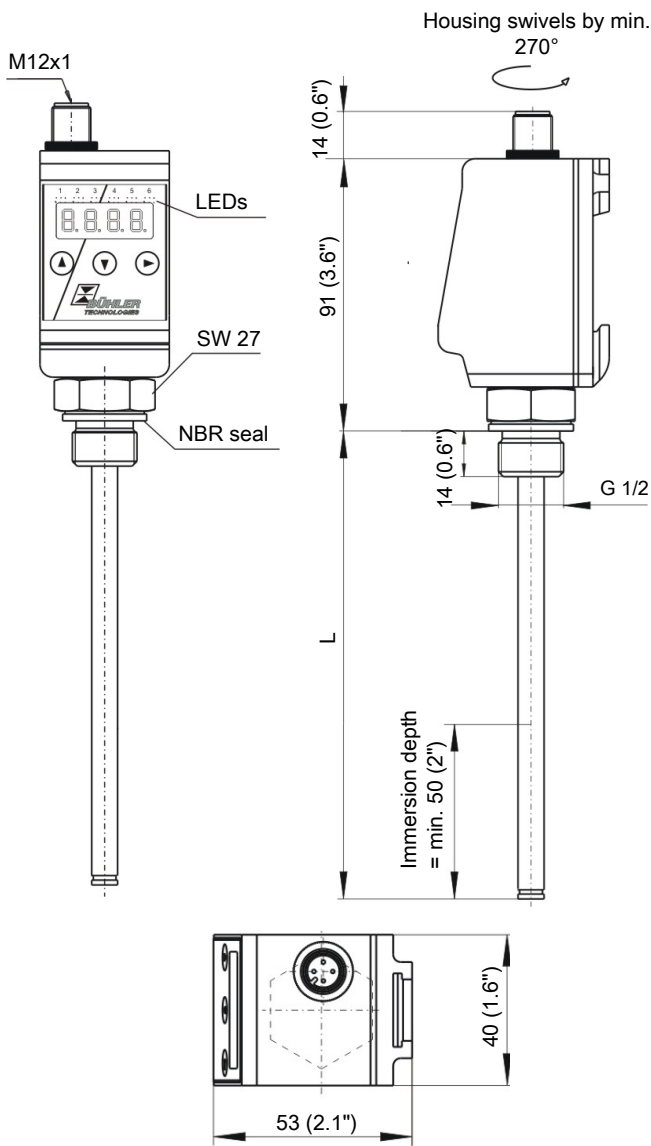
Technical Data TT-77

Material / Version

Version	MS	VA
Operating pressure	max. 5 bar (72.5 psi)	max. 10 bar (145 psi)
Operating temperature	-40°C to +100°C (-40 °F to 212 °F)	-40°C to +100°C (-40 °F to 212 °F)
Lengths	280, 370, 500 mm (11, 14.6, 19.7 inch) (standard) variable from 70 to max. 1000 mm (2.8 to max. 39.4 inch)	
Probe material (immersion tube)	Brass	1.4571
Connection (flange)	G 1/2	G 1/2
Weight at L=280 mm (11")	approx. 390 g (0.9 lb)	approx. 390 g (0.9 lb)
Each 100 mm (3.9") add	approx. 15 g (0.03 lb)	approx. 15 g (0.03 lb)
Degree of protection	IP65	IP65

Analysis display electronics

Display	4 character 7 segment LED
Operation	Via 3 keys
Memory	Min. / Max. Data memory
Starting current input	approx. 100 mA for 100 ms
Current input during operation	approx. 50 mA (without current- and switching outputs)
Supply voltage (U _B)	10 – 30 V DC (nominal voltage 24 V DC) / with IO-Link 18 – 30 V DC
Ambient temperature	-20 °C to +70°C (-4 °F to 158 °F)
Display units	Temperature (°C / °F)
Display range	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value
Measured variables	Temperature
Principle of measurement	Pt 100 Class B, DIN EN 60751



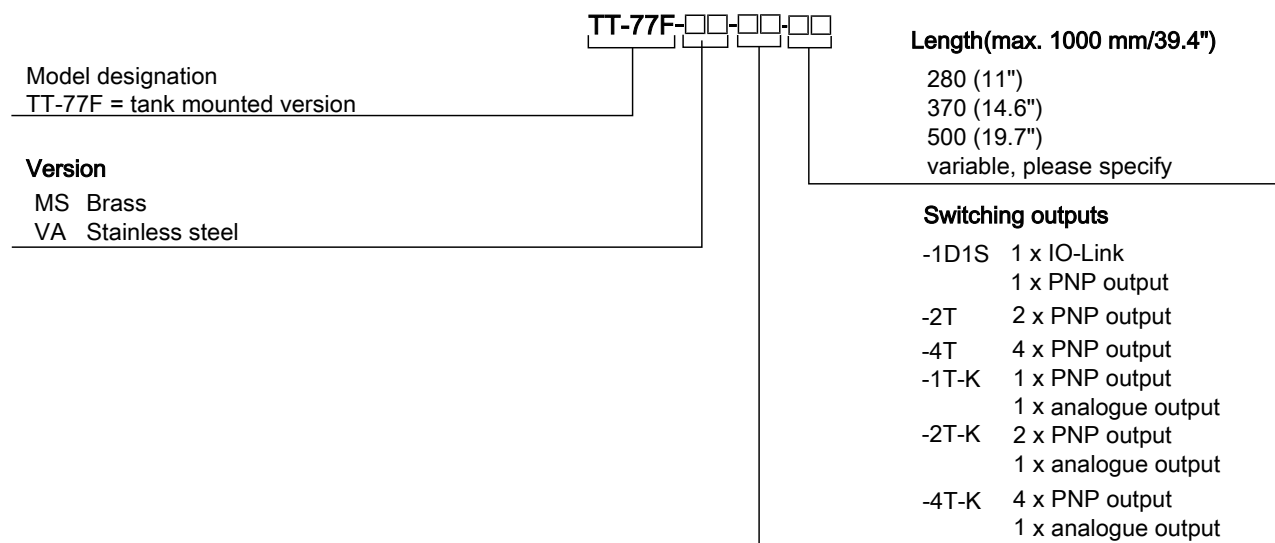
Optional temperature switching outputs: Choose from the following switching outputs

	-1D1S	-2T	-4T
Plug (base)	M12 – 4-pin	M12 – 4-pin	M12 – 8-pin
Switching outputs	IO-Link and 1x freely programmable	2x freely programmable	4x freely programmable
Alarm memory	with 1 x assignable to alarm logbook		with 1 x assignable to alarm logbook
max. switching current*	0.5 A per output continuous short-circuit protected (*Output 1 max. 0.2 A.)		
Contact load	max. 1 A total		

	-1T-KT	-2T-KT	-4T-KT
Plug (base)	M12 – 4-pin	M12 – 5-pin	M12 – 8-pin
Switching outputs	1x freely programmable	2x freely programmable	4x freely programmable
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current*	0.5 A per output continuous short-circuit protected (*Output 1 max. 0.2 A.)		
Contact load	max. 1 A total		
Analogue output	1 x 4 – 20 mA / 2-10 V DC, 0-10 V DC, 0-5 V DC		
Max. load Ω as current output	$= (U_B - 8 V) / 0.02 A$	$= (U_B - 8 V) / 0.02 A$	$= (U_B - 8 V) / 0.02 A$
Min. input load as voltage output	10 k Ω	10 k Ω	10 k Ω

Ordering Instructions TT-77F

Model key



Accessories

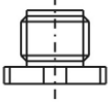
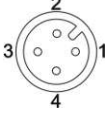
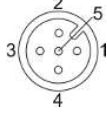
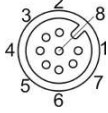
Item no. 4-pin	Item no. 5-pin	Item no. 8-pin	Description
9144 05 0010	9144 05 0016	9144 05 0048	Connecting cable M12x1, 1.5 m, angular coupling and straight plug
9144 05 0046	9144 05 0017	9144 05 0049	Connecting cable M12x1, 3.0 m, angular coupling and straight plug
9144 05 0047	9144 05 0018	9144 05 0033	Connecting cable M12x1, 5.0 m, angular coupling and strands

Ordering example

You require:	Electronic contact thermometer for tank-top installation, brass, length L = 470 mm (18.5"), 1 temperature contact and analogue output
Order:	Thermotronik TT-77F-MS-1T-KT / 470

Standard pin assignment TT-77F

Plug connection

Version	-1D1S	-2T	1T-KT	2T-KT	-4T	-4T-KT
	M12 (base)					
	4-pin	4-pin	4-pin	5-pin	8-pin	8-pin
						
Panel plug						
Pin						
1	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC
2	T2 (PNP)	T2 (PNP)	Analogue	T2 (PNP)	T2 (PNP)	T2 (PNP)
3	GND	GND	GND	GND	GND	GND
4	C/Q (IO-Link)	T1 (PNP)	T1 (PNP)	T1 (PNP)	T1 (PNP)	T1 (PNP)
5				Analog out	T3 (PNP)	T3 (PNP)
6					T4 (PNP)	T4 (PNP)
7						Analog out

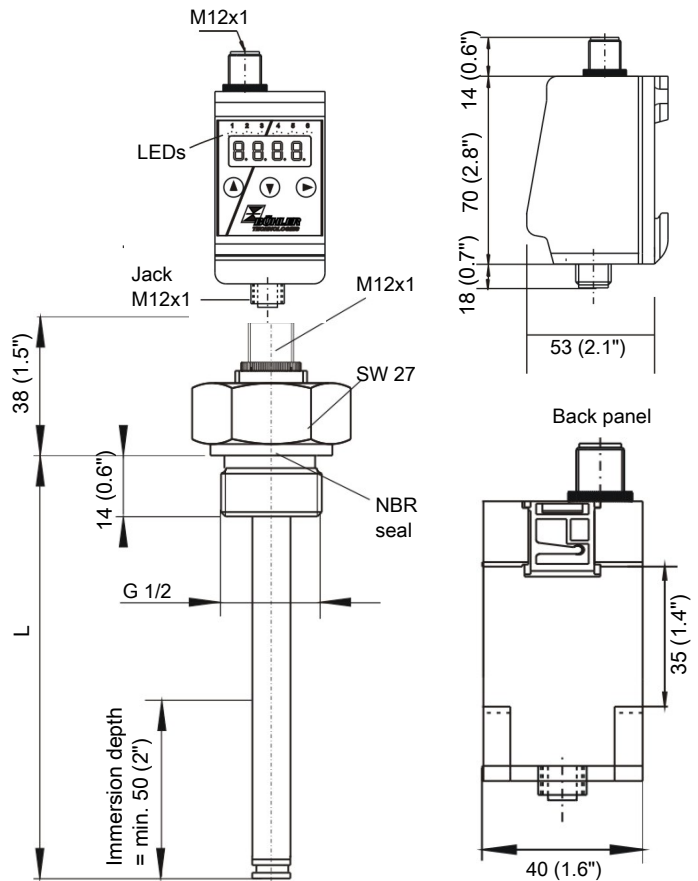
Technical Data TT-77W

Material / Version

Version	MS	VA
Operating pressure	max. 5 bar (72.5 psi)	max. 10 bar (145 psi)
Operating temperature	-40°C to +100°C (-40 °F to 212 °F)	-40°C to +100°C (-40 °F to 212 °F)
Lengths	280, 370, 500 mm (11, 14.6, 19.7 inch) (standard) variable from 70 to max. 1000 mm (2.8 to max. 39.4 inch)	
Probe material (immersion tube)	Brass	1.4571
Connection (flange)	G 1/2	G 1/2
Plug connection	M12 (base)	M12 (base)
Weight at L=280 mm (11") Each 100 mm (3.9") add	approx. 270 g (0.6 lb) approx. 15 g (0.03 lb)	approx. 270 g (0.6 lb) approx. 15 g (0.03 lb)
Degree of protection	IP65	IP65

Analysis display electronics

Display	4 character 7 segment LED
Operation	Via 3 keys
Memory	Min. / Max. Data memory
Starting current input	approx. 100 mA for 100 ms
Current input during operation	approx. 50 mA (without current- and switching outputs)
Supply voltage (U _b)	10 – 30 V DC (nominal voltage 24 V DC) / with IO-Link 18 – 30 V DC
Ambient temperature	-20 °C to +70 °C (-4 °F to 158 °F)
Display units	Temperature (°C / °F)
Display range	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value
Measured variables	Temperature
Principle of measurement	Pt 100 Class B, DIN EN 60751
Tolerance	± 0.8 °C (± 1.4 °F)



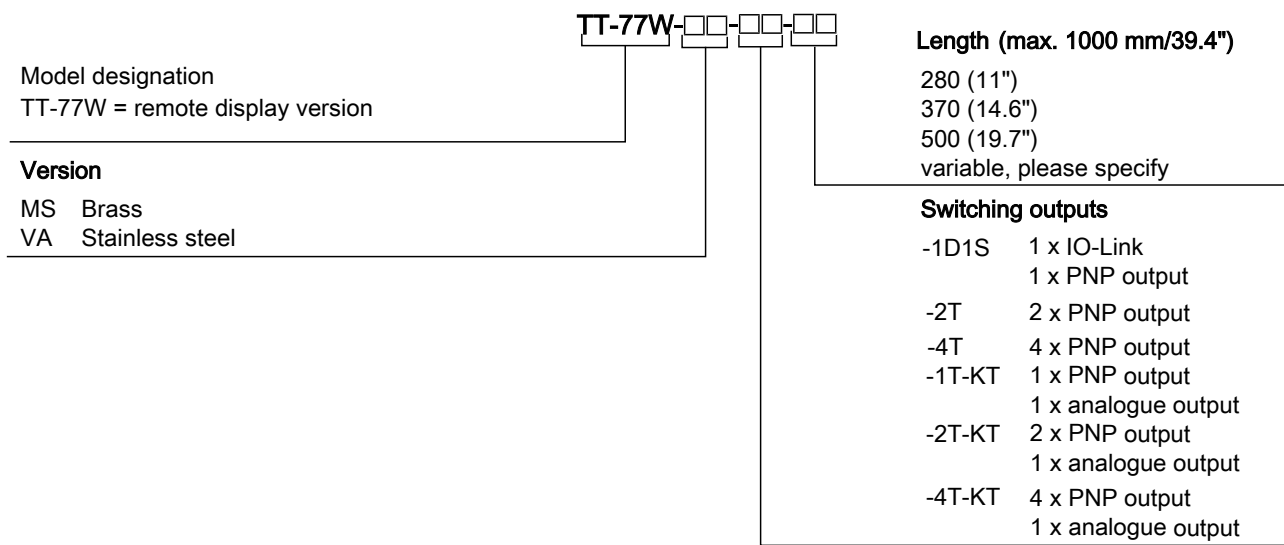
Optional temperature switching outputs: Choose from the following switching outputs

	-1D1S	-2T	-4T
Plug (base)	M12 – 4-pin	M12 – 4-pin	M12 – 8-pin
Switching outputs	IO-Link and 1 x freely programmable	2 x freely programmable	4 x freely programmable*
Alarm memory	with 1 x assignable to alarm logbook		with 1 x assignable to alarm logbook
max. switching current**	0.5 A per output continuous short-circuit protected (Output 1 max. 0.2 A)		
Contact load	max. 1 A total		

	-1T-KT	-2T-KT	-4T-KT
Plug (base)	M12 – 4-pin	M12 – 5-pin	M12 – 8-pin
Switching outputs	1 x freely programmable	2 x freely programmable	4 x freely programmable
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current**	0.5 A per output continuous short-circuit protected (Output 1 max. 0.2 A)		
Contact load	max. 1 A total		
Analogue output	1 x 4 – 20 mA / 2-10 V DC, 0-10 V DC, 0-5 V DC		
Max. load Ω as current output	$= (U_B - 8 \text{ V}) / 0.02 \text{ A}$	$= (U_B - 8 \text{ V}) / 0.02 \text{ A}$	$= (U_B - 8 \text{ V}) / 0.02 \text{ A}$
Min. input load as voltage output	10 k Ω	10 k Ω	10 k Ω
*also programmable as frequency output			
**Output 1 max. 0.2 A.			

Ordering Instructions TT-77W

Model key



Accessories

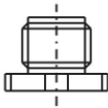
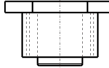
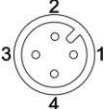
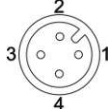
Item no. 4-pin	Item no. 5-pin	Item no. 8-pin	Description
9144 05 0010	9144 05 0016	9144 05 0048	Connecting cable M12x1, 1.5 m, angular coupling and straight plug
9144 05 0046	9144 05 0017	9144 05 0049	Connecting cable M12x1, 3.0 m, angular coupling and straight plug
9144 05 0047	9144 05 0018	9144 05 0033	Connecting cable M12x1, 5.0 m, angular coupling and strands

Ordering example

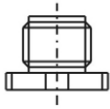
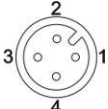
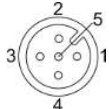
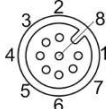
You require: Electronic contact thermometer, remote display version, brass, length L = 470 mm (18.5"), 1 temperature contact and analogue output

Order: Thermotronik TT-77W-MS-1T-KT / 470

Standard pin assignment TT-77W

	Pt100 temperature sensor M12x1 4-pin	Sensor input remote display M12x1 4-pin
		
Panel jack		
Pin		
1	Pt100	Pt100
2	Pt100	Pt100

Plug connection

Version	-1D1S	-2T	1T-KT	2T-KT	-4T	-4T-KT
	M12 (base)					
	4-pin	4-pin	4-pin	5-pin	8-pin	8-pin
						
Panel plug						
Pin						
1	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC
2	T2 (PNP)	T2 (PNP)	Analogue	T2 (PNP)	T2 (PNP)	T2 (PNP)
3	GND	GND	GND	GND	GND	GND
4	C/Q (IO-Link)	T1 (PNP)	T1 (PNP)	T1 (PNP)	T1 (PNP)	T1 (PNP)
5				Analog out	T3 (PNP)	T3 (PNP)
6					T4 (PNP)	T4 (PNP)
7						Analog out

Temperature sensors

Changes in the viscosity of hydraulic oil and lubricants due to the temperature requires precisely monitoring and stabilising the operating temperature.

Carefully monitoring the temperature further also affects the service life of the oils. The oil tank is generally accepted as the control point for the oil temperature, which will usually provide helpful averages. It may further be helpful to also monitor segments or individual units within a system.

The values determined from the measuring points must be transferred to the system control according to standards. For safety reasons, it is advisable to at a minimum display the current oil temperature on the oil tank.

The comprehensive line of system-compatible temperature sensors is tailored specifically for use in hydraulics and lubrication technology.

TF-M/E-G1/2

Pt100 temperature sensor

Continuous temperature measurement

Sensor length up to 1 m (3.3 ft)

Brass or stainless steel housing

MK2-G1/2 / EK2-G1/2

Analog output 4-20 mA

Continuous temperature measurement

Nearly any length of cable connection between sensor and control unit

Sensor length up to 1 m (3.3 ft)

Brass or stainless steel housing

TF-M-VAL

Temperature sensor Pt100 with spring

Pt100 temperature sensor

Continuous temperature measurement

Integrated spring for variable sensor length



TF-M-G1/2



MK2-G1/2



TF-M-VAL



Technical Data TF with Pt100

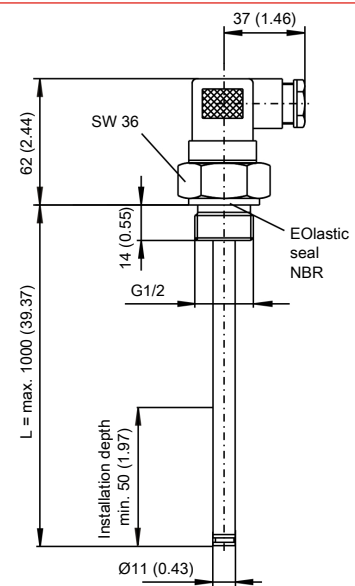
Temperature probe TF with Pt100

	TF-M-G1/2	TF-E-G1/2
Version:	MS	VA
Probe material:	Brass	1.4571
Max. operating pressure:	5 bar (72.5 psi)	10 bar (145 psi)
Connection:	G1/2	G1/2
Operating temperatures:	-40 °C to +100 °C (-40 °F to 212 °F)	
Lengths:	280 (11.02), 370 (14.57), 500 (19.69) (standard) variable up to max. 1000 mm (39.37 inch)	

Temperature sensor

Sensor element:	Pt100 Class B DIN EN 60751
Tolerance:	±0.8 °C (1.4 °F)
Switching type:	2, 3 or 4 lead

Dimensions



Pt100 measuring resistance base values

°C (°F)	0 (32)	10 (50)	20 (68)	30 (86)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)
Ohm	100.00	103.90	107.79	111.67	115.54	119.40	123.24	127.07	130.89	134.70	138.50

Standard Pin Assignment TF with Pt100

Connector:	M3 valve connector	GS4	M12 plug A coded
Dimensions:			
Number of pins:	3-pin + PE	4-pin	4-pin
DIN EN:	175301-803		61076-2-101
IP rating:	IP65	IP65	IP67**
Cable fitting:	PG 11	PG 7	
Standard pin assignment:			
2 lead		---	
3 lead		---	
4 lead	---		

**with IP67 cable box screwed on

Other connectors available on request

Model Key TF with Pt100

XXX - G1/2 - XX - XX - PT100 - XX / XX

TF-M for version MS
TF-E for version V

Version

MS Brass
VA Stainless steel

Connector

M3
M12
GS4 (4 lead only)

Length (max. 1000 mm/39.37 in)

280 (11.02)
370 (14.47)
500 (19.69)
variable (please specify)

Switching type

2L = 2 lead
3L = 3 lead
4L = 4 lead

Ordering example

You need: Brass temperature sensor, with M3 plug connection, length L = 520 mm (20.47 in), Pt100 with 2 lead circuit, operating pressure 2 bar (29 psi)

Order: Temperature sensor TF-M-G1/2-MS-M3-PT100-2L/520

Technical Data MK2/EK2

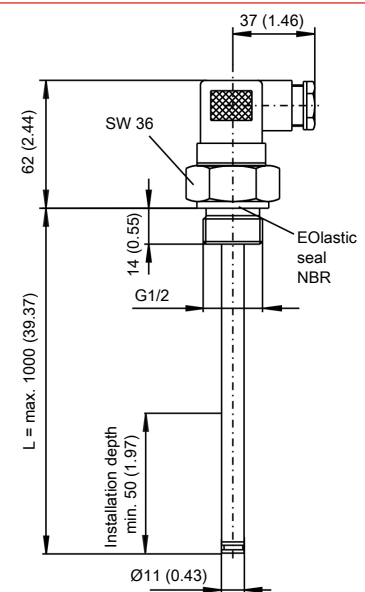
MK2/EK2 with temperature transmitter

	MK2-G1/2	EK2-G1/2
Version:	MS	VA
Probe material:	Brass	1.4571
Max. operating pressure:	5 bar (72.5 psi)	10 bar (145 psi)
Connection:	G1/2	G1/2
Operating temperatures:	-20 °C to +80 °C (-4 °F to 176 °F)	
Lengths:	280 (11.02), 370 (14.57), 500 (19.69) (standard) variable up to max. 1000 mm (39.37 inch)	

Temperature transmitter

Sensor element:	Pt100 Class B DIN EN 60751
Tolerance Pt100:	±0.8 °C (1.4 °F)
Operating voltage (U _B):	10 - 30 VDC
Measuring range*:	0 °C to +100 °C (32 °F to 212 °F)
Output*:	4 - 20 mA
Load Ω max.:	(U _B - 7.5 V)/0.02 A

Dimensions



*Other measuring ranges and outputs available on request.

Standard Pin Assignment MK2/EK2

Connector:	M3 valve connector	M12 plug A coded
Dimensions:		
Number of pins:	3-pin + PE	4-pin
DIN EN:	175301-803	61076-2-101
Voltage max.:	30 V DC	30 V DC
IP rating:	IP65	IP67**
Cable fitting:	PG 11	
Standard pin assignment:		
**with IP67 cable box screwed on Other connectors available on request		

Model Key MK2/EK2

XXX-G1/2-XX-XX/XX

MK2 for version MS
EK2 for version V

Version

MS Brass
VA Stainless steel

Connector

M3
M12

Length (max. 1000 mm/39.37 in)

280 (11.02)
370 (14.57)
500 (19.69)
variable (please specify)

Ordering example

You need: Temperature transmitter brass version, with M3 plug connection, output 0-100 °C (32-212 °F) = 4-20 mA, length L= 520 mm (20.47 in), operating pressure 2 bar (29 psi)

Order: Temperature transmitter MK2-G1/2-MS-M3/520

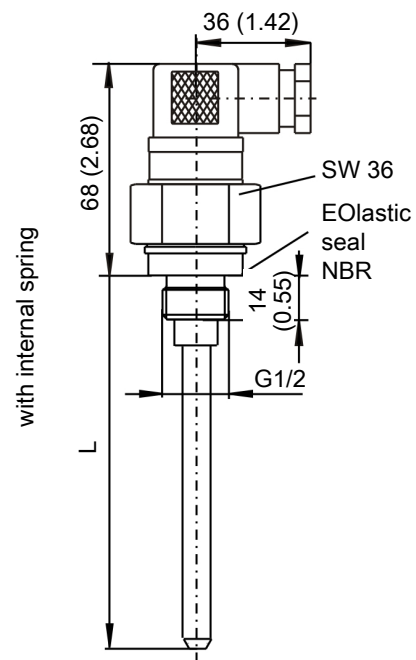
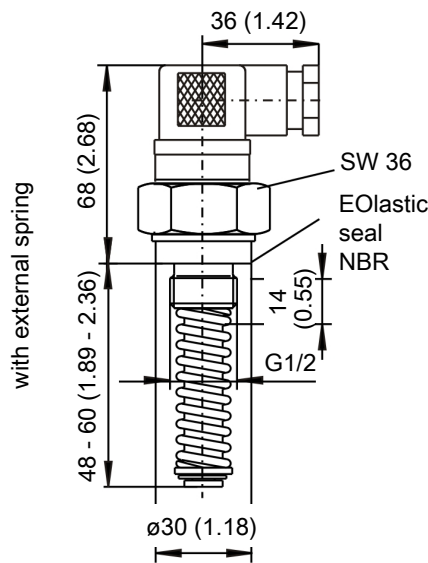
Technical Data TF-M-VAL with Pt100 and Spring

Version with external spring

Length:	L	Spring displacement
	55 (2.17)	48 - 60 mm (1.89 - 2.36 in)
Fastening torque:	25 Nm (18.4 ft lb)	
Probe material:	Anodised aluminium/spring steel	
Seal:	NBR	
Max. operating pressure:	1 bar (14.5 psi)	
Connection:	G1/2	
Operating temperature	-40 °C to +100 °C (-40 °F to 212 °F)	

Version with internal spring

Lengths:	L	Spring displacement
	210 (8.27)	206 - 215 mm (8.11 - 8.46 in)
Fastening torque:	330 (12.99)	325 - 334 mm (12.8 - 13.15 in)
Probe material:	Brass	
Seal:	NBR	
Max. operating pressure:	1 bar (14.5 psi)	
Connection:	G1/2	
Operating temperature:	-40 °C to +100 °C (-40 °F to 212 °F)	



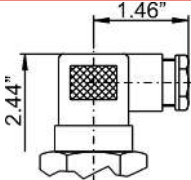
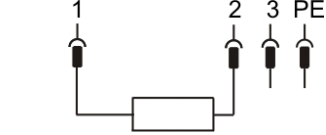
Temperature sensor

Sensor element:	Pt100 Class B, DIN EN 60 751
Tolerance:	±0.8 °C (1.4 °F)
Switching type:	2 lead

Pt100 measuring resistance base values

°C (°F)	0 (32)	10 (50)	20 (68)	30 (86)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)
Ohm	100.00	103.90	107.79	111.67	115.54	119.40	123.24	127.07	130.89	134.70	138.50

Standard Pin Assignment TF-M-VAL with Pt100 and Spring

Connector:	M3 valve connector
Dimensions:	
Number of pins:	3-pin + PE
DIN EN:	175301-803
IP rating:	IP65
Cable fitting:	PG 11
Standard pin assignment:	
2 lead	

Ordering Instructions TF-M-VAL with Pt100 and Spring

Item no.:	Spring displacement	Model
18 92 599	48 - 60 mm (1.89 - 2.36 in)	TF-M-PT100-VAL-M3/55
18 94 599	206 - 215 mm (8.11 - 8.46 in)	TF-M-PT100-VAL-M3/210
18 95 799	325 - 334 mm (12.8 - 13.15 in)	TF-M-PT100-VAL-M3/330

Ordering example

You need: Temperature sensor with Pt100 with spring, spring deflection 48 - 60 mm (1.89 - 2.36 in)

Order: Item no. 18 92 599 temperature sensor TF-M-PT100-VAL-M3/55

Temperature sensor TF with IO-Link

The temperature-based change in the viscosity of hydraulic and lubricating oils requires closely monitoring and stabilising the operating temperature.

Furthermore, close temperature monitoring impacts the life of the oils. The oil tank is typically accepted as the control point for the oil temperature, which generally provides an informative mean value. It may further be helpful to also monitor segments or individual devices in a system.

The IO-Link compatible TF series sensors are suitable to ensure cost-effective and efficient temperature monitoring in hydraulic and lubrication oil tanks IO-Link.

The digital, bidirectional communication of these sensors meets all requirements of modern plant automation, reduces acquisition and installation costs, and improves system availability. Their robust design makes them suitable for virtually any liquid properties, allowing a wide range of applications.

TF-M-G1/2-xx-M12-TD-1D1S

IO-Link and 1 x programmable switching output

Continuous temperature measurement

Brass or stainless steel housing

Sensor length up to 1 m (3.3 ft)

Connecting flange G1/2



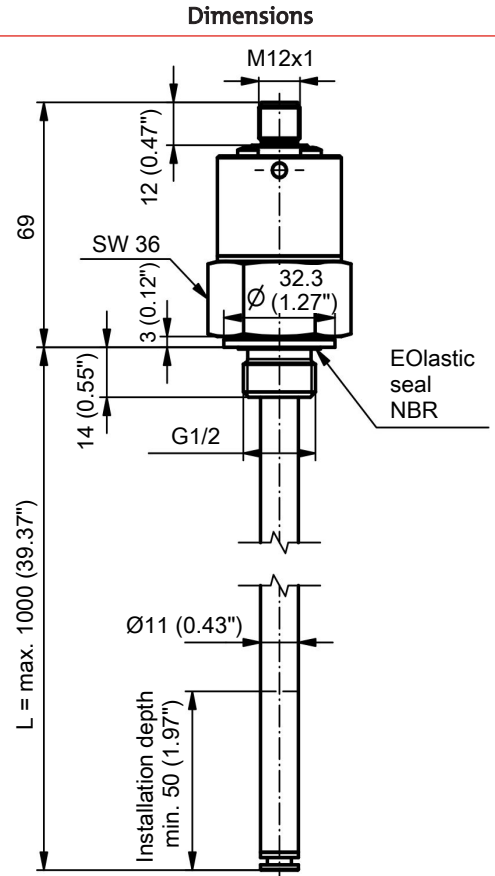
Technical Data

TF-M-G1/2-xx-M12-TD-1D1S

	TF-M-G1/2	TF-E-G1/2
Version:	MS	VA
Probe material:	Brass	1.4571
Max. operating pressure:	5 bar (72.5 psi)	10 bar (145 psi)
Connection:	G1/2	G1/2
Medium temperature:	-20 °C to +80 °C	
Ambient temperature:	-20 °C to +70 °C (-4 °F to +158 °F)	
Lengths:	280 (11.02), 370 (14.57), 500 (19.69) (standard) variable to max. 1000 mm (39.37 inch)	

Input value

Sensor element:	Pt100 Class B DIN EN 60751
Tolerance Pt100:	±0.8 °C (1.4 °F)
Operating voltage (U _B):	18 - 30 VDC
Measuring range:	-20 °C to +120 °C (-4 °F to 248 °F)
Output:	IO-Link
IO-Link	Revision 1.1
Baudrate:	COM3 (230.4 k)
SIO Mode:	Yes
Min. Time Period	10 ms



Standard pin assignment

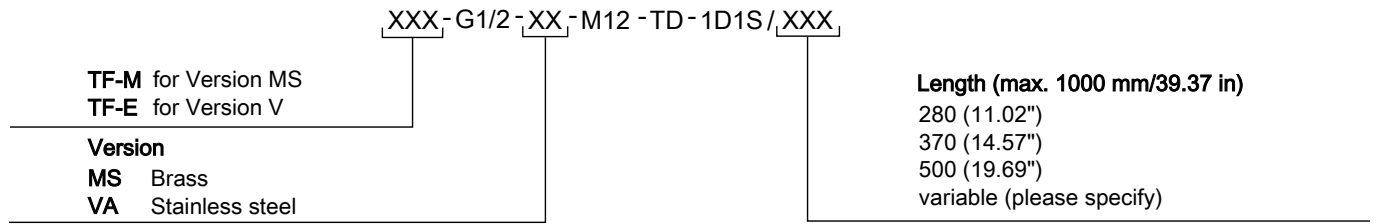
Connector

	M12
Dimensions	
Number of pins	4-pin
DIN EN	61076-2-101
IP rating	IP67*

*with IP67 cable box attached

Version	1D1S
Plug	M12 4-pin
Connection schematic	
Pin	
1	+24 V DC
2	S2 (PNP max. 200 mA)
3	GND
4	C/Q (IO-Link)

Model key



Ordering example

You require: Brass temperature sensor with M12 plug, IO-Link output, length L= 520 mm (20.47 in), operating pressure 5 bar (72.5 psi)

Order: TF-M-G1/2-MS-M12-TD-1D1S/520

Bi-metal-Temperature switch

TSM, TSK, TSA

High operating temperatures significantly reduce the life of oils in the hydraulics and the lubrication. To prevent exceeding harmful limits, e.g. due to unforeseeable overloads or reduced cooling capacity, the systems must be shut off in a timely manner. In the following temperature switches this is done by a bi-metal which interrupts the flow of electricity with a temperature rise. After resolving the cause for the excess temperature, following a cooling phase (hysteresis) the bi-metal element automatically returns to operating mode. However, for safety reasons it is advisable to still display the current oil temperature on the oil tank.

TSM-G1/2, TSE-G1/2

G1/2" threaded connection

Up to 2 temperature switching points

Sensor length up to 1 m (3.3 ft)

TSK-G3/4

G3/4" threaded connection

Up to 2 temperature switching points

Sensor length up to 1 m (3.3 ft)

Low hysteresis

TSA

G1/2" threaded connection

1 x temperature switching point

Fixed length of 29 mm (1.1") for line installation e.g.



TSM-G1/2
TSK-G3/4



TSA

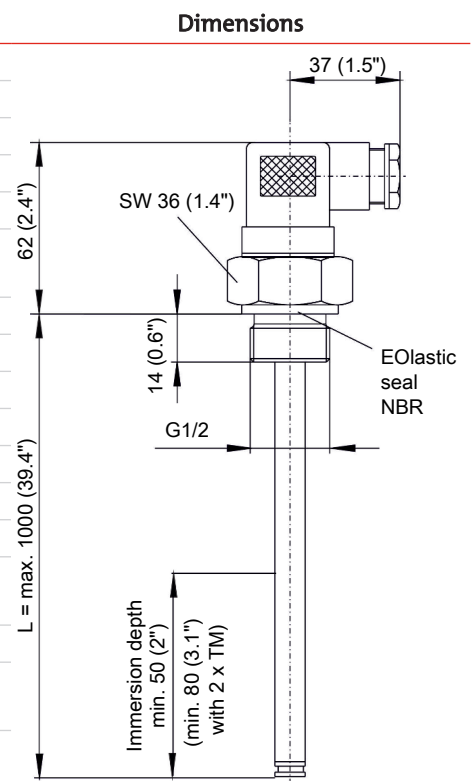


Technical Data TSM/TSE

Model	TSM-G1/2	TSE-G1/2
Version:	MS	VA
Probe material:	Brass	1.4571
Max. operating pressure:	5 bar (72.5 psi)	10 bar (145 psi)
Connection:	G1/2	G1/2
Operating temperatures:	-40 °C to +80 °C (-40 °F to 176 °F)	
Lengths:	280 (11"), 370 (14.6"), 500 (19.7") (standard) variable to max. 1000 mm (39.4")	
Temperature contact	TMxx	
Switch element:	Bi-metal	
Number of contacts:	1 or 2	
Max. voltage:	230 V	
Max. switching current:	2 A	
Max. contact load:	100 VA	
Function	NC*	NO*
Switching point °C (°F):	50/60/70/80 (122/140/158/176)	50/60/70/80 (122/140/158/176)
Switching point tolerance:	± 5 K (± 9 Ra)	± 5 K (± 9 Ra)
Max. hysteresis:	18 K ± 5 K (32 Ra ± 9 Ra)	26/35/40/45 K (47/63/72/81 Ra) ± 5 K (± 9 Ra)

Other temperatures available upon request

* NC = NC contact/NO = NO contact (all data for rising temperature)



Standard Pin Assignment TSM/TSE

Plug connection*:	M3 valve connector	M12 plug A coded
Dimensions:		
Connection schematic:		
Number of pins:	3-pin + PE	4-pin
DIN EN:	175301-803	61076-2-101
Max. voltage:	230 V AC/DC	30 V DC
IP rating:	IP 65	IP 67**
Cable fitting:	PG 11	
Standard pin assignment:		

T1 = lower temperature/T2 upper temperature.
 * other connectors available on request.
 ** with IP67 cable box screwed on.

Model Key for TSM/TSE

XXX - XX - XX - G1/2 - XX - XX - XX - XX

TSM for Version MS
TSE for Version V

Number of temperature contacts
 1 or 2

Version
MS Brass
VA Stainless steel

Connector
 M3
 M12

Length (max. 1000 mm/39.4")
 280 (11")
 370 (14.6")
 500 (19.7")
 variable (please specify)

T2 (2nd temperature contact)

NC contact	NO contact
TM50NC	TM50NO = 50 °C (122 °F)
TM60NC	TM60NO = 60 °C (140 °F)
TM70NC	TM70NO = 70 °C (158 °F)
TM80NC	TM80NO = 80 °C (176 °F)

T1 (1st temperature contact)

NC contact	NO contact
TM50NC	TM50NO = 50 °C (122 °F)
TM60NC	TM60NO = 60 °C (140 °F)
TM70NC	TM70NO = 70 °C (158 °F)
TM80NC	TM80NO = 80 °C (176 °F)

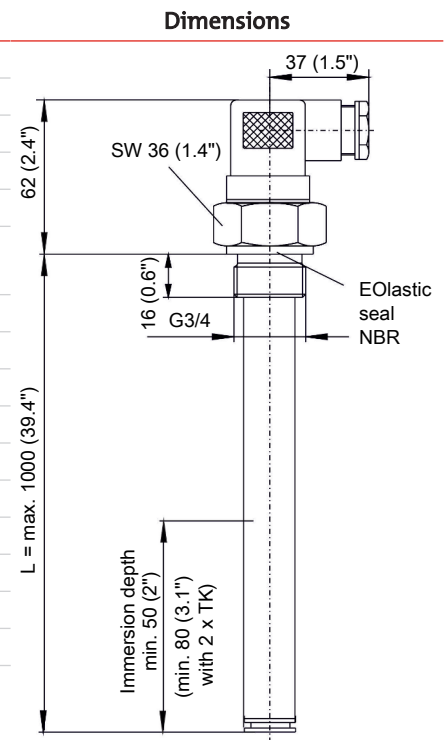
Ordering example

You need: Brass temperature switch, G1/2 connection, length L= 300 mm (11.8"), M3 plug
 2 x temperature contact: 1st Contact 50 °C (122 °F) NC, 2nd contact 70 °C (158 °F) NO

Order: TSM-2-M3/300 -TM50NC-TM70NO

Technical Data TSK

Model	TSK-G3/4	
Version:	MS	VA
Probe material:	Brass	1.4571
Max. operating pressure:	1 bar (14.5 psi)	5 bar (72.5 psi)
Connection:	G3/4	G3/4
Operating temperatures:	-40 °C to +80 °C (-40 °F to 176 °F)	
Lengths:	280 (11"), 370 (14.6"), 500 (19.7") (standard) variable to max. 1000 mm (39.4")	
Temperature contact	TKxx	
Switch element:	Bi-metal	
Number of contacts:	1 or 2	
Max. voltage:	230 V	
Max. switching current:	2 A	
Max. contact load:	100 VA	
Function	NC*/NO*	
Switching point °C (°F):	40/50/60/70/80 (104/122/140/158/176)	
Switching point tolerance:	± 3 K (± 5.4 Ra)	
Max. hysteresis:	10 K ± 5 K (18 Ra ± 9 Ra)	
<i>Other temperatures available upon request</i>		
<i>* NC = NC contact/NO = NO contact (all data for rising temperature)</i>		



Standard Pin Assignment TSK

Plug connection*:	M3 valve connector	M12 plug A coded
Dimensions:		
Connection schematic:		
Number of pins:	3-pin + PE	4-pin
DIN EN:	175301-803	61076-2-101
Max. voltage:	230 V AC/DC	30 V DC
IP rating:	IP 65	IP 67**
Cable fitting:	PG 11	
Standard pin assignment:		
T1 = lower temperature/T2 upper temperature.		
* other connectors available on request.		
** with IP67 cable box screwed on.		

Model Key for TSK

TSK - XX - XX - G3/4 - XX - XX - XX - XX

Number of temperature contacts

1 or 2

Version

MS Brass

VA Stainless steel

Connector

M3

M12

Length (max. 1000 mm/39.4")

280 (11")

370 (14.6")

500 (19.7")

variable (please specify)

T2 (2nd temperature contact)

NC contact

NO contact

TK40NC TK40NO = 40 °C (104 °F)

TK50NC TK50NO = 50 °C (122 °F)

TK60NC TK60NO = 60 °C (140 °F)

TK70NC TK70NO = 70 °C (158 °F)

TK80NC TK80NO = 80 °C (176 °F)

T1 (1st temperature contact)

NC contact

NO contact

TK40NC TK40NO = 40 °C (104 °F)

TK50NC TK50NO = 50 °C (122 °F)

TK60NC TK60NO = 60 °C (140 °F)

TK70NC TK70NO = 70 °C (158 °F)

TK80NC TK80NO = 80 °C (176 °F)

Ordering example

You need: Brass temperature switch, G3/4 connection, length L= 300 mm (11.8"), M3 plug

2 x temperature contact: 1st Contact 50 °C (122 °F) NC, 2nd contact 70 °C (158 °F) NO,

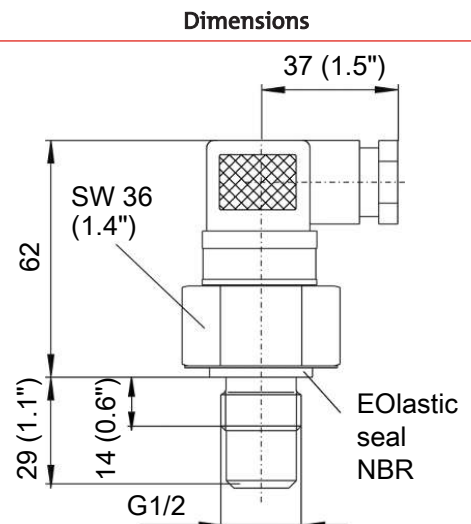
Order: TSK-2-M3/300 -TK50NC-TK70NO

Technical Data TSA

Model	TSA
Probe length:	29 mm (1.1")
Probe material:	Anodised aluminium
Max. operating pressure:	15 bars (217.5 psi)
Operating temperatures:	-40 °C to +80 °C (-40 °F to 176 °F)
Temperature contacts	
Switch element:	Bi-metal
Max. voltage:	230 V
Max. switching current:	2 A
Max. contact load:	100 VA
Tolerance:	± 5 K (± 9 Ra)
Switch-back difference:	15 K ± 3 K (27 Ra ± 5.4 Ra)
Function	NC*/NO*
Switching point °C (°F):	25/40/50/60/70/80 (77/104/122/140/158/176)

Other temperatures available upon request

*NC = NC contact/NO = NO contact (all data for rising temperature)



Standard Pin Assignment TSA

Plug connection*:	M3 valve connector	M12 plug A coded
Dimensions:		
Connection schematic:		
Number of pins:	3-pin + PE	4-pin
DIN EN:	175301-803	61076-2-101
Max. voltage:	230 V AC/DC	30 V DC
IP rating:	IP 65	IP 67**
Cable fitting:	PG 11	
Standard pin assignment:		

* other connectors available on request.

** with IP67 cable box screwed on.

Ordering Instructions TSA

Switching function	NO (closer)		NC (opener)	
	Type	Item no.	Type	Item no.
25 °C	TSA-25-M3	1139699	TÖA-25-M3	1142899
40 °C	TSA-40-M3	1139599	TÖA-40-M3	1143299
50 °C	TSA-50-M3	1138599	TÖA-50-M3	1142199
60 °C	TSA-60-M3	1138699	TÖA-60-M3	1143399
70 °C	TSA-70-M3	1138799	TÖA-70-M3	1140299
80 °C	TSA-80-M3	1139299	TÖA-80-M3	1140899
25 °C	TSA-25-M12	1141199	TÖA-25-M12	1144199
40 °C	TSA-40-M12	1141299	TÖA-40-M12	1144299
50 °C	TSA-50-M12	1141399	TÖA-50-M12	1144399
60 °C	TSA-60-M12	1141499	TÖA-60-M12	1144499
70 °C	TSA-70-M12	1141599	TÖA-70-M12	1144599
80 °C	TSA-80-M12	1141699	TÖA-80-M12	1144699

Ordering example

You need: Temperature contact at 50 °C (122 °F) NO, type M3 plug

Order: Item no. 1138599 Temperature switch TSA-50-M3



2.5 Pressure Measurement

Pressure sensors/pressure switches

Pressotronik

Monitoring the oil pressure is essential in hydraulic systems and oil supply systems. It's important to monitor both process-related pressure ranges as well as safety shutdowns, load limits or simply to determine if the lubricating pressure is adequate.

The pressure transmitters must meet a variety of requirements with respect to their pressure resistance, signal output, programmability or the plug connection style. A local or status display is often required for safety reasons

The Pressotronik series spans a wide range of pressure transmitters and programmable pressure switches. They cover a broad pressure range, meet high safety requirements and feature different signal types. The easyMont housings of the remote displays can be grouped for easy and space-saving display groups, making them easier to monitor.

Pressure ratings up to 600 bar (8700 psi)

Compact size.

Up to four programmable switching outputs

Alternative analogue output (configurable to current or voltage) plus one, two or four programmable switching outputs

Switching outputs characteristics configurable as window or hysteresis

Two switching outputs configurable as window or hysteresis

Direct or external display and control mounting

Virtually any cable length between measuring point and display

Easy to read LED display with status of switching outputs, 270° pivot when direct mounted

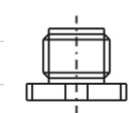
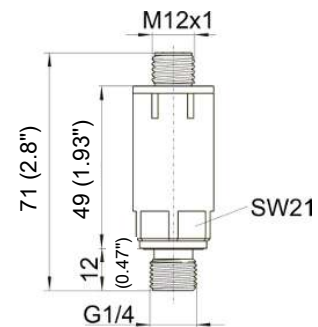
Standard menu structure based on VDMA standard sheet 24574 ff.

Min/max memory, logbook function



Technical Data Pressotronic 700
Pressure transmitter

	Pressure range	Dimensions Pressotronic 700	
	0 - 10 bar (0 - 145 psi) 0 - 25 bar (0 - 362 psi) 0 - 100 bar (0 - 1450 psi) 0 - 250 bar (0 - 3625 psi) 0 - 400 bar (0 - 5800 psi) 0 - 600 bar (0 - 8700 psi)		
	Other pressure ranges available upon request		
Pressure connection	G1/4 external thread, DIN 3852 Form E; peak pressure aperture standard for 100 bar (1450 psi) and higher		
Overload higher values available upon request	2.5 x full range at 10 to 600 bar (145 to 8700 psi) (but max. 900 bar/13000 psi)		
Burst pressure Higher burst pressure available upon request	2.5 x full range at 6 to 600 bar (87 to 8700 psi) (but max. 900 bar/13000 psi) Patented medium stop system to prevent medium leaks when exceeding the bursting pressure range (>40 bar/ 580 psi rated pressure)		
Material / version			
Housing	1.4305		
Material in contact with media	Ceramic, 1.4305, PPS, FPM		
Weight	approx. 95 g (0.2 lb)		
Temperature			
Medium	-15 °C to + 125 °C (5 °F to 257 °F)		
Ambient temperature	max. 85 °C (185 °F)		
Temperature influences	Within -40 to +125 °C (-40 °F to 257 °F) temperature range		
	Calibration in bar	Calibration in psi	
TC0 - Temperature zero error	< ±0.15 % FS/10 K	< ±0.25 % FS/10 K	
TCE - Temperature full range error	< ±0.15 % FS/10 K	< ±0.15 % FS/10 K	
Response time	< 2 ms / typically 1 ms		
Electrical data		Standard pin assignment Pressotronic 700	
Supply voltage (U _B)	10 – 30 V DC (nominal voltage 24 V DC)	Plug: 1xM12x1	
Degree of protection	IP67	Pin	
Burden Ω	= (U _B -8 V) / 0.02 A	1	+24 V DC
Dielectric strength	500 V DC	3	4-20 mA



Accuracy

Parameter	Unit
Tolerance zero	max. ± 0.3 % FS
Tolerance full range	max. ± 0.3 % FS
Resolution	0.1 % FS
Sum of linearity, hysteresis and reproducibility	max. $\pm 0.3\%$ FS/10K
Long-term stability per DIN EN 60770	± 1 % FS
TC zero	max. ± 0.15 % FS/10K
TC sensitivity	max. ± 0.15 % FS/10K

Test conditions: 25 °C (77 °F), 45 % rF, supply 24 V DC, KO/TCE -40 °C... +125 °C (-40 °F... 257 °F)

Ordering instructions Pressotronik 700

Pressotronik 700 - Transmitter only

Item no.	Description	Pressure range
137000100	PT700-010	0 - 10 bar (0 - 145 psi)
137000250	PT700-025	0 - 25 bar (0 - 362 psi)
137001000	PT700-100	0 - 100 bar (0 - 1450 psi)
137002500	PT700-250	0 - 250 bar (0 - 3600 psi)
137004000	PT700-400	0 - 400 bar (0 - 5800 psi)
137006000	PT700-600	0 - 600 bar (0 - 8700 psi)

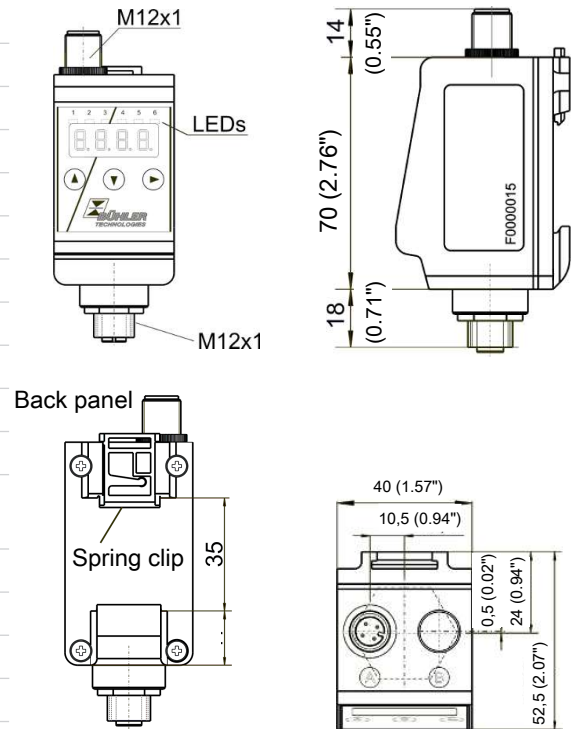
Accessories

Item no.	Description
9144050010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144050046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144050047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

Technical Data Pressotronik 770

Remote display version (PT700 pressure transmitter must be ordered separately)

Pressure transmitter	Pressotronik 700
Control unit	
Housing material	PA
Mount	35 mm (1.38 inch) top-hat rail mounting
Weight	approx. 400 g (0.88 lb)
Degree of protection	IP65
Analysis display electronics	
Display	4 character 7 segment LED display
Operation	via 3 keys
Starting current input	approx. 100 mA for 100 ms
Power input during operation	approx. 50 mA
Supply voltage (U _B)	10 - 30 V DC (nominal voltage 24 V DC) 18 - 30 V DC (1D1S version)
Ambient temperature	-20 °C to +70 °C (-4 °F to 158 °F)
Accuracy	± 1% from end value
Response time	< 10 ms
Input values	
Display units	b (bar), P (psi), °MPa
Input signal	4-20 mA



Optional switching outputs	-1D1S	-2S	-4S	-6S
Plug (base)	1 x M12 – 4-pin	1 x M12 – 4-pin	1 x M12 – 8-pin	1 x M12 – 8-pin
Plug (jack)	1 x M12 – 4-pin	1 x M12 – 4-pin	1 x M12 – 4-pin	1 x M12 – 4-pin
Switching outputs	IO-Link and 1x freely programmable	2 x freely programmable	4 x freely programmable	6 x freely programmable
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current	0.5 A per output*	0.5 A per output*	0.5 A per output*	0.5 A per output*
Contact load	max. 1 A total	max. 1 A total	max. 1 A total	max. 1 A total

*Output 1 max. 0.2 A.

	-1S-K	-2S-K	-4S-K
Plug (base)	1 x M12 – 4-pin	1 x M12 – 5-pin	1 x M12 – 8-pin
Plug (jack)	1 x M12 – 4-pin	1 x M12 – 4-pin	1 x M12 – 4-pin
Switching outputs	1 x freely programmable	2 x freely programmable	4 x freely programmable
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current	0.5 A per output*	0.5 A per output*	0.5 A per output*
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analogue outputs	1 x pressure	1 x pressure	1 x pressure
Programmable as	1 x 4 – 20 mA 2 - 10 V DC, 0 - 10 V DC, 0 - 5 V DC	1 x 4 – 20 mA 2 - 10 V DC, 0 - 10 V DC, 0 - 5 V DC	1 x 4 – 20 mA 2 - 10 V DC, 0 - 10 V DC, 0 - 5 V DC
max. load Ω as current output	(U _B – 8V) / 0.02 A	(U _B – 8V) / 0.02 A	(U _B – 8V) / 0.02 A
min. input load as voltage input	10 kΩ	10 kΩ	10 kΩ

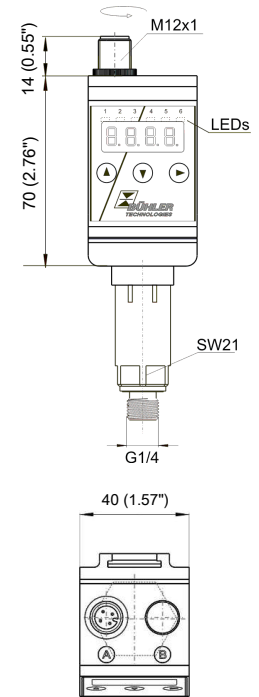
*Output 1 max. 0.2 A.

Technical Data Pressotronik 771

Version with attached transmitter

Pressure transmitter	Pressotronik 700
Control unit	
Housing material	PA
Mount	G1/4 directly mounted display rotates 270°
Weight	approx. 500 g (1.1 lb)
Degree of protection	IP65
Display electronics	
Display	4 character 7 segment LED display
Control	via 3 keys
Starting current input	approx. 100 mA for 100 ms
Power input during operation	approx. 50 mA
Supply voltage (U _b)	10 - 30 V DC (nominal voltage 24 V DC) 18 - 30 V DC (1D1S and 1D1A versions)
Ambient temperature	-20 °C to +70 °C (-4 °F to 158 °F)
Accuracy	± 1% from full range
Response time	< 10 ms
Input values	
Display units	b (bar), P (psi), °MPa

Housing swivels 270 °C



Optional switching outputs	-1D1A	-1D1S	-2S	-4S
Plug (base)	1 x M12 – 4-pin	1 x M12 – 4-pin	1 x M12 – 4-pin	1 x M12 – 8-pin
Switching outputs	IO-Link and 1x freely programmable	IO-Link and 1x freely programmable	2 x freely programmable*	4 x freely programmable*
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current	0.5 A per output*	0.5 A per output**	0.5 A per output**	0.5 A per output**
Contact load	max. 1 A total	max. 1 A total	max. 1 A total	max. 1 A total
Analogue outputs	1 x pressure	-	-	-
Programmable as	1 x 4 – 20 mA, 2 - 10 V DC, 0 - 10 V DC, 0 - 5 V DC	-	-	-
Max. load Ω as current output	(U _b – 8V) / 0.02 A	-	-	-
Min. input resistance as voltage input	10 kΩ	-	-	-

*also programmable as frequency output

**Output 1 max. 0.2 A.

	-6S	-1S-K	-2S-K
Plug (base)	1 x M12 – 8-pin	1 x M12 – 4-pin	1 x M12 – 5-pin
Switching outputs	6 x freely programmable*	1 x freely programmable	2 x freely programmable
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current	0.5 A per output**	0.5 A per output*	0.5 A per output*
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analogue outputs	-	1 x pressure	1 x pressure
Programmable as	-	1 x 4 – 20 mA, 2 - 10 V DC, 0 - 10 V DC, 0 - 5 V DC	1 x 4 – 20 mA, 2 - 10 V DC, 0 - 10 V DC, 0 - 5 V DC
Max. load Ω as current output	-	$(U_B - 8V) / 0.02 A$	$(U_B - 8V) / 0.02 A$
Min. input resistance as voltage input	-	10 k Ω	10 k Ω

**Output 1 max. 0.2 A.

Ordering instructions Pressotronic 770/771

Model key Pressotronic 770/771

Model designation	Version	Pressure range (PT771 only)*	Output card
PT-XXX-XXX-XXX	770 Remote display for transmitter 771 Transmitter built into display	010 0 - 10 bar 025 0 - 25 bar 100 0 - 100 bar 250 0 - 250 bar 400 0 - 400 bar 600 0 - 600 bar	-1D1A** IO-Link 1 x PNP analogue output -1D1S IO-Link 1 x PNP switching output -2S 2 x PNP switching output -4S 4 x PNP switching output -6S 6 x PNP switching output -1S-K 1 x PNP switching output 1 x analogue output -2S-K 2 x PNP switching output 1 x analogue output -4S-K 4 x PNP switching output 1 x analogue output

*on PT770 the pressure range can be preset at the factory.

**only for version PT771.

Item no. 4-pin	Item no. 5-pin	Item no. 8-pin	Description
9144050010	9144050016	9144050048	Connecting cable M12x1, 1.5 m, angular coupling and straight plug
9144050046	9144050017	9144050049	Connecting cable M12x1, 3.0 m, angular coupling and straight plug
9144050047	9144050018	9144050033	Connecting cable M12x1, 5.0 m, angular coupling and strands

Ordering example

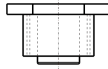
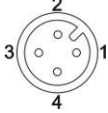
You require: Pressure transmitter with 400 bar (5800 psi); 4 programmable PNP switching outputs; remote display; 3 m (9.8 ft) connecting cable

Order: Pressotronic 700 (item no.: 13700 4000)
Connecting cable (item no.: 9144 05 0046)
Pressotronic 770 display and controller (item no.: 1377 000)

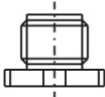
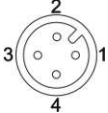
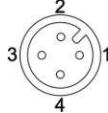
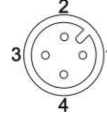
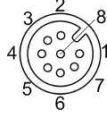
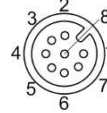
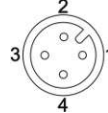
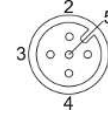

Standard pin assignment Pressotronik 770

Pin assignment Pressotronik 770

For the pressure transmitter assignment, see **Pressotronik 700 standard pin assignment**

Panel jack	1x M12x1
	4-pin
	
Panel jack	
Pin	
1	+24 V DC
3 / 4	4 - 20 mA

Standard pin assignment Pressotronik 770 and 771

Version	-1D1A	-1D1S	-2S	-4S	-6S	-1S-K	-2S-K	-4S-K
Panel plug	1x M12x1							
	4-pin	4-pin	4-pin	8-pin	8-pin	4-pin	5-pin	8-pin
								
Panel plug								
Pin								
1	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC
2	Analogue (out)	S2 (PNP)	S2 (PNP)	S2 (PNP)	S2 (PNP)	Analogue (out)	S2 (PNP)	S2 (PNP)
3	GND	GND	GND	GND	GND	GND	GND	GND
4	C/Q (IO-Link)	C/Q (IO-Link)	S1 (PNP)	S1 (PNP)	S1 (PNP)	S1 (PNP)	S1 (PNP)	S1 (PNP)
5				S3 (PNP)	S3 (PNP)		Analogue (out)	S3 (PNP)
6				S4 (PNP)	S4 (PNP)			S4 (PNP)
7					S5 (PNP)			Analogue (out)
8					S6 (PNP)			



Pressure transmitter Pressotronik 702

Monitoring the oil pressure is essential in hydraulic systems and oil supply systems. It's important to monitor both process-related pressure ranges as well as safety shutdowns, load limits or simply to determine if the lubricating pressure is adequate.

The pressure transmitters must meet a variety of requirements with respect to their pressure resistance, signal output, programmability or the plug connection style. A local or status display is often required for safety reasons

The Pressotronik 702 pressure transmitters have a compact installation size, different connector plugs and fine-tuned pressure levels ranging from low-pressure to high pressure range.

Pressure ratings up to 600 bar (8700 psi)

Compact and robust design

Stainless steel measuring cell

Pressure measuring cell welded seal-free with pressure sensor, no elastomer seal

High burst strength

2 plug connection options available



Technical Data Pressotronik 702

Pressure Transmitter Pressotronik 702

Pressure ranges	0 - 10 bar (0 - 145 psi) 0 - 25 bar (0 - 362 psi) 0 - 100 bar (0 - 1450 psi) 0 - 250 bar (0 - 3625 psi) 0 - 400 bar (0 - 5800 psi) 0 - 600 bar (0 - 8700 psi)
Medium	Liquids, gasses and refrigerants, incl. ammonia
Pressure connection	G1/4 male thread, DIN 3852 Form E with profile gasket FPM
Overload	3 x limit at 10 to 600 bar (145 to 8700 psi)
<i>higher values upon request</i>	(but max. 1500 bar/21756 psi)
Burst pressure	6 x terminal value (max. 2500 bar /36259 psi)
Mounting position	any
Weight	approx. 90 g (0.18 lb)
Material	
Housing	1.4305
Connector holder	Polyarylamide 50 % GF VO
Materials in contact with media	
Pressure connection	Stainless steel 1.4404 / AISI 316L
Measuring element	Stainless steel
Temperature	
Medium	-30 °C to +135 °C (-22...275 °F)
Ambient temperature	-30 °C to +85 °C (-22...185 °F)
Storage	-50 °C to +100 °C (-58...212 °F)

Electrical data

Response time	<= 2 ms / typical 1 ms
Load cycle	<= 100 Hz
Supply voltage (U _b)	7 - 33 V DC
Power input	<= 23 mA
Output signal	4 - 20 mA, 2 wire
Load Ω	= (U _b -7 V) / 0.02 A
Reverse polarity safety	Short circuit and reverse polarity safety (each connection to each with max. voltage)
Connection	M3 (IP 65)
<i>other versions on request</i>	M12 (IP 67) / Delivered without connector head

Accuracy (test conditions: 25 °C, 45 % RH, supply 24 VDC)

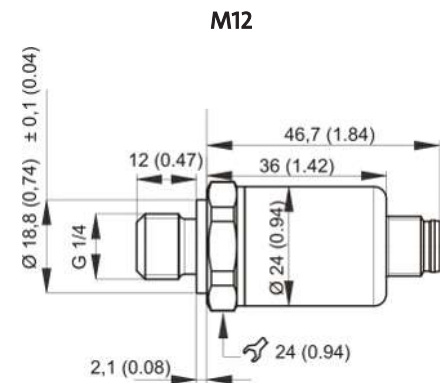
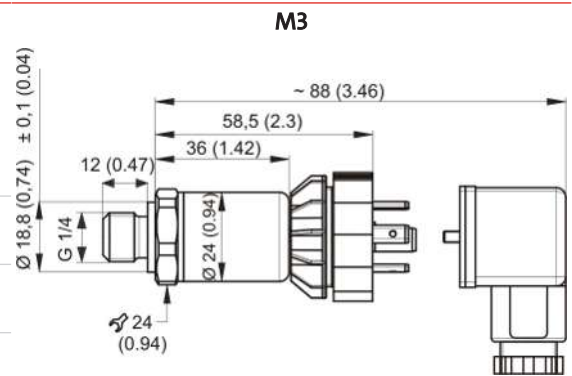
Characteristic*	± 0.3 % FS
Resolution	0.1 % FS
Thermal behaviour**	± 0.2 % FS/10K
Long-term stability per DIN EN 60770-1	± 0.25 % FS

*Typical; max. 0.5 % FS, ** -15 °C to +85 °C (5 to 185 °F)

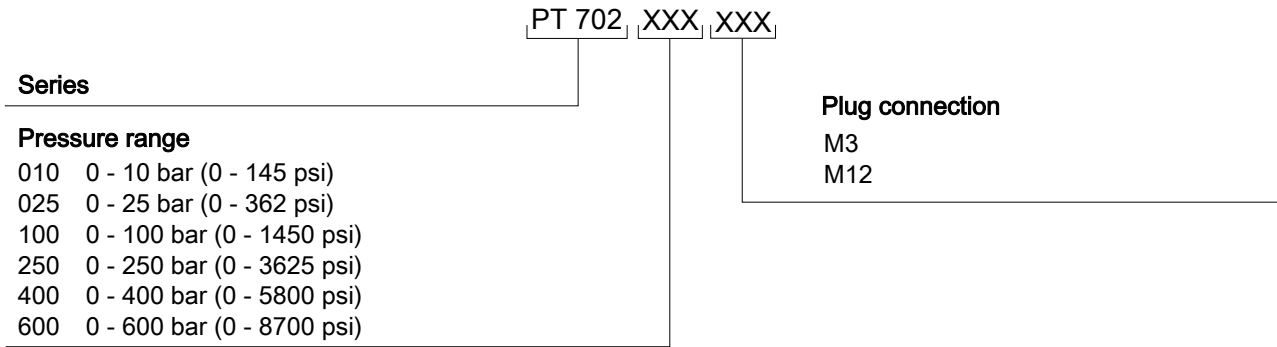
Certificates/Approvals

Electromagnetic compatibility	CE compliant per EN 61326-2-3
Shock per IEC 60068-2-27	100 g (0.2 lb), 11 ms, half-sine curve, all 6 directions, free fall from 1 m (39.37 inch) onto concrete (6x)
Continuous shock per IEC 60068-2-29	40 g (0.08 lb) over 6 ms, 1000x all 3 directions
Vibration per IEC 60068-2-6	20 g (0.04 lb), 15...2000 Hz, 15...25 Hz with amplitude ± 15 mm (0.59 inch), 1 octave/minute all 3 directions, 50 continuous loads

Dimensions



Ordering instructions Pressotronik 702



Item no.	Description	
9144 05 0010	Connecting cable	M12x1, 1.5 m (4.9 ft), angled coupler and straight plug
9144 05 0046	Connecting cable	M12x1, 3.0 m (9.8 ft), angled coupler and straight plug
9144 05 0047	Connecting cable	M12x1, 5.0 m (16.4 ft), angled coupler and strands

Standard pin assignment Pressotronik 702

	M3 valve connector 3-pin + PE DIN EN 175301-803-A IP65	M12 plug A coded 4-pin DIN EN 61076-2-101 IP67
Plug connection		
Pin assignment 2 lead	<ul style="list-style-type: none"> 1 +24 V DC 2 4-20 mA out 3 PE* 	<ul style="list-style-type: none"> 1 +24 V DC 2 3 4-20 mA out 4

* not connected to transmitter housing.



Mechanical Pressure Switches MDS

Monitoring the oil pressure is essential in hydraulic systems and oil supply systems. The measurement of maximum or minimum pressure has a direct effect on the safety of the system, the functionality or process reliability. It is important to monitor both process-related pressure ranges as well as safety shutdowns, load limits or simply to determine if the lubricating pressure is adequate.

MDS mechanical pressure switches serve system pressure monitoring. They are available with adjustable switch points.

robust and compact unit

adjustable switch point

high degree of accuracy

max. operating pressure up to 350 bar (5076 psi) (others upon request)

electromechanical signal converter

M12 as well as M3 plug connector as per DIN EN 175301-803

changeover function

long service life



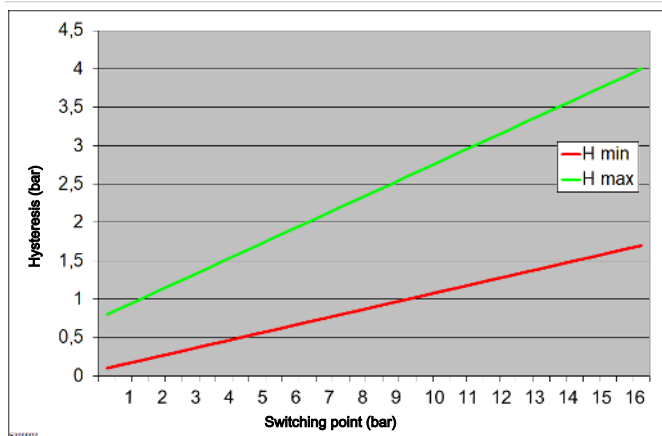
Technical Data MDS

MDS

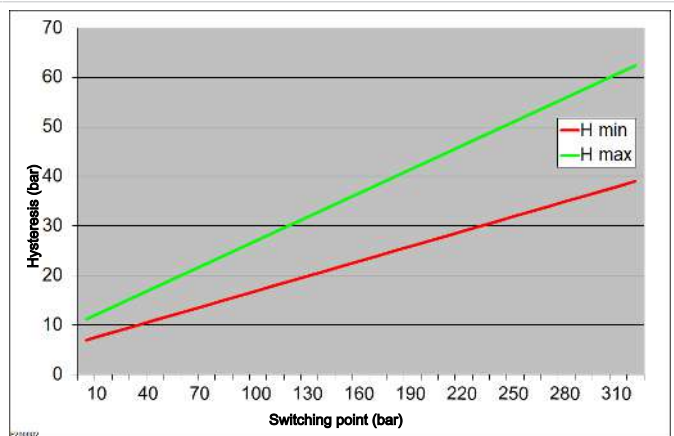
Mediums	Self-lubricating fluids hydraulic fluid and lubricating oils, compressed air	
Process connection	G 1/8"	G 1/4"
Seal	Based on DIN3852-E	
Torque	20 Nm	25 Nm
Principle of Measurement	Membrane spring-loaded ≤ 16 bar (232.1 psi)	Piston spring-loaded ≥ 10 bar (145 psi)
max. working pressure	60 bar (870.2 psi)	350 bar (5076.3 psi)
Materials	Membrane: NBR	Piston: Steel
Seal	---	PTFE, NBR
Housing	Steel, galvanised	Steel, galvanised
Switching output	Changeover contact	
Quantity	1	
Switching element	Microswitch with silver-plated contacts	
max. switching frequency	100/min	
Switching capacity using plug	M3	M12
DC up to 28 V	2 A	2 A
AC up to 250 V	4 A	---
Mounting position	Any	
Response	min. rate of pressure rise 0.01 bar/s (0.1 psi/s)	
Switching point / accuracy	± 2% from end value at room temperature	
Switching point / reproducibility	same as accuracy	
Ambient / operating temperature range	-20... +80 °C (-4... 176 °F)	
Vibration resistance	A-10G / 10-500 Hz	
Shock resistance	I-100G/6 ms	

Switch-back difference

Membrane version



Piston version



Plug connection

M3 (DIN EN 175301-803)

M12 (base)

Voltage

3-pin + PE

4-pin

IP rating

250 V

28 V

Cable fitting

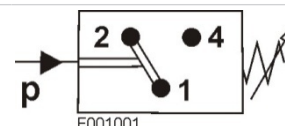
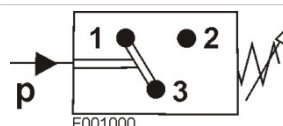
IP65

IP67**

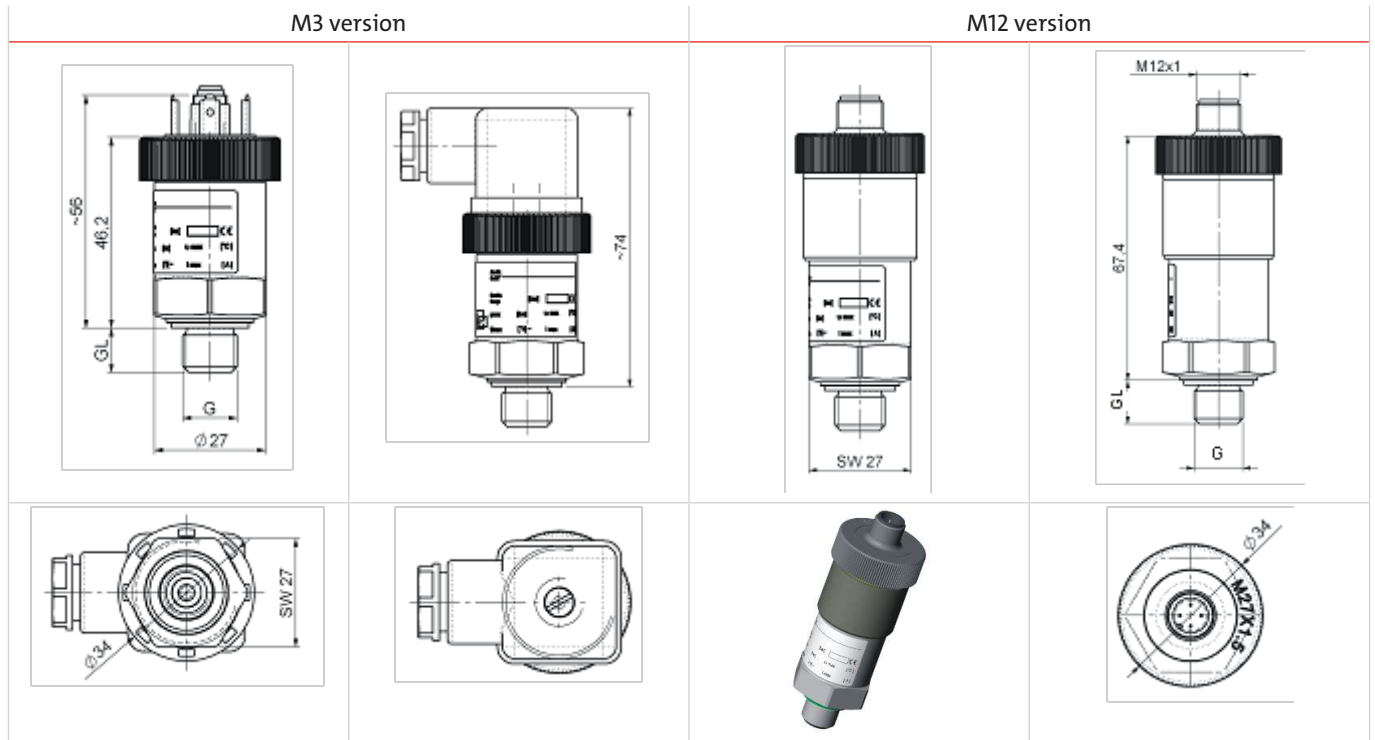
PG9

**when connected

Pin assignment



Dimensions MDS

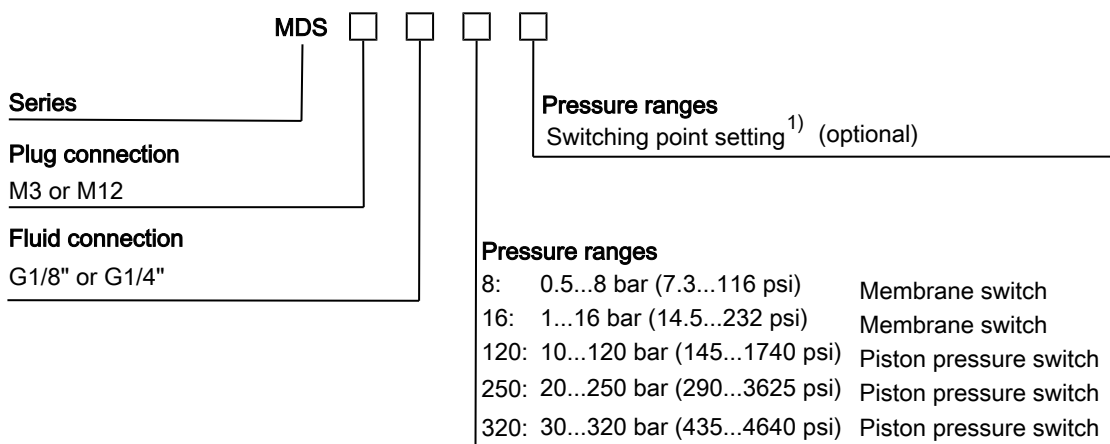


G GL
 1/8 10 mm (0.39 in)
 1/4 12 mm (0.47 in)

Accessories:

- Item no.: 9144050047 Connecting cable M12x1, 4-pin plug, L = 5 m (195 in)
- Item no.: 9146100159 Electric line box M12x1, 90° angle

Model key MDS



¹⁾ If necessary, the switching point can be set at the factory. The switching point must be selected with the pressure rising or falling, i.e. switching point from 0 bar (0 psi) to switching point (rising) or from the max. operating pressure to the switching point (falling). Please refer to the following example for the switching logic:

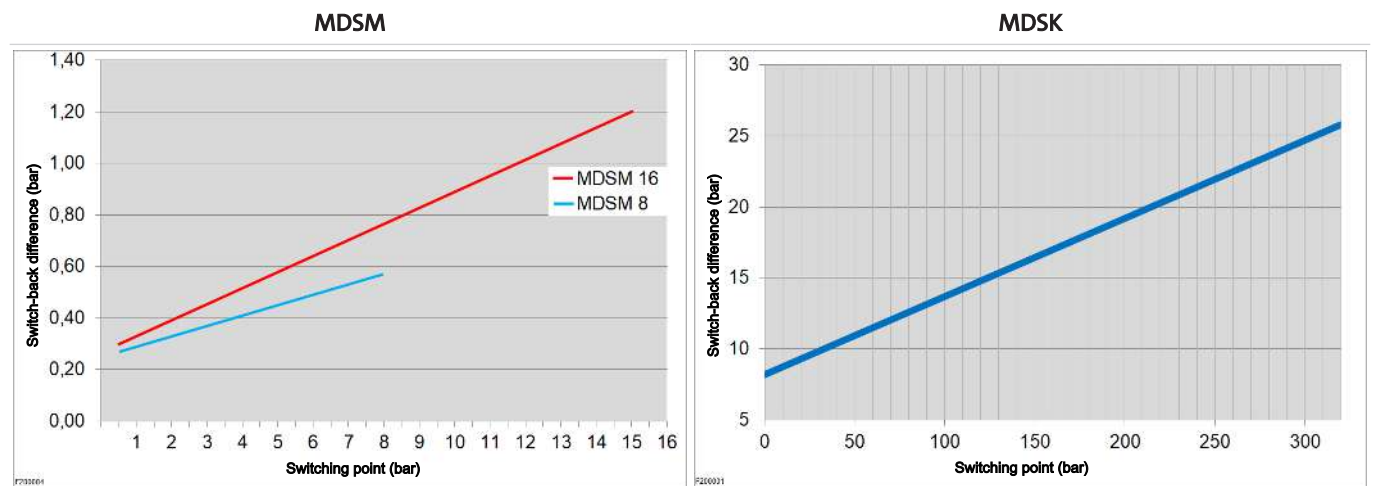
MDS-M3-G1/4-120-80R (switching point 80 bar (1160 psi) rising):
 Pin3-2 closed when switching point reached

MDS-M3-G1/4-120-80F (switching point 80 bar (1160 psi) falling):
 Pin3-1 closed when switching point reached

Technical Data MDSM and MDSK

	MDSM	MDSK
Mediums	Neutral fluids, compressed air	Self-lubricating fluids such as hydraulic fluids and lubricating oils
Process connection	G1/4" internal	G1/4" swivel, vertical flange, DIN ISO 16873, torque: 25 Nm
Mounting position	Any	Any
Principle of Measurement	Spring-loaded membrane	Spring-loaded piston
max. working pressure	60 bar (870.2 psi)	350 bar (5076.3 psi)
min. rate of pressure rise	0.01 bar/s (0.1 psi/s)	0.01 bar/s (0.1 psi/s)
Switching point		
Accuracy/reproducibility	± 2% upper range value at room temp.	± 2% upper range value at room temp.
Materials		
Measuring element	Membrane: NBR	Piston: Stainless steel 1.4305
Pressure connection	Zinc diecasting (G1/4" internal)	Galvanised steel (G1/4" swivel), zinc diecasting (vertical flange)
Housing	Zinc diecasting	Zinc diecasting
Switching output	Changeover contact	Changeover contact
Quantity	1, adjustable with fastener	1, adjustable with fastener
Switching element	Microswitch with silver-plated contacts	Microswitch with silver-plated contacts
max. switching frequency	200/min.	200/min.
max. switching capacity		
with plug	M3 M12	M3 M12
DC up to 28 V	3 A 3 A	3 A 3 A
AC up to 250 V	6 A ---	6 A ---
Ambient conditions		
Ambient / operating temperature range	-10 °C...+80 °C (14...176 °F)	-10 °C...+80 °C (14...176 °F)
Vibration resistance	A-10G/10-500 Hz	A-10G/10-500 Hz
Shock resistance	I-100G/6 ms	I-100G/6 ms
Weight	0.3 kg (0.7 lb)	0.33 kg (0.7 lb)

Switch-back difference:



Plug connection

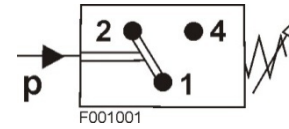
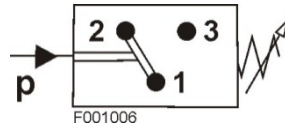
Max. voltage
IP rating
Cable fitting

M3 (DIN EN 175301-803)
3-pin + PE
250 V
IP65
PG9

M12 (base)
4-pin
28 V
IP67**

**when connected

Pin assignment



Dimensions MDSM and MDSK

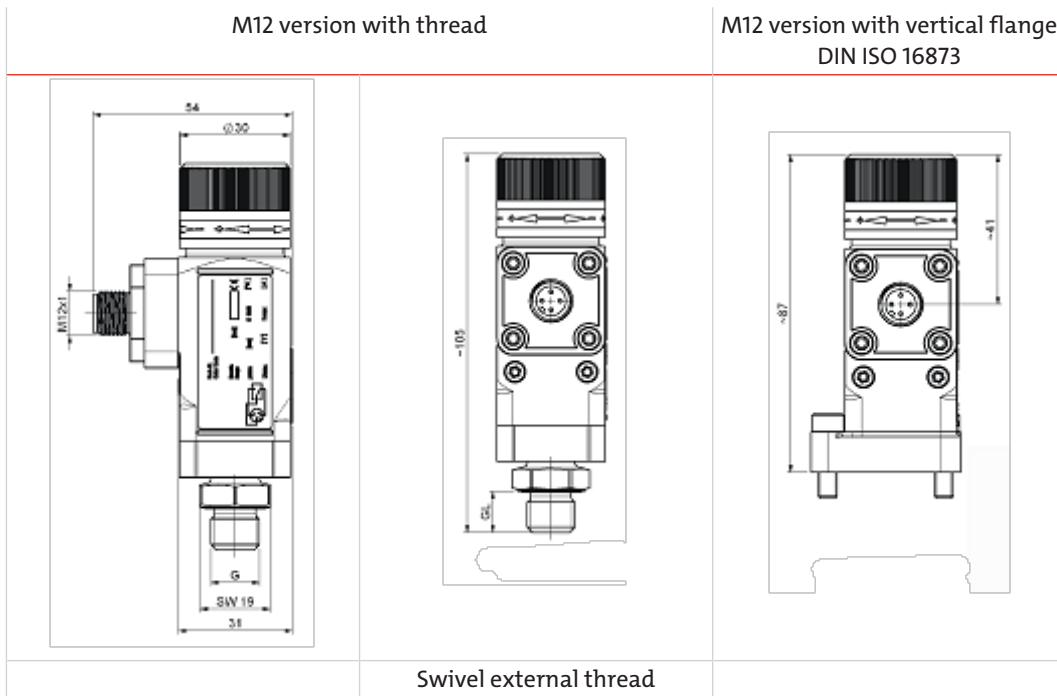
Dimensions MDSM

M3 version			M12 version	
Electric line box included		Rigid internal thread	Rigid internal thread	

Dimensions MDSK

M3 version with thread		M3 version with vertical flange DIN ISO 16873	
Electric line box included		External thread swivel	

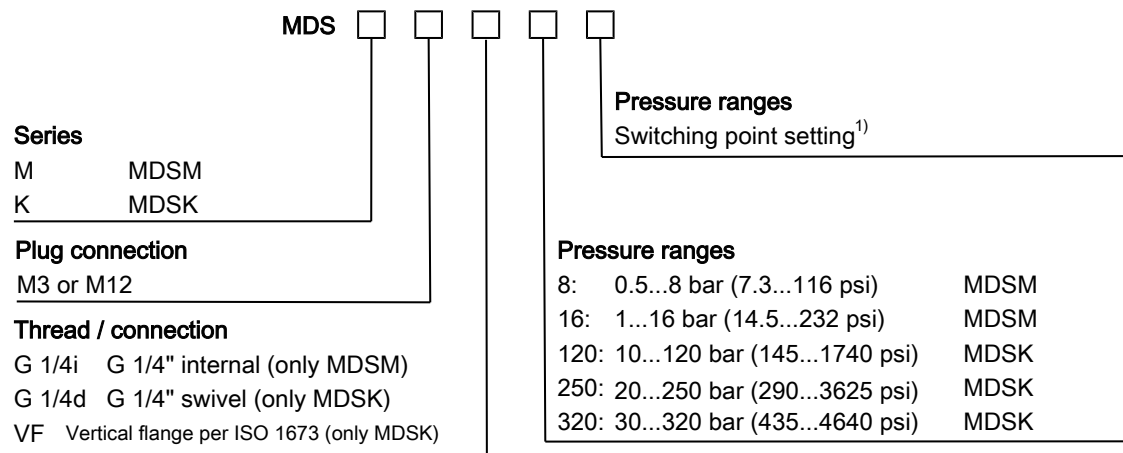
G GL
1/4 92 mm (3.62 in)



Accessories:

Item no.: 9144050047	Connecting cable M12x1, 4-pin plug, L = 5 m (195 in)
Item no.: 9146100159	Electric line box M12x1, 90° angle
Item no.: 9008429	Double nipple G1/4, stainless steel

Model key MDSM and MDSK



¹⁾ If necessary, the switching point can be set at the factory. The switching point must be selected with the pressure rising or falling, i.e. switching point from 0 bar (0 psi) to switching point (rising) or from the max. operating pressure to the switching point (falling). Please refer to the following example for the switching logic:

MDSK-M3-G1/4-120-80R (switching point 80 bar (1160 psi) rising)
PIN1-3 closed when switching point reached

MDSK-M3-G1/4-120-80F (switching point 80 bar (1160 psi) falling)
PIN1-2 closed when switching point reached



2.6 Empty

Dieses Kapitel ist derzeit noch nicht belegt.

This chapter is under construction.



2.7 Standard Controller



Display and control unit Multitronik

Multifunctional device for displaying and controlling various measurements measured variables such as level, temperature, and pressure

Main controllers do not process all parameters recorded for monitoring hydraulic systems and oil supply systems. There are a number of systems which are monitored and controlled as autonomous units.

The necessary monitoring tools are often installed throughout the entire system and quite difficult for operating and service personnel to read.

The easyMont mounting system is a cost-effective and easy option for installing Multitronik display and control units on conventional rails in visible locations. The universal menu structure ensures devices can very quickly be configured to all parameters common in hydraulics and lubrication, such as pressure, temperature, humidity, etc., and to link these with other system components.

Compact design

Easy to read LED display with switching output statuses

Virtually any cable length between measuring point and display

Programmable for units such as cm, inch, °C, °F, bar or psi

Up to 6 programmable switching outputs

Alternative analogue output (configurable to current or voltage) plus 1, 2 or 4 programmable switching outputs

Switching output configurable as frequency output (1-100 Hz)

Switching outputs characteristics configurable as window or hysteresis

Standard menu structure based on VDMA standard sheet 24574 ff.

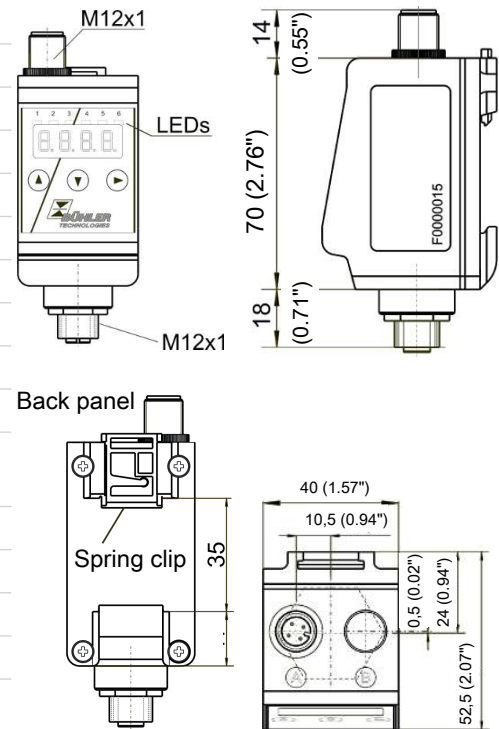
Min/Max memory. Logbook function



Multitronik Technical Data

Version

Housing material	PA	
Mount	35 mm (1.38 inch) top-hat rail mounting	
Weight	approx. 100 g (0.2 lb)	
Degree of protection	IP65	
Analysis/display electronics		
Display	4 character 7 segment LED	
Operation	Via 3 keys	
Memory	Min. / Max. Data memory	
Starting current input	approx. 100 mA for 100 ms	
Current input during operation	approx. 50 mA (without current- and switching outputs)	
Supply voltage (U _B)	10 – 30 V DC (nominal voltage 24 V DC)	
Ambient temperature	-20 °C to +70°C (-4 °F to 158 °F)	
Display units	Level	Temperature
	% , cm, L, i, Gal	°C / °F
Display range	adjustable	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	e.g. 0 – 100 %	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value	± 1 % from end value
Response time	< 10 ms	
Input values		
Display units	b (bar), P (psi), °C, °F, L (litre) as well as various other letters and symbols to choose from	
Input signal	-4 – 20 mA	



Optional switching outputs

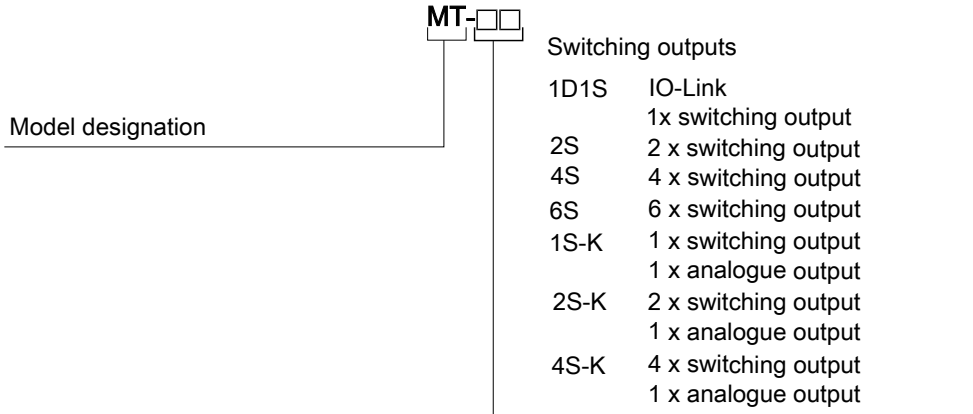
	-1D1S	-2S	-4S	-6S
Plug (base)	1 x M12 – 4-pin	1 x M12 – 4-pin	1 x M12 – 8-pin	1 x M12 – 8-pin
Switching outputs	IO-Link and 1x freely programmable (set to level or temperature)	2 x freely programmable*	4 x freely programmable*	6 x freely programmable*
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
Contact load	max. 1 A total (output 1 max 0.2 A)			
*also programmable as frequency output				
	-1S-K	-2S-K	-4S-K	
Plug (base)	1 x M12 – 4-pin	1 x M12 – 5-pin	1 x M12 – 8-pin	
Switching outputs	1 x freely programmable	2 x freely programmable	4 x freely programmable	
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	
Contact load	max. 1 A total (output 1 max 0.2 A)			
*also programmable as frequency output				

Analogue outputs

Programmable as	1 x 4 - 20 mA, 2 - 10 V DC, 0 - 10 V DC, 0 - 5 V DC	1 x 4 - 20 mA, 2 - 10 V DC, 0 - 10 V DC, 0 - 5 V DC	1 x 4 - 20 mA, 2 - 10 V DC, 0 - 10 V DC, 0 - 5 V DC
Max. load Ω as current output	$(U_B - 8V) / 0.02 A$	$(U_B - 8V) / 0.02 A$	$(U_B - 8V) / 0.02 A$
Min. input load as voltage input	10 k Ω	10 k Ω	10 k Ω

Multitronik ordering instructions

Model key



Item no.	Type
18770099	-1D1S
18770199	-2S
18770299	-4S
18770499	-6S
18770399	-1S-K
18770599	-2S-K
18770699	-4S-K

Accessories

Item no. 4-pin	Item no. 5-pin	Item no. 8-pin	Description
9144050010	9144050016	9144050048	Connecting cable M12x1, 1.5 m, angular coupling and straight plug
9144050046	9144050017	9144050049	Connecting cable M12x1, 3.0 m, angular coupling and straight plug
9144050047	9144050018	9144050033	Connecting cable M12x1, 5.0 m, angular coupling and strands

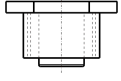
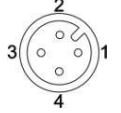
Note

The following Bühler sensors feature a 4-20 mA output and are compatible with the display and control unit

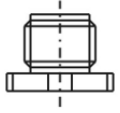
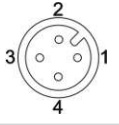
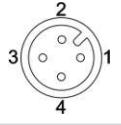
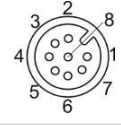
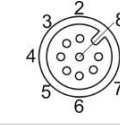
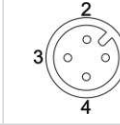
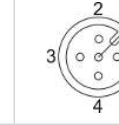
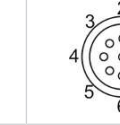
Level measurement	Temperature measurement
Nivotemp NT63 (see data sheet no. 100210)	MK2/EK2 temperature sensor (see data sheet no. 110202)
Nivovent NV 64 (see data sheet no. 100206)	All level switches with KT option

Multitronik standard pin assignment

Remote display sensor supply

Panel jack	1x M12x1
	4-pin
	
Panel jack	
Pin	
1	+24 V DC
3 / 4	4 - 20 mA

Plug connections

Version	1D1S	2S	4S	6S	1S-K	2S-K	4S-K
Panel plug	1x M12x1 (base)						
	4-pin	4-pin	8-pin	8-pin	4-pin	5-pin	8-pin
							
Panel plug							
Pin							
1	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC
2	S2 (PNP)	S2 (PNP)	S2 (PNP)	S2 (PNP)	Analogue (out)	S2 (PNP)	S2 (PNP)
3	GND	GND	GND	GND	GND	GND	GND
4	C/Q (IO-Link)	S1 (PNP)	S1 (PNP)	S1 (PNP)	S1 (PNP)	S1 (PNP)	S1 (PNP)
5			S3 (PNP)	S3 (PNP)		Analogue (out)	S3 (PNP)
6			S4 (PNP)	S4 (PNP)			S4 (PNP)
7				S5 (PNP)			Analogue (out)
8				S6 (PNP)			



2.8 Water Alarms



Water alarm unit WW6

The ingress of water or condensation in hydraulic or lubrication systems changes the properties of the oil and increases wear on bearings and other components. The separated free water therefore needs to quickly be removed from oils with good demulsifying properties.

To detect free water in these applications, physical interface measurement is a reliable method and the basis for our unique water alarm. Optional installation kits make them easier to install and assemble.

Reliable, physical measuring process

High sensitivity

Easy installation

Independent of oil chemistry

Assembly kit available

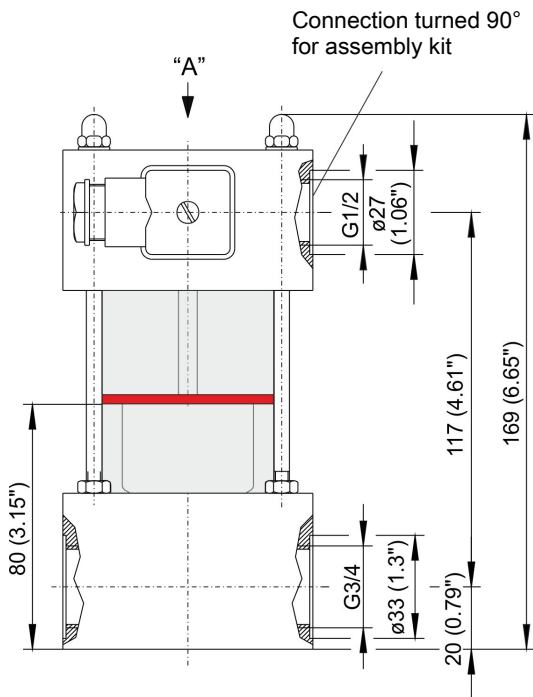


Technical Data

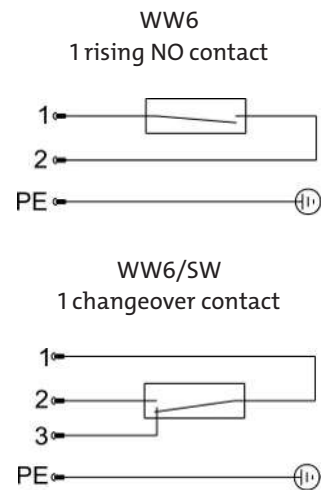
Technical Data WW6

Max. operating pressure:	87 psi
Operating temperature:	min. 32 °F, max. 176 °F
Max. viscosity:	1200 cSt
Max. density of oil:	0.86 kg/dm ³
Material	
Housing:	Al/PC
Float	PP
Contact type:	Reed contact as NO or changeover contact
Max. operating voltage:	230 V AC/DC
Max. switching output:	50 VA/40 VA
Max. switching current:	1 A
Plug connection:	M3 (3-pin + PE DIN EN 175301-803)
IP rating:	IP65
Cable fitting:	PG 11
Weight:	approx. 3 lb

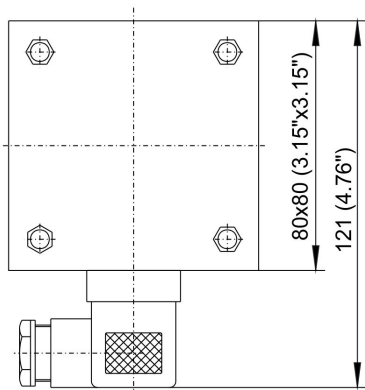
Dimensions/contact assignment



Contact assignment

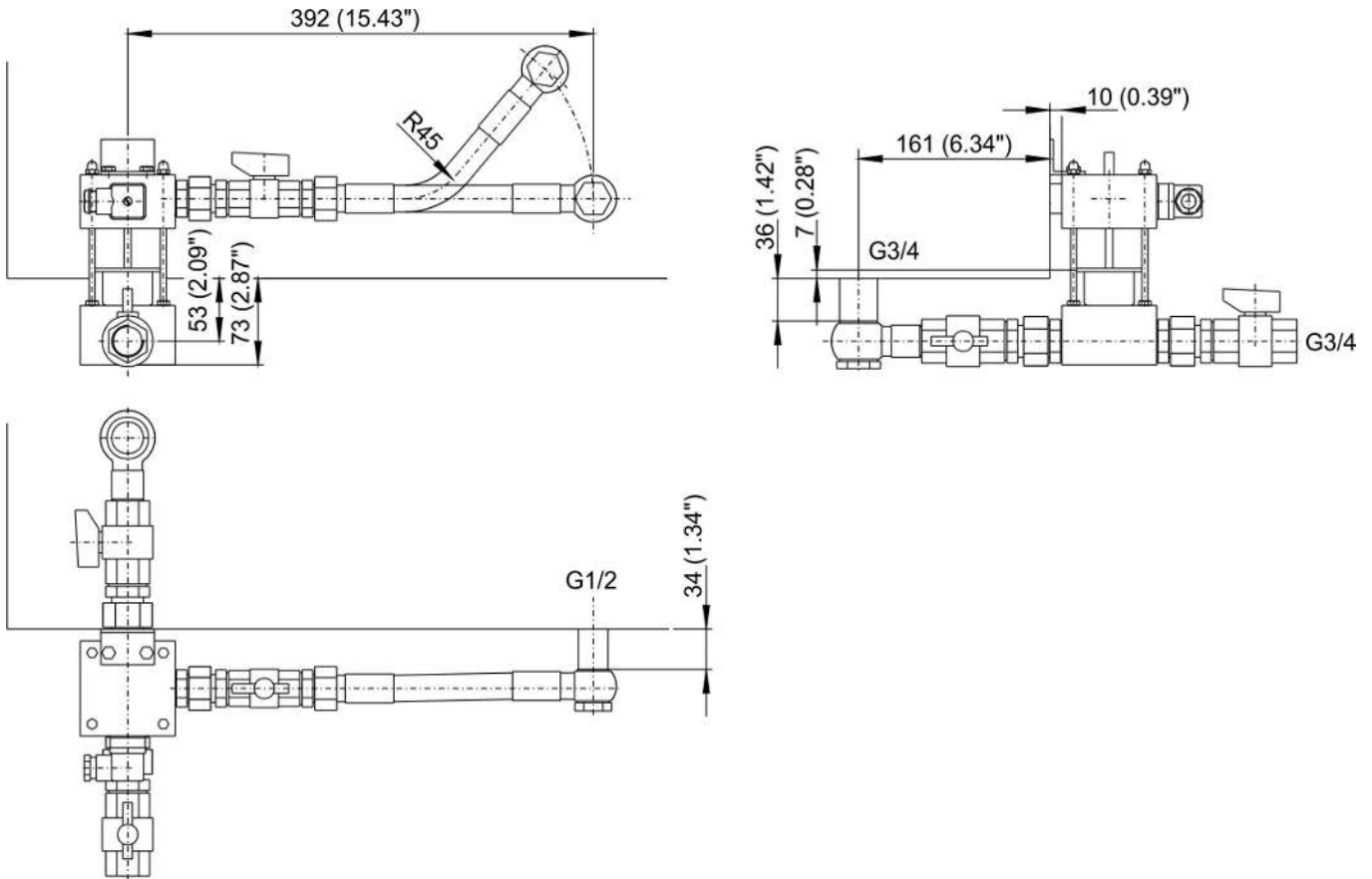


All information are **empty tank** or float on bottom.



Assembly kit

The assembly kit shown enables compact and easy installation of the water alarm to the oil tank. The set includes all connections, fittings and shut-off valves. The fitting lengths provide the smallest possible dead volume. The upper connection is a transparent hose for considerably easier installation.



Ordering Instructions

Item no.:	Description
30 03 999	Water alarm WW6, one rising NO contact
30 16 999	Water alarm WW6, G1/2 connection turned 90°
30 03 899	WW6 including assembly kit
30 04 999	Water alarm WW6/SW, one changeover contact
30 17 999	Water alarm WW6/SW, G1/2 connection turned 90°
30 04 699	WW6/SW including assembly kit
32 04 999	Assembly kit



Water alarm unit WW3, WW10

The ingress of water or condensation in hydraulic or lubrication systems changes the properties of the oil and increases wear on bearings and other components. The separated free water therefore needs to quickly be removed from oils with good demulsifying properties.

To detect free water in these applications, physical interface measurement is a reliable method and the basis for our unique water alarm. Optional installation kits make them easier to install and assemble.

The WW3 and WW10 series are equipped with a special float which is balanced to not become buoyant in oil but float in water.

The housing volume has been reduced so the top contact is activated at approx. 1 litre of water. The bottom contact serves as an alert. These contacts are activated by the float without contact and are separate from the measuring chamber.

If the bottom of the tank has the corresponding design, the function of the water alarm can also be combined with a level and temperature switch. Water alarms with two switching points and for higher operating pressures are available on request.

Reliable, physical measuring process

High sensitivity

Easy installation

Independent of oil chemistry

Assembly kit available

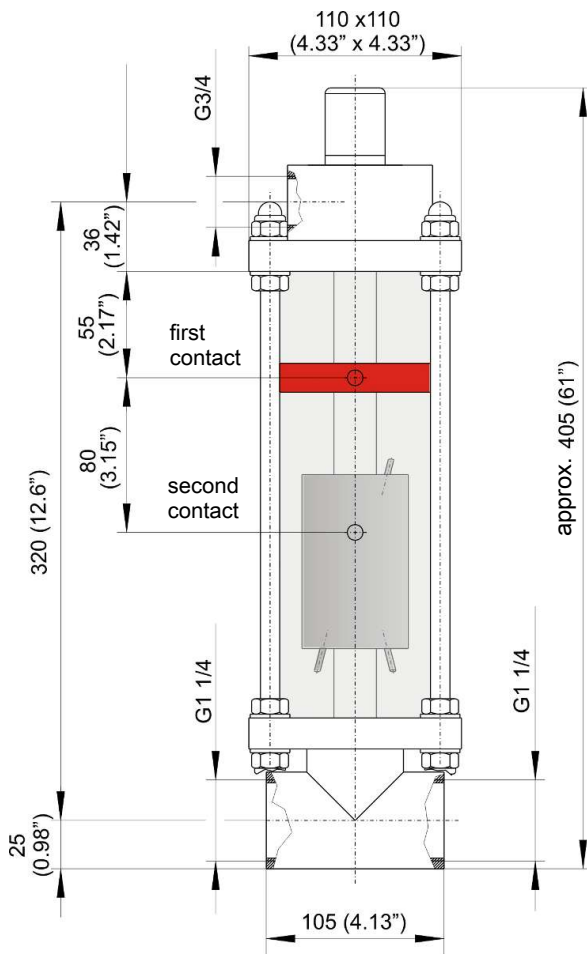


Technical Data

Technical Data WW3 and WW10

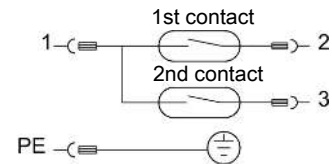
Max. operating pressure:	WW3 = 43.5 psi WW10 = 145 psi
Operating temperature:	32 °F to 176 °F
Max. viscosity:	1200 cSt
Max. density of oil:	0.031 lb/in ³
Material	
Housing:	WW3 = transparent shell WW10 = steel shell
Float:	PP
Contact type:	Reed contacts, 2x each as NO contact, NC contact or change-over (also see contact assignment)
Max. operating voltage:	230 V AC/DC
Max. switching output:	NO contact/NC contact 50 VA (AC)/50 W (DC) Change-over 40 VA/40 W
Max. switching current:	1 A
Plug connection:	S6 (6 pin + PE DIN EN 175301-803)
IP rating:	IP65
Cable fitting:	PG 11
Weight:	WW3 = 13 lb WW10 = 18 lb

Dimensions/contact assignment

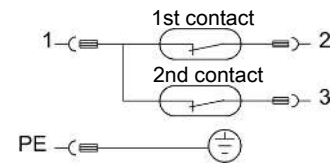


Contact assignment

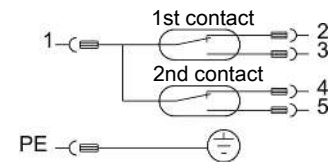
WW3 / WW10



WW3-SO / WW10-SO



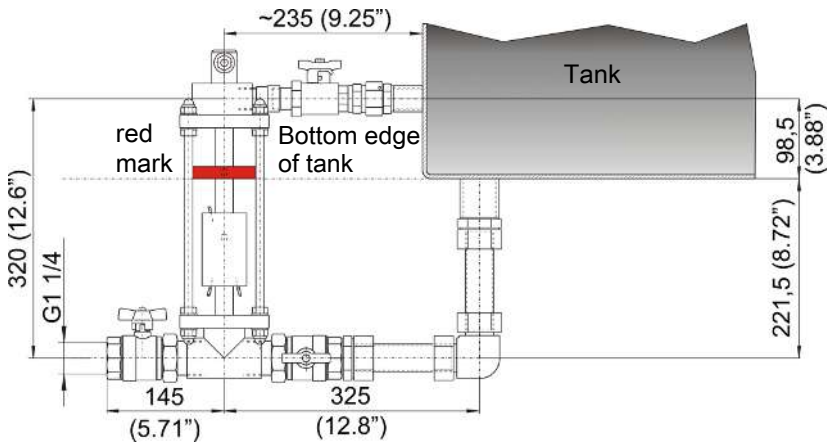
WW3-SW / WW10-SW



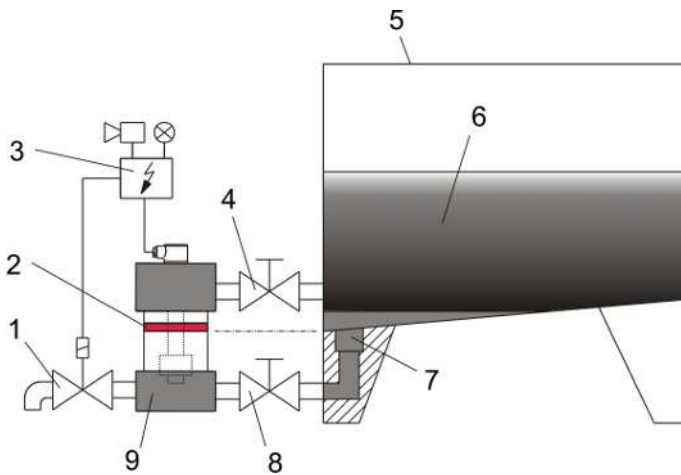
All information are **empty tank** or float on bottom.

Assembly kit

The assembly kit shown enables compact and easy installation of the water alarm to the oil tank. The set includes all connections, fittings and shut-off valves. The fitting lengths provide the smallest possible dead volume. It mounts to the tank with two welded sleeves.



Installation principle



1 Drain valve	2 red mark
3 Control/signal unit	4 upper check valve
5 Tank	6 Oil
7 Water	8 lower check valve
9 Water alarm units	

Ordering Instructions

Item no.:	Description
30 01 999	Water alarm WW3
30 02 999	Water alarm WW3-SO
30 09 999	Water alarm WW3-SW
30 05 999	Water alarm WW10
30 06 999	Water alarm WW10-SO
30 00 999	Water alarm WW10-SW
31 01 999	Assembly kit

Level switch Nivotemp 61-0-WW

The ingress of water or condensation water in hydraulic or lubrication systems will result in premature aging of the oil and the changes in the lubricating properties can increase wear on bearings and other parts. It's therefore important to quickly drain the separated free water from systems where oil with good demulsibility.

A quite reliable physical measurement method to detect water is interface measurement, as it is independent of changing chemical properties of the oil such as conductivity or capacity.

This style Nivotemp 61-0 is equipped with an additional speciality float which is balanced to only become buoyant in water.

The contact tube on the Nivotemp is extended to extend into a small recess in the bottom of the tank. The free water can collect in this recess and will lift the float and trigger a contact at a volume of approx. 8 oz.

Depending on the operating mode required of the respective system, the water can now be drained or an alarm can be triggered.

Level / water monitoring combo

Reliable, physical measuring process

Easy installation

Independent of oil chemistry

Collecting basin available as ready to install accessory

Up to four adjustable level contacts

Connector standard



Technical Data

Base unit

Operating pressure	max. 145 psi
Operating temperature	max. 176 °F
Fluid density	min. 0.029 lb/in ³
Oil density	max. 0.031 lb/in ³

Material/Version

Float SK 610 (level)	Hard PU
Float WW (water alarm)	PPH
Switching tube	MS
Flange	PA 6
Weight at L=19.7"	1.7 lb

Includes:

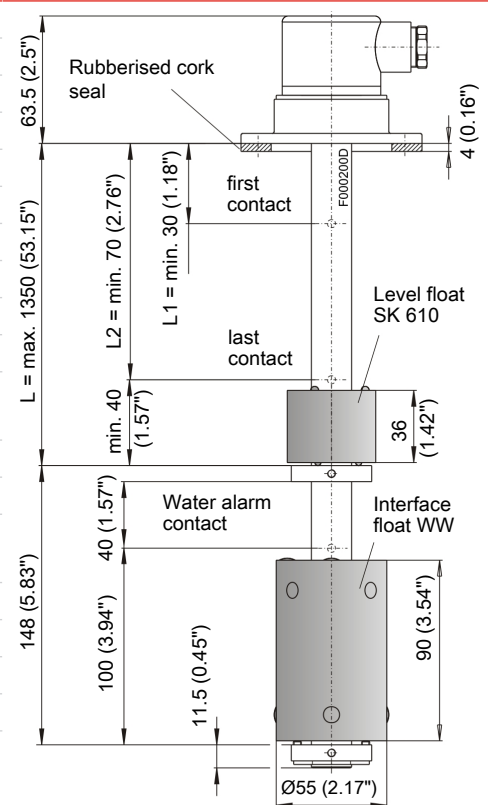
Mounting screws (quantity 6) and rubberised cork seal.

Level contacts	K10	W11	-	-
Water alarm contacts	-	-	K6	W7
Function	NC/NO*	Changeover contact	NC/NO*	Changeover contact
Voltage max.	230 V AC/DC	48 V AC/DC	230 V AC/DC	230 V AC/DC
Max. switching current	0.5 A	0.5 A	1 A	1 A
Contact load max.	10 VA	20 VA	50 VA	40 VA
Min. contact spacing	1.6"	1.6"	fixed	fixed

*NC= NC contact/NO = NO contact

All data with empty tank

Dimensions (mm)



as per DIN24557 part2
6x M5x16 screw

Standard pin assignment

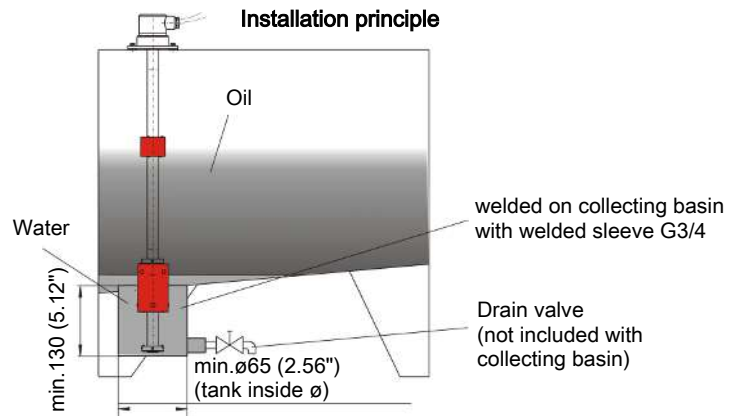
Connector	S6	C6F circular connector	2xM12 plug A coded
Dimensions			
Number of poles	6-pin + PE	6-pin + PE	4 pin/4 pin
DIN EN	175201-804	175301-804	61076-2-101
Voltage max.	230 V AC/DC*	230 V AC/DC*	24 V DC
IP rating	IP65	IP65	IP67**
Cable fitting	M20x1.5	PG 11	PG7**
Max. Number of contacts	4xK10 + 1xK6 2xW11 + 1xK6 3xK10 + 1xW7 1xW11 + 1xW7	4xK10 + 1xK6 2xW11 + 1xK6 3xK10 + 1xW7 1xW11 + 1xW7	2xK10 + 1xK6 1xW11 + 1xK6 2xK10 + 1xW7 1xW11 + 1xW7

*max. 48 V AC/V DC for change-over contact. **with IP 67 cable box attached. Other connectors available upon request.

Installation examples

The Nivotemp 61-0-WW installs in the tank so the bottom part with the interface float is inside a collecting basin which is also installed under the bottom of the tank (see installation principle).

The size of the collecting basin must be of the specified minimum size. In this installation example with a cylinder size of $\varnothing 2.56''$ and a height of 5.12", the interface float would activate the water alarm contact at a water volume of approx. 8 oz.



Ordering instructions

Base version (without level and water alarm contacts)

Item no.	Description	Plug	Total length
10 30 099	Nivotemp 61-0-WW-S6-Level contacts/water alarm contact	S6	L (max. 1350 mm/2.17")
10 30 799	Nivotemp 61-0-WW-2xM12-Level contacts/water alarm contact	2xM12	L (max. 1350 mm/2.17")
10 30 899	Nivotemp 61-0-WW-C6F-Level contacts/water alarm contact	C6F	L (max. 1350 mm/2.17")

Item no.	Description	Number of contacts	Type	Spacing
18 89 999	Level contact K10	See plug connection table	NC/NO	L1 (, L2, L3, L4)
18 90 999	Level contact W11	See plug connection table	Changeover contact	L1 (, L2, L3, L4)
18 50 999	Water alarm contact K6	1	NC/NO	solid
18 49 999	Water alarm contact W7	1	Changeover contact	solid

Accessories:

Item no.	Description
10 30 0991	Collecting basin (with G3/4 connection, including plug), dimensions $\varnothing 70/2.6 (2.76''/0.1'')$ x height = 133 mm (5.24")

Ordering example:

You need: Nivotemp (base): Plug: Type S6; length L= 580 mm (23")
 Level contacts: 1st Contact 100 mm (4") falling NC contact, 2nd contact 500 mm (20") falling NO contact
 Water alarm contact: 1 as NC contact

Order: Item no.: 10 30 099, Nivotemp 61-0-WW-S6-2xK10-1xK6, L= 580
 Item no.: 18 89 999, 2 x level contacts K10, L1=100 NC, L2 = 500 NO
 Item no.: 18 50 999, 1 x Water alarm contact K6 as NC



2.9 Filter Monitoring



Contamination indicator BCI 24-Dx

Filtration is an important component of condition monitoring in hydraulic and lubrication systems. Predictive filter maintenance, however, is only possible if monitoring the remaining life of the filter elements is indicated in a way so replacements do not cause unplanned downtimes.

The BCI series uses various electric signals whilst simultaneously suppressing viscosity-related effects for particularly efficient filter capacity use.

The BCI 24-Dx monitors the pressure difference in in-line filters and technically corresponds to a microprocessor-controlled pressure sensor with 2 switching outputs for advance warning (filter element nearly depleted) and cut-out (filter element full). At the same time the current pressure drop is output via 4-20 mA interface.

The BCI 24-Dx is alternatively available in a more affordable version, only available with IO-Link interface.

Connecting flange compatible with third-party products
G1/2 Hydac, G1/2 Stauff, M20x1.5 Filtration Group,
M20x1.5 Hengst, G1/2 MP-Filtri or G1/2 Eaton

Continuous pressure drop measurement

2 fixed switching outputs for 75 % and 100 % contamination level

4-20 mA output for pressure drop (version 2S1A only)

Signal suppression for outputs during the cold start phase and temporary pressure peaks (version 2S1A only)

IO-Link version with 1 x programmable switching output



Technical Data

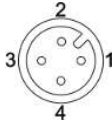
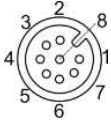
Technical Data BCI 24-Dx

Model	BCI 24-Dx3x0-2S1A	BCI 24-Dx3x7-1D1S
Operating pressure	max. 5802 psi	max. 5802 psi
Ambient temperature	-4 °F to +158 °F	-4 °F to +158 °F
Medium temperature	-40 °F to +185 °F	-40 °F to +185 °F
Material/Version		
Electronics housing	1.4305	Anodised aluminium
Flange G1/2, M20x1.5	1.4305, Viton	1.4305, Viton
Weight	0.79 lb	0.35 lb
Electrical data		
Input values	Pressure drop	Pressure drop
Principle of Measurement	Differential pressure piston with magnet and hall sensor	Differential pressure piston with magnet and hall sensor
Operating voltage	18 - 30 V DC	18 - 30 V DC
Power input	< 100 mA	< 100 mA
IP rating (with plug top)	IP67	IP67
Sum of all deviations	10 % from full range	10 % from full range
Output	4-20 mA + 2x switching output 200 mA Signal suppression for outputs in temperatures under 86 °F** and during temporary pressure peaks.	IO-Link* Signal suppression for outputs during temporary pressure peaks.

*in IO-Link mode 1 switching output, in SIO mode 2 switching outputs

**Other temperatures available upon request.

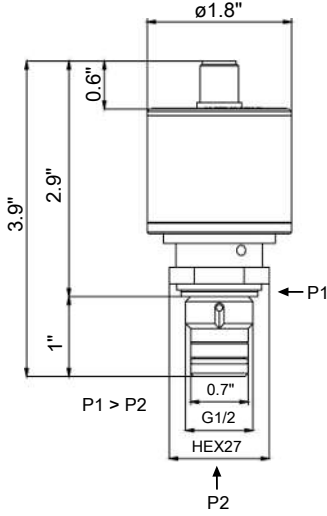
Pin assignment

Version	1D1S	2S1A
Plug	M12 4-pin	M12 8-pin
Connection schematic		
Pin		
1	+24 V DC	+24 V DC
2	S2 (PNP), max. 200 mA	GND
3	GND	PNP OUT1, max. 200 mA
4	C/Q (IO-Link)/S1	NC
5		Analog OUT4 - 20 mA
6		PNP OUT2, max. 200 mA
7		NC
8		NC
	S1 = HnC 75 % S2 = HnC 100 % adjustable via IO-Link	OUT1 = HnC 75 % OUT2 = HnC 100 % not adjustable

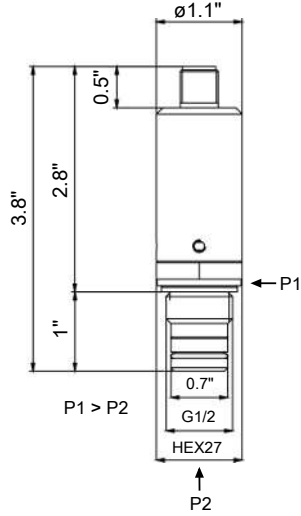
Dimensions

Connecting flange compatible with
third-party product Hydac / Stauff

BCI 24-DH3x0-2S1A

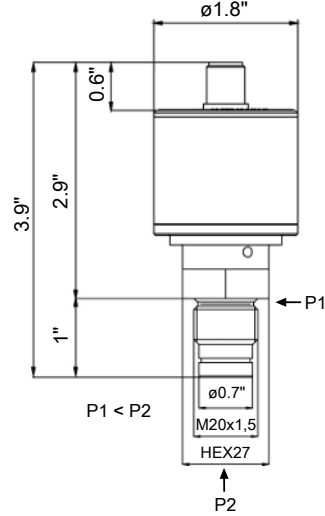


BCI 24-DH3x7-1D1S

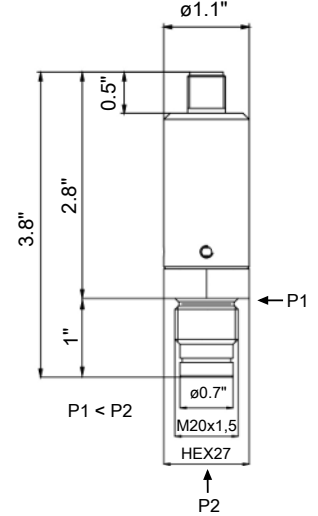


Connecting flange compatible with
third-party product Filtration Group / Hengst

BCI 24-DM3x0-2S1A

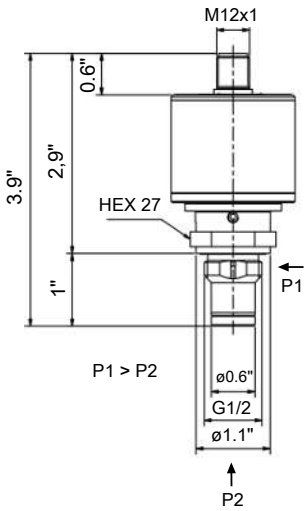


BCI 24-DM3x7-1D1S

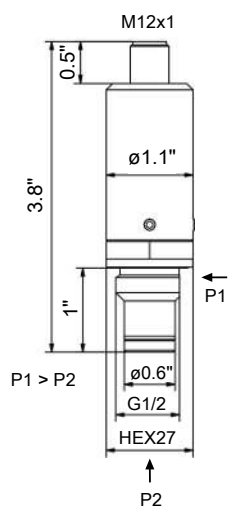


Connecting flange compatible with
third-party product MP-Filtri

BCI 24-DF3x0-2S1A

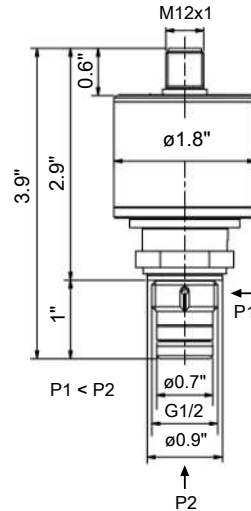


BCI 24-DF3x7-1D1S

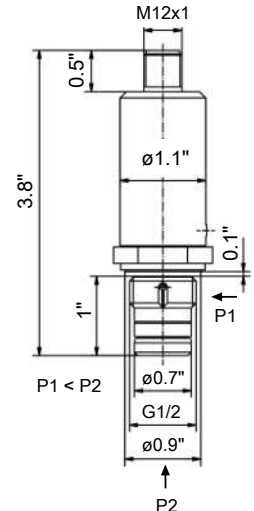


Connecting flange compatible with
third-party product Eaton

BCI 24-DC3x0-2S1A



BCI 24-DC3x7-1D1S



Model key

BCI 24 - D 3 - **Type designation**

BCI Contamination indicator

Process connection

compatible with third-party products

H Hydac/Stauff G1/2
 M Filtration Group/Hengst M20x1,5
 F MP-Filtri G1/2
 C Eaton G1/2

Options/outputs

0 - 2S1A 2 x switching output / 1 x analog
 7 - 1D1S 1 x switching output / IO-Link

Pressure drop range

3 max. 3 bar (44 psi)
 6 max. 6 bar (87 psi)

Ordering examples:

BCI 24-DH350-2S1A: BCI 24 compatible with third-party product Hydac process connection, 6 bar (87 psi) pressure drop range, 2 switching outputs and 1 analog output 4-20 mA

BCI 24-DM357-1D1S: BCI 24 compatible with third-party product Filtration Group process connection, 6 bar (87 psi) pressure drop range, IO-Link output

Accessories

Item no.:	Model
9144050031	M12x1 4-pin LED * 5.0 m connection
9144050047	M12x1 4-pin 5.0 m connection
9144050010	M12x1 4-pin 1.5 m connection
9144050033	M12x1 8-pin 5.0 m connection
9144050048	M12x1 8-pin 1.5 m connection
9146100158	Straight cable socket M12x1 5-pin

*LED cable not compatible with active IO-Link communication. Only use in SIO mode.



Contamination indicator BCI 24-Dx

Filtration, and the monitoring thereof, are important components of condition monitoring in hydraulic and lubrication systems. Condition-based filter maintenance, however, is only possible if monitoring the remaining service life of the filter elements is indicated in such a way that replacements do not cause unplanned downtimes.

Through continuous monitoring of filter capacity using various electric signals, the BCI Series ensures ultra-efficient filter use.

The BCI 24-Dx monitors the pressure drop in in-line filters and is technically equivalent to a microprocessor-controlled pressure sensor with 2 switching outputs for advance warning (filter element nearly depleted) and cut-out (filter element full). Alternatively, the current pressure drop is output via a 4-20 mA signal.

IO-Link is integrated as standard in all versions to enable the simplest possible integration into existing systems.

Connecting flange compatible with third-party products
G1/2 Hydac, G1/2 Stauff, M20x1.5 Filtration Group,
M20x1.5 Hengst, G1/2 MP-Filtri or G1/2 Eaton

Continuous pressure drop measurement

2 adjustable switching outputs for 75% and 100% contamination level

4-20 mA output for pressure drop (version 1D1A only)

Continuous filter monitoring for optimised service planning

IO-Link for easy integration into existing systems



Technical Data

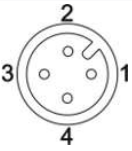
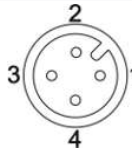
Technical Data BCI 24-Dx

Operating pressure:	max. 5802 psi
Ambient temperature:	-4 °F to +158 °F
Medium temperature*:	-40 °F to +185 °F
Measuring range:	4.4...44 psi/8.7...87 psi, depending on the version
Material/version	
Housing material:	Anodised aluminium (3.2315)
Material in contact with media:	Anodised aluminium (3.2315), spring steel, bright steel, NBR
Weight:	0.15 lb
Electrical data	
Input value:	Pressure drop
Measuring principle:	Differential pressure piston with magnet and hall sensor
Operating voltage:	18–30 V DC
Power input:	< 100 mA
IP rating (with plug top):	IP67
Output:	IO-Link (in SIO mode - switching output) Additional: Switching output for version 1D1S or analog signal 4...20 mA for version 1D1A
Measuring accuracy:	5% of the final value (type)
Repeatability:	0.5% of the final value
Switching point accuracy**:	1% of the final value

*Other temperatures available upon request.

**with factory setting.

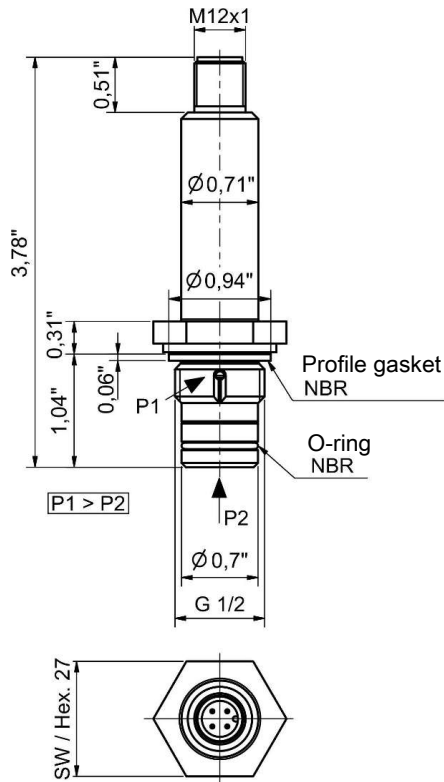
Pin assignment

Version	1D1A	1D1S
Plug	M12 4-pin	M12 4-pin
Connection schematic		
Pin		
1	+24 V DC	+24 V DC
2	OUT2, 4...20 mA	S2 (PNP), max. 200 mA
3	GND	GND
4	C/Q (IO-Link)/S1	C/Q (IO-Link)/S1
	S1 = HnC 75% → 29 psi or 59 psi OUT2 = 4...20 mA → 0...44 / 87 psi adjustable via IO-Link	S1 = HnC 75% → 29 psi or 59 psi S2 = HnC 100% → 41 psi or 80 psi adjustable via IO-Link

Dimensions

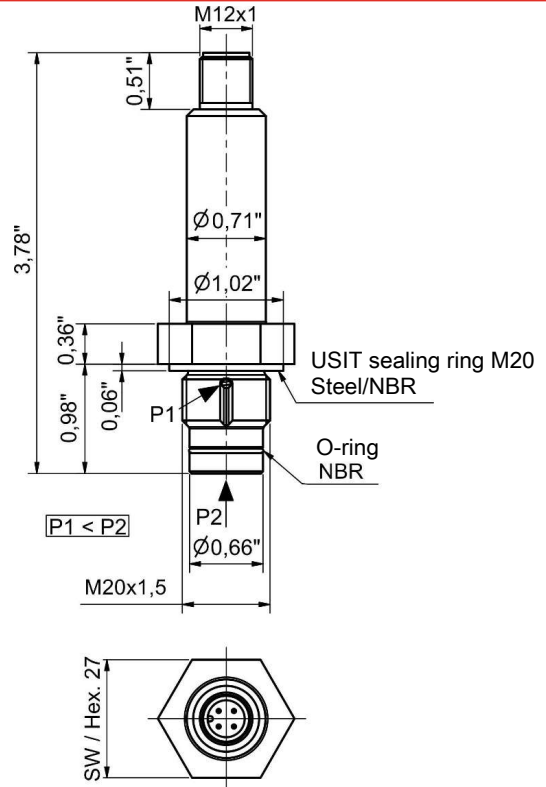
Connecting flange compatible with
third-party product Hydac / Stauff

BCI 24-DHxxx



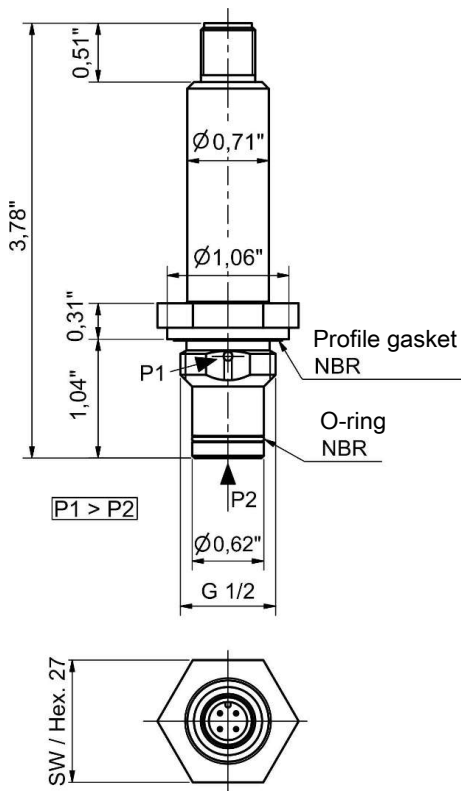
Connecting flange compatible with
third-party product Filtration Group / Hengst

BCI 24-DMxxx



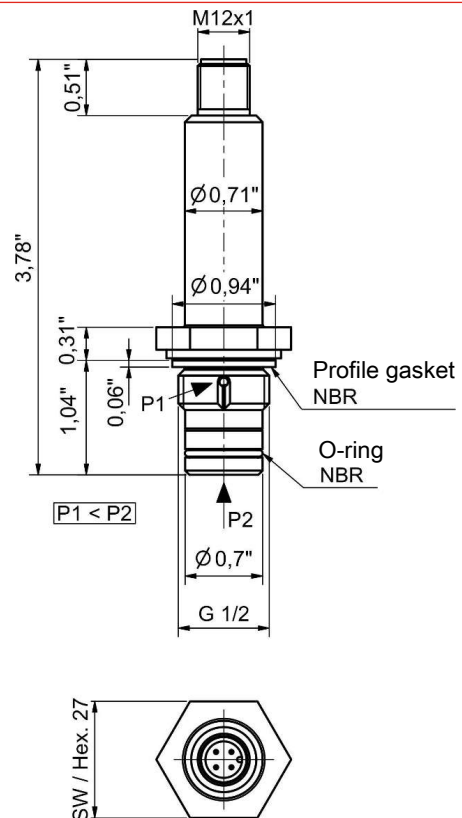
Connecting flange compatible with
third-party product MP-Filtri

BCI 24-DFxxx



Connecting flange compatible with
third-party product Eaton

BCI 24-DCxxx



Model key

BCI 24 - D 3 - - 4

Type designation

BCI contamination indicator

Process connection

compatible with third-party products

H Hydac/Stauff G1/2
 M Filtration Group/Hengst M20x1.5
 F MP-Filtri G1/2
 C Eaton G1/2

Options/outputs

7 - 1D1A 1x analog / IO-Link
 7 - 1D1S 1x switching output / IO-Link

Pressure drop range

3 max. 44 psi
 6 max. 87 psi

Item numbers

1331237740	BCI24-DH337-1D1S-4	Hydac / Stauff G1/2	44 psi	1D1S
1331267740	BCI24-DH367-1D1S-4		87 psi	
1331237840	BCI24-DH337-1D1A-4		44 psi	1D1A
1331267840	BCI24-DH367-1D1A-4		87 psi	
1331137740	BCI24-DM337-1D1S-4	Filtration Group / Hengst M20x1.5	44 psi	1D1S
1331167740	BCI24-DM367-1D1S-4		87 psi	
1331137840	BCI24-DM337-1D1A-4		44 psi	1D1A
1331167840	BCI24-DM367-1D1A-4		87 psi	
1331437740	BCI24-DF337-1D1S-4	MP-Filtri G1/2	44 psi	1D1S
1331467740	BCI24-DF367-1D1S-4		87 psi	
1331437840	BCI24-DF337-1D1A-4		44 psi	1D1A
1331467840	BCI24-DF367-1D1A-4		87 psi	
1331637740	BCI24-DC337-1D1S-4	Eaton G1/2	44 psi	1D1S
1331667740	BCI24-DC367-1D1S-4		87 psi	
1331637840	BCI24-DC337-1D1A-4		44 psi	1D1A
1331667840	BCI24-DC367-1D1A-4		87 psi	

Accessories

Item no.	Type
9144050031	M12x1 4-pin.LED* 5.0 m (16.4 ft) connection
9144050047	M12x1 4-pin 5.0 m (16.4 ft) connection
9144050010	M12x1 4-pin 1.5 m (4.9 ft) connection
9146100158	Straight cable socket M12x1 5-pin

*LED cable not compatible with active IO-Link communication or 4...20 mA signal. Only use in SIO mode.



2.10 Empty

Dieses Kapitel ist derzeit noch nicht belegt.

This chapter is under construction.



2.11 Customized Products

Customized Products

Overview

This chapter contains customized sensor systems. Products from other product ranges like oil coolers are listed in the respective chapter.

Here customized products of the following companies are listed:

- BMW
- Daimler
- Renault

Products and data sheets in detail:

BMW	Data sheet no.
NT 67-XP-DC	100115
NV 77-XP-MA-DC	100116
FC-T-G1/2-NV77-XP-MA-DC	100117

Daimler	Data sheet no.
NT 67-XP-DC	100112
NV 77-XP-MA-DC	100113
FC-T-G1/2-NV77-XP-MA-DC	100114

Renault	Data sheet no.
Nivovent 75 RE	100061
Nivovent 85 RE	100062



Nivovent 75 RE with Thermotronik 71

- RENAULT Specification -

The Nivovent 75 RE with Bühler Easyjust technology is a compact combination of breather filter, level monitor and precise temperature measurement and display with up to two adjustable alarm outputs.

The flange hole pattern standardised to DIN 24557, Part 2 allows for easy installation and using a small yet highly buoyant float.

The easyjust system makes setting the level switching points extremely easy. It consists of a galvanically gold-plated contact strip with cm scale which holds the cordless level contacts or the temperature contact and temperature sensor.

Contact strip and plug-in contacts have a solderless, easy to disconnect connection for easy replacement or modifications and stocking spare parts.

The configuration of the backside of the Nivovent 75 RE is customised to the requirements of Renault. It features two M12 plug bases, a temperature display, preset contacts, and a stilling tube.

Please note, there are other Renault-specific versions of the Nivotemp and Nivovent series.

Combination of air breather, level/temperature monitoring

Adjustable temperature alarm outputs

Wireless, adjustable level contacts

Service indicator in filter cover and filler cap

Replaceable filter elements with qualified retention rate

Highly visible LED display

Connector standard

Easy installation



Technical Data

Basic unit

Operating pressure:	max. 1 bar (14.5 psi)
Operating temperature:	max. 80 °C (176 °F)
Fluid density	min. 0.8 kg/dm ³ (0.029 lb/in ³)

Material

SK 610 float:	Hard PU
Switching tube:	Brass
Flange:	PA

Level contacts

min. contact spacing:	40 mm (1.57 in)
Max. voltage:	24 V
Max. switching current:	0.5 A
Contact load:	10 VA

*NC = NC contact/NO = NO contact, all data with empty tank

Thermotronic 71

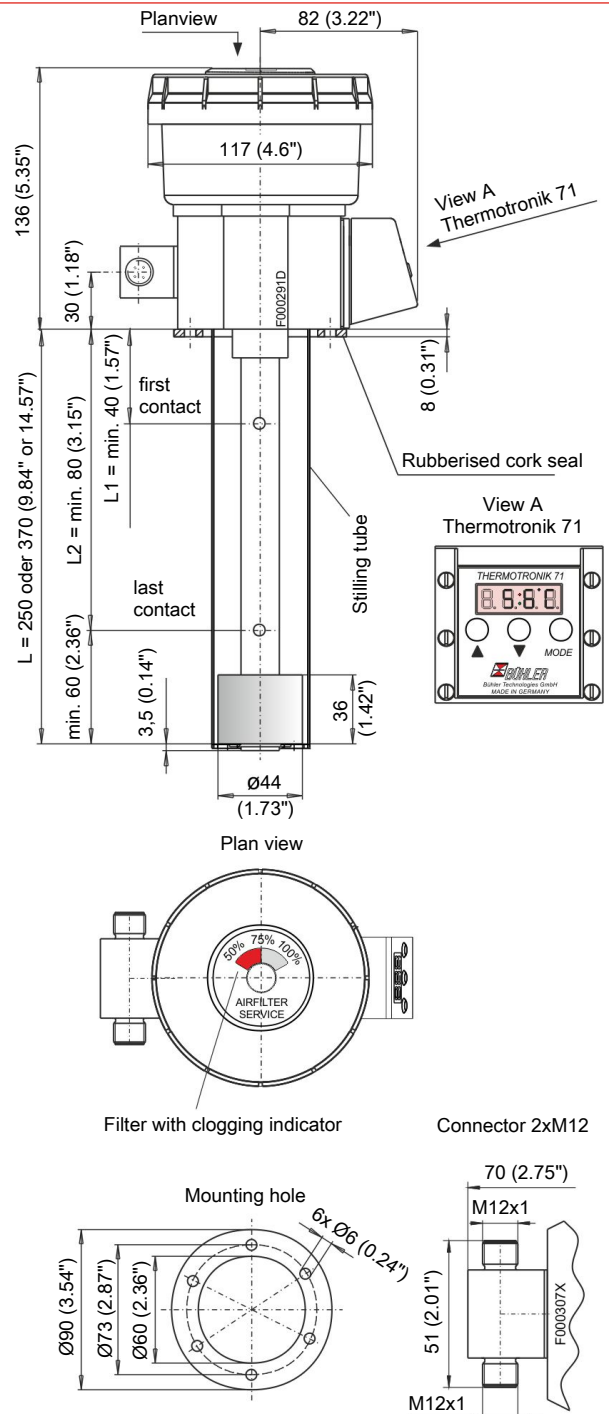
Temperature display range:	approx. -20 to +120 °C/4° to 248 °F
Temperature alarm range:	0 to +99 °C or 32° to 178 °F
Programmable switching points:	max. 2
Housing version:	PA, IP65
Display:	4-digit seven segment LED display
Starting current input:	approx. 140 mA over 100 ms
Current input during operation:	approx. 30 - 50 mA
Supply voltage:	24 V DC ± 10%
Output:	PNP (NC)
Ambient temperature:	0 °C to +70 °C (32 °F to 158 °F)
Accuracy:	1 % of full range
Resolution:	1 °C/2 °F
Operation:	via 3 keys
Temperature sensor:	Pt100

General Description of Thermotronic 71

The Thermotronic 71 is a combined microprocessor controlled temperature display and control unit with one input for Pt100 temperature sensors. The temperature is displayed on a four digit, seven segment LED display. The device also indicates a sensor defect or cable break on the display.

The Thermotronic 71 is programmed via three buttons on the front panel. The settings are protected against unauthorized operation by key lock

Dimensions



Ordering Instructions

Item no.	Plug	Display	Length (L)	L1 =	L2 =	Temperature contact T1	Temperature contact T2	Stilling VA* tube	Filler cap
1075900113	2xM12	Yes	14.57"	11.81"	NO No	T1 = 158 °F PNP (NC)	No	Yes Yes	Yes
1075900118	2xM12	Yes	9.84"	7.87"	NO No	T1 = 158 °F PNP (NC)	No	Yes Yes	Yes
1075900119	2xM12	Yes	14.57"	7.87"	NO 11.42"	NO T1 = 158 °F PNP (NC)	No	Yes Yes	Yes
1075900120	2xM12	Yes	14.57"	5.91"	NO 7.48"	NO T1 = 104 °F PNP (NC)	T2 = 158 °F PNP (NC)	Yes Yes	Yes

*VA = contamination indicator in filter cover

Nivovent 85 RE with Thermotronic 71

- RENAULT Specification -

The Nivovent 85 RE with Bühler Easyjust technology is a compact combination of freely selectable breather filter, level monitor and precise temperature measurement and display with up to two adjustable alarm outputs.

The flange hole pattern standardised to DIN 24557, Part 2 allows for easy installation and using a small yet highly buoyant float.

The easyjust system makes setting the level switching points extremely easy. It consists of a galvanically gold-plated contact strip with cm scale which holds the cordless level contacts or the temperature contact and temperature sensor. Contact strip and plug-in contacts have a solderless, easy to disconnect connection for easy replacement or modifications and stocking spare parts.

The configuration of the backside of the Nivovent 85 RE is customised to the requirements of Renault. It features two M12 plug bases, a temperature display, preset contacts, and a stilling tube. Per Renault specifications, this device is fully equipped with an approved breather filter with contamination indicator and filler cap.

Please note, there are other Renault-specific versions of the Nivotemp and Nivovent series.

Combination of air breather, level/temperature monitoring

Adjustable temperature alarm outputs

Wireless, adjustable level contacts

Hydac breather filter per CNOMO norm, hole pattern
DIN 24557, Part 2

Highly visible LED display

Connector standard

Easy installation

Standard length 250 (9.84"), 370 mm (14.57")



Technical Data

Basic unit

Operating pressure:	max. 1 bar (14.5 psi)
Operating temperature:	max. +80 °C (176 °F)
Fluid density	min. 0.8 kg/dm ³ (0.029 lb/in ³)

Material

SK 610 float:	Hard PU
Switching tube:	Brass
Flange:	PA

Level contacts

min. contact spacing:	40 mm (1.57")
Max. voltage:	24 V
Max. switching current:	0.5 A
Contact load:	10 VA

*NC = NC contact/NO = NO contact, all data with empty tank

Breather filter

Hydac BF 7/-Cnomo

Display:	optic analog vacuum display with manual reset
Display range:	0.35 bar (5.08 psi) = 100 %
Filter fineness	3 µm
Hole pattern	per DIN 24557/T2
Accessories:	Filler cap

Thermotronic 71

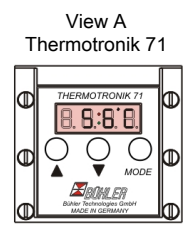
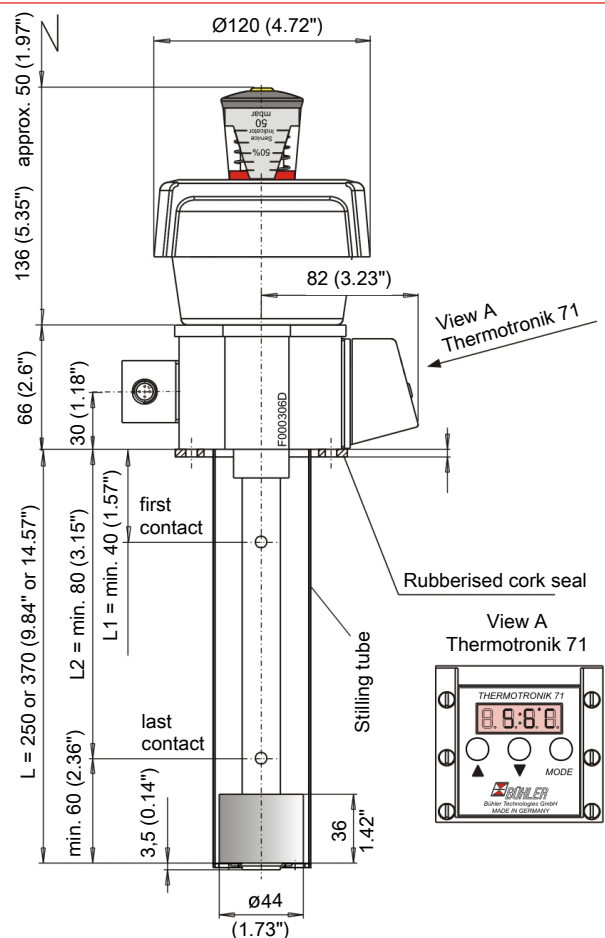
Temperature display range:	approx. -20 to +120 °C/4° to 248 °F
Temperature alarm range:	0 to +99 °C or 32° to 178 °F
Programmable switching points:	max. 2
Housing version:	PA, IP65
Display:	4-digit seven segment LED display
Starting current input:	approx. 140 mA over 100 ms
Current input during operation:	approx. 30 - 50 mA
Supply voltage:	24 V DC ± 10%
Output:	PNP (NC)
Ambient temperature:	0 °C to +70 °C (32 °F to 158 °F)
Accuracy:	1 % of full range
Resolution:	1 °C/2 °F
Operation:	via 3 keys
Temperature sensor:	Pt100

General Description of Thermotronic 71

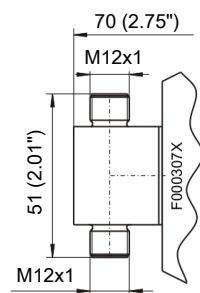
The Thermotronic 71 is a combined microprocessor controlled temperature display and control unit with one input for Pt100 temperature sensors. The temperature is displayed on a four digit, seven segment LED display. The device also indicates a sensor defect or cable break on the display.

The Thermotronic 71 is programmed via three buttons on the front panel. The settings are protected against unauthorized operation by key lock

Dimensions



Connector 2xM12



Ordering Instructions

Item no.	Plug	Display	Length (L)	L1 =	L2 =	Temperature contact T1	Temperature contact T2	Stilling tube
1085900111	2xM12	Yes	14.57"	11.81"	NO No	No	No	Yes
1085900113	2xM12	Yes	14.57"	11.81"	NO No	T1 = 158 °F PNP (NC)	No	Yes
1085900117	2xM12	Yes	9.84"	7.48"	NO No	No	No	Yes
1085900118	2xM12	Yes	9.84"	7.48"	NO No	T1 = 158 °F PNP (NC)	No	Yes

Level- and temperature sensor

Nivotemp NT 67-XP-DC

- Daimler Specification -

In hydraulics and lubrication technology the fill level of oil tanks needs to be monitored continuously. Here, modern factory automation requires compatible signals. Despite central system control, visualising the current level on the actual tanks is often desired. To minimise production costs and the space required on containers, it makes sense to use one monitor for both e.g. the fill level and oil temperature. The Nivotemp series meets virtually all requirements arising in this area of application.

Connecting flange as per DIN 24557 Part 2

Combined, continuous liquid level and oil temperature monitoring

LED display swivels 270°

Menu structure based on VDMA standard sheet 24574 ff.

Two adjustable alarm outputs each for level and temperature

Alternatively one analogue output (current or voltage) for level and temperature plus two parametrisable alarm outputs

IO-Link interface built in

Min/max memory, logbook function

M12 plug base

Proven and tested highly dynamic float system

Immersion tube in matched lengths to max. 1420 mm (55.90 in), other lengths available upon request



Technical Data
Basic Unit

Version	MS
Operating pressure	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 604
Min. fluid density	0.80 kg/dm ³ (0.029 lb/in ³)

Material/Version

Display housing	PA
Float	hard PU
Immersion tube	Brass
Flange (DIN 24557)	PA
Weight at L=280 mm (11.02")	approx. 850 g (1.87 lb)
Each 100 mm (3.94") add	approx. 30 g (0.06 lb)
IP rating	IP65

Analysis Display Electronics

Display	4 character 7 segment LED	
Operation	Via 3 keys	
Memory	Min. / Max. Data memory	
Starting current input	approx. 100 mA for 100 ms	
Current input during operation	approx. 50 mA (without current- and switching outputs)	
Supply voltage (U _B)	10 – 30 V DC (nominal voltage 24 V DC) / with IO-Link 18 – 30 V DC	
Ambient temperature	-20 °C to +70 °C (-4 °F to 158 °F)	
Display units	Level %, cm, L, i, Gal	Temperature °C / °F
Display range	adjustable	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	e.g. 0 – 100 %	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value	± 1 % from end value

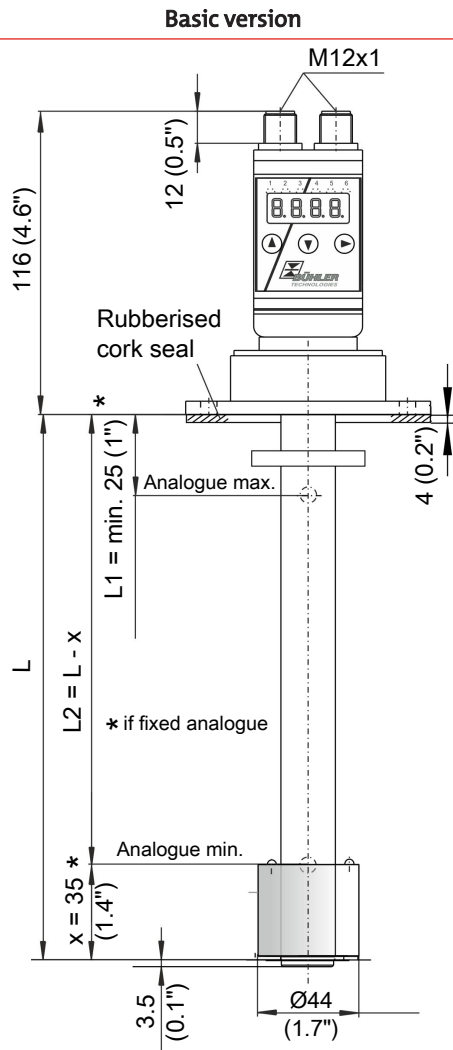
Input values	Level	Temperature
Principle of measurement	Reed-contact Resolution 5 mm (0.2 in)	Pt100 Cl. B, DIN EN 60751 Tolerance ± 0.8 °C (1.44 °F)

Optional switching outputs

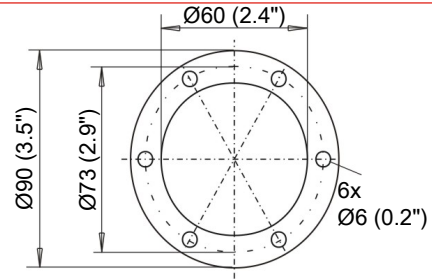
	1D3S	1D1S-KN-KT
Plug (base)	2 x M12 – 4-pin	2 x M12 – 4-pin
Switching outputs (preset per Ordering Instructions [▶ 4])	4 Parametrisable switching outputs Assignment 2 x level/2 x temperature preset or 1 x programmable with assignment options plus IO-Link	2 parametrisable switching outputs with arbitrary assignment level/temperature or 1 x programmable with assignment options plus IO-Link
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total
Analogue outputs		1x level and 1x temperature
Programmable as		4 - 20 mA, 2 - 10 VDC, 0 - 10 VDC, 0 - 5 VDC
Max. burden Ω as current output		(U _B – 8 V) / 0.02 A
Min. input load as voltage output		10 kΩ

*Output 1 max. 0.2 A.

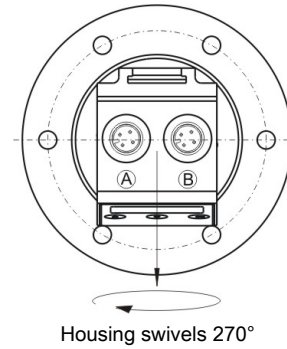
Dimensions



Flange pattern as per DIN 24557 Part 2



Top view



Standard pin assignment

Plug connections

Version	1D3S		1D1S-KN-KT	
Plug	2x M12 4-pin		2x M12 4-pin	
Connection schematic				
Pin				
1	+24 VDC	+24 VDC	+24 VDC	+24 VDC
2	S2 (PNP)	S4 (PNP)	S2 (PNP)	Level (analogue)
3	GND	GND	GND	GND
4	S1 (PNP) *	S3 (PNP)	S1 (PNP)	Temp. (analogue)

* When used as IO-Link, PIN 4 on plug A = C/Q (switching and communications line). Plug B is then not required and must be sealed with a plug to maintain the IP rating (IP65)!

Ordering Instructions

Item no.	Type	Length (L)	Preset Level outputs*	Preset Temperature outputs**
1067901001	NT 67-XP-DC01/280-1D3S	280 mm (11.02")	L1 = 150 mm (5.91") NC (S1) L2 = 190 mm (7.48") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
1067901002	NT 67-XP-DC02/370-1D3S	370 mm (14.57")	L1 = 150 mm (5.91") NC (S1) L2 = 200 mm (7.87") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
1067901003	NT 67-XP-DC03/370-1D3S	370 mm (14.57")	L1 = 200 mm (7.87") NC (S1) L2 = 300 mm (11.81") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
1067901004	NT 67-XP-DC04/500-1D3S	500 mm (19.69")	L1 = 200 mm (7.87") NC (S1) L2 = 300 mm (11.81") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
			* Hysteresis 10 mm (0.39")	** Hysteresis 5 K

with analogue outputs

Item no.	Type	Length (L)	Level (analogue)	Temp. (analogue)
1067901005	NT 67-XP-DC05/280-1D1S-KN-KT	280 mm (11.02")	25 mm (0.98") (20 mA) 245 mm (9.65")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA
1067901006	NT 67-XP-DC06/370-1D1S-KN-KT	370 mm (14.57")	25 mm (0.98") (20 mA) 335 mm (13.98")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA
1067901007	NT 67-XP-DC07/500-1D1S-KN-KT	500 mm (19.69")	25 mm (0.98") (20 mA) 465 mm (18.31")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA

*Function of level switching points NC = falling NO contact, NO = falling NC contact

Level- and temperature sensor

Nivovent NV 77-XP-MA-DC

- Daimler Specification -

The Nivovent NV 77-XP-MA-DC is a compact combo consisting of vent filter, and level and temperature measurement and display. Available with two adjustable alarm outputs each for level and temperature or one analogue output.

The flange hole pattern standardised to DIN 24557, Part 2 allows for easy installation and using a small yet highly buoyant float.

The configuration of the backside of the Nivovent NV 77-XP-MA-DC is customised to the requirements of DaimlerChrysler. It features two M12 plug bases, a display and switching point presets. The versions are equipped for a future IO-Link interface.

Please note our other specific DaimlerChrysler versions.

Connecting flange as per DIN 24557 Part 2

Combined, continuous liquid level and oil temperature monitoring

Two adjustable alarm outputs each for level and temperature

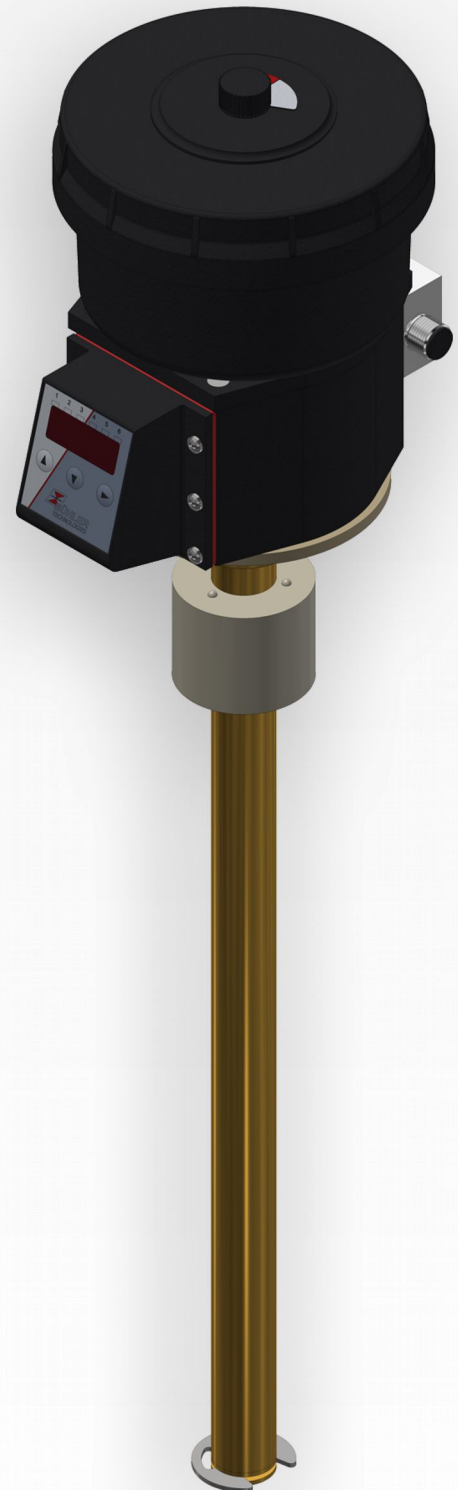
Alternatively one analogue output each (can be set to current or voltage) for level and temperature plus two parametrisable alarm outputs

IO-Link interface built in

In normal mode the LED display shows the actual temperature, with status of the switching outputs

Standard menu structure based on VDMA standard sheet 24574 ff.

Proven and tested highly dynamic float system



Technical Data
Basic Unit

Version	MS
Operating pressure	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 604
Min. fluid density	0.80 kg/dm ³ (0.029 lb/in ³)

Material/Version

Display housing	PA
Float	hard PU
Immersion tube	Brass
Flange (DIN 24557)	PA
Weight at L=280 mm (11.02")	approx. 850 g (1.87 lb)
Each 100 mm (3.94") add	approx. 30 g (0.06 lb)
IP rating	IP65

Vent filter **Filtration Group (Mahle) PI0125 (MA)**

Filter element	SM-L (3 µm)
Additional equipment	Contamination indicator

Analysis Display Electronics

Display	4 character 7 segment LED	
Operation	Via 3 keys	
Memory	Min. / Max. Data memory	
Starting current input	approx. 100 mA for 100 ms	
Current input during operation	approx. 50 mA (without current- and switching outputs)	
Supply voltage (U _b)	10 – 30 V DC (nominal voltage 24 V DC) / with IO-Link 18 – 30 V DC	
Ambient temperature	-20 °C to +70°C (-4 °F to 158 °F)	
Display units	Level	Temperature
	% , cm, L, i, Gal	°C / °F
Display range	adjustable	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	e.g. 0 – 100 %	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value	± 1 % from end value

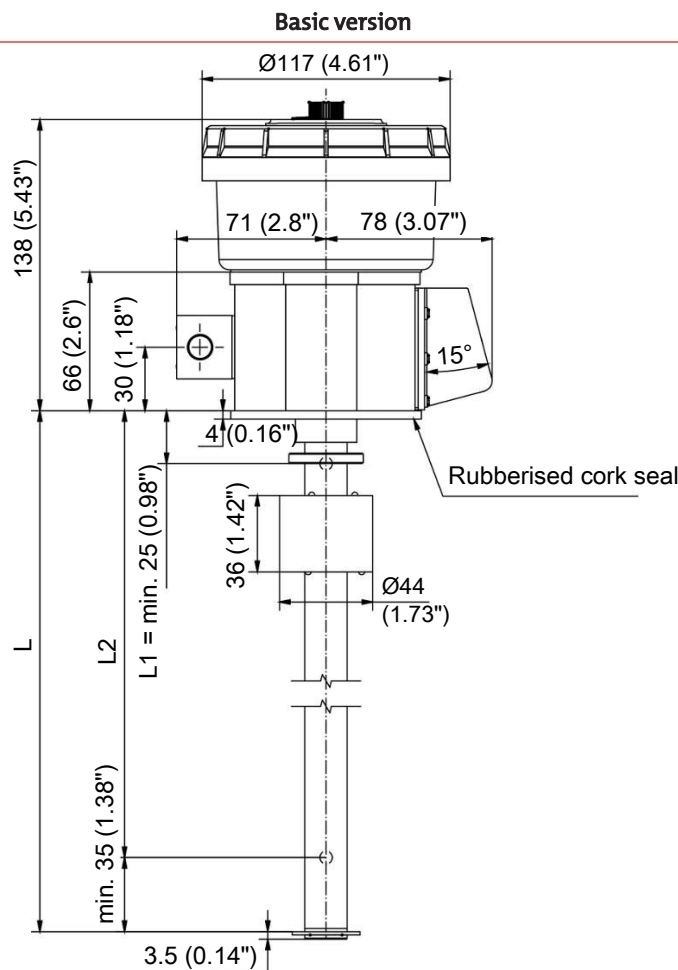
Input values	Level	Temperature
Principle of measurement	Reed-contact	Pt100 Cl. B, DIN EN 60751
	Resolution 5 mm (0.197 in)	Tolerance ± 0.8 °C (1.44 °F)

Optional switching outputs

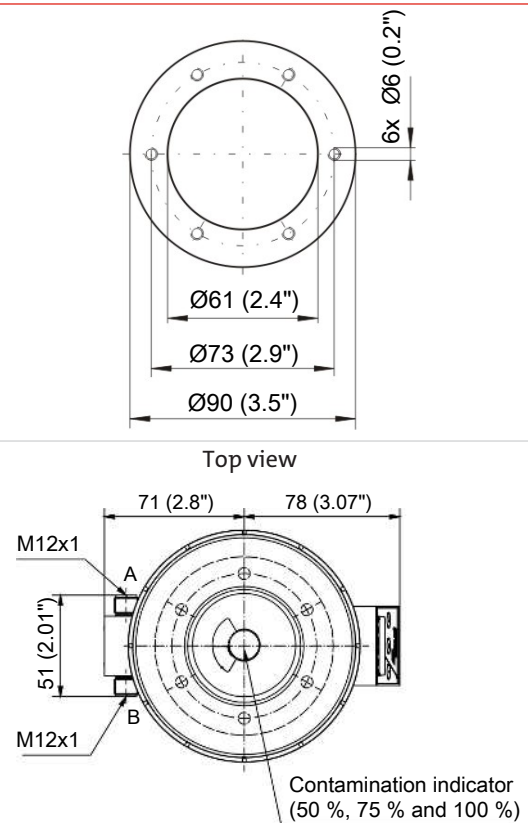
	1D3S	1D1S-KN-KT
Plug (base)	2 x M12 – 4-pin	2 x M12 – 4-pin
Switching outputs (preset per Ordering Instructions [▶ 4])	4 parametrisable switching outputs Assignment 2 x level/2 x temperature preset or 1 x programmable with assignment options plus IO-Link	2 parametrisable switching outputs with arbitrary assignment Level/temperature or 1 x programmable with assignment options plus IO-Link
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total
Analogue outputs		1x level and 1x temperature
Programmable as		4 - 20 mA, 2 - 10 VDC, 0 - 10 VDC, 0 - 5 VDC
Max. burden Ω as current output		$(U_B - 8 V) / 0.02 A$
Min. input load as voltage output		10 k Ω

**Output 1 max. 0.2 A.

Dimensions



Flange pattern as per DIN 24557 Part 2



Standard pin assignment

Plug connection

	2 x M12 (EBS) (galvanically isolated)
Dimensions	
Number of pins	4-pin / 4-pin
DIN EN	61076-2-101
Voltage max.	30 VDC
Contact load max.	0.5 A per output
total max.	1 A

Version	1D3S		1D1S-KN-KT	
Plug	2x M12 4-pin		2x M12 4-pin	
Connection schematic				
Pin				
1	+24 VDC	+24 VDC	+24 VDC	+24 VDC
2	S2 (PNP)	S4 (PNP)	S2 (PNP)	Level (analogue)
3	GND	GND	GND	GND
4	S1 (PNP) *	S3 (PNP)	S1 (PNP)	Temp. (analogue)

* When used as IO-Link, PIN 4 on plug A = C/Q (switching and communications line). Plug B is then not required and must be sealed with a plug to maintain the IP rating (IP65)!

Ordering Instructions

Item no.	Type	Length (L)	Preset Level outputs*	Preset Temperature outputs**
1077900126	NV 77-XP-MA-DC01/280-1D3S	280 mm (11.02")	L1 = 150 mm (5.91") NC (S1) L2 = 190 mm (7.48") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
1077900127	NV 77-XP-MA-DC02/370-1D3S	370 mm (14.57")	L1 = 150 mm (5.91") NC (S1) L2 = 200 mm (7.87") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
1077900128	NV 77-XP-MA-DC03/370-1D3S	370 mm (14.57")	L1 = 200 mm (7.87") NC (S1) L2 = 300 mm (11.81") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
1077900129	NV 77-XP-MA-DC04/500-1D3S	500 mm (19.69")	L1 = 200 mm (7.87") NC (S1) L2 = 300 mm (11.81") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
			* Hysteresis 10 mm (0.39")	** Hysteresis 5 K

with analogue outputs

Item no.	Type	Length (L)	Level (analogue)	Temp. (analogue)
1077900130	NV 77-XP-MA-DC05/280-1D1S-KN-KT	280 mm (11.02")	25 mm (0.98") (20 mA) 245 mm (9.65")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA
1077900131	NV 77-XP-MA-DC06/370-1D1S-KN-KT	370 mm (14.57")	25 mm (0.98") (20 mA) 335 mm (13.98")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA
1077900132	NV 77-XP-MA-DC07/500-1D1S-KN-KT	500 mm (19.69")	25 mm (0.98") (20 mA) 465 mm (18.31")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA

*Function of level switching points NC = falling NO contact, NO = falling NC contact

Fluidcontrolterminal FC-T-G1/2-NV77-XP-MA-DC



Fluidcontrol



- Daimler Specification -

Rapid filling and short oil change times require fixed connection points to connect factory standard circulation units quick and clean. Since hydraulic units are typically always crowded and to minimise installation for all of these functions, the Fluidcontrolterminal was designed. The flange with a connection bore pattern standardised for vent filters as per DIN 24557, Part 2 holds the vent filter, filling port as well as the level and temperature monitor.

The configuration of the backside of the Fluidcontrolterminal FC-T-G1/2-NV77-XP-MA-DC is customised to the requirements of Daimler. It features two M12 plug bases, a temperature display and preset switching points. Please note, there are other Daimler specific versions of the Nivotemp and Nivovent series.

Connecting flange as per DIN 24557, Part 2

Combined, continuous liquid level and oil temperature monitoring

Two adjustable alarm outputs each for level and temperature

Alternatively one analogue output each (can be set to current or voltage) for level and temperature plus two parametrisable alarm outputs

IO-Link interface built in

In normal mode the LED display shows the actual temperature, with status of the switching outputs

Standard menu structure based on VDMA standard sheet 24574 ff.

Filling port G1/2

Vent filter with filler cap

Contamination indicator

Low installation costs

Modular design (filling port and level switch)



Technical Data

Basic Unit

Operating pressure	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)
Fluid density	min. 0.8 kg/dm ³ (0.029 lb/in ³)
Weight at L = 500 mm (19.69")	approx. 5 kg (11 lb)

Material

Float SK 604	Hard PU
Switching tube	Brass
Stilling tube	Brass
Flange	Galvanised steel
Seals	Rubber cork/NBR/FKM

Level switch housing	PA
Filter housing/display	PA
Filter element	SM-L (3 µm)

Vent filter **Filtration Group (Mahle) PI0125 (MA)**

Filter element	SM-L (3 µm)
Additional equipment	Contamination indicator

Analysis display electronics

Display	4 character 7 segment LED
Operation	Via 3 keys
Memory	Min./Max. data memory
Starting current input	approx. 100 mA for 100 ms
Current input during operation	approx. 50 mA (without current- and switching outputs)
Supply voltage (UB)	10 - 30 VDC (nominal voltage 24 VDC)/with IO-Link 18 - 30 VDC
Ambient temperature	-20 °C to +70 °C (-4 °F to 158 °F)

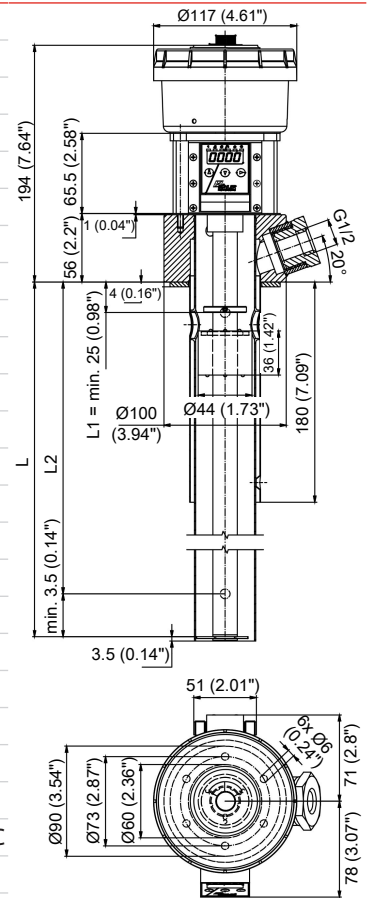
Display units	Level	Temperature
	% , cm , L , i , Gal	°C , °F

Display range	adjustable	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	e.g. 0 to 100 %	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value	± 1 % from end value

Input values **Level** **Temperature**

Display housing	Reed-contact	Pt100 Cl. B, DIN EN 60751
	Resolution 5mm	Tolerance ± 0.8 °C

Dimensions



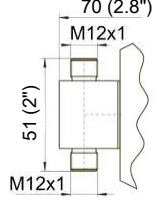
Fixing hole pattern as per DIN 24557, Part 2

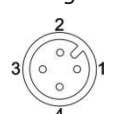
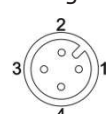
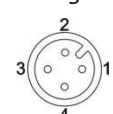
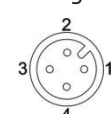
Optional switching outputs	1D3S	1D1S-KN-KT
Plug (base)	2 x M12 – 4-pin	2 x M12 – 4-pin
Switching outputs (preset per Ordering Instructions [▶ 3])	4 parametrisable switching outputs Assignment 2 x level/2 x temperature preset or 1 x programmable with assignment options plus IO-Link	2 parametrisable switching outputs with arbitrary assignment level/temperature or 1 x programmable with assignment options plus IO-Link
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current*	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total
Analogue outputs		1x level and 1x temperature
Programmable as		4 - 20 mA, 2 - 10 VDC, 0 - 10 VDC, 0 - 5 VDC
Max. burden Ω as current output		(U _B - 8 V) / 0.02 A
Min. input load as voltage output		10 kΩ

**Output 1 max. 0.2 A.

Standard pin assignment

Plug connection

	2 x M12 (EBS) (galvanically isolated)
Dimensions	
Number of pins	4-pin / 4-pin
DIN EN	61076-2-101
Voltage max.	30 VDC
Contact load max.	0.5 A per output
total max.	1 A

Version	1D3S		1D15-KN-KT	
Plug	2x M12 4-pin		2x M12 4-pin	
Connection schematic				
Pin				
1	+24 VDC	+24 VDC	+24 VDC	+24 VDC
2	S2 (PNP)	S4 (PNP)	S2 (PNP)	Level (analogue)
3	GND	GND	GND	GND
4	S1 (PNP) *	S3 (PNP)	S1 (PNP)	Temp. (analogue)

* When used as IO-Link, PIN 4 on plug A = C/Q (switching and communications line). Plug B is then not required and must be sealed with a plug to maintain the IP rating (IP65)!

Ordering Instructions

Item no.	Type	Length (L)	Preset Level*	Preset Temperature**
101177900301	FCT-G1/2-NV77XP-MA-DC01/280-1D3S	280 mm (11.02")	L1 = 150 mm (5.91") NC (S1) L2 = 190 mm (7.48") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
101177900302	FCT-G1/2-NV77XP-MA-DC02/370-1D3S	370 mm (14.47")	L1 = 150 mm (5.91") NC (S1) L2 = 200 mm (7.87") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
101177900303	FCT-G1/2-NV77XP-MA-DC03/370-1D3S	370 mm (14.57")	L1 = 200 mm (7.87") NC (S1) L2 = 300 mm (11.81") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
101177900304	FCT-G1/2-NV77XP-MA-DC04/500-1D3S	500 mm (19.69")	L1 = 200 mm (7.87") NC (S1) L2 = 300 mm (11.81") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
			* Hysteresis 10 mm (0.39")	** Hysteresis 5 K

with analogue outputs

Item no.	Type	Length (L)	Level (analogue)	Temp. (analogue)
101177900305	FCT-G1/2-NV77XP-MA-DC05/280-1D15-KN-KT	280 mm (11.02")	25 mm (0.08") (20 mA) 245 mm (9.65")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA
101177900306	FCT-G1/2-NV77XP-MA-DC06/370-1D15-KN-KT	370 mm (14.57")	25 mm (0.08") (20 mA) 335 mm (13.98")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA
101177900307	FCT-G1/2-NV77XP-MA-DC06/500-1D15-KN-KT	500 mm (19.69")	25 mm (0.98") (20 mA) 465 mm (18.31")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA

*Function of level switching points NC = falling NO contact, NO = falling NC contact

Level- and temperature sensor

Nivotemp NT 67-XP-DC

- BMW Specification -

In hydraulics and lubrication technology the fill level of oil tanks needs to be monitored continuously. Here, modern factory automation requires compatible signals. Despite central system control, visualising the current level on the actual tanks is often desired. To minimise production costs and the space required on containers, it makes sense to use one monitor for both e.g. the fill level and oil temperature. The Nivotemp series meets virtually all requirements arising in this area of application.

Connecting flange as per DIN 24557 Part 2

Combined, continuous liquid level and oil temperature monitoring

LED display swivels 270°

Menu structure based on VDMA standard sheet 24574 ff.

Two adjustable alarm outputs each for level and temperature

Alternatively one analogue output (current or voltage) for level and temperature plus two parametrisable alarm outputs

IO-Link interface built in

Min/max memory, logbook function

M12 plug base

Proven and tested highly dynamic float system

Immersion tube in matched lengths to max. 1420 mm (55.90 in), other lengths available upon request



Technical Data
Basic Unit

Version	MS
Operating pressure	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 604
Min. fluid density	0.80 kg/dm ³ (0.029 lb/in ³)

Material/Version

Display housing	PA
Float	hard PU
Immersion tube	Brass
Flange (DIN 24557)	PA
Weight at L=280 mm (11.02")	approx. 850 g (1.87 lb)
Each 100 mm (3.94") add	approx. 30 g (0.06 lb)
IP rating	IP65

Analysis Display Electronics

Display	4 character 7 segment LED	
Operation	Via 3 keys	
Memory	Min. / Max. Data memory	
Starting current input	approx. 100 mA for 100 ms	
Current input during operation	approx. 50 mA (without current- and switching outputs)	
Supply voltage (U _B)	10 – 30 V DC (nominal voltage 24 V DC) / with IO-Link 18 – 30 V DC	
Ambient temperature	-20 °C to +70 °C (-4 °F to 158 °F)	
Display units	Level %, cm, L, i, Gal	Temperature °C / °F
Display range	adjustable	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	e.g. 0 – 100 %	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value	± 1 % from end value

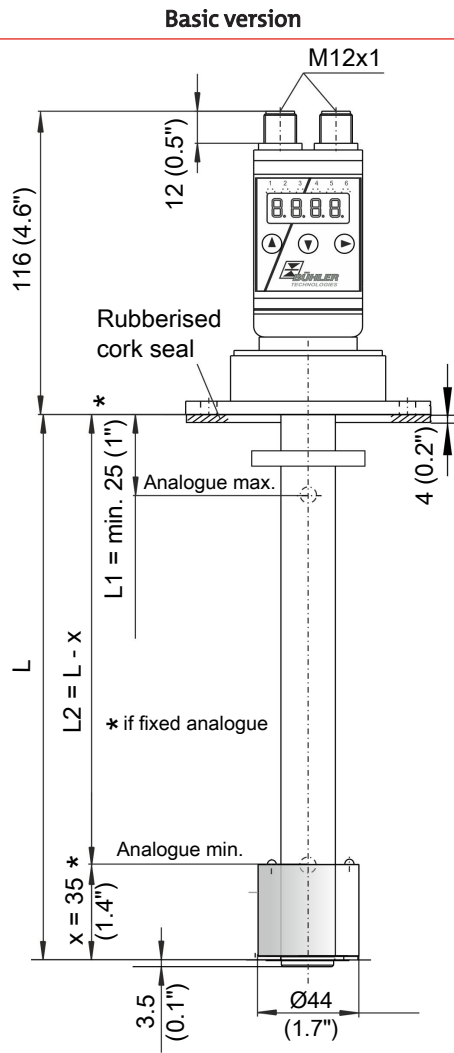
Input values	Level	Temperature
Principle of measurement	Reed-contact Resolution 5 mm (0.2 in)	Pt100 Cl. B, DIN EN 60751 Tolerance ± 0.8 °C (1.44 °F)

Optional switching outputs

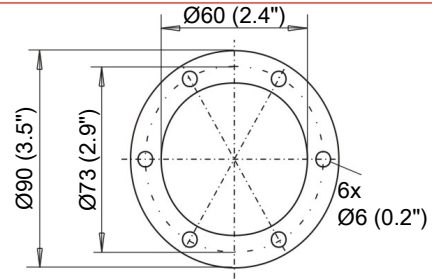
	1D3S	1D1S-KN-KT
Plug (base)	2 x M12 – 4-pin	2 x M12 – 4-pin
Switching outputs (preset per Ordering Instructions)	4 Parametrisable switching outputs Assignment 2 x level/2 x temperature preset or 1 x programmable with assignment options plus IO-Link	2 parametrisable switching outputs with arbitrary assignment level/temperature or 1 x programmable with assignment options plus IO-Link
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total
Analogue outputs		1x level and 1x temperature
Programmable as		4 - 20 mA, 2 - 10 VDC, 0 - 10 VDC, 0 - 5 VDC
Max. burden Ω as current output		(U _B – 8 V) / 0.02 A
Min. input load as voltage output		10 kΩ

*Output 1 max. 0.2 A.

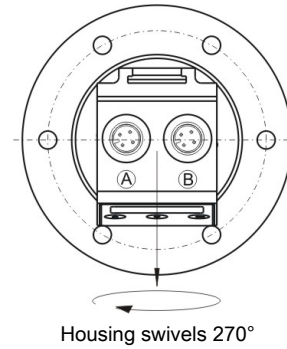
Dimensions



Flange pattern as per DIN 24557 Part 2



Top view



Standard pin assignment

Plug connections

Version	1D3S		1D1S-KN-KT	
Plug	2x M12 4-pin		2x M12 4-pin	
Connection schematic	<p>Plug A</p>	<p>Plug B</p>	<p>Plug A</p>	<p>Plug B</p>
Pin				
1	+24 VDC	+24 VDC	+24 VDC	+24 VDC
2	S2 (PNP)	S4 (PNP)	S2 (PNP)	Level (analogue)
3	GND	GND	GND	GND
4	S1 (PNP) *	S3 (PNP)	S1 (PNP)	Temp. (analogue)

* When used as IO-Link, PIN 4 on plug A = C/Q (switching and communications line). Plug B is then not required and must be sealed with a plug to maintain the IP rating (IP65)!

Ordering Instructions

Item no.	Type	Length (L)	Preset Level outputs*	Preset Temperature outputs**
1067901001	NT 67-XP-DC01/280-1D3S	280 mm (11.02")	L1 = 150 mm (5.91") NC (S1) L2 = 190 mm (7.48") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
1067901002	NT 67-XP-DC02/370-1D3S	370 mm (14.57")	L1 = 150 mm (5.91") NC (S1) L2 = 200 mm (7.87") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
1067901003	NT 67-XP-DC03/370-1D3S	370 mm (14.57")	L1 = 200 mm (7.87") NC (S1) L2 = 300 mm (11.81") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
1067901004	NT 67-XP-DC04/500-1D3S	500 mm (19.69")	L1 = 200 mm (7.87") NC (S1) L2 = 300 mm (11.81") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
			* Hysteresis 10 mm (0.39")	** Hysteresis 5 K

with analogue outputs

Item no.	Type	Length (L)	Level (analogue)	Temp. (analogue)
1067901005	NT 67-XP-DC05/280-1D1S-KN-KT	280 mm (11.02")	25 mm (0.98") (20 mA) 245 mm (9.65")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA
1067901006	NT 67-XP-DC06/370-1D1S-KN-KT	370 mm (14.57")	25 mm (0.98") (20 mA) 335 mm (13.98")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA
1067901007	NT 67-XP-DC07/500-1D1S-KN-KT	500 mm (19.69")	25 mm (0.98") (20 mA) 465 mm (18.31")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA

*Function of level switching points NC = falling NO contact, NO = falling NC contact

Level- and temperature sensor

Nivovent NV 77-XP-MA-DC

- BMW Specification -

The Nivovent NV 77-XP-MA-DC is a compact combo consisting of vent filter, and level and temperature measurement and display. Available with two adjustable alarm outputs each for level and temperature or one analogue output.

The flange hole pattern standardised to DIN 24557, Part 2 allows for easy installation and using a small yet highly buoyant float.

The configuration of the backside of the Nivovent NV 77-XP-MA-DC is customised to the requirements of BMW. It features two M12 plug bases, a display and switching point presets. The versions are equipped for a future IO-Link interface.

Please note our other specific BMW versions.

Connecting flange as per DIN 24557 Part 2

Combined, continuous liquid level and oil temperature monitoring

Two adjustable alarm outputs each for level and temperature

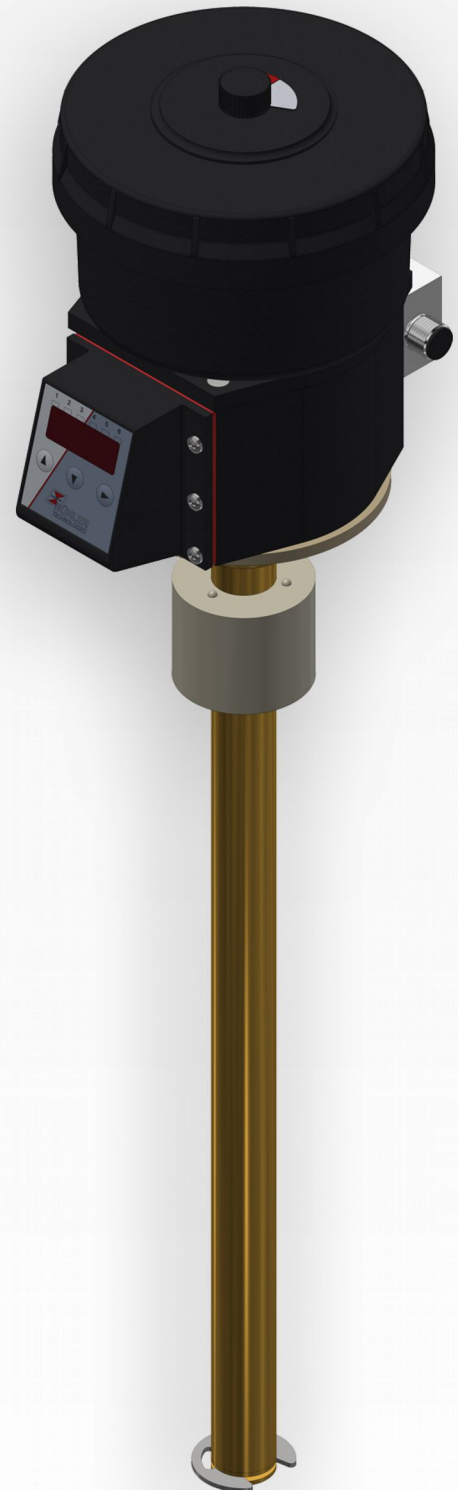
Alternatively one analogue output each (can be set to current or voltage) for level and temperature plus two parametrisable alarm outputs

IO-Link interface built in

In normal mode the LED display shows the actual temperature, with status of the switching outputs

Standard menu structure based on VDMA standard sheet 24574 ff.

Proven and tested highly dynamic float system



Technical Data
Basic Unit

Version	MS
Operating pressure	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 604
Min. fluid density	0.80 kg/dm ³ (0.029 lb/in ³)

Material/Version

Display housing	PA
Float	hard PU
Immersion tube	Brass
Flange (DIN 24557)	PA
Weight at L=280 mm (11.02")	approx. 850 g (1.87 lb)
Each 100 mm (3.94") add	approx. 30 g (0.06 lb)
IP rating	IP65

Vent filter **Filtration Group (Mahle) PI0125 (MA)**

Filter element	SM-L (3 µm)
Additional equipment	Contamination indicator

Analysis Display Electronics

Display	4 character 7 segment LED	
Operation	Via 3 keys	
Memory	Min. / Max. Data memory	
Starting current input	approx. 100 mA for 100 ms	
Current input during operation	approx. 50 mA (without current- and switching outputs)	
Supply voltage (U _b)	10 – 30 V DC (nominal voltage 24 V DC) / with IO-Link 18 – 30 V DC	
Ambient temperature	-20 °C to +70°C (-4 °F to 158 °F)	
Display units	Level	Temperature
	% , cm, L, i, Gal	°C / °F
Display range	adjustable	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	e.g. 0 – 100 %	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value	± 1 % from end value

Input values	Level	Temperature
Principle of measurement	Reed-contact	Pt100 Cl. B, DIN EN 60751
	Resolution 5 mm (0.197 in)	Tolerance ± 0.8 °C (1.44 °F)

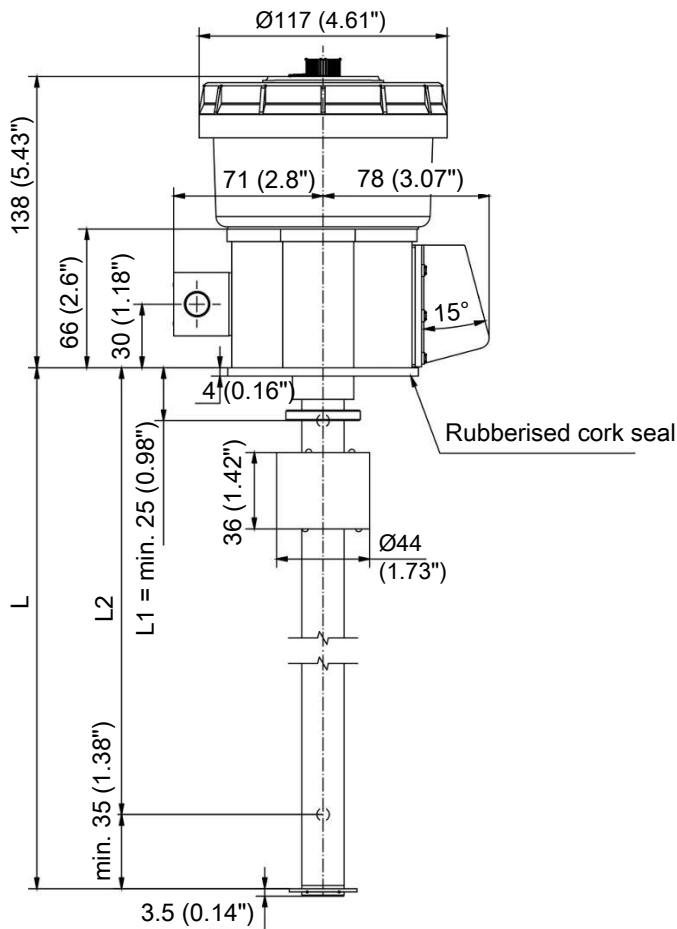
Optional switching outputs

	1D3S	1D1S-KN-KT
Plug (base)	2 x M12 – 4-pin	2 x M12 – 4-pin
Switching outputs (preset per Ordering Instructions)	4 parametrisable switching outputs Assignment 2 x level/2 x temperature preset or 1 x programmable with assignment options plus IO-Link	2 parametrisable switching outputs with arbitrary assignment Level/temperature or 1 x programmable with assignment options plus IO-Link
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total
Analogue outputs		1x level and 1x temperature
Programmable as		4 - 20 mA, 2 - 10 VDC, 0 - 10 VDC, 0 - 5 VDC
Max. burden Ω as current output		$(U_B - 8 V) / 0.02 A$
Min. input load as voltage output		10 k Ω

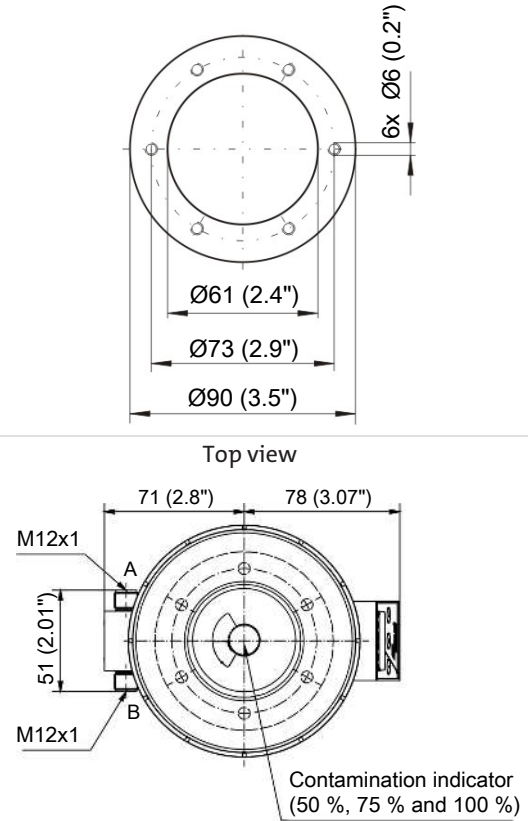
**Output 1 max. 0.2 A.

Dimensions

Basic version

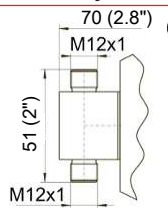


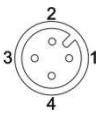
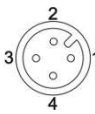
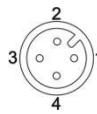
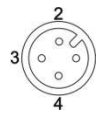
Flange pattern as per DIN 24557 Part 2



Standard pin assignment

Plug connection

	2 x M12 (EBS) (galvanically isolated)
Dimensions	
Number of pins	4-pin / 4-pin
DIN EN	61076-2-101
Voltage max.	30 VDC
Contact load max.	0.5 A per output
total max.	1 A

Version	1D3S		1D15-KN-KT	
Plug	2x M12 4-pin		2x M12 4-pin	
Connection schematic				
Pin				
1	+24 VDC	+24 VDC	+24 VDC	+24 VDC
2	S2 (PNP)	S4 (PNP)	S2 (PNP)	Level (analogue)
3	GND	GND	GND	GND
4	S1 (PNP) *	S3 (PNP)	S1 (PNP)	Temp. (analogue)

* When used as IO-Link, PIN 4 on plug A = C/Q (switching and communications line). Plug B is then not required and must be sealed with a plug to maintain the IP rating (IP65)!

Ordering Instructions

Item no.	Type	Length (L)	Preset Level outputs*	Preset Temperature outputs**
1077900126	NV 77-XP-MA-DC01/280-1D3S	280 mm (11.02")	L1 = 150 mm (5.91") NC (S1) L2 = 190 mm (7.48") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
1077900127	NV 77-XP-MA-DC02/370-1D3S	370 mm (14.57")	L1 = 150 mm (5.91") NC (S1) L2 = 200 mm (7.87") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
1077900128	NV 77-XP-MA-DC03/370-1D3S	370 mm (14.57")	L1 = 200 mm (7.87") NC (S1) L2 = 300 mm (11.81") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
1077900129	NV 77-XP-MA-DC04/500-1D3S	500 mm (19.69")	L1 = 200 mm (7.87") NC (S1) L2 = 300 mm (11.81") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
			* Hysteresis 10 mm (0.39")	** Hysteresis 5 K

with analogue outputs

Item no.	Type	Length (L)	Level (analogue)	Temp. (analogue)
1077900130	NV 77-XP-MA-DC05/280-1D15-KN-KT	280 mm (11.02")	25 mm (0.98") (20 mA) 245 mm (9.65")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA
1077900131	NV 77-XP-MA-DC06/370-1D15-KN-KT	370 mm (14.57")	25 mm (0.98") (20 mA) 335 mm (13.98")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA
1077900132	NV 77-XP-MA-DC07/500-1D15-KN-KT	500 mm (19.69")	25 mm (0.98") (20 mA) 465 mm (18.31")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA

*Function of level switching points NC = falling NO contact, NO = falling NC contact

Fluidcontrolterminal FC-T-G1/2-NV77-XP-MA-DC



Fluidcontrol



- BMW Specification -

Rapid filling and short oil change times require fixed connection points to connect factory standard circulation units quick and clean. Since hydraulic units are typically always crowded and to minimise installation for all of these functions, the Fluidcontrolterminal was designed. The flange with a connection bore pattern standardised for vent filters as per DIN 24557, Part 2 holds the vent filter, filling port as well as the level and temperature monitor.

The configuration of the backside of the Fluidcontrolterminal FC-T-G1/2-NV77-XP-MA-DC is customised to the requirements of BMW. It features two M12 plug bases, a temperature display and preset switching points. Please note, there are other BMW specific versions of the Nivotemp and Nivovent series.

Connecting flange as per DIN 24557, Part 2

Combined, continuous liquid level and oil temperature monitoring

Two adjustable alarm outputs each for level and temperature

Alternatively one analogue output each (can be set to current or voltage) for level and temperature plus two parametrisable alarm outputs

IO-Link interface built in

In normal mode the LED display shows the actual temperature, with status of the switching outputs

Standard menu structure based on VDMA standard sheet 24574 ff.

Filling port G1/2

Vent filter with filler cap

Contamination indicator

Low installation costs

Modular design (filling port and level switch)



Technical Data

Basic Unit

Operating pressure	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)
Fluid density	min. 0.8 kg/dm ³ (0.029 lb/in ³)
Weight at L = 500 mm (19.69")	approx. 5 kg (11 lb)

Material

Float SK 604	Hard PU
Switching tube	Brass
Stilling tube	Brass
Flange	Galvanised steel
Seals	Rubber cork/NBR/FKM
Level switch housing	PA
Filter housing/display	PA
Filter element	SM-L (3 µm)

Vent filter **Filtration Group (Mahle) PI0125 (MA)**

Filter element	SM-L (3 µm)
Additional equipment	Contamination indicator

Analysis display electronics

Display	4 character 7 segment LED
Operation	Via 3 keys
Memory	Min./Max. data memory
Starting current input	approx. 100 mA for 100 ms
Current input during operation	approx. 50 mA (without current- and switching outputs)
Supply voltage (UB)	10 - 30 VDC (nominal voltage 24 VDC)/with IO-Link 18 - 30 VDC

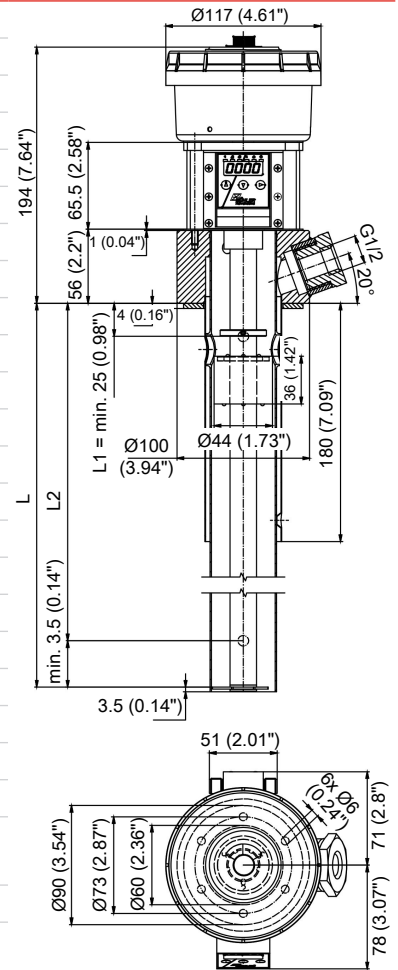
Ambient temperature	-20 °C to +70 °C (-4 °F to 158 °F)	
Display units	Level	Temperature
	% , cm , L , i , Gal	°C , °F

Display range	adjustable	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	e.g. 0 to 100 %	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value	± 1 % from end value

Input values **Level** **Temperature**

Display housing	Reed-contact Resolution 5mm	Pt100 Cl. B, DIN EN 60751 Tolerance ± 0.8 °C
-----------------	--------------------------------	---

Dimensions



Fixing hole pattern as per DIN 24557, Part 2

Optional switching outputs	1D3S	1D1S-KN-KT
Plug (base)	2 x M12 – 4-pin	2 x M12 – 4-pin
Switching outputs (preset per Ordering Instructions)	4 parametrisable switching outputs Assignment 2 x level/2 x temperature preset or 1 x programmable with assignment options plus IO-Link	2 parametrisable switching outputs with arbitrary assignment level/temperature or 1 x programmable with assignment options plus IO-Link
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current*	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total
Analogue outputs		1x level and 1x temperature
Programmable as		4 - 20 mA, 2 - 10 VDC, 0 - 10 VDC, 0 - 5 VDC
Max. burden Ω as current output		$(U_B - 8 V) / 0.02 A$
Min. input load as voltage output		10 k Ω

**Output 1 max. 0.2 A.

Standard pin assignment

Plug connection

	2 x M12 (EBS) (galvanically isolated)
Dimensions	
Number of pins	4-pin / 4-pin
DIN EN	61076-2-101
Voltage max.	30 VDC
Contact load max.	0.5 A per output
total max.	1 A

Version	1D3S		1D1S-KN-KT	
Plug	2x M12 4-pin		2x M12 4-pin	
Connection schematic	Plug A 	Plug B 	Plug A 	Plug B
Pin				
1	+24 VDC	+24 VDC	+24 VDC	+24 VDC
2	S2 (PNP)	S4 (PNP)	S2 (PNP)	Level (analogue)
3	GND	GND	GND	GND
4	S1 (PNP) *	S3 (PNP)	S1 (PNP)	Temp. (analogue)

* When used as IO-Link, PIN 4 on plug A = C/Q (switching and communications line). Plug B is then not required and must be sealed with a plug to maintain the IP rating (IP65)!

Ordering Instructions

Item no.	Type	Length (L)	Preset Level*	Preset Temperature**
101177900301	FCT-G1/2-NV77XP-MA-DC01/280-1D3S	280 mm (11.02")	L1 = 150 mm (5.91") NC (S1) L2 = 190 mm (7.48") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
101177900302	FCT-G1/2-NV77XP-MA-DC02/370-1D3S	370 mm (14.47")	L1 = 150 mm (5.91") NC (S1) L2 = 200 mm (7.87") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
101177900303	FCT-G1/2-NV77XP-MA-DC03/370-1D3S	370 mm (14.57")	L1 = 200 mm (7.87") NC (S1) L2 = 300 mm (11.81") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
101177900304	FCT-G1/2-NV77XP-MA-DC04/500-1D3S	500 mm (19.69")	L1 = 200 mm (7.87") NC (S1) L2 = 300 mm (11.81") NO (S2)	T1 = 50 °C (122 °F) NC (S3) T2 = 60 °C (140 °F) NC (S4)
			* Hysteresis 10 mm (0.39")	** Hysteresis 5 K

with analogue outputs

Item no.	Type	Length (L)	Level (analogue)	Temp. (analogue)
101177900305	FCT-G1/2-NV77XP-MA-DC05/280-1D1S-KN-KT	280 mm (11.02")	25 mm (0.08") (20 mA) 245 mm (9.65")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA
101177900306	FCT-G1/2-NV77XP-MA-DC06/370-1D1S-KN-KT	370 mm (14.57")	25 mm (0.08") (20 mA) 335 mm (13.98")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA
101177900307	FCT-G1/2-NV77XP-MA-DC06/500-1D1S-KN-KT	500 mm (19.69")	25 mm (0.98") (20 mA) 465 mm (18.31")-(4 mA)	0 °C (32 °F) = 4 mA 100 °C (212 °F) = 20 mA

*Function of level switching points NC = falling NO contact, NO = falling NC contact



2.12 Approved Devices

Controls with approval

Overview



Devices for use in explosive areas

Data sheet no.

Level switch for in-tank installation

Nivotemp M-MS/-VA ATEX

10 0009

Nivotemp 61-Z0-ATEX

11 0014

Level switches for on-tank installation

NS25/15-ATEX, NS25/25-ATEX

20 0012

Temperature sensor/switch

Temperature sensor TF-M/TF-E-ATEX

11 0009

Temperature switch TSM/TSE-ATEX

11 0010

Temperature switch TSK-ATEX

11 0011

Temperature switch TSA/TÖA-ATEX

11 0012

Switch amplifier for ATEX level switch

see chapter "Standard Controller"



On-tank level switch, DNV · GL certified

NS 25/15 AM G1/2 -DNV, NS 25/15 AM G1/2 -DNV

20 0011



Devices meeting DESINA standard

Level switch for in-tank installation

Nivotemp 63 K/KN-DESINA

10 0044

Temperature sensor/switch

Thermolog MK2/EK2 DESINA

11 0008



Overfill safety per Federal Water Act

Nivotemp 63-WHG

10 0008





Level and temperature switch

NT M...-Atex

The NT M...-Atex is used to monitor the liquid level and temperature in simple hydraulic systems. This series consists of simple electrical equipment without a separate voltage source. In the case of intrinsically safe connections as per EN 60079-14, the level switch can be used in Zone 2 (group IIC, device category 3G) explosive areas; this also applies to the inner zone of the tank. The NT M...-Atex can be used in temperature class T4.

This unit further has a particularly buoyant float despite its small dimensions. The bistable reed contacts can later be adjusted.

ATEX applications: Zone 2 (cat. 3G), simple electric equipment according to EN 60079-11

Various plug options

Level/temperature monitoring

Adjustable level contacts

Bistable = only one float

Particularly buoyant float

Connector standard

Easy installation

Maintenance free



Technical Data

NT M...-Atex

Operating pressure:	max. 14.5 psi	
Medium /operating temperature:	max. +176 °F (C7 and M3 plug) max. +158 °F (M12 plug)	
Ambient temperature:	-4 to +176 °F (C7 and M3 plug) -4 to +158 °F (M12 plug)	
Fluid density:	min. 0.029 lb/in ³	
Material	MS	VA
Switching tube:	Brass	1.4571
Flange:	Brass	1.4571
Float SK 161	NBR	NBR
Level contacts	K8	W9
Function	NC/NO*	Changeover contact
Min. contact spacing	40 mm (1.6 in)	40 mm (1.6 in)
Temperature contacts		
Switch-back difference:	15 K ± 5 K	
Switching point:		
	NC*	NO*
	50 °C (122 °F)	TMÖ-50 -
	55 °C (131 °F)	- TMS-55
	60 °C (140 °F)	TMÖ-60 TMS-60
	70 °C (158 °F)	TMÖ-70 TMS-70
	80 °C (176 °F)	TMÖ-80 TMS-80

Other temperatures available upon request

*NC = NC contact/NO = NO contact All data for rising temperature

Pt100 resistance thermometer

(Pt100 class B DIN / IEC 751)

Tolerance:	± 0.8 K
Measuring current I_c :	≤ 1 mA
P_i :	100 mW
U_i :	30 V
I_i :	50 mA
L_i, C_i :	negligible

Accessories

Connection cable M12x1 (5-pin) 3.0 m (9.8 ft) long, item no.: 9144050018

Adapter G3/4 to G1, item no.: 1011000

Adapter G3/4 to oval flange, item no.: 1012000

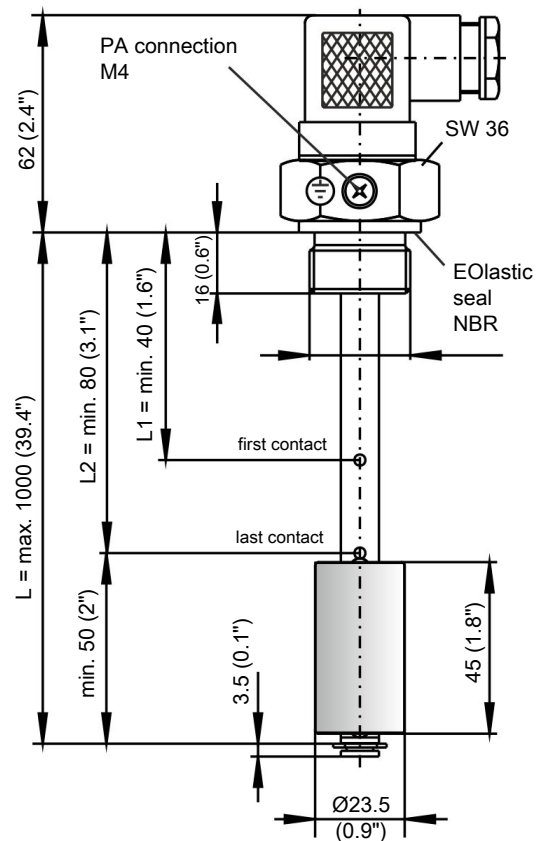
The device is suitable for use in ATEX category II 3 G Ex ic IIC T4 Gc.

The level switches may only be operated on intrinsically-safe circuits!

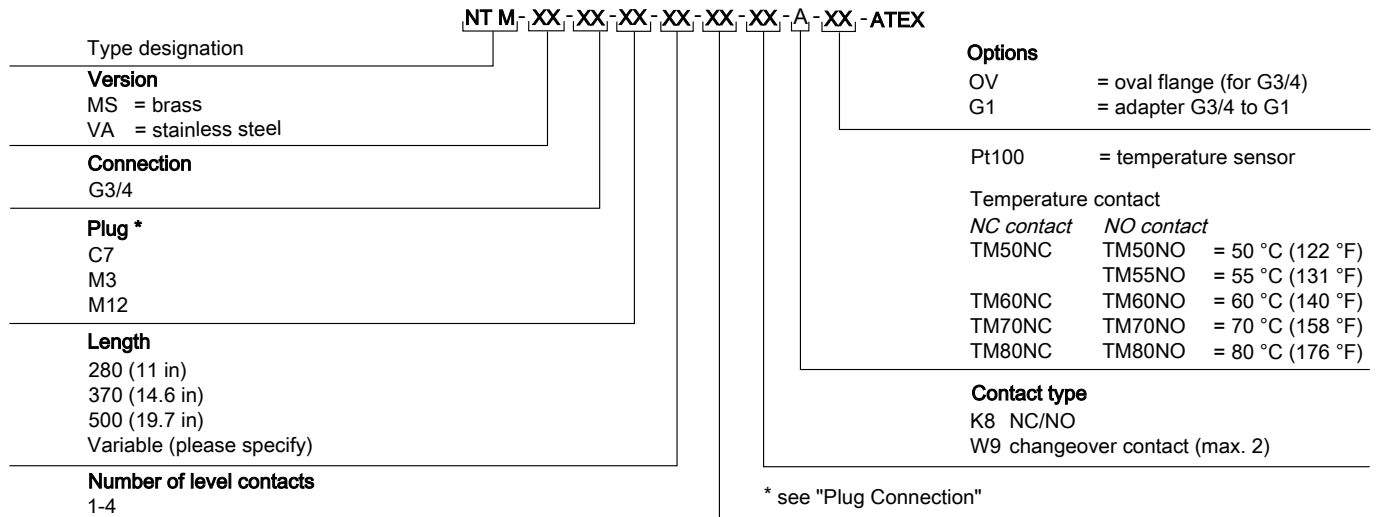
Temperature contacts

P_i	100 mW
U_i	30 V
I_i	50 mA
$L_i; C_i$	Negligible

Dimensions



Model Key

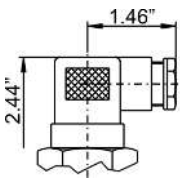
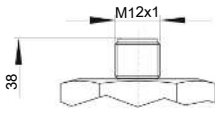
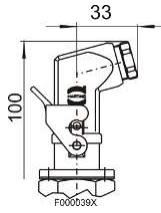
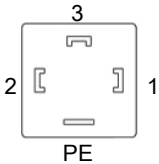
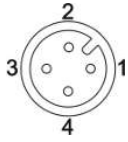
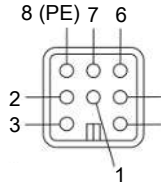
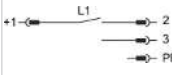
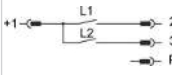
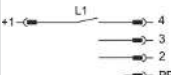
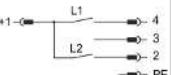

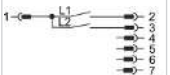


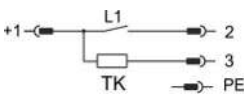
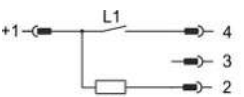
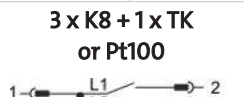
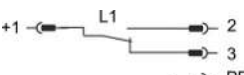
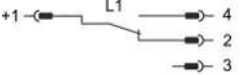
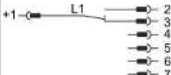
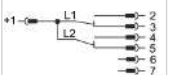
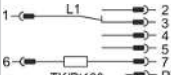
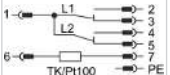


Ordering example

You require: Level switch with G3/4 connection, brass, length L= 500 mm,
2 level contacts, 1st contact 100 mm NC, 2nd contact 450 mm NO

Order NT M-MS-G3/4-M3/500-2K-100NC-450NO-ATEX

Standard pin assignment

Connector:	M3 valve connector	M12 plug A coded	C7 HAN 3 A
Dimensions:			
Connection schematic:			
Number of poles:	3-pin + PE	4-pin + PE	7-pin + PE
DIN EN	175301-803	61076-2-101	175301-801
Max. operating voltage:	30 V DC	30 V DC	30 V DC
IP rating:	IP65	IP67*	IP65**
Cable fitting:	PG 11		PG11
Only level contact(s) Type K8 (NC/NO)	<p>1 x K...</p>  <p>2 x K...</p> 	<p>1 x K...</p>  <p>2 x K...</p> 	<p>1 x K8</p>  <p>2 x K8</p> 
Level contact(s) Type K8 (NC/NO) plus temperature contact TK or Pt100 Attention: 2 separate roots			<p>1 x K8 + 1 x TK or Pt100</p>  <p>2 x K8 + 1 x TK or Pt100</p> 
Level contact(s) type K8 or K10 (NC/NO) plus temperature contact TK	<p>1 x K... + 1 x TK</p> 	<p>1 x K... + 1 x TK</p> 	<p>3 x K8 + 1 x TK or Pt100</p> 
Only level contact(s) Type W9 (changeover contact)	<p>1 x W...</p> 	<p>1 x W...</p> 	<p>1 x W9</p>  <p>2 x W9</p> 
Only level contact(s) Type W9 (change-over contact) plus temperature contact TK or Pt100 Attention: 2 separate roots			<p>1 x W9 + 1 x TK or Pt100</p>  <p>2 x W9 + 1 x TK or Pt100</p> 

*with respective plug top.

**IP 44 with gland/without gasket.



Level switch

NS 25/15 AM-Atex, NS 25/25 AM-Atex

Level switches for tank top installation are primarily used to monitor and control liquid levels in closed tanks.

The lowest detectable level is at the top edge level of the bottom connection.

Each AM switch is equipped with a display, which is even easy to see from various lines of sight. The level contacts can be infinitely adjusted on the scale plate. They are activated by the magnetic system integrated in the float. There is a large selection of contacts available for various applications.

This series consists of simple electrical apparatuses. In the case of intrinsically safe connections as per EN 60079-14, the NS 25/15 (25) AM-Atex can be used in Zone 1 (group IIB, device category 2G) explosive areas; this also applies to the inner zone of the tank. The level switches are classified into temperature class T4.

Level switches for tank top installation

ATEX applications: Zone 1 (cat. 2G), simple electrical apparatus according to EN 60079-11

Compact size

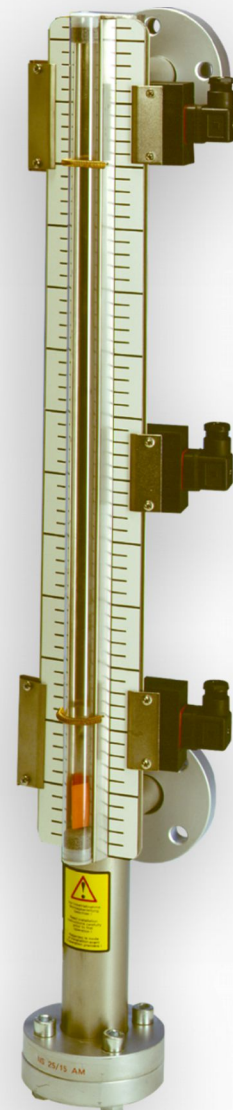
Variable connections

Visual display

Practice-oriented contacts

Sturdy design

Plug-in contacts



Technical Data

Technical Data		
Max. operating pressure	362 psi (25 bar)	
Ambient temperature:	4 °F to 158 °F (-20 °C to +70 °C)	
spec. fluid weight for float SK 661	≥ 0.031 lb/in ³ (≥ 0.85 kg/dm ³)	
Material		
Float SK661	1.4571	
Riser	1.4571	
Flanges	S355 galvanised	
Sight glass	PC	
Dimensions (in mm)		
NS...AM-Atex	25/15	25/25
Connecting flange (DIN 2656)	DN 15	DN 25
ØD	3.74" (95 mm)	4.53" (115 mm)
Øk	2.56" (65 mm)	3.35" (85 mm)
Ød	0.55" (14 mm)	0.55" (14 mm)
b	0.63" (16 mm)	0.71" (18 mm)
ØA	1.77" (45 mm)	2.68" (68 mm)
h	0.47" (12 mm)	0.55" (14 mm)
L max.	118.11" (3000 mm)	118.11" (3000 mm)
S for float, type: SK 661	8.07" (205 mm)	8.07" (205 mm)
Weight at L1=19.69" (500 mm)	21 lb (9.5 kg)	23 lb (10.5 kg)
MKS contacts		
P_i	100 mW	
U_i	30 V	
I_i	50 mA	
$L_i; C_i$	Negligible	

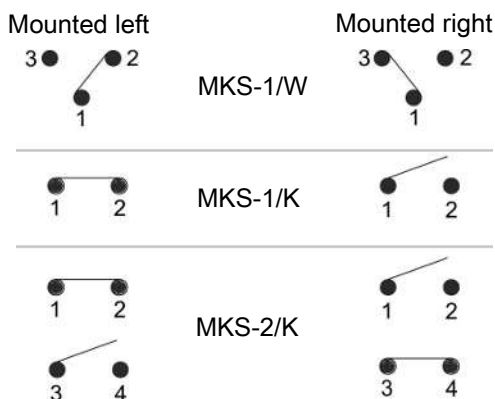
The device is suitable for use in ATEX category II 2 G Ex ib IIB T4 Gb.
The level switches may only be operated on intrinsically safe circuits!

Contacts

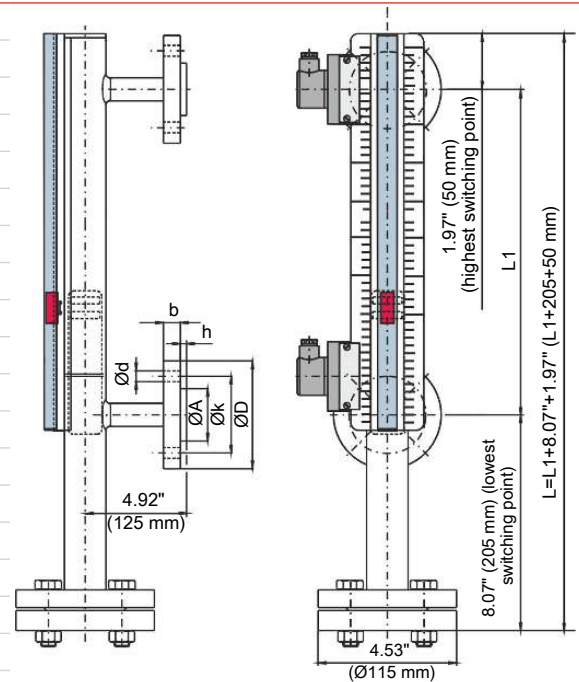
Model	MKS-1/K	MKS-2/K	MKS-1/W
Contact type (bi-stable)	NC contact/NO contact	NC contact/NO contact	NO contact
Connector	3-pin + PE DIN 43650 (M3)	6-pin + PE DIN 43651 (S6)	3-pin + PE DIN 43650 (M3)
IP rating	IP65	IP65	IP65
Item no.	2888999A	2891999A	2889999A

For applications in high shock and vibration environments we recommend using the contacts MKS-1/K and MKS-2K.

Contact position (tank empty)



Dimensions



Accessories

	25/15	25/25
Flange seal		
Model	Ø 45/ Ø22x2	Ø 68/ Ø27x2
Item no.	2251000	2252000
Set of retaining screws with nuts	25/15	25/25
Model	8x) DIN931-M12x80	8x) DIN931-M12x80
Item no.	2272999	2272999
Switch amplifier	25/15	25/25
Type, item no.	see data sheet no. 180003	see data sheet no. 180003

Ordering Instructions

When ordering, always specify the measurement L1 and the number and type of contacts!

Model	NS 25/15 AM-Atex	NS 25/25 AM-Atex
Item no.:	2001999A	2003999A

Bimetal temperature switch

TSA-Atex, TÖA-Atex



Since the viscosity of oil changes based on the temperature, operating temperatures must be monitored. Depending on the requirements, monitoring by means of indicating the minimum temperature to warning points and ending with shut down, will suffice. The warning or shut-off points are implemented using a bimetallic switch and in the process, hysteresis can also be used as a reset point.

When applying switch points below 50 °C (122 °F) the temperature difference between the system and ambient should be adequate or the reset point cannot be reached reliably.

The TSA-Atex series consists of simple electrical equipment without a separate voltage source. In the case of intrinsically safe connections as per EN 60079-14, the TSA-Atex can be used in Zone 1 (group IIC, device category 2G) explosive areas; this also applies to the inner zone of the tank. The temperature switches are classified as temperature class T4.

The temperature switch was designed to allow removing the electrical inner workings without having to remove the switching tube from the tank. This is convenient if the temperature switch is installed laterally inside oil.

ATEX applications: Zone 1 (cat. 2G), simple electrical equipment according to EN 60079-11

Simple, robust design

Electrical inner part, easy to remove

DIN connector cable outlet direction adjustable in 90° steps

Elastic sealing ring



Technical Data TSA-Atex/TÖA-Atex

TSA-Atex, TÖA-Atex

Switch element:	bi-metal
Switching function:	NO contact (NO)
Switching temperature:	25 to 80 °C (77 to 176 °F)
Probe length:	29 mm (1.1 in)
Probe material:	Anodised aluminium
Max. operating pressure:	15 bar (217.6 psi)
Operating temperature:	max. +80 °C (176 °F)
Ambient temperature:	-20 to +80 °C (-4 to 176 °F)

Temperature contacts

Tolerance:	± 5 K (± 9 °Ra)		
Switch-back difference:	15 K ± 3 K (27 °Ra ± 5.4 °Ra)		
Switching point:		NO*	NC*
	25 °C (77 °F)	TSA-25	TÖA-25
	40 °C (104 °F)	TSA-40	TÖA-40
	50 °C (122 °F)	TSA-50	TÖA-50
	60 °C (140 °F)	TSA-60	TÖA-60
	70 °C (158 °F)	TSA-70	TÖA-70
	80 °C (176 °F)	TSA-80	TÖA-80

Other temperatures available upon request

*NC = NC contact/NO = NO contact All data for rising temperature

Accessories

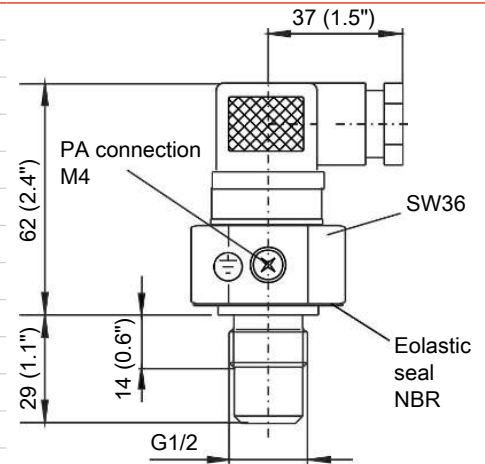
Connection cable M12x1 (5-pin) 3.0 m (9.8 ft) long, item no.: 9144050018

Switch amplifier for temperature switches see data sheet no. 18 0003

The device is suitable for use in ATEX category II 2 G Ex ib IIC T4.

The temperature switch may only be operated on intrinsically-safe circuits!

Dimensions



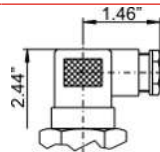
Temperature contacts

P_i	100 mW
U_i	30 V
I_i	50 mA
$L_i; C_i$	Negligible

Plug connection

M3

Dimensions:



Number of pins:	3-pin + PE
DIN EN:	175301-803
Protection class:	IP65
Cable fitting:	PG 11

Other plug connections available upon request

Ordering Instructions

Description	Item no.	Plug connection
TSA-25-Atex	1139699A	M3
TSA-40-Atex	1139599A	M3
TSA-50-Atex	1138599A	M3
TSA-60-Atex	1138699A	M3
TSA-70-Atex	1138799A	M3
TSA-80-Atex	1139299A	M3
TÖA-25-Atex	1142899A	M3
TÖA-40-Atex	1143299A	M3
TÖA-50-Atex	1142199A	M3
TÖA-60-Atex	1143399A	M3
TÖA-70-Atex	1140299A	M3
TÖA-80-Atex	1140899A	M3

Ordering example

You require:	Temperature contact to close at 50 °C (122 °F), type M3 plug
Order:	Item number 1138599A, temperature switch TSA-50-Atex-M3

Bimetal temperature switch

TSM-Atex, TSE-Atex



Since the viscosity of oil changes based on the temperature, operating temperatures must be monitored. Depending on the requirements, monitoring by means of indicating the minimum temperature to warning points and ending with shut down, will suffice. The warning or shut-off points are implemented using a bimetallic switch and in the process, hysteresis can also be used as a reset point.

The TSM/TSE series consists of simple electrical equipment. In the case of intrinsically safe connections as per EN 60079-14, the TSM/TSE can be used in Zone 1 (group IIC, device category 2G) explosive areas; this also applies to the inner zone of the tank. The temperature switches are classified as temperature class T4.

These temperature switches are designed in a manner, which allows the internal electrical components to be replaced without having to remove the switching tube from the tank. This is convenient if the temperature switch is installed laterally inside oil.

ATEX applications: Zone 1 (cat. 2G), simple electrical equipment according to EN 60079-11

Simple, robust design

Electrical inner part, easy to remove

Optionally DIN connector or M12 base connector

DIN connector cable outlet direction adjustable in 90° steps

Elastic sealing ring



Technical Data TSM-Atex/TSE-Atex

TSM-Atex, TSE-Atex

Versions:	TSM-1/TSE-1 = with one temperature contact TSM-2/TSE-2 = with two temperature contacts
Switch element:	bi-metal
Switching function:	NC = NC contact/NO = NO contact
Switching temperature:	50 to 80 °C (122 to 176 °F) (also see chart)
Probe length L max.:	1000 mm (39.4")

	TSM	TSE
Probe material:	Brass	1.4571
Max. operating pressure:	5 bar (72.5 psi)	10 bar (145 psi)
Operating temperature:	max. +80 °C (176 °F)	
Ambient temperature:	-20 to +80 °C (-4 to 176 °F)	

Temperature contacts

Switch-back difference for TMÖ-50 to TMÖ-80:	18 K ± 5 K (32.4 °Ra ± 9 °Ra)	
Switch-back difference for TSM-60:	53 K ± 5 K (95.4 °Ra ± 9 °Ra)	
Switch-back difference for TSM-70:	40 K ± 5 K (72 °Ra ± 9 °Ra)	
Switching point:	NC*	NO*
50 °C (122 °F)	TMÖ-50	-
60 °C (140 °F)	TMÖ-60	TSM-60
70 °C (158 °F)	TMÖ-70	TSM-70
80 °C (176 °F)	TMÖ-80	-

Other temperatures available upon request

*NC = NC contact/NO = NO contact All data for rising temperature

Accessories

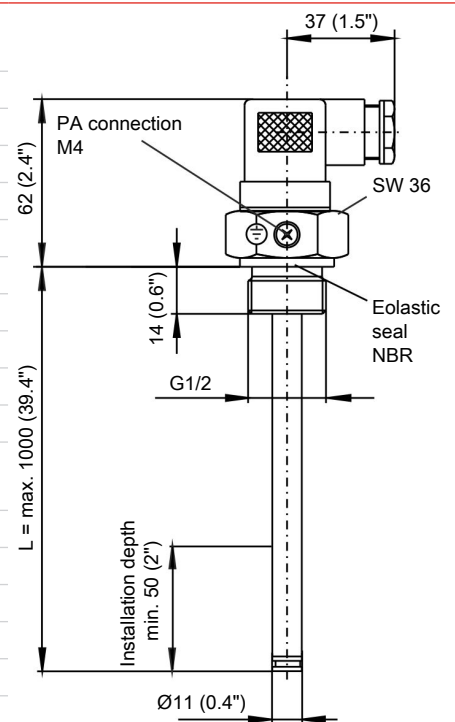
Connection cable M12x1 (5-pin) 3.0 m (9.8 ft) long, item no.: 9144050018

Switch amplifier for temperature switches see data sheet no. 18 0003

The device is suitable for use in ATEX category II 2 G Ex ib IIC T4.

The temperature switch may only be operated on intrinsically-safe circuits!

Dimensions



Temperature contacts

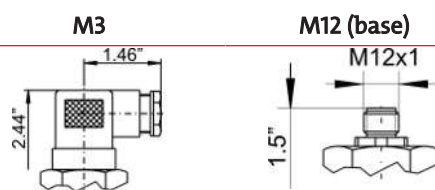
P_i	100 mW
U_i	30 V
I_i	50 mA
$L_i; C_i$	Negligible

Connector

Dimensions:	M3	M12 (base)
Number of pins:	3-pin + PE	4-pin+PE
DIN EN:	175301-803	
IP rating:	IP65	IP 67**
Cable fitting:	PG 11	PG 7**

**with IP67 cable box screwed on

Other connectors available on request



Model key for TSM/TSE temperature switches

XXX-XX-XX-G1/2-XX/XX-XX-XX-ATEX

TSM for Version MS
TSE for Version V

Number of temperature contacts
 1 or 2

Version
MS Brass
VA Stainless steel

Plug connection
 M3
 M12

Length (max. 1000 mm/39.4")
 280 (11")
 370 (14.6")
 500 (19.7")
 variable (please specify)

T2 (2nd temperature contact)

NC contact NO contact
 TM50NC TM50NO = 50 °C (122 °F)
 TM60NC TM60NO = 60 °C (140 °F)
 TM70NC TM70NO = 70 °C (158 °F)
 TM80NC TM80NO = 80 °C (176 °F)

T1 (1st temperature contact)

NC contact NO contact
 TM50NC TM50NO = 50 °C (122 °F)
 TM60NC TM60NO = 60 °C (140 °F)
 TM70NC TM70NO = 70 °C (158 °F)
 TM80NC TM80NO = 80 °C (176 °F)

Ordering example

You require: Pressure 5 bar (72.5 psi), M3 plug connection, length L= 300 mm (11.8 in), 2 temperature contacts, 1st contact (T1) NC contact at 50 °C (122 °F), 2nd contact (T2) NO contact at 70 °C (158 °F)

Order: TSM-2-MS-G1/2-M3/300-TM50NC-TM70NO-ATEX

Bimetal temperature switch TSK-Atex



Fluidcontrol



Since the viscosity of oil changes based on the temperature, operating temperatures must be monitored. Depending on the requirements, monitoring by means of indicating the minimum temperature to warning points and ending with shut down, will suffice. The warning or shut-off points are implemented using a bimetallic switch and in the process, hysteresis can also be used as a reset point.

The TSK-Atex series consists of simple electrical equipment. In the case of intrinsically safe connections as per EN 60079-14, the TSK-Atex can be used in Zone 1 (group IIC, device category 2G) explosive areas; this also applies to the inner zone of the tank. The temperature switches are classified as temperature class T4.

The temperature switch was designed to allow removing the electrical inner workings without having to remove the switching tube from the tank. This is convenient if the temperature switch is installed laterally inside oil.

ATEX applications: Zone 1 (cat. 2G), simple electrical equipment according to EN 60079-11

Simple, robust design

Electrical inner part, easy to remove

Optionally DIN connector or M12 base connector

Outlet direction adjustable in 90° steps

Elastic sealing ring



Technical Data TSK-Atex

TSK-Atex

Versions:	TSK-1 = with one temperature contact TSK-2 = with two temperature contacts
Switch element:	bi-metal
Switching function:	NC = NC contact/NO = NO contact
Switching temperature:	45 to 80 °C (113 to 176 °F) (also see chart)
Probe length L max.:	1000 mm (39.4")
Probe material:	Brass
Max. operating pressure:	1 bar (14.5 psi)
Operating temperature:	max. +80 °C (176 °F)
Ambient temperature:	-20 to +80 °C (-4 to 176 °F)

Temperature contacts

Switch-back difference:	10 K ± 5 K (18 °Ra ± 9 °Ra)	
Switching point:	NC*	NO*
	45 °C (113 °F)	TKÖ-45 TKS-45
	55 °C (131 °F)	TKÖ-55 TKS-55
	65 °C (149 °F)	TKÖ-65 TKS-65
	75 °C (167 °F)	TKÖ-75 TKS-75

Other temperatures available upon request

*NC = NC contact/NO = NO contact All data for rising temperature

Accessories

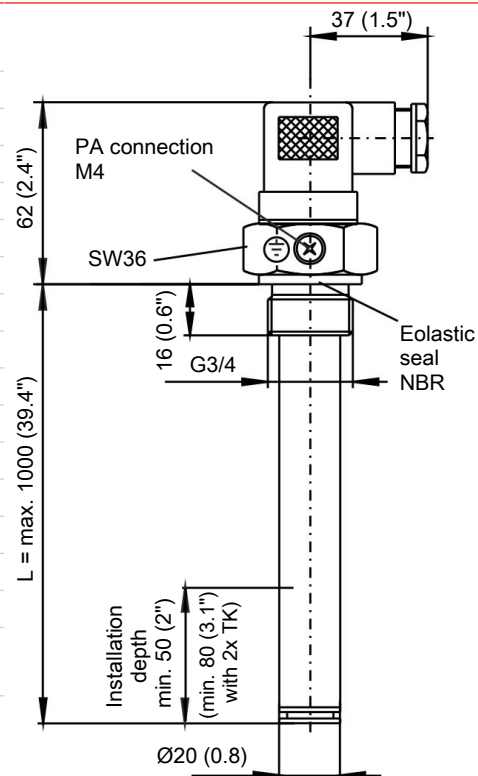
Connection cable M12x1 (5-pin) 3.0 m (9.8 ft) long, item no.: 9144050018

Switch amplifier for temperature switches see data sheet no. 18 0003

The device is suitable for use in ATEX category II 2 G Ex ib IIC T4.

The temperature switch may only be operated on intrinsically-safe circuits!

Dimensions



Temperature contacts

P_i	100 mW
U_i	30 V
I_i	50 mA
$L_i; C_i$	Negligible

Connector

	M3	M12 (base)
Dimensions:		
Number of pins:	3-pin + PE	4-pin+PE
DIN EN:	175301-803	
IP rating:	IP65	IP 67**
Cable fitting:	PG 11	PG 7**

**with IP67 cable box screwed on

Other connectors available on request

Model key for TSK temperature switch

TSK - XX - XX - G3/4 - XX / XX - XX - XX - ATEX

Number of temperature contacts

1 or 2

Version

MS Brass

Plug connection

M3

M12

Length (max. 1000 mm/39.4")

280 (11")

370 (14.6")

500 (19.7")

variable (please specify)

T2 (2nd temperature contact)

NC contact NO contact

TK40NC TK40NO = 40 °C (104 °F)

TK50NC TK50NO = 50 °C (122 °F)

TK60NC TK60NO = 60 °C (140 °F)

TK70NC TK70NO = 70 °C (158 °F)

TK80NC TK80NO = 80 °C (176 °F)

T1 (1st temperature contact)

NC contact NO contact

TK40NC TK40NO = 40 °C (104 °F)

TK50NC TK50NO = 50 °C (122 °F)

TK60NC TK60NO = 60 °C (140 °F)

TK70NC TK70NO = 70 °C (158 °F)

TK80NC TK80NO = 80 °C (176 °F)

Ordering example

You require: Length L= 300 mm (11.8 in), 2 temperature contacts, 1st contact NC at 50 °C (122 °F), 2nd contact NO at 70 °C (158 °F), M3 plug

Order: TSK-MS-G3/4-M3/300-TK50NC-TK70NO-ATEX



Temperature sensor TF-M-Atex, TF-E-Atex

Since the viscosity of oil changes based on the temperature, operating temperatures must be monitored. Depending on the application, this may have to take place continuously with a high degree of accuracy.

In the process, the Pt100 has asserted its position as the standard sensor in nearly all areas of technology. It is a resistor, whose value changes in proportion to the temperature, which results in a continuous signal change.

The resistance value of the Pt100 connection cable must be taken into consideration as of a length of >3 m (9.8 ft), when aligning the measured value.

The TF-M-Atex/TF-E-Atex series consists of simple electrical equipment without a separate voltage source. In the case of intrinsically safe connections as per EN 60079-14, the TF-M-Atex/TF-E-Atex can be used in Zone 1 (group IIC, device category 2G) explosive areas; this also applies to the inner zone of the tank. The temperature sensors are classified as temperature class T4.

The design of the temperature switch was chosen, to enable the removal of the electrical inner workings without having to remove the switching tube from the tank. This is convenient if the temperature sensor is installed laterally inside oil.

ATEX applications: Zone 1 (cat. 2G), simple electrical equipment according to EN 60079-11

Simple, robust design

Electrical inner part, easy to remove

Optionally DIN connector or M12 base connector

DIN connector cable outlet direction adjustable in 90° steps

Elastic sealing ring



Technical Data TF-M-Atex/TF-E-Atex

TF-M-Atex, TF-E-Atex

Operating temperature:	max. +80 °C (176 °F)
Ambient temperature:	-20 to +80 °C (-4 to 176 °F)

	TF-M-Atex-Pt100	TF-E-Atex-Pt100
Probe material:	Brass	1.4571
Max. operating pressure:	5 bar (72.5 psi)	10 bar (145 psi)
Probe length L max.:	1000 mm (39.4 in)	1000 mm (39.4 in)

Pt100 resistance thermometer

Tolerance:	± 0.8 K (± 1.4 °Ra)
Measuring current I_c :	≤ 1 mA
P_i :	100 mW
I_i :	50 mA
U_i :	30 V
L_i, C_i :	negligible

Accessories

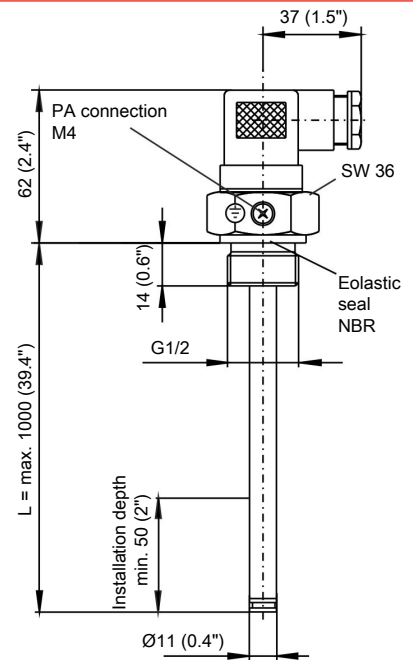
Connection cable M12x1 (5-pin) 3.0 m (9.8 ft) long, item no.: 9144050018

Switch amplifier for temperature sensors see data sheet no. 18 0003

The device is suitable for use in ATEX category II 2 G Ex ib IIC T4.

The temperature sensors may only be operated on intrinsically-safe circuits!

Dimensions

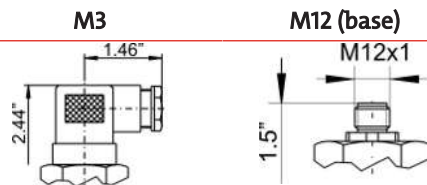


Pt100 measuring resistance base values

°C (°F)	0 (32)	10 (50)	20 (68)	30 (86)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)
Ohm	100.00	103.90	107.79	111.67	115.54	119.40	123.24	127.07	130.89	134.70	138.50

Connector

Dimensions:



	M3	M12 (base)
Number of pins:	3-pin + PE	4-pin+PE
DIN EN:	175301-803	
IP rating:	IP65	IP 67**
Cable fitting:	PG 11	PG 7**

**with IP67 cable box screwed on

Other connectors available on request

Model key for TF temperature sensor

XXX - G1/2 - XX - XX - PT100 - XX / XX - ATEX

TF-M for Version MS
TF-E for Version V

Version

MS Brass
VA Stainless steel

Plug connection

M3
M12

Length (max. 1000 mm/39.4")

280 (11")
370 (14.6")
500 (19.7")
variable (please specify)

Switching type

2L = 2 conductor

Ordering example

You require: Temperature sensor with M3 plug connection length L= 220 mm (8.7 in), operating pressure 2 bar (29 psi)

Order: TF-M-G1/2-MS-M3-PT100-2L/220-ATEX



Level and temperature switch

NT 61-Z0-Atex

In hydraulics and lubrication technology the fill level of oil tanks needs to be monitored continuously. Here, modern factory automation requires compatible signals. To minimise production costs and the space required on containers, it makes sense to use one monitor for both e.g. the fill level and oil temperature. The NT 61-Z0...-ATEX series meets virtually all requirements arising in this area of application. This model can be equipped with max. four fixed, bistable level contacts or max. three level plus one temperature contact to monitor the fill level. The temperature can alternatively also be assessed using a Pt100 resistance thermometer.

The NT 61-Z0...-ATEX is a simple electrical equipment without separate voltage source used to monitor the level and temperature inside a tank in explosive areas. Here the stainless steel tube a stainless steel float slides along is located inside the tank in zone 0. The stainless steel flange is mounted to the outside of the tank by 6 screws, meaning the connector plug is located outside the tank in zone 1. A flat seal between the tank and level switch flange provides the seal between the tank and the environment.

EU type test/IECEX certified

IECEX: IECEX IBE 17.0020X, ATEX: IBExU16ATEX1183 X

Area of application in Ex zone 0/1

Level/temperature combination

Bistable = only one float

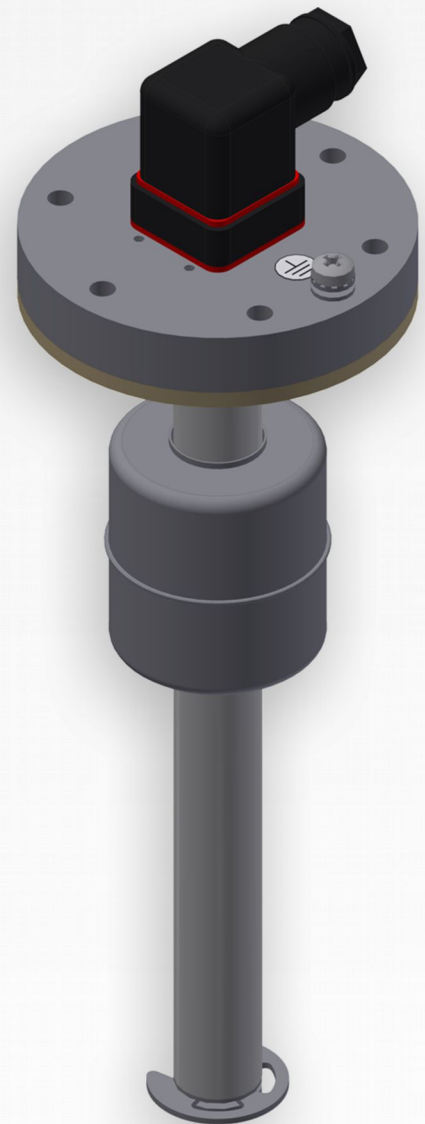
Standardised flange drawing: DIN 24557, part 2

various plug options

variable lengths

Stainless steel version

Maintenance free



Technical Data

NT 61-Z0-Atex

Operating pressure:	max. 1 bar
Operating temperature:	-20 °C to +70 °C (-4 °F to 158 °F)
Ambient temperature:	-20 °C to +70 °C (-4 °F to 158 °F)
Min. fluid density:	0.85 kg/dm ³ (0.03 lb/in ³)
Weight at L = 280 mm (11 in):	approx. 950 g (2.1 lb)
Each 100 mm (3.9 in) add:	approx. 50 g (0.1 lb)

Material

Float:	1.4571
Immersion tube:	1.4571
Flange (DIN 24557)	1.4571

Includes

Mounting screws (quantity 6) and rubberised cork seal.

Options

Stilling tube (SSR)	1.4571/NBR
---------------------	------------

The equipment comply with: IEC 60079-0 (Ed.6.0); IEC 60079-11 (Ed.6.0); EN 60079-0:2012+A11:2013; EN 60079-11:2012

ATEX/IECEx marking

 II 1G Ex ia IIC T4 Ga

 II 1D Ex ia IIIC T70°C Da

The level switches may only be operated on intrinsically-safe circuits!

Level switching outputs

Level contact	K10	W11
Function	NC/NO*	Change-over contact
U _i		30 V
I _i		50 mA
L _i ; C _i		Negligible
P _i		100 mW

*NC = rising NC contact/falling NO contact, NO = rising NO contact/falling NC contact

Optional temperature switching outputs

Temperature contact	TKÖ	TKS
Function	NC**	NO**
U _i		30 V
I _i		50 mA
L _i ; C _i		Negligible
P _i		100 mW

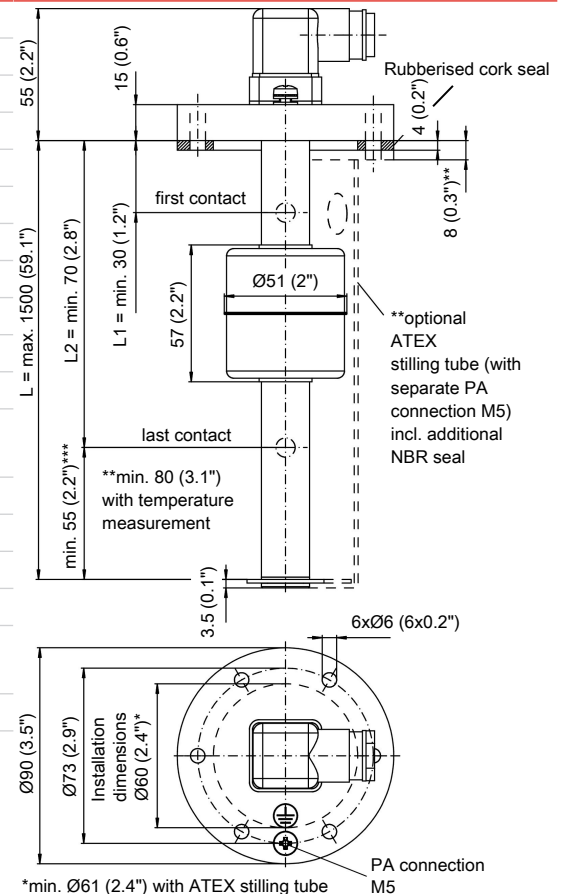
**NC = NC contact, NO = NO contact

Temperature signal

Pt100 Resistance Thermometer

Temperature sensor	Pt100 Class B, DIN EN 60 751
Tolerance:	±0.8 °K
P _i	100 mW
U _i	30 V
I _i	50 mA
I _{Mess} (measuring current)	≤1 mA
L _i ; C _i	Negligible

Dimensions



Pt100 measuring resistance base values

°C (°F)	0 (32)	10 (50)	20 (68)	30 (86)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)
Ohm	100.00	103.90	107.79	111.67	115.54	119.40	123.24	127.07	130.89	134.70	138.50

Standard pin assignment

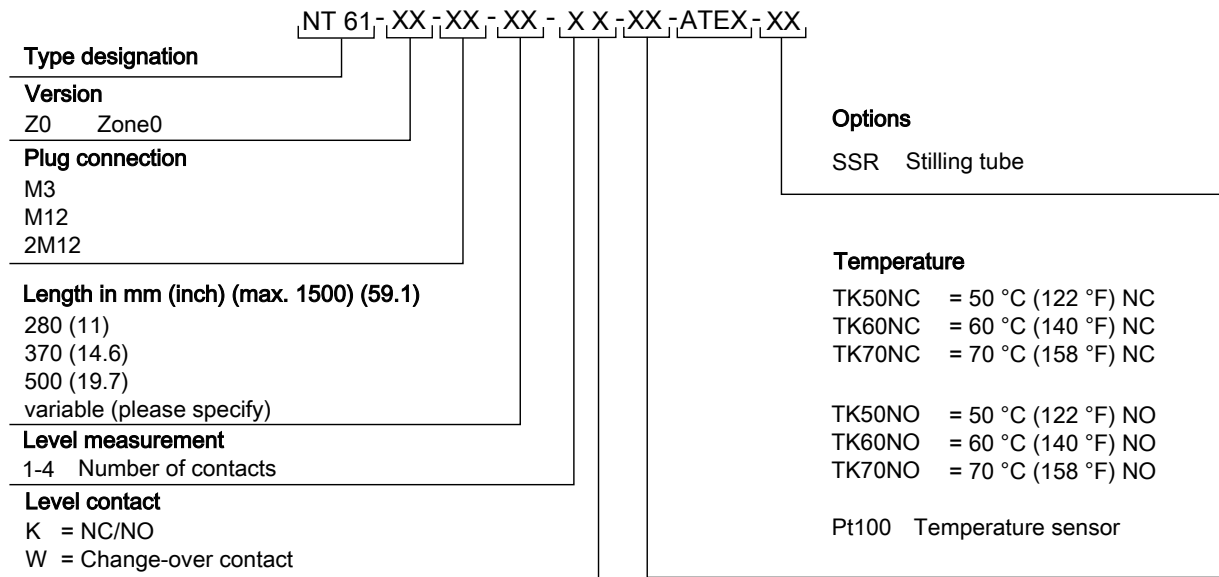
Plug connection

	M3	M12	2 x M12
Dimensions			
Number of pins	3-pin + PE	4-pin	4-pin / 4-pin
DIN EN	175301-803	61076-2-101	61076-2-101
Degree of protection	IP65	IP67**	IP67**
Cable fitting	PG 11		

** with respective plug top

	M3	M12 (base)	2 x M12 (base)
Connection schematic			
Only level contact(s) type K10 (NC/NO)	<p>1 x K... </p> <p>2 x K... </p>	<p>1 x K... </p> <p>2 x K... </p>	<p>A </p> <p>B </p> <p>A </p> <p>B </p>
Only level contact(s) type W11 (changeover contact)			<p>A </p> <p>B </p>
Level contact(s) type K10 plus temperature contact TK			<p>A </p> <p>B </p>
Level contact(s) type K10 plus Pt100 temperature sensor			<p>A </p> <p>B </p>
Level contact(s) type W11 plus temperature contact TK			<p>A </p> <p>B </p>
Level contact(s) type W11 plus Pt100 temperature sensor			<p>A </p> <p>B </p>

Ordering Instructions



Ordering example

You require: Level switch, M12 plug connection, length L=280 mm (11 in), 1x level contact, contact at L1=100 mm (3.9 in) function NC, temperature contact 60 °C (140°F) function NO, with stilling tube

Order: NT 61-Z0-M12-280-1K-TK60NO-ATEX-SSR, L1 = 100 NC

Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

Level switch

NS 25/15 AM-DNV, NS 25/25 AM-DNV, NS 25 AM G1/2-DNV

Level switches for external installation are used to monitor and control fluid levels primarily in closed tanks.

Marine applications are subject to harsher operating conditions. Therefore, the components and devices to be used must undergo a type approval test.

Det Norske Veritas (DNV) is an approved classification society with high quality standards specialised in the marine sector.

Each AM switch is equipped with a display, which is even easy to see from various lines of sight. The contacts can be infinitely adjusted on the scale plate. They are activated by the magnetic system integrated in the float. There is a large selection of contacts available for various applications.

Depending on the model, flanges or fittings can be used for the connection. The MKS-1/W-L-24V contact model is equipped with an LED.

Level switches for external installation

DNV-GL shipbuilding approval

Compact size

Variable connections

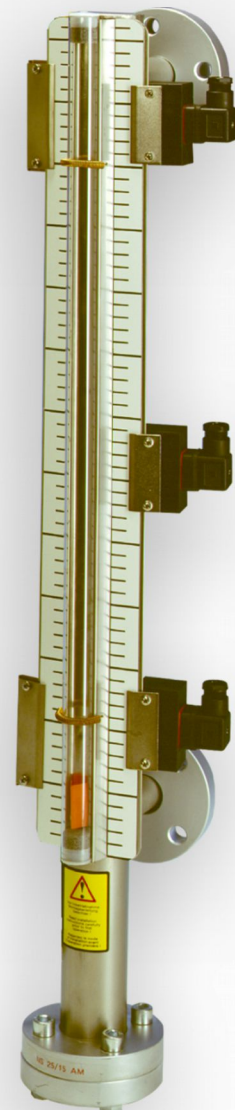
Visual display

Floats for various mediums

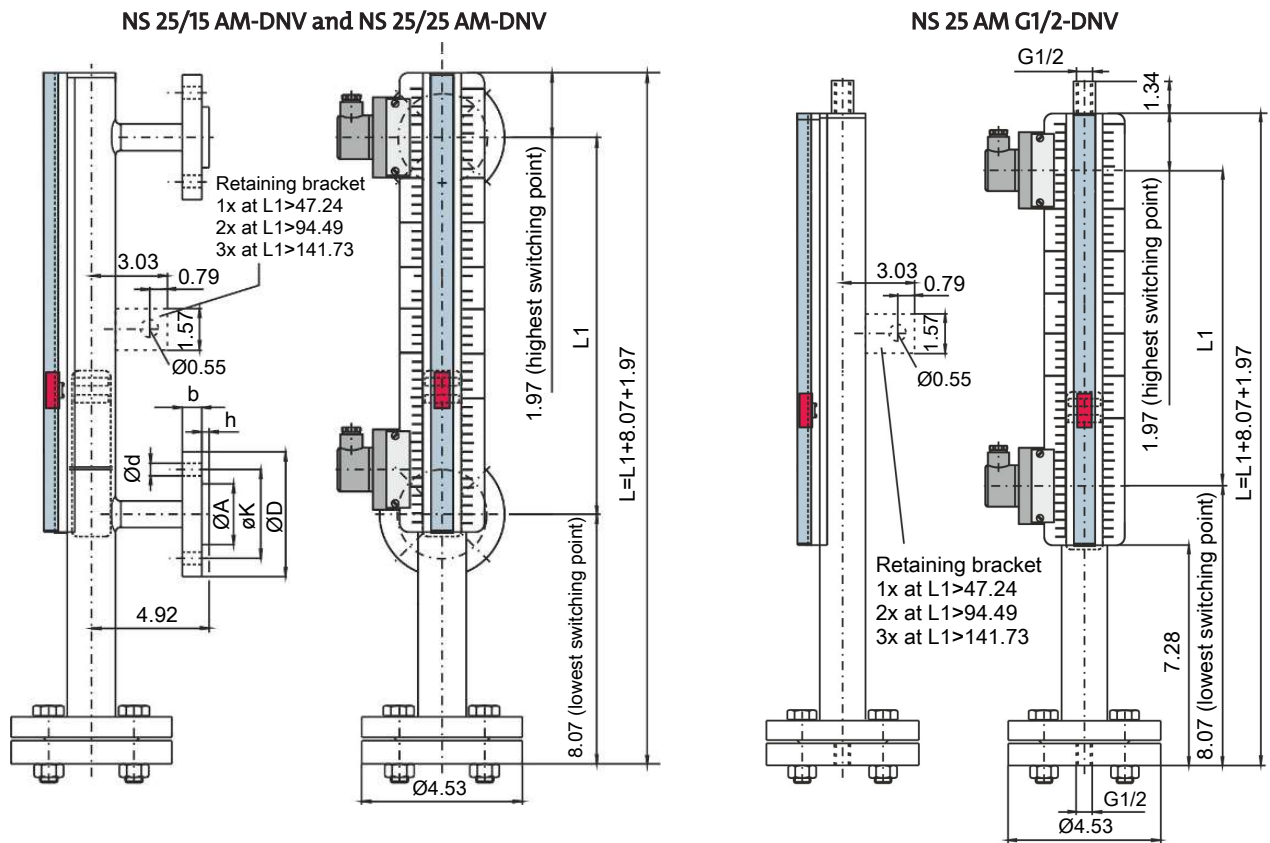
Practice-oriented contacts

Sturdy design

Plug-in contacts



Technical Data



Attention! For adapter spacing over 1200 mm (47.24"), additional retaining brackets are mounted to absorb vibration!

Technical Data

DNV certification classes

Temperature	C
Vibration	A
Humidity	B
Housing	B

Versions NS 25/15 AM-DNV; NS 25/25 AM-DNV; NS 25 AM G1/2-DNV

Max. operating pressure	25 bar (363 psi)
Max. operating temperature	+ 120 °C (248 °F)
spec. Min. fluid weight	≥ 0.85 kg/dm ³ (0.031 lb/in ³)

Material

Float SK661	1.4571
Riser	1.4571
Flanges	St 52-3 galvanised
Sight glass	PC

Dimensions (in inch)

NS...AM-DNV	25/15	25/25
Connecting flange (DIN 2656)	DN 15	DN 25
ØD	3.74	4.53
øK	2.56	3.35
Ød	0.55	0.55
b	0.63	0.71
ØA	1.77	2.68
h	0.47	0.55
Weight at L1=19.69 inch	9.5 kg (21 lb)	10.5 kg (23 lb)

Contacts

Model	MKS-1/K	MKS-2/K	MKS-1/W	MKS-1/W-L 24 V
Contact type (bi-stable)	NC contact/NO contact	NC contact/NO contact	NO contact	NO contact
Max. operating voltage	230 V A/DC	230 V A/DC	230 V A/DC	24 V DC
Max. contact load	50 VA	50 VA	50 VA	50 VA
Max. switching current	1 A	1 A	1 A	1 A
Plug connection	3-pin + PE DIN 43650 (M3)	6-pin + PE DIN 43651 (S6)	3-pin + PE DIN 43650 (M3)	6-pin + PE DIN 43651 (S6)
Degree of protection	IP 65	IP 65	IP 65	IP 65
Item no.	2888999	2891999	2889999	2890999

Accessories

Flange seal	25/15	25/25
Model	Ø 45/ Ø 22x2	Ø 68/ Ø 27x2
Item no.	2251000	2252000
Set of retaining screws with nuts	25/15	25/25
Model	8x) DIN931-M12x80	8x) DIN931-M12x80
Item no.	2272999	2272999

Ordering Instructions

When ordering, always specify the measurement L1 and the number and type of contacts!

NS... AM-DNV with SK661	25/15	25/25	25 AM G1/2
Item no.:	2001999DNV	2003999DNV	20115399DNV

Level and temperature sensor

Nivotemp 63 K/KN-Desina, 63 K-VA/KN-VA-Desina

The level and temperature sensor Nivotemp 63 designed by Bühler Technologies GmbH is produced according to the Desina standard.

Desina is a brand name of the VDW (German Machine Tool Builders' Association) and represents a technically specified standardised installation concept on machine tools, which has decentralised structures.

These models embody the core principle of the Nivotemp series. The Nivotemp 63 K and 63 K-VA are the flagship models of this series. They continuously log the temperature and the level. The transducer and transcoder for level and temperature are located in the ultra-compact connecting flange. The connection on the tank is made via the connection schematic for vent filters, which is standardised according to DIN 24557 Part 2. The Nivotemp 63 KN and 63 KN-VA have just one continuous transducer.

We refer to the combination options for all Nivotemp models with our display and control units.

Easy assembly – reduces costs

Integrated temperature and level monitoring

Integrated continuous signal outputs 4–20 mA

Desina



Technical Data

Switching tube	63-K/KN-Desina	63-K/KN-VA-Desina
Operating pressure:	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature:	max. 80 °C (176 °F)	max. 80 °C (176 °F)
Fluid density:	min. 0.8 kg/dm ³ (0.029 lb/in ³)	min. 0.8 kg/dm ³ (0.029 lb/in ³)
Float:	SK 604 = PU	SK 221 = 1.4571
Switching tube:	MS	1.4571
Flange:	PA 6	PA 6
Weight	L = 220 mm (8.66") per 150 mm (5.91") additional	

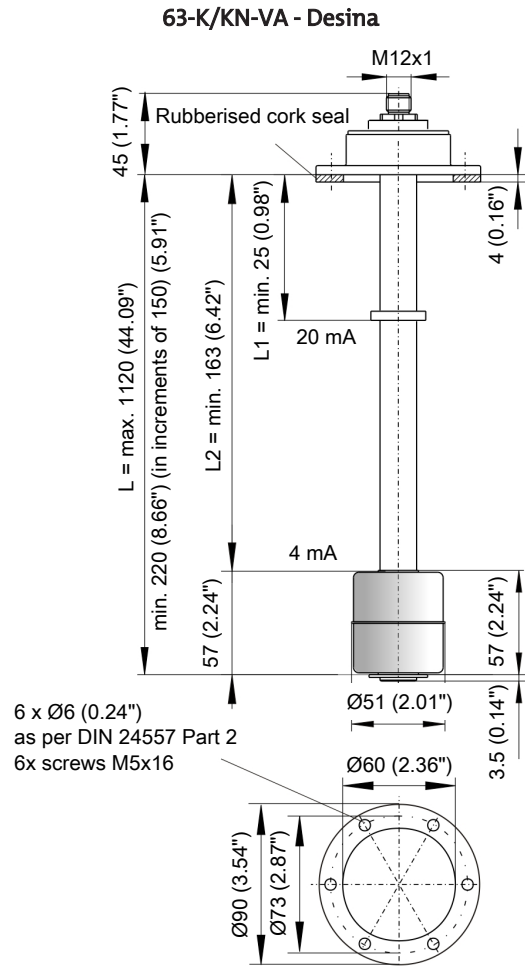
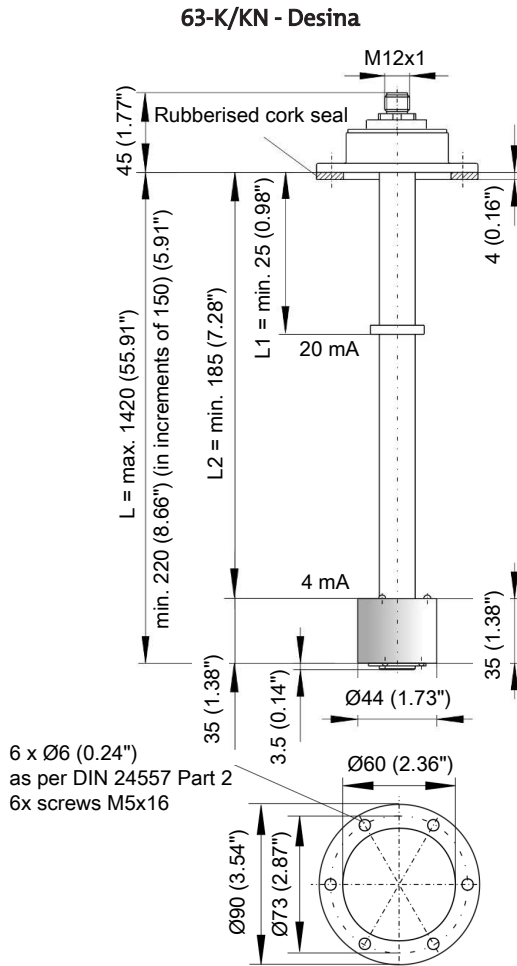
Level signal

Measurement principle	Reed contact	Reed contact
Resolution:	4 mm (0.16")	7.5 mm (0.3")
Supply voltage (U _B):	10–30 V	10–30 V
Voltage ripple:	< 1%	< 1%
Output signal:	4–20 mA	4–20 mA
Max. burden Ω:	= U _B -7.5 V / (0.02 A)	= U _B -7.5 V / (0.02 A)

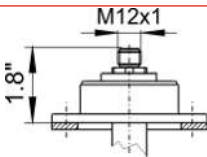
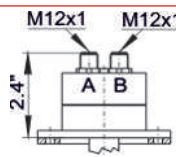
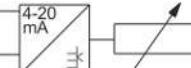
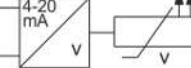
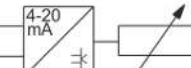
Temperature signal

Measurement principle	Pt100	Pt100
Resolution:	± 0.8 °C (1.4 °F)	± 0.8 °C (1.4 °F)
Supply voltage (U _B):	10–30 V	10–30 V
Voltage ripple:	< 1%	< 1%
Output signal:	4–20 mA (≈ 0–100 °C/32 °F-212 °F)	4–20 mA (≈ 0–100 °C/32 °F-212 °F)
Max. burden Ω:	= U _B -7.5 V / (0.02 A)	= U _B -7.5 V / (0.02 A)

Dimensions



Pin assignments

Connector	M12	2x M12	Pin assignments**
Dimensions:			<p>63-K-2xM12 / 63-K-VA-2xM12</p> <p>A Level output +24 V DC 1- 4-20 mA 2- </p> <p>B Temperature output +24 V DC 1- 4-20 mA 2- </p>
Number of poles:	4-pin	4-pin/4-pin	
IP rating:	IP67*	IP67*	<p>63-KN-M12 / 63-KN-VA-M12</p> <p>Level output +24 V DC 1- 4-20 mA 2- </p>

*with corresponding plug top.

**the pin assignments are based on Desina, Spec_11 and Spec_16.

Ordering Instructions

With continuous level and temperature measurement

Item no.	63-K-2xM12	63-K-VA-2xM12
L = 370 mm (14.57")	10072199	10073199
L = 520 mm (20.47")	10072399	10073399
L = variable*	10072599	10073599

Continuous level measurement only

Item no.	63-K-2xM12	63-K-VA-2xM12
L = 370 mm (14.57")	10026499	10066499
L = 520 mm (20.47")	10026699	10066699
L = variable*	10026299	10066799

*length variable in 150 mm (5.91") increments

63 K / KN L = min. 220 mm (8.66"), max. 1420 mm (55.91")

63 K / KN – VA L = min. 220 mm (8.66"), max. 1120 mm (44.09")

Accessories

Stilling tube made of:	Brass	1.4571
L = up to 520 mm (20.47")	100701601	106000401
L = 520 mm (20.47") or more	100701602	106000402

Ordering example

You need: Length 670 mm (26.38"), with continuous temperature and level output 4 mA = 640 mm (25.2"), 20 mA = 25 mm (0.98")

You order: Item no. 1072599 Nivotemp 63-K-2xM12-Desina; L= 670, L1=25, L2=635

Temperature sensor Thermolog MK2-/EK2-Desina



Fluidcontrol



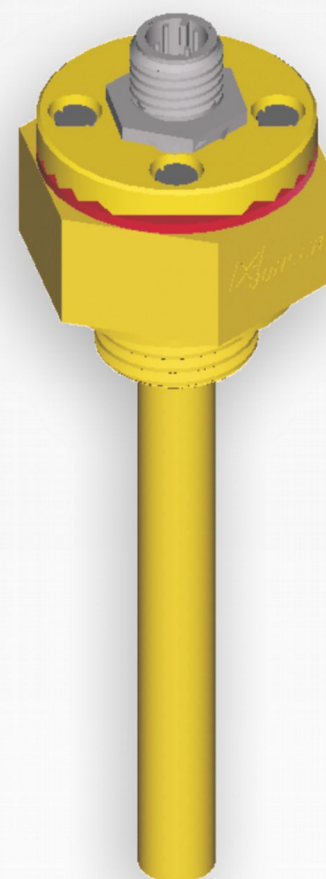
The temperature sensor Thermolog MK2/EK2 designed by Bühler Technologies GmbH is produced according to the Desina standard.

Desina is a brand name of the VDW (German Machine Tool Builders' Association) and represents a technically specified standardised installation concept on machine tools, which has decentralised structures.

With the standard analogue output of 4–20 mA found nearly throughout the entire sector of temperature measuring technology, the Thermolog MK2/EK2 provides a continuous signal, which remains stable over long distances irrespective of the cable length. A Pt100 is used as the sensor. The small and compact transmitter is located inside the hexagon head.

The Thermolog MK2/EK2 measures the current temperature quickly and precisely, and converts it into an analogue signal 4–20 mA. This signal can be implemented in the system control unit in any number of threshold values.

The modular design separates “wet” and “dry” components. This allows work to be performed on the electronics even when installed below the liquid level without draining the fluid.



Simple, robust design

Small dimensions

Electrical inner part, easy to remove

M12 base connector

Elastic sealing ring

Desina



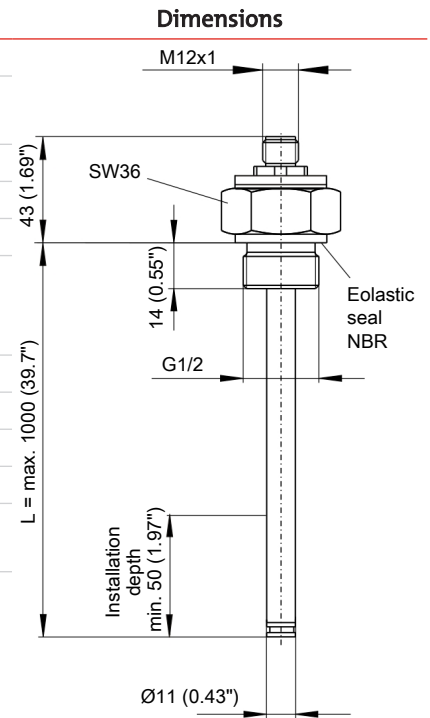
Technical Data

Technical data

Versions:	MK2-/EK2-Desina
Sensor element:	Pt100 Class B DIN/IEC 751
Measuring range*:	-0 °C to +100 °C (23 °F to 212 °F)
Probe length (L max.):	1000 mm (39.37")
Operating voltage (U _B):	10–30 V DC
Output:	4–20 mA (0 °C = 4 mA) (100 °C = 20 mA)
Max. burden Ω:	= (U _B - 7.5 V)/0.02 A
permissible operating temperature:	-20 °C to +100 °C (-4 °F to 212 °F)
Storage temperature:	-40 °C to +100 °C (-40 °F to 212 °F)

Material

Probe:	Model MK 2 = brass Model EK 2 = 1.4571
Max. operating pressure:	Model MK 2 = 5 bar (72.5 psi) Model EK 2 = 10 bar (145 psi)



*other measuring ranges available upon request.

Pin assignment

Plug connection*	M12 (base)	Pin assignment***
Dimensions:		
Number of poles:	4-pin	
IP rating:	IP67**	
Max. voltage:	24 V DC	

*other connectors available upon request.

**with respective plug top.

***the pin assignment is based on Desina, Spec_11 and Spec_16.

Ordering Instructions

Basic version, L = variable

Item no.	Description	Connector	Length (L)
1124599	MK2-Desina	M12 (base)	L = ... mm
1124699	EK2-Desina	M12 (base)	L = ... mm

Ordering example

You need: Temperature sensor with M12 plug connector, length L = 520 mm (20.47"), operating pressure 2 bar (29 psi)

You order: Item no.: 1124599 Thermolog MK2-M12-Desina temperature sensor, L= 520

Level- and temperature sensor

NT 63-WHG

In hydraulics and lubrication technology the liquid level of oil tanks must be monitored continuously. Here, modern factory automation requires compatible signals. To minimise production costs and the space required on tanks, it makes sense to use one monitoring device for both the monitoring of the liquid level and oil temperature for example. The Nivotemp series meets virtually all requirements arising in this area of application.

Certification pursuant to the Federal Water Act

Connecting flange as per DIN 24557 Part 2

Continuous liquid level measurement

Continuous liquid level and temperature measurement

Analog output 4-20 mA

Resolution 4 mm (0.16 in) (liquid level)

Proven and tested highly dynamic float system

Float optionally available in stainless steel

Immersion tube length up to 1420 mm (55.90 in) (longer upon request)



Technical Data NT 63-WHG

Basic unit

K = continuous level and temperature measurement
 KN = continuous level measurement

Version	MS	VA
Operating pressure:	max. 1 bar (14.5 in)	max. 1 bar (14.5 in)
Medium temperature:	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float:	SK604	SK221
Min. fluid density:	0.80 kg/dm ³ (0.029 lb/in ³)	0.85 kg/dm ³ (0.030 lb/in ³)
Lengths (all versions):	280 (11.02 in), 370 (14.57 in), 500 (19.69 in), 670 (26.38 in), 820 (32.28 in), 970 (38.19 in), 1120 (44.09 in), 1270 (50 in) and 1420 mm (55.90 in) (other lengths available upon request)	

Material/Version

Float:	PU	1.4571
Immersion tube:	Brass	Brass
Flange DIN 24557 Part 2:	PA	PA
Weight at L=280 mm (11.02 in):	approx. 200 g (0.44 lb)	approx. 300 g (0.66 lb)
Each 100 mm (3.94 in) add:	approx. 30 g (0.06 lb)	approx. 50 g (0.11 lb)

Includes:

Mounting screws (quantity 6) and rubberised cork seal.

Options

Stilling tube (SSR):	VA	VA
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Analogue version

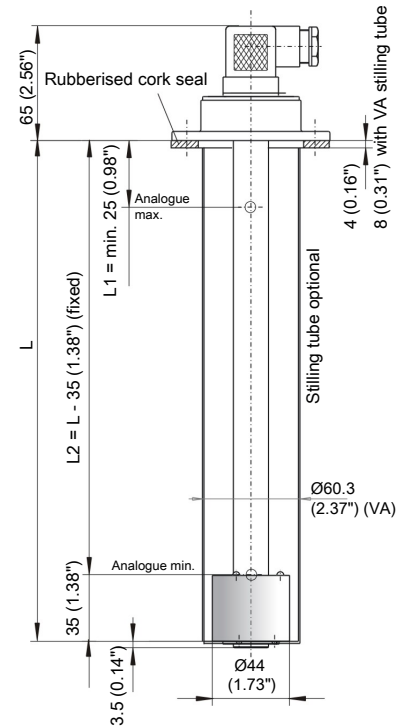
Ambient temperature:	-20 °C to 80 °C (-4 °F to 176 °F)	
Operating voltage (U _B):	10 – 30 V DC	10 – 30 V DC
Analysis display electronics accuracy:	± 1 % from end value	
Output:	4-20 mA	4-20 mA (0-100 °C*) *Other ranges upon request
Max. burden Ω:	$= (U_B - 7.5 V) / 0.02 A$	$= (U_B - 7.5 V) / 0.02 A$

Intake sizes (all versions)

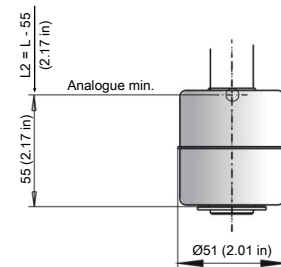
Level	Temperature
Measuring principle: reed-contact resolution 4 mm (0.16 in)	Measuring principle: Pt100 Cl. B, DIN EN 60751 Tolerance ± 0.8 °C (1.44 °F)

Dimensions

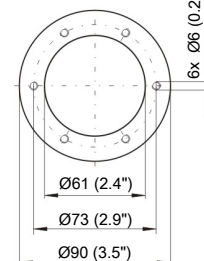
Basic model



SK 221 Float

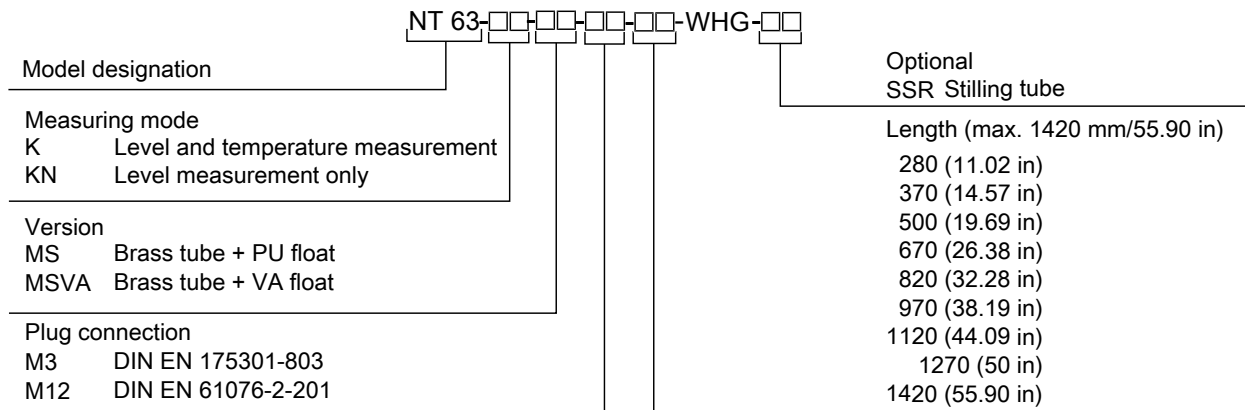


Flange drawing



Ordering instructions NT 63-WHG

Model key



Another accessory offered is a programmable display and control unit for displaying and monitoring measured variables, see data sheet no. 180201.

Accessories

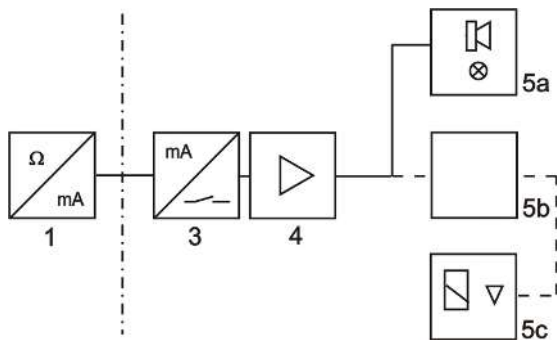
Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

Ordering example

You require: Level and temperature measurement with 4 mm (0.16 in) resolution, brass version with M12 plug connector and length L = 670 mm (26.38 in)

Order: NT 63-K-MS-M12-670-WHG

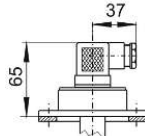
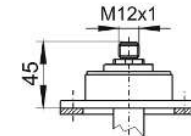
Overfill safety block diagram



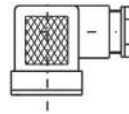
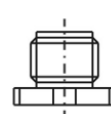
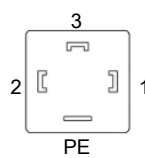
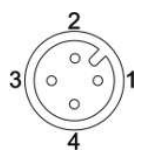
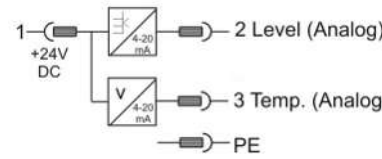
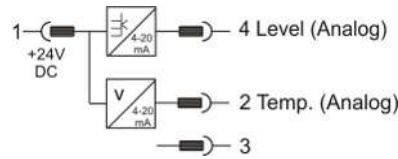
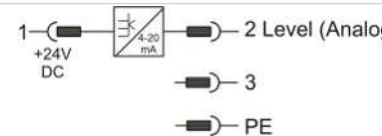
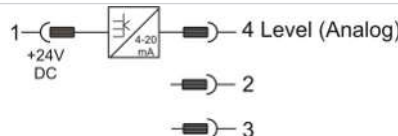
1	Level sensor with built-in transducer (63 K-WHG, 63 KN-WHG)	5a	Signalling unit with lamp and horn
3	Limit signal switch	5b	Control unit
4	Signal amplifier	5c	Actuator

Standard pin assignment NT 63-K-WHG, NT 63-KN-WHG

Plug connection

	M3	M12 (base)
Dimensions		
Number of pins	3-pin + PE	4-pin
DIN EN	175301-803	61076-2-101
Degree of protection	IP65	IP67*
Cable fitting	PG11	

*With moulded plug top

	M3	M12 (base)
		
Connection schematic		
K continuous level and temperature measurement		
KN continuous level measurement		



2.13 Oil Condition Sensors

Oil condition sensors overview

System description

A hydraulic system or lubricating system working properly among other things essentially depends on the fluid choice and quality. Both subtle processes such as the ingress of moisture through air or even sudden errors in the system along with contamination with foreign substances can cause the fluid quality to deteriorate, resulting in costly damage to the unit or tool. Continuous oil condition monitoring is therefore of utmost importance to extend the system life and optimise oil change intervals.

Bühler Technologies offers a wide range of stationary measuring instruments which remain in the system for a variety of oil and lubricant quality parameters.

The devices remaining in the system presents significant advantages over cyclical oil sampling and laboratory testing. It generates a continuous picture of the oil quality to obtain specialised information about the system. Problems in the system can be detected in a very short time and appropriate preventive action taken. So the system meets all requirements of modern maintenance at a go and opens up all possibilities for digitalisation according to I4.0.

Laboratory testing, on the other hand, merely shows a specific point in time. When in doubt, the system is operated with inadequate lubricant quality for many operating hours until the next oil sample is taken. This could be a costly mistake.

Bühler Technologies offers devices for monitoring the following oil quality parameters:

- Particles according to ISO4406 and other standards
- Ferromagnetic particles
- Relative humidity
- Temperature
- Permittivity
- Conductivity
- Liquid level

The technology

Particle monitoring

The **BPM** sensor in the particle monitor uses the optical principle of light obscuration. A laser shines through the measuring cell that oil flows through. The shadow of a particle flowing through causes an intensity reduction on a photodiode. The larger the particle, the greater the reduction in intensity.

Too many or too large of particles in the medium can clog valve seats, dull edges in hydraulic system components and roughen seal surfaces. This will inevitably cause internal leaks and performance loss in the system.

Ferromagnetic particles

Ferromagnetic particles can e.g. be a measure of abnormal wear in gearbox applications.

The **BMD** sensor collects ferromagnetic particles using a permanent magnet on the sensor and inductively monitors particle quantity. The interval between the individual automatic sensor cleanings can be a measure for progressing wear. The sensor can also distinguish between coarse and fine particles. The automatic self-cleaning feature is a unique function of the BMD.

Temperature

Bühler Technologies primarily uses PT100 & PT1000 resistor elements to measure temperature. Some oil quality parameters are directly related to temperature, e.g. relative humidity, permittivity, viscosity and conductivity. Correlating the temperature to precisely these parameters as accurately as possible is therefore essential. In addition, every system is designed for a specific temperature range. Monitoring the temperature is therefore necessary at any rate.



Moisture Measurement

Moisture is an undesired parameter in oil-based hydraulic systems. If the temperature-dependent saturation point of the oil is exceeded, free water in the oil settles out, causing corrosion damage, and in temperatures over 100°C can cause dangerous malfunctions due to degassing. The **BCM** sensor measures relative humidity using a capacitive transducer. If free water or an emulsion is present at the measuring element, the sensor shows 100 %.

Permittivity

Relative permittivity means the capacity to store electrical energy when voltages are present. In the case of fluids, this is a measure for the polarity of the fluid. The polarity can vary in different base oils and additives. Meaning the permittivity can be used to determine if e.g. the correct oil was used in an oil change. Oils also change their polarity as they age. So permittivity provides information on the degree of ageing and the oil type. This measuring technology is used in the **BCM-MS and BCM-LS**.

Conductivity

Fresh oil has a specific conductivity. Since every oil has a specific conductivity, this is a good criterion to distinguish oils. Conductivity can also be used to determine if oil has been mixed with foreign substances. Measuring conductivity is therefore a good tool for monitoring the oil with respect to oil changes, oil mixing and contamination.

Liquid level

The liquid level in the hydraulic oil tank should be monitored to prevent the pump from running dry. A continuously dropping liquid level can also be used to detect a leak in the system and prevent major damage to system components as well as reduce pollution. Monitoring the max. liquid level is also relevant to avoid overfilling.

The **BCM-L** uses capacitive measurement to measure the liquid level. Bühler Technologies further also offers measuring instruments with float in section liquid level measurement.

Oil condition sensor selection guide

	BCM-W	BPM	BMD	BCM-M	BCM-L
Particle measurement		X			
Ferromagnetic particles			X		
Rel. Humidity	X			X	X
Temperature	X	X *	X *	X	X
Permittivity				X	X
Conductivity				X	X
Liquid level					X
Pressure resistance:	50 bar	420/600 bar	20 bar	50 bar	50 bar
Voltage	12-30 VDC	9-33 VDC	22-33 VDC	9-33 VDC	9-33 VDC

*The temperature is measured inside the sensor and therefore only serves as a reference point for the oil temperature.

Oil Moisture Sensor BCM-W

Water or moisture is just as much an undesired parameter in hydraulic and lubrication systems as particles and air, and can cause significant system damage.

The Bühler Condition Monitoring Water Sensor (BCM-W) was designed specifically to continuously monitor the water content of oil whilst also measuring the temperature. The capacitive operating principle ensures reliable information on the saturation level of the respective oil regardless of the water absorption capacity.

The BCM-W product line has a variety of functions. Starting with a pure sensor with switching- and 4-20 mA output all the way to digital communication in form of IO link, it covers all parameters. The version with display allows the display to be mounted directly to the sensor or externally.

Special features

Requires no calibration depending on the respective oil

Up to 725 psi pressure resistance

Continuously logs the relative humidity

Continuously logs the temperature

Reliable measuring system

Display version

IO-Link output

Relative humidity as well as temperature analogue outputs, parametrisable 4-20 mA, 0-5 V, 0-10 V, 2-10 V

Up to 4 PNP switching outputs

Direct or external display mounting

Sensor type

IO-Link output

Output signal 4-20 mA relative humidity and temperature

Fixed relative humidity switching output setting

G1/2" and G3/4" connection thread



Technical Data BCM-WS

Sensor versions	BCM-WS100	BCM-WS120	BCM-WS160
Max. operating pressure	725 psi	725 psi	14.5 psi
Medium	-4 °F to +176 °F *	-4 °F to +176 °F *	-4 °F to +176 °F *
Threaded connection	G3/4" pipe thread, EOlastic seal	G1/2" pipe thread, EOlastic seal	Flange (DIN 24557/T2), seal FKM
max. torque	20 Nm	20 Nm	---
Sensor length from seal face	1.4 in	1.3 in	min. 3.9 in to max. 47.2 in
max. flow rate	110 lpm	110 lpm	110 lpm
max. fluid speed at sensor	5 m/s	5 m/s	5 m/s
Chemical resistance	Mineral oil based liquids, synthetic esters and biopetroleums	Mineral oil based liquids, synthetic esters and biopetroleums	Mineral oil based liquids, synthetic esters and biopetroleums
Ambient temperature	-4 °F to +158 °F	-4 °F to +158 °F	-4 °F to +158 °F
Supply voltage (U _B)	18 - 30 V (nominal voltage 24 VDC) 12 V on request for version 1S2A Note load	18 - 30 V (nominal voltage 24 VDC) 12 V on request for version 1S2A Note load	18 - 30 V (nominal voltage 24 VDC) 12 V on request for version 1S2A Note load

*Medium temperature up to 248 °F, from 194 °F no accurate measurand output possible within the tolerances.

Material/Version	BCM-WS100	BCM-WS120	BCM-WS160
Housing	Stainless steel/aluminium	Stainless steel/aluminium	Stainless steel/aluminium
Material in contact with media	1.4301, 1.4571, 2.4478, FR4, glass	1.4301, 1.4571, 2.4478, FR4, glass	1.4301, 1.4571, 2.4478, FR4, glass
Weight	approx. 0.45 lb	approx. 0.37 lb	approx. 2.05 lb at L = 7.9 in / + 0.11 lb per 3.9 in
IP rating	IP67*	IP67*	IP67*

*with plug-in connector screwed on

IO-Link

IO-Link	Revision 1.1
Baudrate	COM2 (38.4 k)
SIO Mode	Yes
min. time period	20 ms

Moisture measurement

Measuring range	0 - 100 % rel. humidity
Accuracy	± 3 % FS
Analog output	4 – 20 mA (0 – 100 % relative humidity)
Tolerance	± 0.5 % FS
Load Ω	= (U _B – 8 V) / 0.02 A

Switching output for humidity

PNP switching output ¹⁾²⁾	Fixed to 80 % relative humidity NC (normally closed)
Switching current	max. 0.2 A

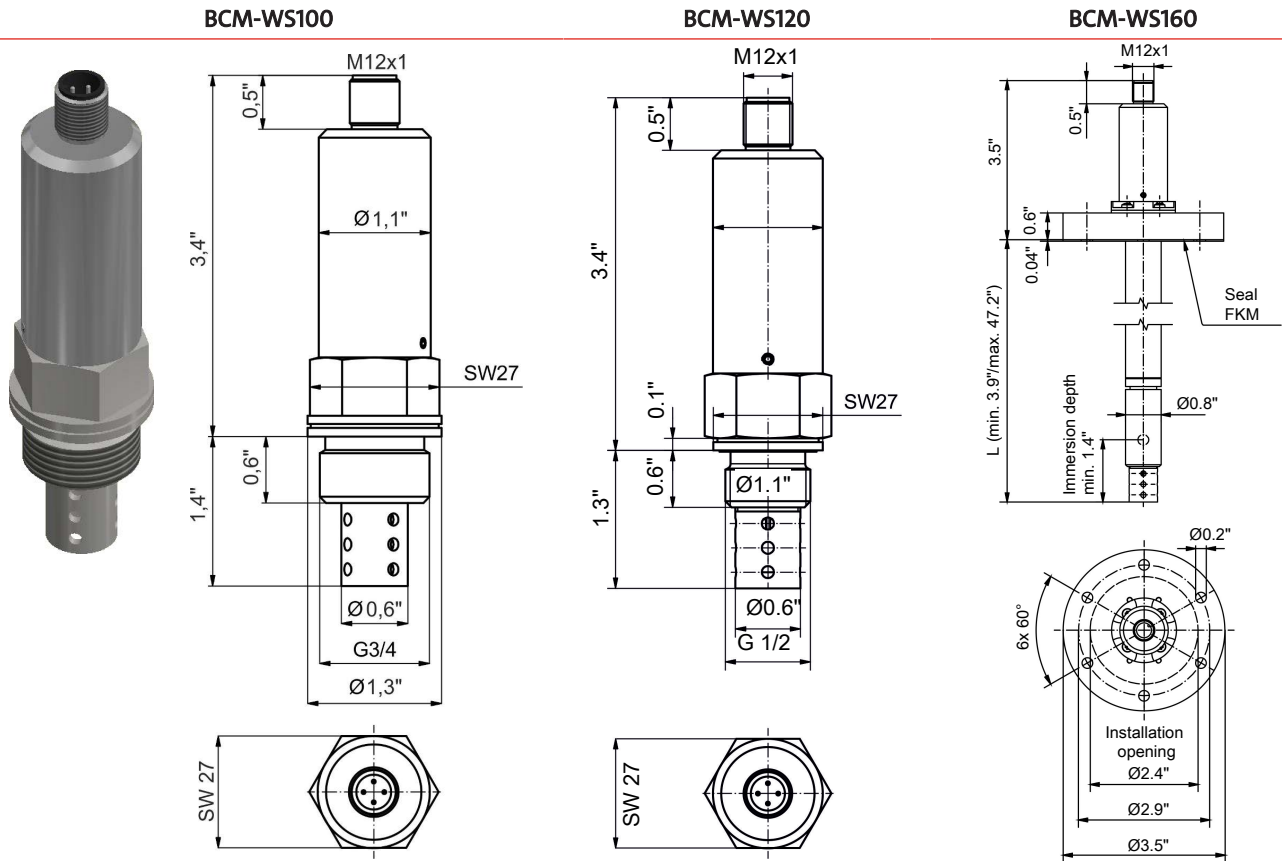
¹⁾ others on request

²⁾ adjustable via IO-Link

Temperature measurement

Measuring range	-4 °F to 248 °F
Accuracy	± 1.5 % FS
Analog output	4 – 20 mA (-4 °F to 248 °F)
Tolerance	± 0.5 % FS
Load Ω	= (U _B – 8V) / 0.02 A

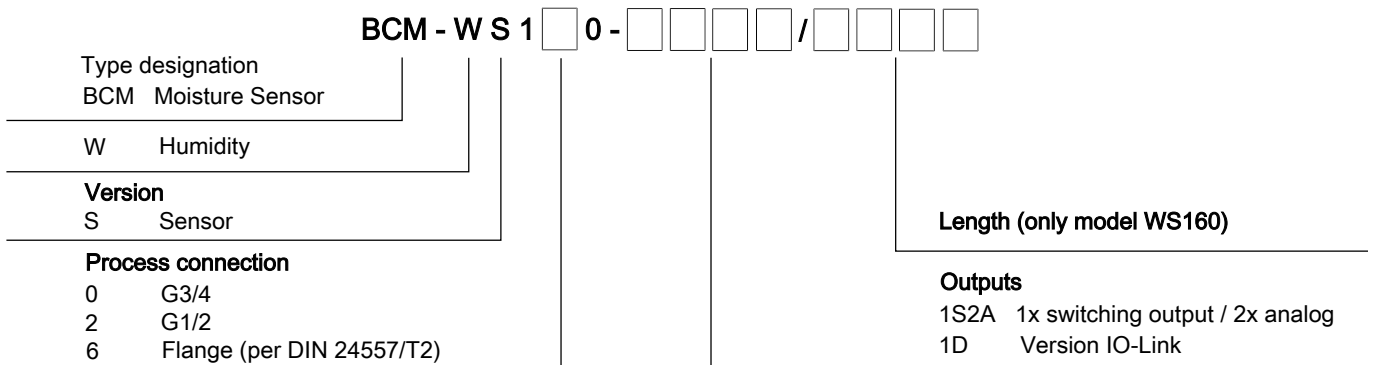
Dimensions BCM-WS



Outputs BCM-WS

Version	1S2A	1D
Plug (base)	1 x M12 – 8-pin	1 x M12 – 4-pin
Switching output (fixed)	X	
IO-Link		X
Humidity analogue output	X	
Temperature analogue output	X	

Model key BCM-WS

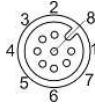
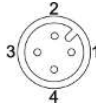


Ordering example:

You require: Moisture sensor with flange connection per DIN 24557/T2, 1 fixed switching output and 1 analogue output for humidity and temperature with a length L of 280 mm

Order: BCM-WS160-1S2A/280

Pin assignment BCM-WS

	WS-1S2A	WS-1D
		
Panel plug/jack	8-pin	4-pin
	Standard	IO Link
Pin		
1	L+	L+
2	L-	
3	S1 humidity	L-
4		C/Q
5		
6	I1 humidity	
7	I2 temp.	
8		

Technical Data BCM-WR/BCM-WD

Sensor with Display and Control Unit

General Technical Data

Max. operating pressure	725 psi 14.5 psi
Medium	-4 °F to +176 °F *
Threaded connection	G3/4" pipe thread, EOlastic seal
max. torque	20 Nm
Sensor length from seal face	1.4 in
max. flow rate	110 lpm
max. fluid speed at sensor	5 m/s
Chemical resistance	Mineral oil based liquids, synthetic esters and biopetroleums

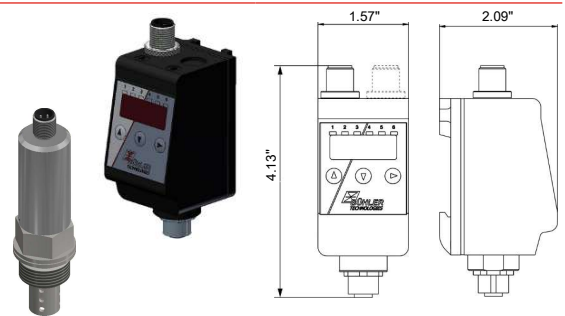
*Medium temperature up to 248 °F, from 194 °F no accurate measurand output possible within the tolerances.

Analysis and Display Electronics

Display	4 character 7 segment LED
Display unit	0 – 100 % relative humidity
Operation	via 3 keys
Memory	Min./Max. data memory
Starting current input	approx. 100 mA for 100 ms
Current input during operation	approx. 50 mA (without current- and switching outputs)
Supply voltage (U _B)	18 – 30 VDC (nominal voltage 24 VDC)
Ambient temperature	-4 °F to 158 °F
Display resolution	0.5 %, 0.5 °C, °F

Version	BCM-WR remote display with sensor
Mounting	1.4 inch (35 mm) top hat rail mounting/ G3/4
Weight	approx. 0.7 lb incl. sensor
Display housing	PA
IP rating	IP65* (display)/IP67* (sensor)

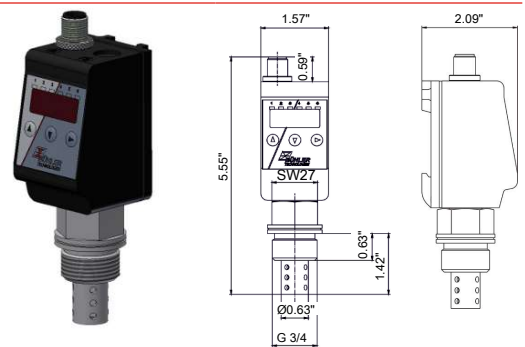
Dimensions



* with plug-in connector screwed on

Version	BCM-WD with attached sensor
Mounting	G3/4 / G1/2
Weight	approx. 0.6 lb
Display housing	PA
IP rating	IP65* (display)

Dimensions



*with plug-in connector screwed on

IO-Link

IO-Link	Revision 1.1
Baudrate	COM3 (230.4 k)
SIO Mode	Yes
min. time period	10 ms

Moisture measurement

Measuring range	0 - 100 % rel. humidity
Accuracy	± 3 % FS
Analog output	Parametrisable current or voltage output (4 - 20 mA, 2 - 10 V, 0 - 10 V or 0 - 5 V)
Tolerance	± 0.5 % FS
Load Ω (current output)	= (U _b - 8 V) / 0.02 A

Switching outputs

PNP switching output	Parametrisable switching function and switching output
Switching current	max. 0.2 A per output

Temperature measurement

Measuring range	-4 °F to +248 °F
Accuracy	± 1.5 % FS
Analog output	Parametrisable current or voltage output (4 - 20 mA, 2 - 10 V, 0 - 10 V or 0 - 5 V)
Tolerance	± 0.5 % FS
Load Ω (current output)	= (U _b - 8 V) / 0.02 A

Outputs BCM-WD/BCM-WR

Version	2S2A	1D1S	4S2A
Plug (base)			
Display & remote	1 x M12 – 8-pin	1 x M12 – 4-pin	1 x M12 – 4-pin 1 x M12 – 8-pin
Sensor connection jack (bottom)	1 x M12 – 8-pin	1 x M12 – 8-pin	1 x M12 – 8-pin
Remote			
Switching outputs	2 x	1 x	4 x
IO-Link		X	
Humidity analog output	X		X
Temperature analog output	X		X

Model key BCM-WD/BCM-WR

BCM - W 1 0 0 -

<p>Type designation BCM Moisture Sensor</p> <hr/> <p>W Humidity</p> <hr/> <p>Version</p> <p>D Display with built-in sensor</p> <p>R Remote display with external sensor</p>	<p>Outputs</p> <p>2S2A 2 x switching output / 2 x analogue</p> <p>1D1S 1 x switching output / IO-Link</p> <p>4S2A 4 x switching output / 2 x analogue</p> <hr/> <p>Process connection</p> <p>0 G 3/4</p> <p>2 G 1/2</p>
--	---

Ordering example:

You require: Moisture sensor with built-in sensor, 2 PNP switching outputs and analogue output for humidity and temperature
 Order: BCM-W-D-100-2S2A

Pin assignment BCM-WR/WD

	Plug A			Plug B	Sensor connection jack
	WD/WR-2S2A 	WD/WR-1D1S 	WD/WR-4S2A 	WD/WR-4S2A 	WR
Panel plug/jack	8-pin	4-pin	4-pin	8-pin	8-pin
	Standard	IO-Link	IO-Link		
Pin					
1	L+	L+	L+		L+
2	L-	DO/S2	S2		L-
3	S1 Humidity	L-	L-	S3	
4		C/Q	S1		
5	S2-Temp.			S4	
6	I1 humidity			I1 humidity	I1 humidity
7	I2 temp.			I2 temp.	I2 temp.
8					

Accessories

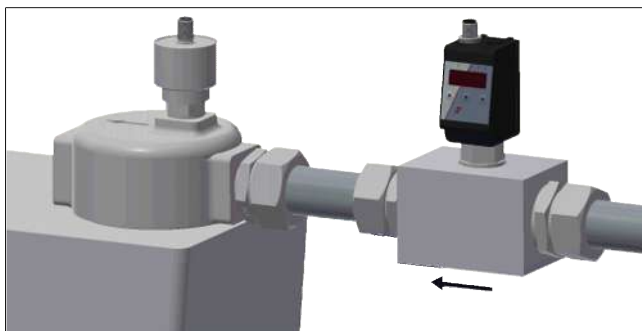
Item no.	Description
91 44 05 00 49	Coupler cable, 3 m
91 44 05 00 47	Connecting cable, 4-pin, 5 m
91 44 05 00 33	Connecting cable, 8-pin, 5 m
15 10 01 00	Assembly block/T-piece (BCM-WS100 only)

Installation recommendation

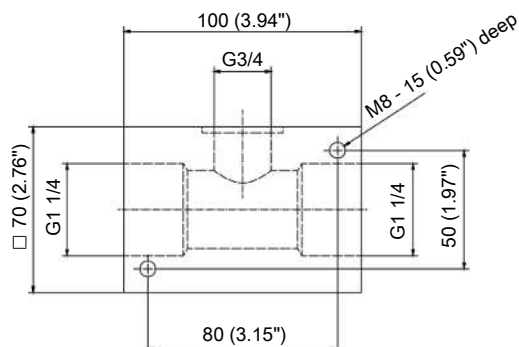
Proper moisture sensor function requires the entire sensor element to be inside the medium at all times. The sensor version is suitable for installation at the side of the tank. Here the installation position should be below the minimum liquid level. When installing into a return pipe, be sure not to exceed the maximum flow rate.

With the BCM-WR version the remote display mounts to a top hat rail.

Installation example:



Assembly block dimensions:





Bühler Particle Monitor BPM

Continuous particle monitor for lubricating and hydraulic oils

Particles are undesired parameters in hydraulic and lubricating systems and can cause considerable system damage.

The Bühler BPM-100 particle monitor was designed specifically for monitoring particles in oil. Continuously monitoring the fluid for solid particles can extend oil change intervals, thus significantly reduce maintenance costs. This makes the Bühler BPM-100 particle monitor an essential part of your condition monitoring system.

The BPM-100 visually detects particles and uses the principle of light obscuration to properly sort the particles in the respective fluid. Meaning a laser inside the measuring cell rates the particles based on size and quantity. It has the classifications according to common purity classes and features a large range of output signals sent by the switching output, 4-20 mA all the way to digital communication.

BPM-100

Switching output, 4-20 mA and CAN bus

High pressure resistance, primarily used in bypass

Continuous particle monitoring for detailed analysis of machine conditions

Compact, tough housing also suitable for demanding applications

Purity classes according to ISO 4406:99, SAE AS 4059, NAS 1638 & GOST 17216

Quick and accurate detection of particles or particle changes

Easy menu navigation

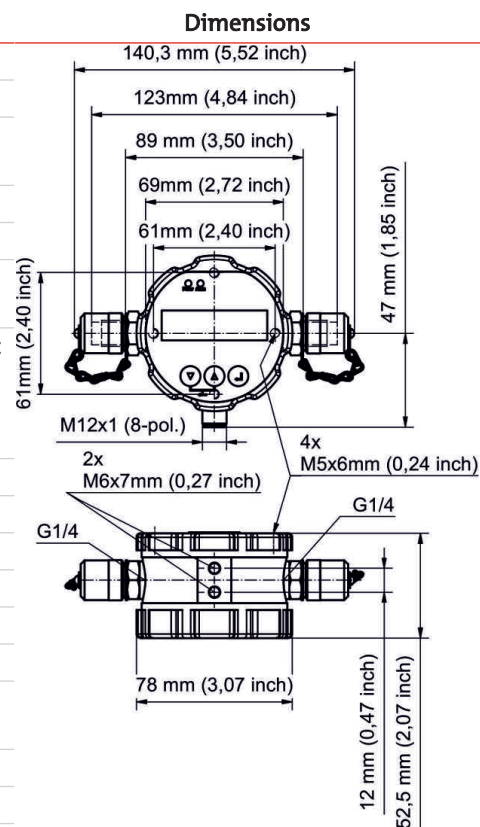
Easy system connection via Minimes or G1/4"

LC display



Technical Data

BPM-100-000-1DC2S1A	1DC2S1A
Version:	Compact unit with Minimess adapter
Process connection:	G 1/4" and M16x2 Minimess adapter
Material in contact with media:	stainless steel, sapphire, chromium, NBR, Minimess coupling: zinc/nickel
Medium temperature:	-4 °F to 185 °F (-20 °C to +85 °C)
Ambient temperature:	-4 °F to 185 °F -20 °C to +85 °C
Pressure resistance:	6091 psi (420 bar) dynamic 8702 psi (600 bar) static
Compatible fluids:	mineral oils (H, HL, HLP, HLPD, HVLP), synthetic esters (HETG, HEPG, HEES, HEPR), polyalkylene glycol (PAG), zinc- and ash-free oils (ZAF), poly-alpha-olefins (PAO)
Weight:	1.59 lb (720 g)
Input value	
Flow range:	50...400 ml/min
Operating voltage (U _b):	9 – 33 V DC
Power input:	max. 0.3 A
Measuring range	
ISO4409:99:	0...28 display 10...22 calibrated
SAE AS 4059E:	0...12 display
Following NAS 1638:	0...12 display
Following GOST 17216:	0...17 display
Size channels:	4, 6, 14, 21 µm
Measuring accuracy in calibrated measuring range	±1 Ordinal number
Additional secondary measurands:	temperature, volume flow, operating hours
1DC output:	RS232/CANopen/SAE J1939
Input/output 2S:	high/low, open collector
1A output:	4-20 mA clocked



Standard pin assignment

Plug connection	M12 (base)
Number of pins	8-pin
Voltage	max. 33 V DC
IP rating with IP67 cable box attached	IP67
Version	1DC2S1A
Connection schematic	
1	L+
2	L-
3	TxD, CAN low [OUT]
4	RxD, CAN high [IN]
5	Switching input [high/low]
6	Analog output 4...20 mA
7	Switching output [high/low]
8	Signal earth
Shield	-

Pressure loss

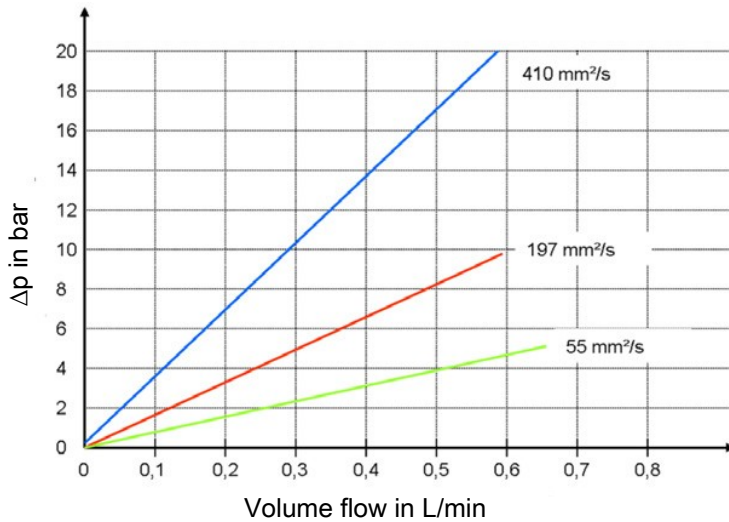


Fig. 1: Flow curve for various viscosities without Minimes connections

Model key

BPM - 100 - □□□ - 1DC2S1A

<p>Type designation BPM Bühler Particle Monitor</p>				
<p>Version 100 Standard compact unit</p>				
<p>Display 000 Unit with display 010 Unit without display</p>				
				<p>Outputs 1DC2S1A 1x RS232/CAN 2x Switching signal input output 1x analogue signal 4...20 mA</p>

Item no.	Model
1530001000	BPM-100-000-1DC2S1A
1530001010	BPM-100-010-1DC2S1A

Accessories

Item no.	Description
1590001006	Recalibration
1590001001	RS232 data cable
1590001002	USB/RS232 adapter
1590001003	Power supply
1590001004	Minimes connection with flow regulator
1590001011	CM terminal (see separate data sheet no. 150107)

Bühler Metal Detector BMD

Metal residue monitor in lubricating and hydraulic oils

Iron particles in particular are undesired parameters in hydraulic and lubricating systems and can cause considerable system damage, particularly to the gearbox area.

The Bühler BMD-100 metal detector was designed specifically to monitor ferrous particles in oil. Continuously monitoring the fluid for ferritic particles allows extending the oil change intervals, thus considerably reduce maintenance costs. This makes the Bühler BMD-100 metal detector an essential part of your condition monitoring system.

The BMD-100 is a smart sensor and based on the inductive measuring system to properly sort the ferritic particles in the respective fluid. It can distinguish between fine and coarse ferromagnetic particles. It has analog and digital output signals.

The BMD-100 features an automatic cleaning process.

BMD-100

4-20 mA and CAN bus output

Use in the main or auxiliary circuit

Continuous particle monitoring for detailed analysis of machine conditions

Compact, tough housing also suitable for demanding applications

G1" process connection

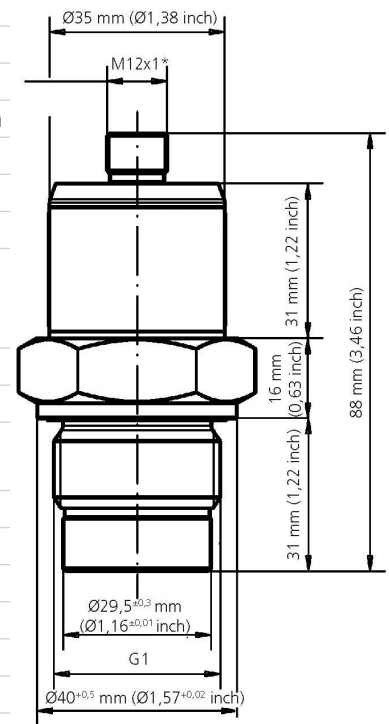
Automatic cleaning process




Technical Data

BMD-100-000-1DC1A	1DC1A
Version:	Compact unit
Process connection:	G1"
Fastening torque:	50 ±5 Nm
Material in contact with media:	aluminium, polyamide (PA6GF30), HNBR, epoxy resin
Medium temperature:	-40 °F to 185 °F (-40 °C to +85 °C)
Ambient temperature:	-40 °F to 185 °F (-40 °C to +85 °C)
Pressure resistance:	290 psi (20 bar)
Compatible fluids:	mineral oils (H, HL, HLP, HLPD, HVLP), synthetic esters (HETG, HEPG, HEES, HEPR), polyalkylene glycol (PAG), zinc- and ash-free oils (ZAF), poly-alpha-olefins (PAO)
Weight:	0.42 lb (190 g)
Input value	
Flow rate:	max. 1 m/s min. 0.05 m/s for automatic cleaning
Operating voltage (U _B):	22 – 33 V DC
Power input:	max. 0.5 A
Measuring range	
Fine particles:	0...100 %
Coarse particles:	1...10
Additional secondary measurands:	Temperature (inside device), operating hours
1D output:	RS232/CANopen
1A output:	4-20 mA clocked

Dimensions



Standard pin assignment

Plug connection	M12 (base)
Number of pins	8-pin
Voltage	max. 33 V DC
IP rating with IP67 cable box attached	IP67
Version	1DC1A
Connection schematic	
1	L+
2	L-
3	TxD, CAN low [OUT]
4	RxD, CAN high [IN]
5	not connected
6	not connected
7	Analog output, 4...20 mA
8	Signal earth
Shield	-

Model key**BMD - 100 - 000 - 1DC1A****Type designation**

BMD Bühler Metal Detector

Version

100 Standard compact unit

Outputs

1DC1A

1x RS232/CAN

1x analog signal 4...20 mA

Item no.	Model
1540001000	BMD-100-000-1DC1A

Accessories

Item no.	Description
9144050033	Connecting cable, 8-pin, 5 m
1590001001	RS232 data cable
1590001002	USB/RS232 adapter
1590001003	Power supply

Bühler Condition Monitor BCM-MS

Continuous condition monitor for lubricating and hydraulic oils

Continuously monitoring the condition of the respective fluid in hydraulic and lubricating systems is essential. Failing to continuously monitor the condition can result in considerable system damage.

The Bühler Condition Monitoring Multi Sensor (BCM-MS) was designed specifically to continuously monitor the relative humidity, temperature, permittivity and conductivity in oil. By monitoring the fluid, sudden and subtle deterioration or changes in oil quality can be accurately detected and the oil change intervals extended or planned accurately. Maintenance costs can be reduced significantly. This makes the Bühler Condition Monitoring Multi Sensor an essential part of your condition monitoring system.

The BCM-MS capacitively measures the relative humidity in the medium to ensure reliable information about the saturation level of the oil.

The conductivity and permittivity can be used to obtain substantiated information about oil ageing, replenishment and mixing with other oils or foreign objects. Since conductivity and permittivity are greatly affected by the temperature, the actual temperature is always determined as well.

BCM-MS200

4-20 mA and CAN bus

High pressure resistance of up to 725 psi (50 bar)

Continuously logs relative humidity, temperature, conductivity and permittivity

Compact, tough housing also suitable for demanding applications

Multifunction sensor

Easy system connection directly inside the tank or via line adapter

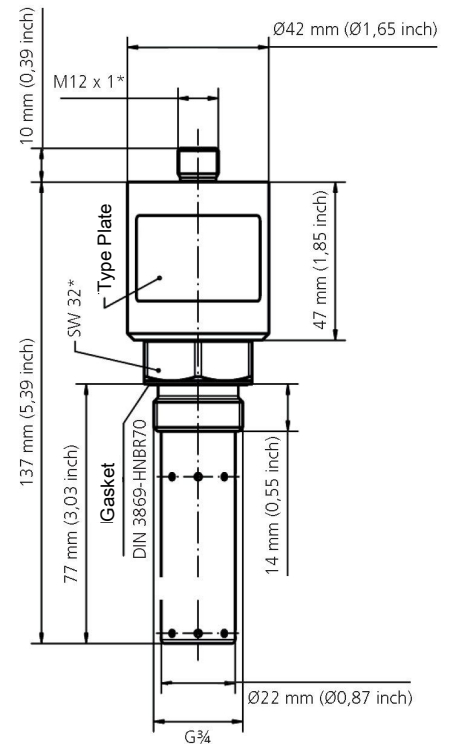
Evaluates and saves actual data



BCM-MS Technical Data

BCM-MS200–1DC2A	1DC2A
Version:	Compact unit
Process connection:	G3/4
Material in contact with media:	aluminium, HNBR, polyurethane resin, epoxy resin, electroless nickel immersion gold (ENIG), solder, aluminium oxide, glass, gold, silver palladium
Medium temperature:	-4 °F to 185 °F (-20 °C to +85 °C)
Ambient temperature:	-4 °F to 185 °F (-20 °C to +85 °C)
Pressure resistance:	725 psi (50 bar)
Compatible fluids:	mineral oils (H, HL, HLP, HLPD, HVLP), synthetic esters (HETG, HEPG, HEES, HEPR), polyalkylene glycol (PAG), zinc- and ash-free oils (ZAF), poly-alpha-olefins (PAO)
Weight:	0.31 lb (140 g)
Operating voltage (U _b):	9 – 33 V DC
Power input:	max. 0.2 A
Measuring range	
Temperature:	-4 °F...185 °F (-20 °C...85 °C)
Rel. humidity:	0...100 %
Rel. permittivity:	1...7
Conductivity:	100...800,000 pS/m
Measuring accuracy	
Temperature:	±2 K
Rel. humidity:	±3 %
Rel. permittivity:	±0.015
Conductivity (100...2,000 pS/m):	±200 pS/m
Conductivity (2,000...800,000 pS/m):	<±10 %
1DC output:	RS232/CANopen/SAE J1939
2A output:	2x 4-20 mA (assigned to one fixed measurand or sequential output of all values)

Dimensions



Standard pin assignment

Plug connection	M12 (base)
Number of pins	8-pin
Voltage	max. 33 V DC
IP rating with IP67 cable box attached	IP67
Version	1DC2A
Connection schematic	
1	L+
2	L-
3	TxD, CAN low [OUT]
4	RxD, CAN high [IN]
5	-
6	Analog output, 4...20 mA
7	Analog output, 4...20 mA
8	Signal earth
Shield	-

Bühler Condition Monitor BCM-LS

Continuous condition and liquid level monitor for lubricating and hydraulic oils

Continuously monitoring and condition and liquid level of the respective fluid in hydraulic and lubricating systems is essential. Failing to continuously monitor the condition can result in considerable system damage.

The Bühler condition monitoring liquid level sensor (BCM-LS) was designed specifically to continuously monitor the relative humidity, temperature, permittivity, conductivity and liquid level in oil tanks. By continuously monitoring the fluid, sudden and subtle level changes, deterioration or changes in oil quality can be accurately detected and the oil change intervals extended or planned accurately. Maintenance costs can be reduced significantly. This makes the Bühler condition monitoring liquid level sensor an essential part of your condition monitoring system.

The BCM-LS capacitively measures the relative humidity in the medium to ensure reliable information about the saturation level of the oil.

The conductivity and permittivity can be used to obtain substantiated information about oil ageing, replenishment and mixing with other oils or foreign objects. Since conductivity as well as permittivity are greatly affected by the temperature, the actual temperature is always determined as well.

The additional liquid level measurement function makes the BCM-LS an comprehensive multifunctional sensor.

BCM-LS200

4-20 mA and CAN bus

High pressure resistance of up to 725 psi (50 bar)

Continuously logs relative humidity, temperature, conductivity, permittivity and liquid level

Compact, tough housing also suitable for demanding applications


Easy system connection directly inside the tank

Evaluates and saves actual data

Multifunction sensor



Standard pin assignment

Plug connection	M12 (base)
Number of pins	8-pin
Voltage	max. 33 V DC
IP rating with IP67 cable box attached	IP67
Version	1DC2A
Connection schematic	
1	L+
2	L-
3	TxD, CAN low [OUT]
4	RxD, CAN high [IN]
5	-
6	Analog output, 4...20 mA
7	Analog output, 4...20 mA
8	Signal earth
Shield	-

BCM-LS model key
BCM - LS200 - 1DC2A / xxx

Type designation BCM Bühler Condition Monitor L Multisensor incl. liquid level measurement S Sensor	Length 200 mm (7.87 in) 375 mm (14.76 in) 615 mm (24.21 in)
Process connection 0 G3/4"	Outputs 1DC2A 1x CANopen/2x analog

Item no.	Model
1550002200	BCM-LS200-1DC2A/200
1550002375	BCM-LS200-1DC2A/375
1550002615	BCM-LS200-1DC2A/615

Accessories BCM-LS

Item no.	Description
1590001001	RS232 data cable
1590001002	USB/RS232 adapter
1590001003	Power supply



CM Terminal for oil condition sensors

Condition Monitoring is a fundamental prerequisite for safe and efficient operation of oil-hydraulic and lubrication systems. Continuously monitoring key parameters enables maximizing the service life of oil and reduce maintenance expenses.

The CM Terminal offers the basis for combining various CM sensors in an easy to see location. Their outputs allow compatible information networking to the master system.

Available:

- Purity class/contamination
- Temperature
- Humidity
- Conductivity
- Permittivity
- Oil ageing/remaining life
- Pressure level

To correctly set the flow range of the BPM particle monitor, the terminal block is directly equipped with a throttle valve.

Compact design

Simple option to combine various oil condition monitoring parameters

Custom combinations

Integrated flow regulation



Planning information

Mount

The block can be mounted with four screws. Be sure the support structure is sized adequately.

Connecting the oil circuit

The connecting line upstream from the particle monitor should be at least 4.9 ft long to remove air bubbles in the oil.

Avoid pressure peaks in the system to ensure a constant flow rate.

Follow the relevant safety regulations to prevent environmental damage due to potential oil leaks (e.g. collection pans).

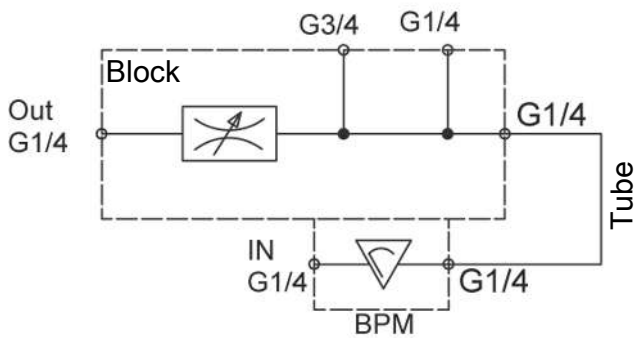
Please also note the information and technical data of the planned sensor types. For information, please refer to the data sheets and operating instructions of the devices.

Technical data

Material/version

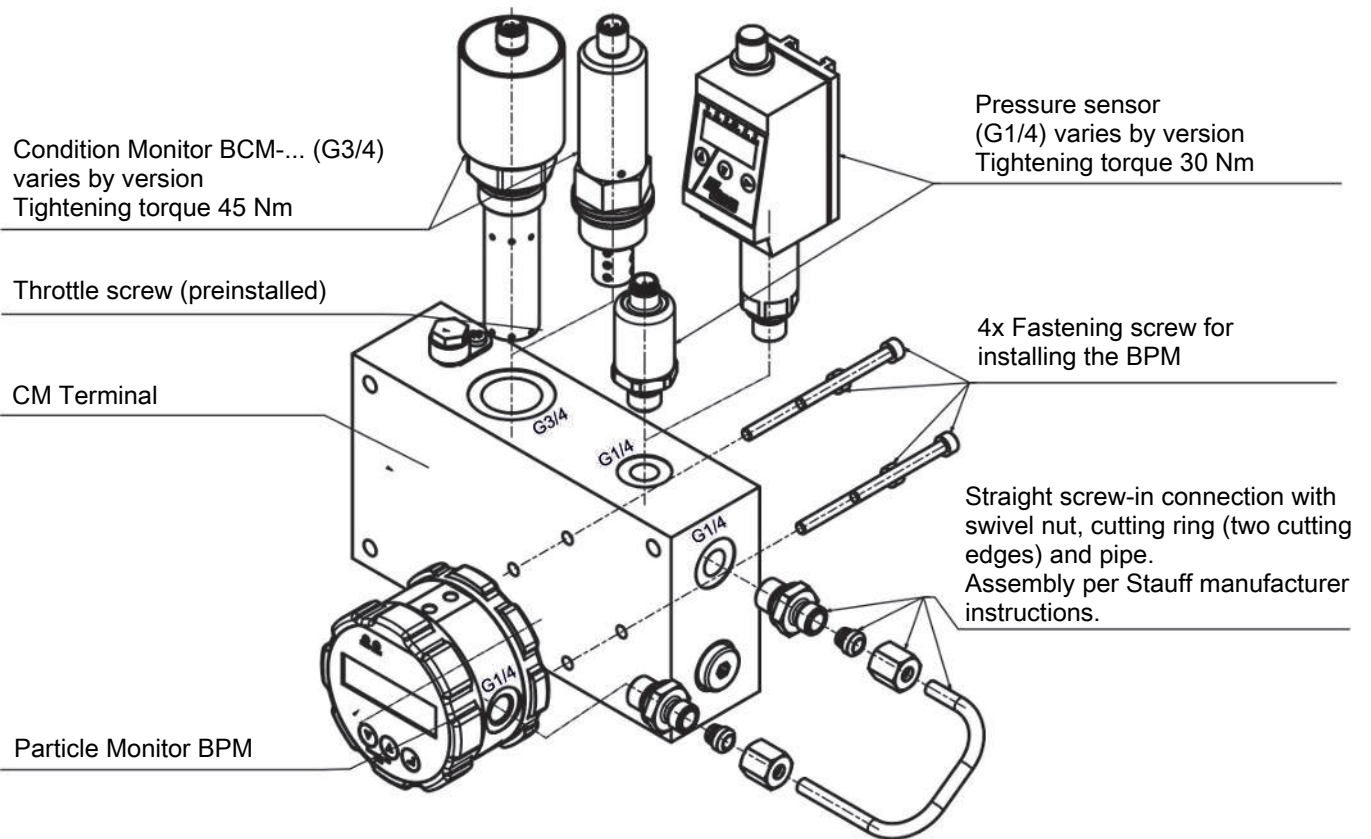
Max. operating pressure:	725 psi
Temperature:	-4...185 °F
Material:	Aluminium, ZnNi-coated steel, brass, NBR

Connection schematic



System layout

In the delivered state, the bores for the BCM and pressure sensor are covered with VSTI- plugs.



Note!

The sensors are not included with item 1590001011 – CM Terminal.

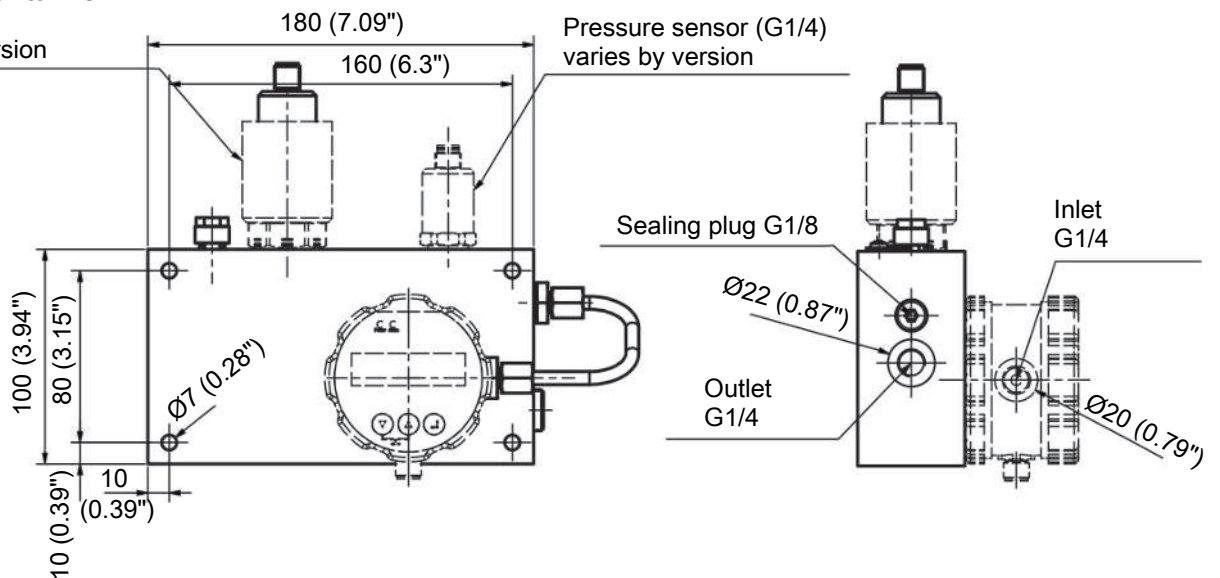
Order sensors separately.

Please note the sensors datasheet on our website:

<https://www.buehler-technologies.com/en/fluidcontrol/oil-condition-sensors/>

Dimensions and mounting options

Condition Monitor BCM-... (G3/4) varies by version





3 Tempering

3.1	Oil- Water Cooling	323
3.2	Oil- Air Cooling.....	343
3.3	Off-line Filter / Cooler Devices.....	373
3.4	Empty.....	394

Chap. 19. Cooler / filter units

cooling agent: air

- integrated pump and filter
- compact design
- DIN- or customized filter
- delivery volume 8/15/30/40/60/90 l/min



cooling agent: water

- integrated pump and filter
- DIN-filter NG250 and NG400
- delivery volume 18/30/60/90 l/min



Chap. 22 Filter units

- stationary
- mobil



Chap. 24 Circulation pumps

- low noise
- Gerotor principle



Chap. 6 Temperature measurement

For limitation

- switch and/or analogue signals



Chap.18. Oil-air cooler

BLK: Return line

- wide operating range
- easy maintenance



BNK: Kidney loop

- wide operating range
- easy maintenance
- integrated pump



Chap. 17. Oil-water cooler

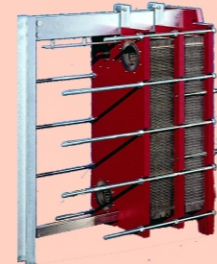
Plate heat exchanger
BWT

- compact design
- maintenance free
- high pressure rating



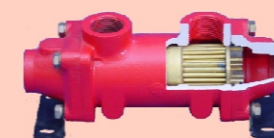
Plate heat exchanger
GC/GL/GX

- modular design
- for very high cooling capacity



tube and shell
heat exchanger F

- compact design
- high pressure rating
- low pressure losses at higher viscosities



Chap. 20 Heating

Heating systems on request



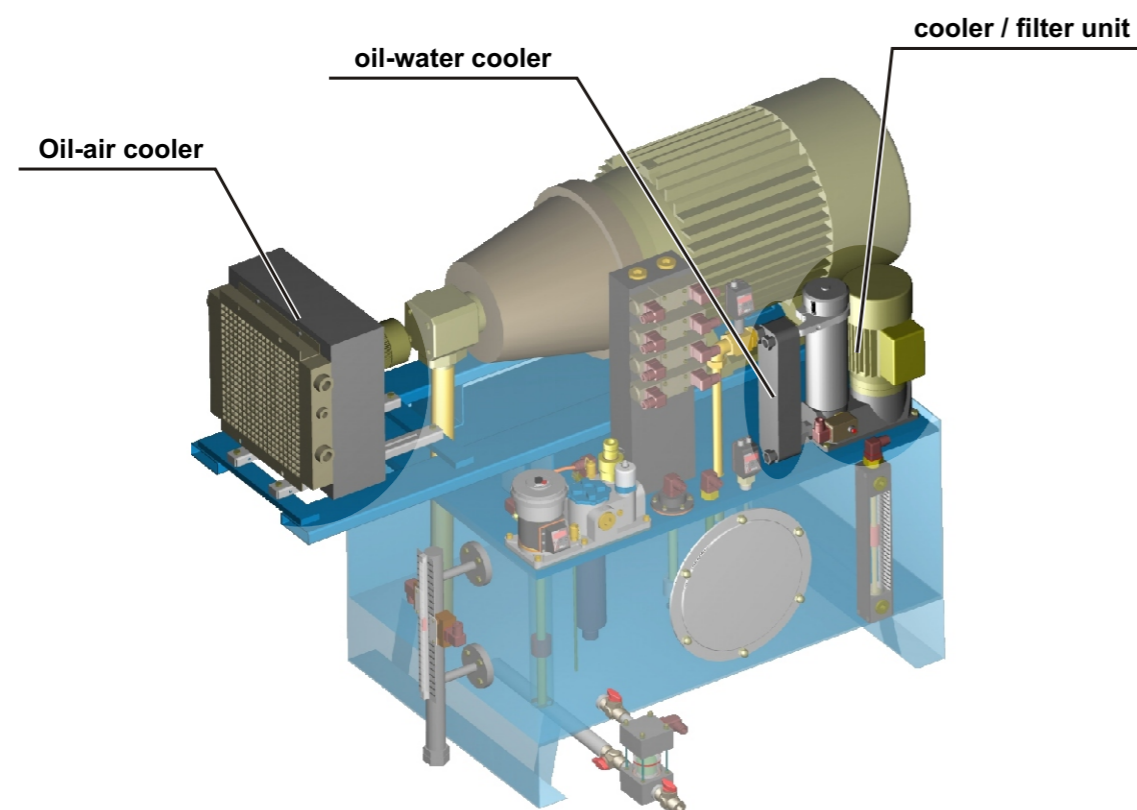
Tempering

Because oil viscosity depends on temperature, the operation temperature must be kept constant. This requires not only measurement of the actual oil temperature with sufficient accuracy. The measured values have to be used in short terms for controlling and stabilising.

Depending on the application it may be necessary to heat the oil up to operation temperature.

Afterwards the oil temperature will rise due to losses and has to be cooled down / stabilized to the required operation temperature.

Because convection depends on ambient conditions the temperature can be limited in narrow ranges by forced cooling only. As cooling agent air or water can be used in combination with the appropriate heat exchanger.





3.1 Oil- Water Cooling



Heat exchangers BWT

Hydraulic drives and lubricating systems are indispensable in machine construction, raw material production, navigation and many other areas.

Both as a power transfer medium and lubricant oil is heated by friction losses during operation.

Since the viscosity of the oil changes along with the temperature, precise temperature stabilisation using coolers is a vital requirement for systems and drives for consistent power. In addition to the unlimited supply of ambient air, water is also used as a coolant. The advantage of water is the low susceptibility to seasonal temperature fluctuations and large companies often use it as a central circulation coolant.

BWT plate heat exchangers are a particularly efficient solution in these cases. They're extremely compact, practically maintenance-free and easy to install.

Equally distributed turbulent flow

High exchange efficiency

Low water consumption

Small installation space

High pressure resistance

Maintenance free

Broad temperature range

Easy installation



Introduction and description

Why coolers?

There are basically two main concepts in the development of fluid power systems.

One is to design systems without using a cooler, and if operational conditions show that the system needs a cooler, install it later at additional costs. This understandably then often calls for compromises, making the system more expensive.

The other concept recognizes that a system originally designed with an integrated cooler needs less installation space and is a better choice with respect to construction and system costs.

Why Bühler?

Using an oil/water cooler nowadays requires paying great attention to low water consumption. The tube bundle heat exchangers Bühler had been selling for decades could not meet this requirements, resulting in our search for a new exchanger concept for hydraulics.

Soldered plate heat exchangers meet these requirements outstandingly and further offer other advantages such as requiring little installation space and the high pressure resistance.

Together with a well-known manufacturer, Bühler implemented these findings in a comprehensive product line customised for the requirements in fluid control.

If our standard range of products does not includes the right solution for your application, we will gladly develop a custom solution for you.

Use the data in this leaflet to determine a suitable cooler for your application. However, we do recommend using our calculator to configure your cooler. This will allow you to optimise it whilst incorporating various parameters.



Construction and application

BWT plate heat exchangers are made from patterned stainless steel plates. The direction of the pattern varies from plate to plate, yielding a large number of contacts on the back of the pattern. When the plates are soldered the contacts also connect, forming an extremely compact, pressure-resistant set of plates. And yet virtually the entire material are available for heat exchange.

Function

Compared to other systems the interior geometry of the BWT ensures a turbulent flow, yielding high heat transfer coefficients when using the limits for low flow rates, thus flow speeds, in the configuration. This excludes Zones with a low speed, maintaining an extremely equally distributed flow across the entire exchanger surface. The materials used result in dense, smooth exchanger plate surfaces, significantly reducing the risk of possible corrosion.

These design features of the BWT plate heat exchangers virtually eliminate the risk of deposits within the exchanger.

Planning information

Set-up

The coolers should be installed providing easy accessible and visibility. Any installation position is permitted and may be adapted to the installation conditions. However, the cooler should not be installed on its back.

Secure the plate heat exchanger with the bracket sold as an accessory. The connection lines must be installed free from tension and vibration. We recommend installing tubes or compensators.

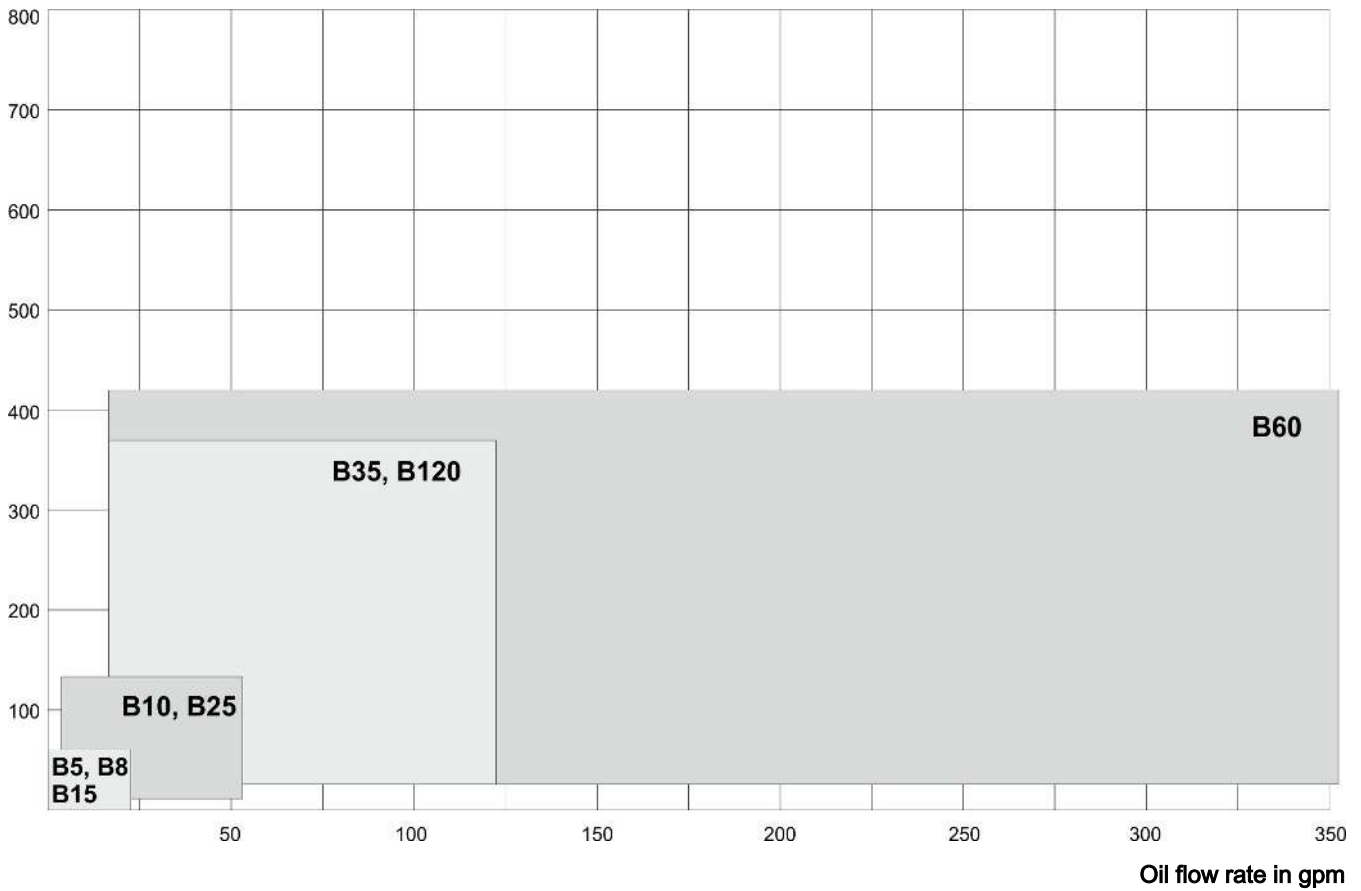
Prevent freezing when installed outdoors.

Flow

Oil and water flow in opposite directions inside the heat exchanger (oil inlet F1 → F3, water inlet F4 → F2). The connections can alternatively be switched (oil inlet F3 → F1, water inlet F2 → F4).

Cooling capacity comparison for the various BWT lines

Cooling performance in hp



The diagram above shows the applications of the various base types.

Approvals

BWT plate coolers are approved by the following authorities:

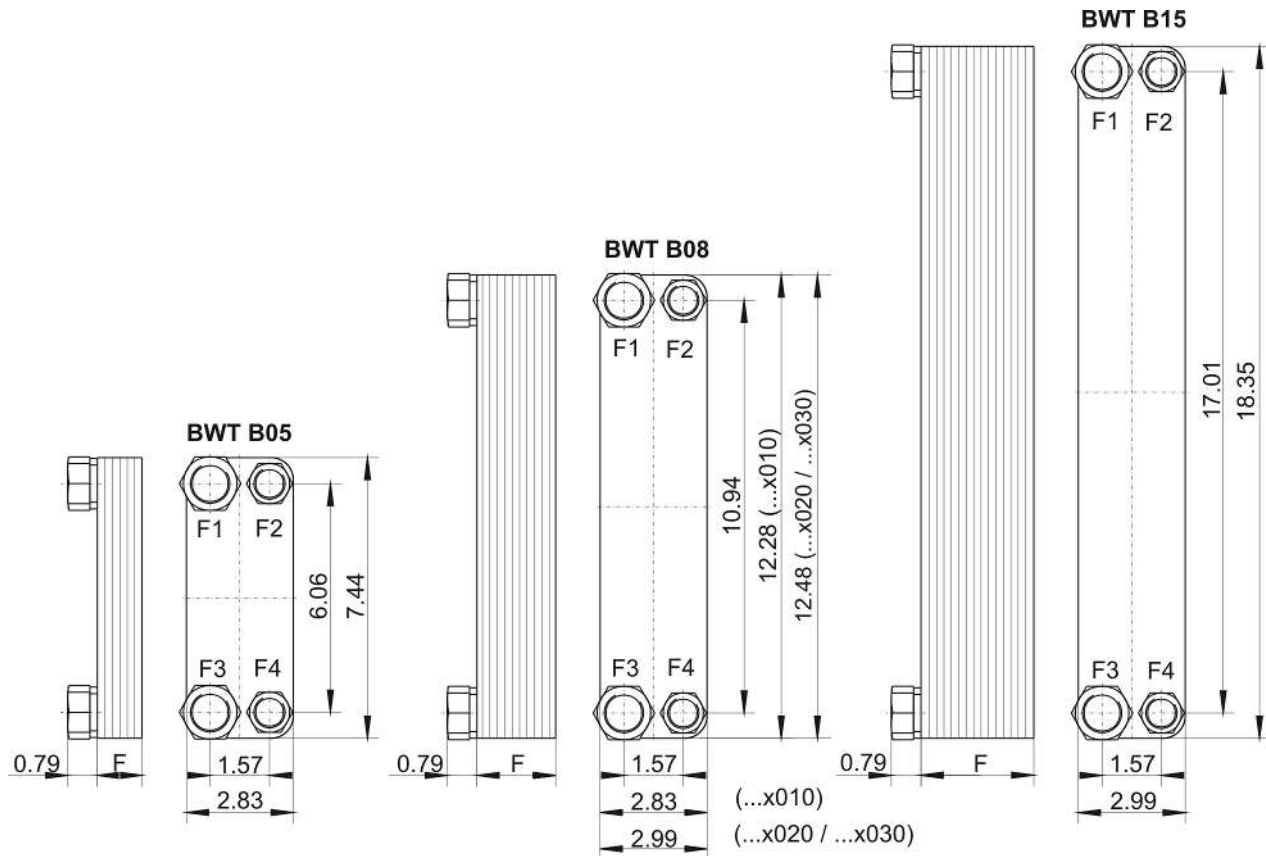
- | | |
|-------------|---|
| Sweden | Statens Anläggningsprovning (SA) |
| Norway | Kjelkontrollen |
| Canada | Canadian Standard Association (CSA) |
| Germany | Technischer Überwachungsverein (TÜV) |
| USA | Underwriters Laboratories (UL) |
| Finland | Teknillinen Tarkastuskeskus (TK) |
| Switzerland | Schweizerischer Verein des Gas- und Wasserfaches (SVGW) |
| EU | TRB801 No. 25 |

Bühler is ISO 9001 certified

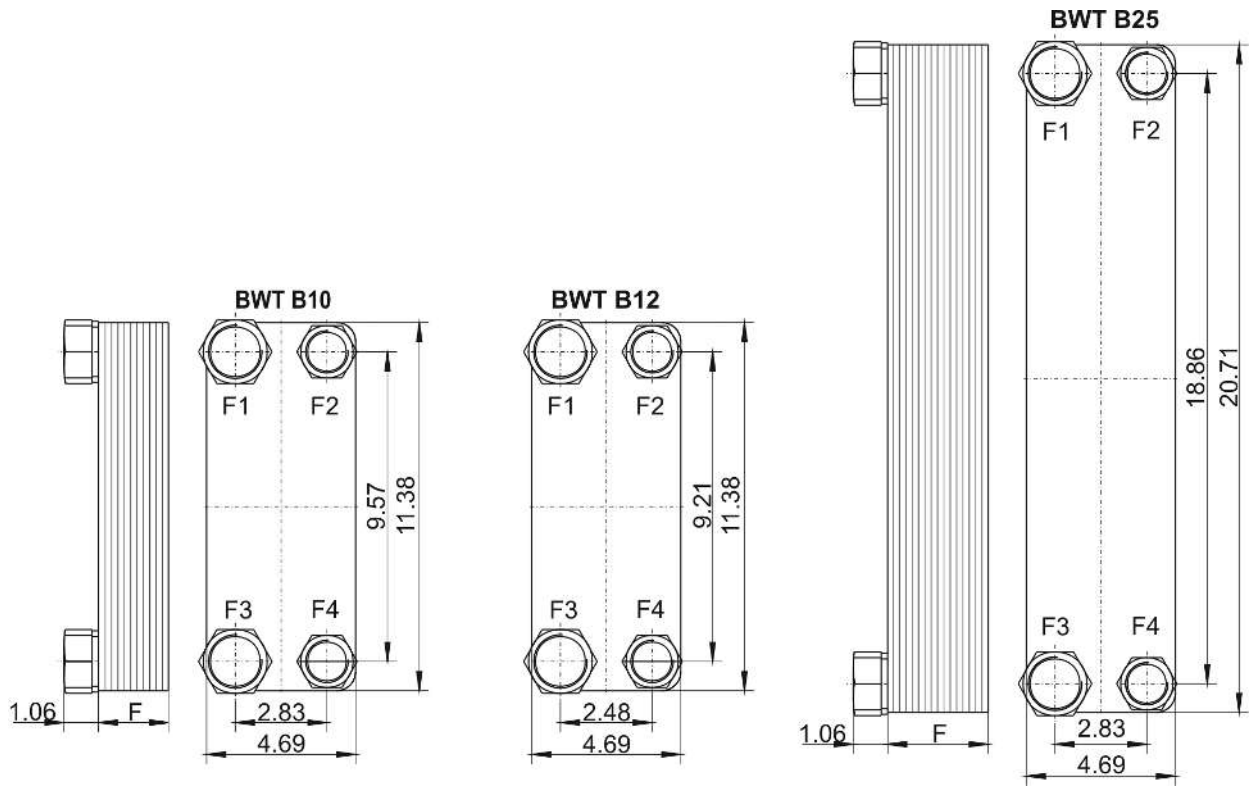
Technical data BWT

Technical Data

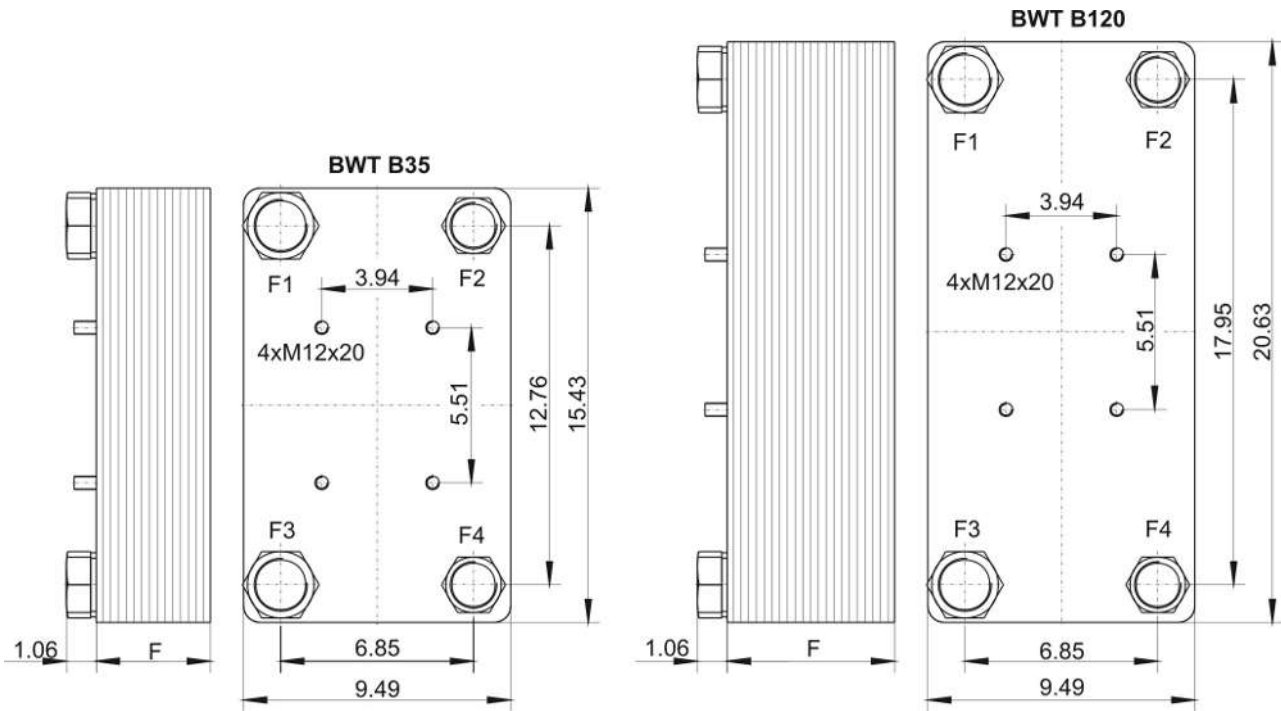
Material	Stainless steel 1.4401, Cu 99.9% and Cu-free soldering material. Also Cu-free soldering materials as special versions BWT-N B5-B28, see data sheet 340005. Flange B60 and up, in Swedish standard SS 2172, DIN 17175.
Operating pressure	
static:	max. 435 psi
dynamic:	290 psi at 5 M load cycle, 3 Hz
Operating oil temperature	max. +365 °F



Type	Item no.	F (in)	Cooling capacity (hp)	Oil connection F3, F1	Water connection F2, F4	Weight (lb – net)	Volume (gal)
BWT B05x010	3405010	1.18	2.0 - 6.7	G ¾ 36 mm	G ½ 27 mm	2.2	0.03
BWT B05x020	3405020	2.09	2.0 - 14.8	G ¾ 36 mm	G ½ 27 mm	3.3	0.05
BWT B08x010	3408010	1.18	3.6 - 8.0	G ¾ 36 mm	G ½ 27 mm	3.5	0.13
BWT B08x020	34080200	2.09	6.7 - 21.5	G ¾ 36 mm	G ½ 27 mm	4.4	0.26
BWT B08x030	34080300	2.99	13.4 - 33.5	G ¾ 36 mm	G ½ 27 mm	6.6	0.4
BWT B15x030	3415030	2.99	8.0 - 40.2	G ¾ 36 mm	G ½ 27 mm	8.8	0.53

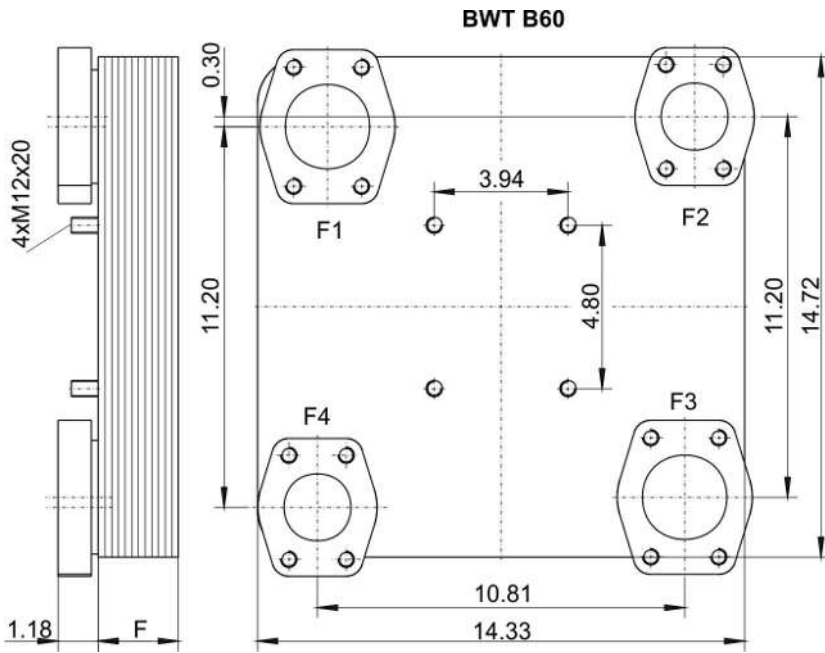


Type	Item no.	F (in)	Cooling capacity (hp)	Oil connection F3, F1	Water connection F2, F4	Weight (lb – net)	Volume (gal)
BWT B10x020	3410020	1.93	6.7 – 33.5	G 1/4 1 mm	G 3/4 36 mm	8.8	0.3
BWT B10x030	3410030	2.83	13.4 - 53.6	G 1/4 1 mm	G 3/4 36 mm	11.0	0.4
BWT B10x040	3410040	3.70	13.4 - 67.0	G 1/4 1 mm	G 3/4 36 mm	15.4	0.5
BWT B10x050	3410050	4.57	20.1 - 80.4	G 1/4 50 mm	G 1 1/4 1 mm	17.6	0.8
BWT B10x070	3410070	6.34	26.8 - 87.1	G 1/4 50 mm	G 1 1/4 1 mm	22.0	0.9
BWT B10x090	3410090	8.11	26.8 - 107.2	G 1/4 50 mm	G 1 1/4 1 mm	28.7	1.1
BWT B12Hx060	3412060	5.71	46.9 - 113.9	G 1/4 50 mm	G 1 1/4 1 mm	29.8	1.1
BWT B25x030	3425030	2.83	17.4 - 194.4	G 1/4 50 mm	G 1 1/4 1 mm	22.0	0.5
BWT B25x040	3425040	3.74	17.4 - 87.1	G 1/4 50 mm	G 1 1/4 1 mm	26.5	0.8
BWT B25x060	3425060	5.47	26.8 - 120.6	G 1/4 50 mm	G 1 1/4 1 mm	37.5	1.3
BWT B25x080	3425080	7.24	33.5 - 140.8	G 1/4 50 mm	G 1 1/4 1 mm	46.3	1.8



Type	Item no.	F (in)	Cooling capacity (hp)	Oil connection F3, F1	Water connection F2, F4	Weight (lb – net)	Volume (gal)
BWT B35x040	3435040	4.06	40.2 - 140.8	G 1½ 60 mm	G 1¼ 50 mm	39.7	1.3
BWT B35x050	3435050	5.00	73.7 - 194.4	G 1½ 60 mm	G 1¼ 50 mm	46.3	1.8
BWT B35x060	3435060	5.94	73.7 - 207.8	G 1½ 60 mm	G 1¼ 50 mm	52.9	2.1
BWT B35x090	3435090	8.78	73.7 - 234.6	G 1½ 60 mm	G 1¼ 50 mm	75.0	3.2
BWT B120x040	3445040	4.06	53.6 - 167.6	G 1½ 60 mm	G 1¼ 50 mm	50.7	1.6
BWT B120x060	3445060	5.94	73.7 - 254.7	G 1½ 60 mm	G 1¼ 50 mm	68.3	2.6
BWT B120x080	3445080	7.83	87.1 - 328.4	G 1½ 60 mm	G 1¼ 50 mm	88.2	3.7
BWT B120x120	3445120	11.61	181.0 - 375.3	G 1½ 60 mm	G 1¼ 50 mm	125.7	5.5

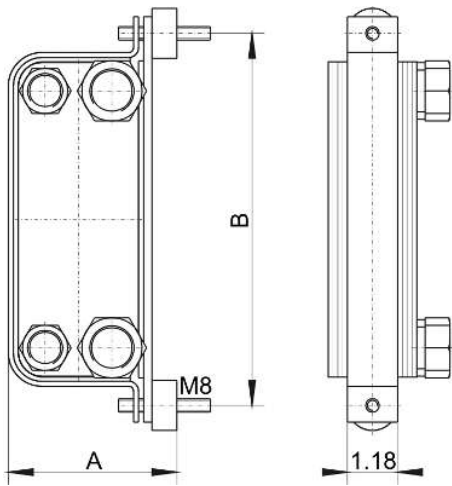
B60



Type	Item no.	F (in)	Cooling capacity (hp)	Oil connection F3, F1	Water connection F2, F4	Weight (lb – net)	Volume (gal)
BWT B60x040	3460040	4.09	40.2 - 151.5	SAE 2 ½ *	SAE 2	72.8	2.4
BWT B60x060	3460060	5.79	46.9 - 221.2	SAE 2 ½ *	SAE 2	92.6	3.4
BWT B60x080	3460080	7.48	53.6 - 289.5	SAE 2 ½ *	SAE 2	114.6	4.5
BWT B60x100	3460100	9.13	57.6 - 357.9	SAE 2 ½ *	SAE 2	134.5	5.8
BWT B60x120	3460120	10.83	75.1 - 403.5	SAE 2 ½ *	SAE 2	154.5	6.9
BWT B60x140	3460140	12.52	101.9 - 423.6	SAE 2 ½ *	SAE 2	176.4	8.2

* SAE connections at pressure range 3000 PSI

Mounting brackets



Type	Part no.	A	B	for BWT type
BB05	34BB05	4.09	8.78	
BB08	34BB08	4.09	13.66	B08 x 010
BB080	34BB080	4.25	13.98	B08 x 020 x 030
BB15	34BB15	4.09	19.72	
BB10	34BB10	5.94	12.72	
BB25	34BB25	5.94	22.09	
BB35	34BB35	10.75	16.77	
BB 45	34BB45	10.75	21.97	

NOTICE! We recommend using two brackets for the types B35-090 and B120-060 up to B120-120.



Heat exchangers BWT-N

Hydraulic drives and lubricating systems are indispensable in machine construction, raw material production, navigation and many other areas.

Both as a power transfer medium and lubricant oil is heated by friction losses during operation.

Since the viscosity of the oil changes along with the temperature, precise temperature stabilisation using coolers is a vital requirement for systems and drives for consistent power. In addition to the unlimited supply of ambient air, water is also used as a coolant. The advantage of water is the low susceptibility to seasonal temperature fluctuations and large companies often use it as a central circulation coolant.

BWT plate heat exchangers are a particularly efficient solution in these cases. They're extremely compact, practically maintenance-free and easy to install.

Particularly suited for corrosive mediums

Equally distributed turbulent flow

High exchange efficiency

Low water consumption

Small installation space

Maintenance free

Broad temperature range

Easy installation

Cu-free soldering material



Introduction and description

Why coolers?

There are basically two main concepts in the development of fluid power systems.

One is to design systems without using a cooler, and if operational conditions show that the system needs a cooler, install it later at additional costs. This understandably then often calls for compromises, making the system more expensive.

The other concept recognizes that a system originally designed with an integrated cooler needs less installation space and is a better choice with respect to construction and system costs.

Why Bühler?

Using an oil/water cooler nowadays requires paying great attention to low water consumption. The tube bundle heat exchangers Bühler had been selling for decades could not meet this requirements, resulting in our search for a new exchanger concept for hydraulics.

Soldered plate heat exchangers meet these requirements outstandingly and further offer other advantages such as requiring little installation space and the high pressure resistance.

Together with a well-known manufacturer, Bühler implemented these findings in a comprehensive product line customised for the requirements in fluid control.

If our standard range of products does not includes the right solution for your application, we will gladly develop a custom solution for you.

Use the data in this leaflet to determine a suitable cooler for your application. However, we do recommend using our calculator to configure your cooler. This will allow you to optimise it whilst incorporating various parameters.



Typical application

- Oil cooling or heating high in sulphur (which reacts to sulphur)
- Pharmaceutical and chemical application where copper-soldered heat exchangers are sensitive to acids and bases
- High-temperature application

Construction and application

BWT plate heat exchangers are made from patterned stainless steel plates. The direction of the pattern varies from plate to plate, yielding a large number of contacts on the back of the pattern. When the plates are soldered the contacts also connect, forming an extremely compact, pressure-resistant set of plates. And yet virtually the entire material are available for heat exchange. In this series the copper solder was replaced with a special nickel-based solder, which in addition to nickel and chromium, also contains silicon, boron and other elements. The basic materials, the duct plates, cover plates, connections, etc. are the same as in copper-soldered BWTs. Our copper-free heat exchangers are much more resistant to aggressive mediums. In addition, the temperature resistance in the BWT-N series is significantly higher than copper-soldered compact heat exchangers. The thermal efficiency corresponds to that of the copper-soldered BWT.

Function

Compared to other systems the interior geometry of the BWT ensures a turbulent flow, yielding high heat transfer coefficients when using the limits for low flow rates, thus flow speeds, in the configuration. This excludes Zones with a low speed, maintaining an extremely equally distributed flow across the entire exchanger surface. The materials used result in dense, smooth exchanger plate surfaces, significantly reducing the risk of possible corrosion.

These design features of the BWT plate heat exchangers virtually eliminate the risk of deposits within the exchanger.

Planning information

Set-up

The coolers should be installed providing easy accessible and visibility. Any installation position is permitted and may be adapted to the installation conditions. However, the cooler should not be installed on its back.

Secure the plate heat exchanger with the bracket sold as an accessory. The connection lines must be installed free from tension and vibration. We recommend installing tubes or compensators.

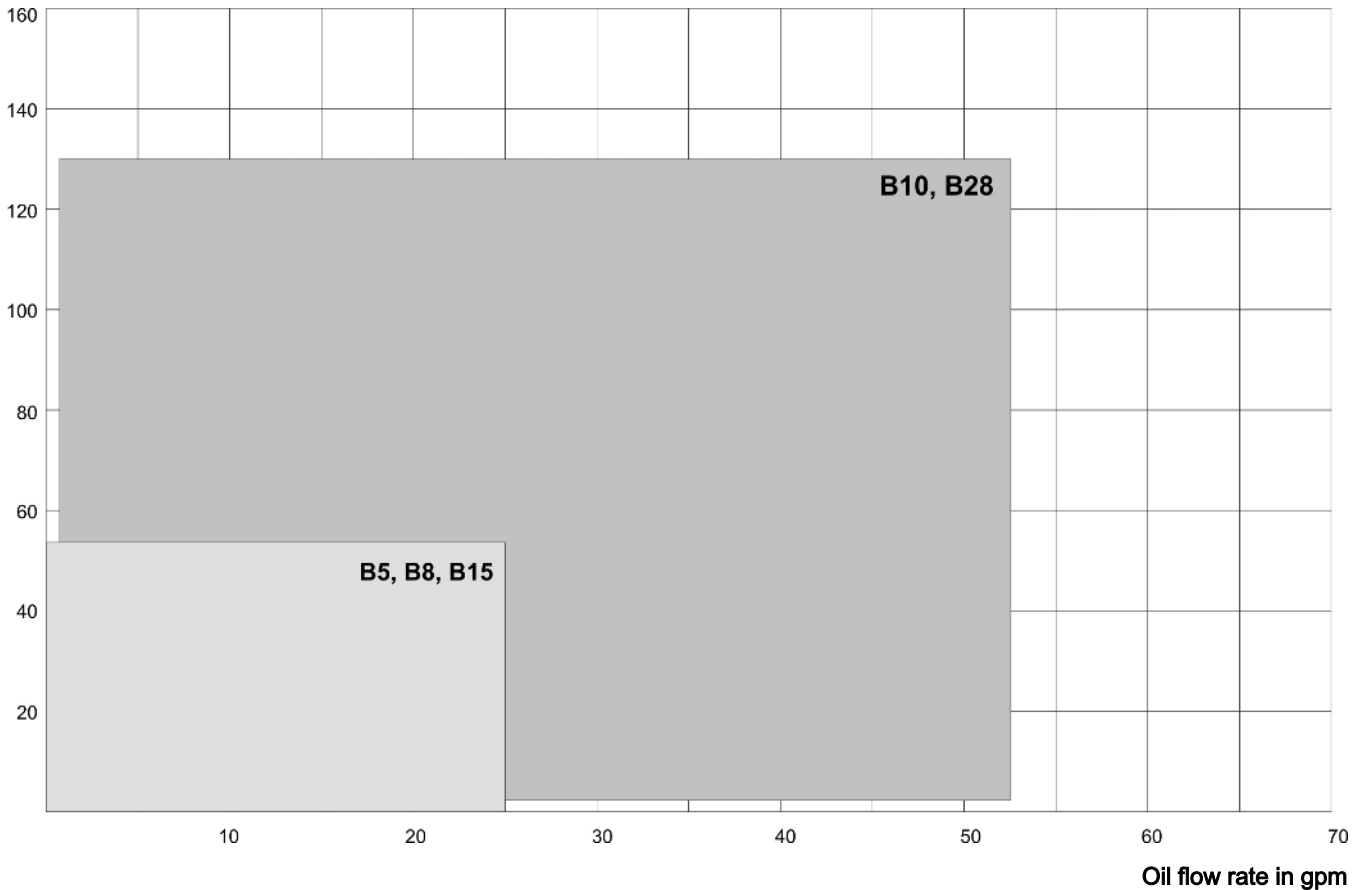
Prevent freezing when installed outdoors.

Flow

Oil and water flow in opposite directions inside the heat exchanger (oil inlet F1 → F3, water inlet F4 → F2). The connections can alternatively be switched (oil inlet F3 → F1, water inlet F2 → F4).

Cooling capacity comparison for the various BWT-N lines

Cooling performance in hp



The diagram above shows the applications of the various base types.

Approvals

BWT plate coolers are approved by the following authorities:

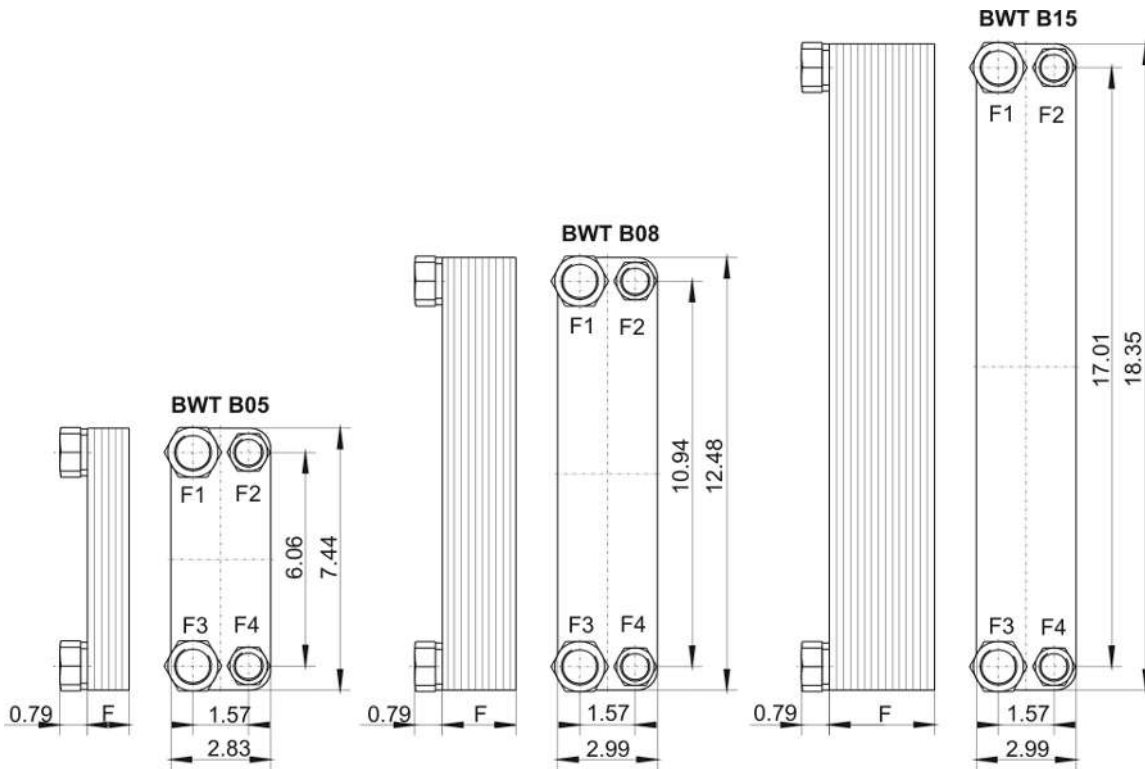
Sweden	Statens Anläggningsprovning (SA)
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Switzerland	Schweizerischer Verein des Gas- und Wasserfaches (SVGW)
EU	TRB801 No. 25

Bühler is ISO 9001 certified

Technical data BWT-N

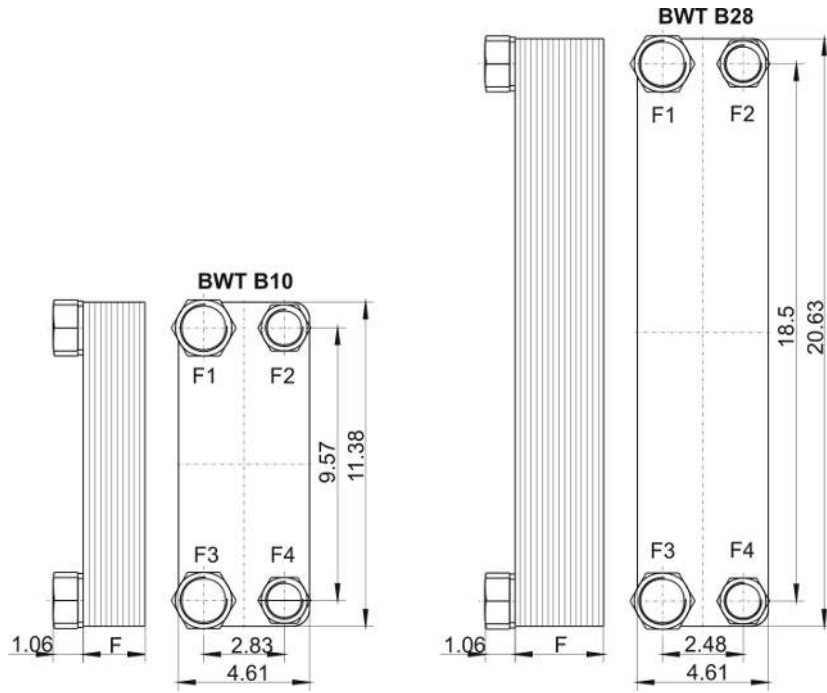
Technical Data

Material	Stainless steel 1.4401, Cu-free soldering material (nickel-based solder)
Operating pressure	
static:	max. 145 psi
Operating oil temperature	+662 °F



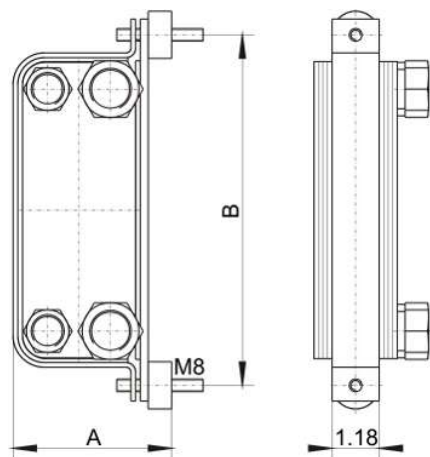
Type	Item no.	F (in)	Cooling capacity (hp)	Oil connection F3, F1	Water connection F2, F4	Weight (lb – net)	Volume (gal)
BWT B05x010N	3405010N	1.18	2 - 6.7	G 3/4 36 mm	G 1/2 27 mm	2.2	0.03
BWT B05x020N	3405020N	2.09	2 - 14.8	G 3/4 36 mm	G 1/2 27 mm	3.3	0.05
BWT B08x010N	34080100N	1.18	3 - 8	G 3/4 36 mm	G 1/2 27 mm	3.5	0.13
BWT B08x020N	34080200N	2.09	6.7 - 21.5	G 3/4 36 mm	G 1/2 27 mm	4.4	0.26
BWT B08x030N	34080300N	2.99	13.4 - 33.5	G 3/4 36 mm	G 1/2 27 mm	6.6	0.40
BWT B15x030N	3415030N	2.99	8 - 40	G 3/4 36 mm	G 1/2 27 mm	8.8	0.53

B10 / B28



Type	Item no.	F (in)	Cooling capacity (hp)	Oil connection F3, F1	Water connection F2, F4	Weight (lb – net)	Volume (gal)
BWT B10x020N	3410020N	2.17	6 - 34	G 1/4 11 mm	G 3/4 36 mm	8.8	0.26
BWT B10x030N	3410030N	3.11	13 - 52	G 1/4 11 mm	G 3/4 36 mm	11	0.40
BWT B10x040N	3410040N	4.06	13 - 67	G 1/4 11 mm	G 3/4 36 mm	15.4	0.53
BWT B10x054N	3410054N	5.39	21 - 80	G 1/2 15 mm	G 3/4 41 mm	18	0.79
BWT B10x070N	3410070N	6.89	27 - 87	G 1/2 15 mm	G 3/4 41 mm	22	0.92
BWT B10x090N	3410090N	8.78	27 - 107	G 1/2 15 mm	G 3/4 41 mm	29	1.06
BWT B28x030N	3428030N	3.11	17 - 60	G 1/4 50 mm	G 1/4 11 mm	22	0.53
BWT B28x040N	3428040N	4.06	17 - 87	G 1/4 50 mm	G 1/4 11 mm	26.5	0.79
BWT B28x060N	3428060N	5.94	27 - 121	G 1/4 50 mm	G 1/4 41 mm	37.5	1.32
BWT B28x080N	3428080N	7.83	34 - 141	G 1/4 50 mm	G 1/4 41 mm	46.3	1.85

Mounting brackets



Type	Part no.	A	B
BB05	34BB05	4.09	8.78
BB08	34BB080	4.25	13.98
BB15	34BB15	4.09	19.72
BB10	34BB10	5.94	12.72
BB25 / BB28	34BB25	5.94	22.09



Heat exchangers BWT-DW

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BWT plate heat exchangers are a particularly efficient solution in these cases. They're extremely compact, practically maintenance-free and easy to install.

Particularly suited for corrosive mediums

Equally distributed turbulent flow

High exchange efficiency

Low water consumption

Little installation space required

Maintenance-free

Broad temperature range

Easy installation



Introduction and description

Why coolers?

There are basically two main concepts in the development of fluid power systems.

One is to design systems without using a cooler, and if operational conditions show that the system needs a cooler, install it later at additional costs. This understandably then often calls for compromises, making the system more expensive.

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Use the data in this leaflet to determine a suitable cooler for your application. However, we do recommend using our calculator to configure your cooler. This will allow you to optimise it whilst incorporating various parameters.

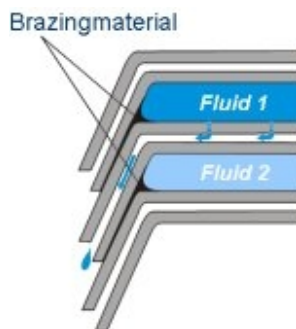
Typical application

In the event of a plate break in a regular plate heat exchanger, a mixing of products is the logical consequence. Double-Wall-plate heat exchangers are used where product mixing must absolutely be prevented due to the reactions which would occur. Each double wall plate consists of two identical individual plates, laser welded together around the clearance holes. In the event of a plate break, the medium will leak in between the two individual plates.

Incorrect installation or operation could result in a defect of the welded joint at the connection, hence media mixing. Please refer to operating manual.

The leak is usually detected quickly and the damage can be corrected. In some countries, double-wall plate heat exchangers are used for service water warming in district heating systems, among other things. Double-wall plate heat exchangers are further required in instances where the products mixing could result in dangerous chemical reactions, e.g. for cooling transformer oil.

The arrows indicate the flow of mediums in a plate break:



Areas of application: Pharmaceutical industry, nuclear technology, petrochemistry, chemical industry, heating potable water, food industry.

Construction and application

BWT plate heat exchangers are made from patterned stainless steel plates. The direction of the pattern varies from plate to plate, yielding a large number of contacts on the back of the pattern. When the plates are soldered the contacts also connect, forming an extremely compact, pressure-resistant set of plates. And yet virtually the entire material area is available for heat exchange.

Function

Compared to other systems the interior geometry of the BWT ensures a turbulent flow, yielding high heat transfer coefficients when using the limits for low flow rates, thus flow speeds, in the configuration. This excludes Zones with a low speed, maintaining an extremely equally distributed flow across the entire exchanger surface. The materials used result in dense, smooth exchanger plate surfaces, significantly reducing the risk of possible corrosion.

These design features of the BWT plate heat exchangers virtually eliminate the risk of deposits within the exchanger.

Planning information

Set-up

The coolers should be installed providing easy accessible and visibility. Any installation position is permitted and may be adapted to the installation conditions. However, the cooler should not be installed on its back.

Secure the plate heat exchanger with the bracket sold as an accessory. The connection lines must be installed free from tension and vibration. We recommend installing tubes or compensators.

Prevent freezing when installed outdoors.

Approvals

BWT plate coolers are approved by the following authorities:

Sweden	Statens Anläggningsprovning (SA)
Norway	Kjelkontrollen
Canada	Canadian Standard Association (CSA)
Germany	Technischer Überwachungsverein (TÜV)
USA	Underwriters Laboratories (UL)
Finland	Teknillinen Tarkastuskeskus (TK)
Switzerland	Schweizerischer Verein des Gas- und Wasserfaches (SVGW)
EU	TRB801 No. 25

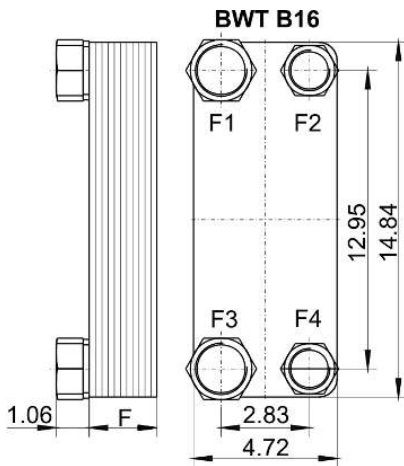
Bühler is ISO 9001 certified

Technical Data BWT-DW

Technical Data

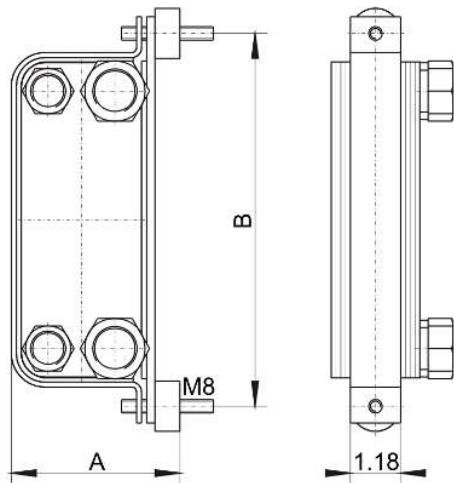
Material	Stainless steel 316H (1.4401), Cu 99.9 %
Operating pressure static:	max. 232 psi
Operating oil temperature	+311 °F

B16



Type	Item no.	F (in)	Oil connection F3, F1	Water connection F2, F4	Weight (lb – net)	Volume (gal)
BWT B16x010DW	3416010DW	1.2	G 3/4 36 mm	G 3/4 36 mm	8.8	0.16
BWT B16x020DW	3416020DW	2	G 3/4 36 mm	G 3/4 36 mm	13.7	0.32
BWT B16x030DW	3416030DW	2.8	G 3/4 36 mm	G 3/4 36 mm	18.5	0.48
BWT B16x040DW	3416040DW	3.5	G 3/4 36 mm	G 3/4 36 mm	23.4	0.63
BWT B16x050DW	3416050DW	4.3	G 3/4 36 mm	G 3/4 36 mm	28.2	0.79
BWT B16x060DW	3416060DW	5.1	G 3/4 36 mm	G 3/4 36 mm	33.1	0.95
BWT B16x070DW	3416070DW	5.9	G 3/4 36 mm	G 3/4 36 mm	37.9	1.11

Mounting bracket



Type	Item no.	A	B
BB16	34BB16	5.8	16.2



Buhler Technologies LLC
 1030 West Hamlin Road
 Rochester Hills, MI 48309

Phone: 248.652.1546
 Fax: 248.652.1598
 e-mail: sales@buhlertech.com

Technical Questionnaire oilcooler

Please fill in this questionnaire as complete as possible. It will help for quoting you an oilcooler system in a short time.

Customer:

Company: _____ Person responsible: _____

Department: _____ Phone: _____

Adress: _____ Fax: _____

_____ e-mail: _____

Parameters	Working-fluid	Cooling-fluid
In temperature (°F)		
Out temperature (°F)		
Max. pressure drop (psi)		
Flow-rate (gal/min)		
Heat dissipation (hp)		
Fluids (VG 46)		
Working-pressure (psi)		
Max. working -temperature (°F)		
Ex- Zone <input type="radio"/> Yes <input type="radio"/> No if yes, which:		

Specification for changing a cooler		
Returnline/bypass		
Manufacturer		Type
Pieces / anno		

Notice



3.2 Oil- Air Cooling



Oil/air cooler BLK

Drives and hydraulic aggregates are used in machine construction, raw material production, maritime and many other areas.

In hydraulic systems oil transfers power and motion, in drives it's a vital lubricant. Both as a power transfer medium and lubricant oil is heated by friction losses during operation.

Since the viscosity of the oil changes along with the temperature, precise temperature stabilisation using coolers is a vital requirement for systems and drives for consistent power. The temperature further affects the ageing behaviour and the life of oils.

Due to the unlimited supply, ambient air as the coolant for heat dissipation. However, since the air temperature fluctuates throughout the year and oil flow can also fluctuate, the heat exchanger required to stabilise the oil temperature must be carefully configured.

The BLK series features efficient cooling matrixes, an easy to maintain design and energy-efficient fan motors.

Easy to maintain design

Compact installation dimensions

Low noise emission

Broad performance range

Rugged cooling matrix

Extensive accessories



Introduction and description

Why coolers?

There are basically two main concepts in developing fluid power systems.

One is to design systems without using a cooler, and if operational conditions show that the system needs a cooler, install it later at additional costs. This understandably then often calls for compromises, making the system more expensive.

The other concept recognizes that a system originally designed with an integrated cooler needs less installation space and is a better choice with respect to construction and system costs.

Why Bühler?

If you plan to cool with an oil/air cooler, it needs to have a simple and compact design, low noise emissions, and be easy and quick to maintain.

When we developed the BLK series we incorporated our years of experience in designing and selling oil/air coolers. Especially the fatigue life of the cooling matrix was a focus during development, since in some cases the matrix has to withstand considerable pressure peaks in the return line.

The cooling matrix can easily be removed from the fan case for maintenance without uninstalling the fan or motor.

If our comprehensive standard range of products does not include the right solution for your application, we will gladly develop a custom solution for you.

Use the data in this leaflet to determine a suitable cooler for your application.

Construction and application

The BLK series consist of the following components:

- Cooling matrix
- Fan case with mounting rails
- Blower, consisting of AC motor, fan and protective/mounting grate
- The cooling matrix and fan can individually be removed from the fan case without the need to uninstall other components

BLK series cooling matrixes are made from aluminum. The coolers are designed for use in hydraulic circuits - including return lines. They are not suitable for pure water.

We also offer cooling matrixes with bypass (see type code).

Depending on the application or system requirements, off-line filtration is often required. In these cases we recommend combining them with an off-line circuit. Please refer to our BNK series for suitable models. These units are also suitable for upgrading existing systems.

Planning information

Set-up

The cooler must be set up so it does not interfere with the air supply and exhaust. The distance to air obstacles behind the cooler should be at least half the cooler height (dimension B).

Ensure adequate ventilation. During set-up, avoid exiting hot air or noise emission from causing problems.

If the ambient air is dirty, excess deposit on the cooling matrix must be expected. This will reduce the cooling capacity. In this case, particularly in the case of air loaded with oil mist, the air ducts must be cleaned regularly.

For outdoor setup, adequately protect the motor from the weather.

Ensure easy access for inspection and maintenance.

Mount

The coolers are secured to the mounting rails with four screws. Be sure the support structure is adequately sized. Install in any position.

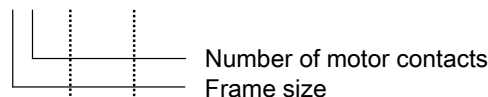
Connecting the oil circuit

The connection between the system and the cooling matrix should be stress and vibration free, which can be achieved by using conduit.

Follow the appropriate safety regulations to prevent environmental damage due to possible oil leaks (e.g. collection pans).

Model key

BLK 4.6- IBx - T50



Including a bypass and/or thermal contact will be indicated by the addition to the type designation:

BLK 4.6- IBx - T50

Bypass version	AB (BLK 2-10) IB (BLK 3-9) ITB (BLK 3-9) ATB (BLK 2-9) x	external bypass internal bypass internal temperature-dependent bypass 29 PSI / 113 °F external temperature-dependent bypass 29 PSI / 113 °F bypass value 29 PSI, 72.5 PSI, 116 PSI
Temperature switch	T50, T60 T70, T80	Temperature in °F, specifications see separate data sheet

Technical Data

Technical Data

Materials / surface protection

Cooling battery:	Aluminium, painted
ventilation box, safety guard and motor brackets:	Steel, powder-coated

Colour:	RAL 7001 / Motor: RAL 7024/7030
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Operating fluids:	Mineral oils according to DIN 51524 Gear lubricant according to DIN 51517-3 Oil/water emulsions HFA and HFB according to CETOP RP 77 H Water glycol HFC according to CETOP RF 77 H Phosphoric ester HFD-R according to CETOP RP 77 H
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Operating pressure

static	
BLK 1.2:	max. 232 psi
BLK 2.2 – BLK 10.8:	max. 305 psi
dynamic	
BLK 1.2:	160 psi (at 5 M load cycle, 3 Hz)
BLK 2.2 – BLK 10.8:	218 psi (at 5 M load cycle, 3 Hz)

Operating oil temperature:	max. 176 °F (higher upon request)
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Ambient temperature:	5 to 104 °F
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Electric motors (others available upon request)

Voltage / frequency:

BLK 1.2:	230 V - 50 Hz
BLK 2.2 – BLK 10.8:	220/380 – 245/420V 50Hz 220/380 – 280/480V 60Hz

Thermal stability:	Insulation class F, utilisation per Class B
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Protection class:

BLK 1.2:	IP44
BLK 2.2 – BLK 10.8:	IP55

The motors comply with standards
IEC 60034, IEC 60072, IEC 60085

Basic data (at 60 Hz frequency)

Item no.	Cooler type	Motor power Number of poles Rated current at 460 V	Weight (lb)	Capacity (fl. oz.)	Noise level db(A)*
3501200	BLK 1.2	0.1 hp / 2 / 0.24 A (230 V)	15	27.1	68
3502200IE3	BLK 2.2	0.75 hp / 2 / 1.1 A	55	44	84
3502400IE3	BLK 2.4	0.25 hp / 4 / 0.5 A	51	44	69
3503200IE3	BLK 3.2	1.5 hp / 2 / 1.9 A	75	60.9	90
3503400IE3	BLK 3.4	0.35 hp / 4 / 0.6 A	64	60.9	74
3504400IE3	BLK 4.4	0.5 hp / 4 / 0.9 A	73	77.8	76
3504600IE3	BLK 4.6	0.25 hp / 6 / 0.6 A	68	77.8	66
3505400IE3	BLK 5.4	1 hp / 4 / 1.3 A	106	104.8	82
3505600IE3	BLK 5.6	0.35 hp / 6 / 0.8 A	88	104.8	71
3506420IE3	BLK 6.4	3 hp / 4 / 3.5 A	170	138.6	89
3506620IE3	BLK 6.6	0.75 hp / 6 / 1.3 A	141	138.6	77
3507420IE3	BLK 7.4	3 hp / 4 / 3.5 A	194	182.6	92
3507620IE3	BLK 7.6	0.75 hp / 6 / 1.3 A	159	182.6	78
3508620IE3	BLK 8.6	2 hp / 6 / 2.4 A	229	213	82
3508820IE3	BLK 8.8	0.75 hp / 8 / 1.6 A	198	213	76
3509620IE3	BLK 9.6	3 hp / 6 / 3.5 A	348	277.3	89
3509820IE3	BLK 9.8	1.5 hp / 8 / 3.2 A	311	277.3	82
3510620IE3	BLK 10.6	7.5 hp / 6 / 8.5 A	569	642.5	93
3510820IE3	BLK 10.8	3 hp / 8 / 6.0 A	542	642.5	87

*DIN EN ISO 3744, Class 3

Calculation example and nomenclature

Determination

An oil/air cooler is determined in two steps:

1. Determining or selecting the cooler size
2. Determining the actual pressure loss

t_{OE} [°F]	Inlet oil temperature
t_{LE} [°F]	Inlet air temperature
ETD [°F]	Temperature differential: $ETD = t_{OE} - t_{LE}$
P_{spec} [hp / °F]	specific cooling performance (see performance curves): $P_{spec} = P / ETD$
P [hp]	Cooling performance in hp
Q [gpm]	Oil flow rate
C_{oil} [BTU/lb·°F]	Specific heat capacity of the oil (approx. 0,48 BTU/lb·°F)
ζ [lb/gal]	Gravity of oil $\approx 7,51$ lb/gal

Calculation example

Assumptions:

Tank capacity	(V)	approx. 52.8 gal
Start up temperature of oil	(T_1)	59 °F (≈ 288 K)
Oil heats up in approx. t = 25 min. (1500 s) to	(T_2)	113 °F (≈ 318 K)
Required oil temperature	(t_{OE})	140 °F
Inlet air temperature	(t_{LE})	86 °F

Calculation

1. Calculating P from the tank warming

$$P = \frac{V \cdot \rho \cdot c_{Oil} (T_2 - T_1)}{t} = \frac{52.8 \text{ gal} \cdot 0.9 \frac{\text{kg}}{\text{l}} \cdot 2 \frac{\text{kJ}}{\text{kg} \cdot \text{K}} \cdot (318 \text{ K} - 288 \text{ K})}{1500 \text{ s}} = 7.2 \text{ kW}$$

2. $ETD = t_{OE} - t_{LE} = 140 \text{ }^\circ\text{F} - 86 \text{ }^\circ\text{F} = 30 \text{ K}$
3. Determining the cooler size: $P_{spec} = P / ETD = 7.2 \text{ kW} / 30 \text{ K} = 0.24 \text{ kW/K}$
4. In the graph, select a cooler at 80 L/min with $P_{spec} 0.24 \text{ kW/K}$. There are two options: BLK 2.2 or the larger but quieter BLK 3.4

Pressure loss curves at medium viscosity of 30 cSt

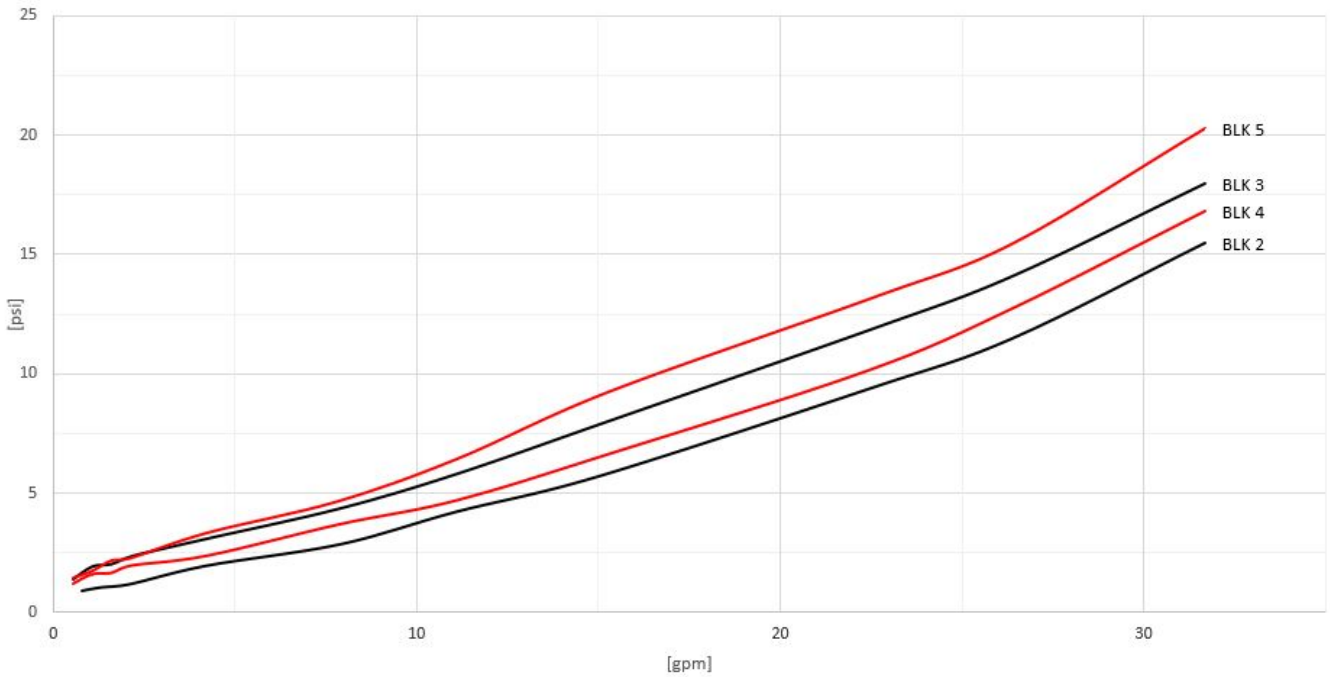


Fig. 1: Pressure loss curves BLK 2 to 5

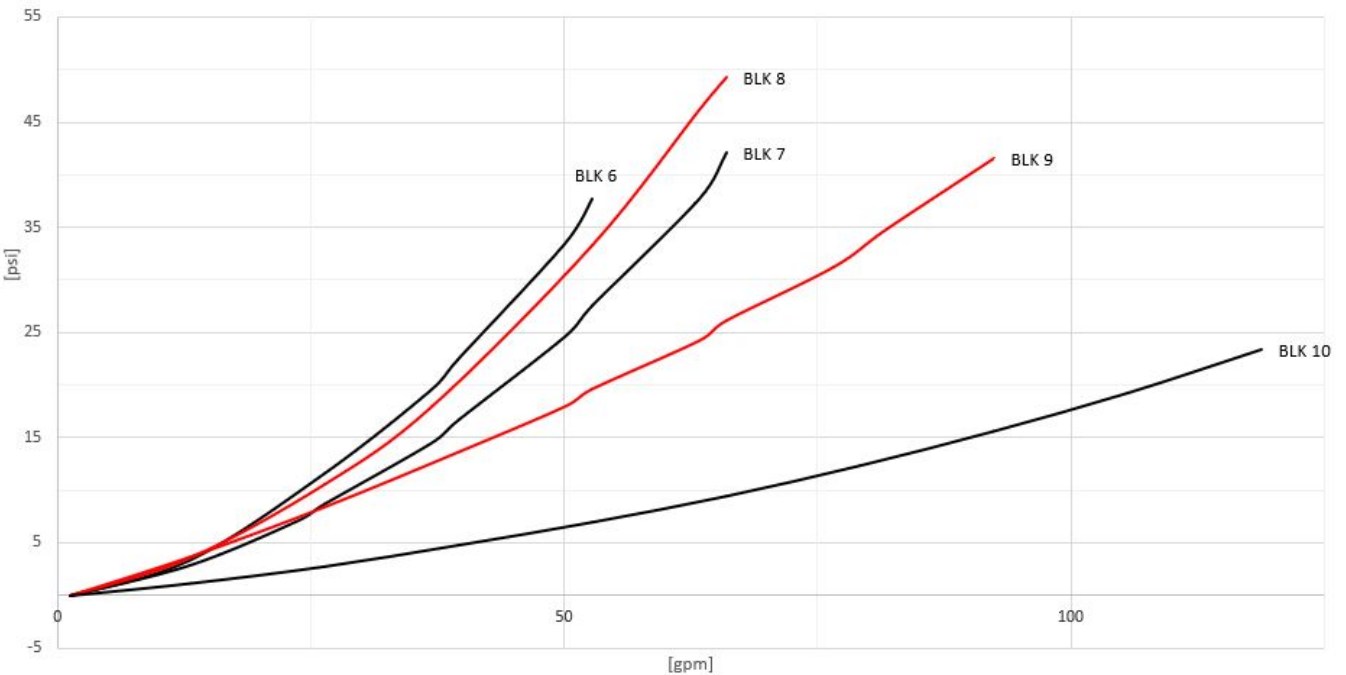


Fig. 2: Pressure loss curves BLK 6 to 10

Note: When installed outdoors or using higher viscosities, bypass valves may be required. Please note chapter Functional diagram.

Temperature/viscosity table

Type of oil	at 122 °F	at 140 °F	at 158 °F
VG 16	9.4	5.6	3.3 cSt
VG 22	15	11	8 cSt
VG 32	21	15	11 cSt
VG 46	29	20	14 cSt
VG 68	43	29	20 cSt
VG 120	68	44	31 cSt
VG 220	126	77	51 cSt
VG 320	180	108	69 cSt

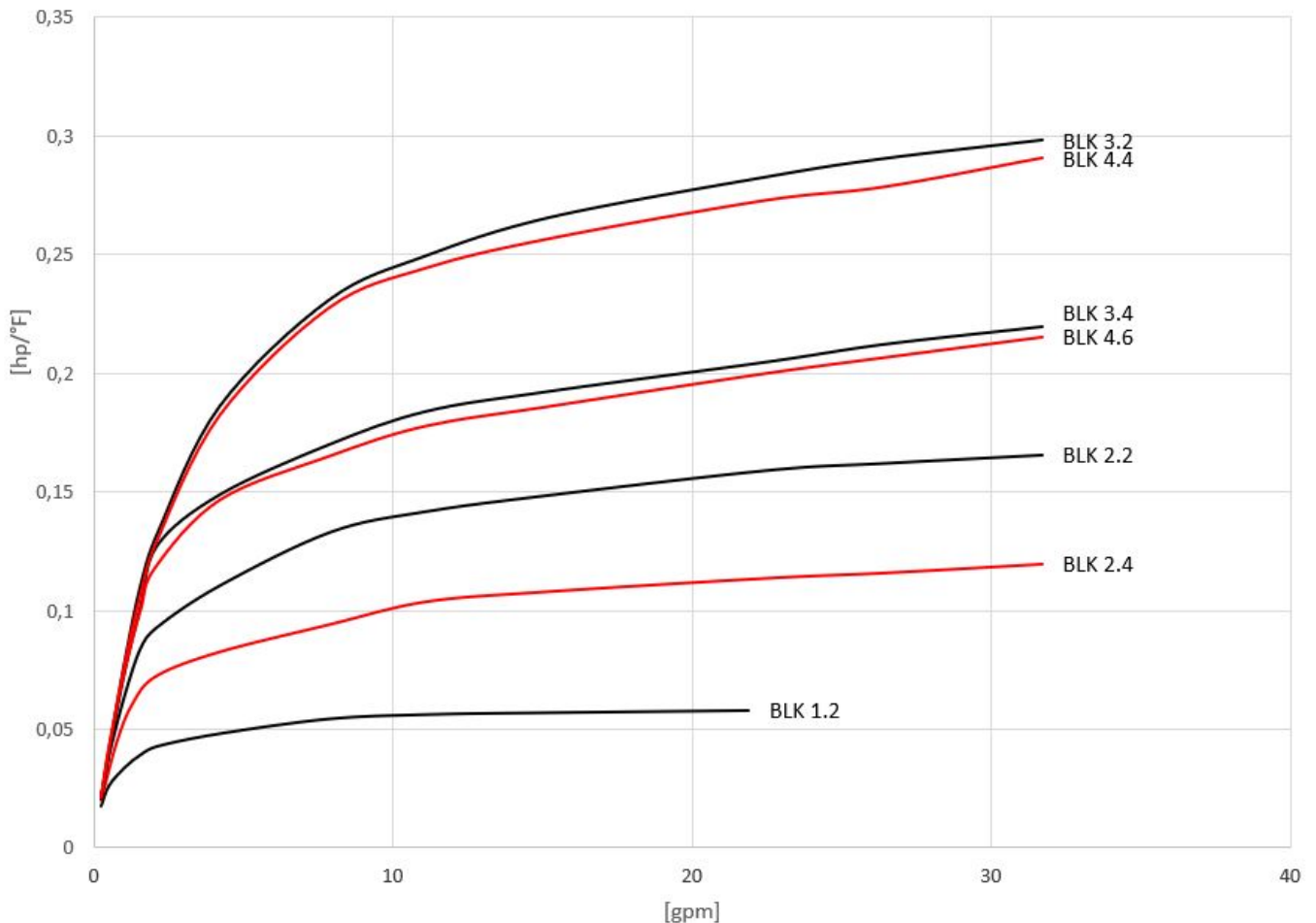
Correction k(visc)

Viscosity (cSt)	K(visc)	Viscosity (cSt)	K(visc)
10	0.6	60	1.6
20	0.8	80	2.1
30	1.0	100	2.7
40	1.2	150	4.2
50	1.4		

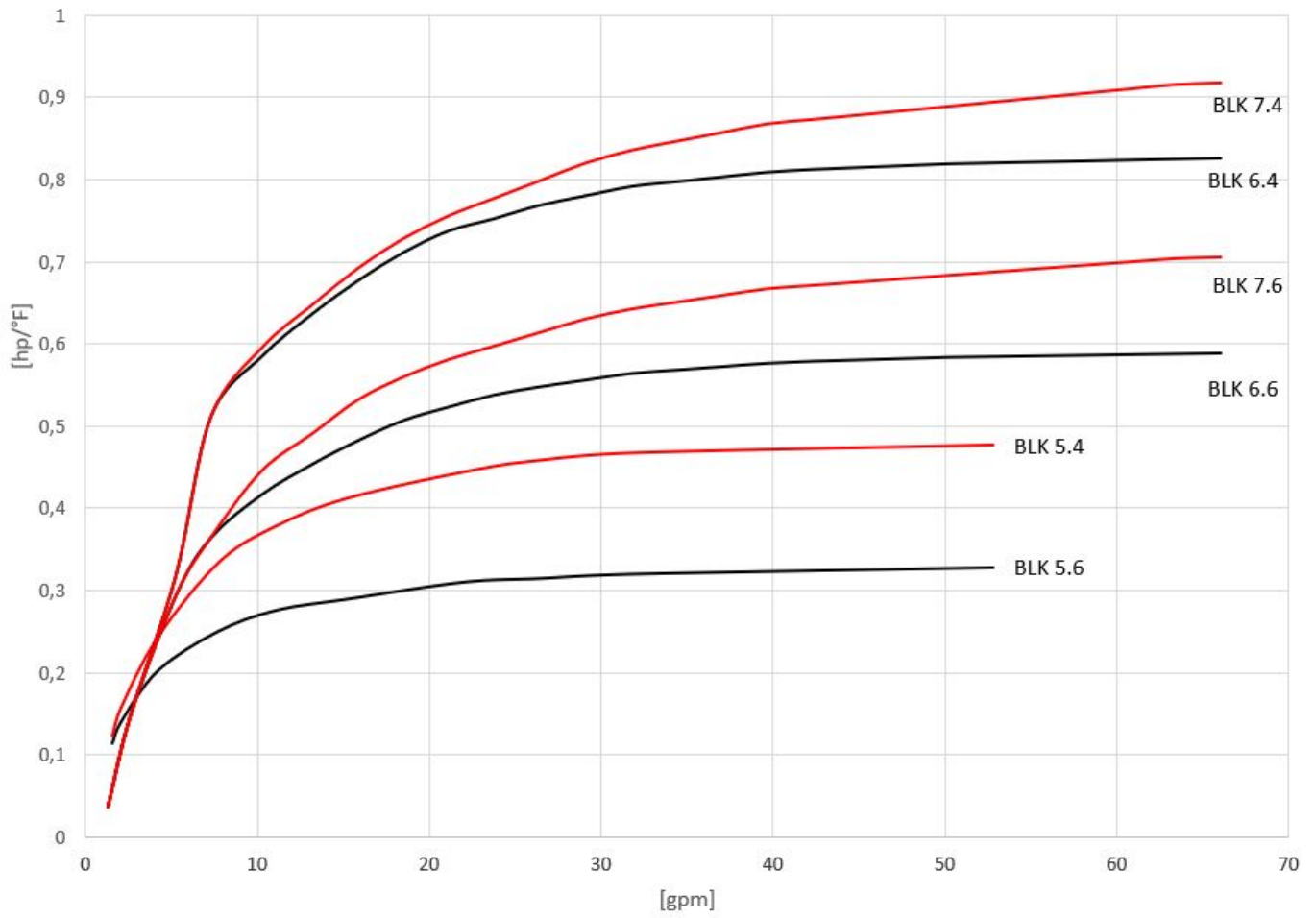
Determining the actual pressure loss

1. Determine Δp from the pressure loss graph for oil flow rate Q and the selected cooler size.
2. Determine the viscosity from the type of oil and temperature.
3. Determine the correction factor k(visc) and multiply by Δp from step 1.

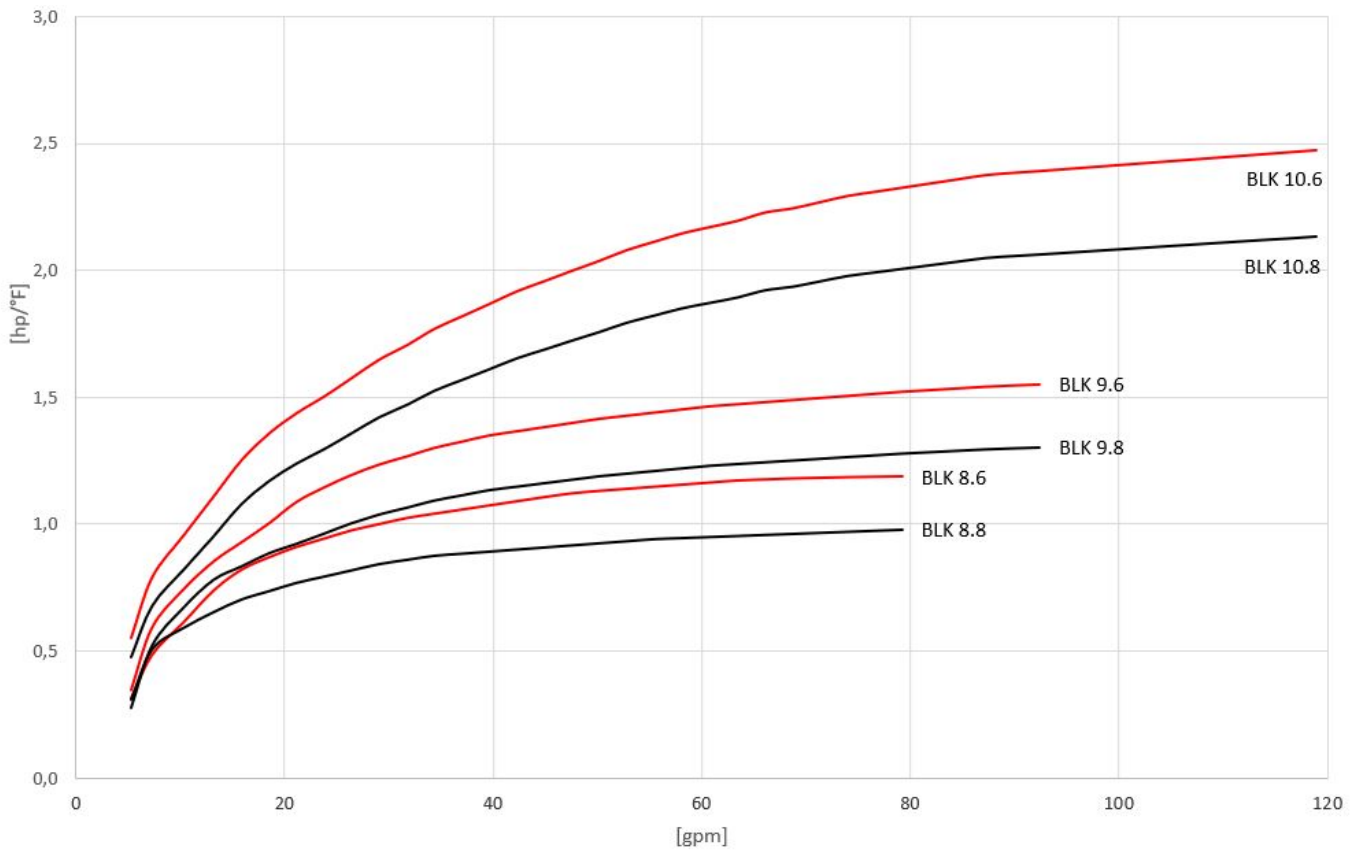
Performance curves frame size 1-4



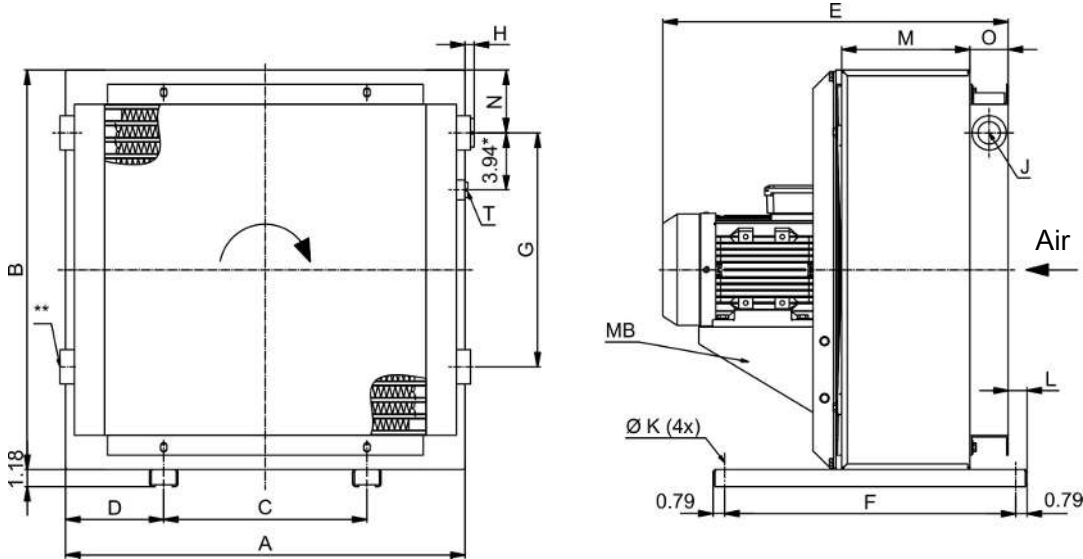
Performance curves frame size 5-7



Performance curves frame size 8-10



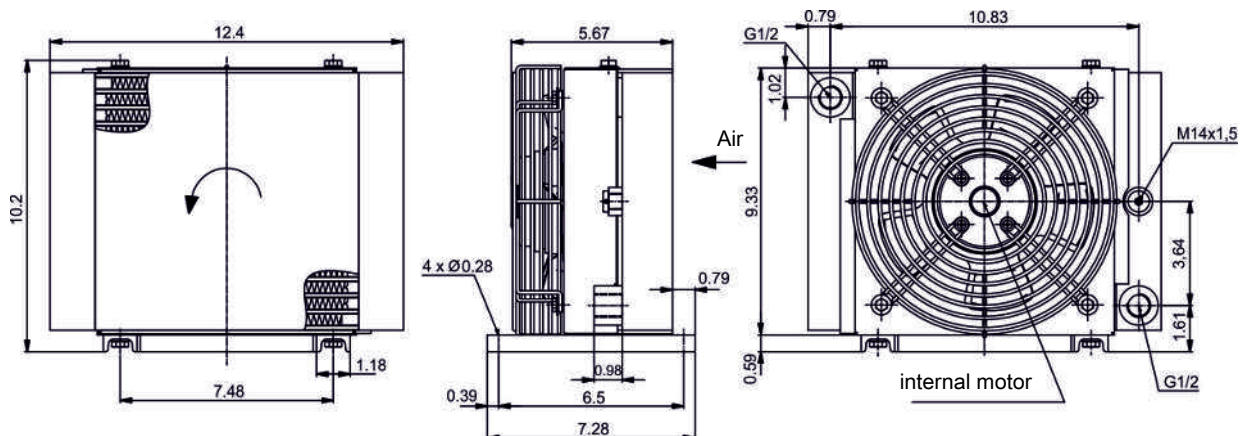
Dimensions



MB on some models the motors are mounted with a bracket
 * on BLK 9 and 10 = 5.91 inch
 ** Connection fitting on BLK 9 and 10 only

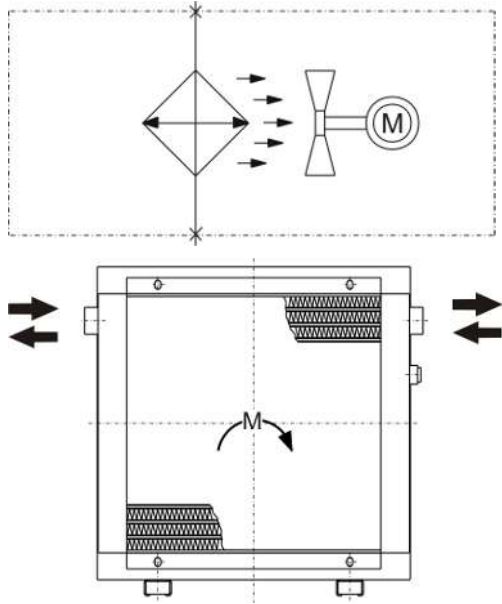
Model	A	B	C	D	E	F	G	H	J	K	L	M	N	O	MB
BLK 1.2	12.40	9.61	7.48	2.46	5.67	6.50	-	-	2x G1/2	0.28	0.79	1.97	1.30	1.77	-
BLK 2.2	14.57	14.57	7.99	3.29	16.38	20.08	-	0.98	2x G1	0.35	1.30	4.92	4.17	2.64	-
BLK 2.4	14.57	14.57	7.99	3.29	15.59	20.08	-	0.98	2x G1	0.35	1.30	4.92	4.17	2.64	-
BLK 3.2	17.32	17.32	7.99	4.67	18.27	20.08	9.06	0.98	3x G1	0.35	1.30	5.91	4.13	2.64	-
BLK 3.4	17.32	17.32	7.99	4.67	17.36	20.08	9.06	0.98	3x G1	0.35	1.30	5.91	4.13	2.64	-
BLK 4.4	19.69	19.69	7.99	5.85	18.35	20.08	9.06	0.98	3x G1	0.35	1.30	6.89	4.09	2.64	-
BLK 4.6	19.69	19.69	7.99	5.85	18.35	20.08	9.06	0.98	3x G1	0.35	1.30	6.89	4.09	2.64	-
BLK 5.4	22.83	22.83	14.02	4.41	20.24	20.08	12.01	0.93	3x G1	0.35	1.30	7.87	3.94	2.64	-
BLK 5.6	22.83	22.83	14.02	4.41	19.33	20.08	12.01	0.93	3x G1	0.35	1.30	7.87	3.94	2.64	-
BLK 6.4	27.56	27.56	14.02	6.77	24.09	20.08	16.14	0.37	3x G1 1/4	0.35	1.30	8.86	4.33	2.64	x
BLK 6.6	27.56	27.56	14.02	6.77	21.22	20.08	16.14	0.37	3x G1 1/4	0.35	1.30	8.86	4.33	2.64	x
BLK 7.4	27.56	33.07	14.02	6.77	25.08	20.08	23.23	0.37	3x G1 1/4	0.35	1.30	9.84	3.58	2.64	x
BLK 7.6	27.56	33.07	14.02	6.77	22.2	20.08	23.23	0.37	3x G1 1/4	0.35	1.30	9.84	3.58	2.64	x
BLK 8.6	34.25	34.25	20.00	7.13	25.63	20.08	23.03	0.43	3x G1 1/4	0.47	1.30	10.83	4.00	2.64	x
BLK 8.8	34.25	34.25	20.00	7.13	24.61	20.08	23.03	0.43	3x G1 1/4	0.47	1.30	10.83	4.00	2.64	x
BLK 9.6	39.76	40.16	20.39	9.69	28.11	35.04	32.36	0.12	4x G1 1/2	0.47	3.07	11.81	3.90	2.64	x
BLK 9.8	39.76	40.16	20.39	9.69	27.24	35.04	32.36	0.12	4x G1 1/2	0.47	2.87	11.81	3.90	2.64	x
BLK 10.6	46.65	46.65	23.62	11.52	33.54	35.83	37.01	0.20	4x SAE 2 1/2	0.47	2.87	12.80	5.12	3.70	x
BLK 10.8	46.65	46.65	23.62	11.52	32.09	35.83	37.01	0.20	4x SAE 2 1/2	0.47	2.87	12.80	5.12	3.70	x

BLK 1



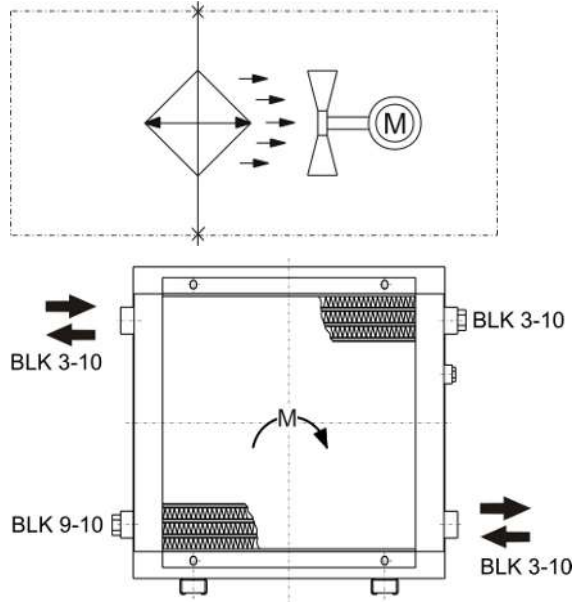
Functional diagram

Standard version BLK 2



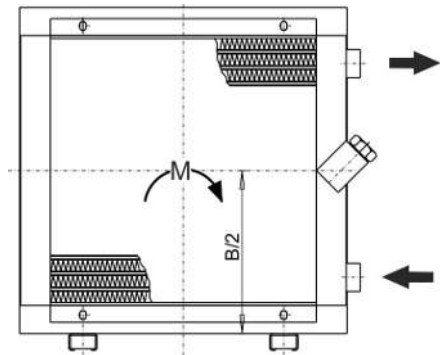
Direction of flow left to right or vice versa.

Standard version BLK 1, 3 to BLK 10



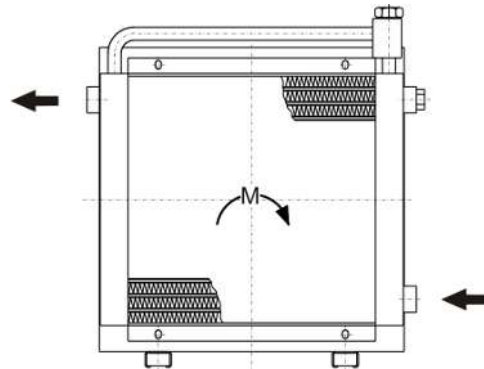
Direction of flow BLK 3-10 top left to bottom right or the exact opposite. The oil outlet is always on the opposite side. The second connection must be closed.

Internal bypass IB/ ITB (BLK 3-9)



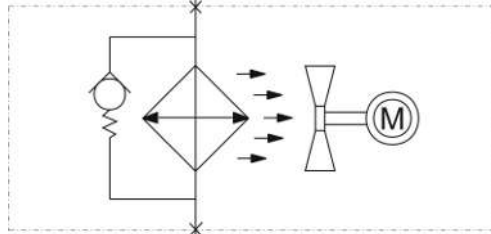
The oil inlet and outlet are always on the same side. Connections on the opposite side must be closed.

External bypass AB (BLK 2-10) / ATB (BLK 2-9)

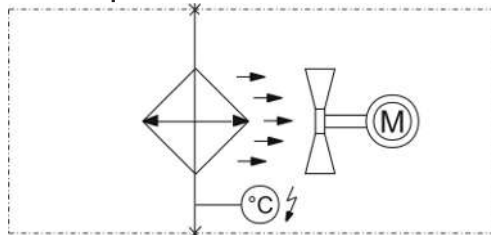


Oil inlet always at the bottom. Other connections must be closed. Oil outlet always on the opposite side.

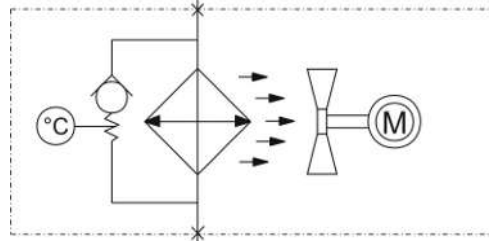
With bypass valve



With temperature switch attached



With temperature-dependent bypass valve





Oil/air cooler ELK

Temperature is one of the key parameters in oil-hydraulic systems. Oils change their viscosity with the temperature, resulting in different lubricating and adhesion properties.

A carefully selected temperature level can also significantly extend the life of the oils.

Die ELK series oil/air coolers stabilise the temperature reliably and efficiently, both in the return or bypass of the systems.

The ELK series is characterised by efficient cooling matrices made from high-strength aluminium as well as a simple and affordable design. They are equipped with energy-efficient fan motors.

Compact design

Low noise emission

High cooling capacities

Rugged cooling matrix

Flexible use in the return or bypass



Planning information

Set-up

The cooler must be set up so it does not interfere with the air supply and exhaust. The distance to air obstacles behind the cooler should be at least half the cooler height (dimension B).

Ensure adequate ventilation. During set-up, avoid exiting hot air or noise emission from causing problems.

If the ambient air is dirty, excess deposit on the cooling matrix must be expected. This will reduce the cooling capacity. In this case, particularly in the case of air loaded with oil mist, the air ducts must be cleaned regularly.

For outdoor setup, adequately protect the motor from the weather.

Ensure easy access for inspection and maintenance.

Mount

The coolers are secured to the mounting rails with four screws. Be sure the support structure is adequately sized. Install in any position.

Connecting the oil circuit

The connection between the system and the cooling matrix should be stress and vibration free, which can be achieved by using conduit.

Follow the appropriate safety regulations to prevent environmental damage due to possible oil leaks (e.g. collection pans).

Technical Data

Technical Data

Materials/surface protection

Cooling matrix:	Aluminium, powder-coated
Fan hub:	Aluminium, bare
Fan blades:	Glass-reinforced polypropylene (PPG), bare
Ventilation box, guard and motor brackets:	Steel, galvanised, powder-coated
Screw connections:	V2A stainless steel
Hydraulic screw fittings:	Steel, zinc-nickel coated

Colour:	Steel parts: RAL 9005, jet black Motor: RAL9005 jet black or RAL7031 blue grey (special colours on request)
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Surface protection:	Steel parts: ISO 12944, C3 medium Motor: ISO 12944, C2 medium (higher on request)
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Operating fluids:	Mineral oils according to DIN 51524 Gear lubricant according to DIN 51517-3 Oil/water emulsions HFA and HFB according to CETOP RP 77 H Water glycol HFC according to CETOP RF 77 H Phosphoric ester HFD-R according to CETOP RP 77 H
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permissible operating pressure

static	max. 305 psi
dynamic	218 psi (at 2 M load cycle, 3 Hz)

Operating oil temperature:	max. 176 °F (higher upon request)
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Ambient temperature:	-4 °F to 104 °F (different ambient temperatures on request)
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max. set-up altitude:	3.3 ft (higher on request)
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Electric motors (others available upon request)

Voltage/frequency:	230/400 V 50 Hz 265/460V 60Hz (special voltages/motor approvals on request)
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Thermal stability:	Class of insulation F, utilisation per class B (higher on request)
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IP rating:	IP55 (higher on request)
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The motors comply with standards
IEC 60034, IEC 60072, IEC 60085, EU 2019/1781

Basic data

Item no.	Cooler model	Power output		Weight (lb)	Volume (gal)	Sound pressure level db(A)*	
		Number of contacts	Rated current			50 Hz	60 Hz
		400 V 50 Hz	460 V 60 Hz	50/60 Hz	50/60 Hz	50 Hz	60 Hz
35ELK10040	ELK100 -50/60Hz	0.12 hp/4-poles/0.31 A	0.13 hp/4-poles/0.3 A	37	0.45	66	70
35ELK20040	ELK200 -50/60Hz	0.16 hp/4-poles/0.37 A	0.19 hp/4-poles/0.37 A	46	0.45	67	71
35ELK30040	ELK300 -50/60Hz	0.34 hp/4-poles/0.66 A	0.39 hp/4-poles/0.67 A	62	0.58	70	74
35ELK40040	ELK400 -50/60Hz	0.5 hp/4-poles/0.92 A	0.58 hp/4-poles/0.91 A	71	0.85	73	77
35ELK50040	ELK500 -50/60Hz	1.01 hp/4-poles/1.75 A	1.15 hp/4-poles/1.68 A	97	0.98	77	81
35ELK60041	ELK600 -50Hz	1.48 hp/4-poles/2.5 A	-	119	1.14	80	-
35ELK60042	ELK600 -60Hz	-	1.74 hp/4-poles/2.5 A			-	83

Calculation example and nomenclature

Determination

An oil/air cooler is determined in two steps:

1. Determining or selecting the cooler size
2. Determining the actual pressure loss

t_{OE} [°F]	Inlet oil temperature
t_{LE} [°F]	Inlet air temperature
ETD [°F]	Temperature differential: $ETD = t_{OE} - t_{LE}$
P_{spec} [hp / °F]	specific cooling performance (see performance curves): $P_{spec} = P / ETD$
P [hp]	Cooling performance in hp
Q [gpm]	Oil flow rate
C_{oil} [BTU/lb·°F]	Specific heat capacity of the oil (approx. 0,48 BTU/lb·°F)
ζ [lb/gal]	Gravity of oil $\approx 7,51$ lb/gal

Calculation example

Assumptions:

Tank capacity	(V) approx. 52.8 gal
Start up temperature of oil	(T ₁) 59 °F (≈ 288 K)
Oil heats up in approx.	
t = 25 min. (1500 s) to	(T ₂) 113 °F (≈ 318 K)
Required oil temperature	(t _{OE}) 140 °F
Inlet air temperature	(t _{LE}) 86 °F

Calculation

1. Calculating P from the tank warming

$$P = \frac{V \cdot \zeta \cdot c_{Oil} (T_2 - T_1)}{t} = \frac{52.8 \text{ gal} \cdot 0.9 \frac{\text{kg}}{\text{l}} \cdot 2 \frac{\text{kJ}}{\text{kg} \cdot \text{K}} \cdot (318 \text{ K} - 288 \text{ K})}{1500 \text{ s}} = 7.2 \text{ kW}$$

2. $ETD = t_{OE} - t_{LE} = 140 \text{ °F} - 86 \text{ °F} = 54 \text{ °F}$
3. Determining the cooler size: $P_{spec} = P / ETD = 9,7 \text{ hp} / 54 \text{ °F} \approx 0.18 \text{ hp/°F}$
4. In the graph, select a cooler at 80 L/min (21.1 gpm) with $P_{spec} 0.18 \text{ hp/°F} \rightarrow$ ELK300

Performance curves

Tolerance: $\pm 5\%$

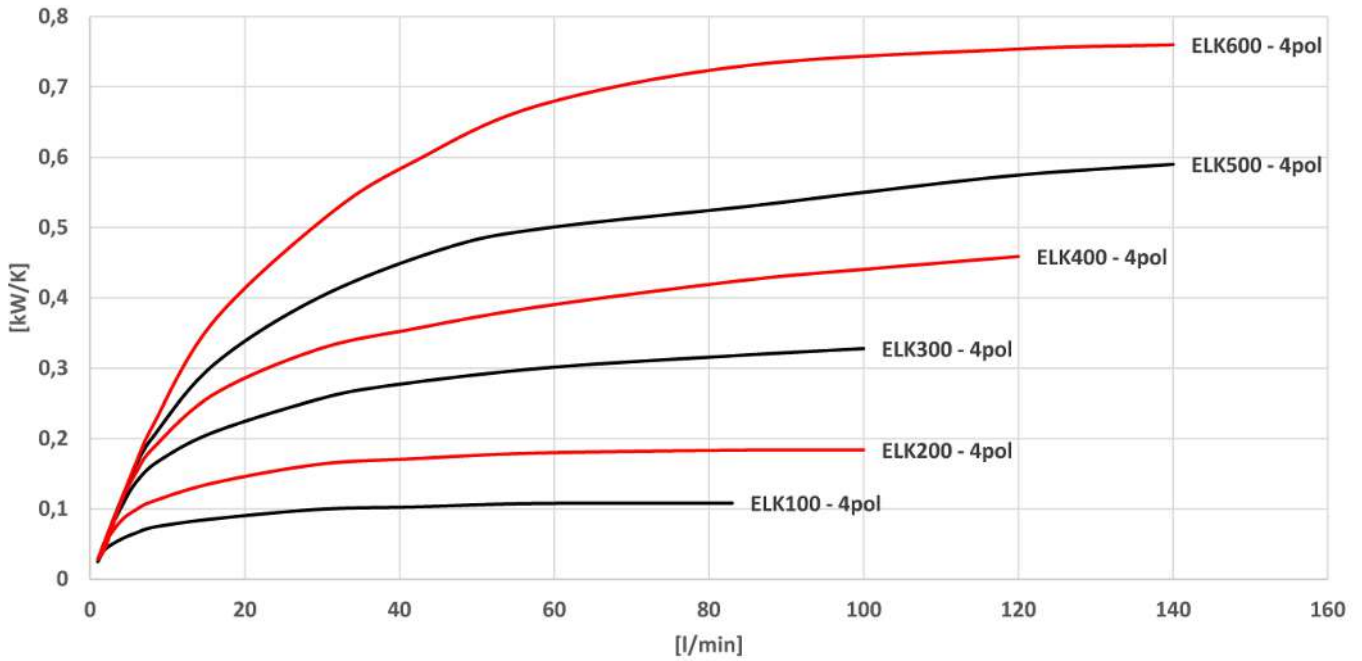


Fig. 1: Specific cooling capacity

Pressure loss curves at medium viscosity of 30 cSt

Tolerance: $\pm 5\%$

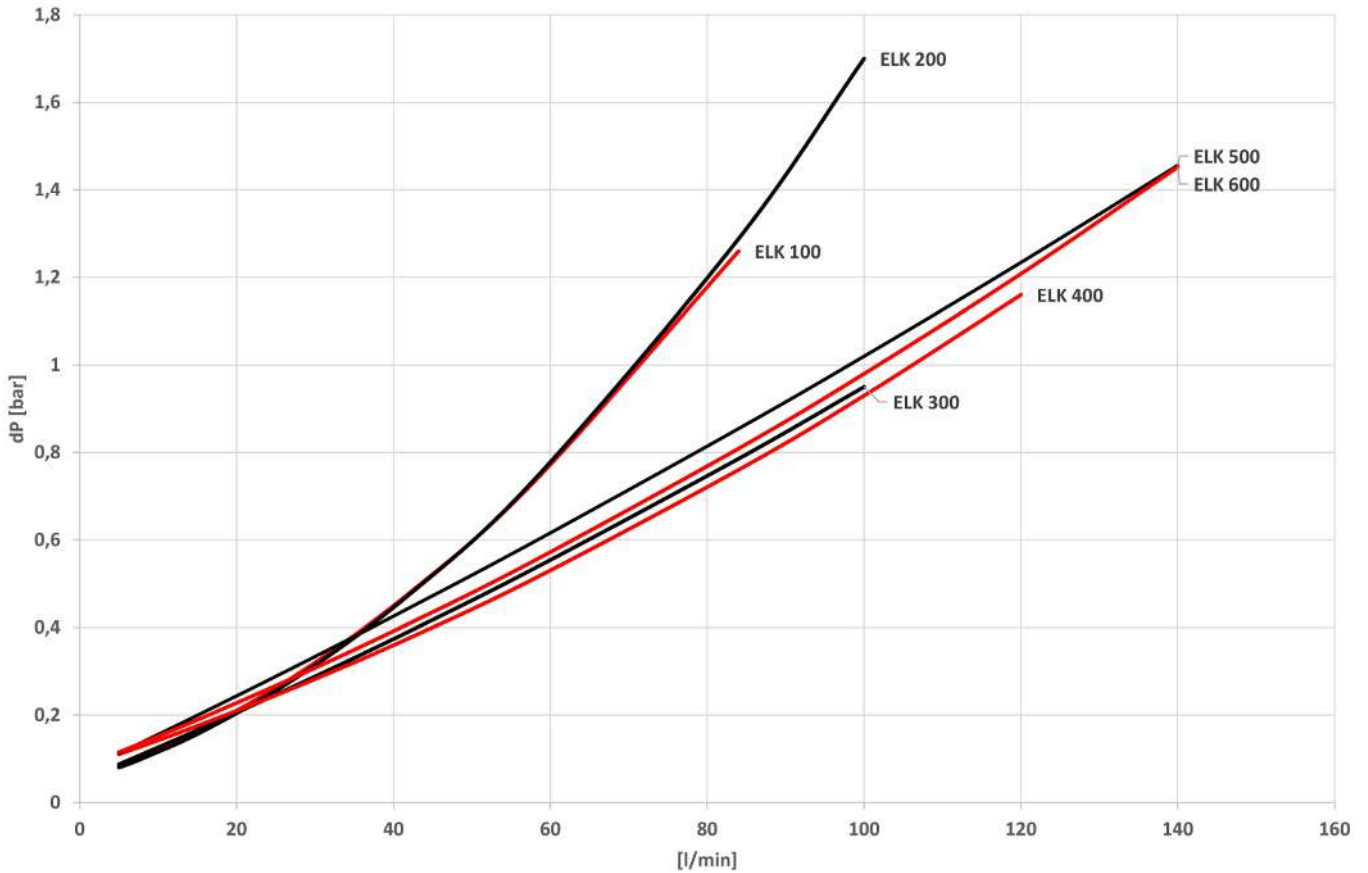


Fig. 2: Pressure loss

Note: When installed outdoors or using higher viscosities, an additional bypass valve may be required. These are not available for the ELK series. In this case, use our BLK series or an external bypass valve.

Temperature/viscosity table

Type of oil	at 122 °F	at 140 °F	at 158 °F
VG 16	9.4	5.6	3.3 cSt
VG 22	15	11	8 cSt
VG 32	21	15	11 cSt
VG 46	29	20	14 cSt
VG 68	43	29	20 cSt
VG 120	68	44	31 cSt
VG 220	126	77	51 cSt
VG 320	180	108	69 cSt

Correction k(visc)

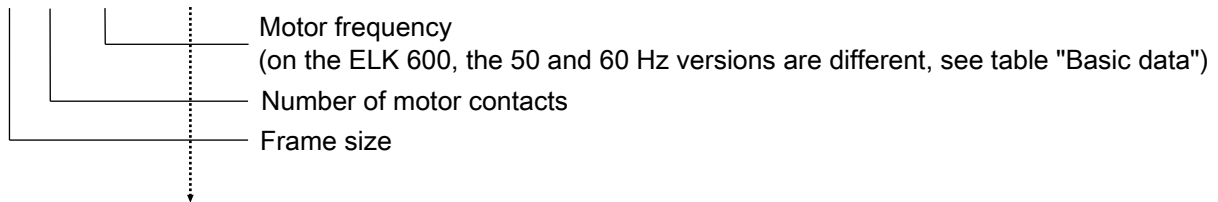
Viscosity (cSt)	K(visc)
10	0.8
30	1
50	1.1
80	1.3
100	1.4
150	1.8

Determining the actual pressure loss

1. Determine Δp from the pressure loss graph (Fig. 2) for oil flow rate L/min and the selected cooler size.
2. Determine the viscosity from the type of oil and temperature.
3. Determine the correction factor k(visc) and multiply by Δp from calculation step 1.

Model key

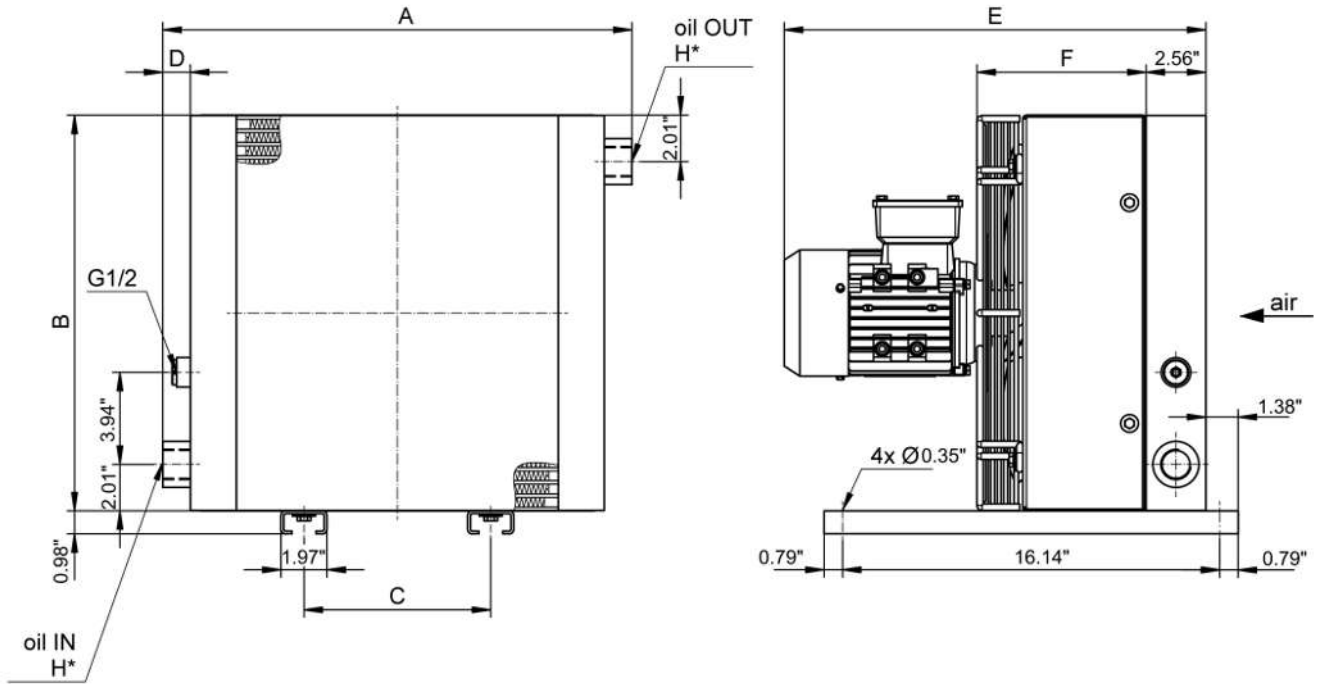
ELK 300-4-50/60Hz-xxx



ELK 300-4-50/60Hz-T50 *To also have a thermal contact, the specification will be added to the type designation:*

Temperature switch	T50, T60 T70, T80	Temperature in °F, specification see separate data sheet
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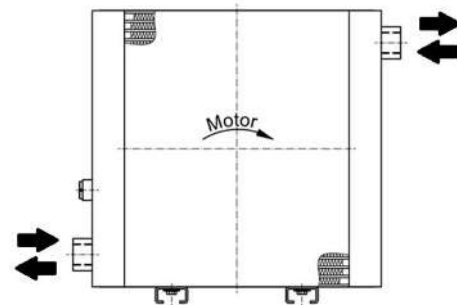
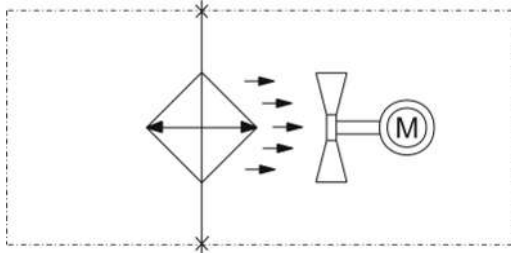
Dimensions



Type	A	B	C	D	E	F	G	H
ELK100	14.17"	11.42"	7.99"	0.98"	15.35"	5.94"	6.69"	2x G3/4"
ELK200	16.73"	13.98"	7.99"	0.98"	15.83"	5.67"	7.95"	2x G3/4"
ELK300	20.08"	16.93"	7.99"	1.18"	18.03"	7.24"	9.45"	2x G1"
ELK400	22.44"	19.33"	7.99"	1.18"	18.74"	7.95v	10.63"	2x G1"
ELK500	24.08"	21.69"	14.02"	1.18"	20.71"	8.39"	11.81"	2x G1"
ELK600	27.17"	24.06"	14.02"	1.18"	23.86"	9.65"	12.99"	2x G1"

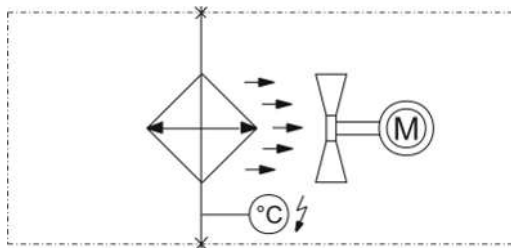
Functional diagram

Standard ELK version



Direction of flow left to right or vice versa.

With temperature switch attached





Off-line cooler BNK

Drives and hydraulic aggregates are used in machine construction, raw material production, maritime and many other areas.

In hydraulic systems oil transfers power and motion, in drives it's a vital lubricant. Both as a power transfer medium and lubricant oil is heated by friction losses during operation.

Since the viscosity of the oil changes along with the temperature, precise temperature stabilisation using oil/air coolers is a vital requirement for systems and drives for consistent power. The temperature further affects the ageing behaviour and the life of oils.

To minimise the negative fluctuating oil flow has on the cooler design with varying ambient air temperatures, it's wise to combine the cooler with a built-in circulation pump.

The BNK series is characterised by efficient cooling matrixes, a compact, easy to maintain design and energy-efficient drive motors along with gerotor pumps.

Easy to maintain design

Compact installation dimensions

System-compatible cooling matrix/flow rate ratio

Low noise emission

Rugged cooling matrix

Extensive accessories

High suction pump



Introduction and description

Why coolers?

In many cases, installing an off-line cooler is not only an emergency solution, but also the best solution with respect to mechanics and economics. Oftentimes off-line filtration can also be incorporated quite effectively.

Since a bypass also always requires installation of a separate circulation pump, it's reasonable to combine it with the motor already installed for the fan.

The BNK series is a tiered line of oil/air coolers with circulation pump directly flange-mounted. The cooler size and pump flow rate are coordinated for performance grades compatible with the system. The gerotor pump ensures low noise emission for the entire aggregate.

Why Bühler?

When we developed the BNK series, we incorporated our years of experience in designing and selling oil/air coolers. Especially the fatigue life of the cooling matrix was a focus during development.

The cooling matrix can easily be removed from the fan case for maintenance without uninstalling the fan or motor.

If our comprehensive standard range of products does not include the right solution for your application, we will gladly develop a custom solution for you.

Use the data in this leaflet to determine a suitable cooler for your application.

Construction and application

The BNK consists of the following components:

- Cooling matrix
- Fan case with mounting rails
- Blower and pump unit consisting of AC motor, pump, fan, protective/mounting grate and motor bracket

The cooling matrix and fan/pump unit can be removed from the fan case individually without having to uninstall other components

The BNK series cooling matrix are made from aluminum. The coolers are designed for use in hydraulic circuits.

We also offer cooling matrix bypass versions (see type code).

Planning information

Set-up

The cooler must be set up so it does not interfere with the air supply and exhaust. The distance to air obstacles behind the cooler should be at least half the cooler height (dimension B).

Ensure adequate ventilation. During set-up, avoid exiting hot air or noise emission from causing problems.

If the ambient air is dirty, excess deposit on the cooling matrix must be expected. This will reduce the cooling capacity. In this case, particularly in the case of air loaded with oil mist, the air ducts must be cleaned regularly.

For outdoor setup, adequately protect the motor from the weather.

Ensure easy access for inspection and maintenance.

Mount

The coolers are secured to the mounting rails with four screws. Be sure the support structure is adequately sized. Install in any position.

Connecting the oil circuit

The connection between the system and the cooling matrix should be stress and vibration free, which can be achieved by using conduit.

Follow the appropriate safety regulations to prevent environmental damage due to possible oil leaks (e.g. collection pans).

Technical data

Technical Data

Materials/surface protection

Cooling matrix:	Aluminium, painted
ventilation box, safety guard and motor brackets:	Steel, powder-coated
Pump:	anodised aluminium, sintered steel

Colour: RAL 7001

Operating fluids: Mineral oils per DIN 51524
Gear oil per DIN 51517-3

Operating pressure, static: 2.5/5.1/9.2/13.3 gpm - max. 87 psi
18.4/27.9 gpm - max. 116 psi

Suction pressure: max. - 6 psi

Operating oil temperature: max. 176 °F (higher upon request)

max. viscosity: 100 cSt medium viscosity (higher upon request)

Ambient temperature: 5 to 104 °F

Electric motors (others available upon request)

Voltage / frequency: 220/380V – 230/400V – 240/415V 50Hz
460 60 Hz

Thermal stability: Insulation class F,
utilisation per Class B

Protection class: IP55

The motors comply with standards
IEC 60034, IEC 60072, IEC 60085

Calculation example and nomenclature

t_{OE} [°F]	Inlet oil temperature
t_{LE} [°F]	Inlet air temperature
ETD [°F]	Temperature differential: $ETD = t_{OE} - t_{LE}$
P_{spec} [hp / °F]	specific cooling performance (see performance curves): $P_{spec} = P / ETD$
P [hp]	Cooling performance in hp
Q [gpm]	Oil flow rate
C_{Oil} [BTU/lb·°F]	Specific heat capacity of the oil (approx. 0,48 BTU/lb·°F)
ζ [lb/gal]	Gravity of oil $\approx 7,51$ lb/gal

Calculation example

Assumptions:

Tank capacity (V) approx. 52.8 gal

Start up temperature of oil (T_1) 59 °F (≈ 288 K)

Oil heats up in approx.

$t = 25$ min. (1500 s) to (T_2) 113 °F (≈ 318 K)

Required oil temperature (t_{OE}) 140 °F

Inlet air temperature (t_{LE}) 86 °F

Calculation:

1. Calculating P from the tank warming

$$P = \frac{V \cdot \zeta \cdot c_{Oil} (T_2 - T_1)}{t} = \frac{52.8 \text{ gal} \cdot 0.9 \frac{\text{kg}}{\text{l}} \cdot 2 \frac{\text{kJ}}{\text{kg} \cdot \text{K}} \cdot (318 \text{ K} - 288 \text{ K})}{1500 \text{ s}} = 7.2 \text{ kW}$$

2. $ETD = t_{OE} - t_{LE} = 140 \text{ °F} - 86 \text{ °F} = 54 \text{ °F}$

3. Determining the cooler size: $P_{spec} = P / ETD = 9,7 \text{ hp} / 54 \text{ °F} \approx 0.18 \text{ hp/°F}$

4. Select a cooler from the basic data with $P_{spec} \approx 0.18 \text{ hp/°F}$. There is one option:
BNK 3.4 with 30 L (9,2 gpm) pump

Basic data (at 60 Hz frequency)

Item no.	Cooler model	spec. cooling power hp/°F	Cooling power at ETD = 72 °F (hp)	max. circulation rate (gpm)	Power output Poles Rated current at 460 V	Motor service factor	Weight (lb)	Capacity (gal)	Sound pressure level db(A)*
3601406IE3**	BNK 1.4-7.5-0.75kW	0,03	2,1	2.5	1.0 hp/4/1.4 A	1.25	66	0.18	67
3601401IE3**	BNK 1.4-15-0.75kW	0,04	2,9	5,1	1.0 hp/4/1.4 A	1.25	66	0.18	67
3602406IE3**	BNK 2.4-7,5-0,75kW	0,07	5	2,5	1.0 hp/4/1.4 A	1.25	82	0.34	66
3602401IE3**	BNK 2.4-15-0.75kW	0,08	5,8	5,1	1.0 hp/4/1.4 A	1.25	86	0.34	69
3602402IE3**	BNK 2.4-30-0.75kW	0,1	7,2	9.2	1.0 hp/4/1.4 A	1.25	88	0.34	69
3602407IE3**	BNK 2.4-40-1.1kW	0,11	7,9	13.3	1.5 hp/4/2.0 A	1.25	95	0.34	69
3603406IE3**	BNK 3.4-8-0,75kW	0,13	9,4	2,5	1.0 hp/4/1.4 A	1.25	101	0.48	71
3603401IE3**	BNK 3.4-15-0.75kW	0,15	10,8	5,1	1.0 hp/4/1.4 A	1.25	99	0.48	74
3603402IE3**	BNK 3.4-30-0.75kW	0,17	12,2	9.2	1.0 hp/4/1.4 A	1.25	99	0.48	74
3603407IE3**	BNK 3.4-40-1.1kW	0,19	13,7	13.3	1.5 hp/4/2.0 A	1.25	106	0.48	74
3604401IE3**	BNK 4.4-15-0,75kW	0,18	13	5,1	1.0 hp/4/1.4 A	1.25	117	0.61	73
3604402IE3**	BNK 4.4-30-0.75kW	0,23	16,6	9.2	1.0 hp/4/1.4 A	1.25	110	0.61	76
3604407IE3**	BNK 4.4-40-1.1kW	0,25	18	13.3	1.5 hp/4/2.0 A	1.25	119	0.61	76
3604403IE3**	BNK 4.4-60-1.5kW	0,26	18,7	18.4	2.0 hp/4/2.8 A	1.25	130	0.61	76
3604404IE3**	BNK 4.4-90-2.2kW	0,28	20,2	27.9	3.0 hp/4/4.0 A	1.25	163	0.61	76
3605403IE3**	BNK 5.4-60-2.2kW	0,42	30,2	18.4	4.0 hp/4/4.0 A	1.25	176	0.82	82
3605404IE3**	BNK 5.4-90-2.2kW	0,45	32,4	27.9	3.0 hp/4/4.0 A	1.25	179	0.82	82
3606423IE3**	BNK 6.4-60-3.0kW	0,68	49	18.4	4.0 hp/4/5.3 A	1.25	220	1.08	89
3606424IE3**	BNK 6.4-90-3.0kW	0,76	54,7	27.9	4.0 hp/4/5.3 A	1.25	223	1.08	89
3606623IE3***	BNK 6.6-60-2.2kW	0,49	35,3	18.4	3.0 hp/6/4.8 A	1.15	194	1.08	77
3607423IE3**	BNK 7.4-60-3.0kW	0,7	50,4	18.4	4.0 hp/4/5.3 A	1.25	242	1.43	92
3607424IE3**	BNK 7.4-90-3.0kW	0,79	56,9	27.9	4.0 hp/4/5.3 A	1.25	245	1.43	92
3607623IE3***	BNK 7.6-60-2.2kW	0,54	38,9	18.4	3.0 hp/6/4.8 A	1.15	216	1.43	78
3608623IE3**	BNK 8.6-60-3.0kW	0,83	59,8	18.4	4.0 hp/6/5.9 A	1.25	357	1.66	82

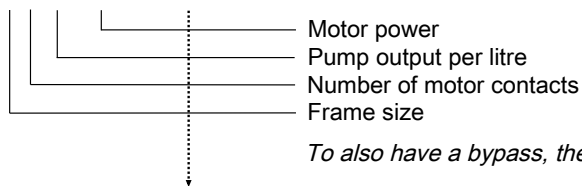
*DIN EN ISO 3744, Class 3

**Electr. motor per NEMA, UL, CSA, EAC approval

***Electr. motor per NEMA, UL, CUL approval

Model key

BNK 4.4-30-0.75kW- IBx



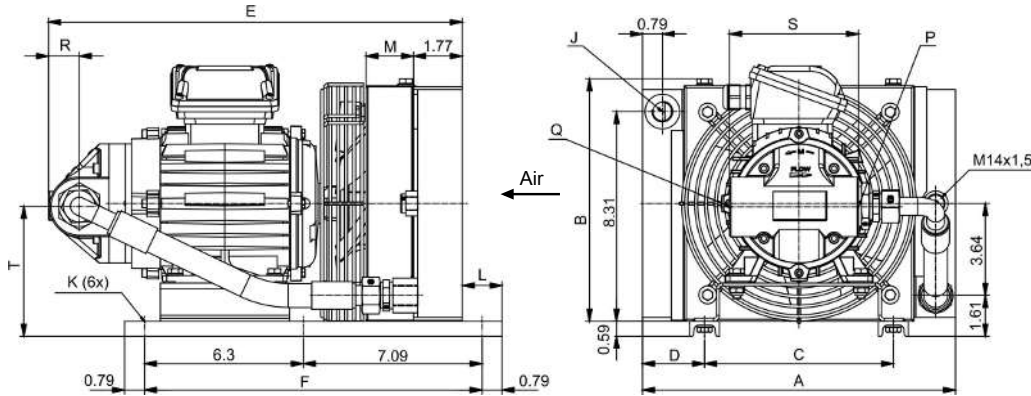
To also have a bypass, the specification will be added to the type designation:

BNK 4.4-30-0.75kW- IBx

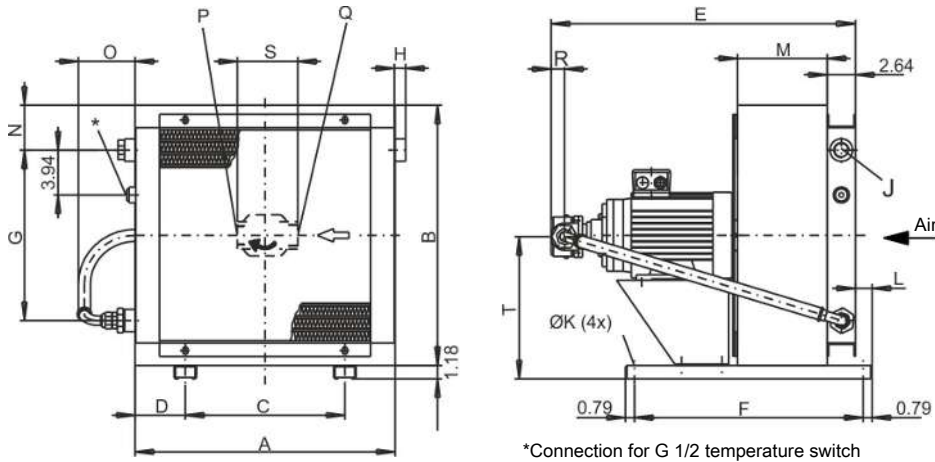
Bypass version	AB	(BNK 2-8)	external bypass
	IB	(BNK 3-8)	internal bypass
	ITB	(BNK 3-8)	internal temperature-dependent bypass 29 psi / 113 °F
	ATB	(BNK 2-8)	external temperature-dependent bypass 29 psi / 113 °F
	x		bypass value 29 psi, 73 psi, 116 psi

Dimensions

BNK 1



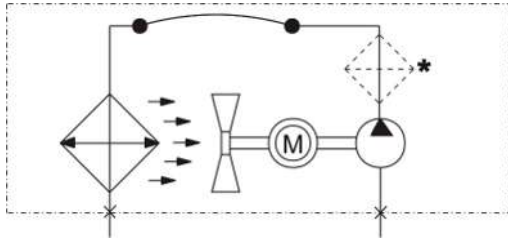
BNK 2-8



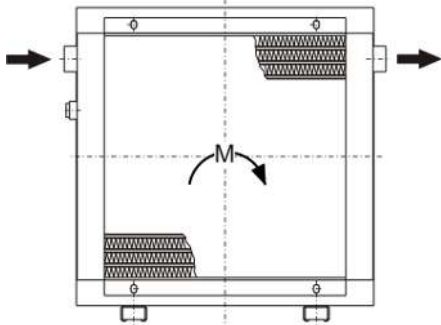
Model	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T
BNK 1.4-7,5-0,75kW	12.4	9.57	7.48	2.46	16.42	13.39	-	-	2x G 1/2	0.35	1.57	2.05	-	-	G1	G3/4	1.18	5.67	5.12
BNK 1.4-15-0,75kW	12.4	9.57	7.48	2.46	16.42	13.39	-	-	2x G 1/2	0.35	1.57	2.05	-	-	G1	G1 1/4	1.18	5.12	5.12
BNK 2.4-7,5-0,75kW	14.57	14.57	7.99	3.92	18.74	20.08	-	0.98	2x G1	0.35	1.3	4.92	4.17	4.69	G1	G3/4	1.18	5.12	8.35
BNK 2.4-15-0,75kW	14.57	14.57	7.99	3.29	18.74	20.08	-	0.98	2x G1	0.35	1.3	4.92	4.17	4.69	G1	G1 1/4	1.18	5.12	8.35
BNK 2.4-30-0,75kW	14.57	14.57	7.99	3.29	18.66	20.08	-	0.98	2x G1	0.35	1.3	4.92	4.17	4.69	G1	G1 1/4	1.18	5.12	8.35
BNK 2.4-40-1,1kW	14.57	14.57	7.99	3.29	19.45	20.08	-	0.98	2x G1	0.35	1.3	4.92	4.17	4.69	G1	G1 1/4	1.18	5.12	8.35
BNK 3.4-8-0,75kW	17.32	17.32	7.99	4.67	19.72	20.08	9.06	0.98	3x G1	0.35	1.3	5.91	4.13	4.69	G1	G3/4	1.18	5.12	9.72
BNK 3.4-15-0,75kW	17.32	17.32	7.99	4.67	19.72	20.08	9.06	0.98	3x G1	0.35	1.3	5.91	4.13	4.69	G1	G1 1/4	1.18	5.12	9.72
BNK 3.4-30-0,75kW	17.32	17.32	7.99	4.67	19.65	20.08	9.06	0.98	3x G1	0.35	1.3	5.91	4.13	4.69	G1	G1 1/4	1.18	5.12	9.72
BNK 3.4-40-1,1kW	17.32	17.32	7.99	4.67	20.47	20.08	9.06	0.98	3x G1	0.35	1.3	5.91	4.13	4.69	G1	G1 1/4	1.18	5.12	9.72
BNK 4.4-15-0,75kW	19.69	19.69	7.99	5.85	20.71	20.08	9.06	0.98	3x G1	0.35	1.3	6.89	4.09	4.69	G1	G1 1/4	1.18	5.12	10.91
BNK 4.4-30-0,75kW	19.69	19.69	7.99	5.85	20.63	20.08	9.06	0.98	3x G1	0.35	1.3	6.89	4.09	4.69	G1	G1 1/4	1.18	1.18	10.91
BNK 4.4-40-1,1kW	19.69	19.69	7.99	5.85	21.5	20.08	9.06	0.98	3x G1	0.35	1.3	6.89	4.09	4.69	G1	G1 1/4	1.18	5.12	10.91
BNK 4.4-60-1,5kW	19.69	19.69	7.99	5.85	24.02	20.08	9.06	0.98	3x G1	0.35	1.3	6.89	4.09	5.16	G1 1/4	G1 1/2	1.18	5.31	10.91
BNK 4.4-90-2,2kW	19.69	19.69	7.99	5.85	27.09	20.08	9.06	0.98	3x G1	0.35	1.3	6.89	4.09	5.16	G1 1/4	G1 1/2	2.09	5.31	10.91
BNK 5.4-60-2,2kW	22.83	22.83	14.02	4.41	26.69	20.08	12.01	0.93	3x G1	0.35	1.3	7.87	3.94	5.16	G1 1/4	G1 1/2	1.18	5.31	12.48
BNK 5.4-90-2,2kW	22.83	22.83	14.02	4.41	28.07	20.08	12.01	0.93	3x G1	0.35	1.3	7.87	3.94	5.16	G1 1/4	G1 1/2	2.09	5.31	12.56
BNK 6.4-60-3,0kW	27.56	27.56	14.02	6.77	29.02	20.08	16.14	0.37	3x G1 1/4	0.35	1.3	8.86	4.33	5.2	G1 1/4	G1 1/2	1.18	5.31	14.84
BNK 6.4-90-3,0kW	27.56	27.56	14.02	6.77	30.39	20.08	16.14	0.37	3x G1 1/4	0.35	1.3	8.86	4.33	5.2	G1 1/4	G1 1/2	2.09	5.31	14.84
BNK 6.6-60-2,2kW	27.56	27.56	14.02	6.77	29.57	20.08	16.14	0.37	3x G1 1/4	0.35	1.3	8.86	4.33	5.2	G1 1/4	G1 1/2	2.09	5.31	14.84
BNK 7.4-60-3,0kW	27.56	33.07	14.02	6.77	1.18	20.08	23.23	0.37	3x G1 1/4	0.35	1.3	9.84	3.58	5.2	G1 1/4	G1 1/2	1.18	5.31	17.6
BNK 7.4-90-3,0kW	27.56	33.07	14.02	6.77	31.38	20.08	23.23	0.37	3x G1 1/4	0.35	1.3	9.84	3.58	5.2	G1 1/4	G1 1/2	2.09	5.31	17.6
BNK 7.6-60-2,2kW	27.56	33.07	14.02	6.77	30.55	20.08	23.23	0.37	3x G1 1/4	0.35	1.3	9.84	3.58	5.2	G1 1/4	G1 1/2	2.09	5.31	17.6
BNK 8.6-60-3,0kW	34.25	34.25	20	7.13	33.62	26.18	23.03	0.43	3x G1 1/4	0.35	1.3	10.83	4	5.24	G1 1/4	G1 1/2	2.09	5.31	18.19

Functional diagram

Standard version BNK 2

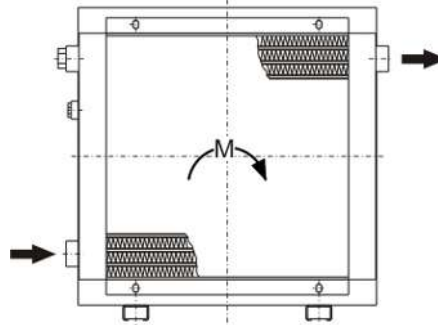
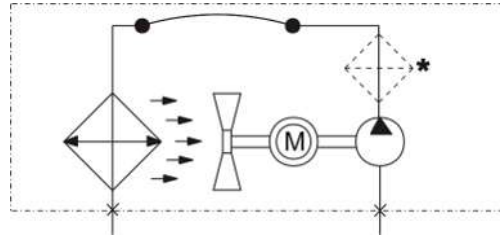


* recommended position of additional oil filter



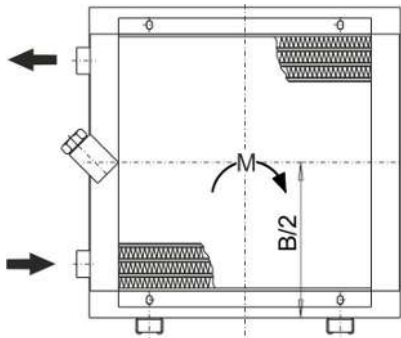
The oil inlet is on the left of the cooling battery. The oil outlet is always on the opposite side.

Standard version BNK 1, 3 to BNK 8



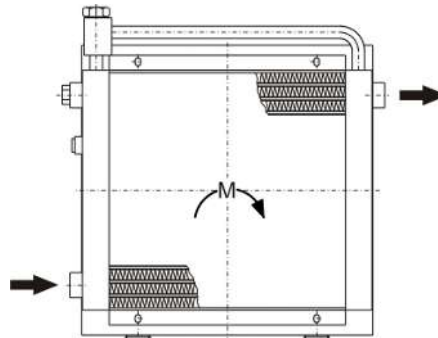
The oil inlet is on the bottom left of the cooling battery. The second connection at the top must be closed. The oil outlet is always on the opposite side.

Internal bypass IB/ ITB (BNK 3-8)



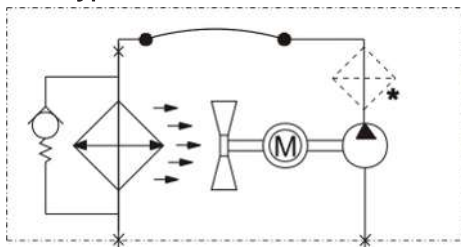
The oil inlet and outlet is always on the same side of the cooling battery. The connection on the opposite side must be closed.

External bypass AB/ATB (BNK 2-8)

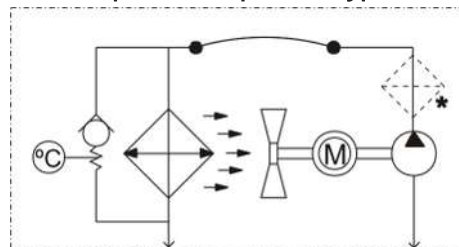


The oil inlet is always at the bottom left of the cooling battery. The second connection must be closed. The oil outlet is always on the opposite side.

With bypass valve



With temperature-dependent bypass valve





Off-line cooler ENK

Temperature is one of the key parameters in oil-hydraulic systems. Oils change their viscosity with the temperature, resulting in different lubricating and adhesion properties.

A carefully selected temperature level can also significantly extend the life of the oils.

In return condensers the temporary oil flow causes the cooling capacity to fluctuate. To prevent this effect, a bypass cooler consisting of oil/air cooler with built-in circulating pump is advisable. These combinations ensure a stable oil flow and constant cooling.

The ENK series is characterised by efficient cooling matrices made from high-strength aluminium as well as a compact, simple and affordable design. These are equipped with energy-efficient drive motors combined with sturdy gerotor pumps.

High cooling capacities

Compact design

System-compatible cooling matrix/flow rate ratio

Low noise emission

Rugged cooling matrix

Efficient high suction pump



Planning information

Set-up

The cooler must be set up so it does not interfere with the air supply and exhaust. The distance to air obstacles behind the cooler should be at least half the cooler height (dimension B).

Ensure adequate ventilation. During set-up, avoid exiting hot air or noise emission from causing problems.

If the ambient air is dirty, excess deposit on the cooling matrix must be expected. This will reduce the cooling capacity. In this case, particularly in the case of air loaded with oil mist, the air ducts must be cleaned regularly.

For outdoor setup, adequately protect the motor from the weather.

Ensure easy access for inspection and maintenance.

Mount

The coolers are secured to the mounting rails with four screws. Be sure the support structure is adequately sized. Install in any position.

Connecting the oil circuit

The connection between the system and the cooling matrix should be stress and vibration free, which can be achieved by using conduit.

Follow the appropriate safety regulations to prevent environmental damage due to possible oil leaks (e.g. collection pans).

Technical Data

Technical Data

Materials/surface protection

Cooling matrix:	Aluminium, powder-coated
Fan hub:	Aluminium, bare
Fan blades:	Glass-reinforced polypropylene (PPG), bare
Ventilation box, guard and motor brackets:	Steel, galvanised, powder-coated
Screw connections:	V2A stainless steel
Hydraulic screw fittings:	Steel, zinc-nickel coated
Hose:	synthetic rubber
Pump:	anodised aluminium, sintered steel
Motor:	Housing die-cast aluminium, painted

Colour:	Steel parts: RAL 9005, jet black Motor: RAL7031 blue grey (special colours on request)
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Surface protection:	Steel parts: ISO 12944, C3 medium Motor: ISO 12944, C3 medium (higher on request)
----------------------------	---

Operating fluids:	Mineral oils per DIN 51524 Gear oil per DIN 51517-3
--------------------------	--

generated operating pressure, static:	2.5/5.1/9.2/13.3 gpm - max. 87 psi 18.4/27.9 gpm - max. 116 psi
--	--

Suction pressure:	max. -6 psi
--------------------------	-------------

Operating oil temperature:	max. 176 °F (higher upon request)
-----------------------------------	-----------------------------------

max. viscosity:	100 cSt medium viscosity (higher upon request)
------------------------	--

Ambient temperature:	-4 °F to 104 °F
-----------------------------	-----------------

max. set-up altitude:	3.3 ft (higher on request)
------------------------------	----------------------------

Electric motors (others available upon request)

Voltage/frequency:	230/400 V 50 Hz 460 V 60 Hz (special voltages/motor approvals on request)
---------------------------	---

Thermal stability:	Class of insulating material F, utilisation per Class B (higher on request)
---------------------------	---

IP rating:	IP55 (higher on request)
-------------------	--------------------------

The motors comply with standards
IEC 60034, IEC 60072, IEC 60085, EU 2019/1781

Calculation example and nomenclature

Determination

An oil/air cooler is determined in two steps:

1. Determining or selecting the cooler size
2. Determining the actual pressure loss

t_{OE} [°F]	Inlet oil temperature
t_{LE} [°F]	Inlet air temperature
ETD [°F]	Temperature differential: $ETD = t_{OE} - t_{LE}$
P_{spec} [hp / °F]	specific cooling performance (see performance curves): $P_{spec} = P / ETD$
P [hp]	Cooling performance in hp
Q [gpm]	Oil flow rate
C_{oil} [BTU/lb·°F]	Specific heat capacity of the oil (approx. 0,48 BTU/lb·°F)
ζ [lb/gal]	Gravity of oil $\approx 7,51$ lb/gal

Calculation example

Assumptions:

Tank capacity	(V)	approx. 52.8 gal
Start up temperature of oil	(T ₁)	59 °F (≈ 288 K)
Oil heats up in approx. t = 25 min. (1500 s) to	(T ₂)	113 °F (≈ 318 K)
Required oil temperature	(t _{OE})	140 °F
Inlet air temperature	(t _{LE})	86 °F

Calculation

1st Calculating P from the tank warming

$$P = \frac{V \cdot \zeta \cdot c_{oil} (T_2 - T_1)}{t} = \frac{52.8 \text{ gal} \cdot 0.9 \frac{\text{kg}}{\text{l}} \cdot 2 \frac{\text{kJ}}{\text{kg} \cdot \text{K}} \cdot (318 \text{ K} - 288 \text{ K})}{1500 \text{ s}} = 7.2 \text{ kW}$$

2. $ETD = t_{OE} - t_{LE} = 140 \text{ °F} - 86 \text{ °F} = 54 \text{ °F}$
3. Determining the cooler size: $P_{spec} = P / ETD = 9,7 \text{ hp} / 54 \text{ °F} \approx 0.18 \text{ hp/°F}$
4. In performance curves with 80 L/min (21.1 gpm), select a cooler with $P_{spec} 0.18 \text{ hp/°F}$. → ENK 300 with 30 L (7.93 gal) pump

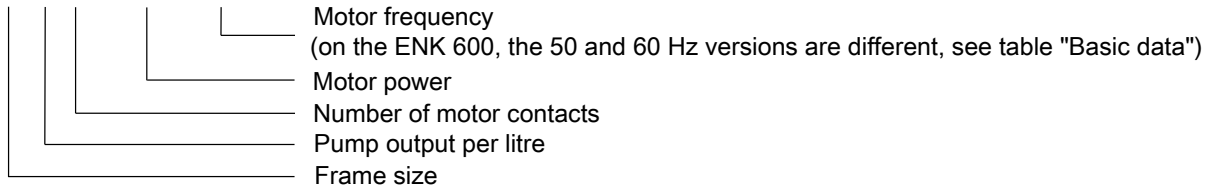
Basic data

Item no.	Cooler model	spec. cooling capacity hp/°F		Cooling capacity at ETD = 72 °F (hp)		max. circulation rate (gpm)		Power output Number of contacts Rated current		Weight (lb)	Volume (gal)	Noise db(A)*			
		50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	400 V 50 Hz	460 V 60 Hz			50/60 Hz	50/60 Hz	50 Hz	60 Hz
36ENK100406	ENK 100-8-4-0.75kW-50/60Hz	0.1	0.12	4	4.8	2.1	2.5	1.01 hp/4/1.77 A	1.17 hp/4/1.74 A	60	0.5	68	71		
36ENK100401	ENK 100-15-4-0.75kW-50/60Hz	0.12	0.13	4.6	5.4	4.2	5.0								
36ENK100402	ENK 100-30-4-0.75kW-50/60Hz	0.13	0.21	5.4	6.3	7.7	9.2								
36ENK200401	ENK 200-15-4-0.75kW-50/60Hz	0.24	0.21	7.4	8.6	4.2	5.0			2.95 hp/4/4.65 A	3.42 hp/4/4.58 A	68	0.53	69	72
36ENK200402	ENK 200-30-4-0.75kW-50/60Hz	0.22	0.25	8.9	10.2	7.7	35								
36ENK300401	ENK 300-15-4-0.75kW-50/60Hz	0.29	0.30	10.7	11.8	4.2	5.0								
36ENK300402	ENK 300-30-4-0.75kW-50/60Hz	0.34	0.37	13.7	14.9	7.7	9.2								
36ENK400402	ENK 400-30-4-0.75kW-50/60Hz	0.44	0.51	17.6	20.4	7.7	9.2								
36ENK400403	ENK 400-60-4-2.2kW-50/60Hz	0.52	0.6	20.8	24.1	15.3	18.5	4.02 hp/4/6.26 A	-	130	0.98	74	78		
36ENK400404	ENK 400-90-4-2.2kW-50/60Hz	0.58	0.66	23.1	26.3	23.4	27.7								
36ENK500403	ENK 500-60-4-2.2kW-50/60Hz	0.67	0.78	26.8	31.1	15.3	18.5								
36ENK500404	ENK 500-90-4-2.2kW-50/60Hz	0.71	0.82	28.4	32.7	23.4	27.7								
36ENK600413	ENK 600-60-4-3.0kW-50Hz	0.9	-	36.2	-	15.3	-	-	-	165	1.32	82	-		
36ENK600414	ENK 600-90-4-3.0kW-50Hz	0.98	-	39.2	-	23.4	-								
36ENK600423	ENK 600-70-4-3.48kW-60Hz	-	0.94	-	37.5	-	18.5	-	4.67 hp/4/6.1 A	-	-	-	84		
36ENK600424	ENK 600-105-4-3.48kW-60Hz	-	1.02	-	40.8	-	27.7								

*DIN EN ISO 3744, Class 3

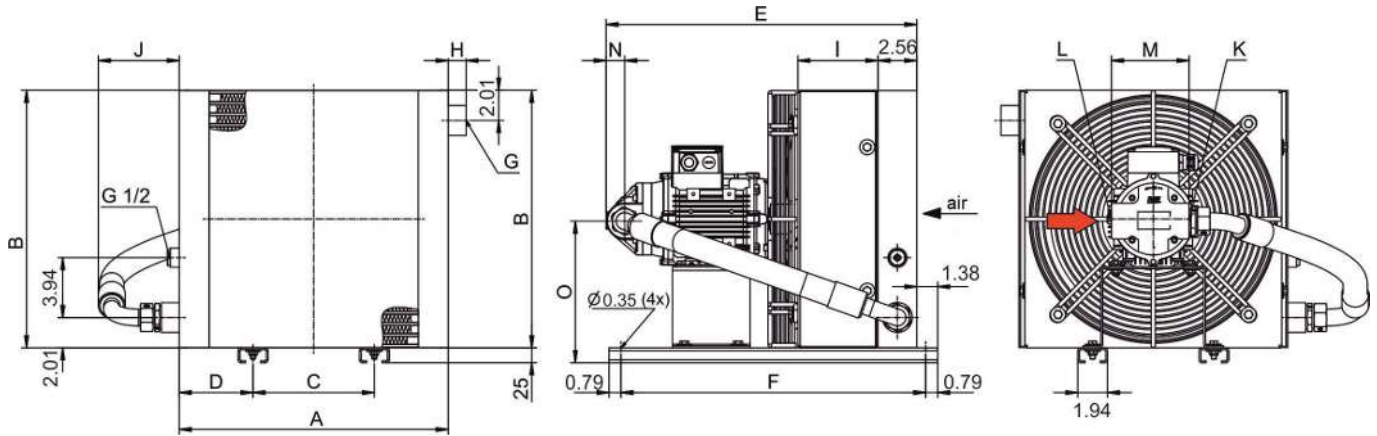
Model key

ENK 300-15-4-0.75kW-50/60Hz



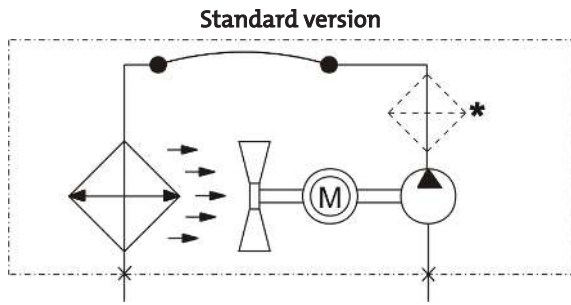
Dimensions

ENK 100-600

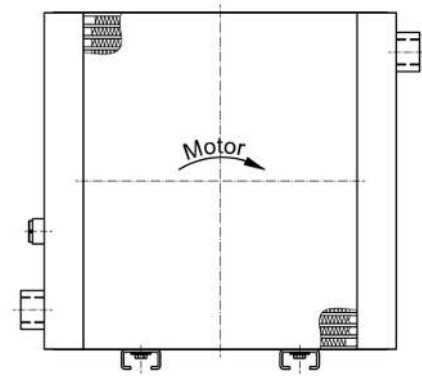


Type	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
ENK 100-8-4-0.75kW-50/60Hz												G 3/4	5.59"		
ENK 100-15-4-0.75kW-50/60Hz	12.2"	11.42"		2.13"	19.25"										6.57"
ENK 100-30-4-0.75kW-50/60Hz					19.17"		G 3/4	0.98"	4.09"	3.66"					
ENK 200-15-4-0.75kW-50/60Hz	14.76"	13.98"		3.39"	18.98"	20.08"					G1	G1 1/4	5.12"	1.22"	7.83"
ENK 200-30-4-0.75kW-50/60Hz			7.99"		18.9"										
ENK 300-15-4-0.75kW-50/60Hz	17.72"	16.93"		4.88"	20.55"				5.28"	4.17"					9.33"
ENK 300-30-4-0.75kW-50/60Hz					20.47"										
ENK 400-30-4-0.75kW-50/60Hz					21.18"										
ENK 400-60-4-2.2kW-50/60Hz	20.08"	19.33"		10.04"	26.26"				5.71"						10.51"
ENK 400-90-4-2.2kW-50/60Hz					27.64"									2.13"	
ENK 500-60-4-2.2kW-50/60Hz	22.44"	21.69"		4.21"	26.65"		G1	1.18"						1.22"	11.69"
ENK 500-90-4-2.2kW-50/60Hz					28.03"				6.3"					2.13"	
ENK 600-60-4-2.2kW-50/60Hz			14.02"		27.83"	24.02"				4.76"	G1 1/4	G1 1/2	5.31"	1.22"	
ENK 600-90-4-2.2kW-50/60Hz					29.21"									2.13"	
ENK 600-70-4-3.48kW-60Hz	24.8"	24.06"		5.39"	27.83"				6.89"					1.22"	12.87"
ENK 600-105-4-3.48kW-60Hz					29.21"									2.13"	

Functional diagram



* recommended position of additional oil filter



The oil inlet is on the left of the cooling matrix. The oil outlet is always on the opposite side.



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 Fax: 248.652.1598
 e-mail: sales@buhlertech.com

Technical Questionnaire oilcooler

Please fill in this questionnaire as complete as possible. It will help for quoting you an oilcooler system in a short time.

Customer:

Company: _____ Person responsible: _____

Department: _____ Phone: _____

Adress: _____ Fax: _____

_____ e-mail: _____

Parameters	Working-fluid	Cooling-fluid
In temperature (°F)		
Out temperature (°F)		
Max. pressure drop (psi)		
Flow-rate (gal/min)		
Heat dissipation (hp)		
Fluids (VG 46)		
Working-pressure (psi)		
Max. working -temperature (°F)		
Ex- Zone <input type="radio"/> Yes <input type="radio"/> No if yes, which:		

Specification for changing a cooler		
Returnline/bypass		
Manufacturer		Type
Pieces / anno		

Notice



3.3 Off-line Filter / Cooler Devices



Off-line filter/cooler unit BKF

In hydraulic systems oil transfers power and motion, and in drives it's a vital lubricant. Both as a power transfer medium and as a lubricant, oil is heated by friction losses during operation and changes its viscosity depending on the temperature. At the same time it is subjected to mechanical strain due to the tribological processes in the systems and takes on wear particles this causes. If these particles aren't removed as quickly as possible, they will cause further abrasion and wear.

Hydraulic and lubrication systems therefore increasingly use bypass filters with built-in cooler. The advantage of these circuits is that they create stable and therefore more predictable operating conditions for both the filtration and cooling.

The BKF series has compact gerotor pump/filter/water cooler combinations with different capacities, including custom. These compact units are combined with the extremely efficient BWT series plate heat exchangers.

The filter housings are suitable for DIN 24550 filter elements.

Compact, space-saving design

DIN filter elements

Easy installation

Easy element replacement

Efficient plate heat exchanger



Introduction and description

Why off-line aggregates?

Depending on the system configuration there are operating conditions (variable capacity pumps, back-flow peaks, etc.), which significantly limit the effectiveness of full flow filtration or even render it completely ineffective.

In addition, quite practical considerations such as installing a cooler with is required anyway or the option of system-independent operation may argue for an off-line aggregate.

Why Bühler?

When we developed the BKF series, we incorporated our years of experience in designing and selling water coolers and filters. Special attention was paid to a compact design. By using standard filter elements in this respect we are not bound to a specific filter supplier.

Together with a well-known manufacturer, Bühler implemented these findings in a comprehensive product line customised for the requirements in fluid control.

Use the data in this leaflet to determine a suitable cooler for your application. If our standard range of products does not includes the right system for your application, we will gladly develop a custom solution for you.

BKF 18/30

A low-noise gerotor pump resistant to dirt is integrated into the very compact baseplate. The drive motor and filter housing are arranged vertically and parallel to save space. The suction and pressure line are positioned so they can be routed straight down into the reservoir. This minimises the installation work.

Since the baseplate is also equipped with front connections, the aggregate can be cased next to the reservoir.

The aggregate has a built-in pressure limiting valve. NG 250 DIN elements are used as filter elements.

BKF 60/90

A compact, space-saving design was also realised in this series. Motor, pump and filter housing are combined into one unit and mounted to a frame for side mounting.

The DIN filter element with NG 400 removes to the top for changing.

Planning information

Installation site requirements

Ensure adequate ventilation.

The aggregates are mounted in the installation site using four screws

Electrical connection

The electrical connection must be made by an appropriately trained electrician! Observe the voltage and mains frequency! Fusing must comply with applicable standards! Please note the direction of rotation of the motor when connecting.

Hydraulic connection

Full utilisation of the high capacity of the aggregates requires care when configuring the intake line. This is a very important factor with use in lubricating systems. These are typically filled with higher viscosity oils and must operate reliably in a large temperature range. Although the tremendous increase in viscosity in low temperatures are frequently overlooked. For applications where the parameters are within critical ranges, we recommend calculating the precise expected pressure loss in the suction pipe or using an adequate size (never smaller than the existing pump suction port!).

The suction and pressure pipe must be installed free from tension and vibration. When using hoses, pay particular attention to the appropriate reinforcement on the suction side so the hose cannot collapse due to the negative pressure.

Do not continuously exceed the recommended suction pressure of the pumps. Some situations may require priming the suction pipe prior to first start-up.

Avoid possible leaks in the circuit to prevent environmental damages. If necessary, use e.g. an oil pan.

Technical data

Technical data

Pump housing:	Anodised and impregnated cast aluminium
Gerotor:	Sintered steel
Hydraulic screw joint:	Galvanised steel
Operating fluids:	Mineral oils per DIN 51524
Operating oil temperature:	max. 176 °F (higher temperatures on request)
Seal:	Perbunan (NBR) or Viton (FPM) on request
Ambient temperature:	-4 °F to 104 °F

Electric motors

Voltage/frequency	BKF 18/30:	220/380 V - 230/400 V - 240/415 V 50 Hz 460 V 60 Hz Electr. motor per NEMA; UL, CSA, EAC approval
	BKF 60/90:	220/380 - 245/420 V 50 Hz 220/380 - 280/480 V 60 Hz no approval

Thermal stability:	Class of insulation F, utilisation per Class B
Design:	three-phase asynchronous squirrel-cage induction motor totally enclosed, fan cooled
Protection class:	IP55
on request:	other voltages higher motor power for higher viscosities UL- or CSA-approved motors higher protection class

The motors comply with standards IEC 60034, IEC 60072, IEC 60085

Please also observe the operating manual for the motor! All motors are supplied with cable gland inside the terminal box. The total height of the aggregate may vary by motor make.

Installation information:

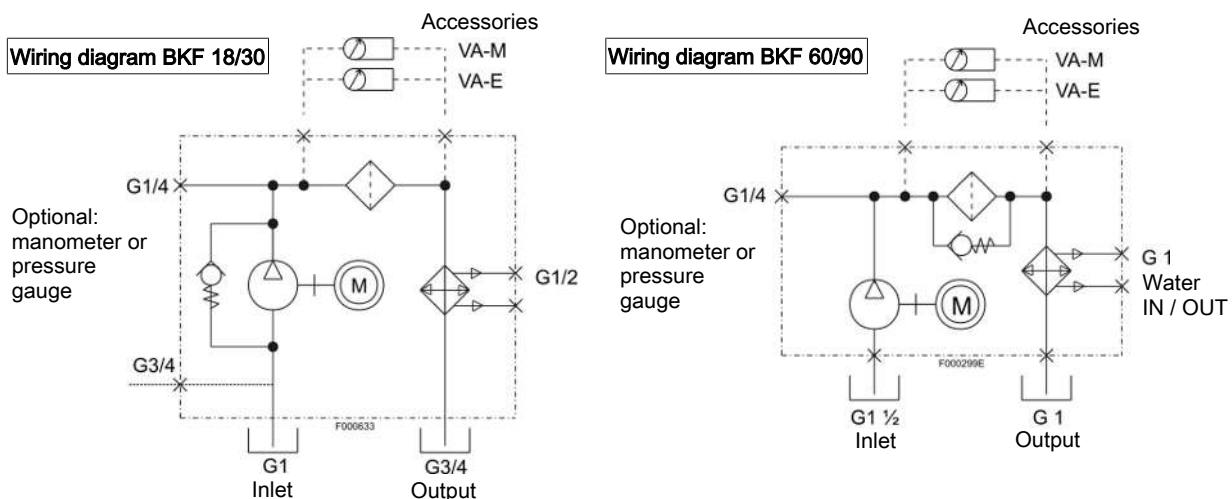
The connection threads are manufactured to ISO 228. The screw-in surfaces are finished and suitable for the use of soft seals. We recommend using screwed plugs per ISO 1179-2.

Please note:

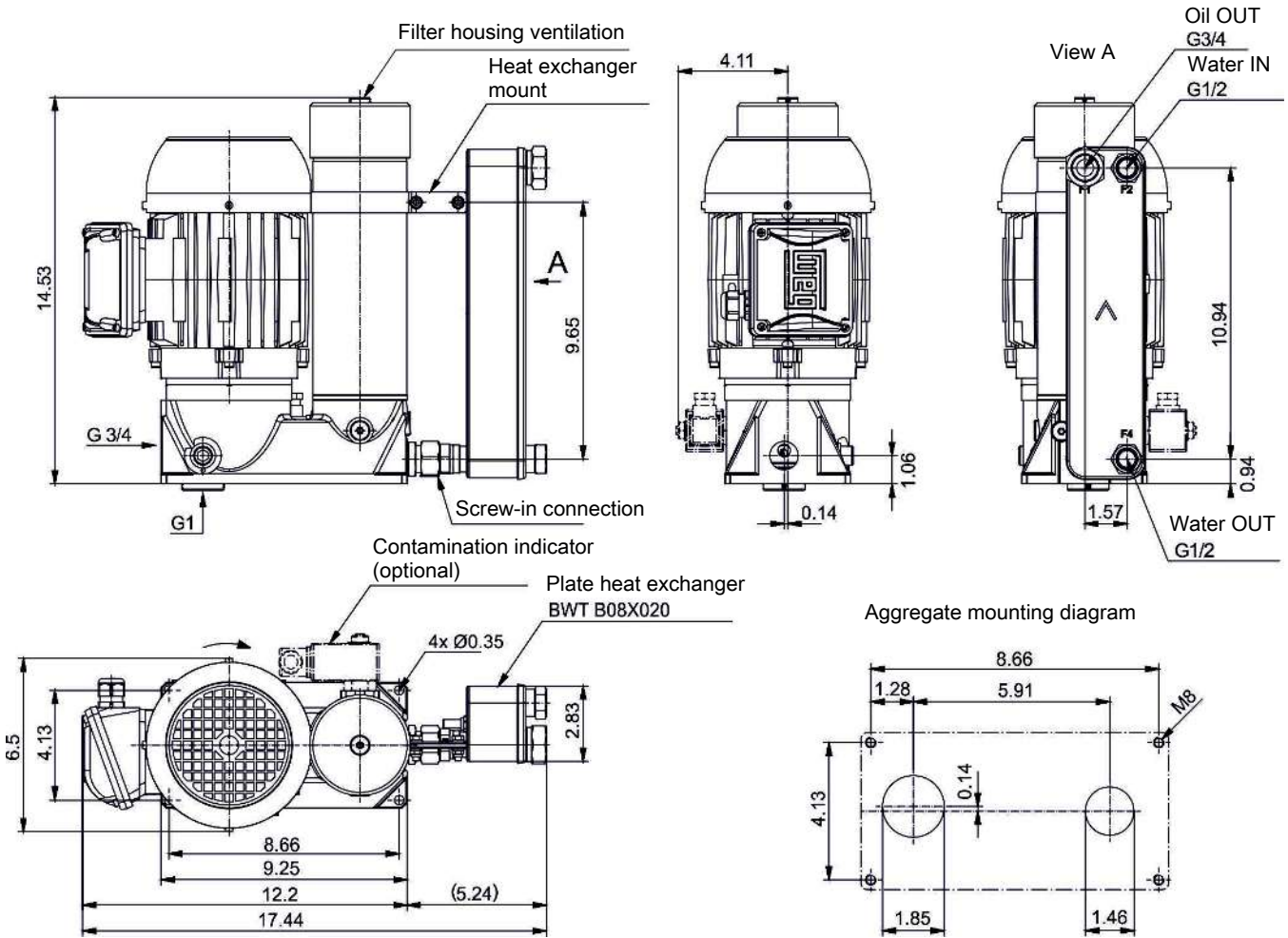
Especially note the dimension of the suction pipe. The cross-sections should not be smaller than specified. In most cases, loud noise indicates the cross-section was reduced too much.

Please refer to the notices in the operating instructions.

Wiring diagrams



BKF 18 / BKF 30



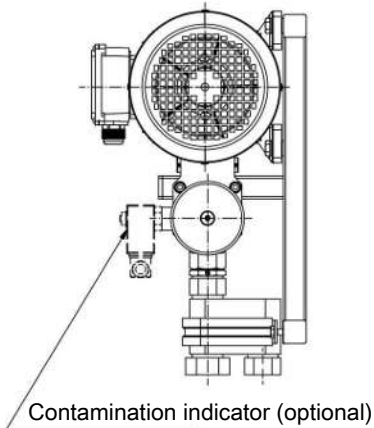
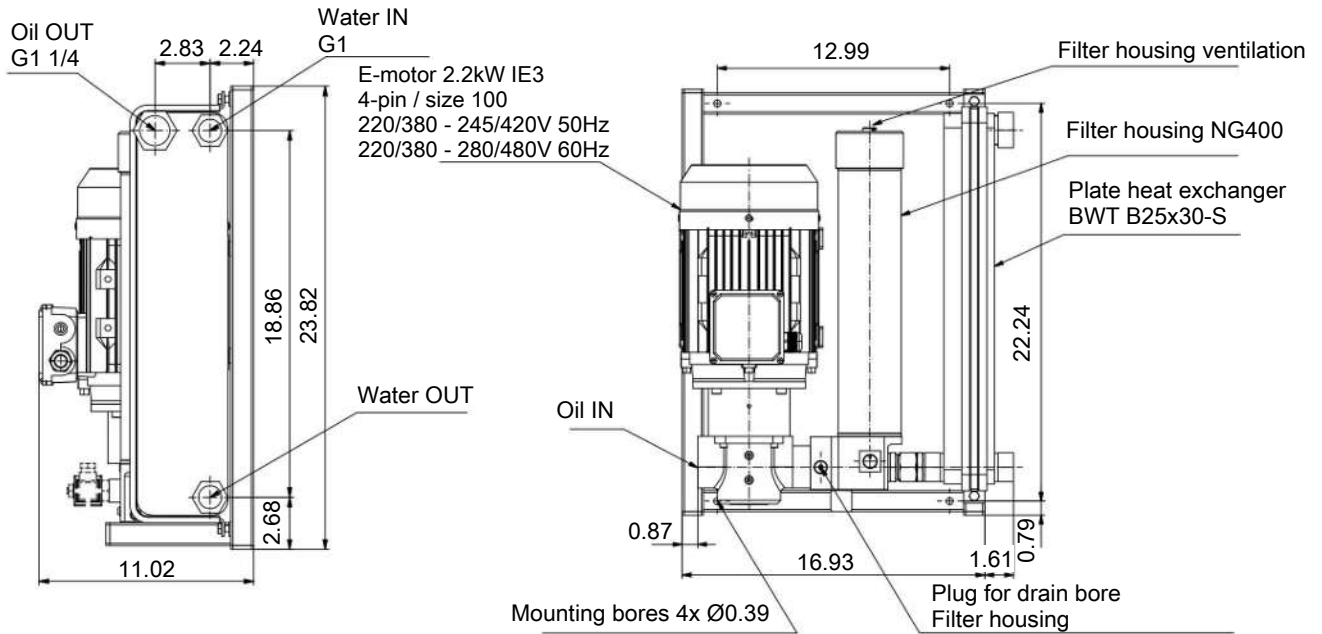
Note: When installing next to the oil reservoir please not the intake!
 When determining the bores on the reservoir be sure the contamination indicators remains visible!

Type:	BKF 18-6-0.55*	BKF 30-4-0.75-IE3*
Motor power:	0.75 hp	1 hp
Number of poles:	6	4
Power input (460 V 60 Hz):	~ ~ 1.4 A	~ ~ 1.4 A
Suction lift:	3.28 ft	3.28 ft
Display pressure contamination indicator:	32 psi	32 psi
Suction end connection:	G3/4 / G1	G3/4 / G1
Suction end hose:	DN 20 / DN 25	DN 20 / DN 25
Pressure end connection:	G3/4	G3/4
Pressure end hose:	DN 20	DN 20
Suction pressure:	-5.8 psi	-5.8 psi
For all aggregates briefly:	-8.7 psi	
Connection "Water IN":	G1/2	G1/2
Connection "Water OUT":	G1/2	G1/2
Flow rate:	5.8 gpm	9.2 gpm
max. oil viscosity:	600 cSt	300 cSt
at maximum feed pressure (pressures above open the internal bypass valve):	87 psi	87 psi
Acoustic power as per ISO 3744** (46 cSt at 29 psi feed pressure):	55 dB(A)	59 dB(A)
Weight:	approx. 44 lb	approx. 50 lb

* Electr. motor per NEMA, UL, CSA, EAC approval

** On 60 Hz versions the acoustic power is approx. 3 dB(A) higher.

BKF 60 / BKF 90



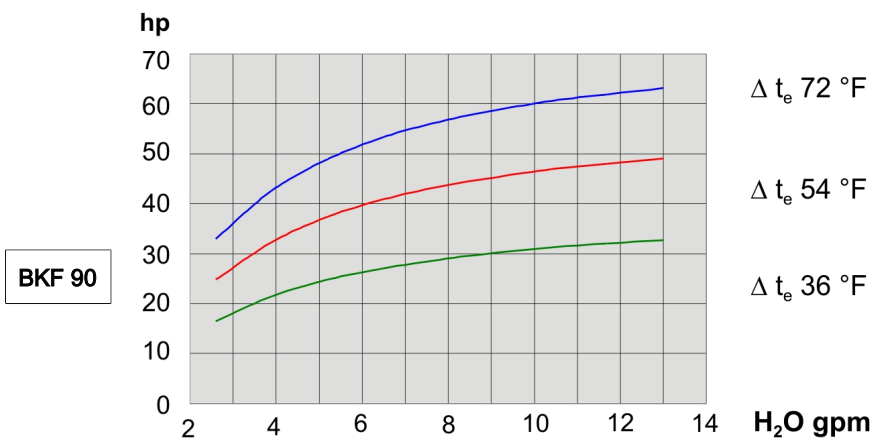
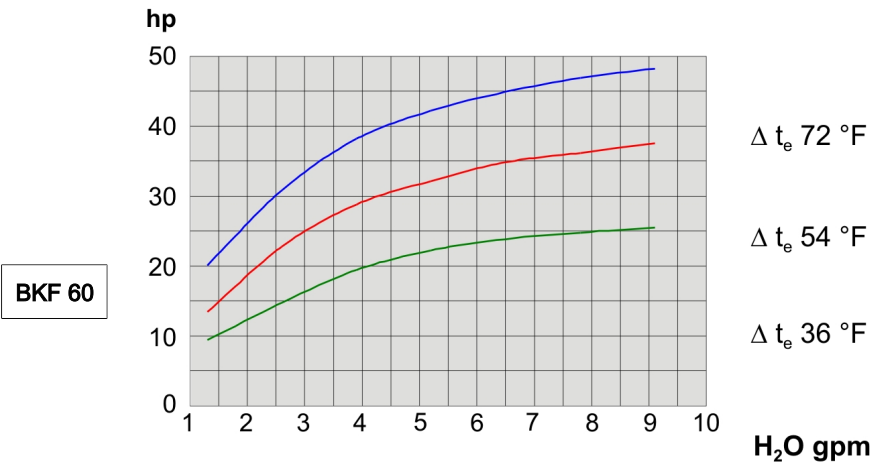
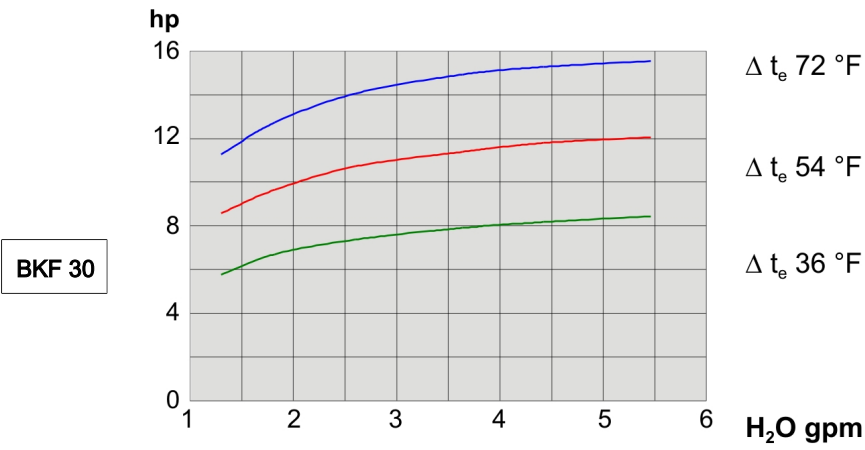
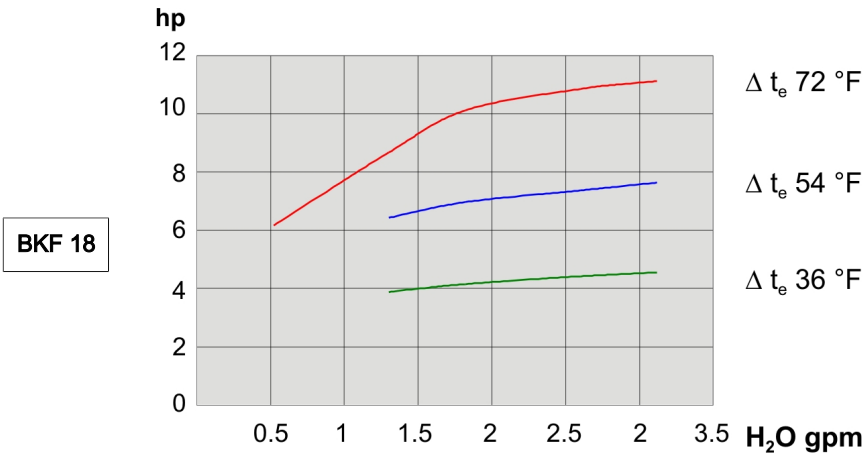
Note: When installing next to the oil reservoir please not the intake!
When determining the bores on the reservoir be sure the contamination indicators remains visible!

Type:	BKF 60-4-2.2-IE3*	BKF 90-4-2.2-IE3*
Motor power:	3 hp	3 hp
Number of poles:	4	4
Power input (460 V 60 Hz):	~ ~ 3.5 A	~ ~ 3.5 A
Suction lift:	3.28 ft	3.28 ft
Filter element pressure limit:	51 psi	51 psi
Display pressure contamination indicator:	32 psi	32 psi
Suction end connection:	G1 1/2	G1 1/2
Suction end hose:	DN 40	DN 40
Pressure end connection:	G1 1/4	G1 1/4
Pressure end hose:	DN 32	DN 32
Suction pressure:	-5.8 psi	-5.8 psi
For all aggregates briefly:	-8.7 psi	
Connection "Water IN":	G1	G1
Connection "Water OUT":	G1	G1
Flow rate:	18.3 gpm	27.9 gpm
max. oil viscosity:	800 cSt	200 cSt
at maximum feed pressure:	116 psi	116 psi
Acoustic power as per ISO 3744** (46 cSt at 29 psi feed pressure):	64 dB(A)	66 dB(A)
Weight:	approx. 101 lb	approx. 104 lb

* On request: Electr. motor per NEMA, UL, CSA, EAC approval.

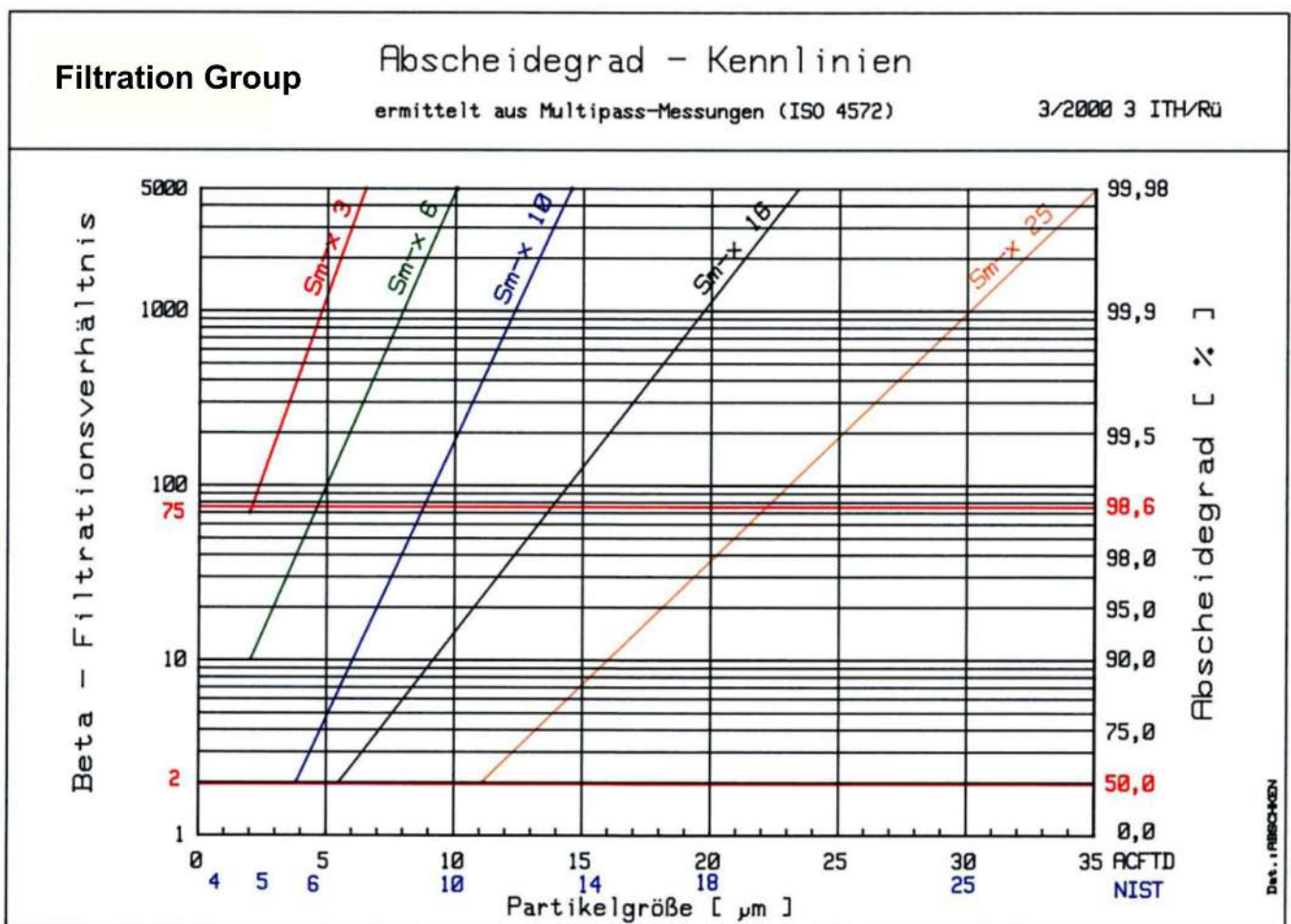
** On 60 Hz versions the acoustic power is approx. 3 dB(A) higher.

Cooling capacity curves



Selecting the filter fineness

Determining the contamination class per ISO 4406			System type	Recommend filter retention rate	Recommended element
>4 µm	>6 µm	>14 µm			
13	11	8	Highly reliable control systems susceptible to sludge accumulations; laboratory or aerospace	1-2	Sm-N2
14	12	9	High performance servo systems and high pressure systems with a long life; e.g. aviation, machine tool, etc.	3-5	Sm-x3
16	13	10			Sm-x6
17	15	11	High-quality, reliable systems: general machinery construction	10-12	Sm-x10
20	17	12	General machinery construction and vehicles; moderate pressure, moderate capacity	12-15	Sm-x16
23	19	13	General machinery construction and vehicles; low-pressure systems in heavy machinery construction	15-25	Sm-x25 / Mic 10



Ordering instructions

Off-line filters

Item no.	Type	Description
3902010	BKF 18	without contamination indicator NBR
3902110	BKF 18	mechanical contamination indicator NBR
3902210	BKF 18	electric contamination indicator NBR
3903020IE3	BKF 30	without contamination indicator NBR
3903120IE3	BKF 30	mechanical contamination indicator NBR
3903220IE3	BKF 30	electric contamination indicator NBR
3906030IE3	BKF 60	without contamination indicator NBR
3906130IE3	BKF 60	mechanical contamination indicator NBR
3906230IE3	BKF 60	electric contamination indicator NBR
3909030IE3	BKF 90	without contamination indicator NBR
3909130IE3	BKF 90	mechanical contamination indicator NBR
3909230IE3	BKF 90	electric contamination indicator NBR

Filter elements

For type	Item no.	Description	Filter fineness	Purity class **
BKF 18/BKF 30	3825003	N 0250 DN 3	3 µm	13/10
	3825006	N 0250 DN 6	6 µm	14/10
	3825010	N 0250 DN 10	10 µm	15/11
BKF 60/BKF 90	3840003	N 0400 DN 3	3 µm	13/10
	3840006	N 0400 DN 6	6 µm	14/10
	3840010	N 0400 DN 10	10 µm	15/11

** Purity classes achievable per ISO 4406 for BKF 18/30 at V = 300 L and 24 h Circulation time (approx. numbers)



Off-line filter/cooler unit FGSL

Coolers are used to stabilise the operating temperature in hydraulic and lubrication systems. This can be implemented particularly cost-efficiently by integrating the cooler in a bypass circuit. The required cooler size can be calculated much more accurately if the flow rate and cooling capacity specifications are definite. At the same time, the bypass circuit can also be used to integrate the working filter. The stable recirculated volumes and low system pressure allow the use of less expensive filter housings. Another advantage is easier maintenance. The filter element can be replaced without shutting down the entire system.

The compact design of Bühler FGSL off-line filter units meet the requirements in application quite well and can also easily be retrofit in existing systems.

Easy to maintain design

Compact design

Low noise emission

Rugged cooling matrix

Extensive accessories

High suction pump

Easy to integrate in existing systems

Low pressure filter with a wide separation range and filtration capacity



Introduction and description

Why coolers?

In many cases, installing an off-line cooler is not only an emergency solution, but often the best solution with respect to mechanics and economics. Off-line filtration can usually also be incorporated quite effectively.

Since a bypass also always requires installing a separate circulation pump, it's reasonable to connect it to the existing fan motor.

The FGSL series is a tiered line of oil/air coolers with directly flange-mounted circulation pump. The cooler size and pump flow rate are coordinated for performance grades compatible with the system. The gerotor pump ensures the entire unit emits very little noise.

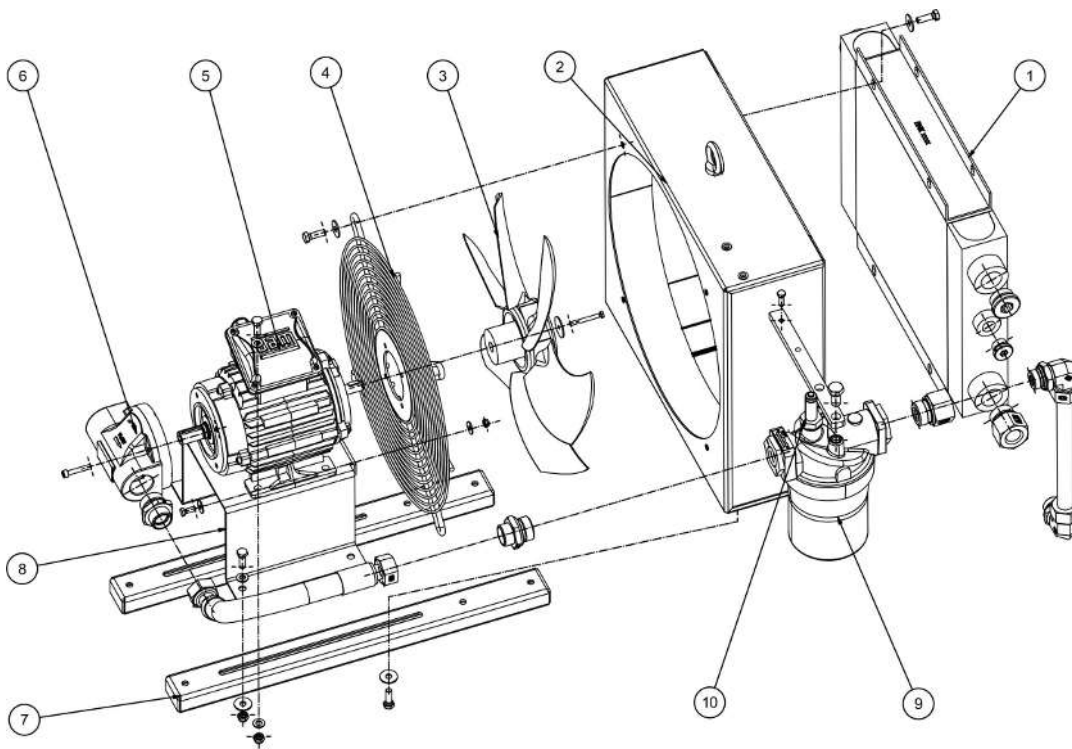
Why Bühler?

When we developed the BNK series, we incorporated our years of experience in designing and selling oil/air coolers and combined units. Especially the fatigue life of the cooling matrix was a focus during development.

The cooling matrix can easily be removed from the fan case for maintenance without removing the fan or motor.

If our comprehensive standard range of products does not include the right solution for your application, we will gladly find a solution specific to your needs.

Use the data in this leaflet to find a unit suitable for your application.



Construction and application

The FGSL's consist of the following components:

- cooling matrix (1),
- fan case (2) with mounting rails (7),
- blower and pump unit consisting of three-phase motor (5), pump (6), fan (3), protective/mounting grate (4) and motor bracket (8),
- attached low pressure filter (9) with built-in bypass valve and mechanical/ visual contamination indicator (10).

The cooling matrix and fan/pump unit can be removed from the fan case individually without having to remove other components.

The cooling matrixes in the FGSL series are aluminium. The coolers are designed for use in hydraulic circuits.

Filtration

We offer a wide range of filter elements to use in the filter housing. Contact us for an in-depth consultation.

Equipment Expansion (upon request)

We also offer cooling matrix versions with internal or external bypass and upgrades with various sensors. For example pressure gauge, pressure transmitter 4-20 mA, pressure switch, thermometer and temperature transmitter 4-20 mA, temperature switch, flow switch, flow meter, particle counters.

Various electric switches can be added to indicate the filter contamination level.

Device Modification (upon request)

- different RAL paint colour up to corrosion-protection class C5 ISO 12944,
- motor equipment, different IP rating, different voltage, approvals from licensing institutions,
- special sizes with different dimensions,
- Modification for installation in altitudes over 3.280 ft and different ambient temperatures.

Planning information

Set-up

The unit must be set up so the air supply and exhaust will not be obstructed. The clearance to air obstacles at the front and back of the cooler should be at least half the cooler height (dimension B).

Ensure adequate ventilation. When installing the unit, be sure the warm exhaust air or noise emitted will not cause problems.

If the ambient air is dirty, excess deposit on the cooling matrix must be expected. This will reduce the cooling capacity. In this case, particularly in the case of air loaded with oil mist, the air ducts must be cleaned regularly.

For outdoor installation, ensure the motor is adequately protected from the weather.

Ensure easy access for inspection and maintenance.

Mounting

The units secure to the mounting rails with four screws. Be sure the support structure is sized adequately. Install in any position.

Connecting the oil circuit

The connection between the system and the cooling matrix should be stress and vibration free, which can be achieved by using conduit.

Follow the relevant safety regulations to prevent environmental damage due to potential oil leaks (e.g. collection pans).

Technical data

Technical Data

Materials / surface protection

Cooling matrix:	painted aluminium
Ventilation box, safety guard and motor brackets:	plastic-coated steel
Pump:	anodised aluminium, sintered steel
Colour:	RAL 7001
Filter housing:	aluminium die casting, passivated, unpainted
Operating fluids:	Mineral oils per DIN 51524 Gear oil per DIN 51517-3
Operating pressure, static:	5,1/9,2/13,3 gpm – max. 87 psi 18,4/27,9 gpm – max. 116 psi
Suction pressure:	max. -6 psi / -8,7 psi temporarily
Operating oil temperature:	max. 176 °F (higher upon request)
max. viscosity:	100 cSt medium viscosity (higher upon request)
Ambient temperature:	5 to 104 °F
max. altitude:	3280 ft (higher upon request)
Filter series:	Filtration Group PI 200
Visual contamination indicator switching point:	Δ P 32 psi +/-10 %
Filter bypass valve opening pressure:	Δ P 51 psi +/-10%
Available filter fineness:	3 – 100 micron
Seals:	NBR

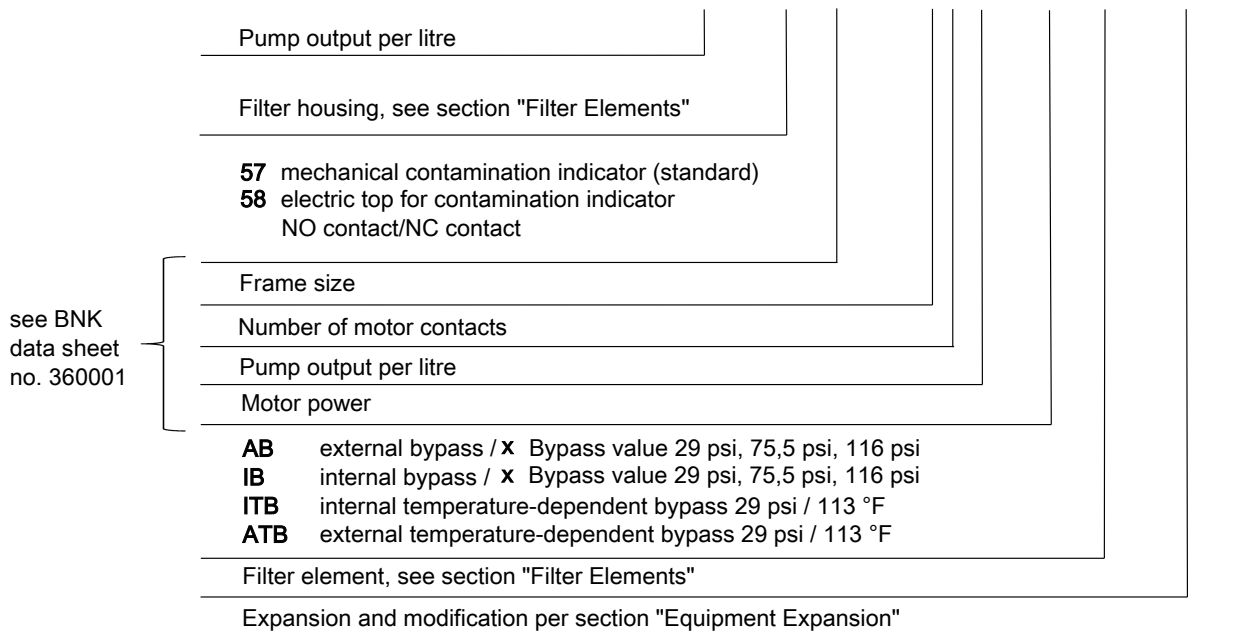
Electric motors (others available upon request)

Voltage/frequency:	220/380V – 230/400V – 240/415V 50Hz 460 60 Hz
Thermal stability:	Insulation class F, utilisation per Class B
IP rating:	IP55

The motors comply with standard IEC 60034. Electric per NEMA, with UL/CSA/EAC approval.

Model key

FGSL 30 / PI 2015-57 / BNK 2.4-30-0.75kW-IBx / 7680358 / 99



Basic Data Standard Models (for 60 Hz frequency)

The standard model includes the installed filter housing with mechanical contamination indicator, without filter element.

Item no.	Cooler model	spec. cooling capacity hp/°F	Cooling capacity at ETD = 72 °F (hp)	max. circulation rate (gpm)	Motor power Number of motor contacts Rated current at 460 V	Motor service factor	Weight (lb)	Capacity (gal)	Sound pressure level db(A)**
27004124IE3	FGSL 15/PI 2008-57/ BNK 2.4-15-0.75kW-IE3	0,08	5.8	5,1	1.0 hp/4/1.4 A	1,25	92,59	0,34	69
27004086IE3	FGSL 30/PI 2008-57/ BNK 2.4-30-0.75kW-IE3	0,1	7,2	9,2	1.0 hp/4/1.4 A	1,25	94,8	0,34	69
27004084IE3	FGSL 15/PI 2015-57/ BNK 3.4-15-0.75kW-IE3	0,15	10,8	5,1	1.0 hp/4/1.4 A	1,25	114,64	0,48	74
27004083IE3	FGSL 30/PI 2015-57/ BNK 3.4-30-0.75kW-IE3	0,17	12,2	9,2	1.0 hp/4/1.4 A	1,25	116,84	0,48	74
27004144IE3	FGSL 40/PI 2015-57/ BNK 3.4-40-1.1kW-IE3	0,19	13,7	13,3	1.5 hp/4/2.0 A	1,25	123,46	0,48	74
27004088IE3	FGSL 30/PI 2015-57/ BNK 4.4-30-0.75kW-IE3	0,23	16,6	9,2	1.0 hp/4/1.4 A	1,25	127,87	0,61	76
27004186IE3	FGSL 40/PI 2015-57/ BNK 4.4-40-1.1kW-IE3	0,25	18	13,3	1.5 hp/4/2.0 A	1,25	134,48	0,61	76
27004085IE3	FGSL 60/PI 2030-57/ BNK 4.4-60-1.5kW-IE3	0,26	18.7	18,4	2.0 hp/4/2.8 A	1,25	156,53	0,61	76
27004232IE3	FGSL 60/PI 2030-57/ BNK 5.4-60-2.2kW-IE3	0,42	30,2	18,4	4.0 hp/4/4.0 A	1,25	165,35	0,82	82
27004187IE3	FGSL 90/PI 2045-57/ BNK 5.4-90-2.2kW-IE3	0,45	32.4	27,9	3.0 hp/4/4.0 A	1,25	165,35	0,82	82
27004141IE3*	FGSL 60/PI 2030-57/ BNK 6.4-60-3kW-IE3	0,68	49	18,4	4.0 hp/4/5.3 A	1,25	246,92	1,08	89
27004192IE3*	FGSL 90/PI 2045-57/ BNK 6.4-90-3kW-IE3	0,76	54.7	27,9	4.0 hp/4/5.3 A	1,25	246,92	1,08	89

*Item numbers for 50 Hz version only. 60 Hz versions available upon request.

**DIN EN ISO 3744, Class 3, when operated at 60 Hz +3 dB

Filter Accessories

Filter elements

PS fibreglass filters are suitable for low viscosity oils and have a high dirt capacity.

DRG wire mesh filter elements DRG are suitable for high viscosity motor and gear oils and have a low dirt capacity. They are more expensive than type PS, but can be cleaned.

PS fibreglass filter elements		3 micron	6 micron	10 micron	25 micron
Filter housing PI 2008	Type:	PI 2108 PS 3	PI 5108 PS 6	PI 3108 PS 10	PI 4108 PS 25
	Item no.:	7680143	7943517	7680341	7680457
Filter housing PI 2015	Type:	PI 2115 PS 3	PI 5115 PS 6	PI 3115 PS 10	PI 4115 PS 25
	Item no.:	7680168	7955099	7680358	7680473
Filter housing PI 2030	Type:	PI 2130 PS 3	PI 5130 PS 6	PI 3130 PS 10	PI 4130 PS 25
	Item no.:	7680176	7955107	7680366	7680481
Filter housing PI 2045	Type:	PI 2145 PS 3	PI 5145 PS 6	PI 3145 PS 10	PI 4145 PS 25
	Item no.:	7680184	7955115	7680374	7680499

DRG wire mesh filter elements		10 micron	25 micron	40 micron	60 micron	100 micron
Filter housing PI 2008	Type:	PI 8108 DRG 10	PI 8208 DRG 25	PI 8308 DRG 40	PI 8408 DRG 60	PI 8508 DRG 100
	Item no.:	7718737	7680929	7680978	7681018	7681075
Filter housing PI 2015	Type:	PI 8115 DRG 10	PI 8215 DRG 25	PI 8315 DRG 40	PI 8415 DRG 60	PI 8515 DRG 100
	Item no.:	7711120	7680945	7680994	7681034	7681083
Filter housing PI 2030	Type:	PI 8130 DRG 10	PI 8230 DRG 25	PI 8330 DRG 40	PI 8430 DRG 60	PI 8530 DRG 100
	Item no.:	7718810	7680952	7718802	7681042	7689078
Filter housing PI 2045	Type:	PI 8145 DRG 10	PI 8245 DRG 25	PI 8345 DRG 40	PI 8445 DRG 60	PI 8545 DRG 100
	Item no.:	7711179	7711187	7681000	76841059	7689094

Item no.	Description
77536550	Electric top for contamination indicator NO/NC contact

Calculation example and nomenclature

t_{OE} [°F]	Inlet oil temperature
t_{LE} [°F]	Inlet air temperature
ETD [°F]	Temperature differential: $ETD = t_{OE} - t_{LE}$
P_{spec} [hp / °F]	specific cooling performance (see performance curves): $P_{spec} = P / ETD$
P [hp]	Cooling performance in hp
Q [gpm]	Oil flow rate
C_{oil} [BTU/lb·°F]	Specific heat capacity of the oil (approx. 0,48 BTU/lb·°F)
ζ [lb/gal]	Gravity of oil $\approx 7,51$ lb/gal

Calculation example

Assumptions:

Tank capacity	(V)	approx. 52.8 gal
Start up temperature of oil	(T_1)	59 °F (≈ 288 K)
Oil heats up in approx.		
t = 25 min. (1500 s) to	(T_2)	113 °F (≈ 318 K)
Required oil temperature	(t_{OE})	140 °F
Inlet air temperature	(t_{LE})	86 °F

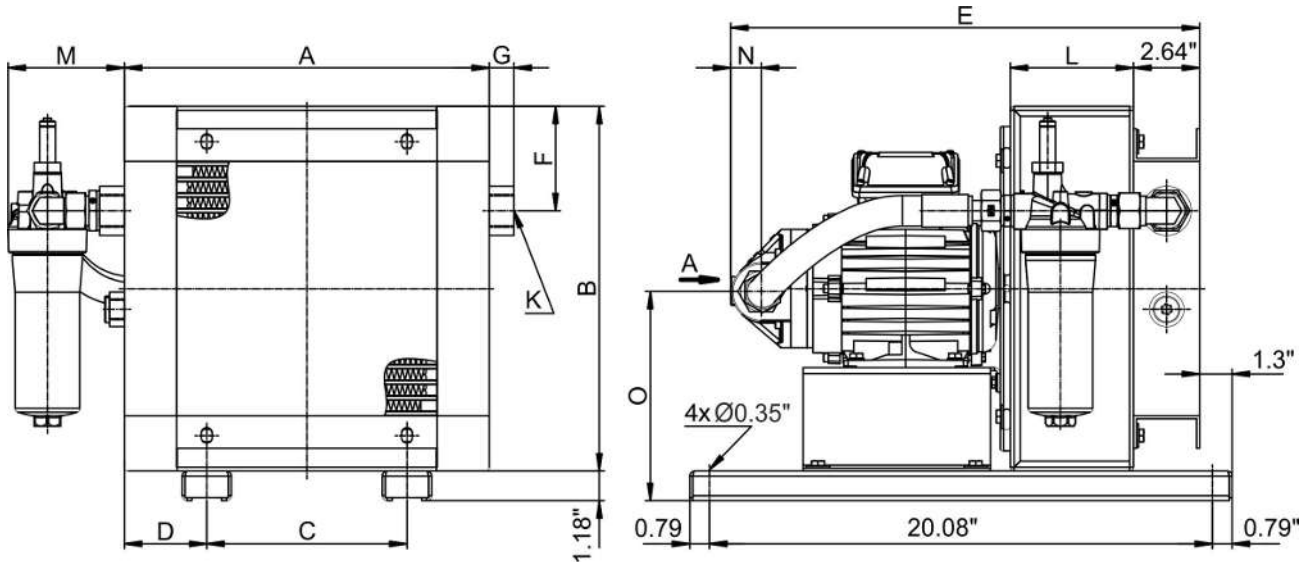
Calculation:

- Calculating P from the tank warming

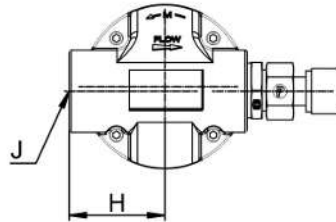
$$P = \frac{V \cdot \zeta \cdot c_{oil} (T_2 - T_1)}{t} = \frac{52.8 \text{ gal} \cdot 0.9 \frac{\text{kg}}{\text{l}} \cdot 2 \frac{\text{kJ}}{\text{kg} \cdot \text{K}} \cdot (318 \text{ K} - 288 \text{ K})}{1500 \text{ s}} = 7.2 \text{ kW}$$

- ETD = $t_{OE} - t_{LE} = 140 \text{ °F} - 86 \text{ °F} = 54 \text{ °F}$
- Determining the cooler size: $P_{spec} = P / ETD = 9,7 \text{ hp} / 54 \text{ °F} \approx 0.18 \text{ hp/°F}$
- Select a cooler from the basic data with $P_{spec} \approx 0.18 \text{ hp/°F}$. There is one option: BNK 3.4 with 30 L (9,2 gpm) pump

Dimensions (in)



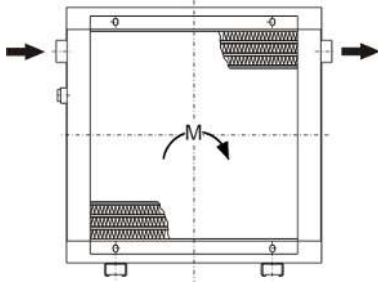
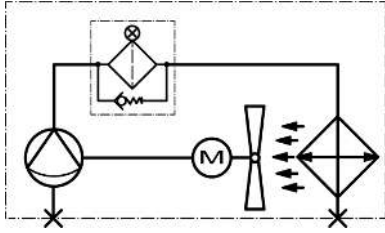
View A



Item no.	Cooler model	A	B	C	D	E	F	G	H	J (Oil ON)	K (Oil OFF)	L	M	N	O
27004124IE3	FGSL 15/PI 2008-57/ BNK 2.4-15-0.75kW-IE3	14,57	14,57	7,99	3,29	18,74	4,17	0,98	2,76	G1 1/4"	G1"	4,92	118	1,18	8,35
27004086IE3	FGSL 30/PI 2015-57/ BNK 2.4-30-0.75kW-IE3	14,57	14,57	7,99	3,29	18,66	4,17	0,98	2,76	G1 1/4"	G1"	4,92	188	1,18	8,35
27004084IE3	FGSL 15/PI 2015-57/ BNK 3.4-15-0.75kW-IE3	17,32	17,32	7,99	4,67	19,72	4,13	0,98	2,76	G1 1/4"	G1"	5,91	156	1,18	9,72
27004083IE3	FGSL 30/PI 2015-57/ BNK 3.4-30-0.75kW-IE3	17,32	17,32	7,99	4,67	19,65	4,13	0,98	2,76	G1 1/4"	G1"	5,91	156	1,18	9,72
27004144IE3	FGSL 40/PI 2015-57/ BNK 3.4-40-1.1kW-IE3	17,32	17,32	7,99	4,67	20,31	4,13	0,98	2,76	G1 1/4"	G1"	5,91	156	1,18	9,72
27004088IE3	FGSL 30/PI 2015-57/ BNK 4.4-30-0.75kW-IE3	19,69	19,69	7,99	5,85	20,63	4,09	0,98	2,76	G1 1/4"	G1"	6,89	148	1,18	10,91
27004186IE3	FGSL 40/PI 2015-57/ BNK 4.4-40-1.1kW-IE3	19,69	19,69	7,99	5,85	21,34	4,09	0,98	2,76	G1 1/4"	G1"	6,89	148	1,18	10,91
27004085IE3	FGSL 60/PI 2030-57/ BNK 4.4-60-1.5kW-IE3	19,69	19,69	7,99	5,85	24,02	4,09	0,98	2,87	G1 1/2"	G1"	6,89	148	1,18	10,91
27004232IE3	FGSL 60/PI 2030-57/ BNK 5.4-60-2.2kW-IE3	22,83	22,83	14,02	4,41	22,76	3,94	0,93	2,87	G1 1/2"	G1"	7,87	153	1,18	12,48
27004187IE3	FGSL 90/PI 2045-57/ BNK 5.4-90-2.2kW-IE3	22,83	22,83	14,02	4,41	28,07	3,94	0,93	2,87	G1 1/2"	G1"	7,87	153	2,11	12,48
27004141IE3	FGSL 60/PI 2030-57/ BNK 6.4-60-3kW-IE3	27,56	27,56	14,02	6,77	29,02	4,33	0,37	2,87	G1 1/2"	G1 1/4"	8,86	151	1,18	14,84
27004192IE3	FGSL 90/PI 2045-57/ BNK 6.4-90-3kW-IE3	27,56	27,56	14,02	6,77	30,39	4,33	0,37	2,87	G1 1/2"	G1 1/4"	8,86	151	2,11	14,84

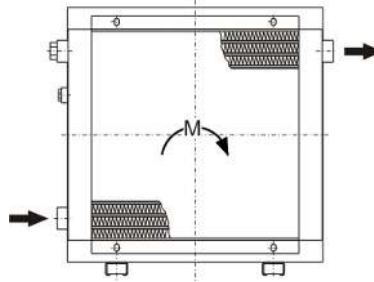
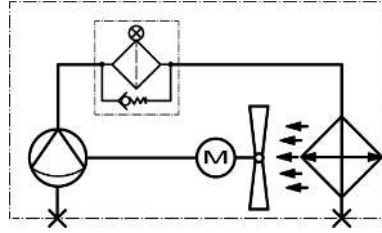
Functional diagram

Standard version BNK 2



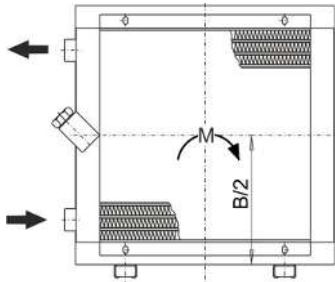
The oil inlet is on the left of the cooling matrix. The oil outlet is always on the opposite side.

Standard version BNK 3 to BNK 6



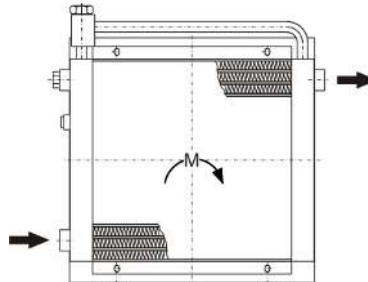
The oil inlet is on the bottom left of the cooling matrix. The second connection at the top must be closed. The oil outlet is always on the opposite side.

Internal bypass IB/ ITB (BNK 3-6)



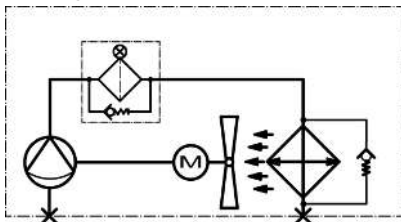
The oil inlet and outlet is always on the same side of the cooling matrix. The connection on the opposite side must be closed.

External bypass AB/ATB (BNK 2-6)

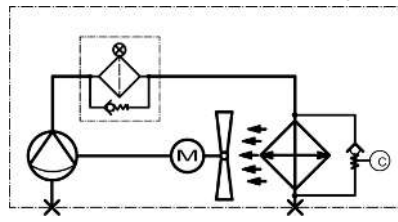


The oil inlet is always at the bottom left of the cooling matrix. The second connection must be closed. The oil outlet is always on the opposite side.

With bypass valve



With temperature-dependent bypass valve



Special units



Special Off-Line Filter/Coolers





3.4 Empty

Dieses Kapitel ist derzeit noch nicht belegt.

This chapter is under construction.



4 Filtration

4.1	Off- line Filter Devices	399
4.2	Filter	410

Chap. 22 Off-line filter

Stationary:
BNF (Chap. 22)

- integrated pump and filter
- compact design
- delivery volume 18/30/60/90 l/min



Multifunction:
Multiterminal (Chap. 2)

- Multiterminal



Chap. 22 Off-Line filter

Mobile:
Filter unit FGM

- delivery volume 30 and 60 l/min
- large filter area



Chap. 23 Filter and filter elements

Filter types

- air filter
- return filter
- in-line filter
- filter housings
- DIN-filter elements



Chap. 11 Filter monitoring

- electronic capacity sensors VSA 24-xx



Chap. 26 Sub systems

Customized units



Chap. 19. Filter / cooler units

cooling agent: air

- integrated pump and filter
- compact design
- DIN-filter or customized filter
- delivery volume 8/15/30/40/60/90 l/min



cooling agent: water

- integrated pump and filter
- DIN-Filter NG250 and NG400
- delivery volume 18/30/60/90 l/min

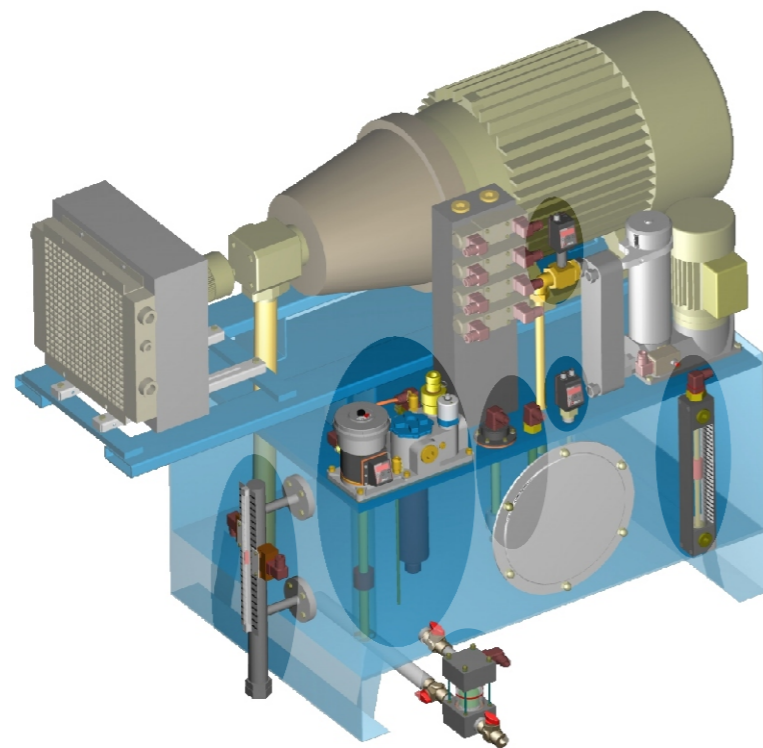


Filtration

Nowadays oil is regarded as a component of the entire system, where its characteristics should stay constant over the whole system life time. This requires temperature control as well as fast removal of any particles due to effective filtration. The international standard ISO 4406 specifies degrees of purity limiting the allowed particle load of the oil. The filtration must guarantee the aimed degree of purity for the specific system stable and permanently.

Appropriate filtration systems are so called kidney loop filters.

These filters provide an optimum filtration due to a constant circulation rate and operation free of pressure pulses. Furthermore, they can be combined with other functions as heating / cooling at low costs.





4.1 Off- line Filter Devices



Off-Line Filter BNF

In hydraulic systems oil transfers power and motion, and in drives it's a vital lubricant. Both as a power transfer medium and as a lubricant, oil is heated by friction losses during operation and changes its viscosity depending on the temperature. At the same time it is subjected to mechanical strain due to the tribological processes in the systems and takes on wear particles this causes. If these particles aren't removed as quickly as possible, they will cause further abrasion and wear.

Hydraulic and lubrication systems therefore increasingly use bypass filters. The advantage of these circuits is that they create stable and therefore more predictable operating conditions for both the filtration and cooling.

The BNF series has compact gerotor pump/filter combinations with different capacities, including custom.

The filter housings are suitable for DIN 24550 filter elements.

Compact, space-saving design

DIN filter elements

Very easy to install

Easy replacement of filter element

Low-noise gerotor pump



Introduction and description

Why off-line aggregates?

Depending on the system configuration there are operating conditions (variable capacity pumps, back-flow peaks, etc.), which significantly limit the effectiveness of full flow filtration or even render it completely ineffective.

In addition, quite practical considerations such as installing a cooler with is required anyway or the option of system-independent operation may argue for an off-line aggregate.

Why Bühler?

When we developed the BNF series, we incorporated our years of experience in designing and selling water coolers and filters. Special attention was paid to a compact design. By using standard filter elements in this respect we are not bound to a specific filter supplier.

Together with a well-known manufacturer, Bühler implemented these findings in a comprehensive product line customised for the requirements in fluid control.

Use the data in this leaflet to determine a suitable cooler for your application. If our standard range of products does not includes the right system for your application, we will gladly develop a custom solution for you.

BNF 18/30

In a filter station it's important to offer a compact design with ample capacity to quickly and permanently clean any given amount of oil.

This aspect has been implemented in to a special degree in the BNF series. A low-noise gerotor pump resistant to dirt is integrated into the very compact baseplate. The drive motor and filter housing are arranged vertically and parallel. The suction and pressure line are positioned so they can be routed straight down into the reservoir. This minimises the installation work.

Since the baseplate is further equipped with front connections, the aggregate can be cased next to the reservoir, if so desired.

The aggregate has a built-in pressure limiting valve. DIN elements with NG 250 are used as filter elements.

BNF 60/90

A compact, space-saving design was also realised in this series. Motor, pump and filter housing are combined into one unit and mounted to a frame for side mounting.

The DIN filter element with NG 400 removes to the top for changing.

Planning information

Installation site requirements

Ensure adequate ventilation.

The aggregates are mounted in the installation site using four screws

Electrical connection

The electrical connection must be made by an appropriately trained electrician! Observe the voltage and mains frequency! Fusing must comply with applicable standards! Please note the direction of rotation of the motor when connecting.

Hydraulic connection

Full utilisation of the high capacity of the aggregates requires care when configuring the intake line. This is a very important factor with use in lubricating systems. These are typically filled with higher viscosity oils and must operate reliably in a large temperature range. Although the tremendous increase in viscosity in low temperatures are frequently overlooked. For applications where the parameters are within critical ranges, we recommend calculating the precise expected pressure loss in the suction pipe or using an adequate size (never smaller than the existing pump suction port!).

The suction and pressure pipe must be installed free from tension and vibration. When using hoses, pay particular attention to the appropriate reinforcement on the suction side so the hose cannot collapse due to the negative pressure.

Do not continuously exceed the recommended suction pressure of the pumps. Some situations may require priming the suction pipe prior to first start-up.

Avoid possible leaks in the circuit to prevent environmental damages. If necessary, use e.g. an oil pan.

Technical data

Technical Data

Pump housing:	Anodised and impregnated cast aluminium
Gerotor:	Sintered steel
Hydraulic screw joint:	Galvanised steel
Operating fluids:	Mineral oils per DIN 51524
Operating oil temperature:	max. 176 °F (higher temperatures on request)
Seal:	Perbunan (NBR) or Viton (FPM) on request
Ambient temperature:	-4 °F to 104 °F

Electric motors

Voltage/frequency	BNF 18/30 220/380 V - 230/400 V - 240/415 V 50 Hz 460 V 60 Hz Electr. motor per NEMA; UL, CSA, EAC approval
	BNF 60/90: 220/380 - 245/420 V 50 Hz 220/380 - 280/480 V 60 Hz no approval
Thermal stability:	Class of insulation F, utilisation per Class B
Design:	three-phase asynchronous squirrel-cage induction motor totally enclosed, fan cooled
Degree of protection:	IP55
on request:	other voltages higher motor power for higher viscosities UL- or CSA-approved motors higher protection class

The motors comply with standards
IEC 60034, IEC 60072, IEC 60085

Please also observe the operating manual for the motor! All motors are supplied with cable gland inside the terminal box. The total aggregate height may vary by motor make.

Installation information:

The connection threads are manufactured to ISO 228. The screw-in surfaces are finished and suitable for the use of soft seals. We recommend using screwed plugs per ISO 1179-2.

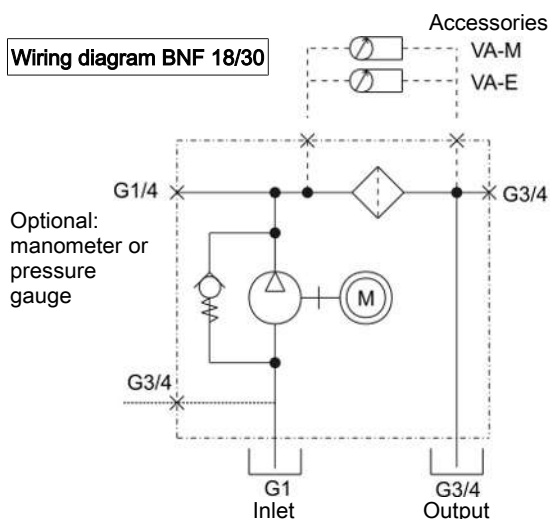
Please note:

Especially note the dimension of the suction pipe. The cross-sections should not be smaller than specified. In most cases, loud noise indicates the cross-section was reduced too much.

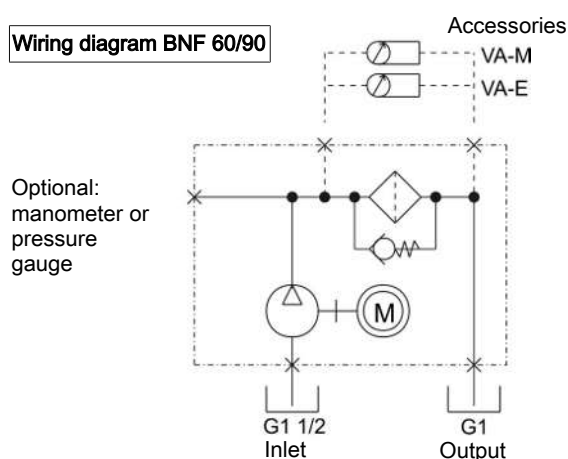
Please refer to the notices in the operating instructions.

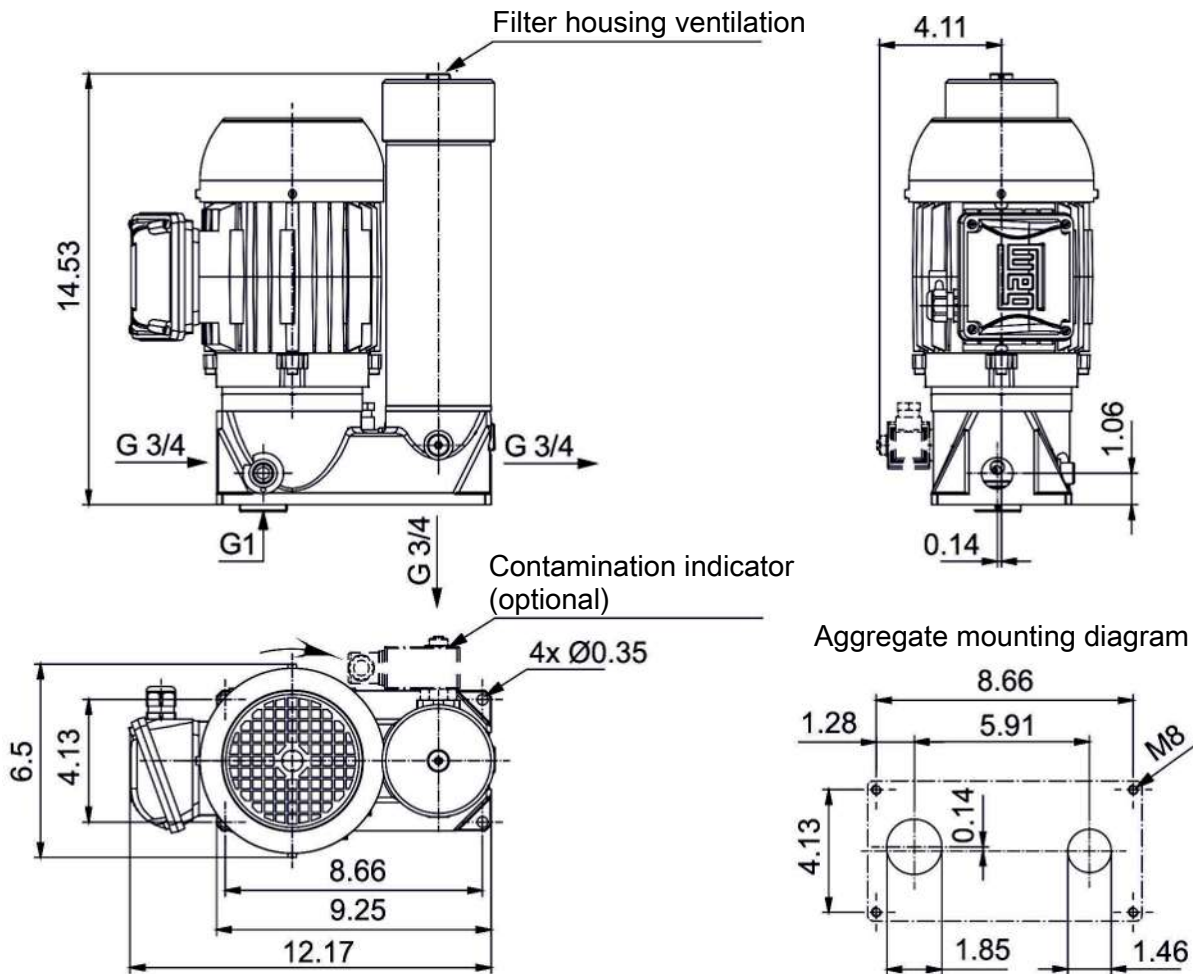
Wiring diagrams

Wiring diagram BNF 18/30



Wiring diagram BNF 60/90





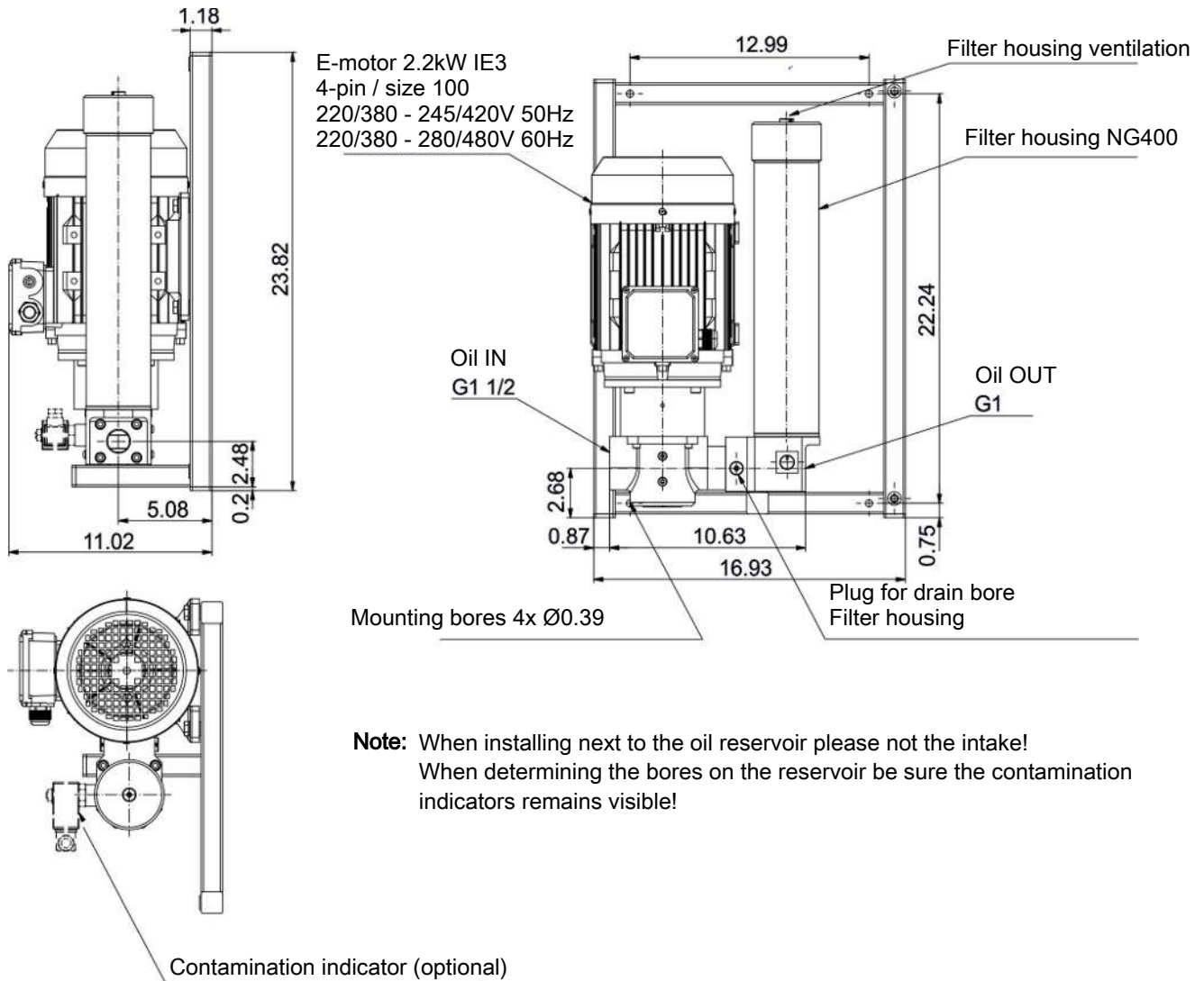
Note: When installing next to the oil reservoir please not the intake!
When determining the bores on the reservoir be sure the contamination indicators remains visible!

Type:	BNF 18-6-0.55*	BNF 30-4-0.75-IE3*
Motor power:	0.75 hp	1 hp
Number of poles:	6	4
Power input (460 V 60 Hz):	~ ~ 1.4 A	~ ~ 1.4 A
Suction lift:	3.28 ft	3.28 ft
Display pressure contamination indicator:	32 psi	32 psi
Suction end connection:	G3/4 / G1	G3/4 / G1
Suction end hose:	DN 20 / DN 25	DN 20 / DN 25
Pressure end connection:	G3/4	G3/4
Pressure end hose:	DN 20	DN 20
Suction pressure:	-5.8 psi	-5.8 psi
For all aggregates briefly:	-8.7 psi	
Flow rate:	5.8 gpm	9.2 gpm
max. oil viscosity:	600 cSt	300 cSt
at maximum feed pressure (pressures above open the internal bypass valve):	87 psi	87 psi
Acoustic power as per ISO 3744** (46 cSt at 29 psi feed pressure):	55 dB(A)	59 dB(A)
Weight:	approx. 40 lb	approx. 44 lb

* Electr. motor per NEMA, UL, CSA, EAC approval

** On 60 Hz versions the acoustic power is approx. 3 dB(A) higher.

BNF 60 / BNF 90



Note: When installing next to the oil reservoir please not the intake!
When determining the bores on the reservoir be sure the contamination indicators remains visible!

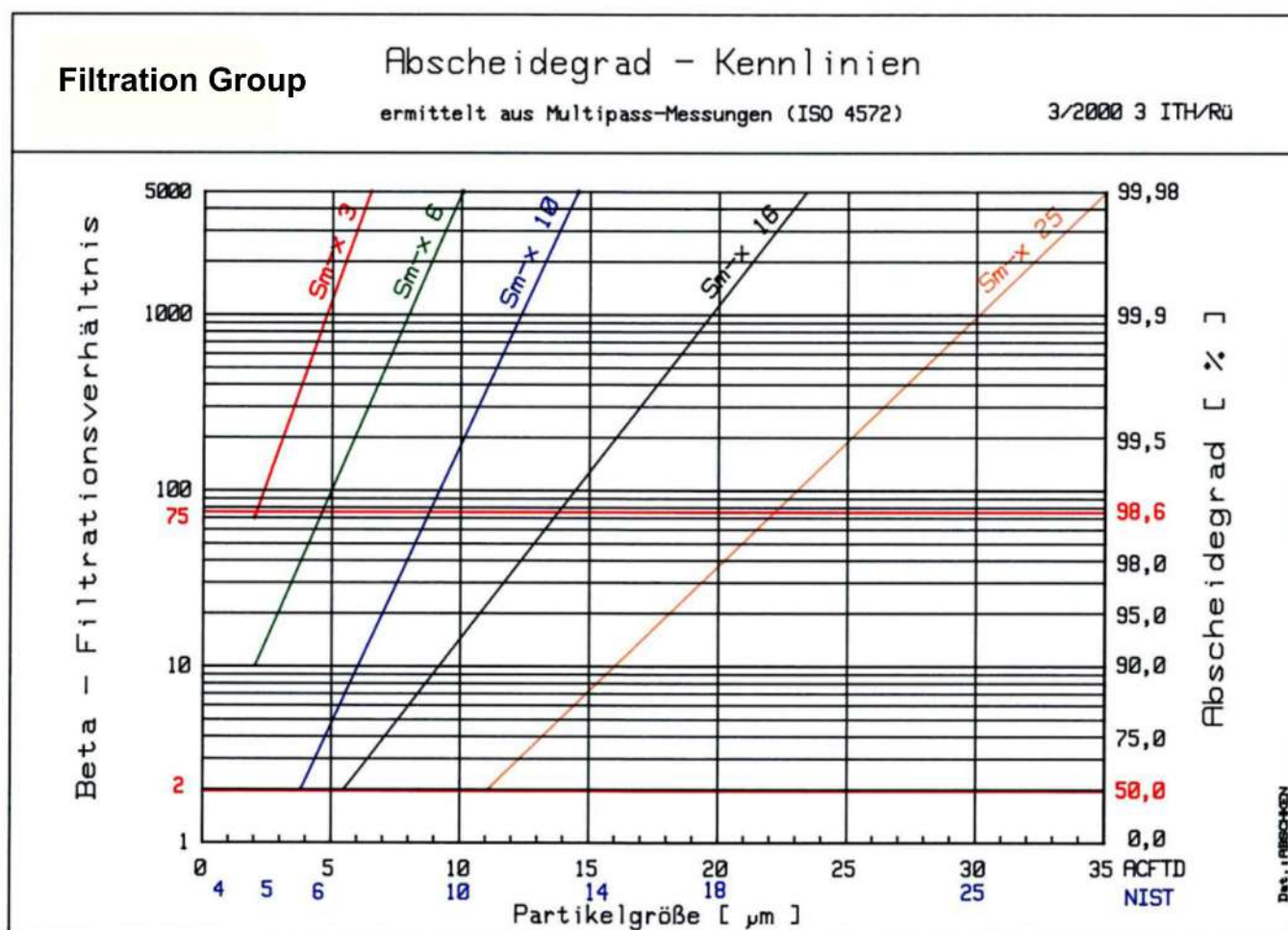
Type:	BNF 60-4-2.2-IE3*	BNF 90-4-2.2-IE3*
Motor power:	3 hp	3 hp
Number of poles:	4	4
Power input (460 V 60 Hz):	~ ~ 3.5 A	~ ~ 3.5 A
Suction lift:	3.28 ft	3.28 ft
Filter element pressure limit:	51 psi	51 psi
Display pressure contamination indicator:	32 psi	32 psi
Suction end connection:	G1 1/2	G1 1/2
Suction end hose:	DN 40	DN 40
Pressure end connection:	G1 1/4	G1 1/4
Pressure end hose:	DN 32	DN 32
Suction pressure:	-5.8 psi	-5.8 psi
For all aggregates briefly:	-8.7 psi	
Flow rate:	18.3 gpm	27.9 gpm
max. oil viscosity:	800 cSt	200 cSt
at maximum feed pressure:	116 psi	116 psi
Acoustic power as per ISO 3744** (46 cSt at 29 psi feed pressure):	64 dB(A)	66 dB(A)
Weight:	approx. 75 lb	approx. 77 lb

* On request: Electr. motor per NEMA, UL, CSA, EAC approval.

** On 60 Hz versions the acoustic power is approx. 3 dB(A) higher.

Selecting the filter fineness

Determining the contamination class per ISO 4406			System type	Recommend filter retention rate	Recommended element
>4 μm	>6 μm	>14 μm			
13	11	8	Highly reliable control systems susceptible to sludge accumulations; laboratory or aerospace	1-2	Sm-N2
14	12	9	High performance servo systems and high pressure systems with a long life; e.g. aviation, machine tool, etc.	3-5	Sm-x3
16	13	10			Sm-x6
17	15	11	High-quality, reliable systems: general machinery construction	10-12	Sm-x10
20	17	12	General machinery construction and vehicles; moderate pressure, moderate capacity	12-15	Sm-x16
23	19	13	General machinery construction and vehicles; low-pressure systems in heavy machinery construction	15-25	Sm-x25 / Mic 10



Ordering instructions

Off-line filters

Item no.	Type	Description
3802010	BNF 18	without contamination indicator NBR
3802110	BNF 18	mechanical contamination indicator (optional)
3802210	BNF 18	electric contamination indicator NBR
3803020IE3	BNF 30	without contamination indicator NBR
3803120IE3	BNF 30	mechanical contamination indicator (optional)
3803220IE3	BNF 30	electric contamination indicator NBR
3806030IE3	BNF 60	without contamination indicator NBR
3806130IE3	BNF 60	mechanical contamination indicator (optional)
3806230IE3	BNF 60	electric contamination indicator NBR
3809030IE3	BNF 90	without contamination indicator NBR
3809130IE3	BNF 90	mechanical contamination indicator (optional)
3809230IE3	BNF 90	electric contamination indicator NBR

Filter elements

For type	Item no.	Description
BNF 18 / BNF 30	3825003	N 0250 DN 3
	3825006	N 0250 DN 6
	3825010	N 0250 DN 10
BNF 60 / BNF 90	3840003	N 0400 DN 3
	3840006	N 0400 DN 6
	3840010	N 0400 DN 10



Off-Line Filter FGM 30 (60) / Pi 2728-57

Before putting hydraulic or lubrication systems into service, the entire system should be flushed. Depending on the application, low viscosity flushing oil or the actual operating oil may be used. The purpose of flushing the system is to protect system components externally via mobile filtration units to ensure residue from assembly is removed.

However, these mobile filtration units are also used to for the initial system fill or when changing the oil.

The filtration units are quiet and compact, with an easy to transport design.

Designed for in-house and mobile use

Small size

Low weight

Low noise emission

High vol. efficiency

Good suction performance

Gerotor principle

Not susceptible to contamination

Low pressure filter with a wide separation range and high filtration capacity



Technical Data
Technical Data

Pump:	Contaminant-resistant gerotor pump
Colour:	Motor RAL 7024/frame RAL 5002
Operating fluids:	Mineral oils per DIN 51524
Operating oil temperature:	max. 122 °F, briefly 149 °F
Seal:	Perbunan (NBR) or Viton (FPM) on request
Ambient temperature:	5 °F to 104 °F
Electrical connection:	Motor circuit breaker with overvoltage release, 5 m oil-proof connection cable with 5-pin CEE shrouded plug 16 A IEC60309/3L+N+PE
Filter housing:	PI 2728-57 with optical contamination indicator, parallel flow through filter cartridges
Filter bypass:	Opening pressure Δp 51 psi
Contamination indicator:	Response pressure Δp 32 psi
Wheel kit:	Steel frame with integrated drip pan with drain, large polyamide wheels, swivel wheels with brake, fold-away handle for pulling the aggregate, storage hooks for connecting cable and hoses
Oil hoses:	clear PVC hoses with integrated steel wire coil, with strainer as suction hose coarse filter, galvanised steel pipe pressure lance

Electric motors

Voltage/frequency	
FGM 30:	220/380 V - 230/400 V - 240/415 V 50 Hz; 460 V 60 Hz Electr. motor per NEMA; UL, CSA, EAC approval
FGM 60:	220/380 – 245/420V 50Hz 220/380 – 280/480V 60Hz
Thermal stability:	Class of insulation F, utilisation per Class B
Design:	three-phase asynchronous squirrel-cage induction motor totally enclosed, fan cooled
Degree of protection:	Motor IP55 Plug IP44
on request:	other voltages higher motor power for higher viscosities UL- or CSA-approved motors higher protection class

The motors comply with the IEC 60034 standards

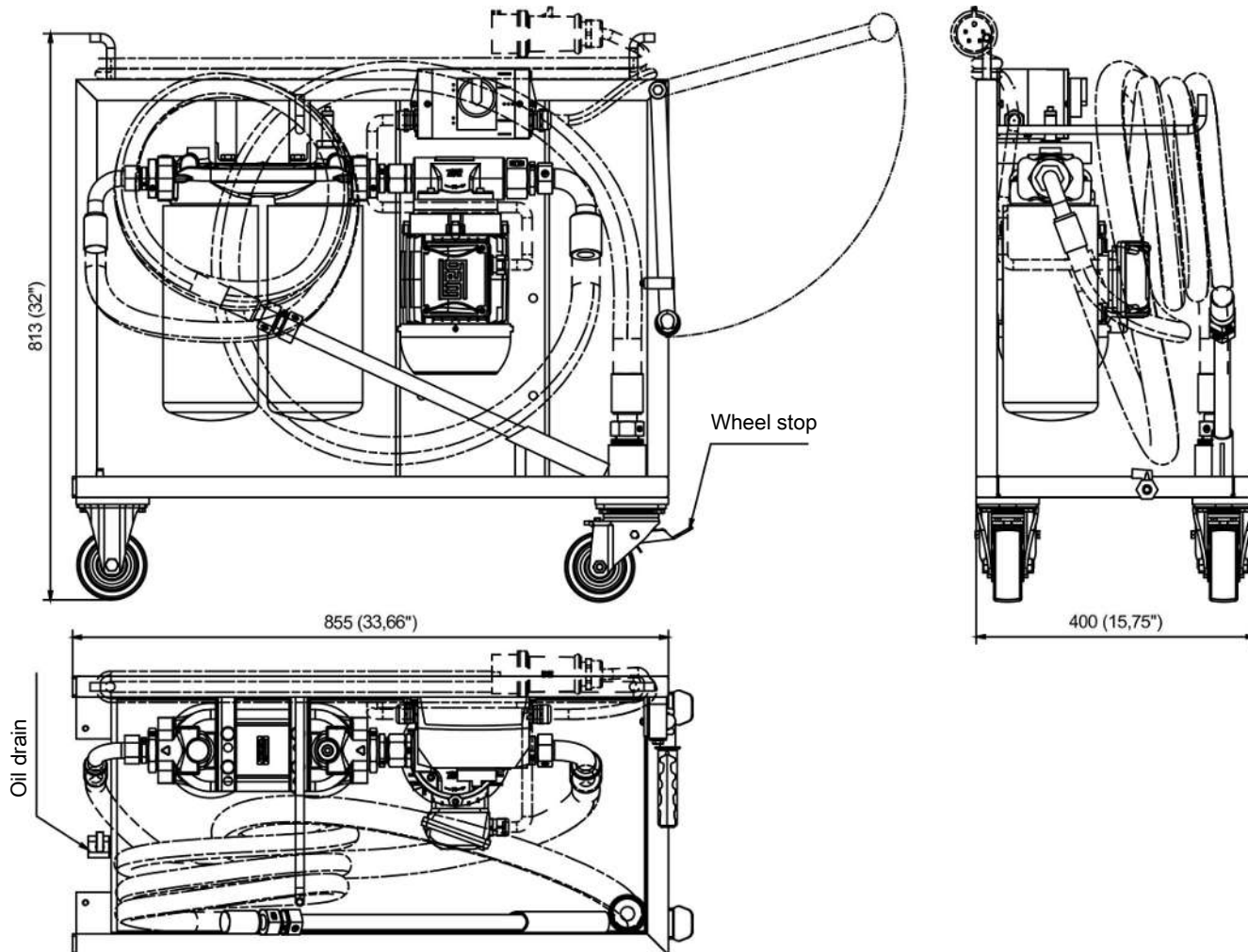
Aggregate	FGM 30	FGM 60
Flow rate:	9.2 gpm	18.3 gpm
Power output/number of pins/ rated current at 460 V:	1 hp/4/1.43 A	3 hp/4/3.46 A
Motor service factor:	1.25	-
Sound pressure level per ISO 3744:	64 dB(A)	67 dB(A)
Speed (rpm):	1690	1690
max. working pressure:	101 psi	101 psi
Suction pressure:	-5.8 psi	-5.8 psi
briefly:	-8.7 psi	-8.7 psi
max. oil viscosity:	500 mm ² /s	500 mm ² /s
Weight:	approx. 132 lb	approx. 154 lb

Accessories (included)

	7.93 gpm	15.85 gpm	Length
Suction hose	DN 25	DN 32	L = 6.5 ft
Pressure hose	DN 20	DN 20	L = 6.5 ft

Screw-in cartridge 3 µm, 6 µm, 10 µm, 25 µm (not included)

Dimensions (mm/inch)



Ordering instructions

Filtration units

Item no.	Type
27002030IE3	FGM 30/Pi 2728-50Hz-57
27002031IE3	FGM 30/Pi 2728-60Hz-57
27002020IE3	FGM 60/Pi 2728-50Hz-57
27002021IE3	FGM 60/Pi 2728-60Hz-57

Screw-in cartridge (not included)

Item no.	Type	Fineness
70541536	PX37-13-2	3 µm
70541537	PX37-13-2	6 µm
70541538	PX37-13-2	10 µm
70541539	PX37-13-2	25 µm



4.2 Filter

KEEPING EVERYTHING FLOWING.

**Comprehensive range of filters
for individual solutions.**

FLUID TECHNOLOGY



HISTORY

FILTRATION GROUP – FILTERING THE WORLD.

Filtration Group has an extensive product range. Our options range from filter components like, filter elements, cartridges – bags and sheets, filter housings and modules to large system installations. Tell us your application, we will advise which product would fit best to support your application.



Amafilter Group

With over 70 years of experience in the application of horizontal and vertical Pressure Leaf Filters, Cricketfilters and several other types of filters, Amafilter Group provides an unique spectrum of filtration and separation solutions, complemented by an extensive range of filter elements, spare parts and services.

MAHLE acquired the Amafiltergroup in 2008, adding the expertise, synergy of technology and filter products of Amafilter, LFC, Nowata, Vanpipe and Eurofiltec to its Industrial Filtration portfolio.

MAHLE Industrial Filtration

MAHLE Industrial Filtration specializes in the cleaning and processing of industrial oils and lubricants as well as air and water. With its extensive application expertise, in-house research and development, technical center, laboratory, and design department, it offers its customers tailor-made filter components and process engineering solutions.

Filtration Group

In 2016 Filtration Group Corporation closed the acquisition of the industrial filtration business of MAHLE GmbH. The acquisition adds filtration capabilities in industrial filtration across a variety of applications including industrial air filtration, process filtration, hydraulics and fuel separation and replacement elements.

This acquisition will give customers more choice and flexibility in how they can utilize filtration to make their environments cleaner, safer and more productive.

An organization's ability to learn, and translate that learning into action rapidly, is the ultimate competitive advantage. — Jack Welch



Fluid Filtration



Automatic Filtration



Air Filtration



Process Filtration



Separation



» FG filters guarantee us optimal economic results every time thanks to their high filter service life and low flow resistance. «

OVERVIEW

SPECIALIZED TECHNOLOGICAL EXPERTISE: FOR OPTIMIZED FILTER PERFORMANCE.

With innovative developments, Filtration Group sets new standards for your ecological progress and economic success. Through our technical expertise, we have established a tradition as your strong partner in fluid technology, air filtration, and automatic filters.

Comprehensive range for individual requirements

As a systems partner, we offer you an extensive product range and tailor-made solutions for your customer-specific requirements. We are expanding our product range to meet your specialized needs, continuously adding innovative filter designs and products based on systematic research.

Precision down to the last detail

Harmonizing environmental protection with positive commercial results is one of the most important issues your company faces. We support you with high-quality products and comprehensive service. We focus on precision down to the last detail, which makes us a reliable development partner and supplier to leading manufacturers of hydraulic systems and equipment around the world.

Safety under hand and seal

Our production is certified to DIN EN ISO 9001 and our environmental management to ISO 14001 and EMAS. All FG products are approved by classification societies, such as GL, Lloyds, or DNV.

Our product range includes:

- Suction filters
- Pressure filters as full-flow or partial-flow filters
- Duplex filters with patented single-hand control
- Bypass filters
- Return-line filters
- Air breathers
- Mobile filter units
- Air filters
- Oil separators
- Filter elements in standard versions, DIN models, and customer-specific designs
- Contamination indicators
- Turbidity sensors
- Coalescer filters
- Service units

Outstanding environmental protection



PRODUCTS

HIGH-QUALITY RANGE: FOR MAXIMUM RESULTS IN EVERY AREA.

Perfect filtration is a prerequisite for the functionality of highly sensitive hydraulic systems. With ever tighter functional tolerances, the hydraulic units and systems must also strictly comply with prescribed cleanliness classes for fluid media at all times. With their multilayer design, our filter elements ensure high dirt-holding capacity and filtration performance remains constant even as differential pressures rise. Our contamination indicators make maintenance easier and provide maximal economic efficiency.

Filter elements

Always specifically matched to the cleanliness class required for your applications, to the pressure ratios, and to the medium properties, our strong and differential pressure-resistant filter elements guarantee failure-free, economical operation with a high dirt-holding capacity. Our extensive range of standard and DIN versions includes alternative variants for nearly all filter manufacturers, as well as filter elements for aggressive fluids, cooling lubricants, and aqueous media. Upon request, we will also develop special models specifically for you.



» Filtration Group always develops the right filter solution to meet our special requirements. «

Suction filters



Installed upstream of the pump, or in the intake line with a contamination indicator accessible from the outside for particularly easy maintenance, our suction filters ensure that the pump is highly safe from coarse contaminants. A wide selection of elements suitable for every system protect installations and pumps in the fine range of 10–25 µm with our mic qualities, or in the coarse range with cleanable wire fabric.

Pressure filters



Our pressure filters are designed for use as full- or partial-flow filters in the ranges of low pressure up to 25 (60) bar, medium pressure up to 210 bar, and high pressure up to 450 bar. As line filters, flange-mounted filters, and sandwich filters, they provide customized solutions for the requirements of a wide variety of applications. A robust housing, streamlined design, and an extensive range of accessories guarantee efficient and sustainable results.

Duplex filters



Patented single-hand control and zero-loss changeover of the fluid flow ensure ultrahigh economic efficiency. Ready for use around the clock in the low- and medium-pressure ranges, or as return-line filters for uninterrupted operation, you can perform maintenance work while taking full advantage of the dirt-holding capacity.

Bypass filters



As a stationary design, our bypass filters are the optimal solution for filtration of large volumes of oil, which a full-flow filter cannot clean sufficiently or economically. As a mobile design, you can use bypass filters very flexibly as rinsing, filling, or filtering units.

Mobile filter units



In combination with appropriate filter elements, these high-performance devices (delivery rates of 27 and 55 L/min) for mobile bypass filtration in hydraulic and lubrication systems guarantee compliance with predefined cleanliness classes. You can also use mobile filter units for high-viscosity media. A robust pump that is not sensitive to dirt ensures long service life and use for a wide range of applications. When filling systems and tanks, transferring tank contents, or relieving the system filter during commissioning or after repairs, our mobile filter units make an impression with service-friendly operation and very high dirt-holding capacity.

Return-line filters



The return-line filter captures all of the dirt that is generated in the system and flushed out of the hydraulic unit. This prevents the risky circulation of contaminants that may arise in the tank and pump.

Air breathers



Our corrosion- and impact-resistant air breathers ensure that tanks are supplied with contaminant-free air. A wide selection of replaceable filter elements suitable for every system ensures that the required filter rating for your hydraulic filters is met.

Air filters

Our air filters ensure that compressors, vacuum pumps, and combustion engines are always supplied with clean intake air. With intake noise mufflers, they even reduce noise levels at the same time.

Oil separators

Oil separators are made of high-quality materials using modern processes. With their long service life (up to 5,000 operating hours or more), they ensure economical production of good compressed air quality in screw compressors cooled by oil injection.

Contamination indicators

Optimal performance of the filter elements depends substantially on being able to fully utilize the dirt-holding capacity with no risk. Mechanical or electronic sensors integrated or retrofitted in the filters respond to continuous changes in the pressure ratios associated with the contamination level. They transmit the values via gauges, optical, or opto-electrical switches, depending on the model. The indicator registers the vacuum pressure for suction filters, the differential pressure for pressure filters, and the back pressure for return-line filters. You can therefore determine the optimal time to change the filter elements with no risk.

Pi 2175 coalescer filter



Our coalescer filter removes free water from hydraulic systems. It works without absorption media, simply and inexpensively. Specifically arranged special filter materials collect the small water droplets floating in the fluid and separate them out.

Service units



With our mobile, easy-to-operate, measuring instruments for various measurement methods, you can quickly measure and analyze contaminants in hydraulic fluids. Calibrated in accordance with ISO 11171:1999 and using analysis in accordance with ISO 4406:1999 and NAS 1638, the PIC 9100 portable contamination measurement unit captures, identifies, and registers all particles in both suction and pressure operation, reliably displaying absolute particle counts and cleanliness classes.



» Decades of experience from Filtration Group experts with countless devices, machines, and systems all over the world pays for itself every day. «

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Filtration Group weltweit

Your contacts at a glance: www.filtrationgroup.com



5 Circulation Pumps



Circulation pumps BFP

Hydraulic and lubrication systems therefore increasingly use bypass filters and/or coolers. The advantage of these circuits is that they create stable and therefore more predictable operating conditions for both the filtration and cooling.

Circulating oil in these circuits requires efficient and preferably silent circulation pumps which provide a constant flow rate at moderate pressures.

Internal gear pumps, so-called gerotor pumps, have proved especially useful for these applications. They offer compact integration, are relatively unsusceptible to particle contamination and have a long life.

The BFP series features a range of particularly compact circulation pumps specifically designed for this area of application.

Low noise emission

High vol. efficiency

Good suction performance

Built-in bell housing

Gerotor principle

Not susceptible to contamination

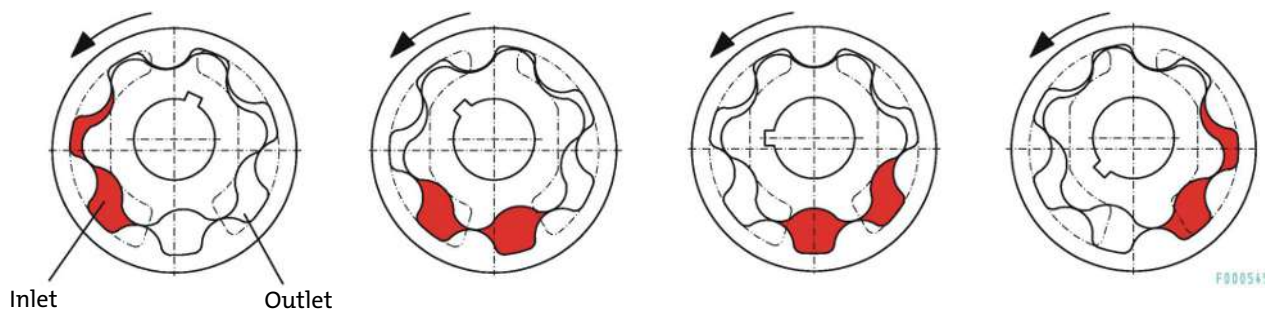


Introduction and description

Why gerotor?

Numerous applications in hydraulic and lubrication systems just require the circulation of the fluid. In such cases low noise emissions and low pressure ripples are more important than highly efficient transmission of energy.

The gerotor is the ideal principle for such applications. The displacement mechanism consists of the inner and the outer rotor. The number of teeth of the inner rotor is always one less than the outer rotor. The rotation of the gerotor generates chambers of changing volumes between the inner and outer rotor. The variation follows a sinus curve, resulting in a very steady surge. Due to the inevitable displacement, the flow rate generated is proportional to the rotation speed.



When we designed the BFP series we specifically selected the number of teeth and the width of the gerotors so the pumps have the smallest possible physical dimensions, low weight and minimal loss in efficiency. The low relative speed between the internal and external gear make the pumps extremely durable and smooth.

The internal design of the pumps further reduces the flow paths and ensures good suction performance.

Why complete pump units?

Every additional component increases the overall installed size of the systems, inevitably increasing the space requirement and typically also the costs. One requirement in developing the BFP series was therefore to keep them as short and compact as possible. On the BFP 8 to 40 models the gerotor is driven directly by the motor shaft. On the larger BFP 60 and 90 pumps the motor shaft is built into a special coupling. The coupling runs in oil and is therefore optimally lubricated and cooled.

Planning information

Installation site requirements

Ensure adequate ventilation.

The pumps are mounted in the installation site using four screws

Electrical connection

The electrical connection must be made by an appropriately trained electrician! Observe the voltage and mains frequency! Fusing must comply with applicable standards! Please note the direction of rotation of the motor when connecting.

Hydraulic connection

Full utilisation of the high capacity of the pumps requires care when configuring the intake line. This is a very important factor with use in lubricating systems. These are typically filled with higher viscosity oils and must operate reliably in a large temperature range. Although the tremendous increase in viscosity in low temperatures are frequently overlooked. For applications where the parameters are within critical ranges, we recommend calculating the precise expected pressure loss in the suction pipe or using an adequate size (never smaller than the existing pump suction port!).

The suction and pressure pipe must be installed free from tension and vibration. When using hoses, pay particular attention to the appropriate reinforcement on the suction side so the hose cannot collapse due to the negative pressure.

If the pump unit is not already intended for an off-line filter, the oil should have an average purity class of 15/11 per ISO 4406 or better. This is essential in significantly extending the service life of all components.

Do not continuously exceed the recommended suction pressure of the pumps. Some situations may require priming the suction pipe prior to first start-up.

Avoid possible leaks in the circuit to prevent environmental damages. If necessary, use e.g. an oil pan.

Technical data

Technical Data

Pump housing:	Anodised and impregnated cast aluminium
Gerotor:	Sintered steel
Colour:	Motor RAL 7024
Operating fluids:	Mineral oils per DIN 51524
Operating oil temperature:	max. 176 °F (higher temperatures on request)
Seal:	Perbunan (NBR) or Viton (FPM) on request
Ambient temperature:	5 °F to 104 °F

Electric motors

Voltage / Frequency	
BFP 5-40:	220/380V – 230/400V – 240/415V 50Hz 460V 60Hz
BFP 60-90:	220/380 – 245/420V 50Hz 220/380 – 280/480V 60Hz
Thermal stability:	Class of insulation F, utilisation per Class B
Design:	three-phase asynchronous squirrel-cage induction motor totally enclosed, fan cooled
Protection class:	IP55
on request:	other voltages higher motor power for higher viscosities UL- or CSA-approved motors higher protection class

The motors comply with standards
IEC 60034, IEC 60072, IEC 60085

Please also observe the operating manual for the motor! All pumps are supplied with cable gland inside the motor terminal box. The total length and height of the pump may vary by motor make.

Pump selection information:

When selecting the pump model, choose the motor output according to the oil viscosity to be used. Motor output information refers to the maximum oil viscosity at maximum operating pressure.

The BFP 5 to BFP 40 are also available as a special version with a 6 bar (87 psi) internal bypass valve for protection. This does not change the dimensions.

Installation information:

The pump head of all pumps can be mounted turned in 90° increments to align with the line routing. Please note the offset from the centre of the motor.

The connection threads are manufactured to ISO 228. The screw-in surfaces are finished and suitable for the use of soft seals. We recommend using screwed plugs per ISO 1179-2.

Please note:

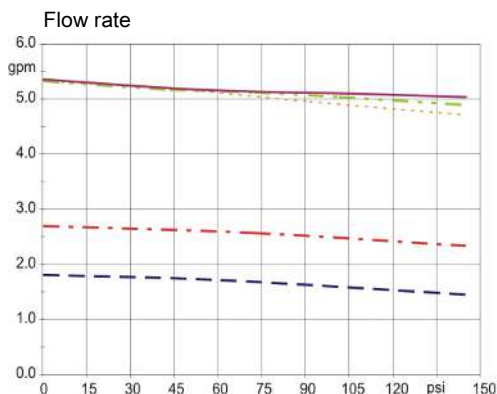
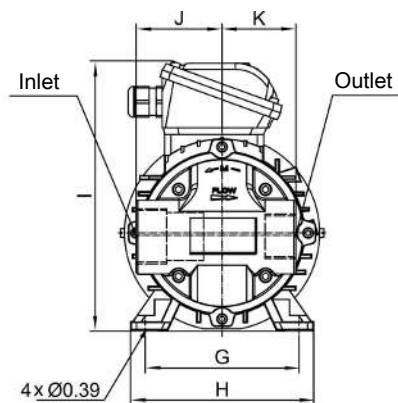
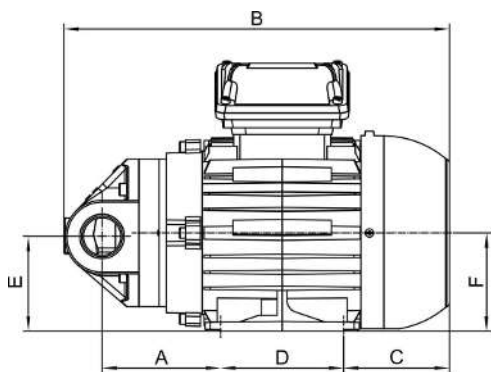
Especially note the dimension of the suction pipe. The cross-sections should not be smaller than specified. In most cases, loud noise indicates the cross-section was reduced too much.

Please refer to the notices in the operating instructions.

BFP 5/BFP 8/BFP 15

	BFP 5-6-0.55kW	BFP 8-4-0.75kW	BFP15-4-0.75kW	BFP15-4-1.1kW	BFP15-4-1.5kW
Item number	3705055*	3708075IE3*	3715075IE3*	3715110IE3*	3715150IE3*
Motor power	0.75 hp	1.0 hp	1.0 hp	1.5 hp	2.0 hp
Motor service factor	1.15	1.25	1.25	1.25	1.25
max. oil viscosity	1500 cSt	1500 cSt	300 cSt	1500 cSt	2000 cSt
at max. operating pressure	145 psi	145 psi	145 psi	145 psi	145 psi
Number of poles	6	4	4	4	4
max. power input (460 V/60 Hz)	approx. 1.4 A	approx. 1.4 A	approx. 1.4 A	approx. 2.0 A	approx. 2.8 A
Nominal delivery volume	0.35 cu.in./rev.	0.35 cu.in./rev.	0.71 cu.in./rev.	0.71 cu.in./rev.	0.71 cu.in./rev.
	1.7 gpm	2.5 gpm	5 gpm	5 gpm	5 gpm
Suction side connection	G1/2-DN16	G3/4/DN20	G1 1/4-DN32	G1 1/4-DN32	G1 1/4-DN32
Pressure side connection	G3/8-DN12	G1/2-DN16	G1-DN25	G1-DN25	G1-DN25
Suction pressure	-5.8 psi	-5.8 psi	-5.8 psi	-5.8 psi	-5.8 psi
for all models temporarily up to			-8.7 psi		
Acoustic power per ISO 3744	55 dB(A)	59 dB(A)	62 dB(A)	62 dB(A)	62 dB(A)
Weight	40.8 lb	40.8 lb	39.9 lb	50.9 lb	59.7 lb
Dimensions					
A	3.8	3.8	3.8	4.04	4.04
B	12.36	12.36	12.32	13.03	14.02
C	3.39	3.39	3.39	3.86	3.86
D	3.94	3.94	3.94	3.94	4.92
E	3.03	3.03	3.03	3.43	3.43
F	3.15	3.15	3.15	3.54	3.54
G	4.92	4.92	4.92	5.51	5.51
H	5.87	5.87	5.87	6.46	6.46
I	8.66	8.66	8.66	9.8	9.8
J	3.23	3.23	2.76	2.76	2.76
K	2.8	2.8	2.36	2.36	2.36

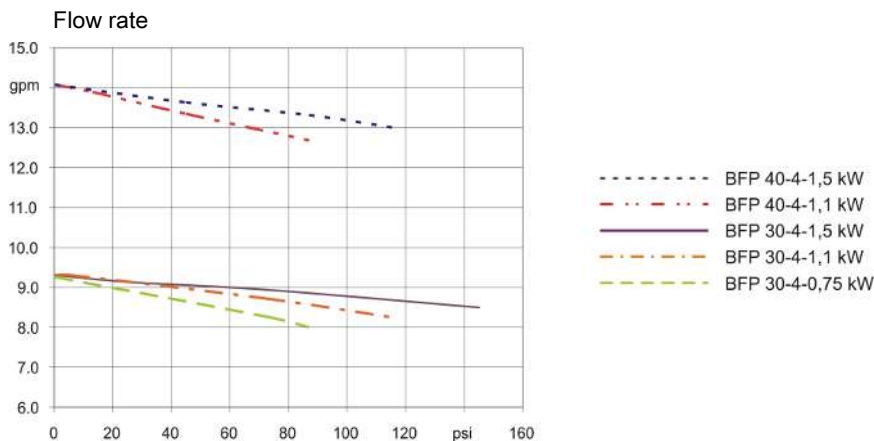
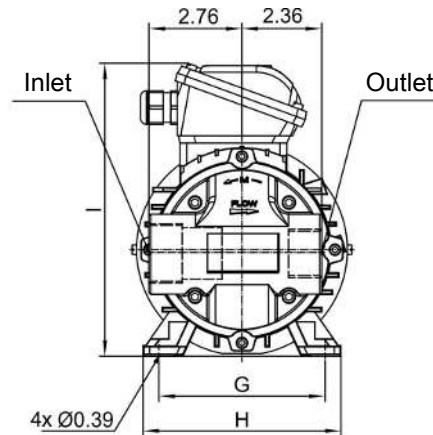
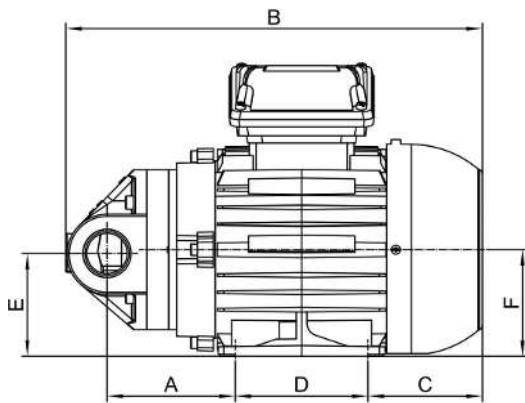
* Electr. motor per NEMA, UL, CSA, EAC approval



BFP 30/BFP 40

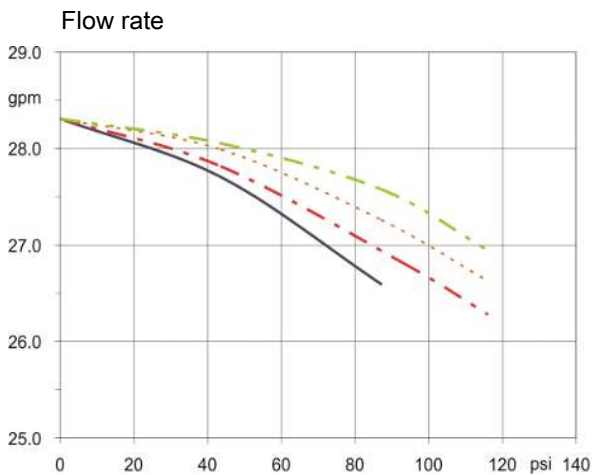
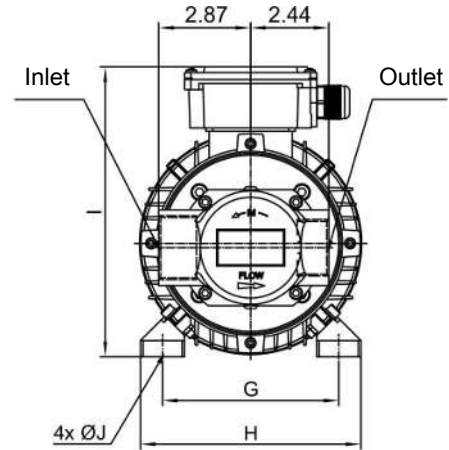
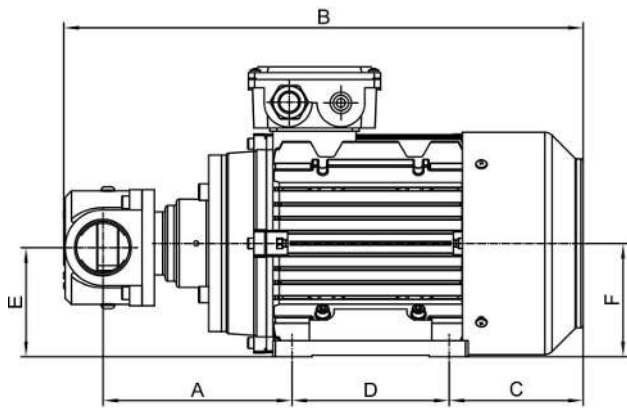
	BFP 30-4-0.75kW	BFP 30-4-1.1kW	BFP30-4-1.5kW	BFP40-4-1.1kW	BFP40-4-1.5kW
Item number	3730075IE3*	3730110IE3*	3730150IE3*	3740110IE3*	3740150IE3*
Motor power	1.0 hp	1.5 hp	2.0 hp	1.5 hp	2.0 hp
Motor service factor	1.25	1.25	1.25	1.25	1.25
max. oil viscosity	100 cSt	300 cSt	1000 cSt	100 cSt	700 cSt
at max. operating pressure	87 psi	116 psi	145 psi	87 psi	116 psi
Number of poles	4	4	4	4	4
max. power input (460 V/60 Hz)	approx. 1.4 A	approx. 2.0 A	approx. 2.8 A	approx. 2.0 A	approx. 2.8 A
Nominal delivery volume	1.25 cu.in./rev. 9.2 gpm	1.25 cu.in./rev. 9.2 gpm	1.25 cu.in./rev. 9.2 gpm	1.87 cu.in./rev. 13.3 gpm	1.87 cu.in./rev. 13.3 gpm
Suction side connection	G1 1/4-DN32	G1 1/4-DN32	G1 1/4-DN32	G1 1/4-DN32	G1 1/4-DN32
Pressure side connection	G1-DN25	G1-DN25	G1-DN25	G1-DN25	G1-DN25
Suction pressure for all models temporarily up to	-5.8 psi	-5.8 psi	-5.8 psi	-5.8 psi	-5.8 psi
			-8.7 psi		
Acoustic power per ISO 3744	64 dB(A)	64 dB(A)	64 dB(A)	65 dB(A)	65 dB(A)
Weight	41.4 lb	52.5 lb	61.7 lb	53.6 lb	62.4 lb
Dimensions					
A	3.74	3.98	3.98	4.35	4.35
B	12.28	12.99	13.98	13.39	14.33
C	3.39	3.86	3.86	3.86	3.86
D	3.94	3.94	4.92	3.94	4.92
E	3.03	3.43	3.43	3.43	3.43
F	3.15	3.54	3.54	3.54	3.54
G	4.92	5.51	5.51	5.51	5.51
H	5.87	6.46	6.46	6.46	6.46
I	8.66	9.8	9.8	9.8	9.8

* Electr. motor per NEMA, UL, CSA, EAC approval



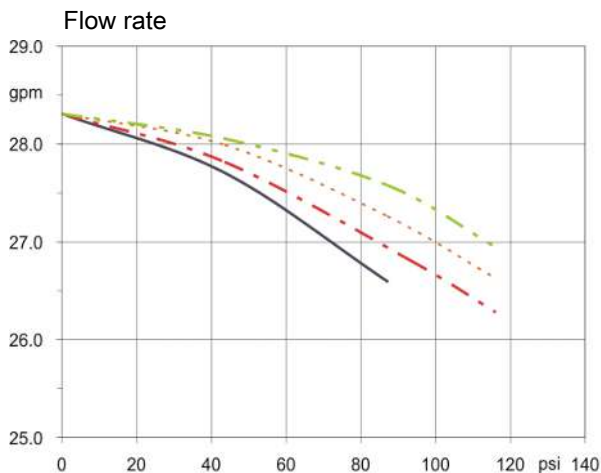
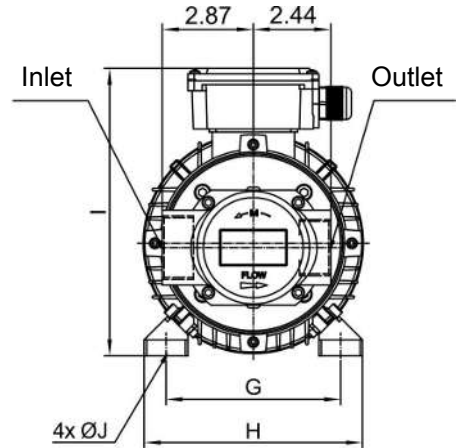
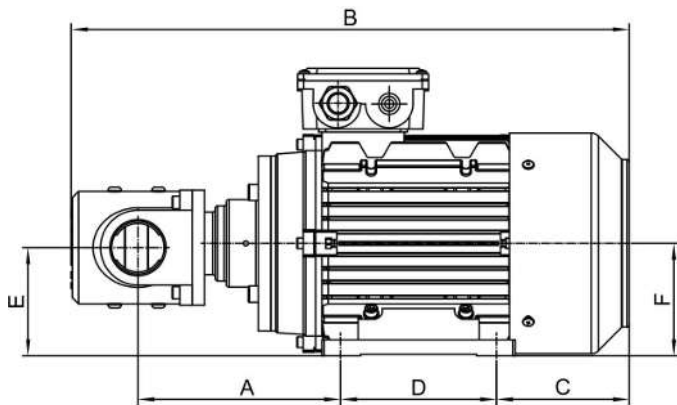
BFP 60

	BFP 60-4-1.5 kW	BFP 60-4-2.2kW	BFP 60-4-3kW	BFP 60-4-4kW
Item number	3760150IE3	3760220IE3	3760300IE3	3760400IE3
Motor power	2.0 hp	3.0 hp	4.0 hp	5.4 hp
max. oil viscosity	100 cSt	300 cSt	800 cSt	1500 cSt
at max. operating pressure	87 psi	116 psi	145 psi	116 psi
Number of poles	4	4	4	4
max. power input (460 V/60 Hz)	approx. 2.5 A	approx. 3.5 A	approx. 4.8 A	approx. 6.5 A
Nominal delivery volume	2.49 cu.in./rev. 18.3 gpm	2.49 cu.in./rev. 18.3 gpm	2.49 cu.in./rev. 18.3 gpm	2.49 cu.in./rev. 18.3 gpm
Suction side connection	G1 1/2-DN40	G1 1/2-DN40	G1 1/2-DN40	G1 1/2-DN40
Pressure side connection	G1 1/4-DN32	G1 1/4-DN32	G1 1/4-DN32	G1 1/4-DN32
Suction pressure for all models temporarily up to	-5.8 psi	-5.8 psi	-5.8 psi	-5.8 psi
			-8.7 psi	
Acoustic power per ISO 3744	67 dB(A)	67 dB(A)	67 dB(A)	67 dB(A)
Weight	46.1 lb	60.2 lb	69.4 lb	75.8 lb
Dimensions				
A	5.91	6.77	6.77	7.05
B	16.22	17.91	17.91	18.78
C	4.17	4.41	4.41	5
D	4.92	5.51	5.51	5.51
E	3.43	3.82	3.82	4.29
F	3.54	3.94	3.94	4.41
G	5.51	6.3	6.3	7.48
H	6.89	7.87	7.87	8.9
I	9.06	10.04	10.04	10.96
J	0.39	0.47	0.47	0.47



BFP 90

	BFP 90-4-1.5kW	BFP 90-4-2.2 kW	BFP 90-4-3kW	BFP 90-4-4kW
Item number	3790150IE3	3790220IE3	3790300IE3	3790400IE3
Motor power	2.0 hp	3.0 hp	4.0 hp	5.4 hp
max. oil viscosity	46 cSt	100 cSt	300 cSt	1000 cSt
at max. operating pressure	87 psi	116 psi	116 psi	116 psi
Number of poles	4	4	4	4
max. power input (460 V/60 Hz)	approx. 2.5 A	approx. 3.5 A	approx. 4.8 A	approx. 6.5 A
Nominal delivery volume	3.73 cu.in./rev.	3.73 cu.in./rev.	3.73 cu.in./rev.	3.73 cu.in./rev.
	27.9 gpm	27.9 gpm	27.9 gpm	27.9 gpm
Suction side connection	G1 1/2-DN40	G1 1/2-DN40	G1 1/2-DN40	G1 1/2-DN40
Pressure side connection	G1 1/4-DN32	G1 1/4-DN32	G1 1/4-DN32	G1 1/4-DN32
Suction pressure	-5.8 psi	-5.8 psi	-5.8 psi	-5.8 psi
for all models temporarily up to	-8.7 psi			
Acoustic power per ISO 3744	68 dB(A)	68 dB(A)	68 dB(A)	68 dB(A)
Weight	48.3 lb	54.7 lb	54.7 lb	75.4 lb
Dimensions				
A	6.4	7.26	7.26	7.54
B	17.52	19.02	19.69	20.12
C	4.09	4.13	4.8	4.96
D	4.92	5.51	5.51	5.51
E	3.43	3.82	3.82	4.29
F	3.54	3.94	3.94	4.41
G	5.51	6.3	6.3	7.48
H	6.89	7.8	7.8	8.74
J	8.9	9.76	9.76	10.87
K	0.39	0.47	0.47	0.47





6 Empty

Dieses Kapitel ist derzeit noch nicht belegt.

This chapter is under construction.



7 Subsystems

Subsystems



We design and manufacture subsystems, to complete your systems.

Please contact:

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Tel.: +49 (0)2102 4989 83

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8 Approvals and Customer's Specifications

Overview Approvals and customized Products



Approved devices and customized devices are listed in the respective chapter. The following cross reference shows the available groups and reference to the respective catalogue chapter. If you need further approvals, please contact Bühler Technologies.

	Sensor Systems			Cooling		
	Level/temperature Tank top installation	level bypass installation	Temperature measurement	Oil-air-cooling	Oil-water-cooling	Circulation pumps
Approvals						
ATEX 	Chapter 14	Chapter 14	Chapter 14	Chapter 18	Application possible Chapter 17	Chapter 24
Desina 	Chapter 14		Chapter 14			
Shipping DNV, GL 	Chapter 14					
WHG 	Chapter 14					
Customized Products						
Automotive	Chapter 13					
Audi,Seat,Skoda, VW	Chapter 13					
BMW	Chapter 13					
Daimler	Chapter 13					
TeDrive, Getrag	Chapter 13					
Opel,GM	Chapter 13					
Renault	Chapter 13					
PSA	Chapter 13					



9 Empty

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This chapter is under construction.



10 Technical articles and certificates

Proactive leakage control for hydraulic systems

Increasingly stringent legislation to protect the environment puts pressure on hydraulic system users to avoid leakage. An effective way to achieve this is to continuously monitor the level of fluid in the system reservoir. In this article Gerd Biller of Buhler Mess-und Regeltechnik GmbH describes the development of one such system which is particularly effective where there are repetitive production cycles.

Most system reservoirs have a sight glass which indicates fluid level over a very limited range. In some there is an electrical level switch, with one contact only. The purpose of this contact is to protect the pump from running dry in the event of leakage, but by the time it is activated there has already been considerable leakage from the system. More advanced systems may have two contacts, one to give 'last chance' warning that dry running is imminent, but it may give as little as ten seconds warning that production will come to a halt very soon. There are more sophisticated systems with three or more contacts, but these generally produce signals for other purposes rather than to monitor leakage.

System requirements

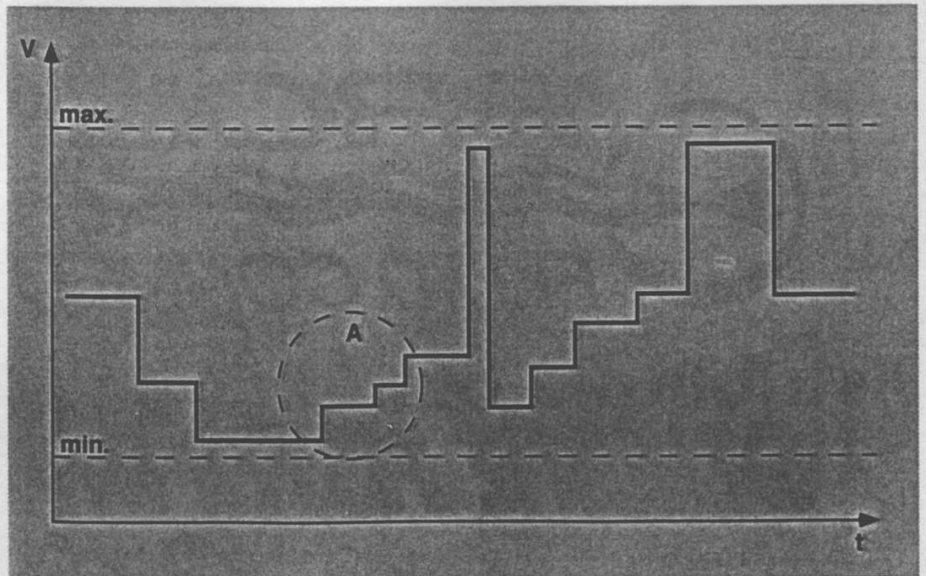
With a level switch having maximum and minimum contacts only we have control over two points of liquid level but no information or control in between. What is needed is a fluid level monitor which gives a continuous signal related to the level between the maximum and minimum. This continuous level monitoring should provide a standard 4-20mA analogue signal output.

Fig.2 shows an example of the changes in reservoir fluid level taking place over a single production cycle. In many modern plants the analogue signal representing the fluid level could be fed



Fig 1. (left) Multi-function unit combining level control with temperature sensing, breather filter and filler port.

Fig 2. (below) Example of reservoir fluid level changes during a production cycle



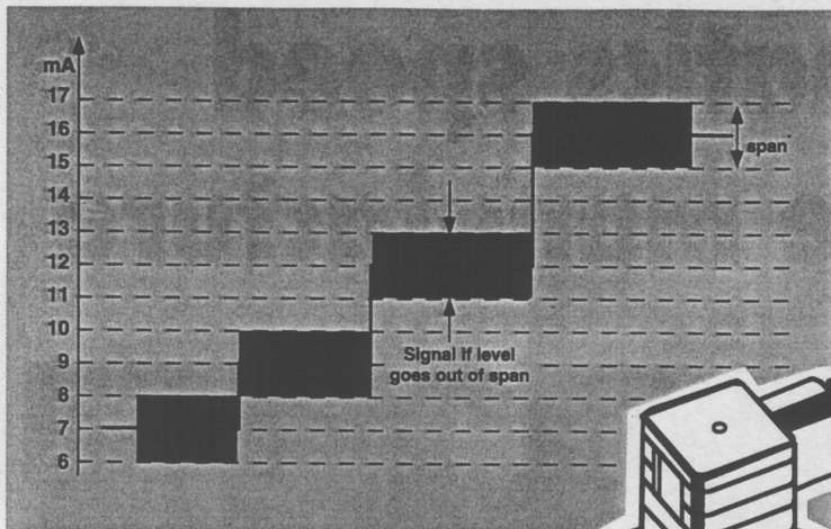
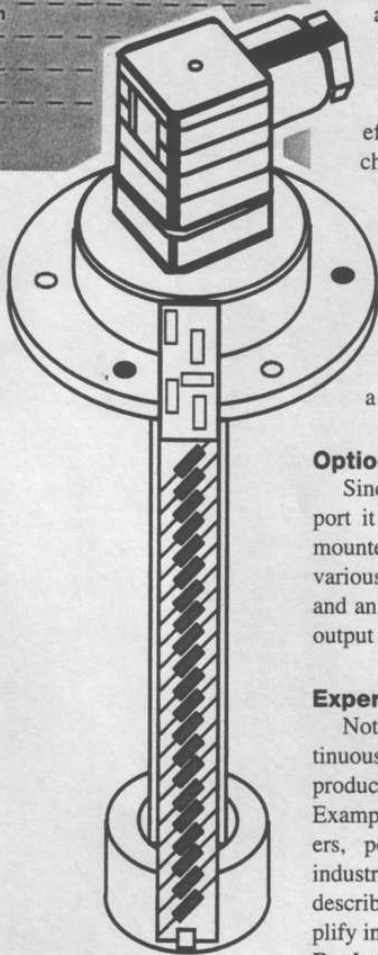


Fig 3. (above) Section of fluid level profile from Fig.1 selected for analysis

Fig 4. (right) Diagram of the fluid level controller showing the arrangement of multiple reed switches.



employ a motorised pump set and use the 'reservoir full' signal from a level control unit to switch off the pump motor. If something along these lines was made compulsory throughout the European Community a great deal of fluid would be saved and much expenditure on cleaning up would be avoided.

The level control unit

The unit providing the analogue signal output has been the subject of much development work. Initially it was intended that this should provide a completely smooth variation of output in response to level changes, but this entailed the use of a larger float and heavier magnets. The combination of mass and viscosity effects led to an unacceptably slow response to changes in level.

The system now in use is based on a series of closely spaced reed switches (Fig.3) in a low voltage circuit that produces the 4-20mA output signal. This is unaffected by cable length and electromagnetic disturbances. The unit is flange mounted with the same fixing dimensions as a standard filler/breather unit.

Options

Since the control unit fits a standard filler/breather port it is convenient to combine it with other tank mounted facilities (Fig.1). It is therefore offered with various combinations of filler/breather, sampling port and an electronic temperature sensor with a 4-20mA output and up to five setpoints.

Experience to date

Not surprisingly, the greatest response to this continuous level control system has come from large production oriented users of hydraulic systems. Examples include several major vehicle manufacturers, power generators and the pulp and paper industry. In many cases the multi-function options described above have been specified in order to simplify installation and save space.

Reply no. 223

into an electronic data processing (EDP) system and it may well then be possible to 'teach in' the level movements over the complete cycle so that these represent the zero line against which unexpected changes become apparent. Fig.3 shows how this applies to a portion of the cycle diagram shown in Fig.2. A small span of acceptable values is allowed either side of the zero line but movement outside it is cause for investigation. Depending on the size of the reservoir this might indicate a loss of just a few litres of fluid, but leakage of even that amount can cause disruption and environmental damage that costs money to rectify.

Clearly this degree of control is possible only where the fluid demand cycle is repetitive, but these days that applies to a large and growing number of hydraulic systems powering automated processes such as injection moulding.

A number of surveys have shown that the greatest potential for fluid loss occurs when the reservoir is being filled or topped up. An effective solution is to

Certificate of Approval

This is to certify that the Management System of:

Bühler Technologies GmbH

Harkortstrasse 29, 40880 Ratingen, Germany

has been approved by Lloyd's Register to the following standards:

ISO 9001:2015

Approval number(s): ISO 9001 – 0017734

The scope of this approval is applicable to:

Design and manufacture as well as procurement of products for instrumentation, process control and for the fluid power industry.



Paul Graaf

Area Operations Manager, Europe

Issued by: Lloyd's Register Deutschland GmbH

for and on behalf of: Lloyd's Register Quality Assurance Limited



Production Quality Assurance Notification

- 2 Equipment and Protective Systems intended for use in potentially explosive atmospheres
Directive 2014/34/EU
Annex IV - Module D: Conformity to type based on quality assurance of the production process
Annex VII - Module E: Conformity to type based on product quality assurance
- 3 Notification number: **BVS 21 ATEX ZQS/E213**
- 4 Product category: **Equipment and components
equipment-group II, categories 1G, 1D, 2G, 2D:
Equipment and components for measurement and control**



- 5 Manufacturer: **Bühler Technologies GmbH**
- 6 Address: **Harkortstr. 29, 40880 Ratingen, Germany**
Site(s) of manufacture: **Harkortstr. 29, 40880 Ratingen, Germany**

- 7 The certification body of DEKRA Testing and Certification GmbH, Notified Body No 0158 in accordance with Article 17 of the Council Directive 2014/34/EU of 26 February 2014 notifies that the manufacturer has a production quality system, which complies with Annex IV of the Directive. This quality system in compliance with Annex IV of the Directive also meets the requirements of Annex VII.

In the updated annex all products covered by this notification and their type examination certificate numbers are listed.

- 8 This notification is based on audit report ZQS/E213/21 issued 2021-09-09. Results of periodical re-assessments of the quality system are a part of this notification.
- 9 This notification is valid from 2021-07-22 until 2024-07-22 and can be withdrawn if the manufacturer does not satisfy the production quality assurance surveillance according to Annex IV and VII.
- 10 According to Article 16 (3) of the Directive 2014/34/EU the CE marking shall be followed by the identification number 0158 of DEKRA Testing and Certification GmbH as notified body involved in the production control phase.

DEKRA Testing and Certification GmbH
Bochum, 2021-09-09

A handwritten signature in blue ink, appearing to be 'J. G. ...', written over a light blue grid background.

Managing Director

This is a translation from the German original.
In the case of arbitration only the German wording shall be valid and binding.



11 Charts and design tools

Conversion table pressure

	Pa	bar	N/mm ²	kp/m ²	kp/cm ² (at)	atm	Torr
1 Pa (N/m ²) =	1	10 ⁻⁵	10 ⁻⁶	0.102	0.102 * 10 ⁻⁴	0.987 * 10 ⁻⁵	0.0075
1 bar (daN/cm ²) =	100000	1	0.1	10200	1.02	0.987	750
1 N/mm ² =	106	10	1	1.02 * 10 ⁵	10.2	9.87	7500
1 kp/m ² =	9.81	9.81 * 10 ⁻⁵	9.81 * 10 ⁻⁶	1	39913	0.968 * 10 ⁻⁴	0.0736
1 kp/cm ² (1 at) =	98100	0.981	0.0981	10000	1	0.968	736
1 atm (760 Torr) =	101325	1.013	0.1013	10330	1.033	1	760
1 Torr =	133	0.00133	1.33 * 10 ⁻⁴	13.6	0.00132	0.00132	1

Conversion table power

	W	kW	kcal/s	kcal/h	hp m/s	PS
1 W=Nms=J/s	1	0.001	2.39*10 ⁻⁴	0.86	0.102	0.00136
1 kW =	1000	1	0.239	860	102	1.36
1 kcal/s =	4190	4.19	1	3600	427	5.69
1 kcal/h =	1.16	0.00116	0.00028	1	0.119	0.00158
1 hp m/s =	9.81	0.00981	0.00234	8.43	1	0.0133
1 PS =	736	0.736	0.176	623	75	1

Flow rates in l/min at different flow speed

NW: nominal width in mm

NW	Flow speed									
	0.5 m/s	1 m/s	1.5 m/s	2 m/s	3 m/s	4 m/s	5 m/s	7 m/s	8 m/s	10 m/s
8	1.5	3	4.5	6	9	12	15	21	24	30
10	2.3	4.6	6.9	9.2	13.8	18.4	23	32.2	36.8	46
12	3.4	6.8	10.2	13.6	20.4	27.2	34	47.6	54.4	68
15	5.3	10.6	15.9	21.2	31.8	42.4	53	74.2	84.8	106
16	6	12	18	24	36	48	60	84	96	120
20	9.5	19	28.5	38	57	76	95	133	152	190
25	15	30	45	60	90	120	150	210	240	300
32	20	40	60	80	120	160	200	280	320	400
40	38	76	114	152	228	304	380	532	608	760
50	60	120	180	240	360	480	600	840	960	1200
65	100	200	300	400	600	800	1000	1400	1600	2000
80	150	300	450	600	900	1200	1500	2100	2400	3000
100	230	460	690	920	1380	1840	2300	3220	3680	4600
125	370	740	1110	1480	2200	2960	3700	5180	5920	7400
150	530	1060	1590	2120	3180	4240	5300	7420	8480	10600
175	750	1500	2250	3000	4500	6000	7500	10500	12000	15000
200	950	1900	2850	3800	5700	7600	9500	13300	15200	19000
225	1200	2400	3600	4800	7200	9600	12000	16800	19200	24000
250	1500	3000	4500	6000	9000	12000	15000	21000	24000	30000
300	2100	4200	6300	8400	12600	16800	21000	29400	33600	42000
350	2900	5800	8700	11600	17400	23200	29000	40600	46400	58000
400	3800	7600	11400	15200	22800	30400	38000	53200	60800	70000
450	4760	9520	14280	19040	28560	38080	47600	66640	76160	95200
500	6000	12000	18000	24000	36000	48000	60000	84000	96000	120000
550	7100	14200	21300	28400	42600	56800	71000	99400	113600	142000
600	8500	17000	25500	34000	51000	68000	85000	119000	136000	170000
700	11500	23000	34500	46000	69000	92000	115000	161000	184000	230000
800	15000	30000	45000	60000	90000	120000	150000	210000	240000	300000
900	19000	38000	57000	76000	114000	152000	190000	266000	304000	380000
1000	23000	46000	69000	92000	138000	184000	230000	322000	368000	460000

Conversion inches to mm

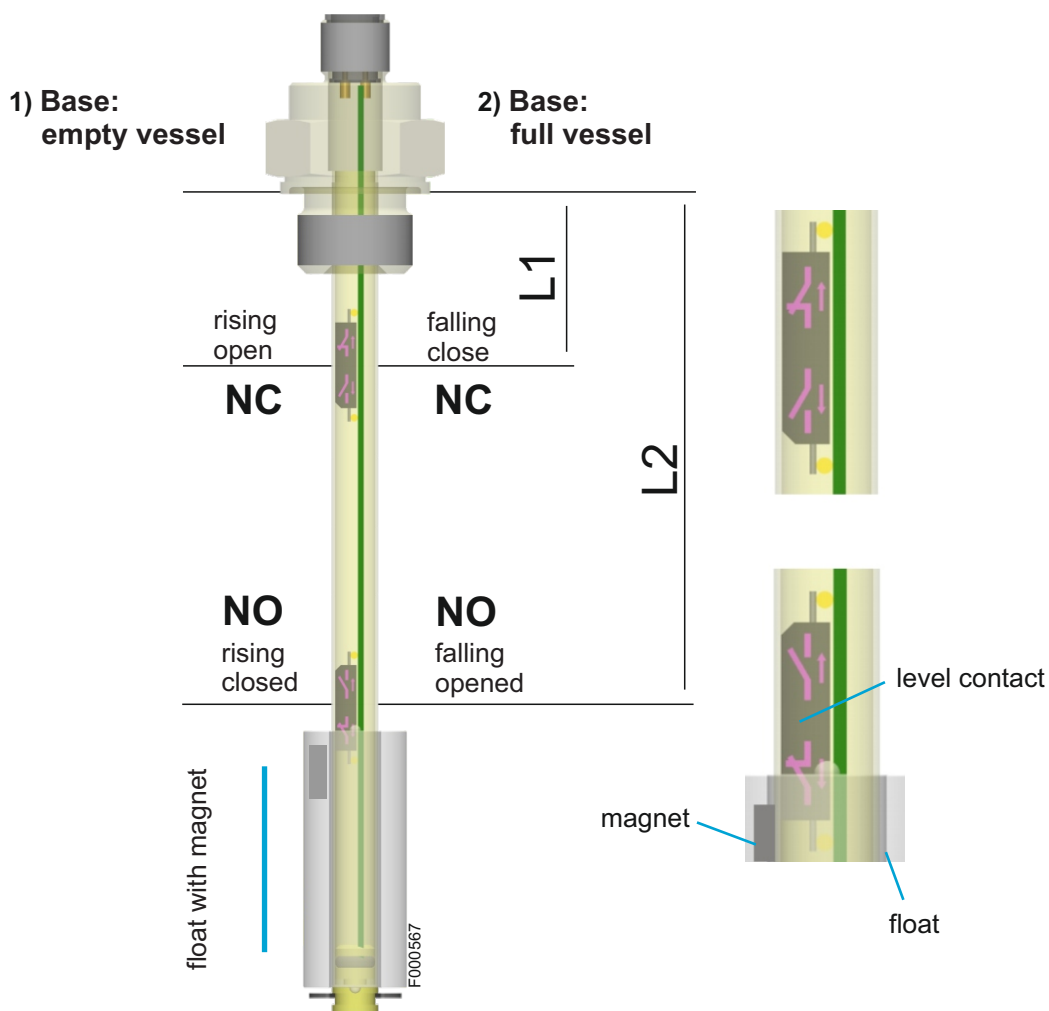
Inches fraction	Inches decimal notation	metric
1/64"	0.016"	0.397 mm
1/32"	0.031"	0.794 mm
1/16"	0.063"	1.587 mm
1/8"	0.125"	3.175 mm
1/4"	0.25"	6.350 mm
3/8"	0.375"	9.525 mm
1/2"	0.500"	12.700 mm
5/8"	0.625"	15.875 mm
3/4"	0.75"	19.050 mm
7/8"	0.875"	22.225 mm
1"	1"	25.400 mm
1 1/4"	1.250"	31.750 mm
1 1/2"	1.500"	38.100 mm
1 3/4"	1.750"	44.450 mm
2"	2"	50.800 mm
2 1/4"	2.250"	57.150 mm
2 1/2"	2.500"	63.500 mm
2 3/4"	2.750"	69.850 mm
3"	3"	76.200 mm
3 1/4"	3.250"	82.550 mm
3 1/2"	3.500"	88.900 mm
3 3/4"	3.750"	95.250 mm
4"	4"	101.60 mm
4 1/4"	4.250"	107.95 mm
4 3/4"	4.750"	120.65 mm
5"	5"	127.00 mm
6"	6"	152.40 mm
7"	7"	177.80 mm
8"	8"	203.20 mm
9"	9"	228.60 mm
10"	10"	254.00 mm

Definitions of the Contact Function of Level switches

There are two possibilities to define the contact function of a switch with respect to the base of the vessel:

1. bottom edge of the vessel / empty vessel and
2. top edge of the vessel / filled vessel

Accordingly, in the first case, the switch will be regarded as closer if the level decreases from full to empty, in the second case, the level increases from the point of view of the operator and a closer has the opposite function. Since most of the market uses the 1st definition, Bühler stays with that as well.



The reference point concerning dimensions remains at the flange in any case, independent from the explanations given above. Please note that the designation of length (L1, L2) are not numbered the same way throughout the market.