

TRAFAG INSIGHT

Pressure and temperature monitoring solutions



troutfords



Sensors and monitoring instruments for pressure and temperature

Trafag, a Swiss-based company founded in 1942, is supported by a broad sales and service network in over 40 countries across the world. This allows Trafag to offer customers personalised and competent advice and ensures the best possible service. High-performance development and production departments not only guarantee the fast and reliable delivery of our high-quality and high-precision products, but also ensure that customisations can be implemented in a short time.



Competent and customer-oriented

Technological competence, manufacturing expertise and customer-orientation form the three cornerstones of Trafag as a company. Trafag is a completely independent company with headquarters in Bubikon, Switzerland, and further manufacturing companies in Germany and the Czech Republic. A fifth of its employees in Switzerland are involved in the fields of research and development, production technology or applications engineering.

Application and solution-oriented

The direct availability of these resources enables Trafag to be extremely flexible in the areas of development and production as well as in its perception and implementation of customer requirements. Thanks to modular engineering, Trafag is able to efficiently adapt its standard products to the specific needs of customers and to develop special OEM solutions.

Market-oriented and always within reach

Trafag maintains an active presence in over 40 countries. A great number of customers in diverse industrial sectors such as mechanical engineering, hydraulics, engine manufacturing, shipbuilding, railway technology or high-voltage technology appreciate the cooperation offered by our technically competent customer advisory service.

Adaptable and efficient

The ability to develop and manufacture its strategically important components in-house means that Trafag can both mass-produce and manufacture on a small scale at short notice. Rigorous quality management in accordance with ISO 9001, state of the art production facilities under clean room conditions and stringently monitored production processes ensure that Trafag meets the highest quality demands.

Our products are at home where you are



Shipbuilding



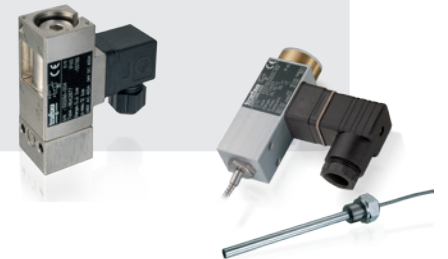
- Propulsion
- Pumps
- Ballast water treatment
- Steering
- Separators
- Tank level



Hydraulics



- Construction machinery
- Agricultural machinery
- Injection molding machines
- Community vehicles
- Elevators



Engines



- Common rail injection
- Cooling water
- Oil pressure
- Fuel pressure
- Turbo charger



Railway

- Brake systems
- Pantograph
- Air compressors



Water treatment

- Drinking water
- Waste water
- Desalination
- Pools
- Sluice steering
- Level control



Various

- Chemical industry
- Mining
- Process technology
- Oil and gas
- Machine building industry
- HVAC

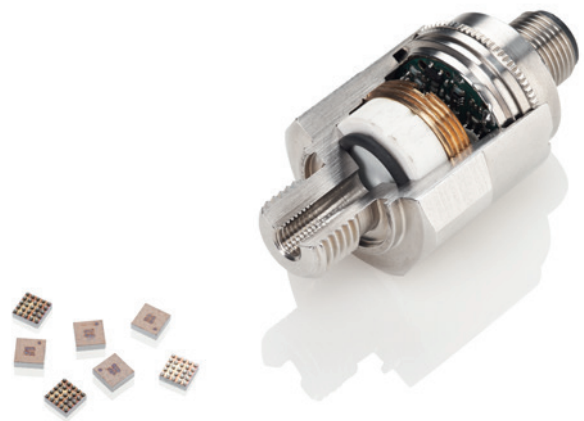


Pressure transmitters

Trafag pressure transmitters are used for electronically measuring and evaluating pressure. Over the decades they have proven themselves in a multitude of demanding applications in harsh environments. They are available in many different designs to suit pressure and electrical connections, measuring procedures, electrical output signals and certifications (CE, EX, rail and ship). Superior technology and precise manufacturing ensure that the transmitters work perfectly. This is especially important in applications where high requirements are placed on long-term stability, vibration resistance, electromagnetic compatibility, shock resistance or temperature insensitivity.

Technology

Thin-film-on-steel (welded and O-ring free) or thick-film-on-ceramic pressure sensors are key components of Trafag pressure transmitters. Both sensor technologies as well as the ASIC (application-specific microchip) are developed and produced in-house. As a result, compact pressure sensors and electronics work in perfect partnership and achieve a unique level of long-term stability and reliability even under the most adverse environmental conditions. Trafag is a technological pioneer when it comes to miniaturising robust pressure transmitters.



Thin-film-on-steel technology

- Very good long term stability
- Resistant to high media temperatures
- Completely welded stainless steel sensor system without O-rings
- Resistant to very high over pressures and ideal for nominal pressures up to 3000 bar



Thick-film-on-ceramic technology

- Resistant to aggressive media
- Ideal for low pressure ranges and absolute measurement
- Economical



Pressure switches

Trafag's electromechanical pressure switches provide high vibration resistance and switch point precision in combination with an extremely robust and durable design. This results in switches that can be operated for decades without requiring maintenance, even under harsh conditions. Various designs with bellows, membrane and piston sensors cover a wide variety of pressure ranges, media and load profiles for many different applications.

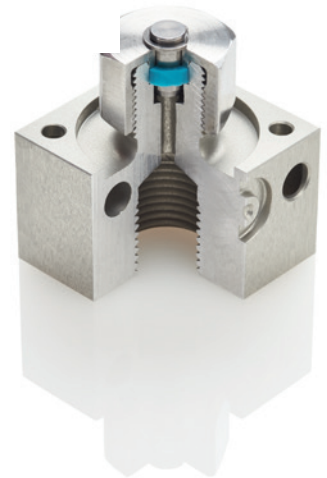
Bellows sensors

- High switching point precision and repeatability
- Stainless steel, bronze and brass designs
- Optionally welded/soldered design for absolute impermeability
- Measure liquid, vaporous and gaseous media



Piston sensors

- Suitable for high pressure ranges
- Not sensitive to pressure surges
- Suitable for applications with many load cycles
- Ideal for hydraulic systems



Membrane sensors

- Resistant to high overpressures and not sensitive to pressure surges
- Suitable for applications with many load cycles
- Measure liquid, vaporous and gaseous media



Thermostats

For 70 years, Trafag thermostats have proven their robustness in the most adverse environmental conditions. Industry useage ranges from air conditioning applications to engine manufacturing and ship building and even to offshore oil and gas platform production. The appeal of Trafag thermostats lies in their high switching point precision even after decades of operation under harsh conditions without maintenance. Various sensor and casing designs cover a wide range of temperatures and possible applications.

Measurement principle

A capillary tube filled with liquid reacts to a temperature change as a result of the principle of thermal expansion. This expansion is detected using a precision structure which switches one or multiple microswitches.

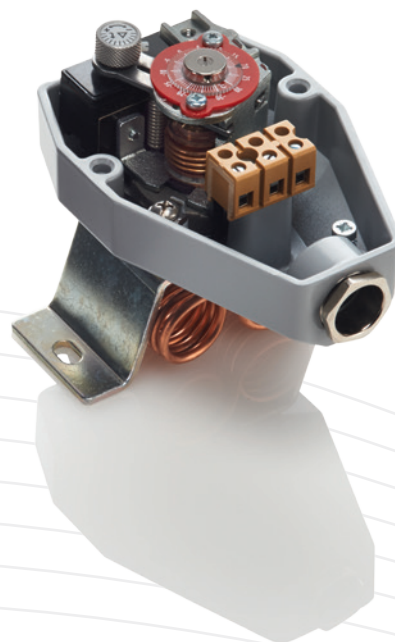


Design variations

- With internal or external temperature set-point adjustment
- Internal or external measuring scale
- With or without a manual reset switch
- With or without switching differential adjustment
- Switch designs for inside or outside applications
- Optional capillary tube safeguard
- Single or double-step circuit
- CE, EX or ship certifications

Sensor systems and accessories

- Sensors that are fixed or can be mounted freely
- Copper (Cu), Cu nickel-plated or stainless steel sensor material
- Nickel-plated bronze or stainless steel protective sensor tube
- Additional capillary tube protection

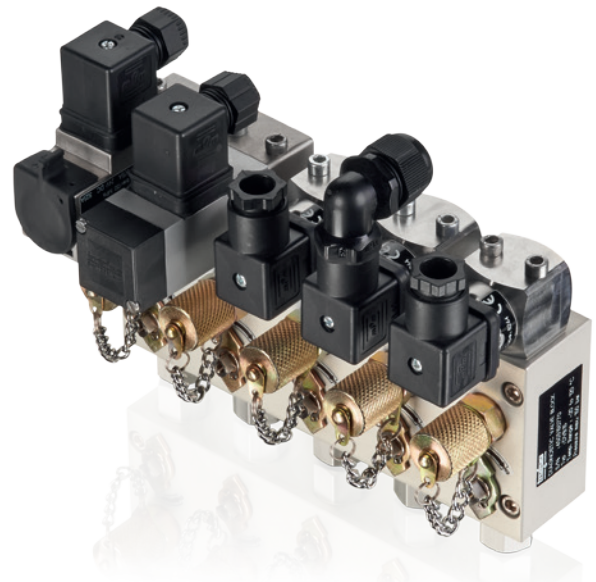


Accessories

Trafag offers a wide range of original accessories which are ideally matched to our products. These include devices for monitoring or configuring transmitters such as hand pumps with precision pressure gauge or the Sensor Communicator, a handheld device which provides direct access to the calibration values of the transmitter in the Trafag ASIC. Trafag also offers a wide range of accessories meet specific application requirements and also make installation easier. They include diagnostic valve manifolds, snubbers and pressure peak damping elements for measuring pressure, or protective pipes for thermostats.

Accessories for pressure measurement instruments

- Sensor Communicator
- Diagnostic valve block
- Hand pump with precision manometer
- Zenerbarrier
- Venting box
- Cable hanger
- Pressure peak damping elements
- Snubbers
- Adapters for different pressure connections
- Stop valves
















Accessories for thermostats

- Protection tubes for direct mounting and remote sensors
- Duct mounting bracket
- Capillary tube holder
- Mounting brackets
- Screwed cable glands, ship approved, for retrofit











Overview pressure transmitters

	NAT 8252	NAH 8253	NAH 8254	NAE 8256	NSL 8257	EPN/EPNCR 8298	
							
Measuring principle	Thin film on steel	Thin film on steel	Thin film on steel	Thin film on steel	Thin film on steel	Thin film on steel	
Measuring range	0 ... 2.5 to 0 ... 600 bar 0 ... 30 to 0 ... 7500 psi	0 ... 2.5 to 0 ... 600 bar	0 ... 2.5 to 0 ... 600 bar 0 ... 30 to 0 ... 7500 psi	0 ... 10 to 0 ... 600 bar 0 ... 150 to 0 ... 7500 psi	0 ... 0.2 to 0 ... 2.5 bar 0 ... 3 to 0 ... 30 psi	0 ... 2.5 to 0 ... 2500 bar	
Output signal	4 ... 20 mA, 0 ... 5 VDC, 1 ... 6 VDC, 0 ... 10 VDC, 0.5 ... 4.5 VDC ratiom.	4 ... 20 mA, 0 ... 5 VDC, 1 ... 6 VDC, 0 ... 10 VDC, 0.5 ... 4.5 VDC ratiom.	4 ... 20 mA, 0 ... 5 VDC, 1 ... 6 VDC, 0 ... 10 VDC, 0.5 ... 4.5 VDC ratiom.	4 ... 20 mA	4 ... 20 mA, 0 ... 5 VDC, 0 ... 10 VDC, 0.5 ... 4.5 VDC ratiom.	4 ... 20 mA 0.5 ... 4.5 VDC ratiom.	
Accuracy @ 25°C typ.	± 0.5 % FS typ.	± 0.3 % FS typ. ± 0.15 % FS typ. ± 0.1 % FS typ.	± 0.3 % FS typ.	0.5 %: ± 0.5 % FS typ. 0.3 %: ± 0.3 % FS typ.	0.15 ... 0.8 % FS typ.	± 0.5 % FS typ. ± 0.3 % FS typ.	
Ambient temperature	-40°C ... +125°C	-40°C ... +125°C	-40°C ... +125°C	-40°C ... +125°C	-40°C ... +125°C	-40°C ... +125°C	
Media temperature	-40°C ... +125°C	-40°C ... +125°C	-40°C ... +125°C	-40°C ... +125°C	-40°C ... +125°C	-40°C ... +125°C	
Protection	IP65, IP67	Min. IP65	IP65, IP67	IP65, IP67	Min. IP65	Min. IP65	
Sensor	1.4542 (AISI630)	1.4542 (AISI630)	1.4542 (AISI630)	1.4542 (AISI630)	1.4542 (AISI630)	1.4542 (AISI630)	
Housing / Pressure connection	1.4301 (AISI304)	1.4301 (AISI304)	1.4301 (AISI304)	1.4301 (AISI304)	1.4301 (AISI304)	1.4542 (AISI630), 1.4301 (AISI304)	
Pressure connections	G1/4" m, 1/4"NPT m, 7/16"-20UNF f, 7/16"-20UNF SAE4 m, R1/4" m, R1/8" m, M10x1 m	G1/4" m, 1/4"NPT m, 7/16"-20UNF m, 7/16"-20UNF f (valve opener)	G1/4" m, 1/4"NPT m, 7/16"-20UNF f, 7/16"-20UNF SAE4 m, R1/4" m, R1/8" m, M10x1 m	G1/4" m, 1/4"NPT m, M10x1 m	G1/4" m, 1/4"NPT m	G1/4" m, R1/4" m, G1/2" m (Manom.), 1/4"NPT m, 1/2"NPT m, M14x1.5 m, M18x1.5 m	
Electrical connections	Industrial standard, contact distance 9.4 mm; M12x1; Cable	Industrial standard, contact distance 9.4 mm; M12x1	Industrial standard, contact distance 9.4 mm; M12x1; cable IP67	Industrial standard, contact distance 9.4 mm; M12x1	Industrial standard, contact distance 9.4 mm; M12x1	EN175301-803-A (DIN43650-A); DIN72585; Cable	
Applications	Machine tools Hydraulics HVAC Refrigeration Process technology Water treatment	Machine tools Hydraulics Process technology Water treatment Test benches	Machine tools Hydraulics HVAC Refrigeration Process technology Water treatment	Shipbuilding Engine manufacturing Hydraulics	Shipbuilding Engine manufacturing Machine tools Process technology Water treatment Test benches	Shipbuilding Engine manufacturing Machine tools Hydraulics	
Ship Approval				BV, GL, NKK, RMRS	GL, DNV, RINA	ABS, BV, CCS, DNV, GL, KRS, LRS, NKK, RINA, RMRS	
Data sheet	H72303	H72300	H72304	H72305	H72302	H72312	
Instructions	H73303	H73250	H73303	H73303	H73250	H73311	







EPR 8293	EPI 8297	NPN 8264	FPT 8235	ECTR 8471	ECT 8472	ECT 0.3 % (0.5 %, 1.0 %) 8473
						
Thin film on steel	Thin film on steel	Thin film on steel	Thin film on steel	Thick film on ceramic	Thick film on ceramic	Thick film on ceramic
0 ... 2.5 to 0 ... 600 bar	0 ... 2.5 to 0 ... 600 bar	0 ... 2.5 to 0 ... 250 bar	0 ... 1 to 0 ... 100 bar 0 ... 15 to 0 ... 1500 psi	-1 ... 9 to 0 ... 40 bar 0 ... 15 to 0 ... 500 psi	0 ... 1 to 0 ... 400 bar 0 ... 15 to 0 ... 5000 psi	0 ... 0.1 to 0 ... 40 bar 0 ... 1.5 to 0 ... 500 psi
4 ... 20 mA	4 ... 20 mA	4 ... 20 mA	4 ... 20 mA, 0 ... 5 VDC, 1 ... 6 VDC, 0 ... 10 VDC, 0.5 ... 4.5 VDC ratiom.	4 ... 20 mA, 0 ... 5 VDC, 1 ... 6 VDC, 0 ... 10 VDC, 0.5 ... 4.5 VDC ratiom.	4 ... 20 mA, 0 ... 5 VDC, 1 ... 6 VDC, 0 ... 10 VDC, 0.5 ... 4.5 VDC ratiom.	4 ... 20 mA, 0 ... 5 VDC, 1 ... 6 VDC, 0 ... 10 VDC, 0.5 ... 4.5 VDC ratiom.
± 0.5 % FS typ. ± 0.3 % FS typ.	± 0.5 % FS typ.	± 0.5 % FS typ. ± 0.3 % FS typ.	± 0.4 % FS	± 0.5 % FS typ.	± 0.5 % FS typ.	± 0.3 % FS typ. (± 0.5 % FS typ., ± 1 % FS typ.)
-40°C ... +125°C	-40°C ... +125°C	-40°C ... +100°C	-40°C ... +85°C	-25°C ... +85°C	-25°C ... +85°C	-25°C ... +85°C
-40°C ... +125°C	-40°C ... +125°C	-40°C ... +100°C	-40°C ... +125°C	-25°C ... +125°C	-25°C ... +125°C	-25°C ... +125°C
IP65	IP65	Min. IP65	Min. IP65	Min. IP65	Min. IP65	Min. IP65
1.4542 (AISI630)	1.4542 (AISI630)	1.4542 (AISI630)	1.4542 (AISI630)	Ceramic, Al ₂ O ₃ (96 %)	Ceramic, Al ₂ O ₃ (96 %)	Ceramic, Al ₂ O ₃ (96 %)
1.4542 (AISI630), 1.4301 (AISI304)	1.4542 (AISI630), 1.4301 (AISI304)	1.4542 (AISI630), 1.4301 (AISI304)	1.4301 (AISI304)	1.4305 (AISI303), 1.4462 (AISI318LN), Titanium Grade 5	1.4305 (AISI303), 1.4462 (AISI318LN), Titanium Grade 5	1.4305 (AISI303), 1.4462 (AISI318LN), Titanium Grade 5
G1/4" m, R1/4" m, 1/4"NPT m, 1/2"NPT m	G1/4" m, R1/4" m, 1/4"NPT m, 1/2"NPT m	G1/4" f, M10x1 f, G1/8" f	G1/2" m, flush membrane	7/16"-20UNF m, 7/16"-20UNF f, 1/4"NPT m	G1/4" f, G1/4" m, G1/2" m, 1/4"NPT m, G3/4" frontal membrane	G1/4" f, G1/4" m, G1/2" m, 1/4"NPT m, G3/4" frontal membrane
EN175301-803-A (DIN43650-A)	EN175301-803-A (DIN43650-A)	EN175301-803-A (DIN43650-A); Cable	EN175301-803-A (DIN43650-A); M12x1; Industrial standard, contact distance 9.4 mm; Packard Metri Pack; Cable	EN175301-803-A (DIN43650-A); M12x1; Industrial standard, contact distance 9.4 mm; Packard Metri Pack; Cable	EN175301-803-A (DIN43650-A); M12x1; Industrial standard, contact distance 9.4 mm; Packard Metri Pack; Cable	EN175301-803-A (DIN43650-A); M12x1; Industrial standard, contact distance 9.4 mm; Packard Metri Pack; Cable
Railways	Machine tools Hydraulics HVAC Refrigeration Process technology Water treatment	Shipbuilding Engine manufacturing Railways Machine tools Hydraulics	Engine manufacturing Machine tools Hydraulics Process technology Water treatment Food Industry Chemical and pharmaceutical industry	HVAC Refrigeration	Machine tools Hydraulics Water treatment	Machine tools Hydraulics Water treatment
		ABS, BV, CCS, DNV, GL, KRS, LRS, NKK, RINA, RMRS				
H72311	H72314	H72313	H72316	H72323	H72324	H72326
H73311	H73311	H73313	H73316	H73324	H73324	H73324

Overview pressure transmitters

	ECON 8498	ECL 8438	NAL 8838	CMP 8270	EPN-S 8320	DCS 8864	
							
Measuring principle	Thick film on ceramic	Thick film on ceramic	Piezoresistive	Thin film on steel	Thin film on steel	Thin film on steel	
Measuring range	0 ... 1 to 0 ... 250 bar	0 ... 0.1 to 0 ... 25 bar	0 ... 0.1 to 0 ... 25 bar	0 ... 1 to 0 ... 600 bar	0 ... 2.5 to 0 ... 600 bar 0 ... 30 to 0 ... 7500 psi	0 ... 1 to 0 ... 600 bar	
Output signal	4 ... 20 mA	4 ... 20 mA	4 ... 20 mA 0 ... 10 VDC	Bus protocol CANopen DS404	Transistor (open source)	4 ... 20 mA, 0 ... 10 VDC 2 Relays, electrically isolated 30W (max.1A), 36 VAC/ DC	
Accuracy @ 25°C typ.	± 0.5 % FS typ.	± 0.3 % FS typ. Range 0...0.1 to 0...0.4 bar: ± 0.5 % FS typ.	NLH: ± 01 %, 0.25 %, 0.5 %	± 0.5 % FS typ. ± 0.15 % FS typ. ± 0.1 % FS typ.	± 0.5 % FS typ. (Switchpoint)	± 0.5 % FS typ.	
Ambient temperature	-25°C ... +85°C	-25°C ... +80°C (+70°C)	-5°C ... +50°C	-40°C ... +125°C	-25°C ... +85°C Option: -40°C ... +125°C	-25°C ... +80°C	
Media temperature	<60 bar: -25°C ... +85°C >60 bar: -10°C ... +85°C	-25°C ... +80°C (+70°C)	-5°C ... +50°C	-50°C ... +135°C	-40°C ... +125°C	-25°C ... +125°C	
Protection	Min. IP65	IP68 (25 bar; 250m)	Min. IP68	Min. IP67	Min. IP65	IP65	
Sensor	Ceramic, Al ₂ O ₃ (96 %)	Ceramic, Al ₂ O ₃ (96 %)	1.4435 (AISI316L)	1.4542 (AISI630)	1.4542 (AISI630)	1.4542 (AISI630)	
Housing / Pressure connection	1.4435 (AISI316L)	1.4404/1.4435 (AISI316L)	1.4435 (AISI316L) or titanium	1.4301 (AISI304)	1.4542 (AISI630), 1.4301 (AISI304)	1.4301/1.4306 (AISI304/304L)	
Pressure connections	G1/4" f, G1/4" m, 1/4"NPT m, 7/16"-20UNF m, 7/16"-20UNF f	Type 1 f, M 10x1, Type 2 m, M 22x1	Open, Closed, G1/4" m	G1/4" m, 1/4"NPT m, 7/16"-20UNF m, 7/16"-20UNF f (valve opener)	G1/4" m, 1/4"NPT m, G1/2" m, M14x1.5 m, 1/2"NPT m	G1/4" m, G1/4" f, G1/2" m, Flange	
Electrical connections	EN175301-803-A (DIN43650-A)	Cable PUR/FEP/PE	Cable PUR/Teflon/PE	M12x1	EN175301-803-A (DIN43650-A); Cable	M12x1	
Applications	Shipbuilding Engine manufacturing	Process technology Water treatment	Shipbuilding Process technology Water treatment	Engine manufacturing Railways Machine tools Hydraulics Process technology Test benches	Shipbuilding Engine manufacturing Railways Machine tools Hydraulics HVAC	Shipbuilding Machine tools Hydraulics Process technology	
Ship Approval	BV, DNV, GL, KRS, LRS, NKK	GL, KRS	GL, KRS		GL	GL	
Data sheet	H72239	H72328	H72228	H72614	H72333	H72605	
Instructions	H73212	H73328		H73614	H73333	H73605	


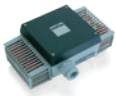




N 8202	ND 8204	EXNT 8292	EXNA 8854	EXL 8432	EXNAL 8858
					
Thin film on steel	Thin film on steel	Thin film on steel	Piezoresistive	Thick film on ceramic	Piezoresistive
0 ... 1.0 to 0 ... 600 bar	0 ... 1 to 0 ... 16 bar	0 ... 0.4 to 0 ... 2000 bar	0 ... 0.1 to 0 ... 1000 bar	0 ... 0.2 to 0 ... 25 bar	0 ... 0.1 to 0 ... 25 bar
4 ... 20 mA	4 ... 20 mA (P1-P2)	4 ... 20 mA	4 ... 20 mA	4 ... 20 mA	4 ... 20 mA
± 0.5 % FS typ.	± 0.8 % FS typ.	± 0.5 % FS typ. ± 0.3 % FS typ.	NLH: ± 01 %, 0.25 %	± 0.3 % FS typ. ± 0.5 % FS typ.	NLH: ± 01 %, 0.25 %, 0.5 %
-25°C ... +85°C	-25°C ... +85°C	Max. -40 ... +120°C	-40°C ... +125°C	T4: -20°C ... +70°C T6: -20°C ... +65°C	T4/T6: -5°C ... +50°C
-25°C ... +125°C	-25°C ... +125°C	Max. -40°C ... +120°C	-40°C ... +125°C	T4: -20°C ... +70°C T6: -20°C ... +65°C	T4/T6: -5°C ... +50°C
Min. IP65	Min. IP65	Min. IP65	Min. IP65	IP68 (25 bar; 250m)	Min. IP68
1.4435/1.4542 (AISI316L/630)	1.4542 (AISI630)	1.4542 (AISI630)	1.4435 (AISI316L) opt. titanium	Ceramic, Al ₂ O ₃ (96 %)	1.4435 (AISI316L)
AlSi10Mg/ Epoxy coated	AlSi10Mg/ Epoxy coated	1.4542 (AISI630), 1.4301 (AISI304)	1.4435 (AISI316L) opt. titanium	1.4404/1.4435 (AISI316L)	1.4435 (AISI316L) or titanium
G1/4" f, G1/2" m	G1/4" f	G1/4" m, G1/4" f, G1/2" m, G1/2" m (Manom.), R1/4" m, 1/4"NPT m, M18x1.5 m	1/4" NPT m, 1/2"NPT m, G1/4" f, G1/4" m, G1/2" m, G1/2" m frontal membrane, G1/2" m flush membrane	Type 1 f, M 10x1, Type 2 m, M 22x1	Open; Closed; G1/4" m
Terminal screw 0.75 ... 2.5 mm ²	Terminal screw 0.75 ... 2.5 mm ²	EN175301-803-A; M12x1; MIL-C 26482; Binder 723; Cable	EN175301-803-A; M12x1; MIL-C 26482; Binder 723; Cable	Cable PUR/FEP/PE	Cable PUR/Teflon/PE
Shipbuilding Engine manufacturing	Shipbuilding Engine manufacturing	Shipbuilding Ex Zones 0, 1, 2 (gas); 20, 21, 22 (dust) and mining	Ex Zone 0, 1, 2 / Gas Ex Zone 20, 21, 22 / Dust Ex Underground Mining	Ex Zone 0, 1, 2 / Gas Ex Underground Mining	Shipbuilding Ex SEV 11 ATEX 0145 X
ABS, BV, CCS, DNV, GL, KRS, LRS, RINA	BV, DNV, RINA	GL, KRS			GL, KRS
H72206	H72218	H72329	H72334	H72330	H72231
H70722	H73218	H73329		H73329	








Overview pressure switches

	PST4B 9B4	PST4K 9K4	PST4M 9M4	PSTD 9D0	P/PS 900/904/912	PV/PVF 903/907/915/940/941/942	
							
Measuring principle	Bellow	Piston	Membrane	Bellow	Bellow	Bellow	
Measuring range	-0.6 ... 3.4 to 4 ... 40 bar -8 ... 45 to 60 ... 500 psi	1 ... 10 to 40 ... 400 bar 14 ... 150 to 580 ... 5800 psi	1 ... 10 to 10 ... 100 bar 14 ... 150 to 150 ... 1500 psi	-1 ... 6 and -1 ... 8 bar	-0.9 ... 1.5 to 10 ... 100 bar 5 ... 50 to 125 ... 1500 psi	-0.9 ... 1.5 to 4 ... 40 bar 5 ... 50 to 50 ... 500 psi	
Output signal	Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact	
Pressure connections	G1/8" f, G1/4" f, M10x1.0 f	G1/8" f, G1/4" f, M10x1.0 f	G1/8" f, G1/4" f, M10x1.0 f	G1/4" f	G1/4" f, G1/2" m, 1/4"NPT f	G1/4" f, G1/2" m, 1/4" NPT	
Electrical connections	EN175301-803-A (DIN43650-A)	EN175301-803-A (DIN43650-A)	EN175301-803-A (DIN43650-A)	EN175301-803-A (DIN43650-A)	Terminal screw	Terminal screw	
Switching differential	Not adjustable	Not adjustable	Not adjustable	Not adjustable	Not adjustable	Adjustable	
Media temperature	-25°C ... +125°C -40°C ... +125°C	-25°C ... +125°C	0°C ... +80°C	-25°C ... +120°C	-40°C ... +150°C	-40°C ... +150°C	
Ambient temperature	-25°C ... +125°C -40°C ... +125°C	-25°C ... +85°C	0°C ... +80°C	-25°C ... +85°C	-25°C ... +70°C	-25°C ... +70°C	
Protection	IP65	IP65	IP65	IP65	IP65	IP65	
Housing	EN AC-AISi10Mg (A360) chemically nickel plated	EN AC-AISi10Mg (A360) chemically nickel plated	EN AC-AISi10Mg (A360) chemically nickel plated	Brass CuZn39Pb3	AlSi10Mg/ Epoxy coated	AlSi10Mg/ Epoxy coated	
Sealing	HNBR 75 Sh	PTFE	FKM	-	NBR	NBR	
Applications	Shipbuilding Engine manufacturing Railways Machine tools	Shipbuilding Engine manufacturing Railways Machine tools Hydraulics	Shipbuilding Engine manufacturing Railways Machine tools Hydraulics	Shipbuilding Engine manufacturing Machine tools Hydraulics	Shipbuilding Engine manufacturing Railways Machine tools Hydraulics	Shipbuilding Engine manufacturing Railways Machine tools Hydraulics	
Data sheet	H72367	H72369	H72368	H72273	H72252	H72257	
Instructions	H73367	H73367	H73367	H73273	H71261	H71261	
Approval	ABS, BV, CCS, DNV, GL, KRS, LRS, NKK, RINA, RMRS, EN60730-1/ EN60730-2-6: Typ 2.B.H	ABS, BV, CCS, DNV, GL, KRS, LRS, RINA, EN60730-1/ EN60730-2-6: Typ 2.B.H	ABS, BV, CCS, DNV, GL, KRS, LRS, RINA, EN60730-1/ EN60730-2-6: Typ 2.B.H	GL EN60730-1/ EN60730-2-6: Typ 2.B.H	ABS, BV, CCS, DNV, GL, KRS, LRS, RINA EN60730-1/ EN60730-2-6: Typ 2.B.H	ABS, BV, DNV, GL, KRS, LRS, RINA EN60730-1/ EN60730-2-6: Typ 2.B.H	
Type of protection							







PK 944/947	PD 920/924/932	901/902/905/906	901/902/905/906	987/988	EXPK 944/947/953	EXPD 920/924/932
						
Piston	Bellow	Bellow	Membrane	Bellow	Piston	Bellow
1 ... 10 to 60 ... 600 bar	-1 ... 6 to -1 ... 18 bar	-0.9...1.5 to 4...40 bar	30 ... 600 and 50 ... 1000 mbar	-0.3 ... 1.3 to 1 ... 10 bar	1 ... 10 to 60 ... 600 bar	-1 ... 6 to -1 ... 18 bar
Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact
G1/4" f, G1/2" m	G1/4" f, G1/8" f, G1/2" m	G1/4" f, G1/2" m	G1/4" f, G1/2" m	G1/4" m	G1/4" f, G1/2" m	G1/4" f, G1/8" f, G1/2" m
Terminal screw	Terminal screw	Terminal screw	Terminal screw	Blade connector	Terminal screw	Terminal screw
Not adjustable	Not adjustable	Not adjustable	Not adjustable	Not adjustable	Not adjustable	Not adjustable
NBR: -30°C ... +100°C FKM: -15°C ... +150°C	-40°C ... +150°C	-40°C ... +150°C	-40°C ... +150°C	-25°C ... +80°C	NBR: -30°C ... +100°C FKM: -15°C ... +150°C	-50°C ... +150°C
-20°C ... +70°C	-25°C ... +70°C	-25°C ... +70°C	-25°C ... +70°C	-25°C ... +70°C	-50°C ... +65°C	-50°C ... +65°C
IP65	IP65	IP65	IP65	IP40 (Microswitch IP67)	IP66 Accessory 06: IP66	IP66
AlSi10Mg/ Epoxy coated	AlSi10Mg/ Epoxy coated	AlSi10Mg/ Epoxy coated	AlSi10Mg/ Epoxy coated	PBTP, Crastin	AlSi10Mg/ Epoxy coated Accessory 06: 1.4301 (AISI 304)	AlSi10Mg/ Epoxy coated
NBR/FKM	NBR	NBR	NBR	-	NBR / FKM	NBR
Shipbuilding Engine manufacturing Railways Machine tools Hydraulics	Shipbuilding Engine manufacturing Railways Machine tools Hydraulics	Engine manufacturing Railways Machine tools Hydraulics	Machine tools HVAC	Machine tools Medium voltage switchgear	⊕ II 2 G / D	⊕ II 2 G / D
H72259	H72253	H72254	H72269	H72272	H72270	H72256
H71261	H73256			H73272	H73171	H73171
ABS, BV, CCS, DNV, GL, KRS, LRS, RINA EN60730-1/ EN60730-2-6: Typ 2.B.H	ABS, BV, CCS, DNV, GL, KRS, LRS, RINA EN60730-1/ EN60730-2-6: Typ 2.B.H	EN60730-1/ EN60730-2-6: Typ 2.B.H	EN60730-1/ EN60730-2-6: Typ 2.B.H	EN60730-1/ EN60730-2-6: Typ 2.B.H	SEV 15 ATEX 0157 X	SEV 15 ATEX 0157 X
					Areas with gas explosion hazards: II 2 G Ex d e IIC T6 Gb; Areas with dust explosion hazards: II 2 D Ex tb IIIC T80°C Db	Areas with gas explosion hazards: II 2 G Ex d e IIC T6 Gb; Areas with dust explosion hazards: II 2 D Ex tb IIIC T80°C Db





Overview thermostats

	A/AS/ASE 645/650	ADS 319	A2/A2S 198/199	IA/IAS 409/419	MSK 624/634	MP/MSP 663/664	
							
Designation of application	Room thermostat	Double room thermostat.	Multistage room thermostat	Industrial room thermostat	Duct thermostat	Pipe mounting thermostat	
Measuring range	-45°C ... +15°C to 0°C ... +60°C	-30°C ... +30°C to 0°C ... +60°C	-45°C ... +15°C to 0°C ... +60°C	-30°C ... +30°C to 0°C ... +60°C	-30°C ... +40°C to +20°C ... +110°C	-10°C ... +35°C to +20°C ... +110°C	
Output signal	Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact	
Switching differential	Adjustable / not adjustable	Adjustable / not adjustable	Not adjustable	Adjustable / not adjustable	Adjustable / not adjustable	Adjustable / not adjustable	
Ambient temperature	See ordering information	See ordering information	See ordering information	See ordering information	-30°C ... +70°C	-30°C ... +70°C	
Protection	IP54	IP54	IP54	IP65	IP54	IP54	
Applications	HVAC Refrigeration	HVAC Refrigeration	HVAC Refrigeration	HVAC	HVAC	Process technology Water treatment	
Data sheet	H72170	H72146	H72137	H72116	H72177	H72175	
Instructions	H73624	H73170	H70311	H73111	H73624	H73663	
Approval	EN60730-1/ EN60730-2-9: Typ 2.B.H	EN60730-1/ EN60730-2-9: Typ 2.B.H	EN60730-1/ EN60730-2-9: Typ 2.B.H	EN60730-1/ EN60730-2-9: Typ 2.B.H	EN60730-1/ EN60730-2-9: Typ 2.B.H	EN60730-1/ EN60730-2-9: Typ 2.B.H	
Type of protection							

MST 624/634	MSK 624/634	MS...R 630/632	F/F...R 990/991/992/993	GS 657/658	D...R 302	M2S 104/114
						
Direct mounting thermostat	Duct thermostat	Remote sensing thermostat with limiter	Frost protection thermostat	Remote sensing thermostat	Double thermostat with remote sensor and limiter	Multistage thermostat with remote sensor
-30°C ... +40°C to +70°C ... +350°C	-30°C ... +40°C to +20°C ... +110°C	-30°C ... +40°C to +70°C ... +350°C	-5°C ... +15°C	+5°C ... +95°C and +20°C ... +150°C	-30°C ... +40°C to +70°C ... +350°C	-30°C ... +40°C to +70°C ... +350°C
Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact
Adjustable / not adjustable	Adjustable / not adjustable	Not adjustable	Not adjustable	Not adjustable	Adjustable / not adjustable	Not adjustable
-30°C ... +70°C	-30°C ... +70°C	-30°C ... +70°C	Max. operating temperature: +70°C Min. operating temperature: switch point + 2°C	-30°C ... +70°C	-30°C ... +70°C	-30°C ... +70°C
IP54	IP54	IP54	IP 54	IP54	IP54	IP54
Machine tools HVAC Process technology Water treatment	HVAC	Railways Machine tools HVAC Refrigeration Process technology	HVAC Refrigeration	Process technology	HVAC Refrigeration	Machine tools HVAC Refrigeration Process technology
H72174	H72177	H72173	H72123	H72179	H72142	H72139
H73624	H73624	H73624	H70821	H73624	H73170	H70311
EN60730-1/ EN60730-2-9: Typ 2.B.H	EN60730-1/ EN60730-2-9: Typ 2.B.H	EN60730-1/ EN60730-2-9: Typ 2.B.H	EN60730-1/ EN60730-2-9: Typ 2.B.H	EN60730-1/ EN60730-2-9: Typ 2.B.H	EN60730-1/ EN60730-2-9: Typ 2.B.H	EN60730-1/ EN60730-2-9: Typ 2.B.H

Overview thermostats

	L/LF 736/754	L...R 755	I/IS 404/414	IS...R 410/412	ISN/ISNT 471/472	ISP/ISPT 474	
							
Designation of application	Remote sensing thermostat, skeleton type	Remote sensing thermostat with limiter, skeleton type	Industrial thermostat with remote sensor	Industrial thermostat with remote sensor and limiter	Thermostat for shipbuilding	Compact thermostat for shipbuilding	
Measuring range	-30°C ... +40°C to +70°C ... +350°C	-30°C ... +40°C to +70°C ... +350°C	-30°C ... +40°C to +70°C ... +350°C	-30°C ... +40°C to +70°C ... +350°C	+20°C ... +110°C to +40°C ... +300°C	+5°C ... +95°C to +20°C ... +150°C	
Output signal	Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact	
Switching differential	Adjustable / not adjustable	Not adjustable	Adjustable / not adjustable	Not adjustable	Not adjustable	Not adjustable	
Ambient temperature	-30°C ... +70°C	-30°C ... +70°C	-30°C ... +70°C	-30°C ... +70°C	-30°C ... +70°C	-30°C ... +70°C	
Protection	IP00	IP00	IP65	IP65	IP65	IP65	
Applications	Machine tools	Machine tools	Railways Machine tools	Machine tools Process technology	Shipbuilding Engine manufacturing Railways	Shipbuilding Engine manufacturing Railways Hydraulics HVAC	
Data sheet	H72122	H72124	H72110	H72138	H72111	H72113	
Instructions	H70211	H70211	H73111	H73111	H73111	H73113	
Approval	EN60730-1/ EN60730-2-9: Typ 2.B.H	EN60730-1/ EN60730-2-9: Typ 2.B.H	EN60730-1/ EN60730-2-9: Typ 2.B.H	EN60730-1/ EN60730-2-9: Typ 2.B.H	ABS, BV, CCS, DNV, GL, KRS, LRS, RINA, RMRS EN60730-1/ EN60730-2-9: Typ 2.B.H	ABS, BV, CCS, DNV, GL, KRS, LRS, NKK, RINA, RMRS EN60730-1/ EN60730-2-9: Typ 2.B.H	
Type of protection							

I/IS 404/414	EXAS 409/419	«Simple Apparatus» conformity to ATEX 414	«Simple Apparatus» conformity to ATEX 419
			
Industrial thermostat with remote sensor	Ex Industrial room thermostat	Industrial room thermostat	Industrial room thermostat
-30°C ... +40°C to +70°C ... +350°C	-30°C ... +30°C to 0°C ... +60°C	-30°C ... +40°C to +70°C ... +350°C	-30°C ... +30°C to 0°C ... +60°C
Floating change-over contact	Floating change-over contact	Floating change-over contact	Floating change-over contact
Adjustable / not adjustable	Not adjustable	Not adjustable	Not adjustable
-30°C ... +70°C	-30°C ... +60°C	-30°C ... +65°C	-30°C ... max. +65°C
IP65	IP65	IP65	IP65
Railways Machine tools	II 2 G / D	Potentially explosive atmosphere	Potentially explosive atmosphere
H72110	H72128	H72183	H72182
H73111	H73172	H73173	H73173
EN60730-1/ EN60730-2-9: Typ 2.B.H	SEV 15 ATEX 0156 X	EN60730-1/ EN60730-2-9: Typ 2.B.H EN60079-0, EN60079-11 Zone 1 and 2, 21 and 22	EN60730-1/ EN60730-2-9: Typ 2.B.H EN60079-0, EN60079-11 Zone 1 and 2, 21 and 22
	Areas with gas explosion hazards: II 2 G Ex d e IIC T6 Gb; Areas with dust explosion hazards: II 2 D Ex tb IIIC T80°C Db		

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