TEMPERATURE MONITORING

- Electronic pressure monitoring
- Mechanical pressure monitoring

trafag
sensors controls


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Table of contents

Temperature monitoring

Trafag – the hightech sensor company

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.

Trafag product lines

Temperature monitoring

For 70 years Trafag thermostats have proven their robustness in order to withstand the most adverse environmental conditions. Industry usage ranges from air conditioning applications to engine and ship manufacturing 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. Trafag thermostats are available in various sensor and housing versions, with various Ex and ship approvals as well as in railway-compliant versions.

Mechanical pressure monitoring

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. Pressostats are available with Ex- and ship approvals as well as with railway conformity.

Pressure transmitters

The technically sophisticated pressure transmitters guarantee flawless pressure measurement. They meet the high requirements for long-term stability, vibration resistance, electromagnetic compatibility, shock resistance and temperature insensitivity. As a result, they have proven themselves for decades in a multitude of demanding applications under harsh environmental conditions. Trafag pressure transmitters are available in a wide variety of versions: various pressure and electrical connections, measuring processes, electrical output signals, approvals for explosion protection and shipboard use. Railway-compliant versions are also available.

Electronic pressure switches

The electronic pressure switches from Trafag are based on the million-times proven, in-house developed transmitter sensor technology. The superior technology and precise production guarantee a faultless functioning even where vibration resistance, electromagnetic compatibility, shock resistance or temperature insensitivity are a prerequisite. The robust pressure switches from Trafag monitor the pressure behavior of liquid and gaseous media, e.g. in plant construction and mechanical engineering, hydraulic systems, process engineering, rail vehicles, shipbuilding or in water treatment.

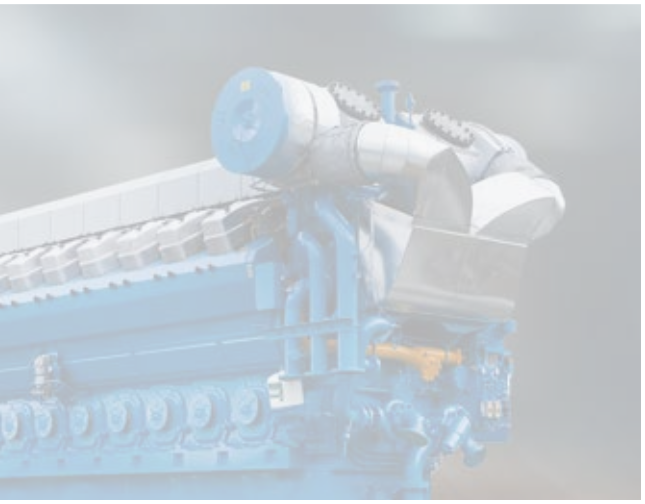
Markets and applications

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

Railways

- Brake systems
- Pantograph
- Air compressors
- Control and safety systems
- Air-conditioning systems

Test & measurement

- Engine and transmission test benches
- Mobile vehicle testing
- Testing of hydraulic components
- Material testing
- Brake and chassis test benches

Various

- Water treatment
- Level monitoring
- Machine building industry
- HVAC
- Oil and gas
- Chemical industry, process technology

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Measuring 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 DT-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

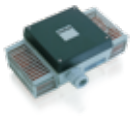
Accessories

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 temperature measuring instruments

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

Temperature monitoring

	A/AS/ASE 645/650	ADS 319	A2/A2S 198/199	IA/IAS 409/419	MSK 624/634	MP/MSP 663/664	
	page 19	page 24	page 29	page 34	page 39	page 44	
							
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	-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	IP54	IP54	IP54	IP65	IP54	IP54	
Applications	HVAC Refrigeration	HVAC Refrigeration	HVAC Refrigeration	HVAC	HVAC	Process technology Water treatment	
Approval / conformity	EN60730-1/ EN60730-2-9: Type 2.B.H	EN60730-1/ EN60730-2-9: Type 2.B.H	EN60730-1/ EN60730-2-9: Type 2.B.H	EN60730-1/ EN60730-2-9: Type 2.B.H	EN60730-1/ EN60730-2-9: Type 2.B.H	EN60730-1/ EN60730-2-9: Type 2.B.H	
Type of protection							
Data sheet	www.trafag.com/H72170	www.trafag.com/H72146	www.trafag.com/H72137	www.trafag.com/H72116	www.trafag.com/H72177	www.trafag.com/H72175	
Instructions	www.trafag.com/H73624	www.trafag.com/H73170	www.trafag.com/H70311	www.trafag.com/H73111	www.trafag.com/H73624	www.trafag.com/H73663	

	MST 624/634	M/MS 624/634	MS...R 630/632	F/F...R 990/991/992/993	GS 657/658	D...R 302	M2S 104/114
	page 49	page 54	page 60	page 65	page 69	page 74	page 79
							
	Direct mounting thermostat	Remote sensing 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 +70°C ... +350°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	Railways Machine tools HVAC Refrigeration Process technology	Railways Machine tools HVAC Refrigeration Process technology	HVAC Refrigeration	Process technology	HVAC Refrigeration	Machine tools HVAC Refrigeration Process technology
	EN60730-1/ EN60730-2-9: Type 2.B.H	EN60730-1/ EN60730-2-9: Type 2.B.H	EN60730-1/ EN60730-2-9: Type 2.B.H	EN60730-1/ EN60730-2-9: Type 2.B.H	EN60730-1/ EN60730-2-9: Type 2.B.H	EN60730-1/ EN60730-2-9: Type 2.B.H	EN60730-1/ EN60730-2-9: Type 2.B.H
	www.trafag.com/H72174	www.trafag.com/H72172	www.trafag.com/H72173	www.trafag.com/H72123	www.trafag.com/H72179	www.trafag.com/H72142	www.trafag.com/H72139
	www.trafag.com/H73624	www.trafag.com/H73624	www.trafag.com/H73624	www.trafag.com/H70821	www.trafag.com/H73624	www.trafag.com/H73170	www.trafag.com/H70311

Temperature monitoring

	L/LF 736/754	L...R 755	I/IS 404/414	IS...R 410/412	ISN/ISNT 471/472	ISP/ISPT 474	
	page 85	page 90	page 95	page 101	page 107	page 113	
							
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	
Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H	EN60730-1/ EN60730-2-9: Typ 2.B.H	EN60730-1/ EN60730-2-9: Type 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: Type 2.B.H	
Type of protection							
Data sheet	www.trafag.com/H72122	www.trafag.com/H72124	www.trafag.com/H72110	www.trafag.com/H72138	www.trafag.com/H72111	www.trafag.com/H72113	
Instructions	www.trafag.com/H70211	www.trafag.com/H70211	www.trafag.com/H73111	www.trafag.com/H73111	www.trafag.com/H73111	www.trafag.com/H73113	

To accessories

	EXS 404/414	**EXAS 409/419**	**«Simple Apparatus» conformity to ATEX 414**	**«Simple Apparatus» conformity to ATEX 419**
	page 119	page 125	page 130	page 136
				
	Ex Industrial thermostat with remote sensor	Ex Industrial room thermostat	Industrial room thermostat with remote sensor	Industrial room thermostat
	-30°C ... +40°C to +70°C ... +350°C°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
	Not adjustable	Not adjustable	Not adjustable	Not adjustable
	-30°C ...+70°C	-30°C ... +60°C	-30°C ...+70°C	-30°C ... max. +65°C
	IP65	IP65	IP65	IP65
	Ⓔx II 2G / D	Ⓔx II 2G / D	Potentially hazardous areas	Potentially hazardous areas
	SEV 15 ATEX 0156 X IECEx SEV 17.0010X	SEV 15 ATEX 0156 X IECEx SEV 17.0010X	EN60730-1/ EN60730-2-9: Type 2.B.H EN60079-0, EN60079-11 Zone 1 and 2, 21 and 22	EN60730-1/ EN60730-2-9: Type 2.B.H EN60079-0, EN60079-11 Zone 1 and 2, 21 and 22
	Areas with gas explosion hazards: II 2G Ex db eb IIC T6 Gb; Areas with dust explosion hazards: II 2D Ex tb IIIC T80°C Db	Areas with gas explosion hazards: II 2G Ex db eb IIC T6 Gb; Areas with dust explosion hazards: II 2D Ex tb IIIC T80°C Db		
	www.trafag.com/H72108	www.trafag.com/H72128	www.trafag.com/H72183	www.trafag.com/H72182
	www.trafag.com/H73172	www.trafag.com/H73172	www.trafag.com/H73173	www.trafag.com/H73173

Temperature transmitter

	DTP 8180	T 8100
	page 139	
		
Measuring principle	PT 1000, DIN EN 60751 class A, 2 conductors	PT100 (with/without)
Measuring range	-50°C ... +150°C / -58°F ... 302°F adjustable 50 ... 100 % FS	-50°C to +200°C
Output signal	4 ... 20 mA, 0 ... 5 VDC, 1 ... 6 VDC, 0 ... 10 VDC, switchable mA or V	4 ... 20 mA
Accuracy @ 25°C typ.	± 0.5 % FS typ.+ temperature sensor error	
Ambient temperature	-25°C ... +85°C	-40°C ... +85°C
Media temperature		-50°C ... +200°C
Protection	IP67	Min. IP65
Sensor (wetted parts)	1.4404/1.4435 (AISI316L)	1.4435/316L, MgO
Pressure connection (wetted parts)		
Housing	Steel, die cast metal galvanised display housing plastic	AlSi10Mg / Epoxy coated
Process connections	G1/8" m; G1/4" m; G1/2" m; 1/4" NPT m; 1/2" NPT m; Tri-Clamp DIN32676; Sanitary fitting DIN11851	
Electrical connections	Male electrical connector M12x1, 5-pole; Male electrical connector M12x1, 4-pole	Spring terminal 0.1...2.5 mm²
Applications	Machine tools Hydraulic power units Cooling and lubrication systems HVAC Process technology	Shipbuilding Railways HVAC Refrigeration
Approval / conformity		ABS
Data sheet	www.trafag.com/H72352	www.trafag.com/H72102
Instructions	www.trafag.com/H73352	www.trafag.com/H73102

AMBISTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for the measurement of pressure and temperature.

Applications

- HVAC
- Refrigeration

Features

- Switching differential adjustable or fixed
- Short response time
- Protection IP54
- Electrical connection on terminal screw

Technical Data			
Designation of application	Room thermostat	Switching differential	Adjustable / not adjustable
Measuring range	-45°C ... +15°C to 0°C ... +60°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

		XXX	XX	XX	XXX	XX	XX
Custom build code	External adjustment	**645**					
	Internal adjustment	**650**					
Microswitch	Small switching differential, not adjustable		**10**				
	Average switching differential, not adjustable		**11**				
	With gold plated contacts, not adjustable		**21**				
	Adjustable large switching differential		**24**				
	Adjustable standard switching differential		**25**				
Range	**Range [°C]** / **Operating temperature [°C]**						
	-45 ... +15 [1] / -45 ... +30			**05**			
	-30 ... +30 / -30 ... +40			**02**			
	-20 ... +40 [1] / -30 ... +50			**06**			
	0 ... +30 / -30 ... +50			**03**			
	+10 ... +40 / -30 ... +70			**04**			
	0 ... +60 / -30 ... +70			**12**			
Sensor	Stainless steel (1.4435 / AISI316L)				**401**		
	Copper				**402**		
	Copper nickel plated				**403**		
Fixing [2]	Console					**19**	
Accessories	Switchpoint locking [1]						**15**
	Switchpoint fixed and sealed upon customer's request [1]						**88**
	Switchpoint preset upon customer's request, no guarantee on switching accuracy [1]						**83**
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing						
	Railway version IEC 61373, category 2						**28**
	Outdoor application (vented)						**44**
	Cover with window						**77**

[1] Only with type 650 internal adjustment
[2] See data sheet H72106

Standard products (extra short lead time)

Product No.	Type Code	Temperature range [°C]	Switching differential [°C]	Operating temperature [°C]
A30	645 2503 402 19	0 ... +30	0.7 ... 6 (adjustable)	-30 ... +50
A33	645 2502 402 19	-30 ... +30	0.7 ... 6 (adjustable)	-30 ... +40
A40	645 2504 402 19	+10 ... +40	0.7 ... 6 (adjustable)	-30 ... +70
A60	645 2512 402 19	0 ... +60	0.7 ... 6 (adjustable)	-30 ... +70
AS30	650 2503 402 19	0 ... +30	0.7 ... 6 (adjustable)	-30 ... +50
AS33	650 2502 402 19	-30 ... +30	0.7 ... 6 (adjustable)	-30 ... +40
AS40	650 2504 402 19	+10 ... +40	0.7 ... 6 (adjustable)	-30 ... +70
AS60	650 2512 402 19	0 ... +60	0.7 ... 6 (adjustable)	-30 ... +70
ASE40	650 2404 402 19 0000 0000 00 00 00 01	+10 ... +40	5 (fixed)	-30 ... +70

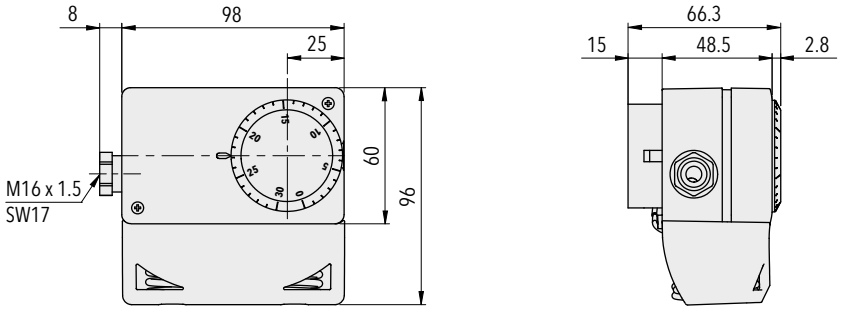
Specifications

Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	see table
Environmental conditions	Ambient temperature	see ordering information
	Storage temperature	Range < +40°C: -30...+50°C Range > +40°C: -30...+85°C
	Protection	IP54
	Humidity	Max. 95 % relative
Mechanical Data	Sensor housing	see ordering information
	Filling	Liquid
	Housing	PC/ABS-Blend V0
	Screwed cable gland	PA, Polyamid
	Installation	any position
	Weight	~ 300 g
Microswitch	Rating	see table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	U ≤ 250V: 1.45 kV U ≤ 500V: 2 kV terminal ground
	Life time (mechanical)	Microswitch 10/11/25: 20 Mio. cycles Microswitch 21: 0.5 Mio. cycles Microswitch 24: 0.3 Mio. cycles
Electrical connection	Cable gland	M16x1.5 Cable-Ø 4...9 mm
	Terminal screw	3 x 1...2.5 mm²

Additional information

Documents	Data sheet	www.trafag.com/H72170
	Instructions	www.trafag.com/H73624
	Flyer	www.trafag.com/H70961

Dimensions



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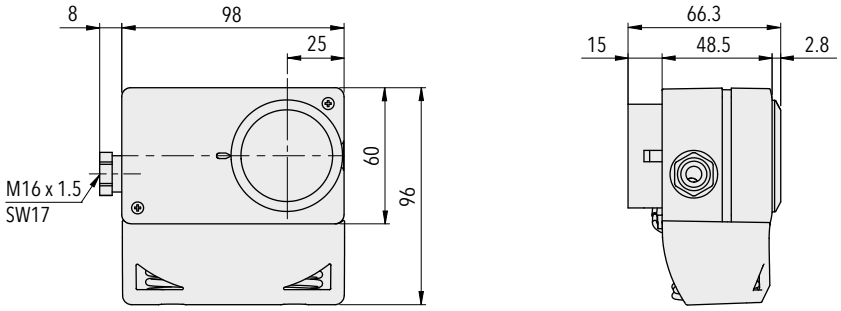

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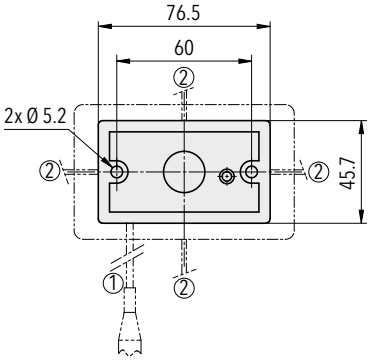
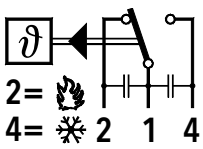


6XX.XXXX.XXX.**19**.XX

Switching differential typ.		
Range	**[°C]**	–45 ... +15 –30 ... +30 –20 ... +40 0 ... +30 +10 ... +40 0 ... +60
Microswitch 10 Switching differential (fixed value, not adjustable)	**[°C]**	0.3
Microswitch 11 Switching differential (fixed value, not adjustable)	**[°C]**	0.7
Microswitch 21 Switching differential (fixed value, not adjustable)	**[°C]**	0.7
Microswitch 24 Switching differential (adjustable value)	**[°C]**	3 ... 10
Microswitch 25 Switching differential (adjustable value)	**[°C]**	0.7 ... 6

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
10	Small switching differential, not adjustable	125 V, 10 (1.5) A 250 V, 10 (1.25) A	250 V, 0.2 (0.02) A 125 V, 0.4 (0.03) A 30 V, 2 (1) A 14 V, 15 (2.5) A
11	Average switching differential, not adjustable	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (1.5) A
21	Gold plated contacts, not adjustable	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A
25	Adjustable standard switching differential	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (2.5) A
24	Adjustable large switching differential	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.3 (0.2) A 125 V, 0.75 (0.4) A 30 V, 15 (1.5) A 14 V, 15 (1.5) A

Electrical Connection



645/650

AMBI DUOSTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for the measurement of pressure and temperature.

Applications

- HVAC
- Refrigeration

Features

- With 2 individual measuring systems
- Protection IP54
- Electrical connection on terminal screw

Technical Data			
Designation of application	Double room thermostat	Switching differential	Adjustable / not adjustable
Measuring range	-30°C ... +30°C to 0°C ... +60°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

			319 . XX	XX	XXX	XX	XX
Microswitch	Small switching differential, not adjustable		10				
	Average switching differential, not adjustable		11				
	With gold plated contacts, switching differential not adjustable		21				
	Adjustable standard switching differential		25				
Range	**Range [°C]**	**Operating temperature [°C]**					
	-30 ... +30	-30 ... +40		02			
	-20 ... +40	-30 ... +50		06			
	0 ... +30	-30 ... +50		03			
	+10 ... +40	-30 ... +70		04			
	0 ... +60	-30 ... +70		12			
Sensor	Copper				402		
	Copper nickel plated				403		
Fixing [2]	Mounting bracket					19	
Accessories	Switchpoint locking						15
	Switchpoint fixed and sealed upon customer's request						88
	Switchpoint preset upon customer's request, no guarantee on switching accuracy						83
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing						
	Railway version IEC 61373, category 2						28
	Outdoor application (vented)						44

[2] See data sheet H72106

Standard products (extra short lead time)

Product No.	Type Code	Temperature range [°C]	Switching differential [°C]	Operating temperature [°C]
ADS30	319 2503 402 19	0 ... +30	0.7 ... 6 (adjustable)	-30 ... +50
ADS33	319 2502 402 19	-30 ... +30	0.7 ... 6 (adjustable)	-30 ... +40
ADS60	319 2512 402 19	0 ... +60	0.7 ... 6 (adjustable)	-30 ... +70

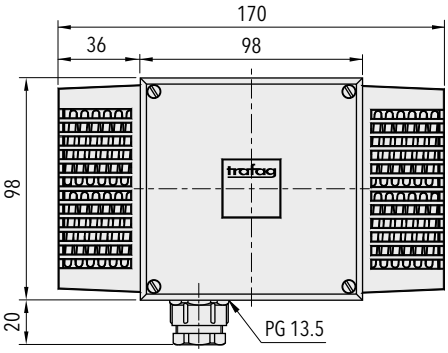
Specifications

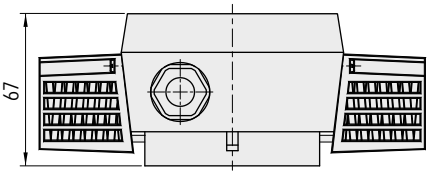
Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	see table
Environmental conditions	Ambient temperature	see ordering information
	Storage temperature	Range < +40°C: -30...+50°C Range > +40°C: -30...+85°C
	Protection	IP54
	Humidity	Max. 95 % relative
Mechanical Data	Sensor housing	see ordering information
	Filling	Liquid
	Housing	Noryl
	Screwed cable gland	PA, Polyamid
	Installation	any position
	Weight	~ 220 g
Microswitch	Rating	see table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	U ≤ 250V: 1.45 kV U ≤ 500V: 2 kV terminal ground
	Life time (mechanical)	Microswitch 10/11/25: 20 Mio. cycles Microswitch 21: 0.5 Mio. cycles
Electrical connection	Cable gland	PG13.5 Cable-Ø 5...12.5 mm
	Terminal screw	3 x 1...2.5 mm²

Additional information

Documents	Data sheet	www.trafag.com/H72146
	Instructions	www.trafag.com/H73170
	Flyer	www.trafag.com/H70960

Dimensions





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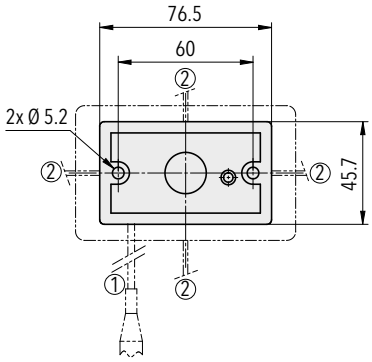
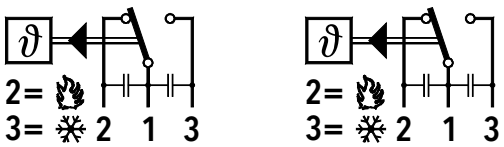


319.XXXX.XXX.**19**.XX

Switching differential typ.		
Range	**[°C]**	–30 ... +30 –20 ... +40 0 ... +30 +10 ... +40 0 ... +60
Microswitch 10 Switching differential (fixed value, not adjustable)	**[°C]**	0.3
Microswitch 11 Switching differential (fixed value, not adjustable)	**[°C]**	0.7
Microswitch 21 Switching differential (fixed value, not adjustable)	**[°C]**	0.7
Microswitch 25 Switching differential (adjustable value)	**[°C]**	0.7 ... 6

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
10	Small switching differential, not adjustable	125 V, 10 (1.5) A 250 V, 10 (1.25) A	250 V, 0.2 (0.02) A 125 V, 0.4 (0.03) A 30 V, 2 (1) A 14 V, 15 (2.5) A
11	Average switching differential, not adjustable	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (1.5) A
21	Gold plated contacts, not adjustable	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A
25	Adjustable standard switching differential	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (2.5) A

Electrical Connection



319

ALTERO AMBISTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for the measurement of pressure and temperature.

Applications

- HVAC
- Refrigeration

Features

- With 1 adjustable step between 2 stages
- Short response time
- Protection IP54
- Electrical connection on terminal screw

Technical Data			
Designation of application	Multistage room thermostat	Switching differential	Not adjustable
Measuring range	-45°C ... +15°C to 0°C ... +60°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

		XXX	XX	XX	XXX	XX	XX
Custom build code	Internal adjustment	198					
	External adjustment	199					
Microswitch	Small switching differential, not adjustable		10				
	Average switching differential, not adjustable		11				
	With gold plated contacts, switching differential not adjustable		21				

Range	Range [°C]	Operating temperature [°C]	
	-45 ... +15	-45 ... +30	05
	-30 ... +30	-30 ... +40	02
	-20 ... +40	-30 ... +50	06
	0 ... +30	-30 ... +50	03
	+10 ... +40	-30 ... +70	04
	0 ... +60	-30 ... +70	12

Sensor	Stainless steel (1.4435 / AISI316L)				401		
	Copper				402		
	Copper nickel plated				403		
Fixing [2]	Mounting bracket					19	

Accessories	Switchpoint locking [1]	15
	Switchpoint fixed and sealed upon customer's request [1]	88
	Switchpoint preset upon customer's request, no guarantee on switching accuracy [1]	83
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing	
	Railway version IEC 61373, category 2	28
	Outdoor application (vented)	44
	Desired stage difference to be indicated when ordering (without indication = switches synchronous) Switch 1 on scale, difference switch 2 to scale -6 °C...+15 °C Minimum distance between switches: Switch 10: ±1 °C Switch 11/21: ±2 °C	

[1] Only with type 198, internal adjustment
[2] See data sheet H72106

Standard products (extra short lead time)

Product No.	Type Code	Temperature range [°C]	Switching differential [°C]	Smallest stage difference [°C]	Largest stage difference [°C]	Operating temperature [°C]
A230	199 1103 402 19	0 ... +30	0.7 (fixed)	-6	15	-30 ... +50
A233	199 1102 402 19	-30 ... +30	0.7 (fixed)	-6	15	-30 ... +40
A260	199 1112 402 19	0 ... +60	0.7 (fixed)	-6	15	-30 ... +70
A2S30	198 1103 402 19	0 ... +30	0.7 (fixed)	-6	15	-30 ...+50
A2S33	198 1102 402 19	-30 ... +30	0.7 (fixed)	-6	15	-30 ... +40
A2S60	198 1112 402 19	0 ... +60	0.7 (fixed)	-6	15	-30 ... +70

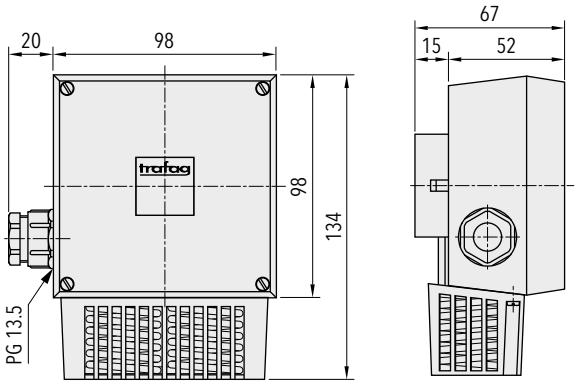
Specifications

Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	see table
Environmental conditions	Ambient temperature	see ordering information
	Storage temperature	Range < +40°C: -30...+50°C Range > +40°C: -30...+85°C
	Protection	IP54
	Humidity	Max. 95 % relative
Mechanical Data	Sensor housing	see ordering information
	Filling	Liquid
	Housing	Noryl
	Screwed cable gland	PA, Polyamid
	Installation	any position
	Weight	~ 480 g
Microswitch	Rating	see table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	U ≤ 250V: 1.45 kV U ≤ 500V: 2 kV terminal ground
	Life time (mechanical)	Microswitch 10/11: 20 Mio. cycles Microswitch 21: 0.5 Mio. cycles
Electrical connection	Cable gland	PG13.5 Cable-Ø 5...12.5 mm
	Terminal screw	6 x 1...2.5 mm²

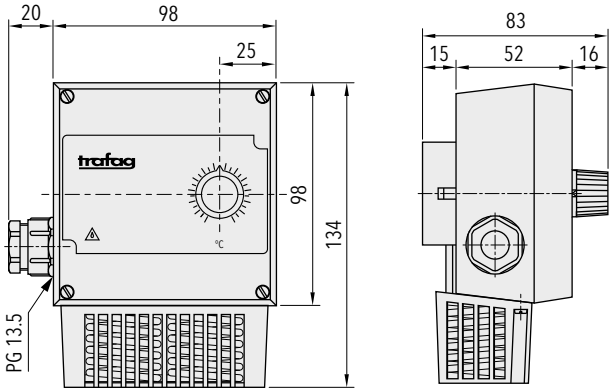
Additional information

Documents	Data sheet	www.trafag.com/H72137
	Instructions	www.trafag.com/H70311
	Flyer	www.trafag.com/H70962

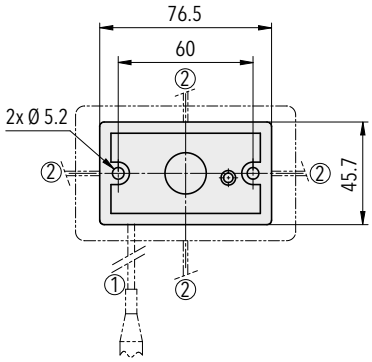
Dimensions



198.XXXX.XXX.XX.XX



199.XXXX.XXX.XX.XX

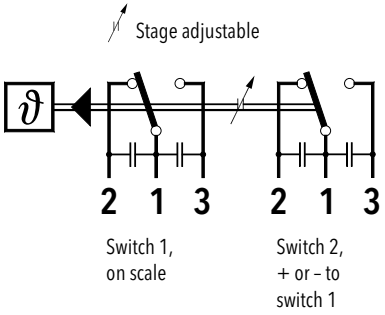


19X.XXXX.XXX.**19**.XX

Switching differential typ.		
Range	**[°C]**	–45 ... +15 –30 ... +30 –20 ... +40 0 ... +30 +10 ... +40 0 ... +60
Microswitch 10 Switching differential (fixed value, not adjustable)	**[°C]**	0.3
Microswitch 11 Switching differential (fixed value, not adjustable)	**[°C]**	0.7
Microswitch 21 Switching differential (fixed value, not adjustable)	**[°C]**	0.7

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
10	Small switching differential, not adjustable	125 V, 10 (1.5) A 250 V, 10 (1.25) A	250 V, 0.2 (0.02) A 125 V, 0.4 (0.03) A 30 V, 2 (1) A 14 V, 15 (2.5) A
11	Average switching differential, not adjustable	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (1.5) A
21	Gold plated contacts, not adjustable	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A

Electrical Connection



INDU AMBISTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for measurement of pressure and temperature.

Applications

- HVAC

Features

- Compact design
- Rugged housing
- Protection IP65
- Any mounting position possible

Technical Data			
Designation of application	Industrial room thermostat	Switching differential	Adjustable / not adjustable
Measuring range	-30°C ... +30°C to 0°C ... +60°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

			XXX	XX	XX	XXXXXX	XX
Custom build code	External adjustment		**409**				
	Internal adjustment		**419**				
Microswitch	Small switching differential, not adjustable			**10**			
	Average switching differential, not adjustable			**11**			
	With gold plated contacts, switching differential not adjustable			**21**			
	Adjustable standard switching differential			**25**			
Range	**Range [°C]**	**Operating temperature [°C]**					
	-30 ... +30	-30 ... +40			**02**		
	-20 ... +40	-30 ... +50			**06**		
	+5 ... +35	-30 ... +70			**10**		
	0 ... +60	-30 ... +70			**12**		
Sensor [1] / Fixing [2]	Sensor: Copper; Fixation: Bracket (open sensor coil)					**522.27**	
	Sensor: Copper nickel plated; Fixation: Bracket (open sensor coil)					**523.27**	
	Sensor: Copper; Fixation: Bracket, with protection tube L=215mm, steel nickel plated					**422.27.2743.0215**	
	Sensor: Copper nickel plated; Fixation: Bracket, with protection tube L=215mm, steel nickel plated					**423.27.2743.0215**	
Accessories	Switchpoint locking [3]						**15**
	Switchpoint fixed and sealed upon customer's request [3]						**88**
	Switchpoint preset upon customer's request, no guarantee on switching accuracy [3]						**83**
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing						
	Railway version IEC 61373, category 2						**28**
	Outdoor application (vented)						**44**

[1] See data sheet H72114/H72163
[2] See data sheet H72106
[3] Only with type 419, internal adjustment

Standard products (extra short lead time)

Product No.	Type Code	Temperature range [°C]	Switching differential [°C]	Operating temperature [°C]
IA33	409 2502 522 27	-30 ... +30	0.7 ... 6 (adjustable)	-30 ... +40
IA35	409 2510 522 27	+5 ... +35	0.7 ... 6 (adjustable)	-30 ... +50
IA60	409 2512 522 27	0 ... +60	0.7 ... 6 (adjustable)	-30 ... +70
IAS33	419 2502 522 27	-30 ... +30	0.7 ... 6 (adjustable)	-30 ... +40
IAS35	419 2510 522 27	+5 ... +35	0.7 ... 6 (adjustable)	-30 ... +50
IAS60	419 2512 522 27	0 ... +60	0.7 ... 6 (adjustable)	-30 ... +70

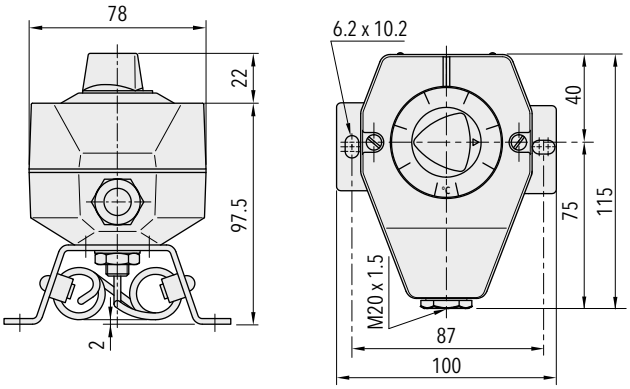
Specifications

Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	See table
Environmental conditions	Ambient temperature	see ordering information
	Storage temperature	Range ≤ +40°C: -30 ... +50°C Range > +40°C: -30 ... +85°C
	Protection	IP65
	Humidity	Max. 95% relative
Mechanical Data	Sensor housing	See ordering information
	Filling	Liquid
	Housing	AlSi9Cu3, coated
	Screwed cable gland	Brass nickel plated
	Installation	any position
	Weight	~ 950 g
Microswitch	Rating	See table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	U ≤ 250V: 1.45 kV / U ≤ 500V: 2 kV terminal ground
	Life time (mechanical)	Microswitch 10/11/25: 20 Mio. cycles Microswitch 21: 0.5 Mio. cycles
Electrical connection	Cable gland	M20x1.5 Cable-Ø 4...10 mm
	Terminal screw	3 x 1...2.5 mm²

Additional information

Documents	Data sheet	www.trafag.com/H72116
	Instructions	www.trafag.com/H73111
	Flyer	www.trafag.com/H70964

Dimensions



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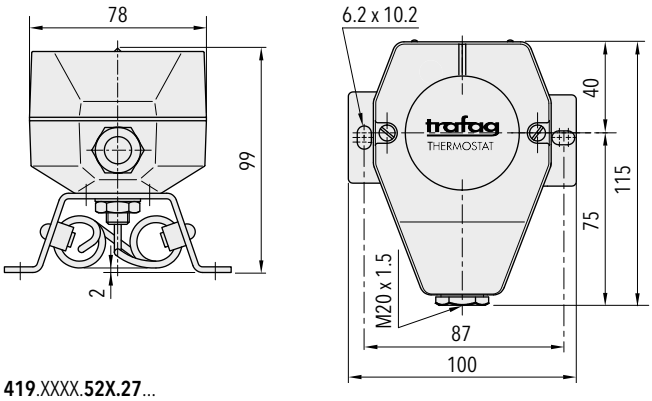
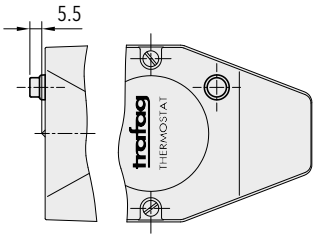
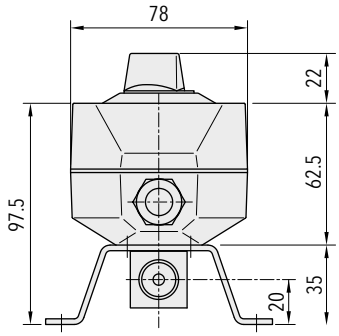
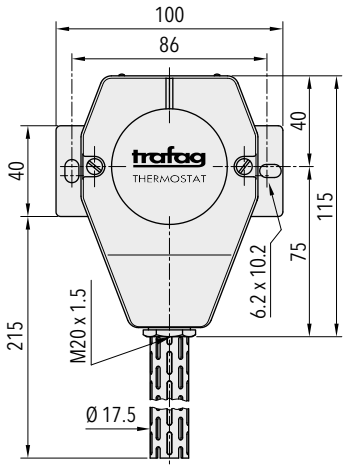


419.XXXX.**52X.27**...



Accessory 14



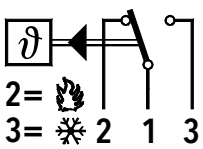


4X9.XXXX.**42X.27.2743.0215**

Switching differential typ.		
Range	**[°C]**	–30 ... +30 –20 ... +40 +5 ... +35 0 ... +60
Microswitch 10 Switching differential (fixed value, not adjustable)	**[°C]**	0.3
Microswitch 11 Switching differential (fixed value, not adjustable)	**[°C]**	0.7
Microswitch 21 Switching differential (fixed value, not adjustable)	**[°C]**	0.7
Microswitch 25 Switching differential (adjustable value)	**[°C]**	0.7 ... 6

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
10	Small switching differential, not adjustable	125 V, 10 (1.5) A 250 V, 10 (1.25) A	250 V, 0.2 (0.02) A 125 V, 0.4 (0.03) A 30 V, 2 (1) A 14 V, 15 (2.5) A
11	Average switching differential, not adjustable	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (1.5) A
21	Gold plated contacts, not adjustable	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A
25	Adjustable standard switching differential	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (2.5) A

Electrical Connection



409 / 419

DUCT THERMOSTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for the measurement of pressure and temperature.

Applications

- HVAC

Features

- Short response time
- Protection IP54
- Electrical connection on terminal screw

Technical Data			
Designation of application	Duct thermostat	Switching differential	Adjustable / not adjustable
Measuring range	-30°C ... +40°C to +20°C ... +110°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

		XXX	XX	XX	XXX	XX	XX
Custom build code	External adjustment	**624**					
	Internal adjustment	**634**					

Microswitch	Small switching differential, not adjustable	**10**
	Average switching differential, not adjustable	**11**
	With gold plated contacts, not adjustable	**21**
	Adjustable large switching differential	**24**
	Adjustable standard switching differential	**25**

	Range [°C]	Sensor max. [°C]	
Range	-30 ... 40	45	**01**
	-10 ... 25 [3]	50	**07**
	0 ... 35	50	**09**
	15 ... 30	60	**17**
	10 ... 45	85	**11**
	10 ... 80 [3]	100	**13**
	5 ... 95	105	**20**
	20 ... 110 [3]	115	**23**

	Range	Sensor diameter [mm]	Sensor material	
Sensor [1]	20,23	Ø7	Copper	**322**
	20,23	Ø9	Copper	**332**

Range	Sensor diameter [mm]	Sensor material	
01, 07, 09, 11, 13, 17	Ø7	Copper	**422**
01, 07, 09, 11, 13, 17	Ø9	Copper	**432**

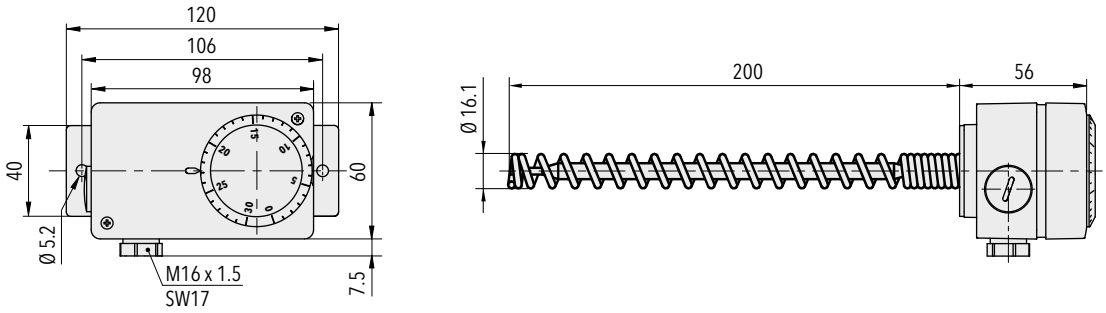
Fixing [2]	With spring tube and flange, for direct mounting, Ø 16.5 x 200mm	**30**

Accessories	Switchpoint locking [3]	**15**
	Switchpoint fixed and sealed upon customer's request [3]	**88**
	Switchpoint preset upon customer's request, no guarantee on switching accuracy [3]	**83**
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing	
	Condensator over Pin 1-2	**12**
	Condensator over Pin 1-3	**13**
	Condensators over Pin 1-2 / 1-3	**23**
	Railway version IEC 61373, category 2	**28**
	Outdoor application (vented)	**44**
	Cover with window	**77**

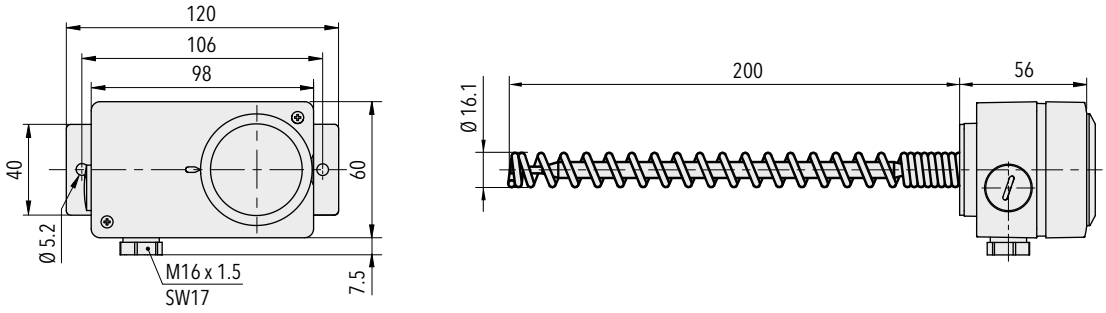
[1] See data sheet H72114/H72163
[2] See data sheet H72106
[3] Only with type 634 internal adjustment

Standard products (extra short lead time)					
Product No.	**Type Code**	**Sensor material**	**Temperature range [°C]**	**Switching differential [°C]**	**Sensor max. [°C]**
MSK35	634 2509 432 30	Copper	0 ... +35	0.7 ... 10 (adjustable)	50
MSK40	634 2501 432 30	Copper	-30 ... +40	0.7 ... 10 (adjustable)	45
MSK80	634 2513 432 30	Copper	+10 ... +80	0.7 ... 10 (adjustable)	100

Dimensions



624.XXXX.XXX.XX.XX



634.XXXX.XXX.XX.XX

Specifications

Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	see table
	Switching point	Temperature compensated with bimetal switch lever
Environmental conditions	Ambient temperature	-30 ... +70°C (important: Temperature at sensor may not exceed maximum sensor temperature)
	Storage temperature	Range ≤ +45°C: -30...+50°C Range > +45°C: -30...+85°C
	Protection	IP54
	Humidity	Max. 95 % relative
Mechanical Data	Sensor housing	See ordering information
	Filling	Liquid
	Housing	PC/ABS-Blend V0
	Screwed cable gland	PA, Polyamid
	Installation	Any position
	Weight	~ 220 g
Microswitch	Rating	See table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	U ≤ 250V: 1.45 kV U ≤ 500V: 2 kV terminal ground
	Life time (mechanical)	Microrupteur 10/11/25: 20 Mio. cycles Microswitch 21: 0.5 Mio. cycles Microswitch 24: 0.3 Mio. cycles
Electrical connection	Cable gland	M16x1.5 Cable-Ø 4...9 mm
	Terminal screw	3 x 1...2.5 mm²

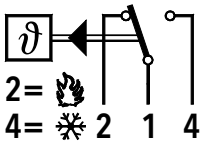
Additional information

Documents	Data sheet	www.trafag.com/H72177
	Instructions	www.trafag.com/H73624
	Flyer	www.trafag.com/H70957

Switching differential typ.			
Range	**[°C]**	–30 ... +40 –10 ... +25 0 ... +35 +15 ... +30 +10 ... +45 +10 ... +80	+5 ... +95 +20 ... +110
Microswitch 10 Switching differential (fixed value, not adjustable)	**[°C]**	0.3	0.8
Microswitch 11/21 Switching differential (fixed value, not adjustable)	**[°C]**	0.7	2
Microswitch 24 Switching differential (adjustable value)	**[°C]**	4 ... 21	5.5 ... 26
Microswitch 25 Switching differential (adjustable value)	**[°C]**	0.7 ... 10	2 ... 12

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
10	Small switching differential, not adjustable	125 V, 10 (1.5) A 250 V, 10 (1.25) A	250 V, 0.2 (0.02) A 125 V, 0.4 (0.03) A 30 V, 2 (1) A 14 V, 15 (2.5) A
11	Average switching differential, not adjustable	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (1.5) A
21	Gold plated contacts, not adjustable	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A
25	Adjustable standard switching differential	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (2.5) A
24	Adjustable large switching differential	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.3 (0.2) A 125 V, 0.75 (0.4) A 30 V, 15 (1.5) A 14 V, 15 (1.5) A

Electrical Connection



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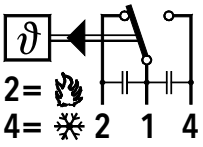


with accessory**23**

PIPE MOUNTING THERMOSTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for the measurement of pressure and temperature.

Applications

- Process technology
- Water treatment

Features

- For pipe or barrel mounting
- Short response time
- Protection IP54
- Electrical connection on terminal screw

Technical Data			
Designation of application	Pipe mounting thermostat	Switching differential	Adjustable / not adjustable
Measuring range	-10°C ... +35°C to +20°C ... +110°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

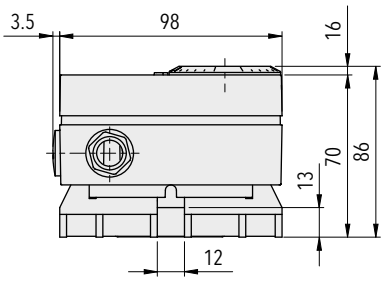
Ordering information/type code

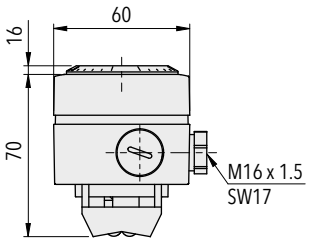
			XXX	XX	XX	XXX	XX	XX
Custom build code	External adjustment		**663**					
	Internal adjustment		**664**					
Microswitch	Small switching differential, not adjustable			**10**				
	Average switching differential, not adjustable			**11**				
	Adjustable standard switching differential			**25**				
Range	**Range [°C]**	**Sensor max. [°C]**						
	-10 ... 35	50			**94**			
	-10 ... 80 [1]	85			**95**			
	0 ... 45 [1]	85			**93**			
	10 ... 55 [1]	85			**22**			
	5 ... 95	105			**20**			
	20 ... 110 [1]	115			**23**			
Sensor	Copper					**502**		
	Copper nickel plated					**503**		
Fixing	Standard with strap						**00**	
Accessories	Switchpoint locking [1]							**15**
	Switchpoint fixed and sealed upon customer's request [1]							**88**
	Switchpoint preset upon customer's request, no guarantee on switching accuracy [1]							**83**
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing							
	Condensator over Pin 1-2							**12**
	Condensator over Pin 1-3							**13**
	Condensators over Pin 1-2 / 1-3							**23**
	Outdoor application (vented)							**44**
	Cover with window							**77**

[1] Only with type 664 internal adjustment

Standard products (extra short lead time)				
Product No.	**Type Code**	**Temperature range [°C]**	**Switching differential [°C]**	**Sensor max. [°C]**
MSP35	664 2594 502 00	-10 ... +35	3.7 ... 14 (adjustable)	50
MSP80	664 2595 502 00	-10 ... +80	3.7 ... 14 (adjustable)	85
MSP95	664 2520 502 00	+5 ... +95	3.7 ... 14 (adjustable)	105
MSP110	664 2523 502 00	+20 ... +110	3.7 ... 14 (adjustable)	115

Dimensions





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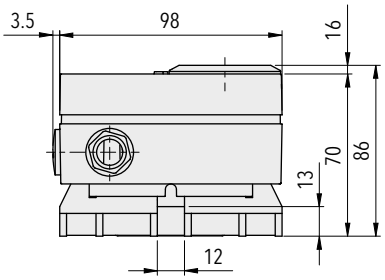

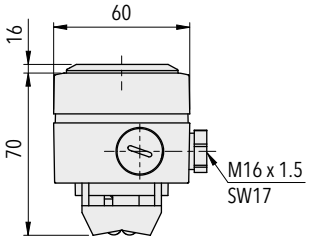

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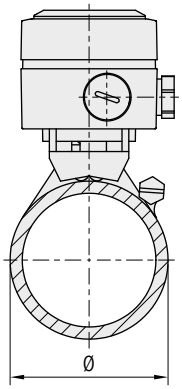


The supplied strap (500mm) is sufficient for double winding upto pipe diameter of 65mm (2"), single winding upto pipe diameter 160mm.
Determination of strap length:
Strap length [mm]
= 180 [mm] + 5 x $ø_{Pipe}$ [mm] (twice wound)

Specifications

Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	Microswitch 10 (not adjustable): 2.5oC 11 (not adjustable): 3.7oC 25 (adjustable): 3.7...14oC
	Switching point	Temperature compensated with bimetal switch lever
Environmental conditions	Ambient temperature	-30 ... +70°C (important: Temperature at sensor may not exceed maximum sensor temperature)
	Storage temperature	Range ≤ +45°C: -30...+50°C Range > +45°C: -30...+85°C
	Protection	IP54
	Humidity	Max. 95 % relative
Mechanical Data	Sensor housing	See ordering information
	Filling	Liquid
	Housing	PC/ABS-Blend V0
	Screwed cable gland	PA, Polyamid
	Installation	Any position
	Weight	~ 220 g
Microswitch	Rating	See table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	U ≤ 250V: 1.45 kV U ≤ 500V: 2 kV terminal ground
	Life time (mechanical)	20 Mio. cycles
Electrical connection	Cable gland	M16x1.5 Cable-Ø 4...9 mm
	Terminal screw	3 x 1...2.5 mm²

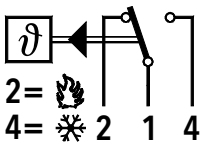
Additional information

Documents	Data sheet	www.trafag.com/H72175
	Instructions	www.trafag.com/H73663
	Flyer	www.trafag.com/H70958

Electrical data switch

		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
10	Small switching differential, not adjustable	125 V, 10 (1.5) A 250 V, 10 (1.25) A	250 V, 0.2 (0.02) A 125 V, 0.4 (0.03) A 30 V, 2 (1) A 14 V, 15 (2.5) A
11	Average switching differential, not adjustable	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (1.5) A
25	Adjustable standard switching differential	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (2.5) A

Electrical Connection



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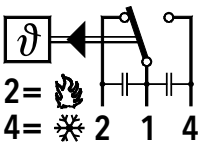


with accessory **23**

MINISTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for measurement of pressure and temperature.

Applications

- Machine tools
- HVAC
- Process technology
- Water treatment

Features

- Short response time
- Protection IP54
- Electrical connection on terminal screw

Technical Data			
Designation of application	Direct mounting thermostat	Switching differential	Adjustable / not adjustable
Measuring range	-30°C ... +40°C to +70°C ... +350°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

		XXX	XX	XXXXXXXXX	XXXX	XXXX	XX
Custom build code	External adjustment	**624**					
	Internal adjustment	**634**					
Microswitch	Small switching differential, not adjustable		**10**				
	Average switching differential, not adjustable		**11**				
	With gold plated contacts, switching differential not adjustable		**21**				
	Adjustable large switching differential		**24**				
	Adjustable standard switching differential		**25**				

Range	**Sensor material**	**Sensor diameter [mm]**	**Range [°C]**	**Sensor max. [°C]**	
	Cu	7	-30...+40	45	**01.422.12**
	Cu [2]	7	-10...+25	50	**07.422.12**
	Cu	7	0...+35	50	**09.422.12**
	Cu	7	+10...+45	85	**11.422.12**
	Cu [2]	7	+10...+80	100	**13.422.12**
	Cu	7	+15...+30	60	**17.422.12**
	Cu	7	-10...+35	50	**94.322.12**
	Cu [2]	7	-10...+80	85	**95.322.12**
	Cu	7	+5...+95	105	**20.322.12**
	Cu [2]	7	+20...+110	115	**23.322.12**
	Cu	7	+20...+150	165	**31.122.12**
	Cu	7	+20...+230	250	**24.022.35**
	Cu [2]	7	+30...+300	330	**53.022.35**
	Cu	7	+70...+350	380	**54.022.35**

Protection tube	For fixing option 12, brass nickel plated, G1/2" [1]	**1216**	
	For fixing option 12, stainless steel, G1/2" [1]	**1211**	
	For fixing option 35, brass nickel plated, G1/2" [1]	**8316**	
	For fixing option 35, stainless steel, G1/2" [1]	**8411**	

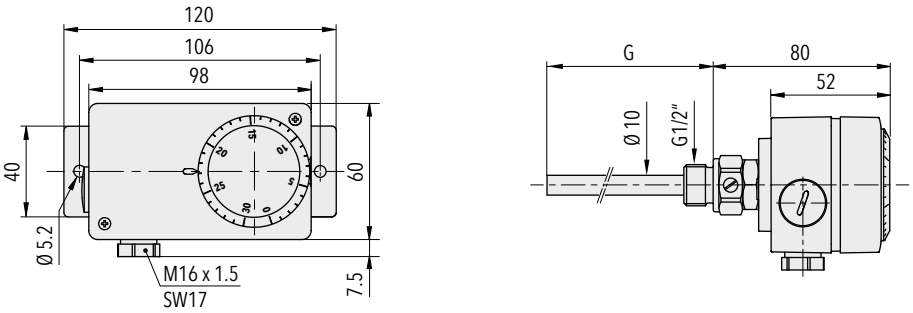
Protection tube length	**Suitable for sensor**	**Protection tube length [mm]**	
	XX.122.XX [1]	110	**0110**
	XX.122.XX; XX.322.XX [1]	150	**0150**
	XX.122.XX; XX.322.XX; XX.422.XX [1]	200	**0200**
	XX.122.XX; XX.322.XX; XX.422.XX [1]	400	**0400**

Accessories	Switchpoint locking [2]	**15**
	Switchpoint fixed and sealed upon customer's request [2]	**88**
	Switchpoint preset upon customer's request, no guarantee on switching accuracy [2]	**83**
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing	
	Condensator over Pin 1-2	**12**
	Condensator over Pin 1-3	**13**
	Condensators over Pin 1-2 / 1-3	**23**
	Railway version IEC 61373, category 2	**28**
	Outdoor application (vented)	**44**
	Cover with window	**77**

[1] See data sheet H72114/H72163
[2] Only with type 634 internal adjustment

Standard products (extra short lead time)					
Product No.	**Type Code**	**Temperature range [°C]**	**Protection tube length [mm]**	**Switching differential [°C]**	**Sensor max. [°C]**
MST8015	634 2595 322 12 1216 0150	-10 ... +80	150	2 ... 12 (adjustable)	85
MST8040	634 2595 322 12 1216 0400	-10 ... +80	400	2 ... 12 (adjustable)	85
MST9511	634 2520 332 12 1217 0110	+5 ... +95	110	2 ... 12 (adjustable)	105
MST9515	634 2520 322 12 1216 0150	+5 ... +95	150	2 ... 12 (adjustable)	105
MST9540	634 2520 322 12 1216 0400	+5 ... +95	400	2 ... 12 (adjustable)	105
MST15015	634 2531 122 12 1216 0150	+20 ... +150	150	2.5 ... 16 (adjustable)	165
MST15040	634 2531 122 12 1216 0400	+20 ... +150	400	2.5 ... 16 (adjustable)	165

Dimensions



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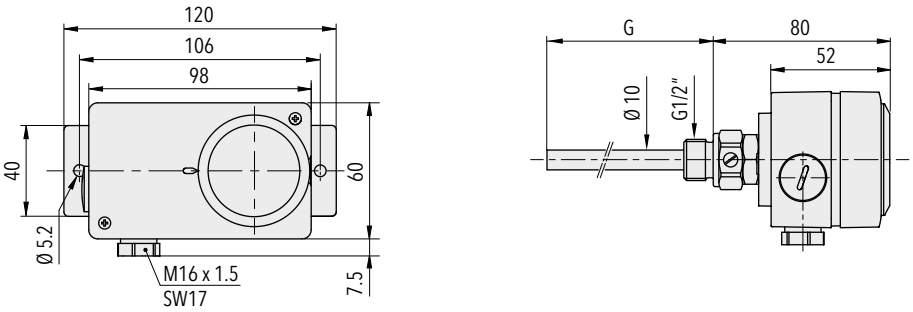

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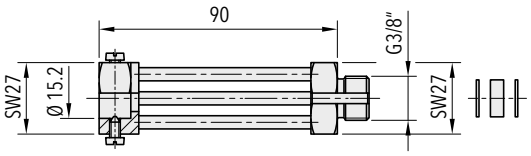


Fixation **35**

Specifications

Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	See table
	Switching point	Temperature compensated with bimetal switch lever
Environmental conditions	Ambient temperature	Range ≤ +45°C: -30°C ... +50°C Range +45°C ... +250°C: -30°C ... +70°C Range > + 250°C: -10°C ... +70°C (Important: Temperature at sensor may not exceed maximum sensortemperature)
	Storage temperature	Range ≤ +45°C: -30°C ...+50°C Range > +45°C: -30°C ... +85°C
	Protection	IP54
	Humidity	Max. 95 % relative
Mechanical Data	Sensor housing	See ordering information
	Filling	Liquid
	Protection tube	See ordering information
	Housing	PC/ABS-Blend V0
	Screwed cable gland	Polyamide (PA)
	Installation	any position
	Weight	~ 430 g
Microswitch	Rating	See table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	U ≤ 250V: 1.45 kV U ≤ 500V: 2 kV terminal ground
	Life time (mechanical)	Microswitch 10/11/25: 20 Mio. cycles Microswitch 21: 0.5 Mio. cycles Microswitch 24: 0.3 Mio. cycles
Electrical connection	Cable gland	M16x1.5 Cable-Ø 4...9 mm
	Terminal screw	3 x 1 ... 2.5 mm²

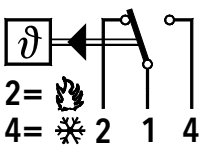
Additional information

Documents	Data sheet	www.trafag.com/H72174
	Instructions	www.trafag.com/H73624
	Flyer	www.trafag.com/H70955

Switching differential typ.						
Measuring range	**[°C]**	–30 ... +40 –10 ... +25 0 ... +35 +15 ... +30 +10 ... +45 +10 ... +80	–10 ... +35 –10 ... +80 +5 ... +95 +20 ... +110	+20 ... +150	+20 ... +230	+40 ... +300 +70 ... +350
Microswitch 10: Switching differential not adjustable	**[°C]**	0.3	0.8	1	1.2	2
Microswitch 11/21: Switching differential not adjustable	**[°C]**	0.7	2	2.5	3	4
Microswitch 24: Switching differential adjustable	**[°C]**	4 ... 21	5.5 ... 26	7 ... 34	15 ... 65	18 ... 84
Microswitch 25: Switching differential adjustable	**[°C]**	0.7 ... 10	2 ... 12	2.5 ... 16	3 ... 32	4 ... 40

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
10	Small switching differential, not adjustable	125 V, 10 (1.5) A 250 V, 10 (1.25) A	250 V, 0.2 (0.02) A 125 V, 0.4 (0.03) A 30 V, 2 (1) A 14 V, 15 (2.5) A
11	Average switching differential, not adjustable	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (1.5) A
21	Gold plated contacts, not adjustable	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A
25	Adjustable standard switching differential	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (2.5) A
24	Adjustable large switching differential	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.3 (0.2) A 125 V, 0.75 (0.4) A 30 V, 15 (1.5) A 14 V, 15 (1.5) A

Electrical Connection



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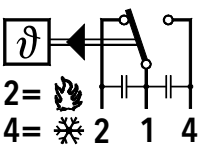


with accessory **23**

MINISTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for measurement of pressure and temperature.

Applications

- Railways
- Machine tools
- HVAC
- Refrigeration
- Process technology

Features

- Short response time
- Protection IP54
- Electrical connection on terminal screw

Technical Data			
Designation of application	Remote sensing thermostat	Switching differential	Adjustable / not adjustable
Measuring range	-30°C ... +40°C to +70°C ... +350°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

		XXX	XX	XX	XXX	XX	XXXXXXXXX	XX	XX
Custom build code	External adjustment	**624**							
	Internal adjustment	**634**							
Microswitch	Small switching differential, not adjustable		**10**						
	Average switching differential, not adjustable		**11**						
	With gold plated contacts, switching differential not adjustable		**21**						
	Adjustable large switching differential		**24**						
	Adjustable standard switching differential		**25**						

Range	Range [°C]	Sensor max. [°C]		Range [°C]	Sensor max. [°C]	
	-30 ... 40	45	**01**	-10 ... 80 [4]	85	**95**
	-10 ... 25 [4]	60	**07**	5 ... 95	105	**20**
	0 ... 35	70	**09**	20 ... 110 [4]	115	**23**
	10 ... 45	85	**11**	20 ... 150	165	**31**
	10 ... 80 [4]	100	**13**	20 ... 230	250	**24**
	15 ... 30	60	**17**	40 ... 300 [4]	330	**53**
	-10 ... 35	70	**94**	70 ... 350	380	**54**

Sensor [1]	See table "Ordering-no. for sensors"			**XXX**					
Fixing [2]	Nut M10 (for remote sensing version)				**10**				
	Grubscrew locked, lateral (direct mounting version) [5]				**12**				
	Cap nut (for direct mounting version) [5]				**14**				
	Angle bracket (for remote sensing version)				**17**				
	Grubscrew locked with spacer (cooling element) (for direct mounting version)				**18**				
	Mounting bracket (for remote sensing version)				**19**				
Protection tube	See data sheet H72114/H72163						**XXXX.XXXX**		
Accessories	Switchpoint locking [4]							**15**	
	Switchpoint fixed and sealed upon customer's request [4]							**88**	
	Switchpoint preset upon customer's request, no guarantee on switching accuracy [4]							**83**	
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing								
	Condensator over Pin 1-2							**12**	
	Condensator over Pin 1-3							**13**	
	Condensators over Pin 1-2 / 1-3							**23**	
	Railway version IEC 61373, category 2							**28**	
	Outdoor application (vented)							**44**	
	Cover with window							**77**	
	Capillary tube protection: Flexible metal tube, brass nickel plated							**90**	
	Capillary tube protection: Flexible metal tube 1.4541/V2A							**91**	
	Capillary tube protection: PVC tube							**92**	
Capillary tube length	Capillary tube length up to 5000 mm (no specification required for direct mounting on protection tube) **L=XXXX** [3]								

[1] See data sheet H72114/H72163
[2] See data sheet H72106
[3] Overlengths upon request
[4] Only with type 634 internal adjustment
[5] Media max. 150°C in continuous operation

Ordering no. for sensors

		Sensor material		
Range	Sensor-Ø	Stainless steel	Copper	Copper nickel plated
01, 07, 09, 11, 13, 17	4.7 mm		412	413
	7.0 mm	421	422	423
	9.0 mm		432	433
94, 95, 20, 23	4.7 mm	311	312	313
	7.0 mm	321	322	323
	9.0 mm	331	332	333
31	4.7 mm	111	112	113
	7.0 mm	121	122	123
	9.0 mm	131	132	133
24, 53, 54	4.7 mm	011	012	013
	7.0 mm	021	022	023
	9.0 mm	031	032	033

Standard products (extra short lead time)

Product No.	Type Code	Sensor material	Temperature range [°C]	Switching differential [°C]	Sensor max. [°C]
M35	624 2509 422 19	Copper	0 ... +35	0.7 ... 10 (adjustable)	70
M40	624 2501 422 19	Copper	-30 ... +40	0.7 ... 10 (adjustable)	45
M95	624 2520 322 19	Copper	+5 ... +95	2 ... 12 (adjustable)	105
M150	624 2531 122 19	Copper	+20 ... +150	2.5 ... 16 (adjustable)	165
M230S	624 2524 021 19	1.4435 (AISI316L)	+20 ... +230	3 ... 32 (adjustable)	250
M350S	624 2554 021 19	1.4435 (AISI316L)	+70 ... +350	4 ... 40 (adjustable)	380
MS35	634 2509 422 19	Copper	0 ... +35	0.7 ... 10 (adjustable)	70
MS40	634 2501 422 19	Copper	-30 ... +40	0.7 ... 10 (adjustable)	45
MS95	634 2520 322 19	Copper	+5 ... +95	2 ... 12 (adjustable)	105
MS150	634 2531 122 19	Copper	+20 ... +150	2.5 ... 16 (adjustable)	165
MS230S	634 2524 021 19	1.4435 (AISI316L)	+20 ... +230	3 ... 32 (adjustable)	250
MS350S	634 2554 021 19	1.4435 (AISI316L)	+70 ... +350	4 ... 40 (adjustable)	380

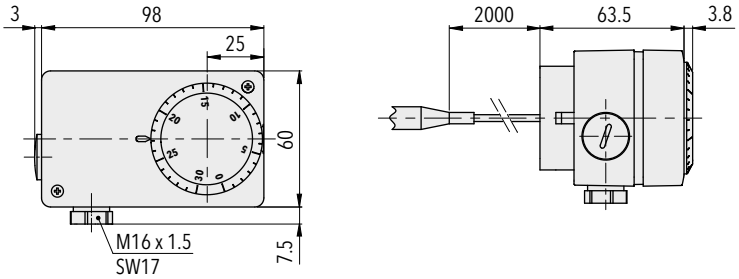
Specifications

Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	See table
	Switching point	Temperature compensated with bimetal switch lever
Environmental conditions	Ambient temperature	Range ≤ +45°C: -30°C ... +50°C Range +45°C ... +250°C: -30°C ... +70°C Range > + 250°C: -10°C ... +70°C (Important: Temperature at sensor may not exceed maximum sensortemperature)
	Storage temperature	Range ≤ +45°C: -30°C ... +50°C Range > +45°C: -30°C ... +85°C
	Protection	IP54
	Humidity	Max. 95 % relative
Mechanical Data	Sensor housing	See ordering information
	Filling	Liquid
	Housing	PC/ABS-Blend V0
	Screwed cable gland	Polyamide (PA)
	Installation	any position
	Weight	~ 380 g
Microswitch	Rating	See table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	U ≤ 250V: 1.45 kV U ≤ 500V: 2 kV terminal ground
	Life time (mechanical)	Microswitch 10/11/25: 20 Mio. cycles Microswitch 21: 0.5 Mio. cycles Microswitch 24: 0.3 Mio. cycles
Electrical connection	Cable gland	M16x1.5 Cable-Ø 4...9 mm
	Terminal screw	3 x 1 ... 2.5 mm²

Additional information

Documents	Data sheet	www.trafag.com/H72172
	Instructions	www.trafag.com/H73624
	Flyer	www.trafag.com/H70954

Dimensions



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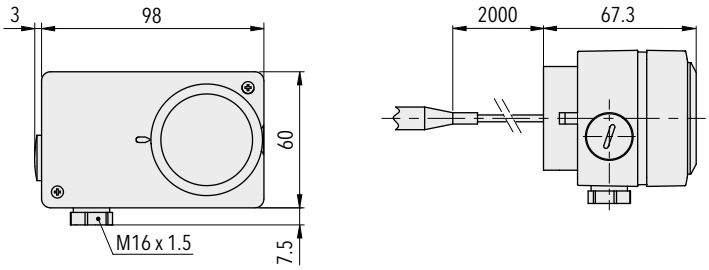

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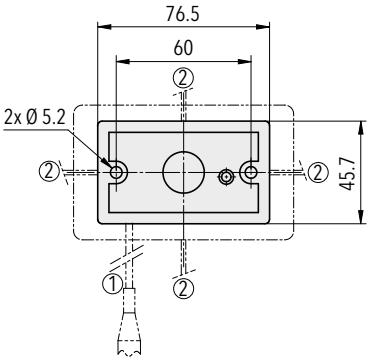
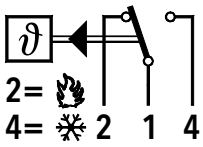


6X4.XXXX.XXX.**19**...

Switching differential typ.						
Measuring range	**[°C]**	–30 ... +40 –10 ... +25 0 ... +35 +15 ... +30 +10 ... +45 +10 ... +80	–10 ... +35 –10 ... +80 +5 ... +95 +20 ... +110	+20 ... +150	+20 ... +230	+40 ... +300 +70 ... +350
Microswitch 10: Switching differential not adjustable	**[°C]**	0.3	0.8	1	1.2	2
Microswitch 11/21: Switching differential not adjustable	**[°C]**	0.7	2	2.5	3	4
Microswitch 24: Switching differential adjustable	**[°C]**	4 ... 21	5.5 ... 26	7 ... 34	15 ... 65	18 ... 84
Microswitch 25: Switching differential adjustable	**[°C]**	0.7 ... 10	2 ... 12	2.5 ... 16	3 ... 32	4 ... 40

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
10	Small switching differential, not adjustable	125 V, 10 (1.5) A 250 V, 10 (1.25) A	250 V, 0.2 (0.02) A 125 V, 0.4 (0.03) A 30 V, 2 (1) A 14 V, 15 (2.5) A
11	Average switching differential, not adjustable	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (1.5) A
21	Gold plated contacts, not adjustable	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A
25	Adjustable standard switching differential	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (2.5) A
24	Adjustable large switching differential	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.3 (0.2) A 125 V, 0.75 (0.4) A 30 V, 15 (1.5) A 14 V, 15 (1.5) A

Electrical connection



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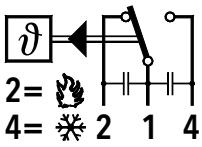


with accessory **23**

MINI LIMISTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for measurement of pressure and temperature.

Applications

- Railways
- Machine tools
- HVAC
- Refrigeration
- Process technology

Features

- External or internal resetting
- Short response time
- Protection IP54
- Electrical connection on terminal screw

Technical Data			
Designation of application	Remote sensing thermostat with limiter	Switching differential	Not adjustable
Measuring range	-30°C ... +40°C to +70°C ... +350°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

		XXX .	XX	XX	XXX	XX	XXXXXXXXX	XX	XX
Custom build code	For increasing temperatures, internal resetting	**630 .**	**12**						
	For increasing temperatures, external resetting	**632 .**	**12**						

Range

Range [°C]	Sensor max. [°C]		Range [°C]	Sensor max. [°C]	
-30 ... 40	45	**01**	-10 ... 80	85	**95**
-10 ... 25	60	**07**	5 ... 95	105	**20**
0 ... 35	70	**09**	20 ... 110	115	**23**
10 ... 45	85	**11**	20 ... 150	165	**31**
10 ... 80	100	**13**	20 ... 230	250	**24**
15 ... 30	60	**17**	40 ... 300	330	**53**
-10 ... 35	70	**94**	70 ... 350	380	**54**

Sensor [1]	See table "Ordering-no. for sensors"	**XXX**
Fixing [2]	Nut M10 (for remote sensing version)	**10**
	Mounting bracket (for remote sensing version)	**19**
	Grubscrew locked, lateral (direct mounting version) [4]	**12**
	Cap nut (for direct mounting version) [4]	**14**
	Grubscrew locked with spacer (cooling element) (for direct mounting version)	**18**
Protection tube	See data sheet H72114/H72163	**XXXX.XXXX**

Accessories

Switchpoint locking	**15**
Switchpoint fixed and sealed upon customer's request	**88**
Switchpoint preset upon customer's request, no guarantee on switching accuracy	**83**
Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing	
Condensator over Pin 1-2	**12**
Condensator over Pin 1-3	**13**

Condensators over Pin 1-2 / 1-3	**23**
Railway version IEC 61373, category 2	**28**
Outdoor application (vented)	**44**
Cover with window	**77**
Capillary tube protection: Flexible metal tube, brass nickel plated	**90**
Capillary tube protection: Flexible metal tube 1.4541/V2A	**91**
Capillary tube protection: PVC tube	**92**

Capillary tube length	Capillary tube length up to 5000 mm (no specification required for direct mounting on protection tube) **L=XXXX** [3]

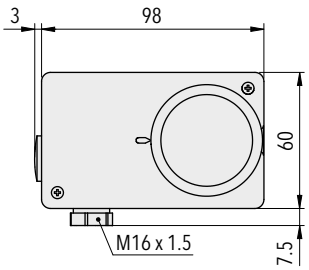
[1] See data sheet H72114/H72163
[2] See data sheet H72106
[3] Overlengths upon request
[4] Media max. 150°C in continuous operation

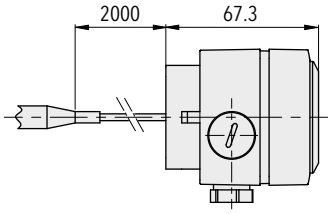
Ordering no. for sensors

		Sensor material		
Range	**Sensor-Ø**	**Stainless steel**	**Copper**	**Copper nickel plated**
01, 07, 09, 11, 13, 17	4.7 mm		412	413
	7.0 mm	421	422	423
	9.0 mm		432	433
94, 95, 20, 23	4.7 mm	311	312	313
	7.0 mm	321	322	323
	9.0 mm	331	332	333
31	4.7 mm	111	112	113
	7.0 mm	121	122	123
	9.0 mm	131	132	133
24, 53, 54	4.7 mm	011	012	013
	7.0 mm	021	022	023
	9.0 mm	031	032	033

Standard products (extra short lead time)				
Product No.	**Type Code**	**Sensor material**	**Temperature range [°C]**	**Sensor max. [°C]**
MS95R	632 1220 322 19	Copper	+5 ... +95	105
MS150R	632 1231 122 19	Copper	+20 ... +150	165
MS230SR	632 1224 021 19	1.4435 (AISI316L)	+20 ... +230	250
MS350SR	632 1254 021 19	1.4435 (AISI316L)	+70 ... +350	380

Dimensions





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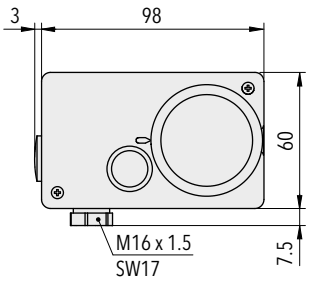

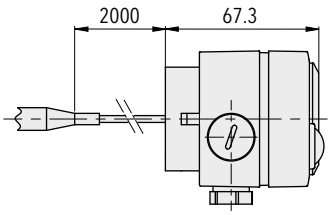

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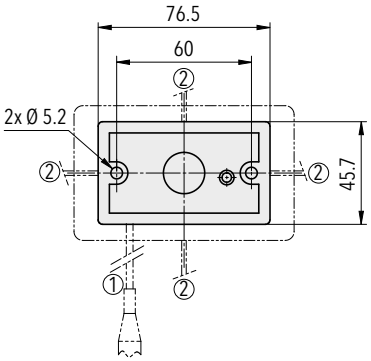


63X.12XX.XXX.**19**...

Specifications

Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	See table
	Switching point	Temperature compensated with bimetal switch lever
Environmental conditions	Ambient temperature	Range ≤ +45°C: -30°C ... +50°C Range +45°C ... +250°C: -30°C ... +70°C Range > + 250°C: -10°C ... +70°C (Important: Temperature at sensor may not exceed maximum sensortemperature)
	Storage temperature	Range ≤ +45°C: -30°C ... +50°C Range > +45°C: -30°C ... +85°C
	Protection	IP54
	Humidity	Max. 95 % relative
Mechanical Data	Sensor housing	See ordering information
	Filling	Liquid
	Housing	PC/ABS-Blend V0
	Screwed cable gland	Polyamide (PA)
	Installation	any position
	Weight	~ 250 g
Microswitch	Rating	See table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	2 kV terminal ground
	Life time (mechanical)	0.3 Mio. cycles
Electrical connection	Cable gland	M16x1.5 Cable-Ø 4...9 mm
	Terminal screw	3 x 1 ... 2.5 mm²

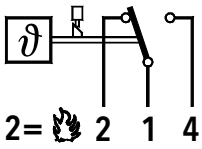
Additional information

Documents	Data sheet	www.trafag.com/H72173
	Instructions	www.trafag.com/H73624
	Flyer	www.trafag.com/H70956

Switching differential typ.						
Measuring range	**[°C]**	–30 ... +40 –10 ... +25 0 ... +35 +15 ... +30 +10 ... +45 +10 ... +80	–10 ... +35 –10 ... +80 +5 ... +95 +20 ... +110	+20 ... +150	+20 ... +230	+40 ... +300 +70 ... +350
Microswitch 12: Switching differential not adjustable	**[°C]**	2.0	6.0	7.5	9.0	12.0

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
12	Average switching differential, high vibration resistance	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.3 (0.2) A 125 V, 0.75 (0.4) A 30 V, 15 (1.5) A 14 V, 15 (1.5) A

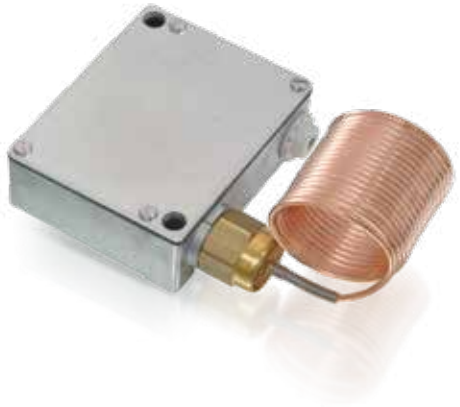
Electrical connection



630/632

FROSTSTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for measurement of pressure and temperature. The Froststat was specifically designed as single stage temperature controller for monitoring temperature around 0°C, i. e. to prevent ice build-up on air heaters.



Applications

- HVAC
- Refrigeration

Features

- Rugged aluminium housing
- Short response time
- Protection IP54
- Electrical connection on terminal screw

Technical Data			
Designation of application	Frost protection thermostat	Switching differential	Not adjustable
Measuring range	-5°C ... +15°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

		XXX . XXXX	XXXXXX
Custom build code	Sensor 3m	990 . 1299	
	Sensor 6m	991 . 1299	
	Sensor 3m, limiter	992 . 1299	
	Sensor 6m, limiter	993 . 1299	
Accessories	Protection level IP65		20
	6 pcs. Capillary holder		K80140

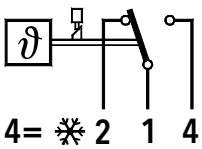
Standard products (extra short lead time)

Product No.	Type Code	Sensor material	Set point adjustment
F15	991 1299 000	Copper capillary tube, L=6m	Internal setpoint adjustment
F153	990 1299	Copper capillary tube, L=3m	Internal setpoint adjustment
F15R	993 1299 000	Copper capillary tube, L=6m	Internal setpoint adjustment and external reset knob
F153R	992 1299	Copper capillary tube, L=3m	Internal setpoint adjustment and external reset knob

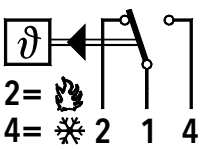
Specifications		
Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 1.5 % FS typ.
	Switching differential	2.0°C typ.
Environmental conditions	Media temperature	Sensor temperature max.: 140°C Sensor response length : ~ 30 cm
	Ambient temperature	Max. operating temperature: +70°C Min. operating temperature: switch point + 2°C
	Storage temperature	-30°C ... +70°C
	Protection	IP 54
	Humidity	Max. 95 % relative
Mechanical Data	Sensor housing	Copper (Cu)
	Filling	Freon R 134, gaseous
	Housing	AlSi9Pb3
	Screwed cable gland	Polyethylen (PE)
	Installation	any position
	Weight	~ 850 g
Microswitch	Rating	See table below
	Resistance of insulation	> 2 MΩ
	Dielectric strength	2 kV terminal ground
	Life time (mechanical)	0.3 Mio. cycles
Electrical connection	Cable gland	M20x1.5 Cable-Ø 8...13 mm
	Terminal screw	3 x 1 ... 2.5 mm²

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
12	Average switching differential, high vibration resistance	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.3(0.2) A 125 V, 075(0.4) A 30 V, 15(1.5) A 14 V, 15 (1.5) A

Electrical Connection



992/993
Limiter, decreasing



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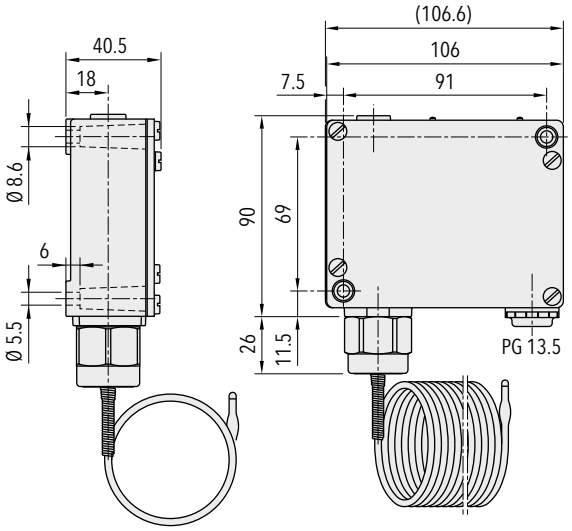
Dimensions



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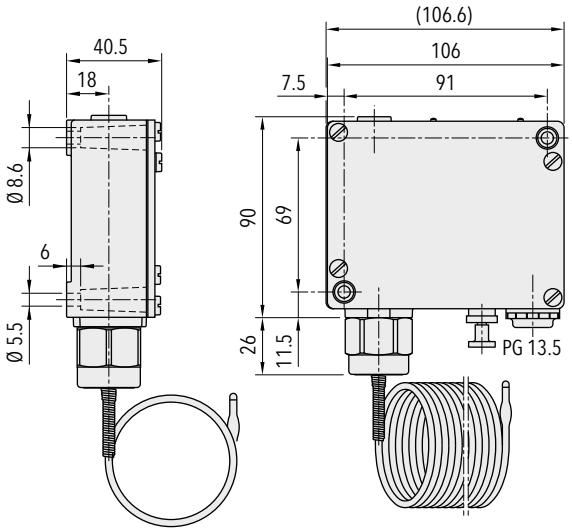

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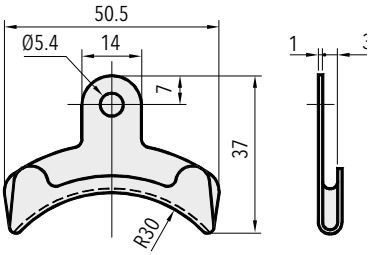


99X.XXXX.**K80140**

Additional information		
Documents	Data sheet	www.trafag.com/H72123
	Instructions	www.trafag.com/H70821
	Flyer	www.trafag.com/H70952

GALVANOSTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for measurement of pressure and temperature.

Applications

- Process technology

Features

- Short response time
- Protection IP54
- Electrical connection on terminal screw
- Coated capillary tube 1500 mm

Technical Data			
Designation of application	Remote sensing thermostat	Switching differential	Not adjustable
Measuring range	+5°C ... +95°C and +20°C ... +150°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

		XXX	XX	XX	XXX	XX	XX	XX
Custom build code	External adjustment	**657**						
	Internal adjustment	**658**						
Microswitch	Small switching differential, not adjustable		**10**					
	Average switching differential, not adjustable		**11**					
	With gold plated contacts, switching differential not adjustable		**21**					
Range	**Range [°C]** / **Sensor max. [°C]**							
	+5 ... +95 / 105			**20**				
	+20 ... +150 / 165			**31**				
Sensor	Copper with protection tube Teflon FEP, range 20				**326**			
	Copper with protection tube Teflon FEP, range 31				**126**			
Fixing	Angle PVC					**26**		
Accessories	Switchpoint locking [2]							**15**
	Switchpoint fixed and sealed upon customer's request [2]							**88**
	Switchpoint preset upon customer's request, no guarantee on switching accuracy [2]							**83**
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing							
	Condensator over Pin 1-2							**12**
	Condensator over Pin 1-3							**13**
	Condensators over Pin 1-2 / 1-3							**23**
	Outdoor application (vented)							**44**
	Cover with window							**77**
Capillary tube length	Capillary tube length up to 5000 mm (no specification required for direct mounting on protection tube) **L=XXXX** [1]							

[1] Overlengths upon request
[2] Only with type 658, internal adjustment

Standard products (extra short lead time)

Product No.	Type Code	Temperature range [°C]	Switching differential [°C]	Sensor max. [°C]
GS95	658 1120 326 26	+5 ... +95	2.5 (fixed)	105
GS150	658 1131 126 26	+20 ... +150	3.0 (fixed)	165

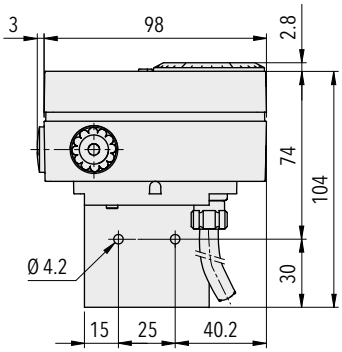
Specifications

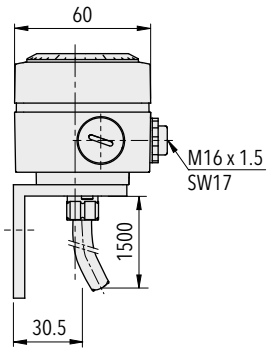
Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 3 % FS typ.
	Switching differential	See table
	Switching point	Temperature compensated with bimetal switch lever
Environmental conditions	Ambient temperature	-30°C ... +70°C
	Storage temperature	-30°C ... +85°C
	Protection	IP54
	Humidity	Max. 95 % relative
Mechanical Data	Sensor housing	See ordering information
	Filling	Liquid
	Housing	PC/ABS-Blend V0
	Screwed cable gland	Polyethylen (PE)
	Installation	any position
	Weight	~ 380 g
Microswitch	Rating	See table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	U ≤ 250V: 1.45 kV U ≤ 500V: 2 kV terminal ground
	Life time (mechanical)	Microswitch 10/11: 20 Mio. cycles Microswitch 21: 0.5 Mio. cycles
Electrical connection	Cable gland	M16x1.5 Cable-Ø 4...9 mm
	Terminal screw	3 x 1 ... 2.5 mm²

Additional information

Documents	Data sheet	www.trafag.com/H72179
	Instructions	www.trafag.com/H73624
	Flyer	www.trafag.com/H70959

Dimensions





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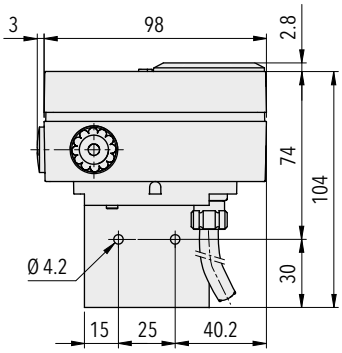

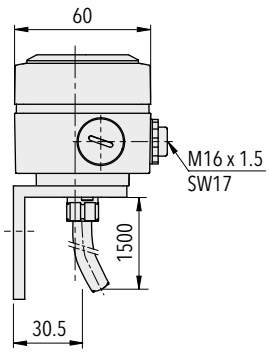

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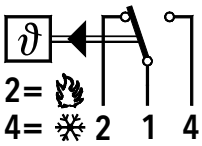
GS...

Switching differential typ.			
Measuring range	**[°C]**	+5 ... +95	+20 ... +150
Microswitch 10: Switching differential not adjustable	**[°C]**	0.3	0.8
Microswitch 11/21: Switching differential not adjustable	**[°C]**	2.5	3.0

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
10	Small switching differential, not adjustable	125 V, 10 (1.5) A 250 V, 10 (1.25) A	250 V, 0.2 (0.02) A 125 V, 0.4 (0.03) A 30 V, 2 (1) A 14 V, 15 (2.5) A
11	Average switching differential, not adjustable	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (1.5) A
21	Gold plated contacts, not adjustable	24 V, 0.1 (0.1)A 12 V, 1 (1) A 5 V, 2 (2) A	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A

Electrical Connection



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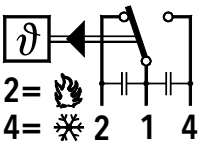


with accessory **23**

DUO LIMISTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for the measurement of pressure and temperature.

Applications

- HVAC
- Refrigeration

Features

- Two individual measuring systems
- Short response time
- Protection IP54
- Electrical connection on terminal screw

Technical Data			
Designation of application	Double thermostat with remote sensor and limiter	Switching differential	Adjustable / not adjustable
Measuring range	-30°C ... +40°C to +70°C ... +350°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

		302 .	XX	XX	XXX	XX	XXXXXXXXX	XX	XX
Microswitch	Small switching differential, not adjustable (Microswitch 10, Limiter Switch 12)		**38**						
	Standard switching differential, not adjustable (Microswitch 11, Limiter Switch 12)		**37**						
	Adjustable standard switching differential (microswitch 25, limiter switch 12)		**58**						

Range	**Temperature controller and limiter [°C]**	**Sensor max. [°C]**	**Temperature controller [°C]**	**Limiter [°C]**	
	-30 ... +40	+50			**01**
	-10 ... +25	+60			**07**
	0 ... +35	+70			**09**
	+10 ... +45	+85			**11**
	+10 ... +80	+100			**13**
	+15 ... +30	+60			**17**
	-10 ... +35	+70			**94**
	-10 ... +80	+85			**95**
	+5 ... +95	+105			**20**
	+20 ... +110	+115			**23**
	+20 ... +150	+165			**31**
	+20 ... +230	+250			**24**
	+40 ... +300	+330			**53**
	+70 ... +350	+380			**54**
			+5 ... +95	+20 ... +110	**36**
			+20 ... +150	+35 ... +175	**42**
			+40 ... +300	+70 ... +350	**39**

Sensor [1]	See table "Ordering-no. for sensors"				**XXX**				
Fixing [2]	Mounting bracket (for remote sensing version)					**19**			
	For direct mounting on protection tube					**21**			
Protection tube	See data sheet H72114/H72163						**XXXX.XXXX**		
Accessories	Condensator over Pin 1-2							**12**	
	Condensator over Pin 1-3							**13**	
	Condensators over Pin 1-2 / 1-3							**23**	
	Railway version IEC 61373, category 2							**28**	
	Outdoor application (vented)							**44**	
	Capillary tube protection: Flexible metal tube, brass nickel plated							**90**	
	Capillary tube protection: Flexible metal tube 1.4541/V2A							**91**	
	Capillary tube protection: PVC tube							**92**	
Capillary tube length	Capillary tube length up to 5000 mm (no specification required for direct mounting on protection tube) **L=XXXX** [3]								

[1] See data sheet H72114/H72163
[2] See data sheet H72106
[3] Overlengths upon request

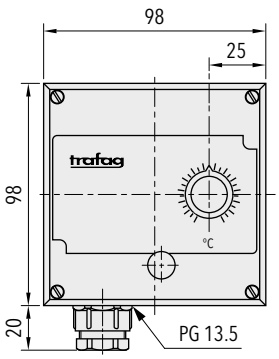
Ordering no. for sensors

Range	Sensor-Ø	Sensor material		
		Stainless steel	Copper	Copper nickel plated
01, 07, 09, 11, 13, 17	4.7 mm		412	413
	7.0 mm	421	422	423
	5.5 / 11 mm		462	463
94, 95, 20, 23, 36	4.7 mm	311	312	313
	7.0 mm	321	322	323
	5.5 / 11 mm		362	363
31, 42	4.7 mm	111	112	113
	7.0 mm	121	122	123
	5.5 / 11 mm		162	163
24, 53, 54, 39	4.7 mm	011	012	013
	7.0 mm	021	022	023
	5.5 / 11 mm		062	063

Standard products (extra short lead time)

Product No.	Type Code	Temperature range [°C]	Switching differential [°C]	Measuring range limiter [°C]	Sensor max. [°C]
D95R	302 5836 362 19	+5 ... +95	2 ... 12 (adjustable)	+20 ... +110	105
D150R	302 5842 162 19	+20 ... +150	2.5 ... 16 (adjustable)	+35 ... +175	165
D300R	302 5839 062 19	+40 ... +300	4 ... 40 (adjustable)	+70 ... +350	380

Dimensions



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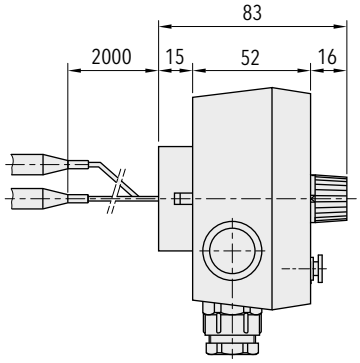
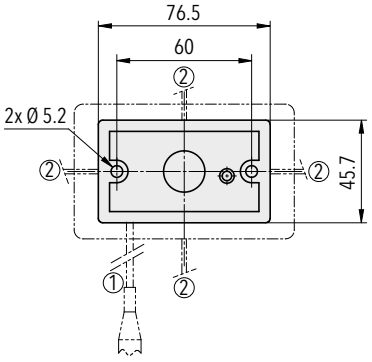




Fixation **19**

Specifications

Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	See table
	Switching point	Temperature compensated with bimetal switch lever
Environmental conditions	Ambient temperature	Range ≤ +45°C: -30°C ... +50°C Range +45°C ... +250°C: -30°C ... +70°C Range > + 250°C: -10°C ... +70°C (Important: Temperature at sensor may not exceed maximum sensortemperature)
	Storage temperature	Range ≤ +45°C: -30°C ... +50°C Range > +45°C: -30°C ... +85°C
	Protection	IP54
	Humidity	Max. 95 % relative
Mechanical Data	Sensor housing	See ordering information
	Filling	Liquid
	Housing	Noryl
	Screwed cable gland	Polyamide (PA)
	Installation	any position
	Weight	~ 620 g
Microswitch	Rating	See table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	U ≤ 250V: 1.45 kV U ≤ 500V: 2 kV terminal ground
	Life time (mechanical)	Microswitch 10/11/25: 20 Mio. cycles Microswitch 12: 0.3 Mio. cycles
Electrical connection	Cable gland	PG13.5 Cable-Ø 5...12.5 mm
	Terminal screw	6 x 1 ... 2.5 mm²

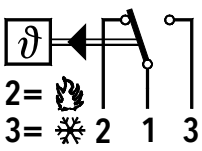
Additional information

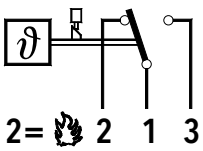
Documents	Data sheet	www.trafag.com/H72142
	Instructions	www.trafag.com/H73170
	Flyer	www.trafag.com/H70963

Switching differential typ.						
Measuring range	**[°C]**	–30 ... +40 –10 ... +25 0 ... +35 +15 ... +30 +10 ... +45 +10 ... +80	–10 ... +35 –10 ... +80 +5 ... +95 +20 ... +110	+20 ... +150	+20 ... +230	+40 ... +300 +70 ... +350
Microswitch 10: Switching differential not adjustable	**[°C]**	0.3	0.8	1	1.2	2
Microswitch 11: Switching differential not adjustable	**[°C]**	0.7	2	2.5	3	4
Microswitch 12: Switching differential not adjustable	**[°C]**	2	6	7.5	9	12
Microswitch 25: Switching differential adjustable	**[°C]**	0.7 ... 10	2 ... 12	2.5 ... 16	3 ... 32	4 ... 40

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
10	Small switching differential, not adjustable	125 V, 10 (1.5) A 250 V, 10 (1.25) A	250 V, 0.2 (0.02) A 125 V, 0.4 (0.03) A 30 V, 2 (1) A 14 V, 15 (2.5) A
11	Average switching differential, not adjustable	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (1.5) A
12	Large switching differential, not adjustable	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.3(0.2) A 125 V, 0.75(0.4) A 30 V, 15 (1.5) A 14 V, 15 (1.5) A
25	Adjustable standard switching differential	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (2.5) A

Electrical Connection





302

ALTEROSTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for measurement of pressure and temperature.

Applications

- Machine tools
- HVAC
- Refrigeration
- Process technology

Features

- With 1 adjustable step between 2 stages
- Short response time
- Protection IP54
- Electrical connection on terminal screw

Technical Data			
Designation of application	Multistage thermostat with remote sensor	Switching differential	Not adjustable
Measuring range	-30°C ... +40°C to +70°C ... +350°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN 60730-1/ EN 60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

		XXX	XX	XX	XXX	XX	XXXXXXXXX	XX	XX
Custom build code	External adjustment	**104**							
	Internal adjustment	**114**							
Microswitch	Small switching differential, not adjustable		**10**						
	Average switching differential, not adjustable		**11**						
	With gold plated contacts, switching differential not adjustable		**21**						

Range

Range [°C]	Sensor max. [°C]		Range [°C]	Sensor max. [°C]	
-30 ... +40	45	**01**	-10 ... +80	85	**95**
-10 ... +25	60	**07**	+5 ... +95	105	**20**
0 ... +35	70	**09**	+20 ... +110	115	**23**
+10 ... +45	85	**11**	+20 ... +150	165	**31**
+10 ... +80	100	**13**	+20 ... +230	250	**24**
+15 ... +30	60	**17**	+40 ... +300	330	**53**
-10 ... +35	70	**94**	+70 ... +350	380	**54**

Sensor [1]	See table "Ordering-no. for sensors"				**XXX**				
Fixing [2]	Nut M10 (for remote sensing version)					**10**			
	Angle bracket (for remote sensing version)					**17**			
	Mounting bracket (for remote sensing version)					**19**			
	Grubscrew locked, lateral (direct mounting version) [5]					**12**			
	Cap nut (for direct mounting version) [5]					**14**			
	Grubscrew locked with spacer (cooling element) (for direct mounting version)					**18**			
Protection tube	See data sheet H72114/H72163						**XXXX.XXXX**		
Accessories	Switchpoint locking [4]							**15**	
	Switchpoint fixed and sealed upon customer's request [4]							**88**	
	Switchpoint preset upon customer's request, no guarantee on switching accuracy [4]							**83**	
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing								
	Condensator over Pin 1-2							**12**	
	Condensator over Pin 1-3							**13**	
	Condensators over Pin 1-2 / 1-3							**23**	
	Railway version IEC 61373, category 2							**28**	
	Outdoor application (vented)							**44**	
	Capillary tube protection: Flexible metal tube, brass nickel plated							**90**	
	Capillary tube protection: Flexible metal tube 1.4541/V2A							**91**	
	Capillary tube protection: PVC tube							**92**	
Capillary tube length	Capillary tube length up to 5000 mm (no specification required for direct mounting on protection tube) **L=XXXX** [3]								
Steps between stages	Desired stage difference to be indicated when ordering (without indication = switches synchronous) Switch 1 on scale, difference switch 2 to scale -6 °C...+15 °C Minimum distance between switches: Switch 10: ±1 °C Switch 11/21: ±2 °C								

[1] See data sheet H72114/H72163
[2] See data sheet H72106
[3] Overlengths upon request
[4] Only with type 114, internal adjustment
[5] Media max. 150°C in continuous operation

Ordering no. for sensors

		Sensor material		
Range	Sensor-Ø	Stainless steel	Copper	Copper nickel plated
01, 07, 09, 11, 13, 17	4.7 mm		412	413
	7.0 mm	421	422	423
	9.0 mm		432	433
94, 95, 20, 23	4.7 mm	311	312	313
	7.0 mm	321	322	323
	9.0 mm	331	332	333
31	4.7 mm	111	112	113
	7.0 mm	121	122	123
	9.0 mm	131	132	133
24, 53, 54	4.7 mm	011	012	013
	7.0 mm	021	022	023
	9.0 mm	031	032	033

Standard products (extra short lead time)

Product No.	Type Code	Temperature range [°C]	Switching differential [°C]	Smallest stage difference [°C]	Largest stage difference [°C]	Sensor max. [°C]
M2S40	114 1101 422 19	-30 ... +40	1.8 (fixed)	0.8	25	45
M2S35	114 1109 422 19	0 ... +35	1.8 (fixed)	0.8	15	50
M2S95	114 1120 322 19	+5 ... +95	2.5 (fixed)	1.2	35	105
M2S150	114 1131 122 19	+20 ... +150	3 (fixed)	1.5	40	165
M2S230S	114 1124 021 19	+20 ... +230	4.5 (fixed)	2	70	250
M2S350S	114 1154 021 19	+70 ... +350	5 (fixed)	2.5	80	380

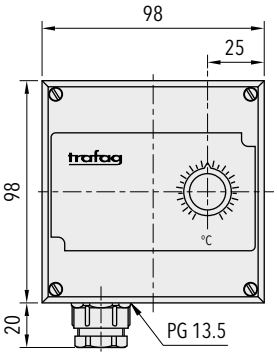
Specifications

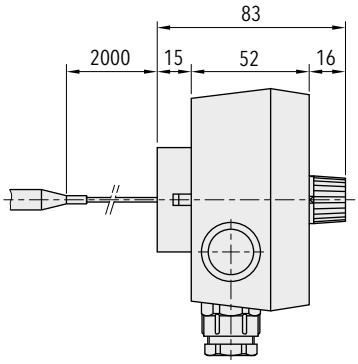
Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	See table
	Switching point	Temperature compensated with bimetal switch lever
Environmental conditions	Ambient temperature	Range ≤ +45°C: -30°C ... +50°C Range +45°C ... +250°C: -30°C ... +70°C Range > + 250°C: -10°C ... +70°C (Important: Temperature at sensor may not exceed maximum sensortemperature)
	Storage temperature	Range ≤ +45°C: -30°C ... +50°C Range > +45°C: -30°C ... +85°C
	Protection	IP54
	Humidity	Max. 95 % relative
Mechanical Data	Sensor housing	See ordering information
	Filling	Liquid
	Housing	Noryl
	Screwed cable gland	Polyamide (PA)
	Installation	any position
	Weight	~ 480 g
Microswitch	Rating	See table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	U ≤ 250V: 1.45 kV U ≤ 500V: 2 kV terminal ground
	Life time (mechanical)	Microswitch 10/11: 20 Mio. cycles Microswitch 21: 0.5 Mio. cycles
Electrical connection	Cable gland	PG13.5 Cable-Ø 5 ... 12.5 mm
	Terminal screw	6 x 1 ... 2.5 mm²

Additional information

Documents	Data sheet	www.trafag.com/H72139
	Instructions	www.trafag.com/H70311
	Flyer	www.trafag.com/H70965

Dimensions





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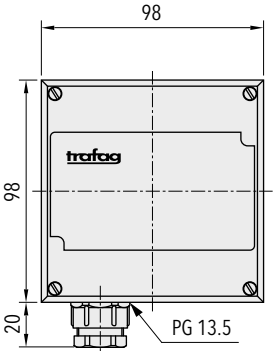

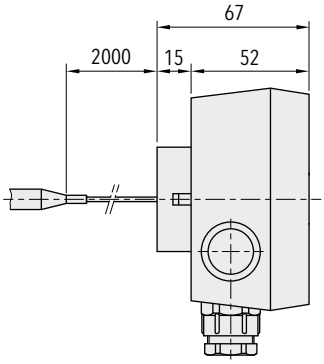

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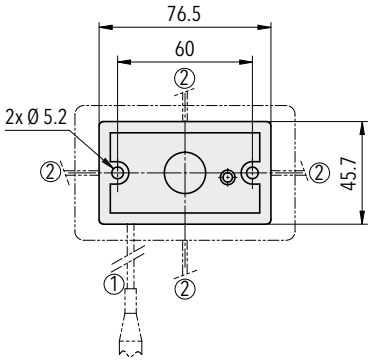
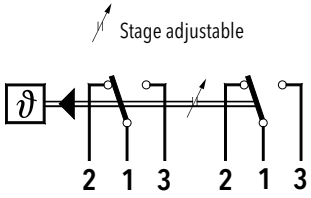


Fixation **19**

Electrical connection



Switch 1, on scale

Switch 2, + or - to switch 1

Switching differential typ.					
Measuring range	**[°C]**	–30 ... +40 +10 ... +80	–10 ... +25 0 ... +35 +10 ... +45	+15 ... +30	-10 ... +35
Microswitch 10: Switching differential not adjustable	**[°C]**	0.7	0.7	0.7	1.5
Microswitch 11: Switching differential not adjustable	**[°C]**	1.8	1.8	1.8	2.5
Microswitch 21: Switching differential not adjustable	**[°C]**	1.8	1.8	1.8	2.5
Steps between stages from switch S2 to switch S1 (S1 on scale): **S1 < S2**	**[°C]**	0.8 ... 25	0.8 ... 15	0.8 ... 10	1.2 ... 25
Steps between stages from switch S2 to switch S1 (S1 on scale): **S1 > S2**	**[°C]**	0.8 ... 12	0.8 ... 6	0.8 ... 4	1.2 ... 8
Measuring range	**[°C]**	-10 ... +80 +5 ... +95 +20 ... +110	+20 ... +150	+20 ... +230	+40 ... +300 +70 ... +350
Microswitch 10: Switching differential not adjustable	**[°C]**	1.5	1.8	2	2.5
Microswitch 11: Switching differential not adjustable	**[°C]**	2.5	3	4.5	5
Microswitch 21: Switching differential not adjustable	**[°C]**	2.5	3	4.5	5
Steps between stages from switch S2 to switch S1 (S1 on scale): **S1 < S2**	**[°C]**	1.2 ... 35	1.5 ... 40	2 ... 70	2.5 ... 80
Steps between stages from switch S2 to switch S1 (S1 on scale): **S1 > S2**	**[°C]**	1.2 ... 15	1.5 ... 20	2 ... 30	2.5 ... 40

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
10	Small switching differential, not adjustable	125 V, 10 (1.5) A 250 V, 10 (1.25) A	250 V, 0.2 (0.02) A 125 V, 0.4 (0.03) A 30 V, 2 (1) A 14 V, 15 (2.5) A
11	Average switching differential, not adjustable	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (1.5) A
21	Gold plated contacts, not adjustable	24 V, 0.1 (0.1) A 12 V, 1 (1) A 5 V, 2 (2) A	24 V, 0.1 (0.1) A 12 V, 1 (1) A 5 V, 2 (2) A

LABORSTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for measurement of pressure and temperature.

Applications

- Machine tools

Features

- Without housing
- Short response time
- Electrical connection on terminal screw

Technical Data			
Designation of application	Remote sensing thermostat, skeleton type	Switching differential	Adjustable / not adjustable
Measuring range	-30°C ... +40°C to +70°C ... +350°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

		XXX	XX	XX	XXX	XX	XXXXXXXXX	XX	XX
Custom build code	Front panel mounting, screw terminal	**736**							
	Screw terminal	**754**							
Microswitch	Small switching differential, not adjustable		**10**						
	Average switching differential, not adjustable		**11**						
	With gold plated contacts, switching differential not adjustable		**21**						
	Adjustable large switching differential		**24**						
	Adjustable standard switching differential		**25**						

Range

Range [°C]	Sensor max. [°C]		Range [°C]	Sensor max. [°C]	
-30 ... +40	45	**01**	+20 ... +110	115	**23**
-10 ... +80	85	**95**	+20 ... +150	165	**31**
0 ... +35	70	**09**	+20 ... +230	250	**24**
+5 ... +95	105	**20**	+40 ... +300	330	**53**
+10 ... +45	85	**11**	+70 ... +350	380	**54**

Sensor [1]	See table "Ordering-no. for sensors"			**XXX**					
Fixing [2]	Nut M10 (for remote sensing version) [4]				**10**				
	Angle bracket (for remote sensing version) [4]				**17**				
	Bracket (for remote sensing version) [4]				**27**				
	Grubscrew locked, lateral (direct mounting version) [4] [5]				**12**				
	Cap nut (for direct mounting version) [4] [5]				**14**				
	Grubscrew locked with spacer (cooling element) (for direct mounting version) [4]				**18**				
	Standard directly mounted on protection tube, only for type 736				**00**				
Protection tube	See data sheet H72114/H72163						**XXXX.XXXX**		

Accessories	Switchpoint locking [4]	**15**	Condensators over Pin 1-2 / 1-3	**23**
	Switchpoint fixed and sealed upon customer's request [4]	**88**	Railway version IEC 61373, category 2	**28**
	Switchpoint preset upon customer's request, no guarantee on switching accuracy [4]	**83**	Capillary tube protection: Flexible metal tube, brass nickel plated	**90**
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing		Capillary tube protection: Flexible metal tube 1.4541/V2A	**91**
			Capillary tube protection: PVC tube	**92**

Capillary tube length	Capillary tube length up to 5000 mm (no specification required for direct mounting on protection tube) **L=XXXX** [3]								

[1] See data sheet H72114/H72163
[2] See data sheet H72106
[3] Overlengths upon request
[4] Only for type 754
[5] Media max. 150°C in continuous operation

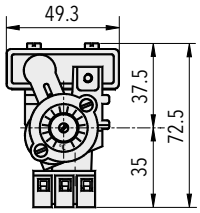
Ordering no. for sensors

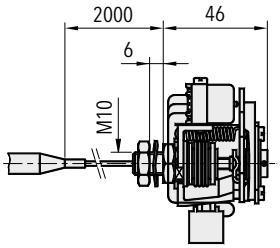
		Sensor material		
Range	Sensor-Ø	Stainless steel	Copper	Copper nickel plated
01, 09, 11	4.7 mm		412	413
	7.0 mm	421	422	423
	9.0 mm		432	433
95, 20, 23	4.7 mm	311	312	313
	7.0 mm	321	322	323
	9.0 mm	331	332	333
31	4.7 mm	111	112	113
	7.0 mm	121	122	123
	9.0 mm	131	132	133
24, 53, 54	4.7 mm	011	012	013
	7.0 mm	021	022	023
	9.0 mm	031	032	033

Standard products (extra short lead time)

Product No.	Type Code	Sensor material	Temperature range [°C]	Switching differential [°C]	Sensor max. [°C]
L35	754 2509 422 10	Copper	0 ... +35	0.7 ... 10 (adjustable)	60
L40	754 2501 422 10	Copper	-30 ... +40	0.7 ... 10 (adjustable)	45
L95	754 2520 322 10	Copper	+5 ... +95	2 ... 12 (adjustable)	105
L150	754 2531 122 10	Copper	+20 ... +150	2.5 ... 16 (adjustable)	165
L230S	754 2524 021 10	1.4435 (AISI316L)	+20 ... +230	3 ... 32 (adjustable)	250
L350S	754 2554 021 10	1.4435 (AISI316L)	+70 ... +350	4 ... 40 (adjustable)	380

Dimensions





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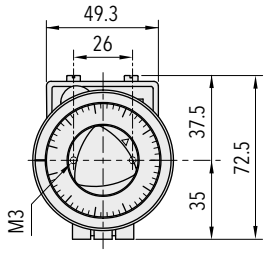

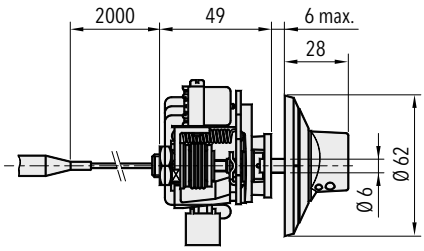

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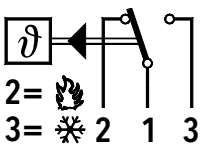
Specifications		
Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	See table
	Switching point	Temperature compensated with bimetal switch lever
Environmental conditions	Ambient temperature	Range ≤ +45°C: -30°C ... +50°C Range +45°C ... +250°C: -30°C ... +70°C Range > + 250°C: -10°C ... +70°C (Important: Temperature at sensor may not exceed maximum sensortemperature)
	Storage temperature	Range ≤ +45°C: -30°C ... +50°C Range > +45°C: -30°C ... +85°C
	Protection	IP00
	Humidity	Max. 95 % relative
Mechanical Data	Sensor housing	See ordering information
	Filling	Liquid
	Installation	any position
	Weight	754: ~ 250 g 736: ~ 300 g
Microswitch	Rating	See table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	U ≤ 250V: 1.45 kV U ≤ 500V: 2 kV terminal ground
	Life time (mechanical)	Microswitch 10/11/25: 20 Mio. cycles Microswitch 21: 0.5 Mio. cycles Microswitch 24: 0.3 Mio. cycles
Electrical connection	Terminal screw	3 x 1 ... 2.5 mm²

Additional information		
Documents	Data sheet	www.trafag.com/H72122
	Instructions	www.trafag.com/H70211
	Flyer	www.trafag.com/H70967

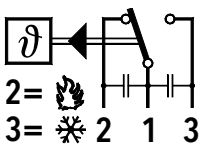
Switching differential typ.						
Measuring range	**[°C]**	–30 ... +40 0 ... +35 +10 ... +45	–10 ... +80 +5 ... +95 +20 ... +110	+20 ... +150	+20 ... +230	+40 ... +300 +70 ... +350
Microswitch 10: Switching differential not adjustable	**[°C]**	0.3	0.8	1	1.2	2
Microswitch 11/21: Switching differential not adjustable	**[°C]**	0.7	2	2.5	3	4
Microswitch 24: Switching differential adjustable	**[°C]**	4 ... 21	5.5 ... 26	7 ... 34	15 ... 65	18 ... 84
Microswitch 25: Switching differential adjustable	**[°C]**	0.7 ... 10	2 ... 12	2.5 ... 16	3 ... 32	4 ... 40

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
10	Small switching differential, not adjustable	125 V, 10 (1.5) A 250 V, 10 (1.25) A	250 V, 0.2 (0.02) A 125 V, 0.4 (0.03) A 30 V, 2 (1) A 14 V, 15 (2.5) A
11	Average switching differential, not adjustable	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (1.5) A
21	Gold plated contacts, not adjustable	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A
25	Adjustable standard switching differential	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (2.5) A
24	Adjustable large switching differential	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.3 (0.2) A 125 V, 0.75 (0.4) A 30 V, 15 (1.5) A 14 V, 15 (1.5) A

Electrical connection



736/754



with accessory **23**

LABOR LIMISTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for measurement of pressure and temperature.

Applications

- Machine tools

Features

- Without housing
- Short response time
- Electrical connection on terminal screw

Technical Data			
Designation of application	Remote sensing thermostat with limiter, skeleton type	Switching differential	Not adjustable
Measuring range	-30°C ... +40°C to +70°C ... +350°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

		L...R .	XX	XX	XXX	XX	XXXXXXXXX	XX	XX
Custom build code	For increasing temperatures, screw terminal	755 .	12						
		.							

Range

Range [°C]	Sensor max. [°C]		Range [°C]	Sensor max. [°C]	
-30 ... +40	45	**01**	-10 ... +80	85	**95**
-10 ... +25	60	**07**	+5 ... +95	105	**20**
0 ... +35	70	**09**	+20 ... +110	115	**23**
+10 ... +45	85	**11**	+20 ... +150	165	**31**
+10 ... +80	100	**13**	+20 ... +230	250	**24**
+15 ... +30	60	**17**	+40 ... +300	330	**53**
-10 ... +35	70	**94**	+70 ... +350	380	**54**

Sensor [1]	See table "Ordering-no. for sensors"	**XXX**
Fixing [2]	Nut M10 (for remote sensing version)	**10**
	Angle bracket (for remote sensing version)	**17**
	Bracket (for remote sensing version)	**27**
	Grubscrew locked, lateral (direct mounting version) [4]	**12**
	Cap nut (for direct mounting version) [4]	**14**
	Grubscrew locked with spacer (cooling element) (for direct mounting version)	**18**
Protection tube	See data sheet H72114/H72163	**XXXX.XXXX**
Accessories	Switchpoint locking	**15**
	Switchpoint fixed and sealed upon customer's request	**88**
	Switchpoint preset upon customer's request, no guarantee on switching accuracy	**83**
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing	
	Condensator over Pin 1-2	**12**
	Condensator over Pin 1-3	**13**
	Condensators over Pin 1-2 / 1-3	**23**
	Railway version IEC 61373, category 2	**28**
	Capillary tube protection: Flexible metal tube, brass nickel plated	**90**
	Capillary tube protection: Flexible metal tube 1.4541/V2A	**91**
	Capillary tube protection: PVC tube	**92**
Capillary tube length	Capillary tube length up to 5000 mm (no specification required for direct mounting on protection tube) **L=XXXX** [3]	

[1] See data sheet H72114/H72163
[2] See data sheet H72106
[3] Overlengths upon request
[4] Media max. 150°C in continuous operation

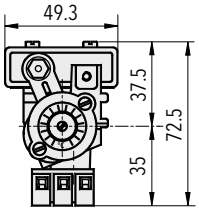
Ordering no. for sensors

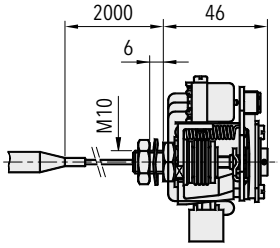
Range	Sensor-Ø	Sensor material		
		Stainless steel	Copper	Copper nickel plated
01, 07, 09, 11, 13, 17	4.7 mm		412	413
	7.0 mm	421	422	423
	9.0 mm		432	433
94, 95, 20, 23	4.7 mm	311	312	313
	7.0 mm	321	322	323
	9.0 mm	331	332	333
31	4.7 mm	111	112	113
	7.0 mm	121	122	123
	9.0 mm	131	132	133
24, 53, 54	4.7 mm	011	012	013
	7.0 mm	021	022	023
	9.0 mm	031	032	033

Standard products (extra short lead time)

Product No.	Type Code	Sensor material	Temperature range [°C]	Sensor max. [°C]
L95R	755 1220 322 10	Copper	+5 ... +95	105
L150R	755 1231 122 10	Copper	+20 ... +150	165
L230SR	755 1224 021 10	1.4435 (AISI316L)	+20 ... +230	250
L350SR	755 1254 021 10	1.4435 (AISI316L)	+70 ... +350	380

Dimensions





755.12XX.XXX.XX...

Specifications

Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	See table below
	Switching point	Temperature compensated with bimetal switch lever
Environmental conditions	Ambient temperature	Range ≤ +45°C: -30°C ... +50°C Range +45°C ... +250°C: -30°C ... +70°C Range > + 250°C: -10°C ... +70°C (Important: Temperature at sensor may not exceed maximum sensortemperature)
	Storage temperature	Range ≤ +45°C: -30°C ... +50°C Range > +45°C: -30°C ... +85°C
	Protection	IP00
	Humidity	Max. 95 % relative
Mechanical Data	Filling	Liquid
	Housing	See ordering information
	Installation	any position
	Weight	~ 250 g
Microswitch	Rating	See table below
	Resistance of insulation	> 2 MΩ
	Dielectric strength	2 kV terminal ground
	Life time (mechanical)	0.3 Mio. cycles
Electrical connection	Terminal screw	3 x 1 ... 2.5 mm²

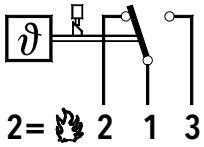
Additional information

Documents	Data sheet	www.trafag.com/H72124
	Instructions	www.trafag.com/H70211
	Flyer	www.trafag.com/H70968

Switching differential typ.						
Measuring range	**[°C]**	–30 ... +40 –10 ... +25 0 ... +35 +15 ... +30 +10 ... +45 +10 ... +80	–10 ... +35 –10 ... +80 +5 ... +95 +20 ... +110	+20 ... +150	+20 ... +230	+40 ... +300 +70 ... +350
Microswitch 12: Switching differential not adjustable	**[°C]**	2.0	6.0	7.5	9.0	12.0

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
12	Average switching differential, high vibration resistance	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.3 (0.2) A 125 V, 0.75 (0.4) A 30 V, 15 (1.5) A 14 V, 15 (1.5) A

Electrical Connection



755.12

INDUSTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for the measurement of pressure and temperature.

Applications

- Railways
- Machine tools

Features

- Compact design
- Rugged housing
- Protection IP65
- Any mounting position possible

Technical Data			
Designation of application	Industrial thermostat with remote sensor	Switching differential	Adjustable / not adjustable
Measuring range	-30°C ... +40°C to +70°C ... +350°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

		XXX	XX	XX	XXX	XX	XXXXXXXXX	XX	XX
Custom build code	External adjustment	**404**							
	Internal adjustment	**414**							
Microswitch	Small switching differential, not adjustable		**10**						
	Average switching differential, not adjustable		**11**						
	With gold plated contacts, switching differential not adjustable		**21**						
	Adjustable large switching differential		**24**						
	Adjustable standard switching differential		**25**						

Range	Range [°C]	Sensor max. [°C]		Range [°C]	Sensor max. [°C]	
	-30 ... 40	50	**01**	-10 ... 80	85	**95**
	-10 ... 25	60	**07**	5 ... 95	105	**20**
	0 ... 35	70	**09**	20 ... 110	115	**23**
	10 ... 45	85	**11**	20 ... 150	165	**31**
	10 ... 80	100	**13**	20 ... 230	250	**24**
	15 ... 30	60	**17**	40 ... 300	330	**53**
	-10 ... 35	70	**94**	70 ... 350	380	**54**

Sensor [1]	See table "Ordering-no. for sensors"			**XXX**					
Fixing [2]	Nut M10 (for remote sensing version)				**10**				
	Flange connection (for remote sensing version)				**16**				
	Angle bracket (for remote sensing version)				**17**				
	Bracket (for remote sensing version)				**27**				
	Grubscrew locked, lateral (direct mounting version) [5]				**12**				
	Cap nut (for direct mounting version) [5]				**13**				
	Cap nut (for direct mounting version) [5]				**14**				
	Grubscrew locked with spacer (cooling element) (for direct mounting version)				**18**				
Protection tube	See data sheet H72114/H72163						**XXXX.XXXX**		
Accessories	Switchpoint locking [4]							**15**	
	Switchpoint fixed and sealed upon customer's request [4]							**88**	
	Switchpoint preset upon customer's request, no guarantee on switching accuracy [4]							**83**	
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing								
	Condensator over Pin 1-2							**12**	
	Condensator over Pin 1-4							**13**	
	Condensators over Pin 1-2 / 1-4							**23**	
	Railway version IEC 61373, category 2							**28**	
	Outdoor application (vented)							**44**	
	Capillary tube protection: Flexible metal tube, brass nickel plated							**90**	
	Capillary tube protection: Flexible metal tube 1.4541/V2A							**91**	
	Capillary tube protection: PVC tube							**92**	
Capillary tube length	Capillary tube length up to 5000 mm (no specification required for direct mounting on protection tube) **L=XXXX** [3]								

[1] See data sheet H72114/H72163
[2] See data sheet H72106
[3] Overlengths upon request
[4] Only with type 414, internal adjustment
[5] Media max. 150°C in continuous operation

Ordering no. for sensors

		Sensor material		
Range	Sensor-Ø	Stainless steel	Copper	Copper nickel plated
01, 07, 09, 11, 13, 17	4.7 mm		412	413
	7.0 mm	421	422	423
	9.0 mm		432	433
94, 95, 20, 23	4.7 mm	311	312	313
	7.0 mm	321	322	323
	9.0 mm	331	332	333
31	4.7 mm	111	112	113
	7.0 mm	121	122	123
	9.0 mm	131	132	133
24, 53, 54	4.7 mm	011	012	013
	7.0 mm	021	022	023
	9.0 mm	031	032	033

Standard products (extra short lead time)

Product No.	Type Code	Sensor material	Temperature range [°C]	Switching differential [°C]	Sensor max. [°C]
I35	404 2509 422 27	Copper	0 ... +35	0.7 ... 10 (adjustable)	60
I40	404 2501 422 27	Copper	-30 ... +40	0.7 ... 10 (adjustable)	45
I95	404 2520 322 27	Copper	+5 ... +95	2 ... 12 (adjustable)	105
I150	404 2531 122 27	Copper	+20 ... +150	2.5 ... 16 (adjustable)	165
I230S	404 2524 021 27	1.4435 (AISI316L)	+20 ... +230	3 ... 32 (adjustable)	250
I350S	404 2554 021 27	1.4435 (AISI316L)	+70 ... +350	4 ... 40 (adjustable)	380
IS35	414 2509 422 27	Copper	0 ... +35	0.7 ... 10 (adjustable)	60
IS40	414 2501 422 27	Copper	-30 ... +40	0.7 ... 10 (adjustable)	45
IS95	414 2520 322 27	Copper	+5 ... +95	2 ... 12 (adjustable)	105
IS150	414 2531 122 27	Copper	+20 ... +150	2.5 ... 16 (adjustable)	165
IS230S	414 2524 021 27	1.4435 (AISI316L)	+20 ... +230	3 ... 32 (adjustable)	250
IS350S	414 2554 021 27	1.4435 (AISI316L)	+70 ... +350	4 ... 40 (adjustable)	380

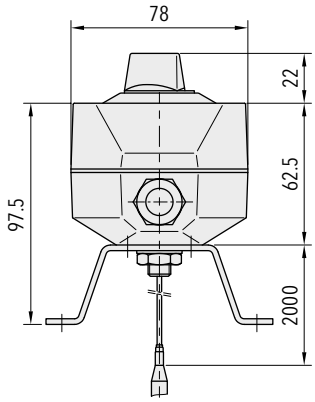
Specifications

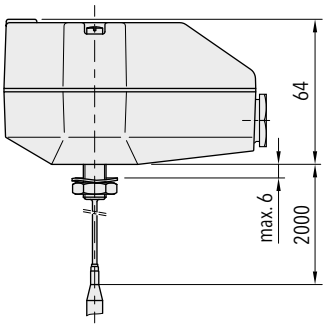
Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	See table
	Switching point	Temperature compensated with bimetal switch lever
Environmental conditions	Ambient temperature	Range ≤ +45°C: -30°C ... +50°C Range +45°C ... +250°C: -30°C ... +70°C Range > + 250°C: -10°C ... +70°C (Important: Temperature at sensor may not exceed maximum sensortemperature)
	Storage temperature	Range ≤ +45°C: -30°C ... +50°C Range > +45°C: -30°C ... +85°C
	Protection	IP65
	Humidity	Max. 95 % relative
	Vibration	5...25 Hz: ±1.6 mm 25...100 Hz: 4g
	Shock	50 g / 11 ms
Mechanical Data	Sensor housing	See ordering information
	Filling	Liquid
	Housing	AlSi9Cu3, coated
	Screwed cable gland	Brass nickel plated
	Installation	any position
	Weight	~ 950 g
Microswitch	Rating	See table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	U ≤ 250V: 1.45 kV / U ≤ 500V: 2 kV terminal ground
	Life time (mechanical)	Microswitch 10/11/25: 20 Mio. cycles Microswitch 21: 0.5 Mio. cycles Microswitch 24: 0.3 Mio. cycles
Electrical connection	Cable gland	M20x1.5 Cable-Ø 4...10 mm
	Terminal screw	3 x 1 ... 2.5 mm²

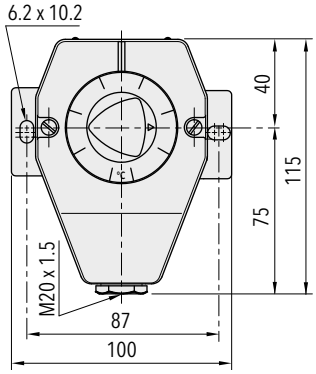
Additional information

Documents	Data sheet	www.trafag.com/H72110
	Instructions	www.trafag.com/H73111
	Flyer	www.trafag.com/H70951

Dimensions







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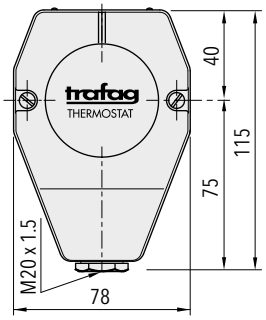

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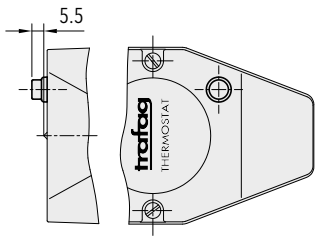
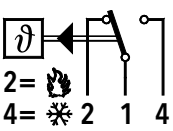


Accessory 14

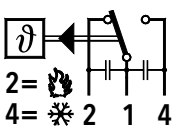
Switching differential typ.						
Measuring range	**[°C]**	–30 ... +40 –10 ... +25 0 ... +35 +15 ... +30 +10 ... +45 +10 ... +80	–10 ... +35 –10 ... +80 +5 ... +95 +20 ... +110	+20 ... +150	+20 ... +230	+40 ... +300 +70 ... +350
Microswitch 10: Switching differential not adjustable	**[°C]**	0.3	0.8	1	1.2	2
Microswitch 11/21: Switching differential not adjustable	**[°C]**	0.7	2	2.5	3	4
Microswitch 24: Switching differential adjustable	**[°C]**	4 ... 21	5.5 ... 26	7 ... 34	15 ... 65	18 ... 84
Microswitch 25: Switching differential adjustable	**[°C]**	0.7 ... 10	2 ... 12	2.5 ... 16	3 ... 32	4 ... 40

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
10	Small switching differential, not adjustable	125 V, 10 (1.5) A 250 V, 10 (1.25) A	250 V, 0.2 (0.02) A 125 V, 0.4 (0.03) A 30 V, 2 (1) A 14 V, 15 (2.5) A
11	Average switching differential, not adjustable	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (1.5) A
21	Gold plated contacts, not adjustable	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A	24 V, 0.1(0.1)A 12 V, 1 (1) A 5 V, 2 (2) A
25	Adjustable standard switching differential	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.25(0.03) A 125 V, 0.5(0.05) A 30 V, 6 (1.5) A 14 V, 15 (2.5) A
24	Adjustable large switching differential	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.3 (0.2) A 125 V, 0.75 (0.4) A 30 V, 15 (1.5) A 14 V, 15 (1.5) A

Electrical Connection



404/414



with accessory 23

INDU LIMISTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for measurement of pressure and temperature.

Applications

- Machine tools
- Process technology

Features

- Compact design
- Rugged housing
- Protection IP65
- Any mounting position possible

Technical Data			
Designation of application	Industrial thermostat with remote sensor and limiter	Switching differential	Not adjustable
Measuring range	-30°C ... +40°C to +70°C ... +350°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

		XXX .	XX	XX	XXX	XX	XXXXXXXXX	XX	XX
Custom build code	For increasing temperatures, internal resetting	**410 .**	**12**						
	For increasing temperatures, external resetting	**412 .**	**12**						

Range

Range [°C]	Sensor max. [°C]		Range [°C]	Sensor max. [°C]	
-30 ... +40	45	**01**	-10 ... +80	85	**95**
-10 ... +25	60	**07**	+5 ... +95	105	**20**
0 ... +35	70	**09**	+20 ... +110	115	**23**
+10 ... +45	85	**11**	+20 ... +150	165	**31**
+10 ... +80	100	**13**	+20 ... +230	250	**24**
+15 ... +30	60	**17**	+40 ... +300	330	**53**
-10 ... +35	70	**94**	+70 ... +350	380	**54**

Sensor [1]	See table "Ordering-no. for sensors"	**XXX**

Fixing [2]	Nut M10 (for remote sensing version)	**10**
	Flange connection (for remote sensing version)	**16**
	Angle bracket (for remote sensing version)	**17**
	Bracket (for remote sensing version)	**27**
	Grubscrew locked, lateral (direct mounting version) [4]	**12**
	Cap nut (for direct mounting version) [4]	**14**
	Grubscrew locked with spacer (cooling element) (for direct mounting version)	**18**

Protection tube	See data sheet H72114/H72163	**XXXX.XXXX**

Accessories

Switchpoint locking	**15**	Condensator over Pin 1-3	**13**
Switchpoint fixed and sealed upon customer's request	**88**	Condensators over Pin 1-2 / 1-3	**23**
Switchpoint preset upon customer's request, no guarantee on switching accuracy	**83**	Railway version IEC 61373, category 2	**28**
Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing		Outdoor application (vented)	**44**
		Capillary tube protection: Flexible metal tube, brass nickel plated	**90**
Condensator over Pin 1-2	**12**	Capillary tube protection: Flexible metal tube 1.4541/V2A	**91**
		Capillary tube protection: PVC tube	**92**

Capillary tube length	Capillary tube length up to 5000 mm (no specification required for direct mounting on protection tube) **L=XXXX** [3]

[1] See data sheet H72114/H72163
[2] See data sheet H72106
[3] Overlengths upon request
[4] Media max. 150°C in continuous operation

Ordering no. for sensors

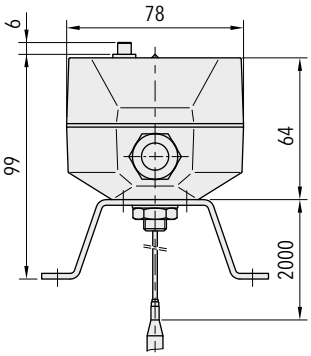
		Sensor material		
Range	Sensor-Ø	Stainless steel	Copper	Copper nickel plated
01, 07, 09, 11, 13, 17	4.7 mm		412	413
	7.0 mm	421	422	423
	9.0 mm		432	433
	12.0 mm	441	442	443
94, 95, 20, 23	4.7 mm	311	312	313
	7.0 mm	321	322	323
	9.0 mm	331	332	333
31	4.7 mm	111	112	113
	7.0 mm	121	122	123
	9.0 mm	131	132	133
24, 53, 54	4.7 mm	011	012	013
	7.0 mm	021	022	023
	9.0 mm	031	032	033

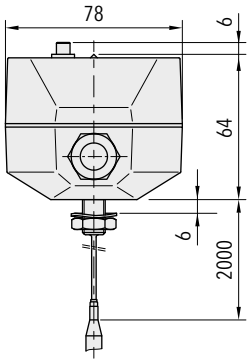
Standard products (extra short lead time)

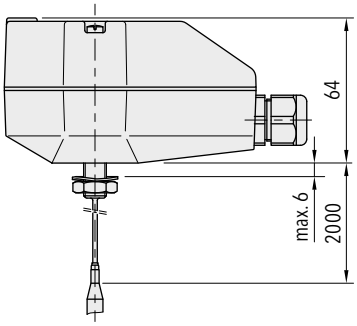
Product No.	Type Code	Sensor material	Temperature range [°C]	Sensor max. [°C]
IS95R	412 1220 322 27	Copper	+5 ... +95	105
IS150R	412 1231 122 27	Copper	+20 ... +150	165
IS230SR	412 1224 021 27	1.4435 (AISI316L)	+20 ... +230	250
IS350SR	412 1254 021 27	1.4435 (AISI316L)	+70 ... +350	380

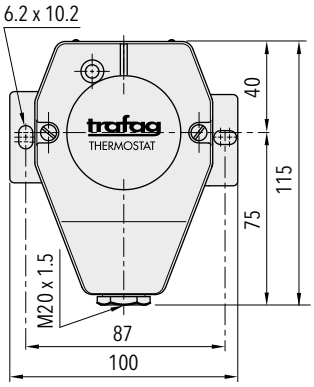
Specifications		
Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	See table
	Switching point	Temperature compensated with bimetal switch lever
Environmental conditions	Ambient temperature	Range ≤ +45°C: -30°C ... +50°C Range +45°C ... +250°C: -30°C ... +70°C Range > + 250°C: -10°C ... +70°C (Important: Temperature at sensor may not exceed maximum sensortemperature)
	Storage temperature	Range < +45°C: -30°C ... +50°C Range > +45°C: -30°C ... +85°C
	Protection	IP65
	Humidity	Max. 95 % relative
	Vibration	5...25 Hz: ±1.6 mm 25...100 Hz: 4g
	Shock	50 g / 11 ms
Mechanical Data	Sensor housing	See ordering information
	Filling	Liquid
	Housing	AlSi9Cu3, coated
	Screwed cable gland	Brass nickel plated
	Installation	any position
	Weight	~ 950 g
Microswitch	Rating	See table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	2 kV terminal ground
	Life time (mechanical)	0.3 Mio. cycles
Electrical connection	Cable gland	M20x1.5 Cable-Ø 4...10 mm
	Terminal screw	3 x 1 ... 2.5 mm²

Dimensions

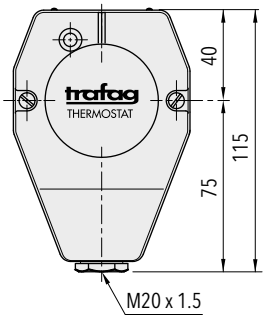




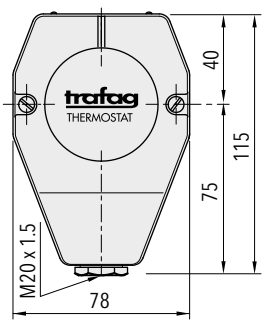




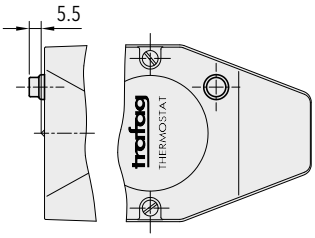
412.12XX.XXX.**27**...



412.12XX.XXX.**10**...



410.12XX.XXX.**10**...

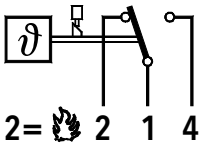


Accessory 14

Switching differential typ.						
Measuring range	**[°C]**	–30 ... +40 –10 ... +25 0 ... +35 +15 ... +30 +10 ... +45 +10 ... +80	–10 ... +35 –10 ... +80 +5 ... +95 +20 ... +110	+20 ... +150	+20 ... +230	+40 ... +300 +70 ... +350
Microswitch 12: Switching differential not adjustable	**[°C]**	2.0	6.0	7.5	9.0	12.0

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
12	Average switching differential, high vibration resistance	125 V, 15 (1.5) A 250 V, 15 (1.25) A 500 V, 10 (0.75) A	250 V, 0.3 (0.2) A 125 V, 0.75 (0.4) A 30 V, 15 (1.5) A 14 V, 15 (1.5) A

Electrical connection



410/412.12
Limiter for increasing temperatures

Additional information		
Documents	Data sheet	www.trafag.com/H72138
	Instructions	www.trafag.com/H73111
	Flyer	www.trafag.com/H70966

NAVISTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for the measurement of pressure and temperature.

Applications

- Shipbuilding
- Engine manufacturing
- Railways

Features

- Compact design
- Rugged housing
- High repeatability
- Protection IP65
- Any mounting position possible

Technical Data			
Designation of application	Thermostat for shipbuilding	Switching differential	Not adjustable
Measuring range	+20°C ... +110°C to +40°C ... +300°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	ABS, BV, CCS, DNV, GL, KRS, LRS, RINA, RMRS EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

		XXX .	XX	XX	XXX	XX	XXXX	XXXX	XX	XX
Custom build code	Controller, increased vibration resistance	**471 .**	**23**							
	Controller, high vibration resistance [1]	**471 .**	**26**							
	Temperature switch with locking, high vibration resistance [2]	**472 .**	**12**							

Range	**Range [°C]**	**Sensor max. [°C]**	
	+20 ... 110	115	**23**
	+20 ... 150	165	**31**
	+40 ... 300	330	**53**

Sensor	**Range [°C]**	**Sensor diameter [mm]**	
	+20 ... 110	Ø7	**322**
	+40 ... 300	Ø7	**122**
	+20 ... 150 / +40 ... 300	Ø9	**132**
	+20 ... 150 / +40 ... 300	Ø12	**142**

Fixing		
	Version B (remote sensing version)	**27**
	Version K (direct mounting version)	**14**

Protection tube	**Suitable for sensor**	**Protection tube diameter [mm]**	**Protection tube length [mm]**	**Electrical connection**	
	322	10/8	min. 150	K, Stainless steel	**1411**
	132 [3]	12/10	min. 110	K, Stainless steel	**1412**
	142 [3]	15/13	min. 65	K, Stainless steel	**1414**
	322	10/8	min. 150	K, Brass nickel plated	**1416**
	132 [3]	12/10	min. 110	K, Brass nickel plated	**1417**
	142 [3]	15/13	min. 65	K, Brass nickel plated	**1419**
	322 122	10/8	min. 150 min. 110	B, Brass nickel plated	**8316**
	332 132	12/10	min. 110 min. 90	B, Brass nickel plated	**8317**
	342 142	15/13	min. 65 min. 65	B, Brass nickel plated	**8319**
	322 122	10/8	min. 150 min. 110	B, Stainless steel	**8411**
	332 132	12/10	min. 110 min. 90	B, Stainless steel	**8412**
	342 142	15/13	min. 65 min. 65	B, Stainless steel	**8414**

Protection tube length		
	Length G, see data sheet H72114/H72163	**XXXX**

Accessories		
	Switchpoint fixed and sealed upon customer's request	**88**
	Switchpoint preset upon customer's request, no guarantee on switching accuracy	**83**
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing	
	Screwed cable gland M20x1.5 (EN 50262)	**07**
	Screwed cable gland M24x1.5 (DIN 89280)	**27**
	Screwed cable gland M18x1.5 (DIN 89280)	**40**
	Capillary tube protection: Flexible metal tube, brass nickel plated	**90**

Capillary tube length	
	Capillary tube length up to 5000 mm (no specification required for direct mounting on protection tube) **L = XXXX** Standard length: L = 3000 mm with flexible metal tube

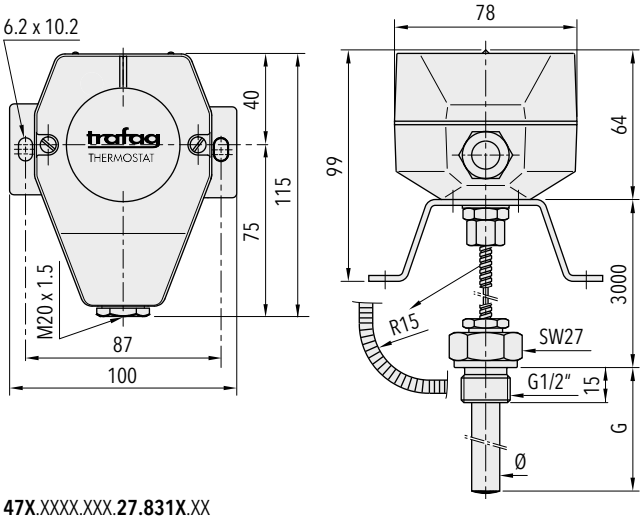
[1] Without ship approval GL
[2] Without ship approval LRS
[3] Only for range +20°C ... 150°C (Ordering no. 31)

Standard products (extra short lead time)

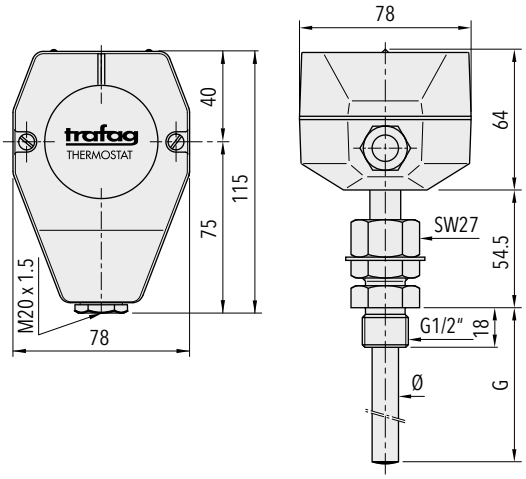
Product No.	Type Code	Temperature range [°C]	Protection tube diameter [mm]	Protection tube length [mm]	Switching differential [°C]	Sensor max. [°C]
ISN11011	471 2323 332 27 8317 0110 90	+20 ... +110	12	110	4.5 (fixed)	115
ISN11015	471 2323 322 27 8316 0150 90	+20 ... +110	10	150	4.5 (fixed)	115
ISN11065	471 2323 342 27 8319 0065 90	+20 ... +110	15	65	4.5 (fixed)	115
ISN15011	471 2331 132 27 8317 0110 90	+20 ... +150	12	110	5 (fixed)	165
ISN15015	471 2331 122 27 8316 0150 90	+20 ... +150	10	150	5 (fixed)	165
ISN15065	471 2331 142 27 8319 0065 90	+20 ... +150	15	65	5 (fixed)	165
ISNT11011	471 2323 332 14 1417 0110	+20 ... +110	12	110	4.5 (fixed)	115
ISNT11015	471 2323 322 14 1416 0150	+20 ... +110	10	150	4.5 (fixed)	115
ISNT11065	471 2323 342 14 1419 0065	+20 ... +110	15	65	4.5 (fixed)	115
ISNT15011	471 2331 132 14 1417 0110	+20 ... +150	12	110	5 (fixed)	165
ISNT15015	471 2331 122 14 1416 0150	+20 ... +150	10	150	5 (fixed)	165
ISNT15065	471 2331 142 14 1419 0065	+20 ... +150	15	65	5 (fixed)	165

Specifications		
Accuracy	Repeatability	± 0.5 % FS typ.
	Stability typ.	± 1 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	see table
	Switching point	Temperatur compensated with bimetal switch lever
Environmental Conditions	Ambient temperature	Range ≤ +45°C: -30 ... +50°C Range +45 ... +250°C: -30 ... +70°C Range > +250°C: -10 ... +70°C
	Storage temperature	-40°C ... +85°C
	Protection	IP65
	Humidity	Max. 95% relative
	Vibration	5...25 Hz: ±1.6 mm 25...100 Hz: 4g
	Shock	50g/ 11ms
Mechanical Data	Housing	Copper (Cu)
	Filling	Liquid
	Protection tube	See ordering information
	Housing	AlSi9Cu3, coated
	Screwed cable gland	Brass nickel plated
	Installation	Any position
	Weight	~ 950 g
Microswitch	Rating	see table
	Resistance of insulation	> 10 MΩ
	Dielectric strength	2 kV terminal ground
	Life time (mechanical)	Microswitch 12/23/26: 0.3 Mio. cycles
Electrical connection	Cable gland	M20x1.5 Cable-Ø 4...10 mm
	Terminal screw	3 x 1...2.5 mm^2

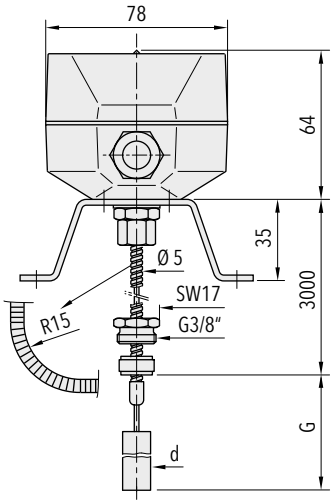
Dimensions



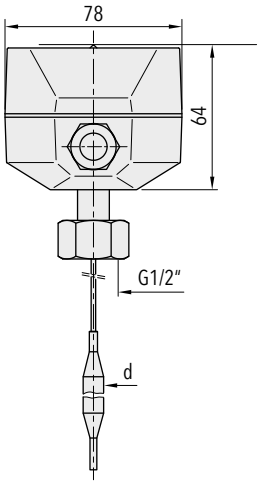
47X.XXXX.XXX.**27.831X**.XX



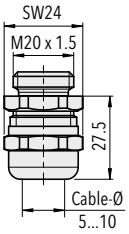
47X.XXXX.XXX.**14.141X**.XX



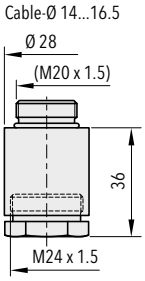
Version B / without protection tube



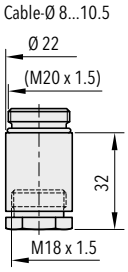
Version K / without protection tube



47X.XXXX.XXX.XX.XXXX.XXXX.**07**
M 20x1.5



47X.XXXX.XXX.XX.XXXX.XXXX.**27**
M 24x1.5

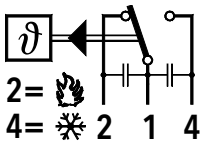


47X.XXXX.XXX.XX.XXXX.XXXX.**40**
M 18x1.5

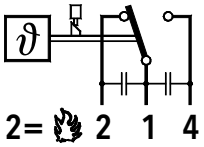
Switching differential typ.				
Range	**[°C]**	**+20 ... +110**	**+20 ... +150**	**+40 ... +300**
Sensor max.	[°C]	115	165	330
Switching differential micro switch 23 (fixed value, not adjustable)	[°C]	4.5	5	8
Switching differential micro switch 26 (fixed value, not adjustable)	[°C]	7.5	8	14
Switching differential micro switch 12 (limiter)	[°C]	(7.5)	(8)	(14)

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
12	Temperature switch with locking	125 V 15 (1.5) A 250 V 15 (1.25) A 500 V 10 (0.75) A	250 V 0.3 (0.2) A 125 V 0.75 (0.4) A 30 V 15 (1.5) A 14 V 15 (1.5) A
23	Controller; average switching differential	125 V 15 (1.5) A 250 V 15 (1.25) A 500 V 10 (0.75) A	250 V 0.3 (0.05) A 125 V 0.6 (0.1) A 30 V 15 (1.5) A 14 V 15 (1.5) A
26	Controller; large switching differential	125 V 15 (1.5) A 250 V 15 (1.25) A 500 V 10 (0.75) A	250 V 0.3 (0.2) A 125 V 0.75 (0.4) A 30 V 15 (1.5) A 14 V 15 (1.5) A

Electrical Connection



Switch 23/26



Switch 12/Limiter

Additional information		
Documents	Data sheet	www.trafag.com/H72111
	Instructions	www.trafag.com/H73111
	Flyer	www.trafag.com/H70950

PICOTHERM

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for measurement of pressure and temperature.

Applications

- Shipbuilding
- Engine manufacturing
- Railways
- Hydraulics
- HVAC

Features

- Compact design
- Rugged housing
- High repeatability
- Protection IP65
- Any mounting position possible

Technical Data			
Designation of application	Compact thermostat for shipbuilding	Switching differential	Not adjustable
Measuring range	+5°C ... +95°C to +20°C ... +150°C	Repeatability	± 1 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	ABS, BV, CCS, DNV-GL, KRS, LRS, NKK, RINA, RMRS EN60730-1/ EN60730-2-9: Typ 2.B.H

Subject to change

Ordering information/type code

			474 . XX	XX	XXX	XX	XXXX	XXXX	XX	XX
Micro-switch	Standard, switching differential not adjustable		**03**							
Range	**Range [°C]**	**Sensor max. [°C]**								
	+5 ... +95	100		**20**						
	+20 ... +110	115		**23**						
	+20 ... +150	165		**31**						
Sensor	**Sensor diameter [mm]**	**Range**								
	Ø7	20, 23			**322**					
	Ø9	20, 23			**332**					
	Ø12	20, 23			**342**					
	Ø7	31			**122**					
	Ø9	31			**132**					
	Ø12	31			**142**					
Fixing	Flange connection (for remote sensing version)					**00**				
	Cap nut (for direct mounting version)					**14**				
Protection tube	**Mounting**	**Suitable for sensor**	**Protection tube diameter [mm]**							
	For direct mounting on protection tube	122, 322	10				**1416**			
	For direct mounting on protection tube	142, 342	15				**1419**			
	For remote sensing version	122, 322	10				**8316**			
	For remote sensing version	142, 342	15				**8319**			
Protection tube length	Length G, see data sheet H72163							**XXXX**		
Accessories	Female electrical connector EN 175301-803-A (DIN43650-A)								**58**	
	Capillary tube protection: Flexible metal tube, brass nickel plated								**90**	
	Fixing set								**V3**	
	Cover with window								**77**	
Capillary tube length	Capillary tube length up to 5000 mm (no specification required for direct mounting on protection tube) **L = XXXX** Standard length: L = 3000 mm with flexible metal tube									

Standard products (extra short lead time)

Product No.	Type Code	Temperature range [°C]	Protection tube diameter [mm]	Protection tube length [mm]	Switching differential [°C]	Sensor max. [°C]
ISPT9515	474 0320 322 14 1416 0150 58 V3	+5 ... +95	10	150	4 (fixed)	100
ISPT9565	474 0320 342 14 1419 0065 58 V3	+5 ... +95	15	65	4 (fixed)	100
ISPT11015	474 0323 322 14 1416 0150 58 V3	+20 ... +110	10	150	4 (fixed)	115
ISPT11065	474 0323 342 14 1419 0065 58 V3	+20 ... +110	15	65	4 (fixed)	115
ISPT15015	474 0331 122 14 1416 0150 58 V3	+20 ... +150	10	150	5 (fixed)	165
ISPT15065	474 0331 142 14 1419 0065 58 V3	+20 ... +150	15	65	5 (fixed)	165
ISP9515	474 0320 322 00 8316 0150 58 90 V3	+5 ... +95	10	150	4 (fixed)	100
ISP9565	474 0320 342 00 8319 0065 58 90 V3	+5 ... +95	15	65	4 (fixed)	100
ISP11015	474 0323 322 00 8316 0150 58 90 V3	+20 ... +110	10	150	4 (fixed)	115
ISP11065	474 0323 342 00 8319 0065 58 90 V3	+20 ... +110	15	65	4 (fixed)	115
ISP15015	474 0331 122 00 8316 0150 58 90 V3	+20 ... +150	10	150	6 (fixed)	165
ISP15065	474 0331 142 00 8319 0065 58 90 V3	+20 ... +150	15	65	6 (fixed)	165

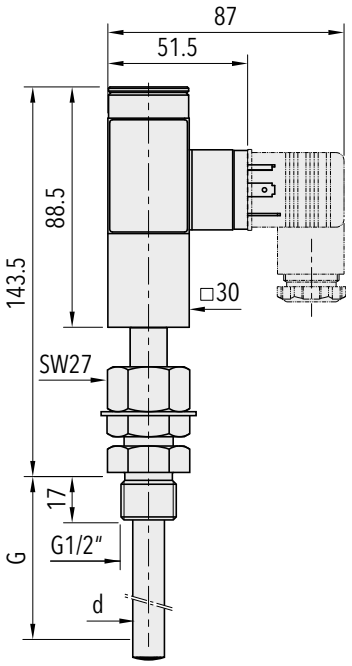
Specifications

Accuracy	Repeatability	± 1 % FS typ.
	Stability typ.	± 1 % FS typ.
	Scale accuracy typ.	± 4 % FS typ.
	Switching differential	See table
	Switching point	Temperature compensated with bimetal switch lever
Environmental conditions	Ambient temperature	-30°C ... +70°C
	Storage temperature	-40°C ... +85°C
	Protection	IP65
	Humidity	Max. 95 % relative
	Vibration	5...25 Hz: ±1.6 mm 25...100 Hz: 4g
	Shock	50 g / 11 ms
Mechanical Data	Sensor housing	Copper (Cu)
	Filling	Liquid
	Protection tube	Brass nickel plated
	Housing	AlMgSi1 anodized
	Male electrical plug	Polyamide (PA)
	Installation	any position
	Weight	~ 260 g
Microswitch	Rating	See table
	Resistance of insulation	> 10 MΩ
	Dielectric strength	2 kV terminal ground
	Life time (mechanical)	10 Mio. cycles
Electrical connection	Cable gland	Cable-Ø: 6...13 mm
	Terminal screw	4 x 0.5...1.5 mm²

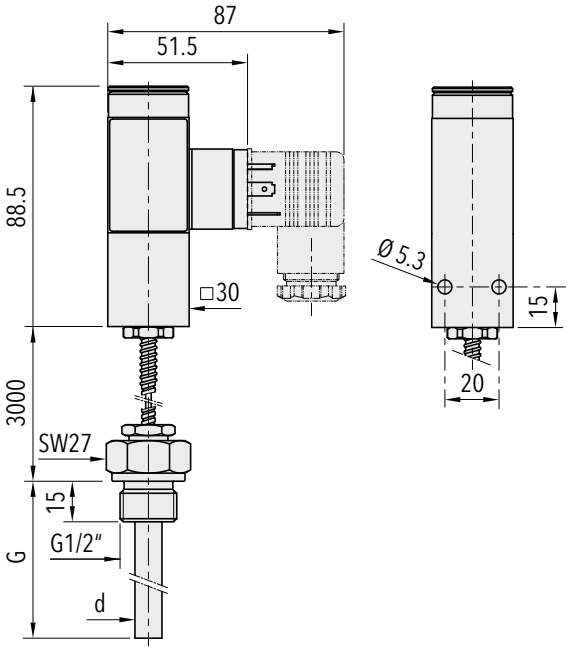
Additional information

Documents	Data sheet	www.trafag.com/H72113
	Instructions	www.trafag.com/H73113
	Flyer	www.trafag.com/H70953

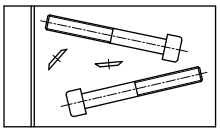
Dimensions



474.XXXX.XXX.**14.14**XX...



474.XXXX.XXX.**00.83**XX...



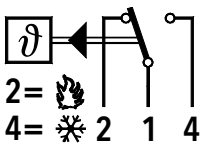
M5x40 ISO4762

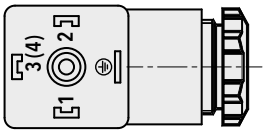
474...**V3**

Switching differential typ.				
Measuring range	**[°C]**	**+5 ... +95**	**+20 ... +110**	**+20 ... +150**
Sensor max.	[°C]	100	115	165
Microswitch 03: Switching differential not adjustable	[°C]	4.0	4.0	6.0

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
03	Silver contacts	250 V, 3 (1) A	250 V, 0.1 (0.05) A 220 V, 0.25 (0.2) A 110 V, 0.5 (0.3) A 24 V, 2.0 (1.0) A

Electrical Connection





DIN 43650-A

EX INDUSTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for measurement of pressure and temperature.

Applications

- Ex II 2 G / D

Features

- Compact design
- Rugged housing
- Any mounting position possible
- Ex db eb IIC T6 Gb
- Ex tb IIIC T80°C Db

Technical Data			
Designation of application	Ex Industrial thermostat with remote sensor	Switching differential	Not adjustable
Measuring range	-30°C ... +40°C to +70°C ... +350°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	SEV 15 ATEX 0156 X IECEx SEV 17.0010X

Subject to change

Ordering information/type code

		XXX	XX	XX	XXX	XX	XXXXXXXXX	XX	XX
Custom build code	External adjustment	**404**							
	Internal adjustment	**414**							
Microswitch	Standard, switching differential not adjustable		**91**						

Range

Range [°C]	Sensor max. [°C]		Range [°C]	Sensor max. [°C]	
-30 ... +40	50	**01**	-10 ... +80	85	**95**
-10 ... +25	60	**07**	+5 ... +95	105	**20**
0 ... +35	70	**09**	+20 ... +110	115	**23**
+10 ... +45	85	**11**	+20 ... +150	165	**31**
+10 ... +80	100	**13**	+20 ... +230	250	**24**
+15 ... +30	60	**17**	+40 ... +300	330	**53**
-10 ... +35	70	**94**	+35 ... +175	200	**56**
+10 ... +70	85	**59**	+20 ... +270	330	**55**
+20 ... +85	100	**58**	+70 ... +350	380	**54**
+20 ... +115	130	**57**			

Sensor [1]	See table "Ordering-no. for sensors"			**XXX**					
Fixing [2]	Nut M10 (for remote sensing version)				**10**				
	Bracket (for remote sensing version)				**27**				
	Grubscrew locked, lateral (direct mounting version) [5]				**12**				
	Cap nut (for direct mounting version) [5]				**14**				
	Grubscrew locked with spacer (cooling element) (for direct mounting version)				**18**				
Protection tube	See data sheet H72114/H72163						**XXXX.XXXX**		
Accessories	Switchpoint locking [4]							**15**	
	Switchpoint fixed and sealed upon customer's request [4]							**88**	
	Switchpoint preset upon customer's request, no guarantee on switching accuracy [4]							**83**	
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing								
	Capillary tube protection: Flexible metal tube, brass nickel plated							**90**	
	Capillary tube protection: Flexible metal tube 1.4541/V2A							**91**	
Capillary tube length	Capillary tube length up to 5000 mm (no specification required for direct mounting on protection tube) **L=XXXX** [3]								

[1] See data sheet H72114/H72163
[2] See data sheet H72106
[3] Overlengths upon request
[4] Only with type 414, internal adjustment
[5] Media max. 150°C in continuous operation

Ordering no. for sensors

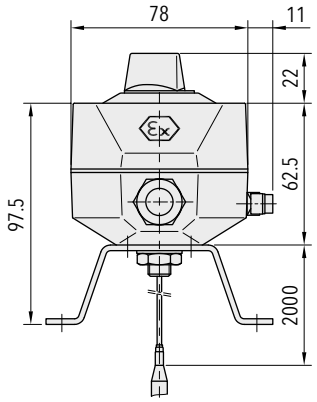
		Sensor material		
Range	Sensor-Ø	Stainless steel	Copper	Copper nickel plated
01, 07, 09, 11, 13, 17, 58, 59	4.7 mm	421	412	413
	7.0 mm		422	423
	9.0 mm		432	433
94, 95, 20, 23, 57	4.7 mm	311	312	313
	7.0 mm	321	322	323
	9.0 mm	331	332	333
31, 56	4.7 mm	111	112	113
	7.0 mm	121	122	123
	9.0 mm	131	132	133
24, 53, 54, 55	4.7 mm	011	012	013
	7.0 mm	021	022	023
	9.0 mm	031	032	033

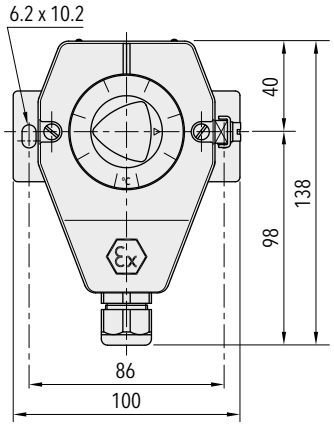
Standard products (extra short lead time)

Product No.	Type Code	Sensor material	Temperature range [°C]	Switching differential [°C]	Sensor max. [°C]
EXS35	414 9109 423 27 0000 0000 02	Copper nickel plated	0 ... +35	2.5 (fixed)	50
EXS40	414 9101 423 27 0000 0000 02	Copper nickel plated	-30 ... +40	2.5 (fixed)	45
EXS95	414 9120 323 27 0000 0000 02	Copper nickel plated	+5 ... +95	3.5 (fixed)	105
EXS150	414 9131 123 27 0000 0000 02	Copper nickel plated	+20 ... +150	5.5 (fixed)	165
EXS230S	414 9124 021 27 0000 0000 02	1.4435 (AISI316L)	+20 ... +230	8 (fixed)	250
EXS350S	414 9154 021 27 0000 0000 02	1.4435 (AISI316L)	+70 ... +350	10 (fixed)	380

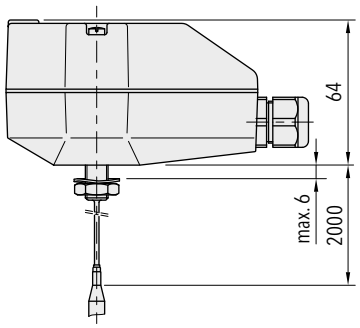
Specifications		
Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	See table
	Switching point	Temperature compensated with bimetal switch lever
Environmental conditions	Ambient temperature	Range ≤ +45°C: -30°C ... +50°C Range +45°C ... +250°C: -30°C ... +60°C Range > + 250°C: -10°C ... +60°C
	Storage temperature	Range ≤ +45°C: -30°C ... +50°C Range > +45°C: -30°C ... +60°C
	Protection	IP65
	Humidity	Max. 95 % relative
	Vibration	5...25 Hz: ±1.6 mm 25...100 Hz: 4 g
	Shock	50 g / 11 ms
Mechanical Data	Sensor housing	See ordering information
	Filling	Liquid
	Housing	AlSi9Cu3, coated
	Screwed cable gland	Polyamide (PA)
	Installation	any position
	Weight	~ 950 g
Microswitch	Rating	See table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	1.5 kV
	Life time (mechanical)	1 Mio. cycles
Electrical connection	Cable gland	M20x1.5/SW24 Cable-Ø 5.5...13 mm Approval: PTB 99 ATEX 3128 X
	Terminal screw	3 x 1 ... 2.5 mm²

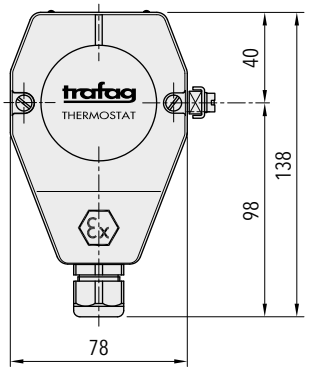
Dimensions





404.XXXX.XXX.**27**...



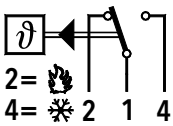


414.XXXX.XXX.**10**...

Switching differential typ.						
Measuring range	**[°C]**	–30 ... +40 –10 ... +25 0 ... +35 +15 ... +30 +10 ... +45 +10 ... +70 +10 ... +80 +20 ... +85	–10 ... +35 –10 ... +80 +5 ... +95 +20 ... +110 +20 ... +115	+20 ... +150	+35 ... +175 +20 ... +230	+40 ... +300 +70 ... +350
Microswitch 91: Switching differential not adjustable	**[°C]**	2.5	3.5	5.5	8	10

Electrical data switch			
		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
91	Standard Ex	250V 5(5) A 125V 5(5) A	250 V 0.25 (0.03) A 125 V 0.5 (0.06) A 75 V 0.75 (0.25) A 50 V 1 (1) A 30 V 5 (3) A 15 V 5 (3) A

Electrical connection



404 / 414

Additional information		
Documents	Data sheet	www.trafag.com/H72108
	Instructions	www.trafag.com/H73172
	Flyer	www.trafag.com/H70970

EX INDU AMBISTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for the measurement of pressure and temperature.

Applications

- Ex II 2 G / D

Features

- Compact design
- Rugged housing
- Protection IP65
- Ex db eb IIC T6 Gb
- Ex tb IIIC T80°C Db

Technical Data			
Designation of application	Ex Industrial room thermostat	Switching differential	Not adjustable
Measuring range	-30°C ... +30°C to 0°C ... +60°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	SEV 15 ATEX 0156 X IECEx SEV 17.0010X

Subject to change

Ordering information/type code

		XXX	XX	XX	XXXXXX	XX
Custom build code	External adjustment	**409**				
	Internal adjustment	**419**				
Microswitch	Standard, not adjustable		**91**			

	Range [°C]	Operating temperature [°C]	
Range	-30 ... +30	-30 ... +40	**02**
	+5 ... +35	-30 ... +50	**10**
	0 ... +60	-30 ... +60	**12**

Sensor [1] / Fixing [2]	Sensor: Copper; Fixation: Bracket (open sensor coil)	**522.27**
	Sensor: Copper nickel plated; Fixation: Bracket (open sensor coil)	**523.27**

Accessories	Switchpoint locking [3]	**15**
	Switchpoint fixed and sealed upon customer's request [3]	**88**
	Switchpoint preset upon customer's request, no guarantee on switching accuracy [3]	**83**
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing	

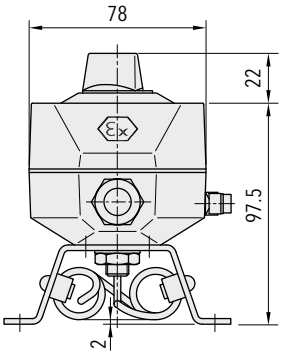
[1] See data sheet H72114/H72163
[2] See data sheet H72106
[3] Only with type 419, internal adjustment

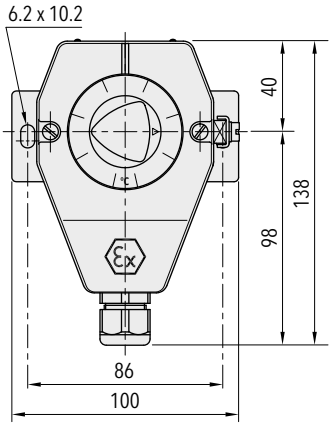
Standard products (extra short lead time)

Product No.	Type Code	Temperature range [°C]	Switching differential [°C]	Operating temperature [°C]
EXAS33	419 9102 523 27 0000 0000 02	-30 ... +30	2.5 (fixed)	-30 ... +40
EXAS35	419 9110 523 27 0000 0000 02	+5 ... +35	2.5 (fixed)	-30 ... +50
EXAS60	419 9112 523 27 0000 0000 02	0 ... +60	2.5 (fixed)	-30 ... +60

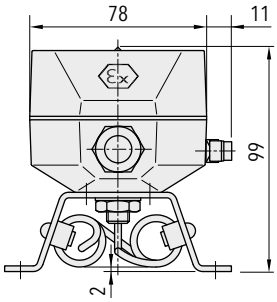
Specifications		
Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	2.5°C (not adjustable)
Environmental conditions	Ambient temperature	-30°C ... +60°C
	Storage temperature	Range ≤ +45°C: -30°C ... +50°C Range > +45°C: -30°C ... +60°C
	Protection	IP65
	Humidity	Max. 95 % relative
	Vibration	5...25 Hz: ±1.6 mm 25...100 Hz: 4 g
	Shock	50g/ 11ms
Mechanical Data	Sensor housing	See ordering information
	Filling	Liquid
	Housing	AlSi9Cu3, coated
	Screwed cable gland	Polyamide
	Installation	any position
	Weight	~ 950 g
Microswitch	Rating	See table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	1.5 kV
	Life time (mechanical)	1 Mio. cycles
Electrical connection	Cable gland	M20x1.5/SW24 Cable-Ø 5.5...13 mm Approval: PTB 99 ATEX 3128 X
	Terminal screw	3 x 1...2.5 mm²

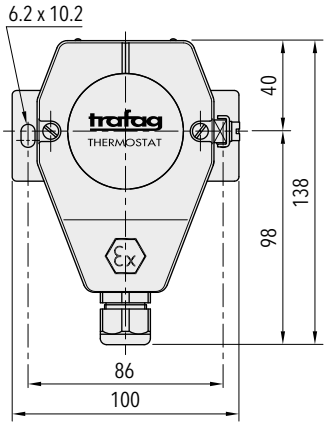
Dimensions





409.91XX.XXX.**27**...



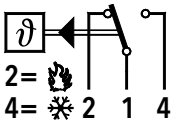


419.91XX.XXX.**27**...

Electrical data switch

		Rating Resistive Load (Inductive Load)	
Type	**Features**	**AC**	**DC**
91	Standard Ex	250V 5(5) A 125V 5(5) A	250 V 0.25 (0.03) A 125 V 0.5 (0.06) A 75 V 0.75 (0.25) A 50 V 1 (1) A 30 V 5 (3) A 15 V 5 (3) A

Electrical connection



409/419

Additional information

Documents	Data sheet	www.trafag.com/H72128
	Instructions	www.trafag.com/H73172
	Flyer	www.trafag.com/H70969

INDUSTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for measurement of pressure and temperature.

Applications

- Potentially hazardous areas

Features

- Compact design
- Rugged housing
- Protection IP65
- Any mounting position possible
- May be used as „simple apparatus" in zones at risk of explosions

Technical Data			
Designation of application	Industrial room thermostat with remote sensor	Switching differential	Not adjustable
Measuring range	-30°C ... +40°C to +70°C ... +350°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H EN60079-0, EN60079-11 Zone 1 and 2, 21 and 22

Subject to change

«Simple Apparatus» conformity to ATEX 414

Ordering information/type code

			XXX	XX	XX	XXX	XX	XXXXXXXXX	XX	XX
Custom build code	Internal adjustment		**414**							
Microswitch	With gold plated contacts, switching differential not adjustable			**71**						
Range	**Range [°C]**	**Sensor max. [°C]**								
	-30 ... +40	50			**01**					
	-10 ... +25	60			**07**					
	0 ... +35	70			**09**					
	+10 ... +45	85			**11**					
	+10 ... +80	100			**13**					
	+15 ... +30	60			**17**					
	-10 ... +35	70			**94**					
	-10 ... +80	85			**95**					
	+5 ... +95	105			**20**					
	+20 ... +110	115			**23**					
	+20 ... +150	165			**31**					
	+20 ... +230	250			**24**					
	+40 ... +300	330			**53**					
	+70 ... +350	380			**54**					
Sensor [1]	See table "Ordering-no. for sensors"					**XXX**				
Fixing [2]	Nut M10 (for remote sensing version)						**10**			
	Flange connection (for remote sensing version)						**16**			
	Angle bracket (for remote sensing version)						**17**			
	Bracket (for remote sensing version)						**27**			
	Grubscrew locked, lateral (direct mounting version) [4]						**12**			
	Cap nut (for direct mounting version) [4]						**13**			
	Cap nut (for direct mounting version) [4]						**14**			
	Grubscrew locked with spacer (cooling element) (for direct mounting version)						**18**			
Protection tube	See data sheet H72114/H72163							**XXXX.XXXX**		
Accessories	Switchpoint locking								**15**	
	Switchpoint fixed and sealed upon customer's request								**88**	
	Switchpoint preset upon customer's request, no guarantee on switching accuracy								**83**	
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing									
	Capillary tube protection: Flexible metal tube, brass nickel plated								**90**	
	Capillary tube protection: Flexible metal tube 1.4541/V2A								**91**	
Capillary tube length	Capillary tube length up to 5000 mm (no specification required for direct mounting on protection tube) **L=XXXX** [3]									

[1] See data sheet H72114/H72163
[2] See data sheet H72106
[3] Overlengths upon request
[4] Media max. 150°C in continuous operation

«Simple Apparatus» conformity to ATEX 414

Optional accessories of third party supplier
Ex-i barriers are suitable for intrinsically safe applications. The device transmits binary signals from the hazardous area into the safe area.

Ex-i-barriers: 24 VDC U_0 = 10.5 V/ I_0 = 13 mA/ P_0 = 34 mW	**ZEN24VDC**
Ex-i-barriers: 230 VAC U_0 = 10.6 V/ I_0 = 19.1 mA/ P_0 = 51 mW	**ZEN230VAC**

Thermostats, when combined with a certified Ex-barrier (see "optional accessories of third party supplier"), can be used as "simple electrical apparatus" in Zone 1 and 2, as well as in Zone 21 and 22, according to IEC/EN 60079-14. These thermostats are not suitable for Zone 0 and Zone 20. Use in safety relevant applications (approved electrical apparatus) is not permitted.

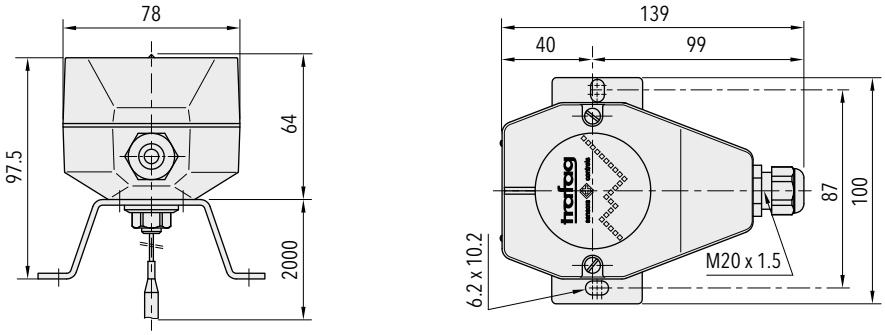
Ordering no. for sensors

		Sensor material		
Range	**Sensor-Ø**	**Stainless steel**	**Copper**	**Copper nickel plated**
01, 07, 09, 11, 13, 17	4.7 mm		412	413
	7.0 mm	421	422	423
	9.0 mm		432	433
94, 95, 20, 23	4.7 mm	311	312	313
	7.0 mm	321	322	323
	9.0 mm	331	332	333
31	4.7 mm	111	112	113
	7.0 mm	121	122	123
	9.0 mm	131	132	133
24, 53, 54	4.7 mm	011	012	013
	7.0 mm	021	022	023
	9.0 mm	031	032	033

«Simple Apparatus» conformity to ATEX 414

Specifications		
Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	See table
Environmental conditions	Ambient temperature	Range ≤ +45°C: -30°C ... +50°C Range > +45°C: -30°C ... +65°C (important: Temperature at sensor may not exceed maximum sensortemperature)
	Storage temperature	Range ≤ +45°C: -30°C ... +50°C Range > +45°C: -30°C ... +70°C
	Protection	IP65
	Humidity	Max. 95 % relative
	Vibration	5...25 Hz: ±1.6 mm 25...100 Hz: 4g
	Shock	50 g / 11 ms
Mechanical Data	Sensor housing	See ordering information
	Filling	Liquid
	Housing	AlSi9Cu3, coated
	Screwed cable gland	Polyamide (PA), light blue
	Installation	Any position Recommendation: screwage pointing downwards
	Weight	~ 950 g
Microswitch	Rating	See table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	1.25 kV terminal ground
	Life time (mechanical)	1 Mio. cycles
Electrical connection	Cable gland	M20x1.5 Cable-Ø 4...10 mm, max. cable length according to EN60079-11
	Terminal screw	3 x 1 ... 2.5 mm²

Dimensions



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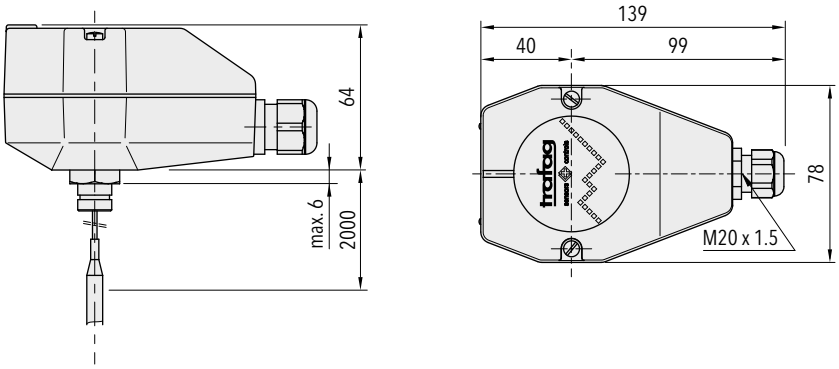
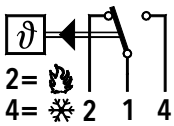


414.71.XX.XXX.XX.XX...

Switching differential typ.						
Measuring range	**[°C]**	–30 ... +40 –10 ... +25 0 ... +35 +15 ... +30 +10 ... +45 +10 ... +80	–10 ... +35 –10 ... +80 +5 ... +95 +20 ... +110	+20 ... +150	+20 ... +230	+40 ... +300 +70 ... +350
Microswitch 71: Switching differential not adjustable	**[°C]**	0.7	2	2.5	3	4

Electrical data switch		
Type	**Features**	**Rating**
71	With gold plated contacts, switching differential not adjustable	U_0 = 24 V I_0 = 100 mA P_0 = 600 mW

Electrical connection



Additional information		
Documents	Data sheet	www.trafag.com/H72183
	Instructions	www.trafag.com/H73173
	Flyer	www.trafag.com/H70971

AMBISTAT

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for the measurement of pressure and temperature.

Applications

- Potentially explosive atmosphere

Features

- Compact design
- Rugged housing
- Protection IP65
- Any mounting position possible
- May be used as „simple apparatus" in zones at risk of explosions

Technical Data			
Designation of application	Industrial room thermostat	Switching differential	Not adjustable
Measuring range	-30°C ... +30°C to 0°C ... +60°C	Repeatability	± 0.5 % FS typ.
Output signal	Floating change-over contact	Approval / conformity	EN60730-1/ EN60730-2-9: Typ 2.B.H EN60079-0, EN60079-11 Zone 1 and 2, 21 and 22

Subject to change

«Simple Apparatus» conformity to ATEX 419

Ordering information/type code

			XXX	XX	XX	XXXXXX	XX
Custom build code	Internal adjustment		**419**				
Microswitch	With gold plated contacts, switching differential not adjustable			**71**			
Range	**Range [°C]**	**Operating temperature [°C]**					
	-30 ... +30	-30 ... +40			**02**		
	-20 ... +40	-30 ... +50			**06**		
	+5 ... +35	-30 ... +50			**10**		
	0 ... +60	-30 ... +65			**12**		
Sensor / Fixing	Sensor: Copper; Fixation: Bracket (open sensor coil)					**522.27**	
	Sensor: Copper nickel plated; Fixation: Bracket (open sensor coil)					**523.27**	
Accessories	Switchpoint locking						**15**
	Switchpoint fixed and sealed upon customer's request						**88**
	Switchpoint preset upon customer's request, no guarantee on switching accuracy						**83**
	Switchpoint adjustment please indicate when ordering: - Switchpoint [°C] - Increasing or decreasing						

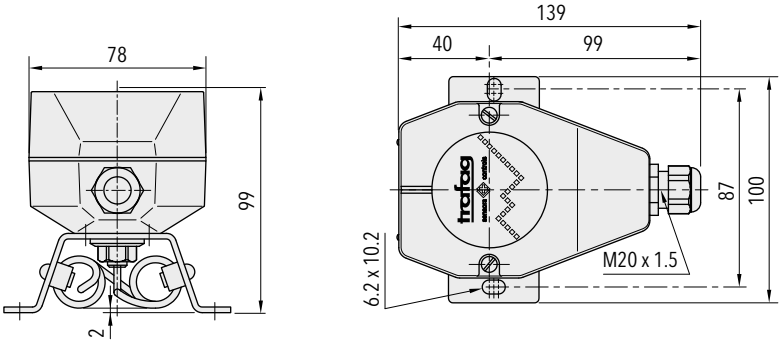
Optional accessories of third party supplier

Ex-i barriers are suitable for intrinsically safe applications. The device transmits binary signals from the hazardous area into the safe area.

Ex-i-barriers: 24 VDC U_0 = 10.5 V/ I_0 = 13 mA/ P_0 = 34 mW	**ZEN24VDC**
Ex-i-barriers: 230 VAC U_0 = 10.6 V/ I_0 = 19.1 mA/ P_0 = 51 mW	**ZEN230VAC**

Thermostats, when combined with a certified Ex-barrier (see "optional accessories of third party supplier"), can be used as "simple electrical apparatus" in Zone 1 and 2, as well as in Zone 21 and 22, according to IEC/EN 60079-14. These thermostats are not suitable for Zone 0 and Zone 20. Use in safety relevant applications (approved electrical apparatus) is not permitted.

Dimensions



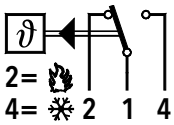
419.71.XX.**52X.27**.XX

«Simple Apparatus» conformity to ATEX 419

Specifications		
Accuracy	Repeatability	± 0.5 % FS typ.
	Scale accuracy typ.	± 2 % FS typ.
	Switching differential	0.7°C (not adjustable)
Environmental conditions	Ambient temperature	-30°C ... max. +65°C
	Storage temperature	Range ≤ +40°C: -30 ... +50°C Range > +40°C: -30 ... +70°C
	Protection	IP65
	Humidity	Max. 95 % relative
Mechanical Data	Sensor housing	See ordering information
	Filling	Liquid
	Housing	AlSi9Cu3, coated
	Screwed cable gland	PA, Polyamide, light blue
	Installation	Any position Recommendation: screwage pointing downwards
	Weight	~ 950 g
Microswitch	Rating	See table
	Resistance of insulation	> 2 MΩ
	Dielectric strength	500 V AC terminal ground
	Life time (mechanical)	1 Mio. cycles
Electrical connection	Cable gland	M20x1.5 Cable-Ø 4...10 mm, max. cable length according to EN60079-11
	Terminal screw	3 x 1...2.5 mm²

Electrical data switch		
Type	**Features**	**Rating**
71	Gold plated contacts	U_0 = 24 V I_0 = 100 mA P_0 = 600 mW

Electrical connection



Additional information		
Documents	Data sheet	www.trafag.com/H72182
	Instructions	www.trafag.com/H73173
	Flyer	www.trafag.com/H70972

TEMPERATURE SWITCH

Swiss based Trafag is a leading international supplier of high quality sensors and monitoring instruments for measurement of pressure and temperature.

Applications

- Machine tools
- Hydraulic power units
- Cooling and lubrication systems
- HVAC
- Process technology

Features

- Parameterization also via NFC-smartphone App (Android)
- Display and electrical connection are independently rotatable 335°/343°
- Analogue output switchable mA or V
- Integrated datalogger
- Temperature measuring range adjustable, 50 … 100 % of the nominal range

Technical Data			
Measuring principle	PT 1000, DIN EN 60751 class A, 2 conductors	Accuracy @ 25°C typ.	± 0.5 % FS typ.+ temperature sensor error
Measuring range	-50°C ... +150°C / -58°F ... 302°F adjustable 50 ... 100 % FS	Ambient temperature	-25°C ... +85°C
Output signal	4 ... 20 mA, 0 ... 5 VDC, 1 ... 6 VDC, 0 ... 10 VDC, switchable mA or V	Temperature unit for display	°C, °F, K, user scale
Switching output	2 transistors PNP	Logger	Ring buffer: 3518 data points Sampling time: 0.1 ... 999.9 s, Off (0)

Subject to change

Ordering information/type code

		8180 . XX	XX	XX	XX	XX	XX
Operating temperature media	Measuring range						
	-50°C ... +150°C (-58°F ... 302°F)	50					
Sensor	Sensor DIN EN 60751, class 1, wetted parts 1.4404 (AISI316L)		21				
	Sensor DIN EN 60751, class 1, wetted parts 1.4404 (AISI316L), shorter response time [1]		22				
Process connections	See table below "Ordering no. for process connections"						
Electrical connection	Male electrical plug M12x1, 4-pole, Mat. PA (Accessories P3, P4)				32		
	Male electrical plug M12x1, 5-pole, Mat. PA (Accessories P1, P2)				35		
Output signal	Switching output PNP, current output 4 ... 20 mA, switchable to 0 ... 10 VDC; output detail see accessories P1, P2, P3					PA	
	Switching output PNP, voltage output 1 ... 6 VDC; output detail see accessories P1, P2, P3					PU	
	Switching output PNP, voltage output 0 ... 10 VDC; output detail see accessories P1, P2, P3					PV	
	Switching output PNP, voltage output 0 ... 5 VDC; output detail see accessories P1, P2, P3					PW	
	Switching output PNP; output detail see accessory P4					PS	
Accessories	Pin configuration 5-pole.; 1: U+, 2: analogue, 3: U-, 4: SP1, 5: SP2						P1
	Pin configuration 5-pole.; 1: U+, 2: SP2 , 3: U-, 4: SP1, 5: analogue						P2
	Pin configuration 4-pole.; 1: U+, 2: analogue, 3: U-, 4: SP1						P3
	Pin configuration 4-pole.; 1: U+, 2: SP2 , 3: U-, 4: SP1						P4
	Female electrical plug M12x1, 5-pole						33
	Parametrisation standard (see table Parameter)						ZS
	Parametrisation according to customer specifications (see table Parameter)						ZC
	Function package 1: Temperature offset correction / Measuring range zero point adjustment (included as basic function)						Z1
	Function package 2: User scale unit / analogue output adjustment						Z2
	Protective cap, 1 pc. F89051, package of 5 pcs. F89052, package of 25 pcs. F89075						

[1] Upon request

Ordering no. for process connections

Sensor length	50 mm	100 mm	150 mm	200 mm *	250 mm *
G1/8" male	11	21	31	41	51
G1/4" male	12	22	32	42	52
G1/2" male	13	23	33	43	53
G1/8" male, compression fitting	14	24	34	44	54
G1/4" male, compression fitting	15	25	35	45	55
G1/2" male, compression fitting	16	26	36	46	56
1/4" NPT male	1B	2B	3B	4B	5B
1/2" NPT male	1C	2C	3C	4C	5C
1/4" NPT male, compression fitting	1D	2D	3D	4D	5D
1/2" NPT male, compression fitting	1E	2E	3E	4E	5E
Tri-Clamp DIN 32676, DN25/DN40 *	1G	2G	3G	4G	5G
Tri-Clamp DIN 32676, DN50 *	1J	2J	3J	4J	5J
Sanitary fitting DIN 11851, DN25 *	1L	2L	3L	4L	5L
Sanitary fitting DIN 11851, DN40 *	1M	2M	3M	4M	5M
Sanitary fitting DIN 11851, DN50 *	1N	2N	3N	4N	5N

* Upon request

Parameters

Name	Standard setting (accessory ZS)	Value range	Short name	Customer adjustment (accessory ZC)
Switch point SP1 (hysteresis mode) Upper switch point FH1 (window mode)	75 % Measuring range	SP1 > RP1 FH1 > FL1 Hysteresis ≥ 1 % FS	SP1	
Reset point RP1 (hysteresis mode) Lower switch point FL1 (window mode)	25 % Measuring range	RP1 < SP1 FL1 < FH1 Hysteresis ≥ 1 % FS	RP1	
Switch point SP2 (hysteresis mode) Upper switch point FH2 (window mode)	75 % Measuring range	SP2 > RP2 FH2 > FL2 Hysteresis ≥ 1 % FS	SP2	
Reset point RP2 (hysteresis mode) Lower switch point FL2 (window mode)	25 % Measuring range	RP2 < SP2 FL2 < FH2 Hysteresis ≥ 1 % FS	RP2	
Switch point delay time SP1 (hysteresis mode) Switch point delay time FH1 (window mode)	0	0 ... 99.99 s	dS1	
Switch point delay time RP1 (hysteresis mode) Switch point delay time FL1 (window mode)	0	0 ... 99.99 s	dR1	
Switch point delay time SP2 (hysteresis mode) Switch point delay time FH2 (window mode)	0	0 ... 99.99 s	dS2	
Switch point delay time RP2 (hysteresis mode) Switch point delay time FL2 (window mode)	0	0 ... 99.99 s	dR2	
Functions switching output 1	Hysteresis, closer (Hno)	Hysteresis NO (Hno), Hysteresis NC (Hnc) Window NO (Fno), Window NC (Fnc)	ou1	
Functions switching output 2	Hysteresis, closer (Hno)	Hysteresis NO (Hno), Hysteresis NC (Hnc) Window NO (Fno), Window NC (Fnc)	ou2	
Temperature units	°C	°C, °F, K	uni	
Measuring range adjustment	100 % Nominal temperature	50 ... 100 % Nominal	T_EP	
Damping (analogue output)	0.01 s	0.01 ... 3.00 s (time constant)	dAA	
Display rotation	No	no, yes (180°)	disr	
Display mode	Current measuring value	Measuring value: current, highest, lowest, display off Current value: decimal places selectable (max. 3)	dis	
Display actualisation	2	1, 2, 5, 20 Hz	duTd	

Specifications		
Electrical Data	Output / supply voltage	4 ... 20 mA: 24 (15 ... 30) VDC 0 ... 5 VDC: 24 (15 ... 30) VDC 1 ... 6 VDC: 24 (15 ... 30) VDC 0 ... 10 VDC: 24 (15 ... 30) VDC
	Switch-on-delay	Typ. 200 ms
	Inverse-polarity protection, short-circuit strength @ 25°C during 5 min.	integrated
	Current consumption	≤ 30 mA
Environmental conditions	Ambient temperature	-25°C ... +85°C
	Protection [1)]	IP67
	Humidity	Max. 95 % relative
	Vibration	10 g (10 ... 2000 Hz) for sensor length ≤ 150 mm
	Shock	50 g / 3 ms
EMC Protection	Emission	EN/IEC 61000-6-3
	Immunity	EN/IEC 61000-6-2
Mechanical Data	Sensor (wetted parts)	1.4404/1.4435 (AISI316L)
	Housing	Steel, die cast metal galvanised display housing plastic
	Sealing	FPM, EPDM
	Male electrical plug	See ordering information
	Weight	~ 189 g, depending on process connector
	Mounting torque	20 Nm
	Housing alignment	Display 335° rotatable, max. 2.5 Nm Electrical connection 343° rotatable, max. 5 Nm

[1)] See electrical connection

Accuracy	
Analogue output	± 0.5 % FS typ. + Temperature sensor error
Switch point	± 0.3 % FS typ. + Temperature sensor error
Display	± 0.3 % FS typ. + Temperature sensor error + 1 digit
Temperature sensor error	For °C: ± (0.15 K + 0.002 | t |) according to EN 60751 For °F: ± [1.8*(0.15 + 0.002 (t - 32) / 1.8)]
Time constant	T_{60} = 12.5 s, in air T_{90} = 33 s, in air

Analogue output			
Output signal	Switchable 4 ... 20 mA or voltage		
Current limiting output signal	4 ... 20 mA: 25 mA (overload)		
	0 ... 10 VDC: < 40 mA (short-circuit)		
Damping (rise time)	0.01 ... 3.00 s / 10 ... 90 % Nominal temperature		
Offset correction of analogue output and display indication	± 5°C		
Measuring range zero point adjustment (T_nP)	0 ... 50 % FS [2)]		
Measuring range end point adjustment (T_EP)	50 ... 100 % FS [2)]		
Zero point adjustment analogue output (o_nP) [1)]	Voltage output: 0 ... 2 VDC Current output: 3.9 ... o_EP - 8 mA		
End point adjustment analogue output (o_EP) [1)]	Voltage output: o_nP + 4 ... 10.5 VDC Current output: o_nP + 8 ... 20.1 mA		

[1)] Available with optional function package, see "Accessories"

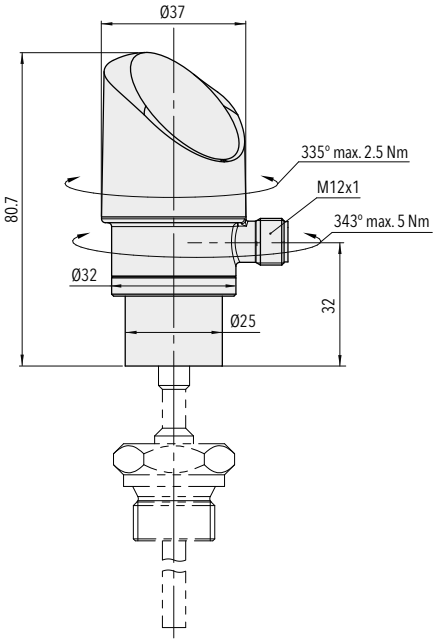
[2)] T_EP – T_nP ≥ 50 % FS

Switching output	
Adjustment range of switchpoints	0 … 100 % FS
Switching hysteresis	≥ 1 % FS
	Switchpoint > reset point
Switching resistance	≤ 3 Ω
Output function	Hysteresis, Window; normally closed (NO), normally open (NC)
Switching current	≤ 0.5 A each switching output
Current limiting	≤ 2 A each switching output
Delay time	0 ... 99.99 s

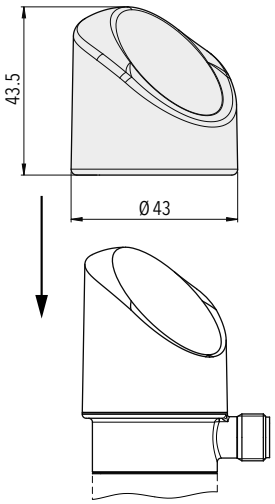
Display	
Display	4-digit 7-segment display 180° flippable with disable function decimal place: 1
Switching status indication	2 LED, red
Operation	With 3 buttons and menu navigation according to VDMA 24574-1
Display resolution	0.1 K
Display range	-3 ... 103 % FS
Setting parameters	See table Parameters
User scale unit; User defined values for display indication zero point and end point [1)]	Display zero point: -999 ... 9998 Display end point: -998 … 9999

[1)] Available with optional function package, see "Accessories"

Dimensions

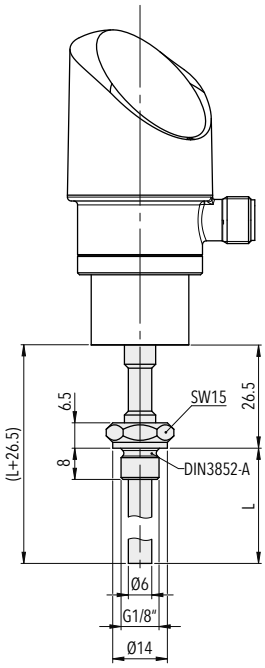


Protective cap

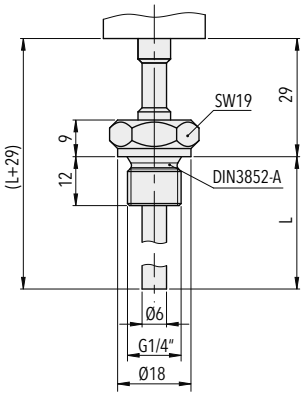


8180.XX.XXXX.**35/32**.XX.XX

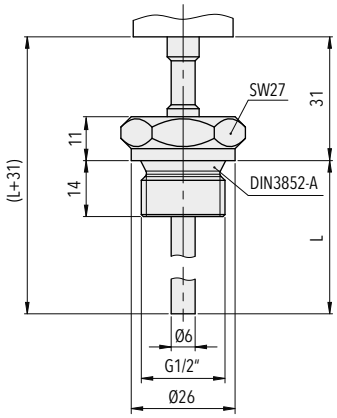
Standard process connection



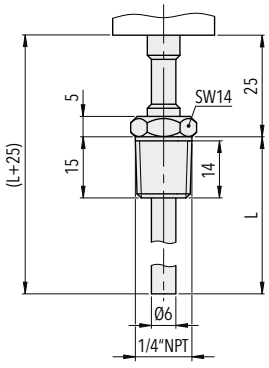
8180.XX.XX**11/21/31/41/51**.XX.XX.XX



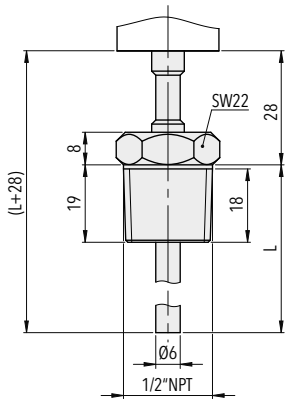
8180.XX.XX**12/22/32/42/52**.XX...



8180.XX.XX**13/23/33/43/53**.XX...

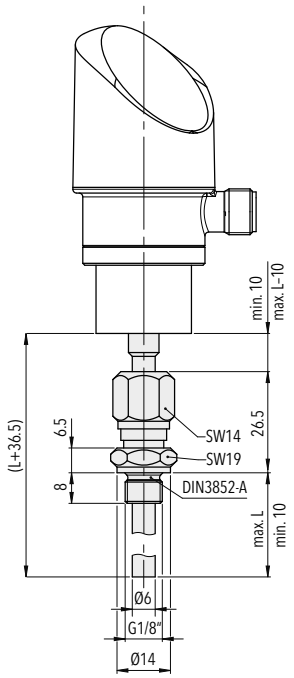


8180.XX.XX**1B/2B/3B/4B/5B**.XX...

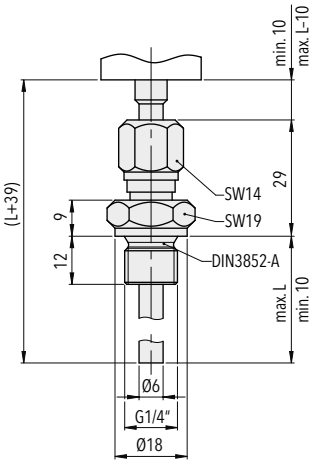


8180.XX.XX**1C/2C/3C/4C/5C**.XX...

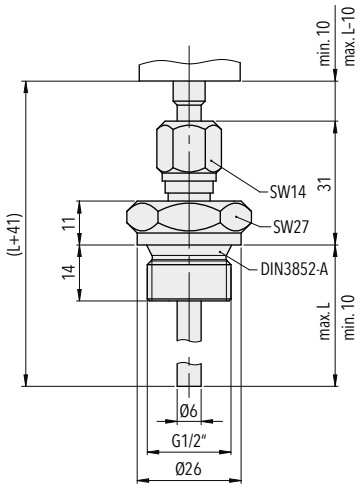
Adjustable process connections



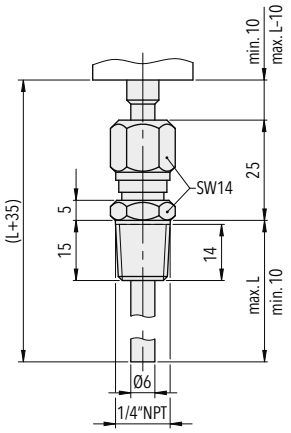
8180.XX.XX**14/24/34/44/54**.XX.XX.XX



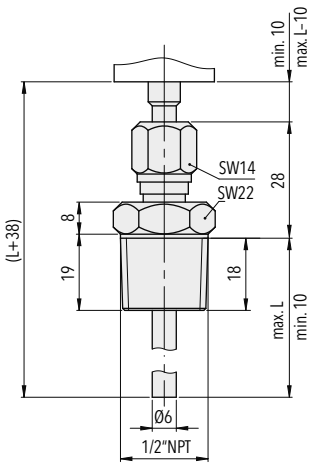
8180.XX.XX**15/25/35/45/55**.XX...



8180.XX.XX**16/26/36/46/56**.XX...

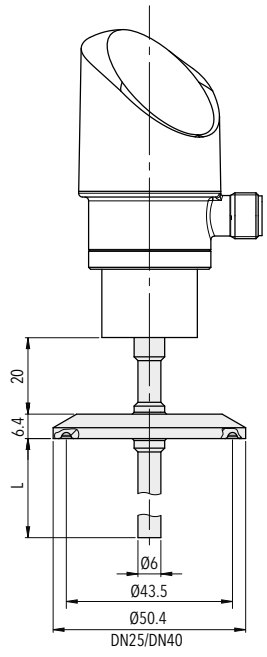


8180.XX.XX**1D/2D/3D/4D/5D**.XX...

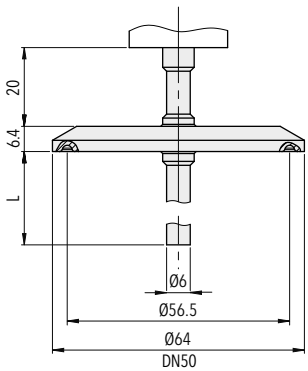


8180.XX.XX**1E/2E/3E/4E/5E**.XX...

Tri-Clamp Process connections

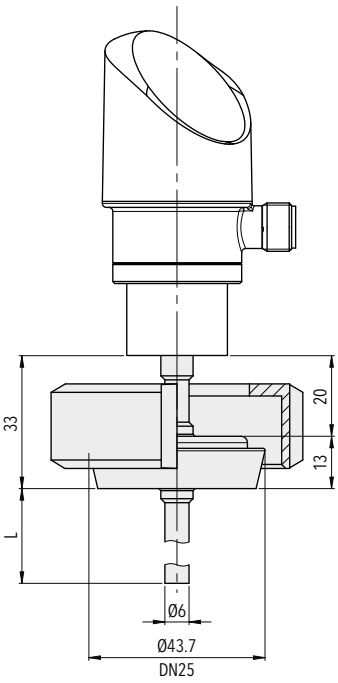


8180.XX.XX**1G/2G/3G/4G/5G**.XX...

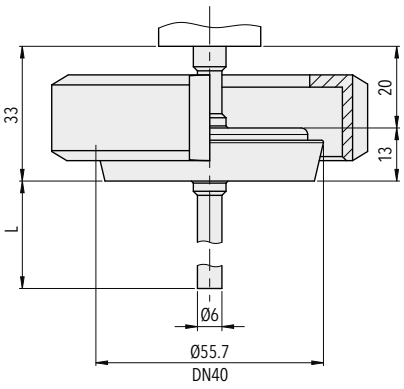


8180.XX.XX**1J/2J/3J/4J/5J**.XX...

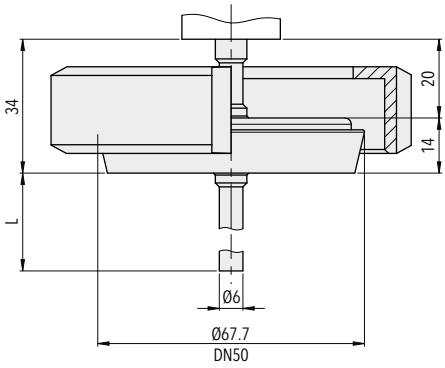
Sanitary fittings



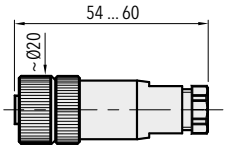
8180.XX.XX**1L/2L/3L/4L/5L**.XX...



8180.XX.XX**1M/2M/3M/4M/5M**.XX...

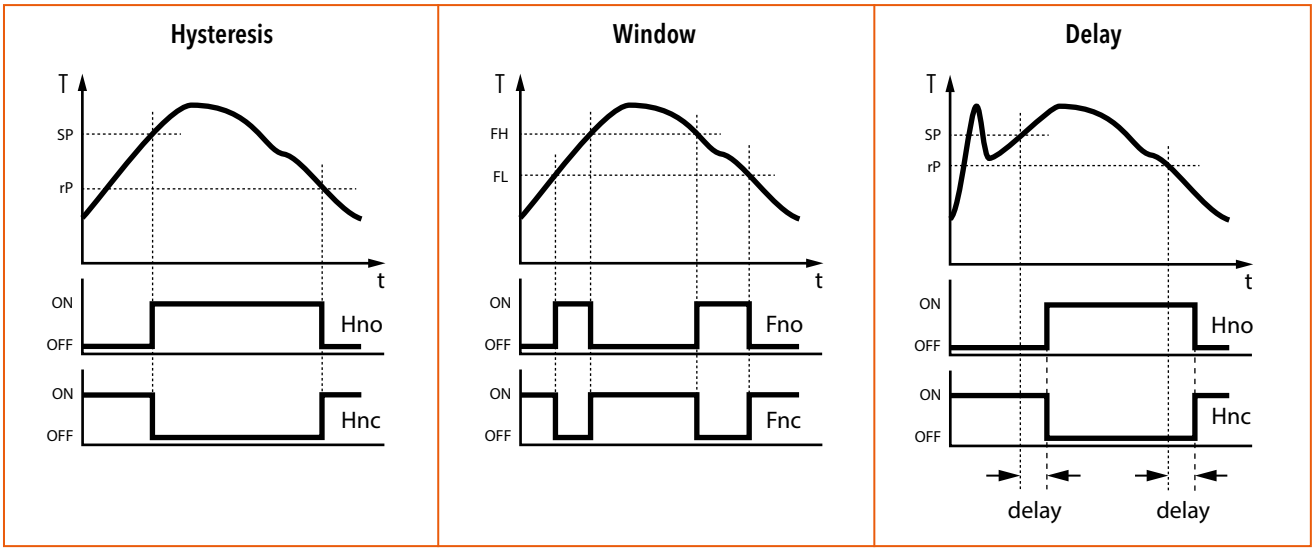


8180.XX.XX**1N/2N/3N/4N/5N**.XX...

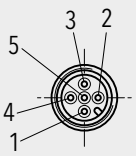
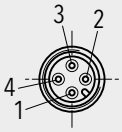
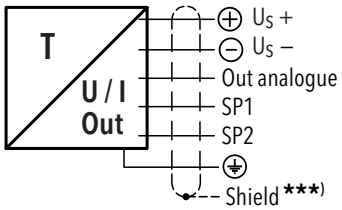


8180.XX.XXXX.XX.XX.**33**

Functions switching output



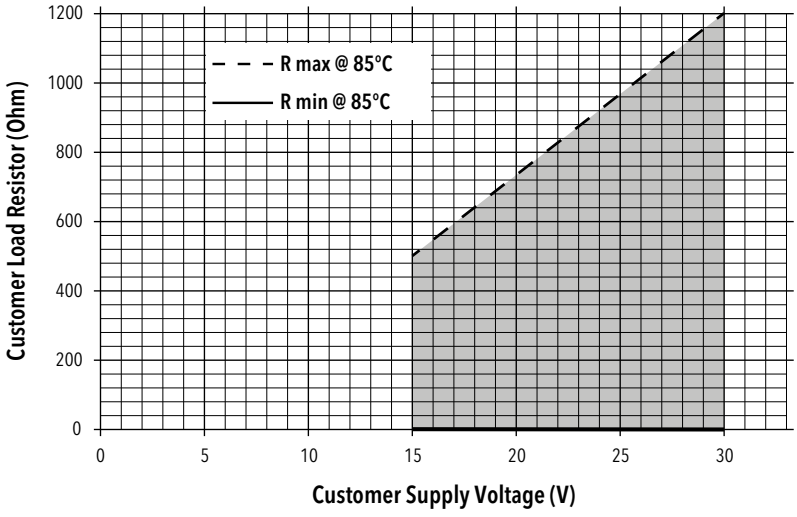
Electrical connection

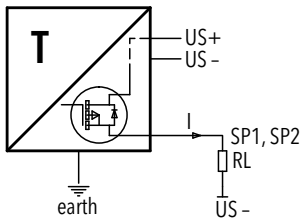
		Protection / electrical connection			
		IP65*)			
		M12x1			
		5-pole **35** 		4-pole **32** 	
Output signal		P1	P2	P3	P4
	PA	✓	✓	✓	
	PU	✓	✓	✓	
	PV	✓	✓	✓	
	PW	✓	✓	✓	
	PS				✓
Pin Configuration		P1	P2	P3	P4
 **8180**.xx.xxxx.xx.**PA/PU/PV/PW/PS**		1 3 2 4 5 Shield ***)	1 3 5 4 2 Shield ***)	1 3 2 4 Shield ***)	1 3 – 4 2

*) Provided female connector is mounted according to instructions

***) The use of a shielded cable is recommended

4...20mA: min./max resistor vs. supply voltage @ Pmax = 100%





Connection of loads to switching output

Additional information

Documents	Data sheet	www.trafag.com/H72352
	Instructions	www.trafag.com/H73352
	Flyer	www.trafag.com/H70605

Safety temperature limiter KTSB

PTB 14
ATEX 3025

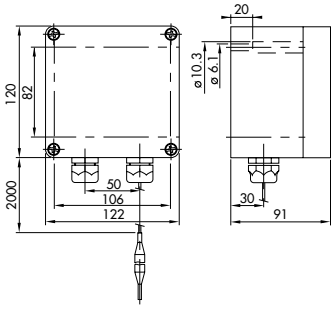
Features

- High current ratings 16 A
- With mechanical reset
- Internal switchpoint adjustment

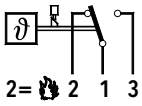
Technical Data	
Sensor technology	Capillary tube with remote sensor
Sensor material	1.4435/316L
Output signal	Microswitch
Electrical connection	Screw terminal

Standard products (extra short lead time)

Product No.	Range T [°C]	Operating temperature [°C]	Media temperature [°C]	Capillary tube length [m]
KTSB150S	+20 ... +150	–50 ... +60	max. 165	2
KTSB230S	+20 ... +230	–50 ... +60	max. 250	2
KTSB350S	+70 ... +350	–50 ... +60	max. 380	2



AC 400 V, 16 A



- Areas with gas explosion hazards Ex II 2G Ex db e IIC T6 Gb
- Areas with dust explosion hazards Ex II 2D Ex tb IIIC T80°C Db

Data sheet www.trafag.com/H72181

Marine transmitter for PT100 sensors T...

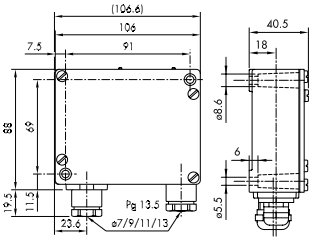
Features

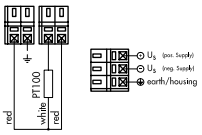
- Excellent long-term stability
- Protection IP65
- EMC protection, IEC 61000
- Complies with IEC 60571 (railway)

Technical Data	
Sensor type	PT100
Operating temperature	–40 ... +85 °C
Electrical connection	Screw terminal
Output signal	4 ... 20 mA

Standard products (extra short lead time)

Product No.	Type code	Range T [°C]	Supply [VDC]	Product No.	Type code	Range T [°C]	Supply [VDC]
T50	8100 01 0003 01	-50 ... +50	12 ... 30	T200	8100 05 0003 01	0 ... +200	12 ... 30
T100	8100 02 0003 01	0 ... +100	12 ... 30	T400	8100 06 0003 01	0 ... +400	12 ... 30





Data sheet www.trafag.com/H72102
Instructions www.trafag.com/H73102

Temperature sensor PT100

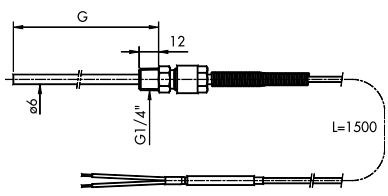
Features

- 2-wire temperature sensor
- Incl. mounting stopper
- Protection IP65

Technical Data	
Sensor type	PT100 (IEC751)
Protection tube material	1.4435/316L
Immersion	Adjustable
Electrical connection	2 wires

Standard products (extra short lead time)

Product No.	Range T [°C]	Protection tube length G [mm]	Class (IEC751)
PT100L15	–50 ... +250	150	B



Temperature sensor PT100/1000

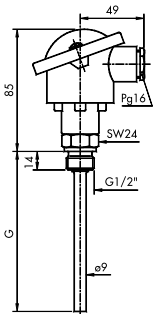
Features

- 3-wire temperature sensor in DIN B head
- Protection IP65

Technical Data	
Sensor type	PT100 (IEC751) or 1000
Protection tube material	1.4435/316L
Immersion	Adjustable
Electrical connection	3 wires

Standard products (extra short lead time)

Product No.	Range T [°C]	Protection tube length G [mm]	Class (IEC751)	Product No.	Range T [°C]	Protection tube length G [mm]	Class (IEC751)
PT100L12	-50 ... +250	120	B	PT100L40	-50 ... +250	400	B
PT1000L12	-50 ... +250	120	B				



Temperature sensor

Features

- High Precision
- Compliant with DIN 43760
- Measuring current 5 mA

Technical Data	
Sensor material	Nickel thin film on ceramic
Temperature range	–60°C ... +200°C
Response time water flow	0.3 s (@ 0.2m/s)
Response time airflow	27 s (@ 0.2m/s)

Description

Resistivity R_0 @ 0°C [Ohm]	Electrical connection
100	lead frames
1000	lead frames

Electronic thermostat with display and relay LTR

Features

- 1 Panel mounting
- Single stage thermostat with display
- 1 Relay (SPDT)
- Protection IP54

Technical Data	
Sensor type	PTC1000
Output signal	1 Relay
Electrical connection	Screw terminal
Operating temperature	–10°C ... +50°C

Standard products (extra short lead time)

Product No.	Range T [°C]	Relay Output	U-Supply [VAC]	Dimensions [mm]	Cutout of panel
LTR5TSRE	–50 ... +150	240 V/16 (4) A	240	76 x 35 x 77	71 x 29

Electronic controller with display ATR

Features

- Supply voltage: 24 ... 230 VAC/VDC
- 17 Sensor inputs to select
- 2 Relays and 1 SSR output, configurable

Technical Data	
Inputs (to be selected)	Thermocouples: K,S,R,J Thermoresistors: PT100, PT500, PT1000, NI100, PTC, NTC, Potentiometers Linear signals: 0…10V, 0…20mA, 4…20mA, 0…40mV
Protection	IP65 front panel (with gasket) IP30 housing IP20 terminals
Operating temperature	0°C ... +45°C

Standard products (extra short lead time)

Product No.	Output signal	Supply voltage	Dimensions [mm]	Cutout of panel [mm]
ATR142	Relay 1: 8A - 250 VAC Resistive Load Relay 2: 5A - 250 VAC Resistive Load SSR 1: Configurable as command output and / or alarm output 12 VDC, 30 mA	24 ... 230 VAC/VDC ±15 %	77 x 35 x 60	28.5 x 70.5

trafag sensors controls

Hygrostat HMH

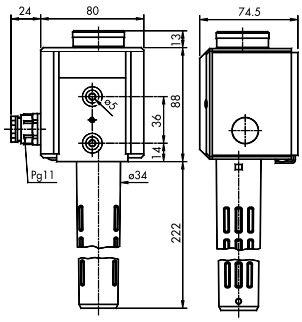
Features

- With adjustable switch point
- rH 10 ... 100 %

Technical Data	
Protection	IP54
Operating temperature	–20°C ... +60°C
Output signal	1 Microswitch 250 V / 10 A
Electrical connection	Screw terminal

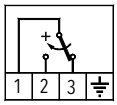
Standard products (extra short lead time)

Product No.	Humidity [%rH]	Hysteresis [d%rH]	Sensor T max. [°C]
HMH	10 ... 100	approx. 1.5	+70

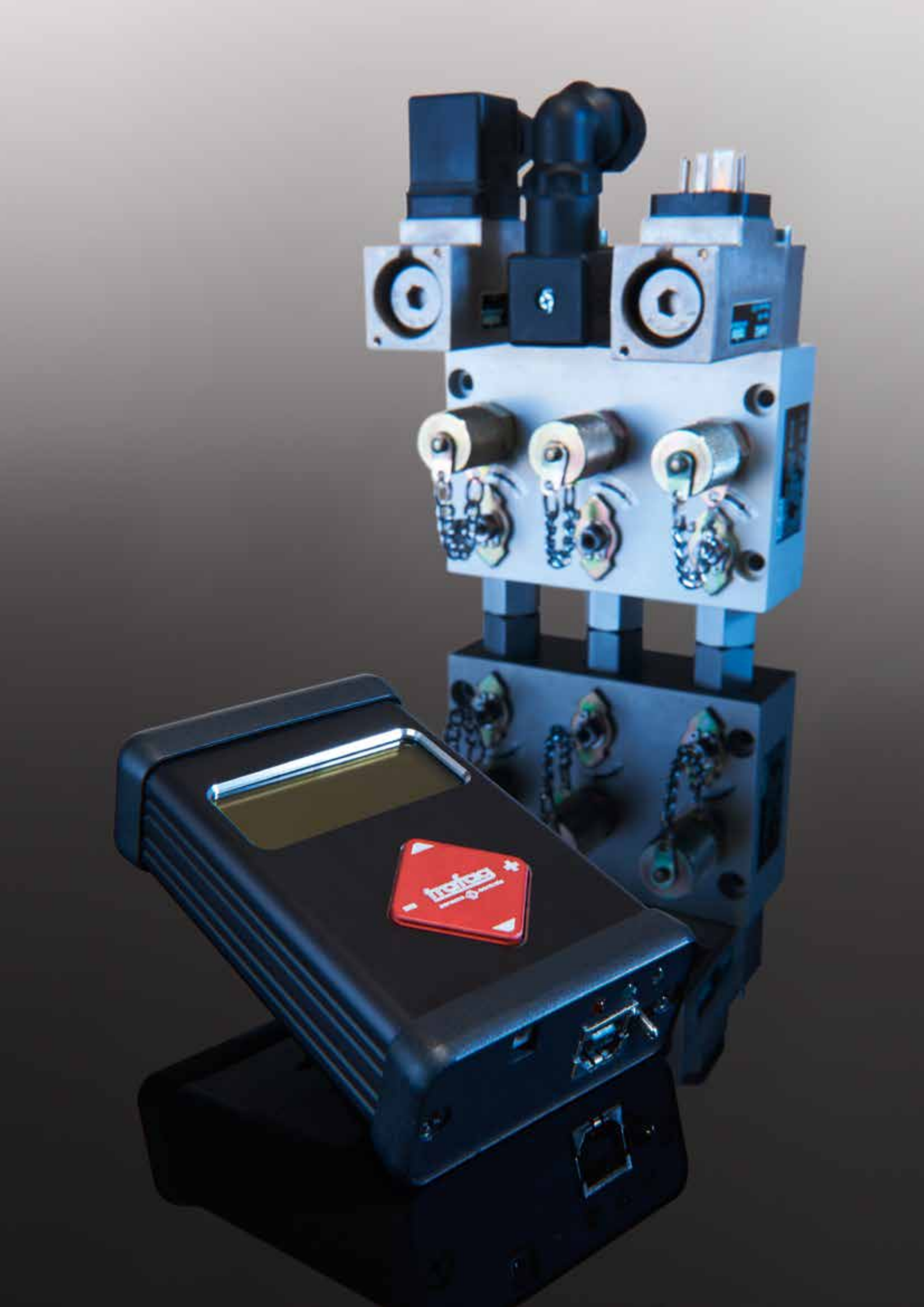


AC 250 V, 10 A (25 °C)
8 A (60 °C)

2= dehumidifying
3= humidyfing



Data sheet www.trafag.com/H72402



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 temperature measuring instruments

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

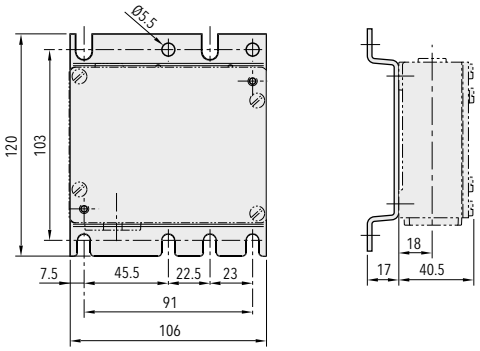
MB31

Mounting Plate

Features

- For pressure transmitters and pressure switches

Technical Data	
Material	Steel galvanised



Standard products (extra short lead time)		
Product No	**Suitable for type**	**Material**
MB31	N, ND, P, PS, PV, PD, PK, PVF, EXP, EXPK, EXPD	Steel galvanised

CG

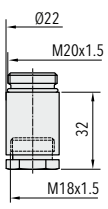
Screwed cable gland

Features

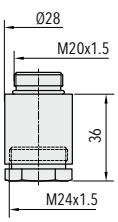
- DIN 8280 for shipbuilding
- Retrofit for pressure transmitters, pressure switches and thermostats

Technical Data	
Material	Brass
Connection	M18x1.5, M24x1.5
Cable	Ø 10.5 mm, 16.5 mm

Standard products (extra short lead time)		
Product No		**Material**
CG18	M18x1.5 for 8 ... 10.5 mm cable diameter	Brass
CG24	M24x1.5 for 14 ... 16.5 mm cable diameter	Brass



CG18



CG24

83../84..

Protection tubes for remote sensors

Features

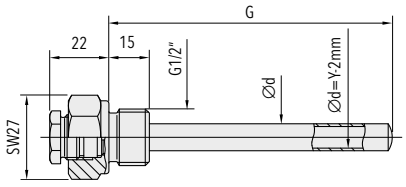
- For liquid media
- Pressure proof up to 25 bar (types 83xx)
- Pressure proof up to 40 bar (types 84xx)

Technical Data	
Material	Stainless steel 1.44435/316L, brass nickel plated
Media temperature	See table

Data sheet www.trafag.com/H72163

Standard products (extra short lead time)

Product No	Suitable for type	Material	Protection tube diameter [mm]	Protection tube length [mm]
83160110K	M, MS, M2S, L, I, IS, ISP	Brass nickel plated	10	110
83160150K	M, MS, M2S, L, I, IS, ISP, ISN	Brass nickel plated	10	150
83160200K	I, IS	Brass nickel plated	10	200
83160300K	M, MS, M2S, L, I, IS	Brass nickel plated	10	300
83160400K	M, MS, M2S, L, I, IS	Brass nickel plated	10	400
83170110	ISP, ISN	Brass nickel plated	12	110
83180150K	D ... R	Brass nickel plated	14	150
83190065	ISP, ISN	Brass nickel plated	15	65
84110110K	M, MS, M2S, L, I, IS, ISP	1.4435 (AISI316L)	10	110
84110150K	M, MS, M2S, L, I, IS, ISP, ISN	1.4435 (AISI316L)	10	150
84110200K	I, IS	1.4435 (AISI316L)	10	200
84110400K	M, MS, M2S, L, I, IS	1.4435 (AISI316L)	10	400
84120110	ISP, ISN	1.4435 (AISI316L)	12	110
84140065	ISP, ISN	1.4435 (AISI316L)	15	65



Operating temperature

Length G [mm]	Range T [°C]	Sensor-Ø [mm]
200	-30 ... +40, 0 ... +35, +10 ... +80	7
150	+5 ... +95, +20 ... +150, +20 ... +110	7
110	+20 ... +230, +70 ... +350	7
180	-30 ... +40, 0 ... +35	5.5/11
150	+5 ... +95, +20 ... +150	5.5/11
110	+20 ... +230, +70 ... +350	9
65	+5 ... +95, +20 ... +150, +20 ... +110	12

121.../141...

Protection tubes for direct mounting

Features

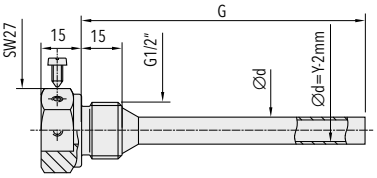
- For thermostats type MST and ISPT/ISNT
- Lateral clamp mounting (type MST)
- Pressure proof up to 40 bar (types 141x)
- With captive nut (types 141x)

Technical Data	
Material	Stainless steel 1.44435/316L, brass nickel plated
Media temperature	See table

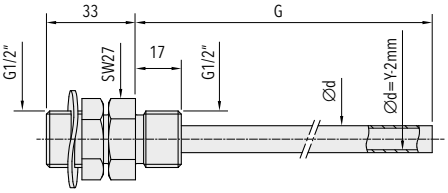
Data sheet www.trafag.com/H72163

Standard products (extra short lead time)

Product No	Suitable for type	Material	Protection tube diameter [mm]	Protection tube length [mm]
12110150K	MST ... 15	1.4435 (AISI316L)	10	150
12110400K	MST ... 40	1.4435 (AISI316L)	10	400
12160150K	MST ... 15	Brass nickel plated	10	150
12160400K	MST ... 40	Brass nickel plated	10	400
14110150K	ISNT ... 150	1.4435 (AISI316L)	10	150
14120110K	ISNT ... 110	1.4435 (AISI316L)	12	110
14140065K	ISP/ISNT ... 65	1.4435 (AISI316L)	15	65



121X..



141X..

Operating temperature

Length G [mm]	Range T [°C]	Sensor-Ø [mm]
200	-30 ... +40, 0 ... +35, +10 ... +80	7
150	+5 ... +95, +20 ... +150, +20 ... +110	7
110	+20 ... +230, +70 ... +350	7
180	-30 ... +40, 0 ... +35	5.5/11
150	+5 ... +95, +20 ... +150	5.5/11
110	+20 ... +230, +70 ... +350	9
65	+5 ... +95, +20 ... +150, +20 ... +110	12

trafag sensors controls

W.../K...

Thermostat sensor duct holder

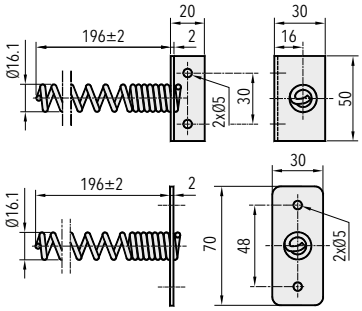
Features

- For HVAC
- For retrofitting of thermostats

Technical Data	
Material	Steel galvanised

Data sheet www.trafag.com/H72106

Standard products (extra short lead time)		
Product No	**Suitable for type**	**Material**
K200	L, LF, M, MS	Steel galvanised
W200	I, IS, M2, M2S	Steel galvanised



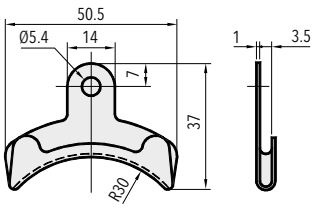
K80140

Capillary tube holder

Features

- For Froststats F/F...R

Technical Data	
Material	Steel galvanised



Standard products (extra short lead time)		
Product No	**Material**	
K80140	Steel galvanised	Package size 6 pcs.

Information about Ex products

Trafag draws from decades of experience in the design and manufacturing of pressure and temperature measuring instruments for hazardous area applications. We continuously meet the rising expectations in respect of safety and reliability of our products. These products provide reliable functionality in various hazardous zones with ATEX and in many cases also IECEx certification.

CE - Designation and marking

CE 1258 Ex II 2 GD

Control No. of notified body for the supervision of the quality assurance system	I: Mining II: All other applications	Category (see below)	G = Gas D = Dust

- Category 1: Can be used in zone 0 (gas) and 20 (dust)
  - Potentially explosive atmosphere: Permanent
  - Two independent failures – safety
- Category 2: Can be used in zone 1 (gas) and 21 (dust)
  - Potentially explosive atmosphere: Regularly
  - One failure – safety
- Category 3: Can be used in zone 2 (gas) and 22 (dust)
  - Potentially explosive atmosphere: Unlikely or for very short time

IEC/EN 60079-0 – Gases

Ex ia IIC T6 Ga

Type of protection	Equipment groups (for gases)	Temperature class	Equipment protection level

- Type of protection: Intrinsically safe
- Equipment group (gases): IIC = Hydrogen, Acetylene
- Temperature level: Defines ignition temperature and permissible temperature of equipment surface
- Protection level: Referring to installation zone (Ga = Zone 0 = Category 1 in ATEX)

IEC/EN 60079-0 – Dust

Ex ia IIIC T130 °C Da

Type of protection	Equipment groups (for dust)	Surface temperature	Equipment protection level

- Type of protection: Intrinsically safe, powder filling, encapsulation, …
- Equipment group (dust): IIIC = Conductive dust
- Temperature level: Defines maximum surface temperature
- Protection level: Referring to installation zone (Da = Zone 20 = Category 1 in ATEX)

EN 50303 - Mining

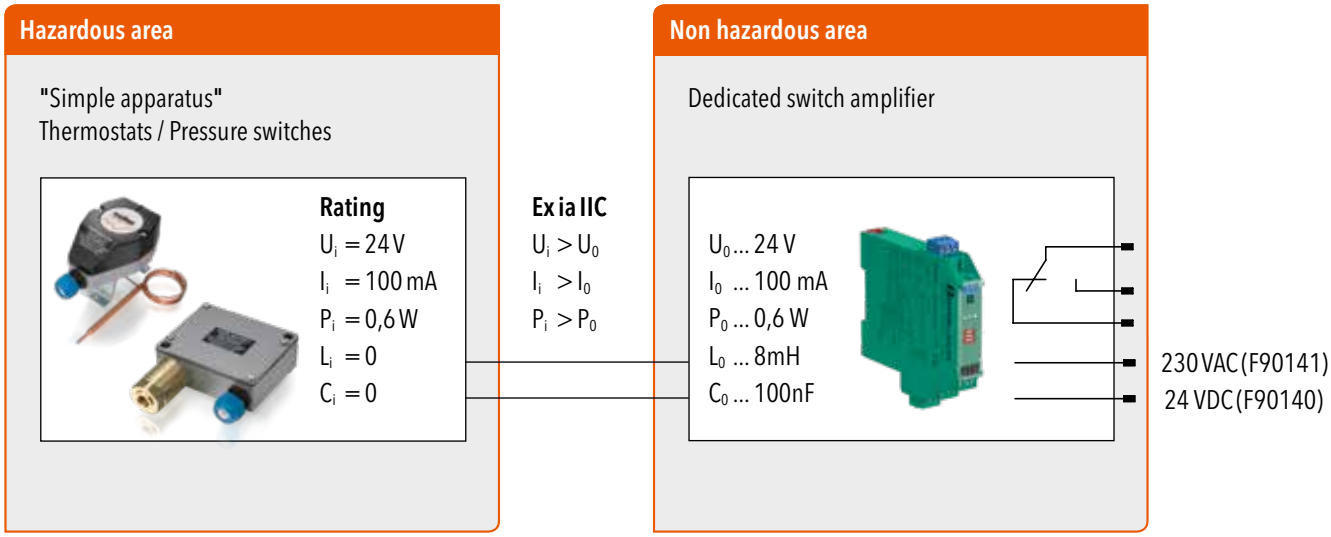
Ex ia I Ma

Type of protection	Equipment for mining	Equipment protection level

- Category and Protection level:
  - Category M1 / Protection level Ma: Fully functional and safe when explosive atmosphere is present. Requires means to cope with two independent failures
  - Category M2 / Protection level Mb: These products are intended to be deenergised in the presence of an explosive atmosphere

Simple Apparatus

Pressostats and Thermostats, when combined with a certified switch amplifier (Zener barrier/Zener relay), can be used as "simple electrical apparatus" in Zone 1 and 2, as well as in Zone 21 and 22, according to IEC/EN 60079-11. These pressostats and thermostats are not suitable for Zone 0 and Zone 20. The use in safety relevant applications (approved electrical apparatus) is not permitted. Switch amplifiers are suitable for intrinsically safe applications. The device transmits signals from the hazardous area into the safe area.



Recommended switch amplifier (see chapter „Accessories"):

Trafag parts no.: ZEN230VAC (230 VAC)

ZEN24VDC (24 VDC)

If another type of switch amplifier is used, make sure its electrical rating limits are within the specification of the „Simple Apparatus" thermostat or pressostat.

Fluid resistance guide

CODES: S - SATISFACTORY F - FAIR U - UNSATISFACTORY T - TEST FOR SPECIFIC APPLICATION

	RESILIENT MATERIALS														PLASTICS															METALS														
	BUNA-N (NBR)	ETHYLENE-PROPYLENE (EPDM)	HYPALON (CSM)	NEOPRENE (CR)	URETHANE	SILICONE	VITON (FKM/FPM)	BUTYL	FLUOROSILICONE	HYTREL	CELCON	DELRIN	LEXAN	NYLON	POLYSULFONE	PVC	TEFLON	POLYPROPYLENE	POLYETHYLENE	POLYPHENYLENE SULFIDE	POLYCARBONATE	ULTEM	ST. ST. DIN 1.4435/1.4404	STEEL	ST. ST. AISI430	ST. ST. DIN 1.4301/1.4305/1.4542	SILVER	49 - NICKEL-IRON	MONEL	LEAD	IRON	INCONEL	COPPER	BRONZE	BRASS	ALUMINUM	
	U	S	T	U	U	U	U	F	U	F	S	T	U	U	U	U	S	U	U	S	U		S	U	F	F	S		S	S	S	T	U	U	U	S	Acetaldehyde
	S	S		F	U	F	F	F	F					S	U		S	S	S	S	U		S	U	S	S	S		U	S	F		U	U	U	U	Acetamide
	U	S		U	U	U	U	T	U	U	S					U	S								S	S			S		S	S	S	S	F	F	Acetate, Amyl
	T	S		T	U	T	T	T	U	U	T	T	S	S	S	T	S	F	T	S	S	S	S	U	F	S	F		F		U	U	U	U	U	F	Acetic acid, 10%
	T	F		F	U	S	U	F	U	U	U	U	S	U	T	U	S	F	T	S	T	T	F	U	F	F	S	U	S	F	U	U	U	U	U	S	Acetic acid, Glacial
	U	F	T	T	U	U	U	F	U	U	F	U		U	U	U	S	T	U	S	U		T	U	U	T	S		S	U	T	S	U	U	U	S	Acetic anhydride
	U	S	U	U	U	U	U	F	U	U	F	F	U	S	U	U	S	S	T	S	U	U	S	S	F	F	S		S	F	S	S	S	S	S	F	Acetone
	S	S	T	F		U	S	T	U	T		S	T	S	U	S	S	U	F	S	U		S	S	S	S	S	U		S	U	S		U	U	T	S	Acetylene gas
	U	U		U		U	S	U						U			S						U	U	U	U			U	U	U					F	Acetylene tetra-chloride
	U		S	U			S																S	T	T	T	T									S	Acrylic acid
	U	S	S	F	U	U	S	F	T	T		S		S	S	S	S		T	S					F	S	S		S					S	S	F		Alcohol amyl
	F	S	S	F	T	F	F	F	T	T	S	S		S		S			T		S		S	F	S			S	F	F	F	S	F	F	F	T	Alcohol ethyl (Ethanol)
	S	S	S	F	U	S	U	F	S	T	S	S		S	U	S	S	S	S			S	S	S	F	S	S		S	F	S	S	S	S	S	T	Alcohol methyl (Methanol)
	U	U	U	U	U	U	S	U	T					S			S								S	S								S		S		Alkazine
	S			S	S	S								S			S												S					S	S	S	S	Alumina
	S	S	S	S	S	S	S	F	T	F	F	S	S	S	S	S	S	S	S	S	T		U	U	U	U	F		F	U	U	S	T	T	U	U	Aluminum chloride
	S	S	S	S	S	S	S	F	T		U	U		S	S	S	S	F	S				U	T	U	U	F		F	F	T		T	F		S	Aluminum uoride
	S	S	S	S	S	S	S	T	T		F			S	T	S	S	S	S		U		F	F	F	F	S		F		F		F	F	F	F	Aluminum hydroxide
	S	S		S	S	T	S	F						S		S	S	S	F		T		F	U	U	T	F		T	F	U		T	T	T	F	Aluminum potassium sulfate
	F																S							U	T	T			F			F			U	F	Aluminum potassium 10%
	F	F		F	S	T	F	F									S						T	U	U	U	T		U	F	U	U	T	T	U	U	Aluminum sodium sulfate
	S	S	S	S	S	S	S	F	T	T	F	S	S	U	S	S	S	S	F	S	S		T	U	U	T	F		T	F	U	T	T	T	T	U	Aluminum sulfate (Alum)
	F	T	U	S	U	U	U	F	U	U	U	U	U		S	F	T	S	F	T	S	U		S	S	S	S	T	S	U	F	S	S	T	U	U	F	Ammonia
	S	F		S	S	S					F	T	T	S	S	S	S		F				F	F	F	F	F		S	F	F	F	U	U	U	F	Ammonium bicarbonate
	S	T		T			U	T			F			T		S	S	F	F				F	U	U	U	F		F		U		U	U	U	U	Ammonium bromide
	U	S		S		U	S	F			S	S		T	S	S	S	S	F	S			T	F	F	F	S		F		F	T	U	U	U	F	Ammonium carbonate
	S	S		S	S	U	S	F	U	F	F	S	S	S	S	S	S	S	T	S	S		U	U	U	U	F		U	T	U	S	U	U	U	U	Ammonium chloride
	T	S	S	S	U	S	F	T	T	U	S	U	U	S	S	S	S	S	S	S	U	T	S	U	S	S	U		U			S	U	U	U	F	Ammonium hydroxide
	S			S			S								S	S								U		F											Ammonium monophosphate
	S	S	S	S	T	U	F	S	U	F	F	S	S	S	S	S	S	S	S	S	S	U		S	T	F	S	S		U	U	F	S	U	U	U	T	Ammonium n trate
	S		S	S	S	S	U							S			S							F	F	F			U		F	S	U	U	U	F	Ammonium nitrate hydroxide 25%
	F	S			U	U	S	S									S	S	T				S	U	S	T	U	S	U			S	F	F	U	U	Ammonium persulfates 5%
	S	S	S	S	S	S	S	F	U	F	F	F	S	S	S	S	S	S	S	S	S		T	S	F	S	F		F	F	T	S	U	F	U	T	Ammonium phosphate
	S	S	S	S		S					F	F	U	U	S	S	S	S	S					T	U	T	S		F	F	T	F	U	U	U	U	Ammonium sulfate
	S			S	S									S			S							U	U	T	F		U	F	U		U	U	U	U	Ammonium sulfite
	S			S		T											S							T	S	S			S	S	S		F		T	F	Ammonium triphosphate
	U	S	U	U	U	U	U	T	U	U	F	U	U	T	U	U	U	U	U	S	U		S	F	F	F	S		S			S	U	S	S	S	Amyl acetate
	U	F	F	F	U	U	U	F	F	U	T	T	S	S	U	U	S						S		F	F	S		S	S	S		T	T	T	U	Aniline dyes
	U	F	T	U	U	U	F	U	T								S	U	U	U	U		U	U	U	U	T		F			U	T	U	U	U	Aniline hydrochloride
	F	F		F			S																														Animal fat
	T			T										S		S	S							U	U	U			F			F			U	U	Antimony trichloride
	S			S		S					S						S												S								Antioxidents
	F	T		S		F	F			S	S			S				S					S	F	S	S	S	S	S	T	T	T	T	T	T	T	Argon gas
	T	U		U		U	S				S			S		U	S							S	S	S	S	S	S	S	S		S	S	S		Aromatic hydrocarbons
	S	S	S	S	T	S	S	F	S						S	S		S	S	F	S	T		F	T	F	T	U		U	F	U	U	T	T	T	U	Arsenuc acid
	S	U		S		S	U	U									S						U	T		U	F		S				U				T	Arsenic trichloride
	F	U	U	F	S	U	S	U	F	S	S	S	F	F		S	S	S	F				S	S	F	S			S		S	S	S	S	F	S	Asphalt
	S	S	S	S	S	S	S	F	S	F	S	S	S	S	S	S	S	S	F	S	S		U	T	S	S	S		S			S	F	F	U	U	Barium chloride 5%
	S	S	S	S	U	S	S	F	S	F				S	S		S	S	F	S	U		T	T	S	S	S		S			S	U	U	U	U	Barium hydroxide
	F	F		S		T	S	T	S			S	S		S	S	S	S	F		U		F	T	S	S	S		T			F	U	U	U	F	Barium nitrate
	U	S	S	S	S	S	S	S	F	S		S			U	S	S	S	F				F	U	F	S	U		S				U	U	U	U	Barium sulphide
	S	S		F	U	S	S	S	S	F	S	S	S	S	S		S	S	S	S	S		S	S	F	S			S		S	S	S	F	F	S	Beer
	S	S	S	S	S	S	S					S	S	S		S	S	F	F				S	S	F	S		S	S		S	S	S	S	S	F	S	Beet sugar liquid
	U	U	U	U	U	T	F	U	F	U	F	T	U	S	U	U	S	U	U	S	U		F	S	S	S	S		F	F	S	S	S	S	S	S	Benzene benzol (Benzene)
	U	S	U	U	U	U	U	F	U	F				T	U	U	S	U	U	S	U		T	F	F	F	U		F			F	T	T	T	T	Benzaldehyde
	U	U	T	U	U	U	F	U	F	U	F	T		F	U	S	S	T	F	S	S		F	F	F	F	S		F	U	U	S	T	T	F	T	Benzoic acid
	S	F	S	U	S	S	F	T	T					U		S	S	S					T	T	F				F	U	T		U	U	U	U	Black sulfate liquor
	T	U	U	T	U	T	T	U	T	T		S	S	T		S	S							S		T			T	U	S		U				Blast furnace gas
	S	S		S		S	S							S			S								U	T			U				F	F	U	U	Bleaching powder, wet
	U	T		T		T	U				S		S		S	U	S						S	U	S	S			S			S				T	Blood
	F	S	F	T	U	S	S				F	F	U	S	S	S	S	S	S					S	S	S			S		S	S	F	S	F	U	Borax
	S	S	S	T	U	S	S	F	T	F	U	U		T		S	S	S	S	S	T		F	U	F	T	S	S	T	F	U	S	T	T	T	T	Boric acid
	U	S		F	U	U	U	F	U		T											U			S	S	S						S	S	S		Brake fluid (non-petroleum)
	S	S	S	S		S	S				S	S	S	S	S	S	S		T						U				S		F	S	F	F	U		Brine
	U	U	U	U	U	U	F	U	T	U	U	U	U	U	U	U	U	S	U	U	U	U		U	U	U	U	S		T	T	U	F	T	T	T	U	Bromine, dry
	U	U	U	U	U	U	F	U	T	U	U	U	U	U	U	U	S	U	U	U	U	U		U	U	U	U	F		U	U	U	U	U	U	U	U	Bromine, wet
	S	S	T	T	S	U	S				S			S	U		S	U	S	U			S	S	S	S	T		S		S		S	S	S	T	Butadiene (gas)

Due to the numerous different application possibilities Trafag cannot accept any guarantee for the correctness of these recommendations. We therefore suggest that for a particular application you carry out tests to verify the fluid resistance.

trafag sensors controls

Fluid resistance guide

CODES: S - SATISFACTORY F - FAIR U - UNSATISFACTORY T - TEST FOR SPECIFIC APPLICATION

RESILIENT MATERIALS | PLASTICS | METALS

BUNA 'N' (NBR)	ETHYLENE PROPYLENE (EPDM)	HYPALON (CSM)	NEOPRENE (CR)	URETHANE	SILICONE	VITON (FKM/FPM)	BUTYL	FLUOROSILICONE	HYTREL	CELCON	DELRIN	LEXAN	NYLON	POLYSULFONE	PVC	TEFLON	POLYPROPYLENE	POLYETHYLENE	POLYPHENYLENE SULFIDE	POLYCARBONATE	ULTEM	ST. ST DIN 1.4435/1.4404	STEEL	ST. ST. AISI430	ST. ST. DIN 1.4301/1.4305/1.4542	SILVER	49 - NICKEL-IRON	MONEL	LEAD	IRON	INCONEL	COPPER	BRONZE	BRASS	ALUMINUM	
F	U	F	F		T	S	U	S	F	S	S	U	S		T	S	U	U	S	U		S	S	S	S	S		S	S	S	T	S	S	S	S	Butane
S	F	S	F	U	F	S	F	T	T				S	S		S					S	S	S	S	S	F		S				S	S	S	S	Butanol
S	S	S	F	S	T	S		T		S			S			S	S	S		S		S	U	S	F			S		U	S	U	U	U	S	Buttermilk
U	T	U	U	U	U	U	U	U	U	F	F	U	S	U	U	S	U	U	S	U		S	S	F	F	S		F	F	F		F	F	F	S	Butyl acetate
S	F	S	S	F	T	S				S			S			S	S	T					S		F			S		S		S	S	S	S	Butyl alcohol
T	U	U	U		U	S	U	T	U							S						F	F	F		F						F	F	F	F	Butyl stearate
U	F	U	U		S	F	T	T	T	U	U		U	U		S	T		S	U		F	T	U	U	S		T	U	U	S	T	T	U	T	Butyric acid
F	S	U	F	U	U	U	F	U														T	T	F	T	F						F	F	F	U	Calcium acetate
S	U	S	S		S	F	U	T	U	U	U	U	U	S	S	S	S	S	S	U		T	U	U	F	F		U	F	U	U	T	F	U	U	Calcium bisulfite
																S	S						S		F			F		S		U			U	Calcium carbide
S	S	S	S	U	S	S	T	T		S	S		S		S	S	S	S		U		F	F	F	S	S		F	U	F	T	F	S	F	S	Calcium carbonate
F	S		F			S	F			F	S		U		S	S	S	S				F	F	F	F	T		T		F	T	T	U	T	T	Calcium chlorate
F	S	S	S	S	S	S	F	T	F	F	S	S	U	S	S	S	S	S	S	U		T	S	T	F	S	S	T	U	T	S	T	F	T	U	Calcium chloride
																S						T	T		F	S						F	F	U	T	Calcium uoride
S	T	S	T	U	S	S	T	T	T	S	S	S	S	S	S	S	S	S		U		F	F	F	F	S	S	F	U	F	S	F	F	U	U	Calcium hydroxide
U	S	S	U	U	S	F	T	F	T	F	F		T	S	S	S	S	S	S	U		U	U	U	U	T		U	U	U	U	U	U	U	U	Calcium hypochlorite
S	S	S	S	U	F	S	T	T		S			T	S	S		S	S	S	T		T	T	F	T	F						F	F	F	T	Calcium nitrate
S	S	S	U	S	S	S	T			S			S	S	S	S	S		S	S		T	T	F	F	S		F	F	F		U	F	U	F	Calcium sulfate
S	S	S	S	S	F													U					F	F	F	U						U	U	U	T	Calcium sulphide
S	T	S	S	U	S	S	F	T		S	S		S			S						F	U	F	S			S		U			U			Calgon
S			S			S										S							S													Caliche liquid
S	S	S	S	U	S					S	S	S		S	S	S	S							F	S			S				S	S	F	F	Cane sugar syrups
U	F	U	U		U	F				U			S			S							T	F	S	S		F	F	T		F	S	F	T	Carbolic acid (Phenol)
U	U	U	U	S		S				S	S	S	S	S	U	S	U						S	F	F	F		F	F	F	S	F	F	F	F	Carbon bisulfide
S	T	T	T	S	U	T	T	T	F	S	S		U	S	S	S	S	S	S	T		S	S	S	S	S		S	S	S	S	S	S	S	S	Carbon dioxide dry
U	U	U	U	U	U	S	U	T	U	F	F	U	U	U	U	S	U	U	S	U		T	S	S	S	F		F			S	U	F	U	S	Carbon disulfide
F	S		T		S	S	T	F	F	S	T		T		S	S	S	S	S			S	S	F	S	F		S	S	S	S	S	S	S	S	Carbon monoxide
U	U	U	U	U	U	S	U	U	U	F	F	U	U	U	T	S	U	U	T	U	S	F	T	F	F	F		F	T	U	S	T	F	T	U	Carbon tetrachloride
S			S		S	S							S			S								S	S			S				T	F	F	F	Carbonated water
T	S	S	S	T	S	S	F	T	U	S			F	S		S	S	S	S	F		S	U	F	F	F		S	U	U	S	T	T	F	F	Carbonic acid
S	F	S	S	F	S					S	S	S	S	S	S	S	S						S	T	S			S		S	S	S	S	S	S	Castor oil
											S																									Cellosolve (see Ethyle acetate)
U	S	U	U	U	T	T										S							S	S	S	S	S	S	S	S		F	S	S	F	Cellulube
S	U	T	F	T	T	S					F	S	S		S	S							S	T	S			S		S		F	T	F	S	China wood oil (Tung)
U	U		U	U	U	S	U	T	U													T	T		T	T						T		T	T	Chlordane
F			S										U			S								S	S			T		U					U	Chlorides, organic
U										U	U					S	U	T	U			U	U	U	U	U		U			U			U	U	Chloric acid
F	F			S		F							U			S	F							U	U									U		Chlorinated water
U	U	U	U	U	U	S	U	T	U			U	U	U	T	S	U					T	F		F	T						T	S	T	U	Chlorinated solvents
U			U		F	S				U	U	U	U	U	T	S	T							F	U			S	F	U		T	T	U		Chlorine anhydrous liquid
U	U	U	U	U	U	F	U	T		U	U	U	U	U	U	S	U	U	U	U		T	T	U	U	F		T	F	T	T	T	T	U	U	Chlorine, gas
U	U	U	U	U	U	T	U	T		U						S	U					U	U		U	S						U	U	U	T	Chlorine, dioxide
U	U	U	U	U	U	U	U	U		U	U	U		U	U	F						T	S	T	T			S				T	T		T	Chlorine trifluoride
U	F	T	U	U	U	S	T	U	U	U	U		S	U		S	S	U	S	U		T	U	U	U	U		F			F	U	F	U	U	Chloroacetic acid
U	U	U	U	U	U	S	U	T	U	S	S	U	T	U	U	S	U	U	S	U		T	T	T	F	F		F		T	T	F	F	F	S	Chlorobenzene
U	U	U	U	U	T	T	U	U	U	F	F	S	S	U	U	S	U	U	U	U	F	T	T	F	S	S		S	F	T	T	T	F	T	U	Chloroform
U	U	U	U	U	U	U	U	U	U	U	U		U	U		S	U	U	U	U		U	U	U	T			F			F	U		U	F	Chlorosulfonic, acid, diluted
U			U	U		T	U	T														T	T	T	T	F						T	U	T	T	Chlorothene (trichloroethane)
U	F	U	F		S	S					U		S		T	S							U	U	U			F		U		U	U	U	U	Chlorox
F					S	T				U						S												S					U	U		Choline chloride
U	F	U	U	U	F	F				U																										Chrome plating solution
U	U	F	U	U	T	U	T	T	U	U	U		U	U	T	S	T	T	T	T		T	U	U	T	U		U	F	F	F	U	U	U	U	Chromic acid
S	S		F	T	T	S	F						S			S	S					T	U	U	F			T	F	U		T		T	U	Chromium-potassium sulfate
													S			S							U	F	F			T	F	U		F		F		Chromium sulfate (basic)
S	S		S	U	S	S	U	T	T	S			T			S	S					S	U	S	S			S				S	S	U	F	Cider
S	S	S	S	S	S	S	S	T	F	S			S	T	S	S	S	F	S	T	T	T	U	T	T	T		T	U	U	F	U	U	U	T	Citric acid
T	U		U	U	U	T	U	T	U				U			S						S			S			S							S	Coal tar
S	F	U	U	U	U	S	F	T		S			T			S	T					F	F	S	S			S		S			T		T	Cocoanut oil
T	S	U	F	S	F	S	F	T		S			T			S	T			T			U			U		S		U		U	U	U	S	Cod liver oil
S	T		S	U	S	S	T	T		S			S			S	T			T		S		S	S			S				S	S	S	S	Coffee
T	U	U	T	U	T	F	U	T			S	T	T		S	S	T					T	S	S	S	S		S	U	S		T	T	U	S	Coke oven gas
	T					S				S														S	S							S		S		Cooking oil
T	S	U	F	U	U	U	T	U								S						T	U	F	F	S		F		U		F	T	U	U	Copper acetate
U	S		U	U	U	U		U		S	S	U			U	S						T	S	S	S	U				S		U	U	U	U	Copper ammonium acetate
S	S	F	F	S	S	S	F	T	T	U	U	U	U	S	S	S	S	S	S	T		T	U	U	U			U	U	U	U	U	U	U	U	Copper chloride
S	S	S	S	S	S	S	T	T		S			T	S		F	S	S	S	U		T	S	S	S	S		F		S	U	U	U	U	U	Copper cyanide (elect. pl. sol.)
S	S		S	T	S	S	F			S	S	S	S	S	S	S	S	S	S	U		F	U	F	F	F		U		U	U	U	U	U	U	Copper nitrate
S	S	S	S	S	S	S	F	T	F	S	S	S	F	S	S	S	S	S	S	T		F	U	F	F	F		T	F	U	U	U	U	U	U	Copper sulfate
S	S	S	S	S	S					S	S	S	S	S	S	S		S					U	F	F			F	F	U		U			U	Copper sulfate (elect. pl. sol.)

Fluid resistance guide

CODES: S - SATISFACTORY F - FAIR U - UNSATISFACTORY T - TEST FOR SPECIFIC APPLICATION

	RESILIENT MATERIALS												PLASTICS																METALS												
	BUNA-N (NBR)	ETHYLENE PROPYLENE (EPDM)	HYPALON (CSM)	NEOPRENE(CR)	URETHANE	SILICONE	VITON (FKM/FPM)	BUTYL	FLUOROSILICONE	HYTREL	CELCON	DELRIN	LEXAN	NYLON	POLYSULFONE	PVC	TEFLON	POLYPROPYLENE	POLYETHYLENE	POLYPHENYLENE SULFIDE	POLYCARBONATE	ULTEM	ST. ST. DIN 1.4435/1.4404	STEEL	ST. ST. AISI430	ST. ST. DIN 1.4301/1.4305/1.4542	SILVER	49 - NICKEL-IRON	MONEL	LEAD	IRON	INCONEL	COPPER	BRONZE	BRASS	ALUMINUM	
	S	U	F	F	T	S	S	F	T	S	F	F		T	S	S	S	S			U		S	S		S	S		S	S	S		S	U	F	S	Corn oil
	S	T		S	T	S	T		T		S						S							S	F	S	S	F	T	S	S		S	S	F	F	Corn starch slurrys
	S	T	S	U	T	S	F	U	T	T	S	S		S	S	S	S	S	S	S	S	S		S	S	S			S	S	S	S	T	S	U	S	Cottonseed oil
	U	U	U	U	T	U	S	U	T	U	U	U		U	U	T	S	U	U	S	U		F	S	F	S			F	U	F	S	F	S	F	S	Creosote
	U	U	U	U	U	U	F	U		U	U	U		U			S	U	U		U		T	U	F	S	F		F	U	F		F	F	U	F	Cresylic acids (alkyl phenols)
	F					S																		U	U	U			U			U			U	U	Cupric chlorides 5%
	U	S	U	U	U	T	S	U	U	T	F	F	U	T	F	U	S	F	U	S	U		T	U		T	T		T			T	T	T	T	F	Dibutyl phthalate
	S	U		U	U	U	S	U	T	T	S			S	S		S	S	U	S	S		S	S	S	S	S	S	S	S	S	S	S	S	S	S	Diesel fuel
	U	U			U	U	S				S			S			S		U				S	S	S	S	S	S	S	S	S	S	S	S	S	F	Diesel oil, light
	U	U	U	U	S	U	U				F													F	F	F			F		F		F	F	F	F	Diethyl ether
	U	U		U	U	U	F	U	U	U	T	T		U			S	T	U		U		F	U	T	F	T		S			F	T		U		Dichlorethane
																	S						F	U		F			S	F	F		F	F	F	F	Difluoroethane(dow chem. # 200)
	F			S		S					S			S		S	S								S	S	S		S		U					S	Distilled water
	F	U		T	S	U	S	U	T	F	S			S			S						S	S	S	S	S	S	S	S	S	S	S	S	S	S	D.T.E. Lubricating oil
	U	U	U	U	U	U	S	U	S	T	S	T		U	U		S	U		S	T		S	S	S	S					U			T	T	T	Dowtherm A or E
	T			S	F					T	S	S	T	S		U	S						S	S	S	S	S	S	S		S	S	S	S	S	T	Enamel
	S	U		F	S	S	S	U	T					S			S						S	S	S	S	S	S	S	S	S	S	S	S	S	S	Esso # 90 line
	S	U	F	F	U	U	S	U	T		S	S	U	S		U	S	U					S	S	S	S	S		S		S		S	S	S	S	Ethane
	U	U	U	T	U	U	U				S			S		U	S	U						S	F	S	S		F	F	F	S	F	S	F	S	Ether
	U	T	U	U	U	U	U	T	U		F	F	U	S	U	U	S	S	U	S	U	U	S	S	F	S	S		F		T	T	F	S	F	T	Ethyl acetate
	U	U	U	U	U	U	F	U	F		F	F		S	U		S	U	U		U		F	T	F	F	S						F	F	F	T	Ethyl benzene
	S	F	F	F	F	F	U	T	U	T	S	S	U	S		T	S						F	T	F	F	S						F	F	F	F	Ethyl cellulose
	S	S	U	U	U	U	S	T	T	U	S	S	U	S	U	U	S	U	U	S	U		T	T	T	T	S		F		F	T	T	T	T	Ethyl chloride
	U	U	U	F			S				T													F	F	F	U						U	U	U	F	Ethyl metcaptan
	U	S		S	U	T	U	T	U		S			S			S	T					U	F					T				F	F	F		Ethyl sulfate
	S	U		U	T	U	S	T	T		S			S		F	S						S	S	S	S	S		S		S		S	S	S	S	Ethylene
											S					U		U	U					T			F		F	F	T		T	T	T	T	Ethylene bromide
		T	T	U	U	T	T				S				U		S			S				T	T	T	F		F		T		T	F	F	T	Ethylene chloride
	U	U	U	U	U	U	S	U	U		S			S			S	T					T	U	T	T	F		T		U		T	T	T	U	Ethylene dibromide
	U	U	U	U	U	U	T	U	U	U	T	T		S	U	U	S	U	U	S	U		F	T	T	F	S		F	F	T	T	U	F	F	F	Ethylene dichloride
	S	S	S	F	U	T	S	S	S	T	S	S		S	S	S	S	S	S	S	S		F	S	F	S	S		F	F	F	S	F	F	F	F	Ethylene glycol
	U	T	U	U	U	U	U	T	U	T	S	S		S	S	U	S	U	U	U	U		F	S	S	F	T		S		F		T	T	T	U	Ethylene oxide
	F																							T	F	S	S		F	F	T		F	S	F	U	Embalming fluid
																																						Ethanol (see alcohol-ethyl)
	S	T	U	U		T	S				S			S		S	S	T					U	S	S	S		T	U	U	S	U	U	U	S	Fatty acids
	S	S	F	F	S	F	S	F	T	F	F	S	S	U	S	S	S	S	S	S	S		U	U	U	U	U		U	U	T	U	U	U	U	U	Ferric chloride
	T	S	S	S	S	U	S	T	T		F			T	S	S	S	S	S	S	T		S	U	F	S	U		U		U	U	U	U	U	U	Ferric nitrate
	S	F		S	T	S	S	F	T	T	F	F		S	S	S	S	S	S	S	T		T	U	T	T	T		T	F	U	F	U	U	U	U	Ferric sulfate
				T			T										S							U			U			F	U		U	U	U	F	Ferrous ammonium sulfate
	S	S		S	T	S	S	F		T	F	F	S	U	S	S	S	S	S	S	U		U	U	U	U	F		U	U	U	U	T	U	T	U	Ferrous chloride
	S	S		S	T	S	S	F	T	T	F	F	S	S	S	S	S	S	S	S	T		F	U	S	S	U		T	T	U	F	T	T	U	S	Ferrous sulfate
	S	U		F	S	T	S		T					S			S	S	S		T		S	S	S	S			S		S		S	S		U	Fish oil
	S	S	S	S	U	T	S	U	T	U					S		S	S	F	S			T		S	S			T			T		T		T	Fluoboric acid
	U	T	T	U	U	U	T	U		U	U	U		U	U		T	U	U	U	U		T	U	F	F	S		S	F		F	T	T	T	F	Fluorine
	S	S	S	S	U	S	U	T	U	F	U	U			S		S	S	T	S			T	U	T	T	T		S			T	T	U	U	U	Fluosilic acid
	S	S	T	T	U	S	U	T	U	U	S	T	U	S	T		S	S	T	T	S		S	T	F	S	S		F	U	T	S	F	F	F	S	Formaldehyde
	U	F	S	S	U	S	U	F	U	U	U	U	S	U	F	T	S	S	U	S	T	T	F	U	U	T			F	U	U	F	T	U	T	U	Formic acid
	F	U	S	F	U	U	U	U	F	T	S			S	U	T	S	U	U	U	U		S	U	S	S	S		F		U	T	S	S	S	S	Freon 11
	S	U	S	S	S	U	T	U	U	T	S			S	U	S	S	U	U	U	U		S	U	S	S	S		F		U	S	S	S	S	S	Freon 12
	S	U	S	S	U	U	U	U	U		S			S	U		S	U	U	U	U		S	U	S	S	S		F		U	S	S	S	S	S	Freon 13
	U	U	T	T		U	U	U			S			S	U	U	S	U	U	U	U		S	U	S	S	S		F		U	S	S	S	S	S	Freon 21
	U	T	T	T	U	U	U	U	U	U	S			S	U	U	S	U	U	U	U		S	U	S	S	S		F		U	S	S	S	S	S	Freon 22
	U	T		F			U	T			S			S	U		S	U	U	U	U		S	U	S	S	S		F		U	S	S	S	S	S	Freon 31
	S	T	S	S				T			S			S	U		S	U	U	U	U		S	U	S	S	S		F		U	S	S	S	S	S	Freon 32
	F	U	F	T	F	U	T	U			S			S	U		S	U	U	U	U		S	U	S	S	S		F		U	S	S	S	S	S	Freon 112
	S	U	S	S		U	U	U	U	S	S			S	U		S	U	U	U	U		S	U	S	S	S		F		U	S	S	S	S	S	Freon 113
	S	U	S	S	T	U	F	U	F	T	S			S	U		S	U	U	U	U		S	U	S	S	S		F		U	S	S	S	S	S	Freon 114
	S	S		S		U	T	T			S			S	U		S	U	U	U	U		S	U	S	S	S		F		U	S	S	S	S	S	Freon 115
	S			S							S			S			S							U	S	S	S				U		S	S	S	S	Freon 218
	U			S			U				S			S	U		S	U	U	T	U		S	U	S	S	S		T		U	T	S	S	S	S	Freon 502
	S	S		S	U	U	S	S	U	U	F	F		U	U		S	U	U	U	U		S	T	S	S	S		F			S	S	S	S	T	Freon 503
	S													S											S	S							S		S			Freon 13B1
	S			S							S			S			S							U	S	S	S			U			S	S	S	S	Freon 6316
	S			S							S			S			S							U	S	S	S			U			S	S	S	S	Freon 6318
	S	U	S	S	T	U	S	U	U	S	S	S		U	T		S	T	U		T	S	S	T	S	S	S		F			S	S	S	S	T	Freon TF (solvent)
	T	T	S	T	S	U	S	T			S	S					S	T	U		T		U	U	S	T						S	S	S	S	T	Freon TWD 602 (solvent)
	F		F	T			S	T			S	S					S	T	U		T		S	T	F	F			F			F	S	F	S	F	Freon TE 35

trafag sensors controls

Fluid resistance guide

CODES: S - SATISFACTORY F - FAIR U - UNSATISFACTORY T - TEST FOR SPECIFIC APPLICATION

RESILIENT MATERIALS													PLASTICS															METALS									
BUNA 'N' (NBR)	ETHYLENE PROPYLENE (EPDM)	HYPALON (CSM)	NEOPRENE (CR)	URETHANE	SILICONE	VITON (FKM/FPM)	BUTYL	FLUOROSILICONE	HYTREL	CELCON	DELRIN	LEXAN	NYLON	POLYSULFONE	PVC	TEFLON	POLYPROPYLENE	POLYETHYLENE	POLYPHENYLENE SULFIDE	POLYCARBONATE	ULTEM	ST. ST. DIN 1.4435/1.4404	STEEL	ST. ST. AISI430	ST. ST. DIN 1.4301/1.4305/1.4542	SILVER	49 - NICKEL-IRON	MONEL	LEAD	IRON	INCONEL	COPPER	BRONZE	BRASS	ALUMINUM	
																																				Freon TM
T	T		T	T	U	S	T			S	S			U		S	T	U		U		S	T	F	T			F			F	F		S	U	Freon TMC (solvent)
F	U		U	U	U	U	U	T	T	F	F			U		S	U	U	U	U		S	T	S	S	S		F			S	S	S	S	T	Freon MF (solvent)
F	U		U	T	U	S	U			F	F			U		S	U	U	U	U		S	T	S	S	S		F			S	S	S	S	T	Freon BF (solvent)
S	S	S	S	S	S	S		S	T	T	T	S	S		S	S	S	S	S			S	U	F	F			S		U		F	F	U	T	Fruit juices
T	U		U	T	U	S	U	T	T	S	S	S	S	F	S	S			S				T	S	S	S		S	S	T	S	T	S	S	S	Fuel oils
U	F	U	U	U	U	U	S	U	T	F	F	S	U	U	U	S	U	U	S	U		S	S	S	S	F		F	T	T	F	F	S	F	S	Furfural
T			S				S			F	F			U		S	U	U	U	U		S	T	S	S			F			S	S	S	S	T	Freon 123
U	S		S	U	U	U	U	U	U	F	F		T	U		S	U	U	U	U		S	T	S	S			F			S	S	S	S	T	Freon 134A
S	U	T	U	U	U	F	U	T	F	U	U		S	F	S	S	T	U	S	T		S	U	F	S	S		F			S	F	S	F	S	Gallic acid
T	U	U	U	T	U	S	U	S	T	S	F	S	S	T	S	S	U	U	S	T	S	S	S	S	S	S		S	S	T	S	T	S	S	F	Gasoline
S	S	S	S	U	S	S	T	T		S	S		S	S	S	S	S	S	S			S	U	S	S			S		U		S	S	F	S	Gelatin
S	S	S	S	U	S	S	F	T	F	S	S	S	S	S	S	S	S	S		T		S	S	S	S			S		S		S	S	F	S	Glucose, edible
S	S	S	S	U	S					S	S	S	S	S	S	S							S	T	S			S		S		S	S	F	S	Glue (non acid)
S	S	S	S	U	S	S	F	T	T	S	S	S	S	S	S	S	S	S	S	S		S	S	S	S	S		S	F	F	S	F	S	S	S	Glycerine (Glycerol)
S	U		U	S	U	S	U	T	T	S	S		S			S	T					S	S	S	S	S		S		S		S	S	S	S	Grease, petroleum base
S			S	S	S	S							S			S						S	S	S	S	S	S	S	F	S		S	S	S	U	Goulac (core binder)
S	S		S	T	T	S	F	T	U				U	S		S						F	T	U	F			F	U	T		U	U	U	U	Green sulfate liquid
S	S	S	S	U	S					S								S						S	S	S						S	S	S		Glycol solution
U	U		U	U		F		U	U	U	U		U	U		S	U	U	U	U		S	U	S	S	S						S		F	U	Halon 1011
F			U			U												U																S		Halon 1202
T						S		T										U				S	S	S	S							S	S	S	S	Halon 2402
T			S	T	F	F	S	U		S	S		S			T		U				S	T	T	S						S	S		S	T	Halon 1301
T			U			F		U					S									U	S	S	S							S	S	S	S	Halon 1211
S	U	F	F	F	U	S	U	T	T	S	S		S	U		S	U	U	S	U		S	S	S	S	S		S				S	S	S	S	Heptane (liquid)
F	U	S	F	S	U	S	U	T	T	S	S		T	S		S	U	U	S	U	S	S	S	S	S	S		S		F		F	F	S	F	Hexane
S	U	S	T	F	U	S		T	S	S	S		T	S		S	T	U	S	T		S	S	S	S	S	S	S	S	S		S	S	S	S	Hydraulic oil
F	S		F	U	U	S	U	U	F			S	S		S	S	U					S	U	F	S	U		U	U	U		U	U	U	S	Hydrazine
U	S	S	U	U	U	F	T	U		U	U	S	U	S		S	S	T	U	U		U	U	U	U			U			U	U	U	U	U	Hydrobromic acid
T	U	T	U	T	U	F						U	U	U	U	S								F	F	F		S				S	S	S	S	Hydrocarbons (chlorinated)
T	F	T	T	U	U	T	T	T	U	U	U	S	U	S	S	F	T	T	T	T	T	U	U	U	U	T		U	U	U	F	U	U	U	U	Hydrochloric acid (aerated)
T	F	T	U	U	U	T	T	T	U	U	U	S	U	S	S	F	T	T	T	T	T	U	U	U	U	F		U	U	U	T	U	U	U	U	Hydrochloric acid (air free)
S	S	S	S	U	U	S	F	T	U	U	U	S	U	S	S	S	S	S				F	U	S	S	T		F		U	T	U	U	U	S	Hydrocyanic acid
T	T	S	U	T	U	S	U	U	U	U	U	S	U	S		S	T	T	T	T		T	T	U	U	F		U	U	U	U	U	U	U	U	Hydrofluoric acid (aerated)
U	T		U	T	U	S	U	U	U	U	U	S	U	S		S	T	T	T	T		T	T	U	U	S		F	T	U	U	T	T	U	U	Hydrofluoric acid (air free)
S	S	S	S		U					U	U	S		S	S								U	U	U			S			S			U	U	Hydrofluosilicic acid
S	S	S	S	S	T	S	S	U	F	U	U	S	S	U	S	S	S	S	S	S		S	S	S	S	S		T	S	S		S	S	S	S	Hydrogen 377
U	T		U	U	U	S	F	U		U	U			T		S	F		T	U		T	T	U	U	U		U	U		U	U	U	U	U	Hydrogen bromide(anhydrous)
U	S		T		S	T	T	U		U	U		U			S	S	S				S	T	U	T	F		T	F	T	S	T	T	T	U	Hydrogen chloride(anhydrous)
T	F		U	U	S	U	U		U							F	T	T					F	F	F		S				S	T	T	T	U	Hydrogen ßoride
U	T	U	U	T	T	T	T	T	U	T	U		U	T	S	S	T	T	T	T		T	T	T	T	U		T	U	T	F	U	U	U	F	Hydrogen peroxide
T	S	T	F	U	T	U	F	U	T	U	U	S	U	S	S	S	S	S	S	T		T	T	T	T	U		T	F	T	S	U	U	U	F	Hydrogen sulfide
T		S	T	S		S							F		S	S							S	S	T			S		U					T	Ink (non aniline)
U	F	F	U	U	U	S	T	T	T	U	U		S	S	U	S	T	U	U			T	T	T	T	U		T	U	U	S	T	T	U	U	Iodine
																							U	U	U			T	F	U		T			U	Iron potassium sulfate
T	U		F	T	U	F	U	T		S			S			S							S	S	F	S	S	S	S	S	S	S	S	S	S	Isobutane
S	U	S	F	S	U	S	U	S	S	S	F	S	T		S	S	T	T	S	T		S	S	S	S	S	S	S	S	S	S	S	S	S	S	Isooctane
U	F	U	U	U	U	U	F	U	U	S			T	U		S	T	T		U		F	S	T	F	U		T				U		T	T	Isopropyl acetate
F	S	S	F	U	S	S	F	T	T	S	S		S	F		S	S	F	S	S	S	F		S	S	S		S			F	S	S	S	S	Isopropyl alcohol (Isopropanol)
F	U		U	U	U	S	U	T					U					U																			JP-1, JP-A, JP-A1
F	U		U	U	U	S	U	T					U					U																			JP-2
F	U		U	U	U	S	U	T		T	T		U	S		S	T	U	S	T		S	S	S	S			S			S	S	S	S	S	JP-3
T	U	U	U	U	T	S	U	T	S	F	F	S	S	S	S	S	T	U	S	T	S	S	S	S	S	S	S	S	S	F	S	F	S	F	S	JP-4
S	U		U	T	U	S	U	T		F	F			S		S	T	U	S	T		S	S	S	S			S			S	S	S	S	S	JP-5
T	U		U	U	U	S	U	T										U				S	S	S				S			S	S	S			JP-6
																		U																			JP-7
T	U		U	U	U	S	U	T										U				S	S	S	S			S			S	S	S			JP-8
S	U	U	F	F	U	S	U	T	F	S	S	S	S	F	S	S	U	U	S	T	S	S	S	S	S	S		S	S	S	S	S	S	S	S	Kerosene
S	T	S	S	S	T	S		T				S		S	S							S	U	S	S			S		U			U		U	Ketchup
T			U		U		U	S										U																			JP-B
T	U		U		U	S	U	U										U																			JP-X
U	U	U	U	U	U	U	U	U	U	S			S			S	U	T		U		S	T	F	F	S		S		T		S	S	S	S	Lacquers & Lacquer solvents
T	T	T	T	U	S	F	T	T	U	U	U		T	S	T	S	S	T	S	F		U	U	T	T	F		T	U	U	S	T	U	U	U	Lactic acid
S	F	U	U	U	F	S	U	T	T	F	F		S			F	T	T		S		S	T	F	F	S		F	U			U	U	T	U	Lard
S	S	T	S	U	U	U	F	U		F	S	U	S	S	S	S	S	S	S			F	U	F	F	F		S			F	U	U	U	U	Lead acetate
U	S														S	S							S	S												Light water (fire ext.)

Back to overview

Fluid resistance guide

CODES: S - SATISFACTORY F - FAIR U - UNSATISFACTORY T - TEST FOR SPECIFIC APPLICATION

RESILIENT MATERIALS												PLASTICS															METALS												
BUNA 'N' (NBR)	ETHYLENE PROPYLENE (EPDM)	HYPALON (CSM)	NEOPRENE (CR)	URETHANE	SILICONE	VITON (FKM/FPM)	BUTYL	FLUOROSILICONE	HYTREL	CELCON	DELRIN	LEXAN	NYLON	POLYSULFONE	PVC	TEFLON	POLYPROPYLENE	POLYETHYLENE	POLYPHENYLENE SULFIDE	POLYCARBONATE	ULTEM	ST. ST. DIN 1.4435/1.4404	STEEL	ST. ST. AISI430	ST. ST. DIN 1.4301/1.4305/1.4542	SILVER	49 - NICKEL-IRON	MONEL	LEAD	IRON	INCONEL	COPPER	BRONZE	BRASS	ALUMINUM	
S	S		S		S	S						S				S								F	F	S		S				S	S	S	F	Lime slurry
S	S	T	S	T	S	S	F	T				S				S	S	S				S	S	F	S			S		S		U	U	U	U	Lime sulfur
	S	U	U	U	T	U				S																										Lindol (TCP)
S	U	F	U	S	S	S	F	T	T	S	S		S	T	S	S	S	U	S	S		S	S	S	S	S		S		S		U	S	S	S	Linseed oil
F	U	U	U	U	U	S	U	T	T	S	S		F			S	U		S			S	S	S	S	S		T				S	S	S	S	Liquid petroleum gas (LPG)
S	S		F	U	T	S		T							S	F								F	S	S			S				F	F	F		Lithium bromide
S	F		S	T		S	T			S			S		S	S	S	S		F		S	F	F	F	T		F	U	F		F	F	F	U	Magnesium carbonate 437
S	S	S	S	S	S	S	F	T	T	S	S	S	T	S	S	S	S	S	S	S		T	U	U	T	F		F	U	T	S	U	U	U	U	Magnesium chloride
S	S	S	S	U	S	S	F		U	S	S	U	S	S	S	S	S	S	S	F		S	S	S	S	S	T		S	U	F	S	F	S	F	U	Magnesium hydroxide
S	T		S		S	T										S						S	S	S	S	S	S		S					S	S	S	Magnesium oxide
S	S	S	S	U	S	S	F	T	T	S			S	S	S	S	S	S	S	F		F	S	F	S	F		S	F	F	F	T	T	T	F	Magnesium sulfate
S	S	S	S		S	S	S	S		S			S									S	U	T	T	S		U	F	U		U	U	U	F	Magnesium sulfite
S	S	S	S	S	S	S	S						S			S						S	F	S	S			S		U		F	F	U	S	Malt beverages
S	S		F	T	U	S	F			F	F	S		S	S	S	T				T			U			F		F		U	F	F				Manganese sulfate
S		S	S	S	S	S				S		S			S								F	S	S			S		U		F	F	U	S	Margarine
S	U	S	S	U	S	S				S			S			S	S					S	F	S	F			S		U		F	F	U	U	Mayonnaise
S	S	S	S	T	T	S	F	T		F	F	S	U	S	S	S	S	S		S		U	U	U	U	U		U	U	U	U	U	U	U	U	Mercuric chloride
F	T		F			T	F			S					S	S	S	S				F	U	U	F			U			F	U	U	U	U	Mercuric cyanide
S	S	S	S	T	S	S	T	U	T	U	U	F	S	S	S	S	S	S				S	S	S	S	U		U	U	S	S	U	U	U	U	Mercury
S		S	S		S	S							S			S								T	U			F		U		U	U	U	U	Mercury salts
U	T					U										S						T	F	F				U		F		U	U	U	F	Methallylamine
T				S	U								U		U	S							T	F	U	F		F		S	S	F	S	S	U	Methallyl chloride
S	U	T	F	U	U	S	U	U	T	S			F		S	S	T	U				S	S	S	S	S		S	S	S		S	S	S	S	Methane
																																				Methanol (see alcohol-methyl)
U	F	U	F	U	U	U	T	U	U	F	F		F	U	U	S	T					S	S		T	T				S		F			T	Methyl acetate
U	U	U	U	U	U	U	F	U	T	U	F	F	F	S	U	U	S	U	U	T	U		T	T	T	F		F		S	T	F	S	T	U	Methyl chloride
U	F	U	U	U	U	U	F	U	T	F	T		S	U	U	S	U	U	S	U	U	S	S	F	F	F		S	S	S		S	S	S	S	Methyl ethyl ketone (MEK)
U	U	U	U	U	U	F	U	F	U	S			U	U	U	S	T	U	S	U	U	F	T	T	T	S		F	T	F	T	T	U	S	U	Methylene chloride
S													S			S								S	S	S						S		S		MIL-F-5516
S													S			S								S	S	S						S		S		MIL-F-5572
S													S			S								S	S	S						S		S		MIL-F-5624
S						S																		S	S	S						S		S		MIL-F-25558
S	U		S	S		S							S			S								S	S	S						S		S		MIL-H-5606
S	U		S	S		S																	S	S	S	S						S		S	S	MIL-L-7808
S	S	S	S	U	S	S	U	T	F	S	F	S	S	U	S	S	F	S		S		S	S	S	S	U		U		S	S	U	U	U	S	Milk 474
S			S		S	U				U	T	S	S	S	S	S								U	F		F	S	T	U		U	U	U	F	Mine water (acid)
S	U		F	F	S	S	U	T	T	S			S	S	S	S	U	U	S	F		S	S	S	S	S		S	S	S	S	S		S	S	Mineral oil, USP
F	U		U		U	S				S							U							S	S	S						S		S	S	Mineral spirits
										U			U			S								F	F	U		U	U			U	U	U	U	Mixed acids (H_2SO_4 & HNO_3)
S	T	S	S	T	S	S	F	T	T	S	S	S	S		S	S	S	S	S			S	S	S	S	S		S		S	S	S	S	F	S	Molasses
S	U	S	T	T		S			T	S			T	S	S	S	U	U	S	S	S	S	S	S	S	S		S			S	S	S	S	S	Motor oil - sae #10, etc.
F	U	U	U	U	U	S	U	T	T	S		F	S	T	T	S	U	U	S			S	S	S	S	S		F		T	S	F	F	F	S	Naphtha
U	U	U	U	T	U	S	U	T	T	S			S		U	S	F	U	S			S	S	S	S	S		F	F	F		F	F	F	F	Naphthlene
F	U	U	U		U	S	U	T		U						S						T	T	F	T	S		T		T		F	U	F	F	Naphthenic acid
S	U	S	S	U	U	S	U	U	T	S			S		S	S	S	U				S	S	S	S	S		S		S		F		S	S	Natural gas
S	S	S	F	U	S	S	F	T	U	F	F	S	U	S	S	S	S	S	S	S		T	U	U	T			T	F	U	F	U	U	U	U	Nickel chloride
S	S		S		S	S	F			F			S		S	S	S	S	T	S		T	T	F	F			T			U	U	U	U	U	Nickel nitrate
S	S	S	S	U	S	S	F	T	U	F	F	S	U	S	S	S	S	S	S		F	U	T	F				T	F	U	F	T	T	T	U	Nickel sulfate
U	T	T	U	U	U	U	T	U	U	U	U	S	U	U	T	S	T	T	T		T		U	T	S	U		U	U	U	F	U	U	U	T	Nitric acid with 40% H_2O 493
U	T	U	U	U	U	F	T	T	U	U	U	S	U	U		S	T	T	S	U	T	S	U	T	T	U		U		U	T	U	U	U	U	Nitric acid vapors
U	U	U	U	U	U	U	U	U	U	U	U	S	U	U		S	S	U	T	U		T	U	T	T	U		U		U	F	U	U	U	T	Nitric acid (red ßuming)
										U	U		U	U									U	U	U			U	U	U		U	U	U	U	Nitric + HCL acids
													U										S	S	S					S		S				Nitriding gases
U	F	U	U	U	U	U	T	U	U	S	S	U	S	U	U	S	S		S	U		T	S	S	S	S		F	U	F		T	F	F	T	Nitrobenzene
U	T	U	U	U	U	U			U	F			U			S							F	F	F	U	U	U	U			U	U	U	S	Nitrogen tetroxide-dry
		S	S				T			U												T	S	F	F	T		F	U	S	S	F	F	F	S	Nitroglycerine
U	T	S				T				U			U			S	U	U				T	U	U	U			U	U		F	U	U	U	U	Nitrous acid
F	F	U	F	S	F	U	T	T		S			S			S	U	U				T	S	F	F	U		U			U	F	F	F	T	Nitrous oxide
																							S	S	S		S						S	S	S	S	Nyval (Mobil)
S	S		S	S	S	S	F	T	F	S	S		S	S		S	S	S	S			S	S	S	S	S					S		S	S	S	S	Nitrogen
S	U	U	S	S	U	S																	S	S	S	S						S	S	S	S	Oronite 8200
											S																	S								Oakite
F	U	U	T	T	T	S	U	S	T	F			S	S	S	S	F	U	F	F		T	F	F	S	S		F	U	F	T	T	T	T	T	Oleic acid
U		U	U							U			S		U	S	U						S	S			F								F	Oleum
S	F	U	S	S	S	S	T	T		S			T	U		S	S	T		S		S		S	S			S		S	S	T		S	S	Olive oil 514

trafag sensors controls

Fluid resistance guide

CODES: S - SATISFACTORY F - FAIR U - UNSATISFACTORY T - TEST FOR SPECIFIC APPLICATION

RESILIENT MATERIALS										PLASTICS												METALS														
BUNA 'N' (NBR)	ETHYLENE PROPYLENE (EPDM)	HYPALON (CSM)	NEOPRENE (CR)	URETHANE	SILICONE	VITON (FKM/FPM)	BUTYL	FLUOROSILICONE	HYTREL	CELCON	DELRIN	LEXAN	NYLON	POLYSULFONE	PVC	TEFLON	POLYPROPYLENE	POLYETHYLENE	POLYPHENYLENE SULFIDE	POLYCARBONATE	ULTEM	ST. ST. DIN 1.4435/1.4404	STEEL	ST. ST. AISI430	ST. ST. DIN 1.4301/1.4305/1.4542	SILVER	49 - NICKEL-IRON	MONEL	LEAD	IRON	INCONEL	COPPER	BRONZE	BRASS	ALUMINUM	
T	U		T	S	U	S	U	T	S														S	S	S	S						F	S	S	S	Oronite hydraulic fluid
F	S	T	F	T	F	U	F	T	U	U			S	S		S	S	T	S	T		T	U	T	T	F		T	U	U	S	T	F	T	T	Oxalic acid
										U													T	T	T			T	F	T		T	T	T	F	Oxidizing gases
U	T	T	S	T	T	S	F	T	F	U	U	T	T	T	T	T	U	U	S	T		S	S	S	S	F		S		S		S	S	S	S	Oxygen
U	S	S	T	S	S	T	F	S	U	U	U		U	T	T	S	U	U		T		F	U	F	F	F									F	Ozone
F			F	F		U	U						S	T	S	F						S	S		S			S					S	T	T	Paint, oil base
T			T		T								S			S												S								Paint vechicles (except soya)
S	U		U	T	T	S	U	T														S	S	S	S			S					S	T	S	Palm oil
F	F	U	U	T	U	F	T	T	T				U	S		S	F	T				S	S	S	S	T		F				F	F	U	S	Palmitic acid
S	U		U	F	T	S	U			F	F	S	S	S	S	S	T	U		T		S	S	S	S			S			S	S	S	S	S	Paraffin
S			S	F	T	S				F						S		U				S		S	S			S				S	S	S	S	Paraffin oil
S			S		F			F								S												T							S	Pencillin solution
F	U	F	S	U	U	S	U	U		S						S		U		S		F	F	F	F	S	F	S				F	F	F	S	Pentane
U	F	T	F	U	U	F	T	S	U	U	U		U	U		S	T	U	S	U		T	U	T	T			U		U		U	U	U	T	Perchloric acid
U	U	U	U	U	U	S	U	T	U	F	F		T	U	U	S	U	U	T	U	U	F	F	F	F	S		F	T	F	S	F	F	F	T	Perchloroethylene 539
S	U	T	T	T	T	S				S													S	S		S		S		S		S	S	S	S	Petroleum oils
				S																																Petroleum residue from distillation
U	U	U	U	U	T	F	F	T	U	U	U	S	U	U	T	S	U		S	U	U	T	U	F	S	S		F	F	T	T	F	S	F	T	Phenol
	S		F	F	F	F				U	U		T	U	U	S							S	S	S	S	S	S	S	S		F	S	S	F	Phosphate ester non-inflammable oils
T	F	S	T	T	U	S	F	T	U	U	U	S	U	S	S	S	S	T	S	T	T	T	U	U	T	F		U	T	U	S	U	U	U	T	Phosphoric acid (aerated)
T	F	S	T	T	T	S	F	T	U	U	U	S	U	S	S	S	S	T	S	F	T		U	U	T	F		T	T	U	T	T	T	T	U	Phosphoric acid (air free)
U										U					S	S	T					T	F		S			S	S	F		T	T	T	S	Phosphorous
	F		T			S				U	U	S	U			S	S						U	U	T			U	U	U		U	U	U	U	Phosphoric acid vapors
	T	U	U	U	U	U				U																										Pickling solution
F	F	S	S	T	T	U	U	T	U	U	T	F	S	S	S	S	T	T				F	U	F	S	S		U	T	U	U	U	U	U	U	Picric acid
F	U	U	U	S	U	S	U	S					S			S						S			S			S		S			U		S	Pine oil
S	S	U	F	U	U	U	F	U		F			T			S	T	T				F	S	F	F	S		F		S		F	F	F	U	Potassium acetate
S	S		S		S	S				S			S		S	S							U		S			F	F	U		F				Potassium aluminum sulfate
S	S		F	U	F	S	T	T		F			T		S	S	S	S				F	F	F	S			F	U	F		F	F	F	U	Potassium bicarbonate
S	S		S		S	S	T			S			T		S							T	U		U	S		U	F	U	U	F	U	U	F	Potassium bisulfate
S	S		S	U	S	S	T	T		T			T	S	S	S	S	S	S	T		F	U	U	F	U		F	F	U	S	F	F	F	U	Potassium bromide
S	S		S	U	S	S	F	T	U	F	F	U	U	S	S	S	S	S	S		T	T	F	F	S	F		F	U	T	S	U	U	U	U	Potassium carbonate
T	S		S	S	S	S	F			U	F	F	S	S	S	S	S	S	S			F	F	F	S	F		U			S	T	U	U	U	Potassium chlorate
S	S	S	S	S	S	S	F	T	T	S	F	F	U	F	S	S	S	S	S	T		F	T	T	T	U		F	U	T	F	F	F	T	U	Potassium chloride
S	S		T	T	S	S	T			U			S		S	S	S	S				F	T	F	F	F		F	F	F	S	F	S	F	F	Potassium chromates
S	S	S	S	S	S	S	S	S	T	U	U	F	S	F	S	S	S	S	S			F	S	S	S	U		F	U	T	F	U	U	U	U	Potassium cyanide
	S	S	S	S	S	S	F	T	T	U			T	S	S	S	S	S	S	T		T	F	F	F	S		F	F	F	S	F	F	F	F	Potassium dichromate
U	T		T			S	T			S			T		S	S	S	S				T	U	U	F	U		F	F	U	T	F	F	F	S	Potassium ferricyanide
S	S	S	F	U	T	T	F	U		S	F	F	F	F	S	S	T	F	T	U	S	T	T	F	S	F		F	U	T	S	T	T	U	U	Potassium hydroxide
F	S		F	T		U	U						T			S	U	U	S			T	T	U	U	U		U			U	U	U	U	U	Potassium hypochlorite
S	S	S	S	S	S	S	S	S	T	F	F	F	S	F	S	F	S	S	S	S		T	F	F	F	T		F	F	F	T	F	F	F	F	Potassium nitrate
U	S	S	S	U	S	S				U	S		U	S		S	S	S	S	S		F	F	S	S	U		F	U	F	F	F	F	F	F	Potassium permanganate
										U												F	T	T	F	U		F	U	U		U	U	U	U	Potassium peroxide
S	S		U	T		S	T			S			T			S	S	S				T	T	S	S	U		U	U	U		U	U	U	U	Potassium persulfate
S	S	F	S	S	S	S	S	S	T	S	F	F	S	S	S	S	S	S	S	T		T	S	S	S	F		F	F	U	S	F	F	U	S	Potassium sulfate
S	S		S	S	S	S	S						S			S	S	S	S			F	U	F	F	U		U			S	U	U	U	U	Potassium sulfide
F	S	F	S	S	S	S	F	T					T			S	S	S				T	T	U	T	S		U	F	U		F	F	U	U	Potassium sulfite
S	S	S	U	U	U	S	T	T	T	S			S			S						S		F	S	S		S				F	F	F	S	Prestone anti-freeze
S	U	F	F	S	F	S				F	F	F			S	S							S												S	Producer gas
S	U	S	U	U	U	S	U	T	T	S	S		S	U	S	S	U	U		U		S	S	S	S	S		S	S	S	S	S	S	S	S	Propane
U	S		U	U	T	U	T			U						F						T	T		F	S		T	U	U		T	T	T	T	Propionic acid
S	S	S	S		S	S				S					S		S						S	S	S	S		S		S		S	S	S	T	Propyl alcohol
U	U		U	U	U	S	U	T							U	S	U	U				T	T	S	T			S				S	S	F	U	Propylene dichloride
U	U		F	T	U	S	U	T					T			S	T		S			S	S	S	S	S	S	U	S	F	U	U	U	U	U	Pyranol (dielectric)
U	T	U	U	U	F	S	T	U	U				T			S		U		U		S	S	S	S	S	S	S	S	S		F	S	S	F	Pydraul (mansanto)
U	F	T	U	U	U	U	F	U	U	F	F	U	S	U	U	S		T	S			T	T	F	F			F	F	U		T	F	F	F	Pyridine
		T				U				U						S							F	F	F			S			F			F	F	Pyrogallic acid
F	S	U	U	U	U											S																S				Pyrogard (mobil) 5%
	F	U	U	U						U													T		F			T		U		T			F	Pyroligneous acid
																												(see Sodium thiosulfate)								Photo solution
U						F										S							S	S	S	S						S		S	S	Propylene
S	S		U	T	T	S	U	T		S				U		S	S	F		T	S	F	T	S	S	S		F			F	S	F	S	F	Propylene glycol
F			S			S							F			S							T	F	F			S		T	S	F	F	F	F	Rosin emulsion
F	T		F	U	T	T	F			F						S						T	T	F	F			F	F	T		F	F	F	F	Sacchrin solution
F	S		U		S	S				U			S		S	S	S	F		F		F	U	F	F	S		F	F	U	F	F	F	F	T	Salicylic acid
S	S	S	F	U	S	S	T	T	T	S	T	S	S	S	S	S	S	S				T	U	U	T			T			T	F	F	U	U	Sewage
T	S	S	U	U		U				F	F	U	S		U	S	T	T				S	S	S	S			S		S		S	S	S	S	Shellac

Back to overview

Fluid resistance guide

CODES: S - SATISFACTORY F - FAIR U - UNSATISFACTORY T - TEST FOR SPECIFIC APPLICATION

RESILIENT MATERIALS												PLASTICS															METALS													
BUNA 'N' (NBR)	ETHYLENE PROPYLENE (EPDM)	HYPALON (CSM)	NEOPRENE (CR)	URETHANE	SILICONE	VITON (FKM/FPM)	BUTYL	FLUOROSILICONE	HYTREL	CELCON	DELRIN	LEXAN	NYLON	POLYSULFONE	PVC	TEFLON	POLYPROPYLENE	POLYETHYLENE	POLYPHENYLENE SULFIDE	POLYCARBONATE	ULTEM	ST. ST. DIN 1.4435/1.4404	STEEL	ST. ST. AISI430	ST. ST. DIN 1.4301/1.4305/1.4542	SILVER	49 - NICKEL IRON	MONEL	LEAD	IRON	INCONEL	COPPER	BRONZE	BRASS	ALUMINUM		
S	S	S	S	S	U	S	S	S	T	S	S	S	T	S	S	S	S		T	S		S	S	S	S	S						S	S	S	S	Silicone oil
					S	S										S						T	U	T	S			F			T	U	U	U	U	Silver bromide
																S	F	F		S		U	U	U	U			F			T	T	T	U	U	Silver chloride 602
U	S	S	U	S	S	S	F	T		F	F	F	S	F	S	S	S	S	S	S		T	U	F	S			U	U	U	S	U	U	U	U	Silver nitrate
S		S		S	S	S				S	S	T	S	S	S	S	S						S	S	S			T	S	S		S	S	F	F	Soap (molten)
U	F	U	U	U	T	U	T	U	U					T				U			T	S	S	S	S	S						U	U	U	S	Skydrol
F	S					U				U	U	U			U	U						S	S	S	S			S			S	U	U	U	S	Sodium
F	S	U	F	U	U	U	T	U		S			S	S	S	S	S	S	S	F		T	U	F	S	F		T	T	T	S	F	F	F	S	Sodium acetate
S			S		S	S	T						S			S						S	T	F	S	T		S	U	S		S	F	U	U	Sodium aluminate
S	S	S	S	T	S	S	F	T	T	F	U	U	S	S	S	S	S	S	S	S		T	T	F	T			F	F	T	T	F	F	T	U	Sodium bicarbonate
													S		S	S							F	F	F							U	U	U	F	Sodium bichromate
S	F		S	T	S	S	F	T	U	F	F	S	U	S	S	S	S	S	S	S	T		T	T	T	T	F	S	T	F	U	F	T	T	U	U	Sodium bisulfate
S			S		S	S					S	S		S	S		S	S						U	S		S									Sodium bisulfate 10%
S	S		S	T	S	S	F	T	T	U	U		S		S	S	S	S		T		T	U	T	T	F	S	F	F	U	T	F	F	U	T	Sodium bisulfite
S	S	S	S	T	S	S	F	T	T	S			S	S		S	F	S	S	T		F	T	F	F	T		F			T	F	T	T	U	Sodium borate
S	T		T			T	T			S			F		S	F	S	S				T	U	U	T	U		F		U	F	T	T	T	S	Sodium bromide
S	S		S	T	S	S	F	T	T	S	S	U	S	S	S	S	S	S	S	S		T	F	F	F	S		F	T	F	S	F	F	U	U	Sodium carbonate (soda ash)
S	S	S	S	S	S	S	F	T	T	S	T		S	S	S	S	S	S	S	F		T	T	T	T	F		F	F	T	S	F	F	T	T	Sodium chloride
S			T		S	S	T			U			S	S		S	S		S	S		F	F	F	F	F		F		F		T	F	F	F	Sodium chromate
																S						T	T	F	F	U		F		U	F	U	T		U	Sodium citrate
S	S	S	S	S	S	S	F	T	T	F	F	S	S	S	S	S	S	S	S			T	F	S	F	U		T	U	F	F	U	U	U	U	Sodium cyanide
T	T	S	T	T	S	T	T	U					T		S	S	S	S	T			F	U	F	F			T			T	U	U	U	T	Sodium dichromate
S	S		T			S	T			S			T		S	F	S	S				T	F	F	F	U				F		U	U	U	T	Sodium ferricyanide
S	S		S	T	S	S	T			S			S		S	S	S	S				T	T	U	U	S		S		F	T	T	S	F	F	Sodium fluoride
T	S	S	T	S	S	T	T	T	U	S	U	F	S	S	S	S	F	F	T	T	T	T	T	F	F	S	S	T	U	T	S	U	T	T	U	Sodium hydroxide (caustic soda)
U	F	T	U	U	T	S	T	T	T	U	U		U	S	T	S	F	F	S	T		T	U	U	U	F		U	U	U	T	U	U	U	U	Sodium hypochlorite
																S						U	U	F				S			F	U	U	U	U	Sodium hyposulfite
S	S	F	F	T	T	S	T	T		F	F	S	S	T	F	F	S	T	T				S	U	F	F	S		T				F	F	U	U	Sodium metaphosphate
S	S		S	T	S	S	F			F	F	S	F	S	S	F							S	F	F	F	S		F		F	S	F	F	F	T	Sodium metasilicate 563
F	S	S	F	T	U	S	F		T	S	F	S	S	F	S	S	S	S	S				T	T	F	T	F		F	U	F	S	T	T	U	F	Sodium nitrate
S	S		T		S	S	T			S			S		S	S	S	S					F	F	F	F	T		S		F		F	F	F	F	Sodium nitrite
F	S	F	F	T	S	S	F	T	T	F	F	S	T	F	S	S	S	T					F	F	F	F	U		F	U	F	S	F	T	U	U	Sodium perborate
T	S	S	T	U	U	S	S	T	T	U	U		T		S	S	F	F		S		S	U	T	F	U		F	U	F	S	U	U	U	U	Sodium peroxide
																						S	U	S	S	S				S		T	T		U	Sodium phenolate
S	S	S	F	S	U	S	T	T	T	F	F	S	U	S	S	F	S	S				F	F	F	F	S		F		F	T	F	F	F	U	Sodium phosphate
F	S	S	U	S	T	S	T	T	T				T			S	S	S				F	F	F	F	F		F	U	F	S	F	T	T	U	Sodium phosphate (tri-basic)
T				T		T	T						T									F	F	F				F		F	S				U	Sodium plumbite
S			S		S		S			S			S			S						F	F		F			F								Sodium resinate 642
																						F	U	F	F	T		F		F		T		T	T	Sodium salicylate
S	S	S	S	F	S	S	T		T	S	S	S	S	S	S	S	S	S	S			S	T	F	F	F		F	U	F	S	F	F	F	U	Sodium silicate
S	S	S	S	S	S	S	F	T	T	S	S	S	S	S	S	S	S	S	S	S		T	T	T	T	S		F	F	F	F	F	F	T	S	Sodium sulfate
F	S	S	S	S	S	S	T	T	T	S	S	S	S	S	S	S	S	S	S	U		T	T	U	S	U		F	F	U	S	U	U	U	U	Sodium sulfide
S	S	S	S	S	S	S				S	S	S	S	S	S	S							F	T	F			F	F	U	T	T	F	U	F	Sodium sulfite
S	T		S	T	S	S	F		T	U	U		S	S		S	F	S	S	T		F	F	T	F			F		F	F	F	T	T	U	Sodium tetraborate
F	S		T	T	F	S	F	T	T		T		S																					U		Sodium thiophosphate (aeroßoat)
F	S	S	S	S	S	S	S	F			T	T	S	S	U	S	S	S	F	S	S		S	U	T	F	U		F			F	U	U	U	F	Sodium thiosulfate
S			S	S	S	S	S						S			S																				Solvac (socony)
S	U	F	F	F	U	S	U	T					S			S																				Sovasol #1
S	U	F	F	F	U	S	U	T					S			S																				Sovasol #2
S	U	F	F	F	U	S	U	T					S			S																				Sovasol #3
S	U	F	F	F	U	S	U	T					S			S																				Sovasol #73
S	U	F	F	F	U	S	U	T					S			S																				Sovasol #74
S	S	U	U	T	T	S	F	T	T	F		S	U	S	S	S	S	S	S			T	T	U	U	T		T		U	U	U	U	U	Stannic chloride
F	U	S	S	U	F	T	F	T	T	F			U			S	S	F	T	T		T	T	U	U			T	U	T	F	U	U	U	U	Stannous chloride
S	F	S	S	T	S	S			T	F	F	S	S	S	S	S	S	F	S			S	S	F	S	S		S		T		S	T		S	Starch
U	T	U	U	U	U	T	T	U	U	U	U	U	U	T	U	T	U	U	T	U		S	F	S	S	F		F		F	S	F	S	F	T	Steam
S	S		S	U	U	U		U		T																		F						S		Steam condensate 663
F	F		S	T	S	T	T	U	T	F			S	U	S	S	S	S		F		T	T	T	T	S	S	F	U	U		U	U	U	U	Stearic acid
S	U	U	F	S	U	S								S	U		S		S					S	S								S	S		Stoddards solvent
	F			T						F	F	S		S	S	T						F	U	F	F	F		F		U		F	F	F	F	Stronitium nitrate
U	U	T	U	U	U	T				S						S							S	S	S			S				F	F	F		Styrene 666
T	T					T				U			T			S	T					F	F		U	F						F	F	F	T	Succinic acid
																																				Sul (dil)
T	F		F		T	S	T	T	U				U			S	T	S				F	U	F	T		S	S		S		U	U	U	U	Sulfate liquor
U	S		U	T	S	S	T	T	F	S			S		S	S	S	S	S	T		T	T	F	F	U		T	U	T	S	U	U	T	S	Sulfur
U	U	U	U	U	U	S	U	T	U	U	U		U	T	S	S	U	U		U		T	U	T	T	U		U	F	U	F	U	U	U	U	Sulfur chloride
U	S		F	U	F	S	F	F	U	F			U	U	U	S	T	T	S	T		T	T	T	T	T		T	F	T	U	T	T	T	F	Sulfur dioxide

trafag sensors controls

Fluid resistance guide

CODES: S - SATISFACTORY F - FAIR U - UNSATISFACTORY T - TEST FOR SPECIFIC APPLICATION

RESILIENT MATERIALS												PLASTICS													METALS											
BUNA 'N' (NBR)	ETHYLENE PROPYLENE (EPDM)	HYPALON (CSM)	NEOPRENE (CR)	URETHANE	SILICONE	VITON (FKM/FPM)	BUTYL	FLUOROSILICONE	HYTREL	CELCON	DELRIN	LEXAN	NYLON	POLYSULFONE	PVC	TEFLON	POLYPROPYLENE	POLYETHYLENE	POLYPHENYLENE SULFIDE	POLYCARBONATE	ULTEM	ST. ST. DIN 1.4435/1.4404	STEEL	ST. ST. AISI430	ST. ST. DIN 1.4301/1.4305/1.4542	SILVER	49 - NICKEL - IRON	MONEL	LEAD	IRON	INCONEL	COPPER	BRONZE	BRASS	ALUMINUM	
T	S		F	S	U	U	T	T	T		S		T			S						T	T	S	T				S	S		S			Sulfur hexaßuoride
	U					S											T				F	F	F	F	U		F		F		F	F	F	F	Sulfur oils
U	F	U	U	T	F	S	U	T	U	U			S			S	U	U				T	T	T	T	U		F	F	T		T	T	T	F	Sulfur trioxide dry
T	T	T	U	U	U	S	T	U	T	U	U	S	U	U	T	S	T	T	T	T	T	T	T	T	T	T		U	U	U	U	U	U	U	U	Sulfuric acid
T	F	S	T	U	U	S	F		U	U	U	S	U	U	S	S	S	S	S			T	U	U	U	F		U	F	U	U	U	U	U	T	Sulfurous acid
S	T	S	S		T					F	F	S	S	F	F	S								S				S		F		F		F	S	Soybean oil
																																				(Synthetic lubricant -diester type)
T	U		U	T	T	S				S	S		S	T	U	S	T	T	S			S	S	S	S	S						S		S	S	
S			S		S					S			S			S												S								Talc slurry
S	U	F	U	T	U	S	U	T							S	F	S	F				T	U	U	T			F		U	T	U		U	U	Tall oil
S	F		S		S	S				F	F	T	S		S	S												S		S						Tallow, molten
T	S		T	F	S	S	T	F	T	U			S	S	S	S	S	S	S	U		T	T	F	F	S		F		F	F	T	T	T	T	Tannic acid 686
T	U	U	T		U	F				F	F	F	S		S	S							S	F	S			S		S	S	S	S	F	S	Tar
																																				Water (see types below)
S	S		S	T	S	S		T					S			S								S	S			S				F	F	F	F	Carbonated
T	S	S	F			S	F			S	S		S	S	S	S	S	S	S		T	S	U	S	S	S		S	U	U	S	T	T	T	S	Distilled, demineralized, deionized
S	S	S	T	T	S	S	T	S	T	S	S		S	S	S	S	S	S	S	S		S	T	S	S	S		S		U	S	S	S	F	F	Fresh
T	S		U	U	U	U		T		S			T			S						S	T	S	S	S		S			S	F	F	T	F	Boiler feed
S	S		T	U	S	T				S			T			S							T	S	S	S						F	F	T	F	Return condensate
T	T		T	U	T	S	F									S		S	S			F	T	F	F	S		S	S	U	S	S	S	U	U	Brackish
S	S	S	S	U	F	S	F	T	T	S	S	F	S	S	S	S	S	S	S			U	U	U	T	S	U	S	S	U	F	F	S	U	U	Sea
			S							S				S	S													S						S	Wax molten
T	T	T	U	U	S	T		T		S	S	F	S	S	S	S	S	U				S	U	F	F			S		U		S	T	F	U	Whiskey and wines
T	T	T	T	U	S	T	F	T	T	S	S	F	S	S	S	S	S	S		T		S	U	S	S			U			S	F	F	F	T	Wine
S	S		U	U	T	S	F	T					T			S						S	S	S	S							U	T	T	S	Xanthates
			S							S			S			F								S	S											X-ray development solution
U	U	U	U	U	U	U				S	S	U	S	S	U	S	U	U					S	S	F		S	S		S		S	S	S	F	Xlol (dry & no alkalies)
U	U	U	U	T	U	F	U	T	U	S	S	U	S	U	T	S	U	U	S	U	U	S	F	S	S	S		S			S	S	S	S	S	Xylene
T	S	S	T	T	S	S	F	T	T	F	S	F	U	S	S	S	S	S	S	S	T	T	T	U	U	F		T	T	T	F	U	U	U	U	Zinc chloride
S	S	S	S	T	S	S	F	T	U		S	F	U	S	S	S	S	S		S		T	U	T	F	S		T	F	U	F	T	T	U	U	Zinc sulfate
T	U	S	T	T	S	F	F	T	T	U			S	S	S	S	S	F	S	T		T	U	T	T	S		T	U	U	S	T	T	U	T	Tartaric acid
		S																																		Tetrabutyl titrate
	U	U	U	U	U																	T	S	S	S						S	S	S	T	Tetrachloroethylene
U	U	U	U	U	U	U	U	T	U	U	S			T	U		S	U	S	S	U		S												F	Tetrahydrofuran
										U	U					S			S			T	U	U	T			U	U	U		U	U	U	U	Tetraphosphoric acid
										U												U	U	U	U					U		U	U	U		Tin ammonium chloride
S	T									U	S	U			U	S							S		U			T		U						Tin tetrachloride
S																F						T	U	T	F			T	F	U		T	T	U	U	Titanium sulfate
U	U	U	U	U	U	S	U	T								S	U	U		S		T	T	T	T			T				T	T	U	U	Titanium tetrachloride
U	U	U	U	T	U	S	U	T	U	F	F		S	U	U	S	U	U	S	U	U	S	S	S	S	S		S	S	S	S	S	S	S	S	Toluene (Toluol)
S										S													S	S	S	S						S		S	S	Transmission fluid (type A)
U	U	U	U	U	U	U	T	U	U	F	F	F	F		U	S	F	U				S	S		S											Tributyl phosphate
U	F	U	U	U	T	U	T	U	U	U			U			S	F	U	S	T		U	U	U	U			T	U	U	T	U	U	U	U	Trichloroacetic acid
U	U	U	U	U	U	F	U	U	U	S	F	U	U	U	U	S	U	U	S	U		T	T	F	F			F	U	T	S	T	T	T	F	Trichloroethylene
S			S	S		S	U									S						S	T		S	T		S		S		F	S	S		Trichloropropane
U	S	U	U	U	U	S	F	T	U				T			S	F	T	S			S	S	S	S							S	S	S	U	Tricresyl phosphate
			F							T						S							U	U	U			U	U	U		U	U	U	U	Trifluoroacetic acid
S			S		S					S			S			S	S						S	F	F	F		F	U	S		T			U	Trisodium phosphate
S	U	T	S	U	U	T	U	T	T				S			S	S					S	F		S			T			T	T	T	T	S	Tung oil
						S																														Turco # 2976
		T																																		Turco oil # 15
S	U	U	T	U	U	F	U	T	T	S			S	U		S	U	U	T	U		S	F	F	F	S		F	F	F	S	F	F	F	F	Turpentine
U	S		U		U	U							S			S							S		S			S		U		U	U	U	S	Udmh (Hydrazine)
F	F	S	S	T	S	F	F		T	S	T	F	S	F	S	S	S	S	S	U		T	T	F	F	S		T	S	F		T	S	T	F	Urea
					T	T										S						T	S		T		T	S				T	T	T	S	Uranium hexafluoride
																								S	S											Vanadium pentoxide
F	U	U	U	U	U	T	U	T					S	U	U	S	T	U				S	T	T	S			S		T	S	S	T	F	S	Varnish
S			S			S										S						F		F	F	F						F	F	F		Varsol # 1 & # 2 (mineral spirits)
F	S	S	U	T	S	S	F	T		F	F	S	S	S	S	S						S	S	F	S			F			S			U	S	Vegetable oils
T	S	S	T	U	S	S	T	U	T		F	T	T	S		S	S	S	S	S		S	U	F	F	S		S		T	S	F	F	U	T	Vinegar
	T	U	S	S			U			S						S						T	T	T	T	S		F	U	T	T	U	U	U	T	Vinyl chloride

Back to overview

Conversion of pressure units

	bar	mbar	Pa N/m^2	kPa kN/m^2	MPa MN/m^2	at kp/cm^2	atm	mmWS mmCE	mWS mCE	Torr mm Hg	psi lbf/in^2
1 bar	1	1000	10^5	100	0.1	1.02	0.987	$1.02 \cdot 10^4$	10.2	750	14.5
1 mbar	0.001	1	100	0.1	10^{-4}	$1.02 \cdot 10^{-3}$	$0.987 \cdot 10^{-3}$	10.2	0.0102	0.75	0.0145
1 Pa 1 N/m^2	10^{-5}	0.01	1	0.001	10^{-6}	$1.02 \cdot 10^{-5}$	$0.987 \cdot 10^{-5}$	0.102	$1.02 \cdot 10^{-4}$	0.0075	$1.45 \cdot 10^{-4}$
1 kPa 1 kN/m^2	0.01	10	1000	1	0.001	0.0102	$9.87 \cdot 10^{-3}$	102	0.102	7.5	0.145
1 MPa 1 MN/m^2	10	10^4	10^6	1000	1	10.2	9.87	$1.02 \cdot 10^5$	102	7500	145
1 at 1 kp/cm^2	0.981	981	$0.981 \cdot 10^5$	98.1	0.0981	1	0.968	10^4	10	736	14.22
1 atm	1.013	1013	$1.013 \cdot 10^5$	101.3	0.1013	1.033	1	$1.033 \cdot 10^4$	10.332	760	14.696
1 mmWS 1mmCE	$0.981 \cdot 10^{-4}$	0.098	9.807	$9.81 \cdot 10^{-3}$	$9.81 \cdot 10^{-6}$	10^{-4}	$0.968 \cdot 10^{-4}$	1	0.001	0.0736	$1.422 \cdot 10^{-3}$
1 mWS 1mCE	0.0981	98.07	9807	9.81	$9.81 \cdot 10^{-3}$	0.1	0.0968	1000	1	73.6	1.422
1 Torr 1 mmHg	$1.133 \cdot 10^{-3}$	1.333	133.323	0.133	$1.333 \cdot 10^{-4}$	$1.36 \cdot 10^{-3}$	$1.316 \cdot 10^{-3}$	13.595	$1.359 \cdot 10^{-2}$	1	$1.934 \cdot 10^{-2}$
1 psi 1 lbf/in^2	$6.895 \cdot 10^{-2}$	68.95	6895	6.895	$6.895 \cdot 10^{-3}$	$7.031 \cdot 10^{-2}$	0.06805	703.1	0.7031	51.7	1

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Conversion of pressure units

[°F] to [°C]
Formula: °C = 5/9·(°F –32)

°F	°C	°F	°C	°F	°C
–100	–73.3	105	40.6	315	157.2
–95	–70.6	110	43.3	320	160.0
–90	–67.8	115	46.1	325	162.8
–85	–65.0	120	48.9	330	165.6
–80	–62.2	125	51.7	335	168.3
–75	–59.4	130	54.4	340	171.1
–70	–56.7	135	57.2	345	173.9
–65	–53.9	140	60.0	350	176.7
–60	–51.1	145	62.8	355	179.4
–55	–48.3	150	65.6	360	182.2
–50	–45.6	155	68.3	365	185.0
–45	–42.8	160	71.1	370	187.8
–40	–40.0	165	73.9	375	190.6
–35	–37.2	170	76.7	380	193.3
–30	–34.4	175	79.4	385	196.1
–25	–31.7	180	82.2	390	198.9
–20	–28.9	185	85.0	395	201.7
–15	–26.1	190	87.8	400	204.4
–10	–23.3	195	90.6	405	207.2
–5	–20.6	200	93.3	410	210.0
0	–17.8	205	96.1	415	212.8
5	–15.0	210	98.9	420	215.6
10	–12.2	215	101.7	425	218.3
15	–9.4	220	104.4	430	221.1
20	–6.7	225	107.2	435	223.9
25	–3.9	230	110.0	440	226.7
30	–1.1	235	112.8	445	229.4
32	0	240	115.6	450	232.2
35	1.7	245	118.3	455	235.0
40	4.4	250	121.1	460	237.8
45	7.2	255	123.9	465	240.6
50	10.0	260	126.7	470	243.3
55	12.8	265	129.4	475	246.1
60	15.6	270	132.2	480	248.9
65	18.3	275	135.0	485	251.7
70	21.1	280	137.8	490	254.4
75	23.9	285	140.6	495	257.2
80	26.7	290	143.3	500	260.0
85	29.4	295	146.1	505	262.8
90	32.2	300	148.9	510	265.6
95	35.0	305	151.7	515	268.3
100	37.8	310	154.4	520	271.1

[°C] to [°F]
Formula: °F = 9/5·(°C +32)

°C	°F	°C	°F	°C	°F
–100	–148	105	221	315	599
–95	–139	110	230	320	608
–90	–130	115	239	325	617
–85	–121	120	248	330	626
–80	–112	125	257	335	635
–75	–103	130	266	340	644
–70	–94	135	275	345	653
–65	–85	140	284	350	662
–60	–76	145	293	355	671
–55	–67	150	302	360	680
–50	–58	155	311	365	689
–45	–49	160	320	370	698
–40	–40	165	329	375	707
–35	–31	170	338	380	716
–30	–22	175	347	385	725
–25	–13	180	356	390	734
–20	–4	185	365	395	743
–15	5	190	374	400	752
–10	14	195	383	405	761
–5	23	200	392	410	770
0	32	205	401	415	779
5	41	210	410	420	788
10	50	215	419	425	797
15	59	220	428	430	806
20	68	225	437	435	815
25	77	230	446	440	824
30	86	235	455	445	833
32	89.6	240	464	450	842
35	95	245	473	455	851
40	104	250	482	460	860
45	113	255	491	465	869
50	122	260	500	470	878
55	131	265	509	475	887
60	140	270	518	480	896
65	149	275	527	485	905
70	158	280	536	490	914
75	167	285	545	495	923
80	176	290	554	500	932
85	185	295	563	505	941
90	194	300	572	510	950
95	203	305	581	515	959
100	212	310	590	520	968

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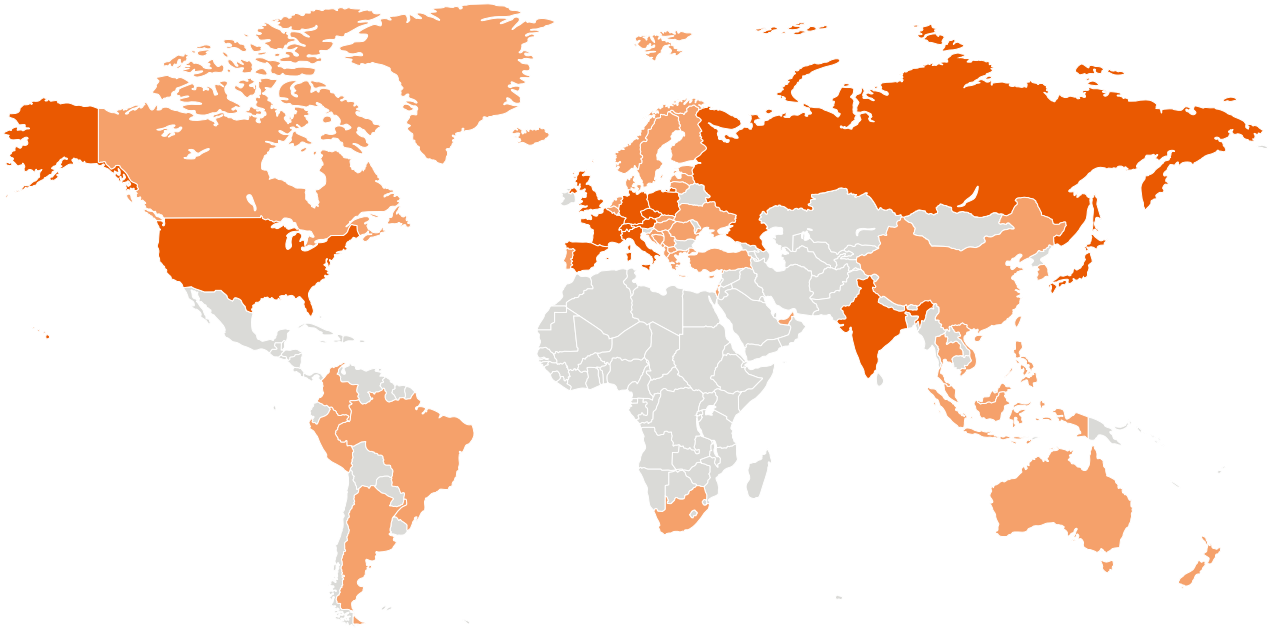

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