Insertion Thermocouples with Bayonet Lock

KOBOLD

T2

- Measuring ranges: 0 ... + 400 °C
- Bulbs in stainless steel 1.4571
- NiCr-Ni or Fe-CuNi thermocouples
- Accuracy class 2 (option category 1)
- Connection: bayonet
- Good heat transfer with adjustable spring pressure
- Fitting and removal without tools

°C

Model:
TTE...

133

Description

The insertion thermocouples comprise a rugged sensor made of stainless steel. Due to the special form of the probe tip, these temperature detectors are suitable for service in threaded borings. The thermostable compression spring made of stainless steel, which also acts as the bend protection, ensures steady contact pressure of the probe tip in the hole. The immersion length can be varied by rotating the bayonet lock. Bayonet locks and counterparts are available in 12 mm diameters, others upon request.

Thermocouples according to IEC 584-1, category 2 are used as standard in the measuring insert.

Thermocouples according to DIN 43 710 or other versions are also available upon request.

The sensors are available as single or double thermocouples.

Applications

Insertion thermocouples with bayonet lock are particularly suited for measuring temperature in solids, sliding contact bearings and tools.

Many areas of application are to be found especially in the plastics industry.

Insertion thermocouples
With bayonet lock

Protective tube in stainless steel 1.4571
Compression spring in stainless steel 1.4310
Connecting lead: glass silk/glass silk/stainless steel braided, 0.22 mm² with bend protection
Standard cable length: 2500 mm, others upon request
Temperature range: 0 ... +400°C

Model number	Diameter/immersion length	Sensor type/category	Connection cable
TTE-564 17P..	6 mm / adjustable 20-175 mm (0...+400°C)	**..J1..** = 1 x FeCu-Ni, category 2 **..J2..** = 2 x FeCu-Ni, category 2 **..K1..** = 1 x NiCr-Ni, category 2 **..K2..** = 2 x NiCr-Ni, category 2	**..E** = stainless steel braided cable (standard 2.5 m)
TTE-584 17P..	8 mm / adjustable 20-175 mm (0...+400°C)		

Please specify special lengths for cable in writing

Counterpart for thermocouples with bayonet lock
Material steel 1.0718

Model: TUZ-A1..: connection M 12 x 1
Model: TUZ-A2..: connection G ¼ AG

Model: TUZ-B1..: connection M 12 x 1

Model: TUZ-C1..: connection M 12 x 1

Diameter ..6 = 6 mm ..8 = 8 mm

Immersion and Insertion Thermocouples with Compensating Lead

KOBOLD

T2

- Measuring ranges:
  0 ... +600 °C
- Bulbs in stainless steel
  1.4571
- NiCr-Ni or Fe-CuNi
  thermocouples
- Accuracy class 2
  (option category 1)

Model:
TTE

135

T2

Description

The immersion and insertion thermocouples comprise a rugged sensor made of stainless steel in which the thermocouple is inserted. It is directly connected with the compensating lead. Depending on the version, the connecting leads are suitable for dry or moist rooms. The junction between connecting lead and protective tube is strain relieved.

Protective tube and thread are made of stainless steel. Other materials are available on request.

Thermocouples according to IEC 584-1, category 2 are used in the measuring insert as standard. Thermocouples according to DIN 43 710 or other versions are also available upon request.
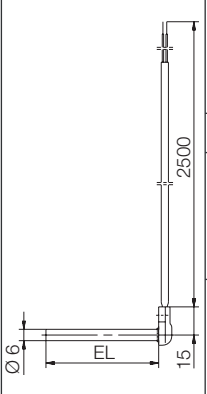
Applications

Immersion and insertion thermocouples are particularly suited for measuring temperature in liquid and gaseous media.

Areas of application are to be found in heating installation, furnace, machine and apparatus construction as well as in industry in general.

Immersion / insertion thermocouples
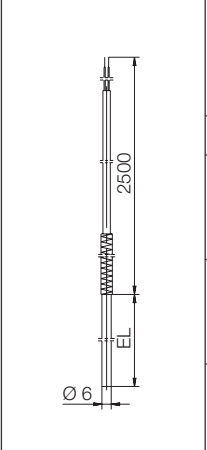Angular sensor

Bulb in stainless steel 1.4571, Ø 6 mm Connecting lead: stainless steel braided 0.22 mm^2 Standard cable length: 2500 mm, others upon request Temperature range: 0 ... +300 °C			
Model number	**Immersion length**	**Sensor type / category**	**Connection cable**
TTE-664 060..	60 mm	**..J1..** = 1 x FeCu-Ni, categ. 2 **..J2..** = 2 x FeCu-Ni, categ. 2 **..K1..** = 1 x NiCr-Ni, categ. 2 **..K2..** = 2 x NiCr-Ni, categ. 2	**..E** = stainless steel braided cable (standard 2.5 m)
TTE-664 xx0..	other length		

Please specify special lengths for bulb or cable in writing

Immersion / insertion thermocouples
Straight version

Bulb in stainless steel 1.4571, Ø 6 mm Connecting lead: stainless steel braided 0.22 mm^2, with bend protection Standard cable length: 2500 mm, others upon request Temperature range: 0 ... +600 °C (0 ... +400 °C for EL = 50 mm)			
Model number	**Immersion length**	**Sensor type / category**	**Connection cable**
TTE-864 050..	50 mm	**..J1..** = 1 x FeCu-Ni, categ. 2 **..J2..** = 2 x FeCu-Ni, categ. 2 **..K1..** = 1 x NiCr-Ni, categ. 2 **..K2..** = 2 x NiCr-Ni, categ. 2	**..E** = stainless steel braided cable (standard 2.5 m)
TTE-864 100..	100 mm		
TTE-864 xx0..	other length		

Please specify special lengths for bulb or cable in writing

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Sheath Thermocouples

T2

- Flexible sheathed cable
- Measuring ranges: -50 ... +1100 °C
- Sheath in stainless steel 1.4571 or Inconel
- NiCr-Ni or Fe-CuNi thermocouples
- Sheath diameter from 0.5 mm
- Fast response times
- Accuracy class 2 (option category 1)
- Connection: cable, connector or connection head MA

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Model:
TTM...

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T2

Description

Sheath thermocouples comprise a thin-walled and flexible sheathed cable made of stainless steel or Inconel. The cable contains thermal wires embedded in pressed fireproof magnesium oxide.

Good heat transfer between sheath and thermocouple allows fast response times and high measuring accuracies.
The vibration-proof design assures long service life.

The flexible probe tube allows temperature measurements at locations that are difficult to access. The minimum bend radius is 5 x outer diameter. The minimum mounting length is ≥ 50 mm for sheath diameter 0.5 to 2.0 mm; ≥ 100 mm for sheath diameter 3.0 to 6.0 mm.

Thermocouples according to IEC 584-1, category 2 are used in the measuring insert as standard. Thermocouples according to DIN 43 710 or other versions are also available upon request.

Applications

Because of their characteristics sheath thermocouples are used in difficult measurement applications with strong vibrations as well as at all measuring positions where flexibility and ease of replacement are needed.
Areas of application are to be found in chemical plants, power stations, motors, as well as in machine construction and building installations and in general industrial applications.
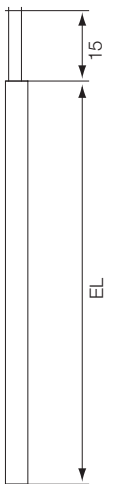
Upon request

● Sheath diameter 0.25 and 1.5 mm

Temperature ranges

Sheath diameter	Temperature
0.5 to 1.0 mm	- 50 to +600 °C
2.0 to 3.0 mm	- 50 to +900 °C
4.0 to 6.0 mm	- 50 to +1100 °C

Sheath thermocouples
with (uninsulated) connecting wires

15

EL

Enclosing tube in stainless steel 1.4571
Temperature range: max. 800 °C, depending on sheath diameter

Model number	Sheath Ø	Immersion length	Sensor type/category	Connection cable
TTM-804..	0.5 mm	..100.. = 100 mm		
TTM-814..	1.0 mm	..200.. = 200 mm	..J1.. = 1 x FeCu-Ni, category 2	..0 = uninsulated wires
TTM-824..	2.0 mm	..300.. = 300 mm		
TTM-834..	3.0 mm	..500.. = 500 mm	..J2.. = 2 x FeCu-Ni, category 2[1]	
TTM-844..	4.5 mm	..xxx.. = special length		
TTM-864..	6.0 mm			

Enclosing tube made of Inconel 2.4816
Temperature range: max. 1100 °C, depending on sheath diameter

Model number	Sheath Ø	Immersion length	Sensor type/category	Connection cable
TTM-80F..	0.5 mm	..100.. = 100 mm		
TTM-81F..	1.0 mm	..200.. = 200 mm	..K1.. = 1 x NiCr-Ni, category 2	..0 = uninsulated wires
TTM-82F..	2.0 mm	..300.. = 300 mm		
TTM-83F..	3.0 mm	..500.. = 500 mm	..K2.. = 2 x NiCr-Ni, category 2[1]	
TTM-84F..	4.5 mm	..xxx.. = special length		
TTM-86F..	6.0 mm			

Please specify special lengths for enclosing tube in writing [1]) not for sheath diameter less than 2.0 mm

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Sheath thermocouples
with reinforcing sleeve and silicone-insulated connecting lead

Enclosing tube in stainless steel 1.4571
Connecting lead: PTFE/silicone 0.22 mm² with reinforcing sleeve
Standard cable length: 2500 mm, others upon request
Temperature range: max. +800 °C, depending on sheath diameter

Model number	Sheath Ø	Immersion length	Sensor type/category	Connection cable
TTM-804..	0.5 mm	**..100..** = 100 mm		
TTM-814..	1.0 mm	**..200..** = 200 mm	**..J1..** = 1 x FeCu-Ni, category 2	
TTM-824..	2.0 mm	**..300..** = 300 mm		**..S** = silicone cable
TTM-834..	3.0 mm	**..500..** = 500 mm	**..J2..** = 2 x FeCu-Ni, category 2[1]	
TTM-844..	4.5 mm	**..xxx..** = special length		
TTM-864..	6.0 mm			

Enclosing tube in Inconel 2.4816
Connecting lead: PTFE/silicone 0.22 mm² with reinforcing sleeve
Standard cable length: 2500 mm, others upon request
Temperature range: max. 1100 °C, depending on sheath diameter

Model number	Sheath Ø	Immersion length	Sensor type/category	Connection cable
TTM-80F..	0.5 mm	**..100..** = 100 mm		
TTM-81F..	1.0 mm	**..200..** = 200 mm	**..K1..** = 1 x NiCr-Ni, category 2	
TTM-82F..	2.0 mm	**..300..** = 300 mm		**..S** = silicone cable
TTM-83F..	3.0 mm	**..500..** = 500 mm	**..K2..** = 2 x NiCr-Ni, category 2[1]	
TTM-84F..	4.5 mm	**..xxx..** = special length		
TTM-86F..	6.0 mm			

Please specify special lengths for enclosing tube and length of cable in writing [1] not for sheath diameter less than 2.0 mm

Sheath thermocouples
with flat connector

Enclosing tube in stainless steel 1.4571
Connection: flat connector, no thermal e.m.f.
Temperature range: max. 800 °C, depending on sheath diameter

Model number	Sheath Ø	Immersion length	Sensor type/category	Connection cable
TTM-804..	0.5 mm	**..100..** = 100 mm		**..F** = Mini plug with flat pin
TTM-814..	1.0 mm	**..200..** = 200 mm		
TTM-824..	2.0 mm	**..300..** = 300 mm	**..J1..** = 1 x FeCu-Ni, category 2	
TTM-834..	3.0 mm	**..500..** = 500 mm		**..F** = standard plug with round pin
TTM-844..	4.5 mm	**..xxx..** = special length		
TTM-864..	6.0 mm			

Enclosing tube in Inconel 2.4816
Connection: flat connector, no thermal e.m.f.
Temperature range: max. 1100 °C, depending on sheath diameter

Model number	Sheath Ø	Immersion length	Sensor type/category	Connection cable
TTM-80F..	0.5 mm	**..100..** = 100 mm		**..F** = Mini plug with flat pin
TTM-81F..	1.0 mm	**..200..** = 200 mm		
TTM-82F..	2.0 mm	**..300..** = 300 mm	**..K1..** = 1 x NiCr-Ni, category 2	
TTM-83F..	3.0 mm	**..500..** = 500 mm		**..F** = standard plug with round pin
TTM-84F..	4.5 mm	**..xxx..** = special length		
TTM-86F..	6.0 mm			

Please specify special lengths for enclosing tube in writing

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Sheath thermocouples
with connection head MA without process connection

Enclosing tube in stainless steel 1.4571 Connection: small compact connection head MA Temperature range: max. 800 °C, depending on sheath diameter				
Model number	**Sheath Ø**	**Immersion length**	**Sensor type / category**	**Connection cable**
TTM-804..	0.5 mm	**..100..** = 100 mm	**..J1..** = 1 x FeCu-Ni, category 2	**..M** = head form MA
TTM-814..	1.0 mm	**..200..** = 200 mm		
TTM-824..	2.0 mm	**..300..** = 300 mm		
TTM-834..	3.0 mm	**..500..** = 500 mm	**..J2..** = 2 x FeCu-Ni, category 2[1]	
TTM-844..	4.5 mm	**..xxx..** = special length		
TTM-864..	6.0 mm			

Enclosing tube in Inconel 2.4816 Connection: small compact connection head MA Temperature range: max. 1100 °C, depending on sheath diameter				
Model number	**Sheath Ø**	**Immersion length**	**Sensor type / category**	**Connection cable**
TTM-80F..	0.5 mm	**..100..** = 100 mm	**..K1..** = 1 x NiCr-Ni, category 2	**..M** = head form MA
TTM-81F..	1.0 mm	**..200..** = 200 mm		
TTM-82F..	2.0 mm	**..300..** = 300 mm		
TTM-83F..	3.0 mm	**..500..** = 500 mm	**..K2..** = 2 x NiCr-Ni, category 2[1]	
TTM-84F..	4.5 mm	**..xxx..** = special length		
TTM-86F..	6.0 mm			

Please specify special lengths for enclosing tube in writing [1] not for sheath diameter less than 2.0 mm

Sheath thermocouples
with connection head form MA, process connection thread G ½

Enclosing tube in stainless steel 1.4571 Connection: small compact connection head MA Temperature range: max. 800 °C, depending on sheath diameter				
Model number	**Sheath Ø**	**Immersion length**	**Sensor type / category**	**Connection cable**
TTM-104..	0.5 mm	**..100..** = 100 mm	**..J1..** = 1 x FeCu-Ni, category 2	**..M** = head form MA
TTM-114..	1.0 mm	**..200..** = 200 mm		
TTM-124..	2.0 mm	**..300..** = 300 mm		
TTM-134..	3.0 mm	**..500..** = 500 mm	**..J2..** = 2 x FeCu-Ni, category 2[1]	
TTM-144..	4.5 mm	**..xxx..** = special length		
TTM-164..	6.0 mm			

Enclosing tube in Inconel 2.4816 Connection: small compact connection head MA Temperature range: max. 1100 °C, depending on sheath diameter				
Model number	**Sheath Ø**	**Immersion length**	**Sensor type / category**	**Connection cable**
TTM-10F..	0.5 mm	**..100..** = 100 mm	**..K1..** = 1 x NiCr-Ni, category 2	**..M** = head form MA
TTM-11F..	1.0 mm	**..200..** = 200 mm		
TTM-12F..	2.0 mm	**..300..** = 300 mm		
TTM-13F..	3.0 mm	**..500..** = 500 mm	**..K2..** = 2 x NiCr-Ni, category 2[1]	
TTM-14F..	4.5 mm	**..xxx..** = special length		
TTM-16F..	6.0 mm			

Please specify special lengths for enclosing tube in writing [1] not for sheath diameter less than 2.0 mm

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Standard plug connections with no thermal e.m.f. for temperatures from - 60 to +200°C

Plug connections for thermocouples

No thermal e.m.f. is produced in the connections between thermocouples and compensating lead, when the contact material is the same as the thermocouple material.

| Measuring sensor	Order number		Sheath diameter
	Connector	Mating con.	
K (NiCr-Ni)	**TUZ-S900K**	**TUZ-S911K**	0.25 - 2.0 mm
K (NiCr-Ni)	**TUZ-M900K**	**TUZ-M911K**	3.0 - 6.0 mm
J (Fe-CuNi)	**TUZ-S900J**	**TUZ-S911J**	0.25 - 2.0 mm
J (Fe-CuNi)	**TUZ-M900J**	**TUZ-M911J**	3.0 - 6.0 mm

T2

Clamp process connections

Clamp process connections for passing through sheath thermocouples with a pressure washer made of PTFE (up to 200°C, that can be removed) or a conical ring made of stainless steel (for higher temperatures and pressures).

Process connection material: Steel
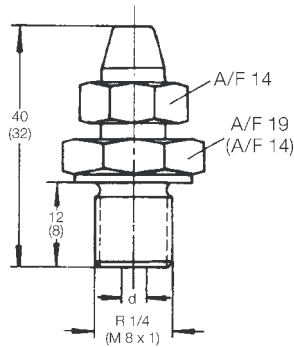
| for sheath thermocouple Ø	Thread	with PTFE pressure washer Order number	with stainless steel wedge Order number
1.0	M 8 x 1	**TUZ-VS10T**	**TUZ-VS10V**
2.0	M 8 x 1	**TUZ-VS20T**	**TUZ-VS20V**
3.0	M 8 x 1	**TUZ-VS30T**	**TUZ-VS30V**
4.5	R ¼"	**TUZ-VS45T**	**TUZ-VS45V**
6.0	R ¼"	**TUZ-VS60T**	**TUZ-VS60V**

Process connection material: stainless steel, material no. 1.4541
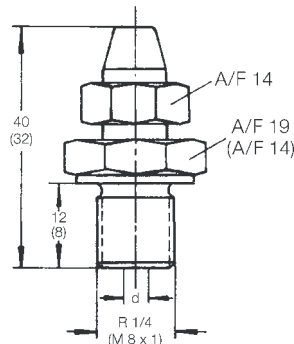
for sheath thermocouple Ø	Thread	with PTFE pressure washer Order number	with stainless steel wedge Order number
1.0	M 8 x 1	**TUZ-VV10T**	**TUZ-VV10V**
2.0	M 8 x 1	**TUZ-VV20T**	**TUZ-VV20V**
3.0	M 8 x 1	**TUZ-VV30T**	**TUZ-VV30V**
4.5	R ¼"	**TUZ-VV45T**	**TUZ-VV45V**
6.0	R ¼"	**TUZ-VV60T**	**TUZ-VV60V**

Hard soldered thread glands
for hard-soldering sheath thermocouples tapped to specification or with a centre hole 3.0 mm Ø.
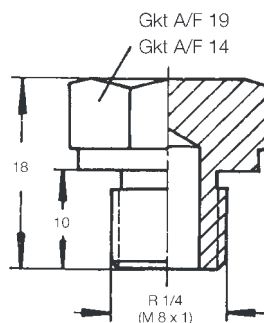
Thread	Order number
M 8 x 1 (to 3,0 mm Ø)	**TUZ-V408**
Gewinde R ¼"	**TUZ-V410**

Resistance Temperature Sensor

Special temperature measurement for food applications

- ● Measuring range: -50 ... +250 °C
- ● Sensor Pt 100, accuracy class A
- ● p_{max} 10 bar, t_{max} 250 °C
- ● hygienic (acc. to EHEDG)
- ● variable mounting with different sleeves
- ● Sensor completely assembled from st. steel
- ● Optional with head mounted transmitter
- ● CIP/SIP-compliant

For more informations please refer to our brochure "Food L1"

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Head Mounted Temperature Transmitters

measuring
•
monitoring
•
analysing

T2

- ● Accurate measurements
- ● Voltage linear or temperature linear
- ● Easy to connect and install
- ● Large centre bore
- ● Sensor failure monitoring
- ● High load capacitance

Model:
TUM-K

143

Description

Transmitters for head mounting convert the temperature-dependant change in voltage of thermocouples and the temperature-dependant change in resistance of resistance thermometers to a linear standard current signal.

The transmitter for top mounting is a two-wire transmitter with 4 - 20 mA output. Transmission is absolutely noise-free even over long distances.

Standard version
Settings are made with solder pads and potentiometers.

Model	Input	Output
TUM-KW	Pt 100	Temperature linear
TUM-KT	Thermocouple J, L, T, K or N	Voltage linear

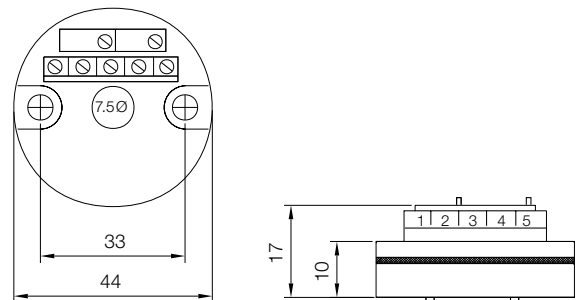Option: Factory setting. Please specify special data in writing.

The transmitter is designed for the connection head according to DIN 43 729, form B or larger.

The transducers can be mounted and calibrated in the connection head when ordering a suitable sensor, see temperature detectors with connection head.

Dimensions in mm

Technical Details

Model	TUM-KW	TUM-KT
Input	Pt 100 (α = 0.00385) 3-wire connection	Thermocouples J, L, T, K or N
Settings	-50...+550 °C	Measuring ranges: -5...+55 mV
Zero-point	-50...+50 °C	±10 % of measuring span
Measuring span, selectable	50...500 °C	10...50 mV
Measuring span, fine adjustment	±10 %	±10 %
Supply, reverse polarity protected	6.5...32 V_{DC} (not electrically isolated)	6.5...32 V_{DC} (not electrically isolated)
Output	4...20 mA	4...20 mA
Linearity	Temperature linear	Voltage linear
Sensor failure monitoring, selectable	Max. approx. 25 mA, Min. approx. 3 mA	Max. approx. 25 mA, Min. approx. 3 mA
Current limiting	approx. 25 mA	approx. 25 mA
Maximum load	700 Ω at 24 V_{DC}, 25 mA	700 Ω at 24 V_{DC}, 25 mA
Long-term stability	±0.1 % of measuring span/year	±0.1 % of measuring span/year
Connection (wire or stranded cable)	≤ 2.5 mm²	≤ 2.5 mm²
Protection, housing/terminals	IP 20 / IP 10	IP 20 / IP 10

Wiring diagrams **TUM-KW**   **TUM-KT**   **Load diagram**
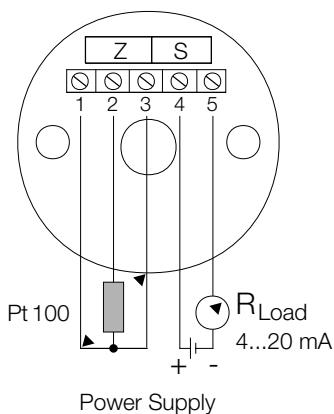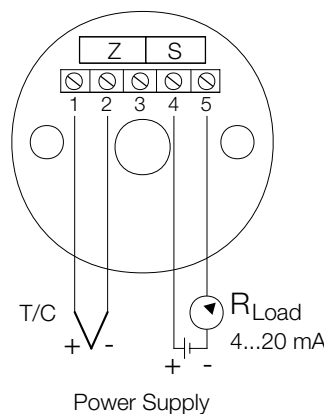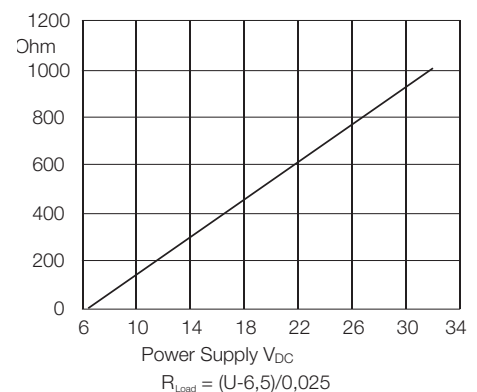
$R_{Load} = (U-6,5)/0,025$
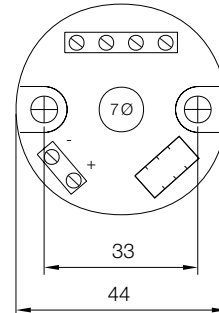
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T2

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Programmable version

for industrial applications.

A device for resistance thermometers and thermocouples, thus reduced inventory costs.

Configuration in seconds with a Windows-based, user-friendly software without need for external supply for transmitter.

Model	Input	Output
TUM-KP	Pt 100 Thermocouples	Temperature linear

Accessories

TUM-KP01	Software with cable

Dimensions in mm

7Ø

33

44

Option: Factory setting. Please specify special data in writing.

T2

Technical Details

Model	TUM-KP			
Input	Pt 100, IEC751, $\alpha = 0.00385$, 3-wire connection, -200...+1000°C			
	D100. (Pt 100 acc. to JIS1604, $\alpha = 0.003916$), 3-wire connection, -200...+1000°C, Thermocouple			
	Type AE	W5%Rh-W26%	-10...2300°C	Type N	NiCrSi-NiSi	-270...1300°C
	Type B	PtRh30%-PtRh6%	0...1800°C	Type R	Pt13%Rh-Pt	-50...1750°C
	Type E	NiCr-CuNi	-200...1000°C	Type S	Pt10Rh-Pt	-50...1750°C
	Type J	Fe-CuNi	-200...1000°C	Type T	Cu-CuNi	-200... 400°C
	Type K	NiCr-Ni	-200...1350°C	Type U	Cu-CuNi	-200... 600°C
	Type L	Fe-CuNi	-200... 900°C			
Adjustment	Minimum input range			
Zero-point	any value within the range limits			
Minimum input range	Thermocouples 2 mV; Pt 100 10°C			
Supply, reverse polarity protected	8...36 V_{DC} (electrically isolated)			
Output	4...20 mA			
Linearity	Temperature linear			
Sensor failure monitoring, selectable	Minimum/Maximum			
Minimum output signal	(measurement/fault) 3.8 mA / 3.5 mA			
Maximum output signal	(measurement/fault) 20.5 mA / 21.6 mA			
Maximum load	700 Ω at 24 V_{DC}, 22 mA			
Long-term stability	±0.2 % of measuring span/year			
Operating temperature	-40...+85°C			
Storage temperature	-40...+85°C			
Connection (wire or stranded cable)	≤ 1.5 mm²			
Protection, housing/terminals	IP 50 / IP 10			

Wiring diagrams

Resistance Thermometer
Thermo Couple

PC-Interface

R_L (Load)

Power Supply
8...36 VDC

Pt100, 3 - Wire

Thermo Couple

R_L in Ohm

Maximum Load

Power Supply U (V DC)

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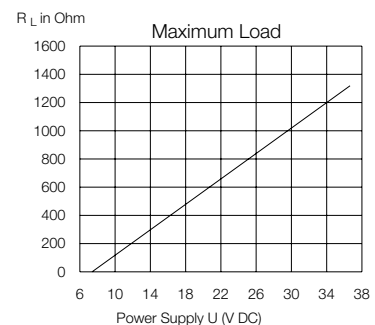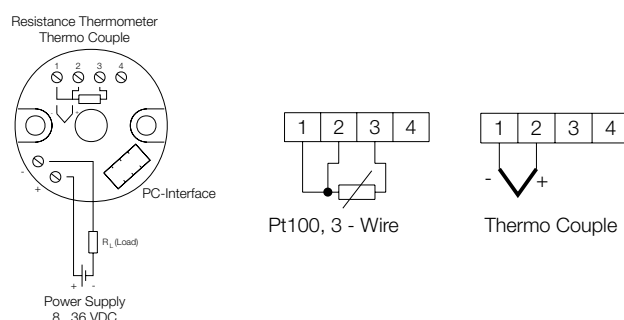
Universal Indicating Unit
in Field Housing

for all Inputs (Frequency, Current, Voltage)

- Analogue and digital display
- User scaling
- 2 limit values
- Min/max memory
- Protection IP 65
- Simple button programming
- Sensor supply

Temperature Transmitters for DIN-Rail and Surface Mounting

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T2

- Accurate measurements
- Voltage linear or temperature linear
- Easy to connect and install
- Sensor failure monitoring
- High load capacitance

7 - Test
5 + Out - 6

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V/mA
- +
1   2
3   4

Model:
TUM-S

147

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Description

Transmitters for rail and surface mounting convert the temperature-dependant change in voltage of thermocouples and the temperature-dependant change in resistance of resistance thermometers to a linear standard current signal.

The transmitter is a two-wire transmitter with 4 - 20 mA output. Transmission is absolutely noise-free even over long distances.

These transmitters are used where the use of transmitters for head mounting is not viable because of unsuitable field service conditions.

Dimensions in mm

Option: Factory setting. Please specify special data in writing.
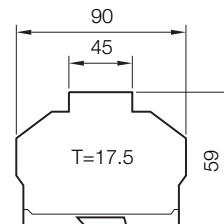
Standard version

Settings are made with internal solder pads and potentiometers situated on the front panel.

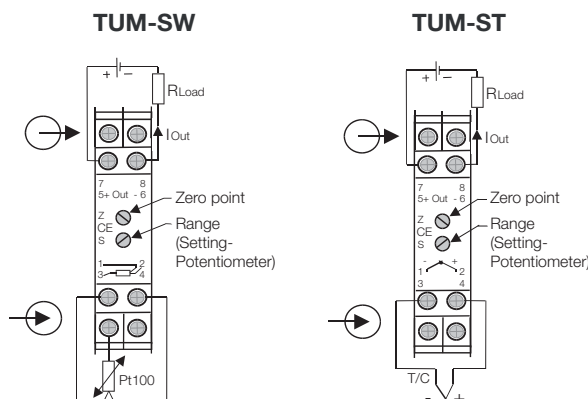| Model	Input	Output
TUM-SW	Pt 100	Temperature linear
TUM-ST	Thermocouples J, L, T, K or N	Voltage linear

Technical Details

Model	TUM-SW	TUM-ST
Input	Pt 100 (α= 0.00385) 3-wire connection	Thermocouples J, L, T, K or N
Settings	-50...+550 °C	Measuring ranges: -5...+55 mV
Zero-point	-50...+50 °C	±10 % of measuring span
Measuring span, selectable	50...500 °C	10...50 mV
Measuring span, fine adjustment	±10 %	±10 %
Supply, reverse polarity protected	6.5...32 V_{DC} (not electrically isolated)	6.5...32 V_{DC} (not electrically isolated)
Output	4...20 mA	4...20 mA
Linearity	Temperature linear	Voltage linear
Sensor failure monitoring, selectable	Max. approx. 25 mA, Min. approx. 3 mA	Max. approx. 25 mA, Min. approx. 3 mA
Current limiting	approx. 25 mA	approx. 25 mA
Maximum load	700 Ω at 24 V_{DC}, 25 mA	700 Ω at 24 V_{DC}, 25 mA
Long-term stability	±0.1 % of measuring span/ year	±0.1 % of measuring span/ year
Operating temperature	-20...+70 °C	-20...+70 °C
Storage temperature	-20...+70 °C	-20...+70 °C
Connection (wire or stranded cable)	≤ 2.5 mm²	≤ 2.5 mm²
Protection, housing/terminals	IP 20 / IP 20	IP 20 / IP 20

Wiring diagrams   **TUM-SW**   **TUM-ST**   **Load diagram**
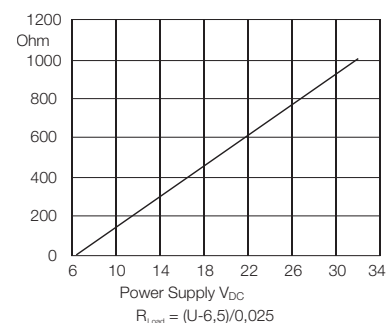
$R_{Load} = (U-6,5)/0,025$

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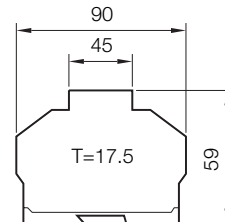## Programmable version

for industrial applications.

A device for resistance thermometers and thermocouples, thus reduced inventory costs.

Configuration in seconds with a Windows-based user-friendly software.

Model	Input	Output
TUM-SP	Pt 100 Thermocouples	Temperature linear

Accessories

TUM-SP01	Software with cable

Dimensions in mm

Option: Factory setting. Please specify special data in writing.

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Technical Details

Model	TUM-SP				
Input	Pt 100, IEC751, $\alpha = 0.00385$, 3+4-wire connection, -200...+1000°C				
	D100. (Pt 100 acc. to JIS1604, $\alpha = 0.003916$), 3+4-wire connect., -200...+1000°C, Thermocouple				
	Type AE	W5%Rh-W26%	-10...2300°C	Type N	NiCrSi-NiSi	-270...1300°C
	Type B	PtRh30%-PtRh6%	0...1800°C	Type R	Pt13%Rh-Pt	-50...1750°C
	Type E	NiCr-CuNi	-200...1000°C	Type S	Pt10Rh-Pt	-50...1750°C
	Type J	Fe-CuNi	-200...1000°C	Type T	Cu-CuNi	-200...400°C
	Type K	NiCr-Ni	-200...1350°C	Type U	Cu-CuNi	-200...600°C
	Type L	Fe-CuNi	-200...900°C			
Adjustment	Minimum input range				
Zero-point	any value within the range limits				
Minimum input range	Thermocouples 2 mV; Pt 100 10°C				
Supply, reverse polarity protected	7.5...36 V_{DC} (electrically isolated)				
Output	4...20 mA				
Linearity	Temperature linear				
Sensor failure monitoring, selectable	Minimum/Maximum				
Minimum output signal	(measurement/fault) 3.8 mA / 3.5 mA				
Maximum output signall	(measurement/fault) 20.5 mA / 21.6 mA				
Maximum load	750 Ω at 24 V_{DC}, 22 mA				
Long-term stability	±0.1 % of measuring span/ year				
Operating temperature	-20...+70°C				
Storage temperature	-20...+70°C				
Connection (wire or stranded cable)	≤ 1.5 mm²				
Protection, housing/terminals	IP 20 / IP 20				

Wiring diagrams

No responsibility taken for errors;
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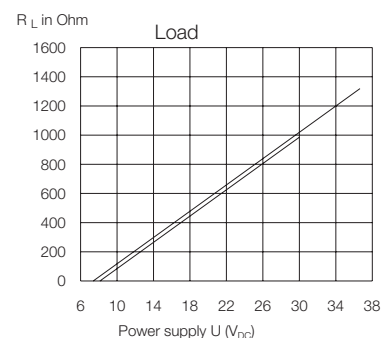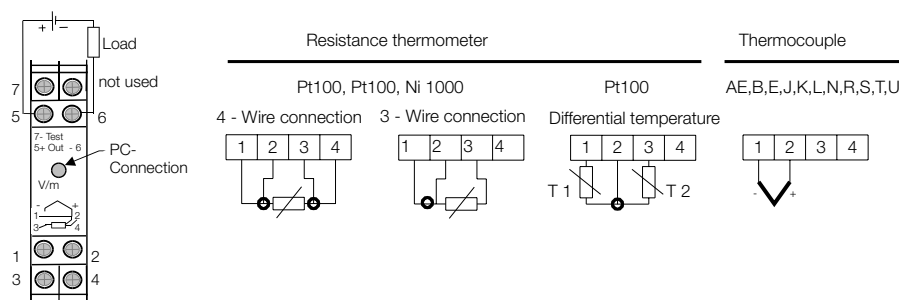
Resistance Temperature Sensor
with Neck Well

Special temperature measurement for food applications

- Measuring range: -50 ... +250 °C
- optional with neck well for high temperatures
- Sensor Pt 100, accuracy class A
- p_{max} 10 bar, t_{max} 250 °C
- hygienic (acc. to EHEDG)
- variable mounting with different sleeves
- Sensor completely assembled from st. steel
- Optional with head mounted transmitter
- CIP/SIP-compliant

For more informations please refer
to our brochure "Food L1"

Processor-Based Digital Indicating Units

with Limit Switches and Analogue Output

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T2

Model DAG-1...
48 x 24 mm

gal/min.

Model DAG-2...
72 x 36 mm

°F

Model DAG-3...
96 x 24 mm

l/min

Model DAG-4...
96 x 48 mm

°C

- Programmable
- 96x48; 96x24; 72x36; 48x24 mm
- Input: temperature, current, voltage, frequency
- Analogue output, contacts, min./max. memory

°C

Model:
DAG...

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Description

Price competitive and reliable digital indicating units for measurement of temperature, current and voltage. As option the units can be supplied with analogue output and an additional sensor supply. The units can be delivered with a factory calibration. In case of models with current or voltage input the decimal point and digits before the decimal point can be determined with help of jumpers. The display can be adapted with help of a potentiometer whereas the dimension with replaceable labels.

● **Sensor Supply (optional)**

In order to supply the connected transmitter with current or voltage output, the units may be delivered with an additional sensor supply. Please note that digital displays must be supplied with at least 20 V_{DC} (galvanic separated version) or 26 V_{DC} (not galvanic separated version).

● **Galvanic separated version (optional)**

The voltage supply is galvanic separated from measured input and analogue output. The measured inputs are not galvanic separated from the analogue output. Because by all measurement methods errors may occur because of earth currents, only units with galvanic separation should be used when possible.

● **Pluggable Terminals (optional)**

To facilitate the installation and dismantling of the units, pluggable connection terminals may be supplied as an option. Pluggable terminals should not be used on units with a temperature measurement input because of increased contact resistance.

Technical Details

Display:	7-segment red LED, 14 mm high 3 ½-segment (1999 digit) or 4 ½-segment (19999 digit)
Accuracy:	Pt100 (-50..+199.9 °C) ±0.2 °C, ±0.5 °C resolution: 0.1 °C Pt100 (-100..+600 °C) ±1 °C thermocouples: ±1 % of m. value ±1 digit resolution: 1 °C, current, voltage: ±0.1 % of measured value ±1 digit
Measuring rate:	1 measurement per second
Power input:	approx. 5 VA (input current, voltage) approx. 2 VA (PT 100) approx. 4 VA (thermocouples)
Max. temperature:	0 to +60 °C operating, -20 to +80 °C storage
Case material:	PC/ABS-BLEND, colour black
Mounting:	latching snap-on fixing
Protection type:	standard: front IP 40, terminal IP 00 option: front IP 65, terminal IP 00
Dimensions:	96 x 48 x 135 mm (W x H x D) 96 x 48 x 148 with pluggable option
Cut-out dimensions:	92 x 45 mm
Weight:	approx. 0.35 kg

Order Details (Example: **DAG-D1 0 0 0 000**)

Display 14 mm	Input	Model	Supply	Output	Sensor supply for current/voltage input only	Options Pluggable terminal not for temperature input
3½-digit	Pt100/2-wire (-50...+199.9°C) Pt100/2-wire (-100...+600°C) Pt100/2+3-wire (-50...+199.9°C) Pt100/2+3-wire (-100...+600°C) NiCr-Ni (-100...+800°C) Fe-CuNi (USA) -50...+500°C) Fe-CuNi (DIN) -50...+500°C) 0(4)-20 mA, 0-200 mA and 0-10, 50, 200, 600 V_{DC}	DAG-D1 DAG-D2 DAG-D3 DAG-D4 DAG-DK DAG-DJ DAG-DL DAG-DV	**0**= 115/230 V_{AC} **1** = 18-30 V_{DC} **2**= 18-30 V_{DC} electrically isolated	**0** = without **1** = 0-20 mA **4** = 4-20 mA **6** = 0-10 V_{DC}	**0** = without **V** = 10 V_{DC} / 20 mA **W** = 24 V_{DC} / 50 mA	**000**= standard **S00**= IP 65, Poti back **K00**= terminal pluggable **L00**= IP 65/ terminal pluggable
4½-digit	0(4)-20 mA, 0-200 mA and 0-10, 50, 200, 600 V_{DC}	DAG-HV		**0** = without		

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Description

Processor-based digital indicating units for measuring frequency, temperature, current and voltage. The measured input is calibrated at the factory. The scale of the unit may be altered with replaceable labels.

The following parameters may be set by the customer from a tactile keypad:

● Desired indicated value and offset
● Position of point, display time, measurement frequency
● Full scale value and offset of analogue output
● Switch point, hysteresis, closed-circuit current/load current

The units may be provided with the following:

● Two changeover contacts
● Min./max. memory (not for frequency)
● Output: 0-20 mA, 4-20 mA, 0-10 V (optional)
● Sensor supply (optional for current input, voltage input, or frequency input)

● **Sensor Supply (optional)**

In order to supply the connected transmitter with current or voltage output, the units may be delivered with an additional sensor supply. Please note that digital displays must be supplied with at least 20 V_{DC}.

● **Pluggable Terminals (optional)**

To facilitate the installation and dismantling of the units, pluggable connection terminals may be supplied as an option. Pluggable terminals should not be used on units with a temperature measurement input because of increased contact resistance.

Technical Details

Display:	7-segment red LED, 14 mm high
Accuracy:	Pt 100 (-100...+600 °C)
	±0.2 °C, ± 1 digit, resolution: 0.1 °C
	thermocouples: ± 1 °C, ± 1 digit
	resolution: 1 °C,
	frequency: ± 0.04 % of display, ± 1 digit
	resolution: 0 to 9999
	current, voltage: ± 0.2 % of measured
	value, ± 1 digit
Display time:	0.2-10 seconds, adjustable
Power input:	5 VA (max.)
Max. temperature:	0 to +60 °C operating,
	-20 to +80 °C storage
Case material:	ABS, colour black
Mounting:	latching snap-on fixing
Protection type:	standard: front IP 40, terminal IP 00
	option: front IP 65, terminal IP 00
Output/load:	0(4)-20 mA / 500 Ω
Relay:	2 changeover contacts
	max. 230 V_{AC}/2A-120 V_{DC}/0.5 A
Dimensions:	96 x 48 x 131 mm (W x H x D)
	96 x 48 x 148 with pluggable option
Cut-out dimensions:	92 x 45 mm
Weight:	approx. 0.45 kg

Order Details (Example **DAG-42 2 0 0 0 2M**)

Display 14 mm	Input	Model	Supply	Output	Sensor supply for current/voltage input only	Options Pluggable terminal, not for temperature input	Contacts/ memory
4-digit	Pt 100/2-wire (-100.0...+600.0 °C) Pt 100/2+3-wire (-100.0...+600.0 °C) Pt 100/4-wire (-100.0...+600.0 °C) NiCr-Ni (-250...+1350 °C) Fe-CuNi (USA) -200...+1200 °C Fe-CuNi (DIN) -100...+900 °C 0(4)-20 mA, 0-10 V_{DC}	DAG-42.. DAG-44.. DAG-45.. DAG-4K.. DAG-4J.. DAG-4L.. DAG-4V..	**2**= 20-30 V_{DC} electrically isolated **4**= 115 V_{AC} **0**= 230 V_{AC}	**0**=without **1**=0-20 mA **4**=4-20 mA **6**=0-10 V_{DC}	**0**= without **V**= 10 V_{DC}/ 20 mA **W**=24 V_{DC}/ 50 mA	**0**= standard **S**= IP 65, **K**= IP 40/ terminal pluggable **L**= IP 65/ terminal pluggable	**2M**=2 changeover contacts incl. min/max.-memory
4-digit	1 Hz...500 kHz	DAG-4F..	**2**= 20-30 V_{DC} electrically isolated **4**= 115 V_{AC} **0**= 230 V_{AC}	**0**=without **1**=0-20 mA **4**=4-20 mA **6**=0-10 V_{DC}	**V**= 10 V_{DC}/ 20 mA **W**=24 V_{DC}/ 50 mA	**0**= standard **S**= IP 65 **K**= IP 40/ terminal pluggable **L**= IP 65/ terminal pluggable	**20**= 2 changeover contacts

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Processor-Based Digital Indicating Units 96 x 24 mm Model DAG-3...

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Description

Processor-based digital indicating units for measuring frequency, temperature, current and voltage. The measured input is calibrated at the factory. The scale of the unit may be altered with replaceable labels.

The following parameters may be set by the customer from a tactile keypad:

- Desired indicated value and offset
- Position of point, display time, measurement frequency
- Full scale value and offset of analogue output
- Switch point, hysteresis, closed-circuit current/load current

The units may be provided with the following:

- Two changeover contacts
- Min./max. memory (not for frequency)
- Output: 0-20 mA, 4-20 mA, 0-10 V (optional)
- Sensor supply (optional for current input, voltage input, or frequency input)
- **Sensor Supply (optional)**

  In order to supply the connected transmitter with current or voltage output, the units may be delivered with an additional sensor supply. Please note that digital displays must be supplied with at least 20 V_{DC}.

- **Pluggable Terminals (optional)**

  To facilitate the installation and dismantling of the units, pluggable connection terminals may be supplied as an option. Pluggable terminals should not be used on units with a temperature measurement input because of increased contact resistance.

Technical Details

Display:	7-segment red LED, 14 mm high
Accuracy:	Pt100 (-100.0 to +600.0 °C) ± 0.2 °C, ± 1 digit, resolution: 0.1 °C thermocouples: 1 °C, frequency: ±0.04 % of display, ±1 digit resolution: 0 to 9999 current, voltage: ± 0.2 % of measured value, ± 1 digit
Display time:	0.2-10 seconds, adjustable
Power input:	5 VA (max.)
Max. temperature:	0 to +60 °C operating, -20 to +80 °C storage
Case material:	ABS, colour black
Mounting:	latching snap-on fixing
Protection:	standard: front IP 40, terminal IP 00 option: front IP 65, terminal IP 00
Output/load:	0(4)-20 mA / 500 Ω
Relay:	2 changeover contacts max. 230 V_{AC} / 2 A - 120 V_{DC} / 0.5 A
Dimensions:	96 x 24 x 131 mm (W x H x D) 96 x 24 x 148 with pluggable option
Cut-out dimensions:	92 x 22 mm
Weight:	approx. 0.29 kg

Order Details (Example: **DAG-32 0 0 0 0 2M**)

Display 14 mm	Input	Model	Supply	Output	Sensor supply for current/voltage input only	Options Pluggable terminal, not for temperature input	Contacts/ memory
4-digit	Pt100/2-wire (-100.0...+600.0 °C) Pt100/2+3-wire (-100.0...+600.0 °C) Pt100/4-wire (-100.0...+600.0 °C) NiCr-Ni (-250...+1350 °C) Fe-CuNi (USA) -200...+1200 °C) Fe-CuNi (DIN) -100...+900 °C) 0(4)-20 mA, 0-10 V_{DC}	**DAG-32..** **DAG-34..** **DAG-35..** **DAG-3K..** **DAG-3J..** **DAG-3L..** **DAG-3V..**	**2**= 20-30 V_{DC} electrically isolated **4**= 115 V_{AC} **0**= 230 V_{AC}	**0**=without **1**=0-20 mA **4**=4-20 mA **6**=0-10 V_{DC}	**0** = without **V**= 10 V_{DC}/ 20 mA **W**=24 V_{DC}/ 50 mA	**0**= standard **S**= IP 65, **K**= IP 40/ terminal pluggable **L**= IP 65/ terminal pluggable	**2M**=2 changeover contacts incl. min/max.-memory
4-digit	1 Hz...500 kHz	**DAG-3F..**	**2**= 20-30 V_{DC} electrically isolated **4**= 115 V_{AC} **0**= 230 V_{AC}	**0**=without **1**=0-20 mA **4**=4-20 mA **6**=0-10 V_{DC}	**V**= 10 V_{DC}/ 20 mA **W**=24 V_{DC}/ 50 mA	**0**= standard **S**= IP 65 **K**= IP 40/ terminal pluggable **L**= IP 65/ terminal pluggable	**20**= 2 changeover contacts

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T2

Description

Processor-based digital indicating units for measuring frequency, temperature, current and voltage. The measured input is calibrated at the factory. The scale of the unit may be altered with replaceable labels.

The following parameters may be set by the customer from a tactile keypad:

● Desired indicated value and offset

● Position of point, display time, measurement frequency

● Full scale value and offset of analogue output

● Switch point, hysteresis, steady state current/load current

The units may be provided with the following:

● 1 open collector /1 changeover contact (for units without analogue output)

● Min./max. memory (not for frequency)

● Output: 0 - 20 mA, 4 - 20 mA, 0 - 10 V (optional)

● **Sensor Supply**
   Not available

● **Pluggable Terminals (optional)**
   To facilitate the installation and dismantling of the units, pluggable connection terminals may be supplied as an option. Pluggable terminals should not be used on units with a temperature measurement input because of increased contact resistance.

Technical Details

Display:	7-segment red LED, 14 mm high
Accuracy:	Pt 100 (-100.0 to +600.0 °C)
	± 0.2 % of measured value, ± 1 digit,
	resolution: 0.1 °C
	thermocouples: ± 1 °C, ± 1 digit
	resolution: 1 °C,
	frequency: ± 0.04 % of display
	resolution: 0 to 9999
	current, voltage: ± 0.2 % of measured
	value ± 1 digit
Display time:	0.2-10 seconds, adjustable
Power input:	3 VA (max.)
Max. temperature:	0 to +60 °C operating,
	- 20 to +80 °C storage
Case material:	PC/ABS-Blend, colour black
Mounting:	latching snap-on fixing
Protection:	standard: front IP 40, terminal IP 00
	option: front IP 65, terminal IP 00
Output /load:	0(4) - 20 mA / 500 Ω
Relay:	1 changeover contact
	max. 230 V_{AC} / 2 A - 120 V_{DC} / 0.5 A
Open collector:	U_B = 5 - 40 V_{DC} / I_{max} = 100 mA, PNP
	(supply by customer)
	(units without analogue output)
Dimensions:	72 x 36 x 97 mm (W x H x D)
	72 x 36 x 115 with pluggable option
Cut-out dimensions:	68 x 33 mm
Weight:	approx. 0.19 kg

Order Details (Example: **DAG-22 0 00 0 5M**)

Display 14 mm	Input	Model	Supply	Output	Options	Contacts / memory
4- digit	Pt100/2-wire (-100.0..+600.0 °C) Pt100/2+3-wire (-100.0..+600.0 °C) NiCr-Ni (-250...+1350 °C) Fe-CuNi (USA) -200...+1200 °C) Fe-CuNi (DIN) -100...+900 °C) 0(4)-20 mA, 0-10 V_{DC}	**DAG-22..** **DAG-24..** **DAG-2K..** **DAG-2J..** **DAG-2L..** **DAG-2V..**	**0**= 230 V_{AC} **2**= 20-30 V_{DC} electrically isolated **4**= 115 V_{AC}	**00** =without **10** =0-20 mA **40** =4-20 mA **60** =0-10 V_{DC}	**0**= standard **S**= IP 65 **K**= IP 40/ terminal pluggable **L**= IP 65/ terminal pluggable	**5M**=1 open collector/ 1 changeover cont. min/max.-memory incl. (units **without** analogue output) **1M**=1 changeover cont. min/max.-memory (units **with** analogue output)
4-digit	1 Hz...500 kHz	DAG-2F..	**0**= 230 V_{AC} **2**= 20-30 V_{DC} electrically isolated **4**= 115 V_{AC}	**00** =without **10** =0-20 mA **40** =4-20 mA **60** =0-10 V_{DC}	**0**= standard **S**= IP 65 **K**= IP 40/ terminal pluggable **L**= IP 65/ terminal pluggable	**50**= 1 open collector/ 1 changeover cont. (units **without** analogue output) **10**= 1 changeover cont. (units **with** analogue output)

T2

Description

Processor-based digital indicating units for measuring frequency, temperature, current and voltage. The measured input is calibrated at the factory. The scale of the unit may be altered with replaceable labels.

The following parameters may be set by the customer from a tactile keypad:

- Desired indicated value and offset
- Position of point, display time, measurement frequency
- Full scale value and offset of analogue output
- Switch point, hysteresis, closed-circuit current/load current

The units may be provided with the following:

- 2 open collectors
  (for units without analogue output)
- Min./max. memory (not for frequency)
- Output: 0-20 mA, 4-20 mA, 0-10 V (optional)

- **Sensor Supply**
  not available

- **Pluggable Terminals**
  To facilitate the installation and dismantling of the units, pluggable connection terminals are supplied. Pluggable terminals should not be used on units with a temperature measurement input because of in-creased contact resistance.

Technical Details

Display:	7-segment red LED, 10 mm high
Accuracy:	Pt 100 (-100.0 to +600.0 °C) $\pm 0.2\%$ of meas. value, ± 1 digit, Resolution: 0.1 °C Thermocouples: ± 1 °C, ± 1 digit Resolution: 1 °C, Frequency: $\pm 0.04\%$ of display Resolution: 0 to 9999 Current, voltage: $\pm 0.2\%$ of measured value, ± 1 digit
Display time:	0.2-10 seconds, adjustable
Power input:	5 VA (max.)
Max. temperature:	0...+60 °C operating, -20...+80 °C storage
Case material:	PC/ABS-Blend, colour black
Mounting:	Latching snap-on fixing
Protection:	Standard: front IP 40, terminal IP 00 Option: front IP 65, terminal IP 00
Output/load:	0(4)-20 mA / 500 Ω
Open collector:	$U_B = 5 - 40$ V_{DC} / $I_{max} = 100$ mA, PNP (supply by customer)
Dimensions:	48 x 24 x 90 mm (W x H x D) 48 x 24 x 101 with pluggable option
Cut-out dimensions:	45 x 22.2 mm
Weight:	approx. 75 g

Order Details (Example: **DAG-12 2 00 K 6M**)

Display 10 mm	Input	Model	Supply	Output	Options	Contacts / memory
4-digit	Pt100/2-wire (-100.0...+600.0 °C) NiCr-Ni (-250...+1350 °C) Fe-CuNi (USA) -200...+1200 °C) Fe-CuNi (DIN) -100...+900 °C) 0(4)-20 mA, 0-10 V_{DC}	**DAG-12..** **DAG-1K..** **DAG-1J..** **DAG-1L..** **DAG-1V..**	**2** = 20-30 V_{DC} electrically isolated	**00** = without **10** = 0-20 mA **40** = 4-20 mA **60** = 0-10 V_{DC}	**K** = IP 40/ terminal pluggable **L** = IP 65/ terminal pluggable	**6M** = 2 open collectors min/max.-memory incl. (units without analogue output) **0M** = without contacts min/max.-memory incl. (units with analogue output)
4-digit	1 Hz...500 kHz	**DAG-1F..**	**2** = 20-30 V_{DC} electrically isolated	**00** = without **10** = 0-20 mA **40** = 4-20 mA **60** = 0-10 V_{DC}	**K** = IP 40 / terminal pluggable **L** = IP 65/ terminal pluggable	**60** = 2 open collectors (units without analogue output) **00** = without contacts (units with analogue output)

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