

TEMPERATURE MEASUREMENT

TEMPERATURE MEASURING DEVICES

Temperature measurement is very important in many production, storage, shipping and drying processes. The law in many countries requires that, in addition to other parameters, the process and storage temperatures are carefully controlled and recorded in (for example) the food and pharmaceutical industries.

The new ThermoFlex5 transmitters from ROTRONIC meets these needs. Easy to use, simple to install and with a large measurement range, the devices can be used for almost every application. Depending on the model, the transmitters provide analogue or digital output signals. The digital models can be integrated in networks via TCP/IP, USB and RS485 interfaces.

The devices are based on the new AirChip3000 technology.



TF5X SERIES for interchangeable Pt100 probes

Applications

HVAC applications, building management systems, museums, libraries, warehouses, cold stores, etc.

Highlights and common features

- Probe interchangeable in just a few seconds
- Temperature measurement with Pt100 probes in 4-wire circuit
- Range of application -40...60 °C; -10...60 °C with LCD, 0...100 %rh
- Measurement range -100...600 °C, freely scalable
- Use as a simulator for system validation *
- UART service interface
- 4-pin Binder connector
- Can be mounted on a DIN rail (see accessories, page 102)
- Suitable probes: Pt100 probes AC1900...AC1916-AT (page 74)

* Requires HW4 software



TF52-W SERIES

- 2-wire 4...20 mA type
- Signal freely scalable *
- Version with display and keypad (optional)
- Alarm indicators

TF53-W SERIES

- 3/4-wire types with selectable output signal (mA, V)
- Signals freely selectable and scalable by user *
- Version with display and keypad (optional)
- Backlit display
- Alarm indicator
- Optional USB & RS485 interface

* Requires HW4 software

Dimensions as HF5 series

Order information (for accessories see pages 100-102)

Power supply and output signal type

TF520-					2-wire, <28 VDC, common V+, 4...20 mA (Only display without backlight possible)
TF531-					3/4-wire, 15...40 VDC / 12...28 VAC, 0...20 mA
TF532-					3/4-wire, 15...40 VDC / 12...28 VAC, 4...20 mA
TF533-					3/4-wire, 5...40 VDC / 5...28 VAC, 0...1 V
TF534-					3/4-wire, 15...40 VDC / 3...28 VAC, 0...5 V
TF535-					3/4-wire, 15...40 VDC / 12...28 VAC, 0...10 V

Instrument type

	W	T			Wall model
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Scaling of the output signals

		1	X		0...50 °C / 0...122 °F
		2	X		10...40 °C / 50...104 °F
		3	X		-40...60 °C / -40...140 °F
		4	X		-30...70 °C / -22...158 °F
		5	X		-40...85 °C / -40...185 °F
		6	X		0...100 °F (-17.7...37.7 °C)
		7	X		0...200 °F (-17.7...93.3 °C)
		8	X		0...300 °F (-17.7...148.8 °C)
		9	X		-50...200 °F (-45.5...93.3 °C)
		A	3		0...100 °C
		C	4		-50...150 °C

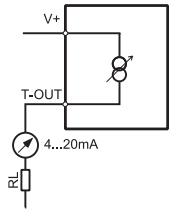
Optional display

			D	With keypad & LC display
			X	Without display

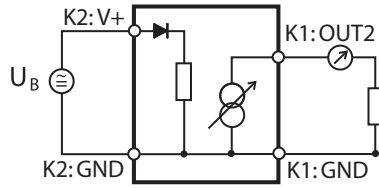
Electrical connections (analogue signals to terminals)

				1	1 M16 x 1.5 cable gland
				5	1 x 1/2" conduit adapter

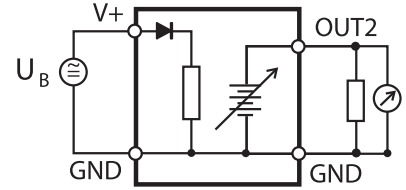
TEMPERATURE MEASUREMENT



Schematic 2-wire types



Schematic 3-wire current signal

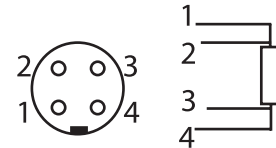


Schematic 3-wire voltage signal

The devices can be operated with the Pt100 probes on page 74.

Fundamentally, however, all Pt100 probes may be used. The drawing to the right shows the pin configuration:

Pt100 input (contact side of the flange socket / corresponds to the solder side of the connector)



4-wire Pt100

Detailed specifications		
Power supply / Connections	TF52	TF53
Supply voltage	10...28 VDC V min = 10 V + (0.02 x load*)	15...40 VDC / 12...28 VAC
Current consumption	20 mA, 4...20 mA current loop	
Electrical connections	Screw terminals and M16 cable gland or 1/2" conduit adapter	
Temperature measurement	TF52	TF53
Sensor	Pt100 1/3 Class B (order separately)	
Measurement range	-100...600 °C / -58...212 °F	
Accuracy at 23 °C	±0.2 K	
Repeatability	0.05 °C	
Long term stability	<0.1 °C/year	
Response time	Typically 4 s for 63 % of a change from 23 to 80 °C (1 m/sec air flow at sensor)	
Start-up time and refresh rate	TF52	TF53
Start-up time	Typically 3.4 s	Typically 1.9 s
Signal type	4...20 mA	0...20 mA, 4...20 mA 0...1 V, 0...5 V, 0...10 V
Scale limits	-999.99...+9999.99 units, user programmable	
*Maximum load	0/500 Ω	0/500 Ω (current signal), min. 1000 Ω (voltage signal)
Service interface	UART (universal asynchronous receiver transmitter) on mini USB interface	
Service cable maximum length	5 m (16.4 ft)	
General specifications		
Optional display	LCD, 1 or 2 decimals, without backlight	LCD, 1 or 2 decimals, with backlight and trend indicator
Housing material / Protection	ABS / IP 65	
Weight	Approx. 250 g	
CE/EMC compatibility	EMC Directive 2004/108/EC EN 61000-6-1: 2001, EN 61000-6-2: 2005, EN 61000-6-3: 2005, EN 61000-6-4: 2001 + A11	
Solder	Lead-free (RoHS-compliant)	
Fire resistance	Conforms to UL94-HB	
FDA/GAMP compatibility	Conforms to FDA 21 CFR Part 11 and GAMP 4	
Electronics operating range	-40...60 °C / -10...60 °C (models with display) 0...100 %rh, non-condensing	

THERMOPALM TP22

For HVAC technicians, the pharmaceutical industry, building management systems, the paper industry, research and many others.

Highlights and common features

- Probe interchangeable in just a few seconds
- Temperature measurement with Pt100 probes in 4-wire circuit
- Electronics operating range -40...60 °C; -10...60 °C with LCD, 0...100 %rh
- Measurement range -100...600 °C, freely scalable
- UART service interface
- 4-pin Binder connector
- Suitable probes: Pt100 probes AC1900...AC1916-AT



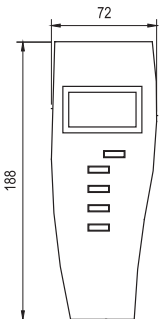
THERMOPALM

Order code TP22

Applications

HVAC applications, pharmaceutical industry, building management systems, paper industry, research, etc.

- For interchangeable Pt100 probes in 4-wire circuit
- Electronics operating range -10...60 °C
- Saves up to 2,000 data records (temperature, date, time)
- 9 V battery
- Accuracy: ± 0.1 K (depending on probe)

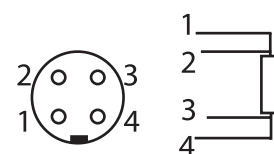


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Specifications	TP22
Main features	
Probe type	Pt100 probes in 4-wire circuit
Measurement range	-100...600 °C
Accuracy at 23 ± 5 °C	±0.1 K
Reproducibility	0.01K
Initialization time	<2 seconds
Range of application electronics	-10...60 °C
Display resolution	2 decimals
Display illumination	Yes
Alarm indicators	Yes
Battery power indicator	«Low Battery» indicator
Functions	
Trend indicator	Yes
Probe adjustment with software	1-point and multi-point with AC3006 service cable
Probe adjustment with keys	1-point
Data logging	2,000 readings
Event logging	Yes
User information	Via service cable & HW4 software
Device lock (password-protected)	Via service cable & HW4 software
Service information	Scheduled calibration
Audit trail / Electronic records	Conforms to FDA 21 CFR Part 11 and GAMP
Electrical specifications	
Power supply	9 V battery
Rechargeable battery charge	No
Current consumption	<10 mA
Communication interfaces	Via service cable
Service interface	UART (universal asynchronous receiver transmitter) on mini USB interface
Maximum length service cable	5 m
Mechanical specifications	
Housing material	ABS
Dimensions	274 x 72 x 35 mm
Weight	Approx. 300 g
Standards	EN 61000-6-4 & EN 61000-6-2
FDA / GAMP compatibility, audit trail	Conforms to FDA 21 CFR Part 11 and GAMP 4
IP protection	IP 40

The devices can be connected to the Pt100 probes on page 74. Fundamentally, however, all Pt100 probes may be used. The drawing to the right shows the pin configuration:

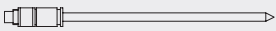
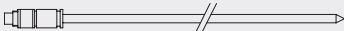
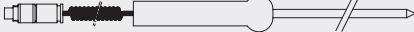
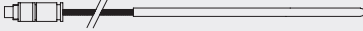

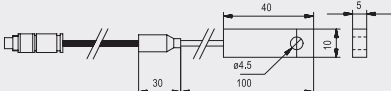
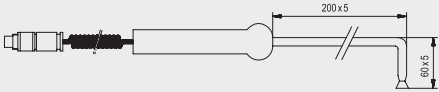
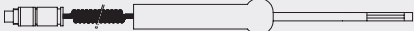
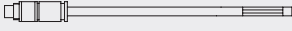
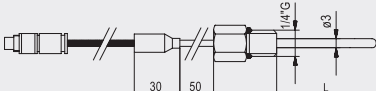
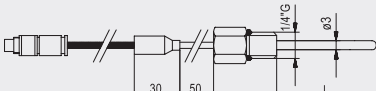
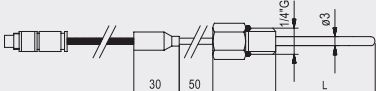


Pt100 input
(contact side of the flange socket / corresponds to the solder side of the connector)



4-wire Pt100

PT100 PROBES

All probes Pt100 Class A with 4-wire connection, except AC1913: Class B. Connection: 4-pin Binder connector plug series 712
 τ_{90} : Time to adjustment of 90% of a temperature jump, specified for air / water.

Specifications			
Order code			
AC1900	Rod probe 100 x 3 mm, DIN 1.4401 -70...500 °C, τ_{90} : 8 / 6 s		
AC1901	Rod probe 250 x 3 mm, DIN 1.4401 -70...500 °C, τ_{90} : 8 / 6 s		
AC1902	Insertion probe with handle, DIN 1.4401 -70...500 °C, τ_{90} : 8 / 6 s	1 m PUR cable max. 80 °C	
AC1903	Cable probe 200 x 6 mm, not waterproof DIN 1.4401, -70...500 °C, τ_{90} : 170 / 15 s	2 m thermoplastic cable, max. 110 °C	
AC1904	Cable probe 50 x 6 mm, waterproof DIN 1.4401, -50...500 °C, τ_{90} : 185 / 20 s	2 m thermoplastic cable, max. 110 °C	
AC1905	Surface probe 40 x 10 x 5 mm DIN 1.4301, -70...500 °C, τ_{90} : approx. 90 s no standard	2 m silicon cable max 180 °C	
AC1907	Surface probe with handle, offset DIN 1.4401, -70...500 °C, τ_{90} : approx. 90 s no standard. Do not calibrate in oil!	1 m PUR helix cable max. 80 °C	
AC1908	Handheld probe for measurements in air 250 x 4 mm, -50...120 °C, τ_{90} : 20 / --s	1 m PUR helix cable max. 80 °C	
AC1909	Rod probe for measurements in air 100 x 4 mm, DIN 1.4401, -50...120 °C, τ_{90} : 20 / -- s		
AC1910	30 mm screw-in probe 1/4" G DIN 1.4401, -70...500 °C, τ_{90} : 8 / 6 s	2 m silicon cable max. 180 °C	
AC1911	50 mm screw-in probe 1/4" G DIN 1.4401, -70...500 °C, τ_{90} : 8 / 6 s	2 m silicon cable max. 180 °C	
AC1912	100 mm screw-in probe 1/4" G DIN 1.4401, -70...500 °C, τ_{90} : 8 / 6 s	2 m silicon cable max. 180 °C	
AC1913	Silicon foil probe, 26 x 32 x 2.5 mm -50...200 °C, τ_{90} : approx. 7 s, no standard	1 m silicon cable max. 180 °C	
AC1916-A-T	Cable probe 60 x 6 mm, waterproof DIN 1.4571 (316Ti)-100...180 °C τ_{90} : 185 / 20	2 m PTFE cable max. 180 °C	

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Accessories		
Order code		
HC2-PT100-B4	Adapter for Pt100 probes for HP22 and HP23	
AC1960-50	Screw-in measuring sleeve for 3 mm probes Thread 1/4" G Immersion depth 50 mm	
AC1960-100	Screw-in measuring sleeve for 3 mm probes Thread 1/4" G Immersion depth 100 mm	
AC1607-2	Extension cable for Pt100 probes, 4-pin Binder male/female plugs	2 m
AC1607-3	Extension cable for Pt100 probes, 4-pin Binder male/female plugs	3 m
AC1607-5	Extension cable for Pt100 probes, 4-pin Binder male/female plugs	5 m

PT100 TEMPERATURE SENSORS

A Pt100 sensor changes its electrical resistance with every change in temperature. Its value is 100 Ohms at 0 °C. This characteristic is used in a bridge circuit to generate a signal suitable for further processing. Like any manufactured product, a Pt100 sensor is subject to variations. Today there are five accuracy classes by selection: Class B, Class A, 1/3, 1/5 and 1/10. They correspond to tolerances at 0 °C of ± 0.3 , ± 0.15 , ± 0.1 , ± 0.06 and ± 0.03 °C. The table below illustrates this.

Due to the cost of the selection process, a 1/10 Pt100 sensor is much more expensive than the 1/3 version usually used. The lower adjustment point is normally 0 °C and the tolerance range expands from there. If the adjustment point is then moved to the target temperature, the performance potential available is used and investments in the wrong place avoided. This procedure should not be used for portable Pt100 measuring devices. Another way of obtaining optimum results is to use the probes in a 3 or 4-wire system, thereby eliminating falsification by connection cable resistance. ROTRONIC only uses platinum Pt100 temperature sensors for temperature measurement. To ensure precision measurements, the temperature and humidity sensors should be matched to one another.

Temp. °C	Tolerance									
	Class A		Class B		1/3 Class B		1/5 Class B		1/10 Class B	
	$\pm K$	$\pm \Omega$	$\pm K$	$\pm \Omega$	$\pm K$	$\pm \Omega$	$\pm K$	$\pm \Omega$	$\pm K$	$\pm \Omega$
-200	0.55	0.24	1.3	0.56	0.44	0.19	0.26	0.11	0.13	0.06
-100	0.35	0.14	0.8	0.32	0.27	0.11	0.16	0.06	0.08	0.03
0	0.15	0.06	0.3	0.12	0.10	0.04	0.06	0.02	0.03	0.01
100	0.35	0.13	0.8	0.30	0.27	0.10	0.16	0.05	0.08	0.03
200	0.55	0.20	1.3	0.48	0.44	0.16	0.26	0.10	0.13	0.05
300	0.75	0.27	1.8	0.64	0.60	0.21	0.36	0.13	0.18	0.06
400	0.95	0.33	2.3	0.79	0.77	0.26	0.46	0.16	0.23	0.08
500	1.15	0.38	2.8	0.93	0.94	0.31	0.56	0.19	0.28	0.09
600	1.35	0.43	3.3	1.06	1.10	0.35	0.66	0.21	0.33	0.10
650	1.45	0.46	3.6	1.13	1.20	0.38	0.72	0.23	0.36	0.11