Delta OHM

HD 788TR1 - HD 786TR1
HD 988TR1 - HD 988TR2

CONFIGURABLE TEMPERATURE TRANSMITTERS 4÷20 mA FOR Pt100 SENSORS

Description

HD 788TR1, HD 786TR1, HD 988TR1 and HD 988TR2 are 4-20 mA transmitters with a microprocessor, configurable for Pt100 Platinum temperature sensors. They convert the temperature variations found with any standard Pt100 sensor (100Ω at 0°C) into a linear current signal with two leads in the field 4÷20 mA. Linearisation with a digital technique allows excellent precision and stability to be obtained. The user can set the 4÷20 mA output (or 20÷4 mA) in any temperature range within the field -200...+650°C, with a minimum amplitude of 25°C; it may be simply reprogrammed by pressing a key, without any need to regulate jumpers, potentiometers, software, etc. A led indicates any alarm situations (temperature outside the set range, broken or short-circuiting sensor) and assists the user in the programming phase. The transmitters are also protected against inversions of polarity. The HD 788TR1 is specifically designed for installing in type DIN B connecting heads, while the HD 988TR1 and HD 988TR2 are suitable for fitting in containers with a 35 mm DIN bar connection. As well as the 4÷20 mA output, the HD 988TR2 has a convenient 3½ digit display (height 10 mm) which allows the display of the measured temperature. Suitable for fitting on the wall.

Technical data (20°C and 24V DC)

INPUT	HD 788TR1 HD 786TR1 HD 988TR1	HD 988TR2
Sensor	Pt100 (100Ω)	
Connection	3 (or 2) leads	
Linearisation	EN 60751, IEC 751 BS 1904 (α=0,00385)	
Current in the sensor	<1 mA	
Measuring range	-200…+650°C	
Default range	0…100°C	
Minimum measuring amplitude	25°C	
Influence of the connecting leads	Negligible with coupled lead	
Conversion speed	2 measurements per second	
Accuracy	±0.1°C ±0.1% of the reading (-100…+500°C) ±0.2°C ±0.2% of the reading (-200…+650°C)	
Sensibility to variations of env. temp.	0,01°C/°C	
Working temperature	0…70°C	
Storage temperature	-40…+80°C	
OUTPUT		
Output	4…20 mA (or 20…4 mA) 22 mA in case of errors in programming or temperature out of range note 1 and Fig. 2	
Resolution	4 µA	Analogue output: 4 µA Display: 0.1°C up to 200°C 1°C over 200°C
Feeding voltage	7…30V DC (protection against inversions of polarity)	
Sensibility to variations of the feeding voltage Vcc	0,4 µA/V	
Load resistance	$R_{LMax} = \dfrac{Vcc-9}{0,022} \Rightarrow R_{LMax} = 680\ \Omega\ @\ Vcc = 24\ Vdc$	
Red led	Lights up during the programming phase and when the measured temperature is outside the set range	

Note 1) If the measured temperature T is outside the set range T1…T2 (T1<T2), HD 788TR1, HD 988TR1 and HD 988TR2 maintain 4 mA for T<T1 and 20 mA for T>T2 for a dead band of 10°C before going into error status at 22 mA.

Installation and connection

Fig. 1 shows the mechanical dimensions of the HD 788TR1, with the 5 mm diameter holes for fitting it in the DIN head and the central hole for the entry of the sensor leads.

Fig. 1 shows the mechanical dimensions of the HD 786TR1, HD 988TR1 and the HD 988TR2. Note the compact dimensions of the HD 988TR1 (only 17.5 mm wide) which allow a greater number of units to be installed in a smaller space. When installing the transmitters, it is recommended that the working temperature remain within the range 0…70°C. Fig. 6 shows the diagrams for connecting the HD 788TR1, HD 786TR1, HD 988TR1 and HD 988TR2 in the current loop. To obtain maximum precision, the connection to the Pt100 must be made with 3 leads,
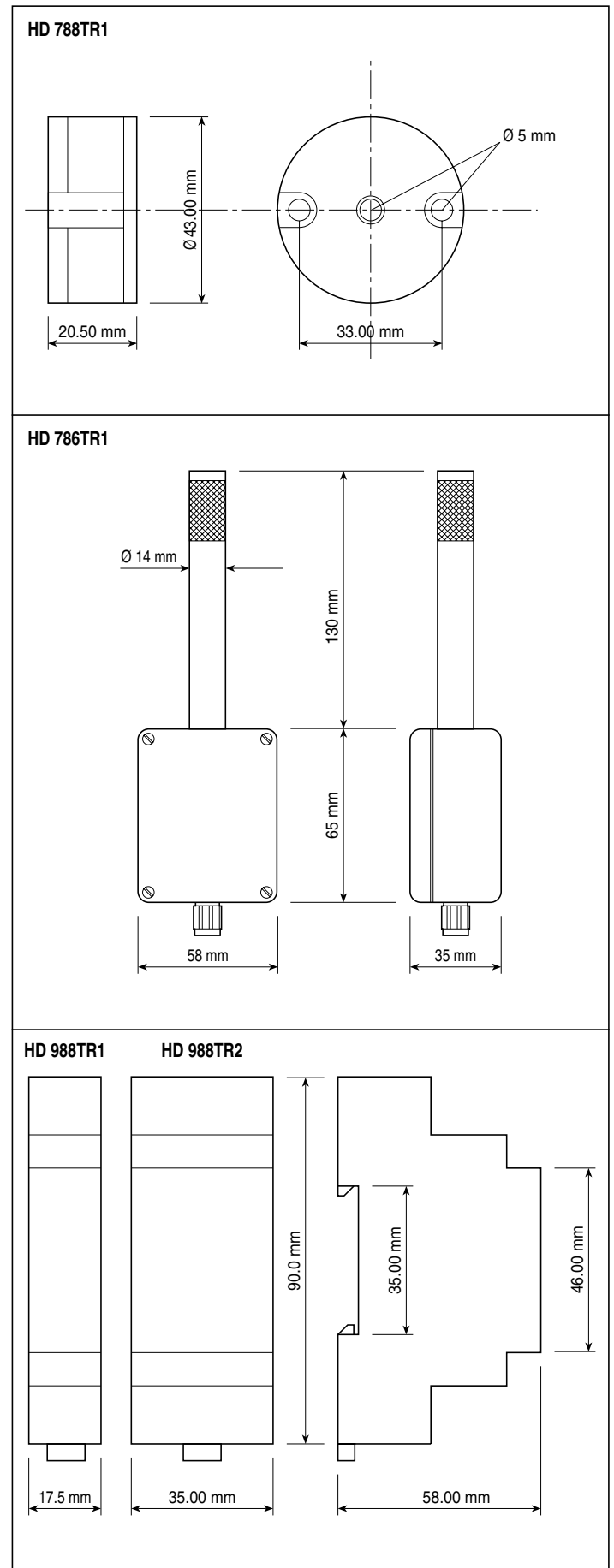

HD 788TR1

HD 786TR1

HD 988TR1   HD 988TR2

Fig. 1

using leads with the same diameter so as to guarantee the same impedance in each connection. The symbol RL (load) is used to represent any device inserted in the current loop, that is an indicator, a controller, a data logger or a recorder.

Programming

HD 788TR1, HD 786TR1, HD 988TR1 and HD 988TR2 are supplied by default with range 0…100°C, however the user may set a different range, making use of the following accessories:
- continuous power source 7-30V DC,
- Pt100 calibrators or set of precision resistances,
- precision ammeter with minimum range 0…25 mA,

and following the procedure:

1. Connect HD 788TR1, HD 786TR1, HD 988TR1 or HD 988TR2 as shown in Fig. 6 and set the Pt100 calibrator at the required temperature for 4 mA (for example, supposing the range to be set is -50...+200°C, you will set the calibrator at -50°C or alternatively connect an 80.31Ω resistance between terminals 1 and 3 while short-circuiting 1 and 2).

2. Wait 10 seconds until the measurement becomes settled, then keep pressed the programming key for at least 4 seconds, until the LED flashes once and remains lit. When the key is released the LED flashes.

3. Set the Pt100 calibrator at the required temperature for 20 mA (in the example above, set the calibrator at +200°C, or alternatively connect 175.86Ω resistance between terminals 1 and 3 while short-circuiting 1 and 2).

4. Wait 10 seconds until the measurement becomes settled, then press the programming key for at least 4 seconds, until the LED doesn't flash anymore. Now release the key and the LED flashes twice. At this point the SET POINT procedure is completed.

5. Check that the setting complies with the required specifications, setting the calibrator (or connecting the precision resistances) at the values corresponding to 4 and 20 mA and checking the currant on the ammeter.

The temperature range may be programmed using precision resistances with a fixed value which simulate the value of a Pt100 sensor. For example, the resistance values corresponding to some temperature values are listed below (see Tab. 1).

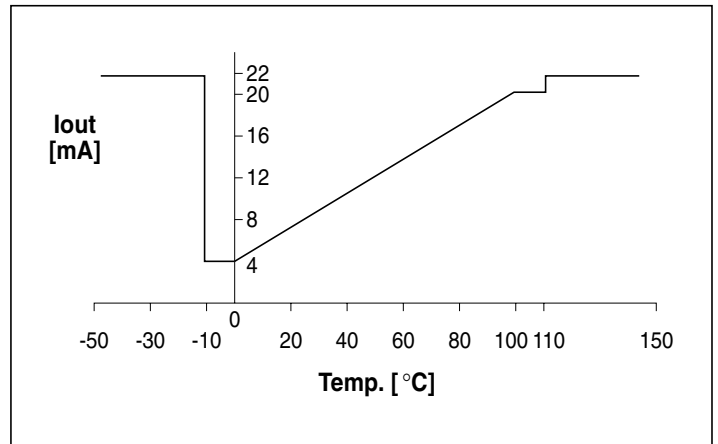| °C	Ω	°C	Ω	°C	Ω
-200	18.52	70	127.08	200	175.86
-100	60.26	80	130.90	220	183.19
-50	80.31	90	134.71	250	194.10
-30	88.22	100	138.51	280	204.90
-20	92.16	110	142.29	300	212.05
-10	96.09	120	146.07	350	229.72
0	100.00	130	149.83	400	247.09
10	103.90	140	153.58	450	264.18
20	107.79	150	157.33	500	280.98
30	111.67	160	161.05	550	297.49
40	115.54	170	164.77	600	313.71
50	119.40	180	168.48	650	329.64
60	123.24	190	172.17		

Tab. 1

Fig. 2 Range 0...100°C, output current with relation to temperature.
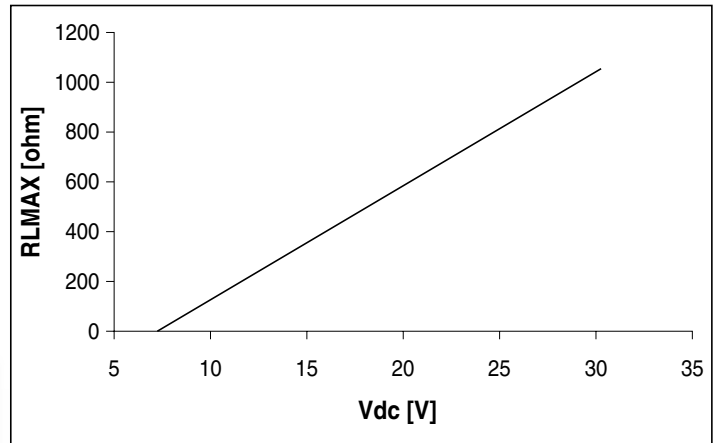

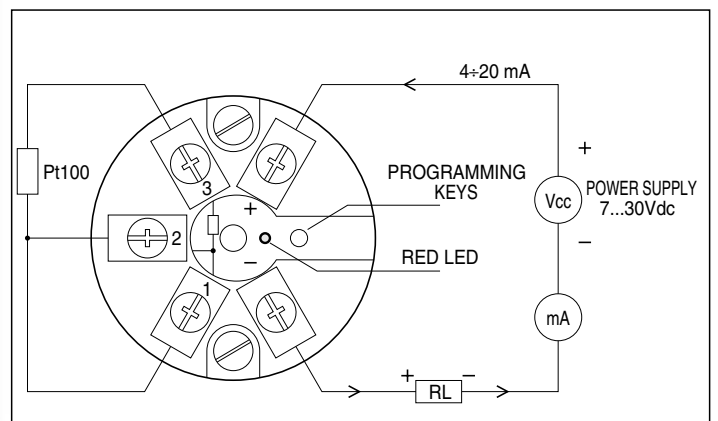**Fig. 3** Load with relation to the feeding voltage.

Fig. 4

**Fig. 6** Wiring diagram of the transmitters.

Order codes

HD 788TR1: 4÷20 mA/20÷4 mA temperature transmitter for Pt100 sensor with 2 or 3 leads configurable in the range -200...+650°C with minimum amplitude range 25°C, in a container for DIN B 43760 heads.

HD 786TR1: 4÷20 mA/20÷4 mA temperature transmitter for Pt100 sensor with 2 or 3 leads configurable in the range -200...+650°C with minimum amplitude range 25°C. Suitable for fitting on the wall.

HD 988TR1: 4÷20 mA/20÷4 mA temperature transmitter for Pt100 sensor with 2 or 3 leads configurable in the range -200...+650°C with minimum amplitude range 25°C, in a container for 35 mm DIN bar connection, dimension 1 module.

HD 988TR2: 4÷20 mA/20÷4 mA temperature transmitter for Pt100 sensor with 2 or 3 leads configurable in the range -200...+650°C with minimum amplitude range 25°C, in a container for 35 mm DIN bar connection, dimension 2 modules, with 3½ digit display, height 10 mm.

HD 9008.21.1: holder for vertical sensor, wall distance 250mm, hole Ø 26. Use with reduction HD9008.26.14.

HD 9008.21.2: holder for vertical sensor, wall distance 125mm, hole Ø 26. Use with reduction HD9008.26.14.

HD 9008.26/14: reduction for Ø 26 and Ø 14mm holes, for HD9008.21.1 and HD 9008.21.2.

Fig. 5

HD 9008.21.2 + HD 9008.26/14 support 125 mm.
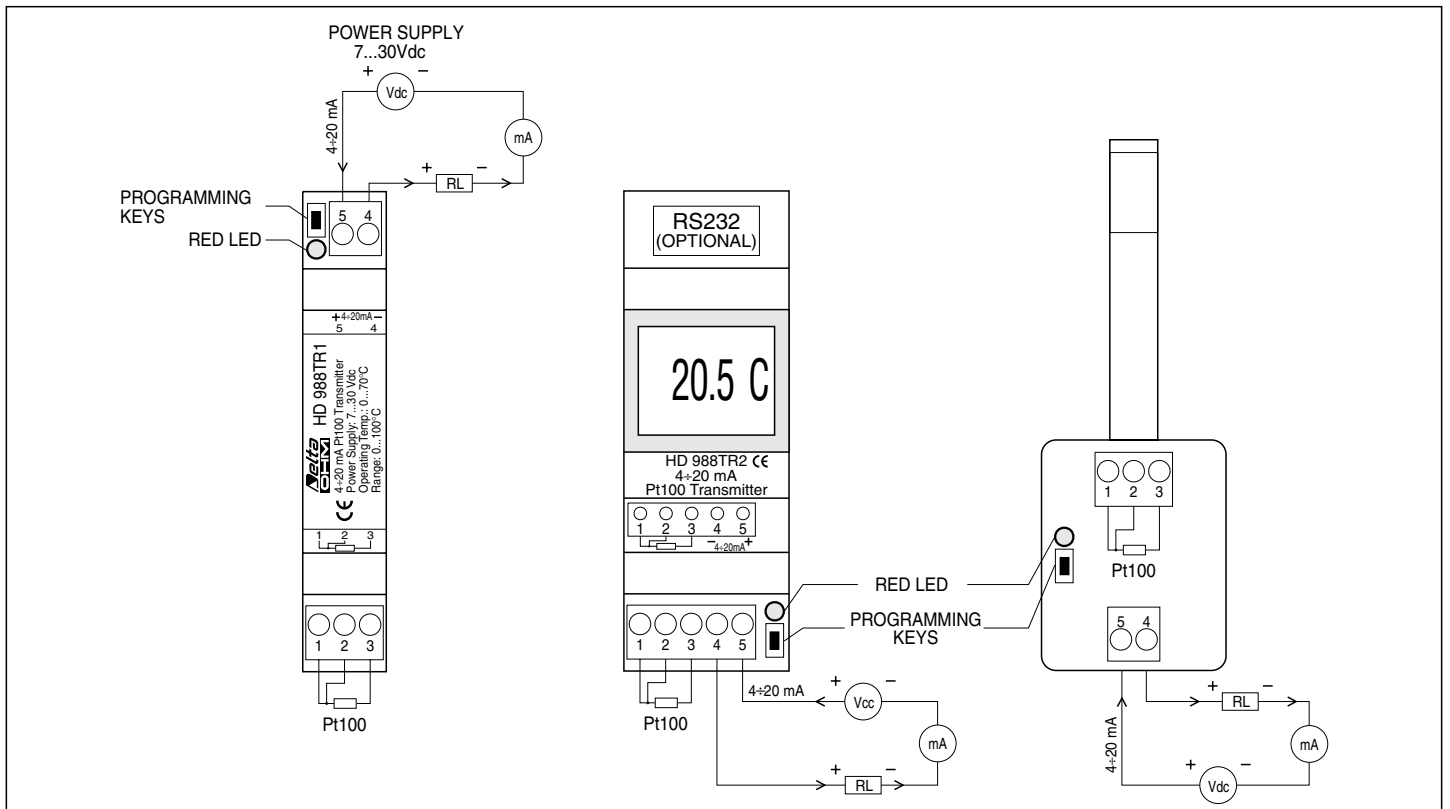
Note: a Pt100 sensor with 2 leads is connected between terminals 1 and 3 of the HD 988TR1 and HD 988TR2 while terminals 1 and 2 are short-circuited together.