



HD788TR1, HD788TR1-I, HD786TR1, HD988TR1, HD988TR1-I, HD988TR2 4÷20 mA CONFIGURABLE TEMPERATURE TRANSMITTERS FOR Pt100 SENSORS

HD 788TR1, HD 788TR1-I, HD 786TR1, HD 988TR1, HD 988TR1-I and HD 988TR2 are 4÷20 mA configurable transmitters with microprocessor for Pt100 Platinum temperature sensor. 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. Linearization with a digital technique allows excellent precision and stability to be obtained. 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 4÷20mA output of models HD788TR1-I and HD988TR1-I is galvanically isolated from the Pt100 input.** The transmitters are also protected against inversions of polarity. The HD 788TR1, HD 788TR1-I are specifically designed for installing in type DIN B connecting heads, while the HD 988TR1, HD988TR1-I 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 3 and 1/2 digit display (height 10 mm) which allows the display of the measured temperature. The HD786TR1 is indicated for wall installation.

Technical data (20°C and 24VDC)

INPUT	HD 788TR1 HD 788TR1-I HD 786TR1 HD 988TR1 HD 988TR1-I	HD 988TR2
Sensor	Pt100 (100Ω at 0°C)	
Connection	3 (or 2) wires	
Linearization	EN 60751, IEC 751 BS 1904 (α=0,00385)	
Current into 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. temperature	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 incorrect 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
Power supply voltage	7...30Vdc (protection against inversions of polarity)	
Sensibility to variations of the feeding voltage Vcc	0,4 µA/V	
Load resistance	$R_{LMax} = \frac{Vdc-7}{0,022} \Rightarrow R_{LMax} = 680 \Omega @ Vdc = 24 Vdc$	
Red led	It switches on while programming and when the measured temperature is out of the set range	
Input-Output isolation for models HD 788TR1-I and HD 988TR1-I	500 Vdc	-

Note 1) If the measured temperature T is out of the set range T1...T2 (T1<T2), HD 788TR1, HD 788TR1-I, HD 988TR1, HD 988TR1-I 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.

Fig. 2 reports the connection diagrams for the transmitters in the current loop. In order to obtain the maximum precision, the connection to the Pt100 should be performed with 3 wires and with wires having the same diameter so to grant the same impedance in each connection. The symbol RL (load) represents any device in the current loop that is to say an indicator, a controller, a data logger or a recorder.

°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

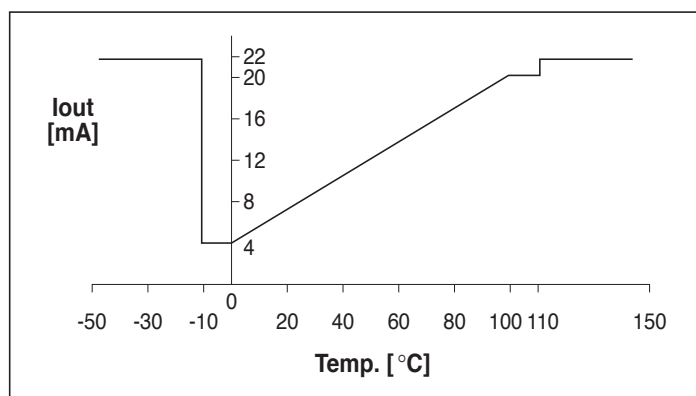


Fig. 1 Range 0...100°C, output current according to the temperature function.

Programming

All transmitters are supplied by default with a range $0 \dots 100^\circ\text{C}$, anyway user can set a different range by using the following accessories:

- continuous 7-30 Vdc power source,
- Pt100 calibrator or set of precision resistors,
- precision ammeter with minimum range $0 \dots 25 \text{ mA}$,

And by following this procedure:

1. Connect the transmitter to set-up as shown in Fig. 2 and set the Pt100 calibrator at the required temperature suitable for 4 mA (for example, assuming that you want to set the range $-50 \dots +200^\circ\text{C}$, you will set the calibrator to -50°C or equivalently you will connect a resistance of $80,31\Omega$ between terminals 1 and 3 while 1 and 2 shorted).
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 (according to the above example, set the calibrator at $+200^\circ\text{C}$, or alternatively connect $175,86\Omega$ resistance between terminals 1 and 3 with 1 and 2 shorted).
4. Wait 10 seconds until the measurement becomes settled, then press the programming key for at least 4 seconds, until the LED stops flashing. Now release the key and the LED flashes twice. At this point the SET POINT procedure is completed.
5. Verify 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 current on the ammeter.

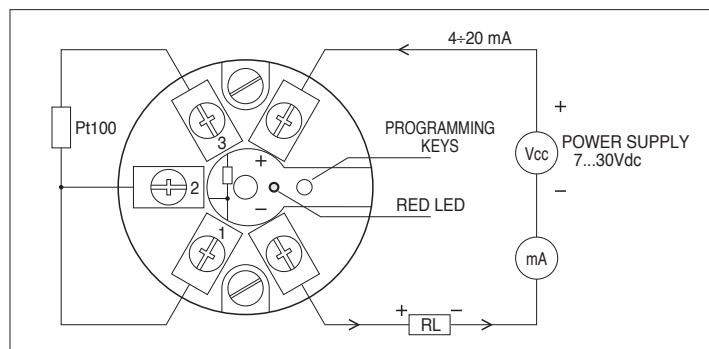


Fig. 2 Wiring diagram of the transmitters.

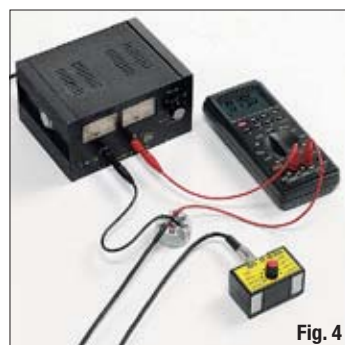


Fig. 4

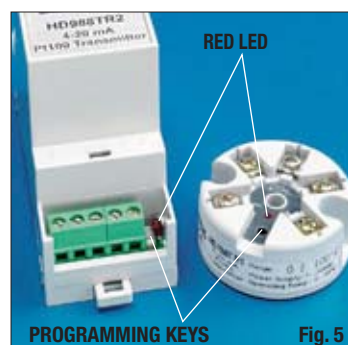


Fig. 5

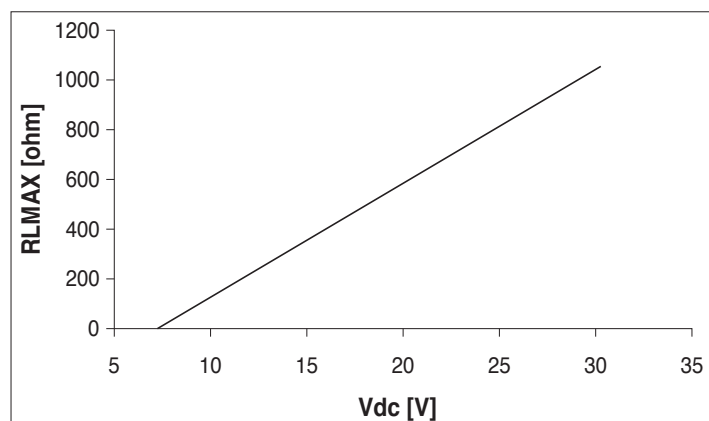


Fig. 3 Load with relation to the supply voltage.

The temperature range programming can be performed by using some precision resistances of fixed value that simulate a Pt100 sensor value.

For example, the resistance values corresponding to some temperature values are reported (see Tab. 1).

ORDERING CODES

HD 788TR1: $4 \div 20 \text{ mA}/20 \div 4 \text{ mA}$ temperature transmitter for 2 or 3 wires Pt100 sensor configurable in the range $-200 \dots +650^\circ\text{C}$ with minimum amplitude range 25°C , in a container for DIN B 43760 heads.

HD 788TR1-I: $4 \div 20 \text{ mA}/20 \div 4 \text{ mA}$ temperature **isolated** transmitter for 2 or 3 wires Pt100 sensor configurable in the range $-200 \dots +650^\circ\text{C}$ with minimum amplitude range 25°C , in a container for DIN B 43760 heads.

HD 786TR1: $4 \div 20 \text{ mA}/20 \div 4 \text{ mA}$ temperature transmitter for 3 wires Pt100 sensor configurable in the range $-200 \dots +650^\circ\text{C}$ with minimum amplitude range 25°C . Suitable for mounting on wall.

HD 988TR1: $4 \div 20 \text{ mA}/20 \div 4 \text{ mA}$ temperature transmitter for 2 or 3 wires Pt100 sensor configurable in the range $-200 \dots +650^\circ\text{C}$ with minimum amplitude range 25°C , in a container for 35 mm DIN bar connection, dimension 1 module.

HD 988TR1-I: $4 \div 20 \text{ mA}/20 \div 4 \text{ mA}$ temperature **isolated** transmitter for 2 or 3 wires Pt100 sensor configurable in the range $-200 \dots +650^\circ\text{C}$ with minimum amplitude range 25°C , in a container for 35 mm DIN bar connection, dimension 1 module.

HD 988TR2: $4 \div 20 \text{ mA}/20 \div 4 \text{ mA}$ temperature transmitter for 2 or 3 wires Pt100 sensor configurable in the range $-200 \dots +650^\circ\text{C}$ with minimum amplitude range 25°C , in a container for 35 mm DIN bar connection, dimension 2 modules, with $3\frac{1}{2}$ digit LCD, height 10 mm.

Industrial probes characteristics and dimensions on page TP-10.

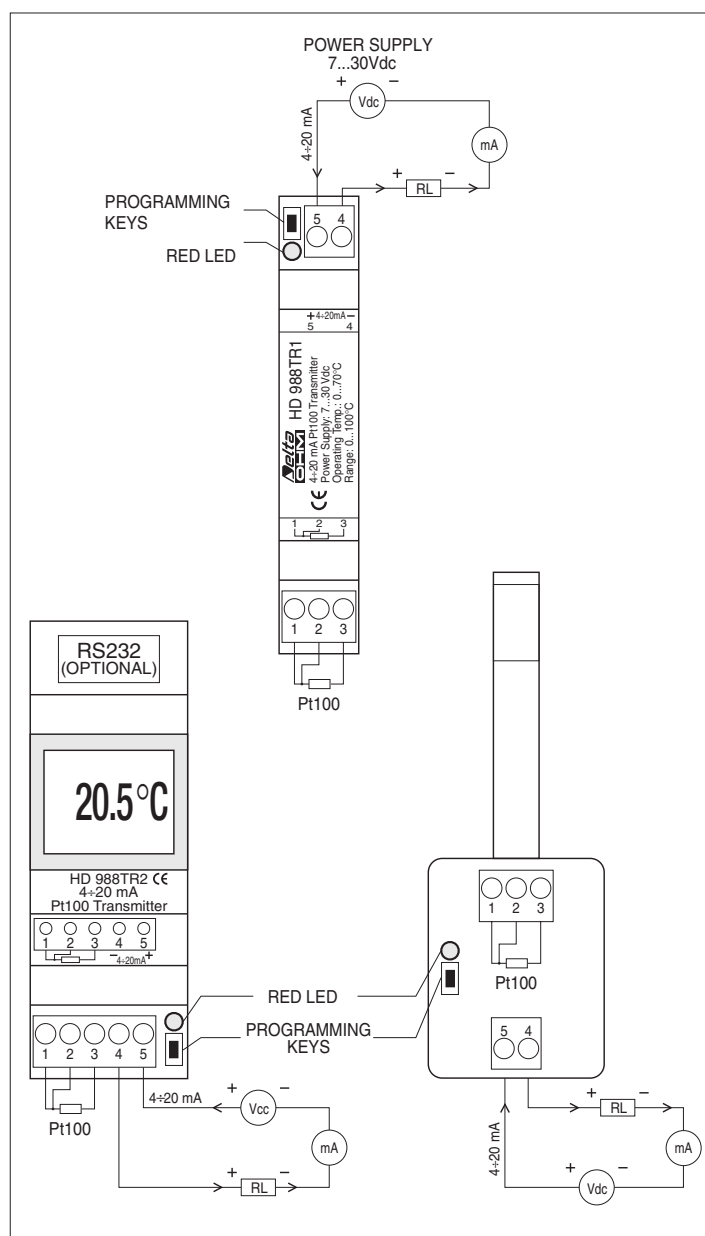


Fig. 6