

**HD788TR1, HD788TR1-I, HD786TR1, HD786TR2  
HD988TR1, HD988TR1-I, HD988TR2**



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**4÷20 CONFIGURABLE TEMPERATURE TRANSMITTERS FOR  
Pt100 mA SENSORS**

**HD788TR1, HD788TR1-I, HD786TR1, HD786TR2, HD988TR1, HD988TR1-I** and **HD988TR2** 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.

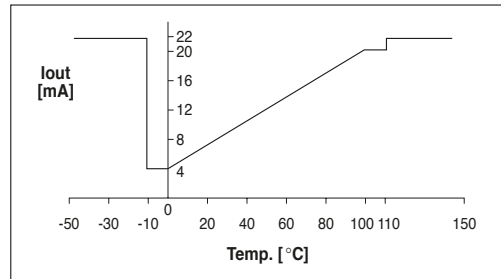
User can set the 4÷20 mA output (or 20÷4 mA) in any temperature range within the field -200...+650°C, with a minimum amplitude of 25°C; it may be simply reprogrammed by pressing a key, without any need to regulate jumpers, potentiometers, software, etc. A led indicates any alarm situations (temperature 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 HD788TR1, HD788TR1-I are specifically designed for installing in type DIN B connecting heads, while the HD988TR1, HD988TR1-I and HD988TR2 are suitable for fitting in containers with a 35 mm DIN rail connection. As well as the 4÷20 mA output, the HD988TR2 has a convenient 3 and 1/2 digit display (height 10 mm) which allows the display of the measured temperature. The HD786TR1 and HD786TR2 are indicated for wall installation.

Technical specifications (20°C and 24Vdc)		
	HD788TR1 HD788TR1-I HD786TR1 HD786TR2 HD988TR1 HD988TR1-I	HD988TR2
Input		
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 ±0.02% of the reading (-200...+650°C)	
Sensibility to variations of env. temperature	0.01°C/°C	
Electronics operating temperature	-20...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 ( <b>note 1</b> ).	
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	$R_{LMax} = \frac{Vdc-7}{0.022} \Rightarrow R_{LMax} = 770 \Omega @ Vdc = 24 Vdc$	
Red led	It switches on while programming and when the measured temperature is out of the set range	
Input-Output isolation for models HD788TR1-I and HD988TR1-I	500 Vdc	-

**Note 1** - If the measured temperature T is out of the set range T1...T2 (T1<T2), HD788TR1, HD788TR1-I, HD988TR1, HD988TR1-I and HD988TR2 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. 1** Range 0...100°C, output current according to the temperature function.



## Programming

All transmitters are supplied by default with a range 0...100°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...25 mA,

and by following this procedure:

1. Connect the transmitter as shown in Fig. 3 and set the Pt100 calibrator at the required temperature suitable for 4 mA (for example, assuming that you want to set the range -50...+200°C, you will set the calibrator to -50°C or equivalently you will connect a resistance of 80,31Ω 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°C, or alternatively connect 175.86Ω 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 setting 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.

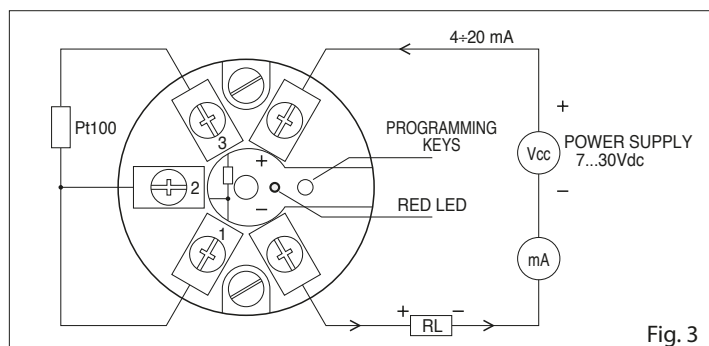


Fig. 3

Fig. 3 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.



Fig. 4



Fig. 5

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 table below).

°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		

## ORDERING CODES

**HD788TR1:** 4÷20 mA/20÷4 mA temperature transmitter for 2 or 3 wires Pt100 sensor configurable in the range -200...+650°C with minimum amplitude range 25°C, in a container **for DIN B 43760 heads**.

**HD788TR1-I:** 4÷20 mA/20÷4 mA temperature **isolated** transmitter for 2 or 3 wires Pt100 sensor configurable in the range -200...+650°C with minimum amplitude range 25°C, in a container **for DIN B 43760 heads**.

**HD786TR1:** 4÷20 mA/20÷4 mA temperature transmitter for 3 wires Pt100 sensor configurable in the range -200...+650°C with minimum amplitude range 25°C. Suitable **for wall mounting**, complete with **Pt100 014 L=90mm**.

**HD786TR2:** 4÷20 mA/20÷4 mA temperature transmitter for 3 wires Pt100 sensor configurable in the range -200...+650°C with minimum amplitude range 25°C. Suitable **for wall mounting**, complete with **Pt100 probe 03 L=55mm**.

**HD988TR1:** 4÷20 mA/20÷4 mA temperature transmitter for 2 or 3 wires Pt100 sensor configurable in the range -200...+650°C with minimum amplitude range 25°C, in a container **for 35 mm DIN rail connection, dimension 1 module**.

**HD988TR1-I:** 4÷20 mA/20÷4 mA temperature **isolated** transmitter for 2 or 3 wires Pt100 sensor configurable in the range -200...+650°C with minimum amplitude range 25°C, in a container **for 35 mm DIN rail connection, dimension 1 module**.

**HD988TR2:** 4÷20 mA/20÷4 mA temperature transmitter for 2 or 3 wires Pt100 sensor configurable in the range -200...+650°C with minimum amplitude range 25°C, in a container **for 35 mm DIN rail connection, dimension 2 modules, with 3½ digit LCD, height 10 mm**.

