

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



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**4...20 mA CONFIGURABLE TEMPERATURE TRANSMITTERS FOR
Pt100 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 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 @ 25°C and 24Vdc	
	All models
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 (note 1).
Resolution	Analog output 4 μA For HD988TR2 - Display: 0.1 °C up to 200 °C; 1 °C over 200°C
Power supply voltage	7...30 Vdc (protection against inversions of polarity)
Sensibility to variations of the feeding voltage Vdc	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	500 Vdc <i>Only for models HD788TR1-I and HD988TR1-I</i>

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.



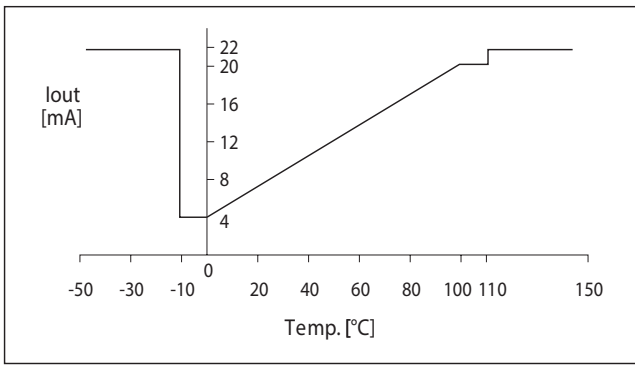


Fig. 1 Range 0...100 °C, output current according to the temperature function.

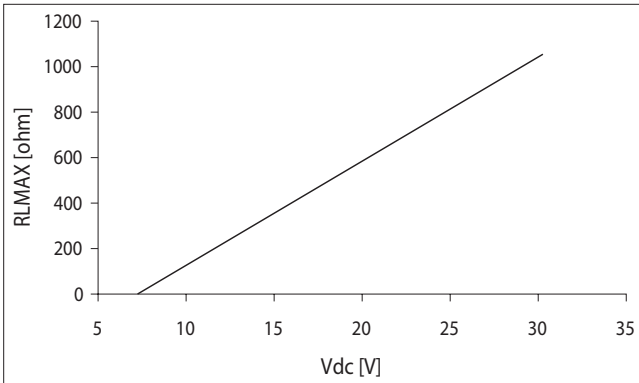


Fig. 2 Load with relation to the supply voltage.

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.

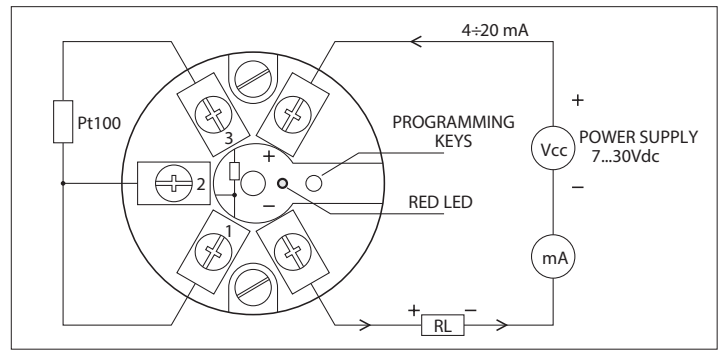


Fig. 3 reports the connection diagrams for the transmitters in the current loop. In order to obtain the maximum precision, the connection to the Pt100 should be performed with 3 wires and with wires having the same diameter so to grant the same impedance in each connection. The symbol RL (load) represents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

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		

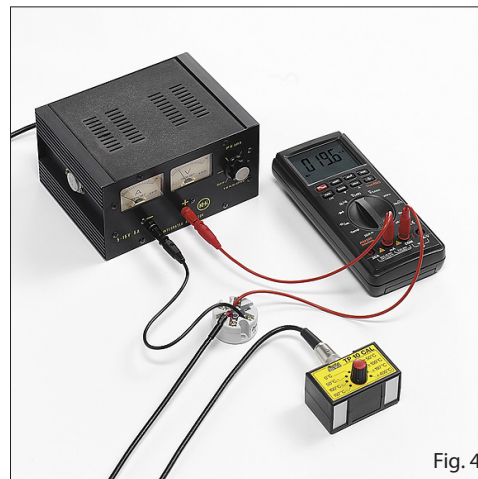


Fig. 4

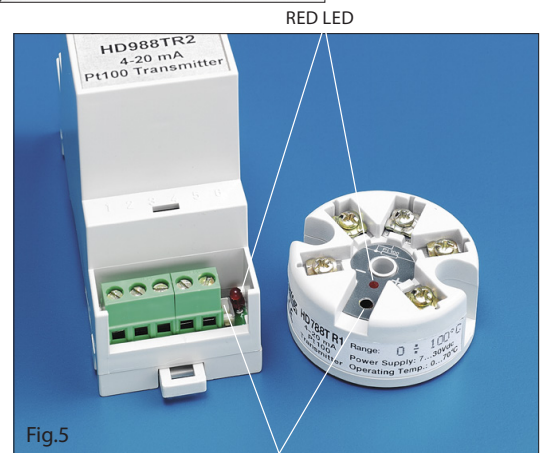
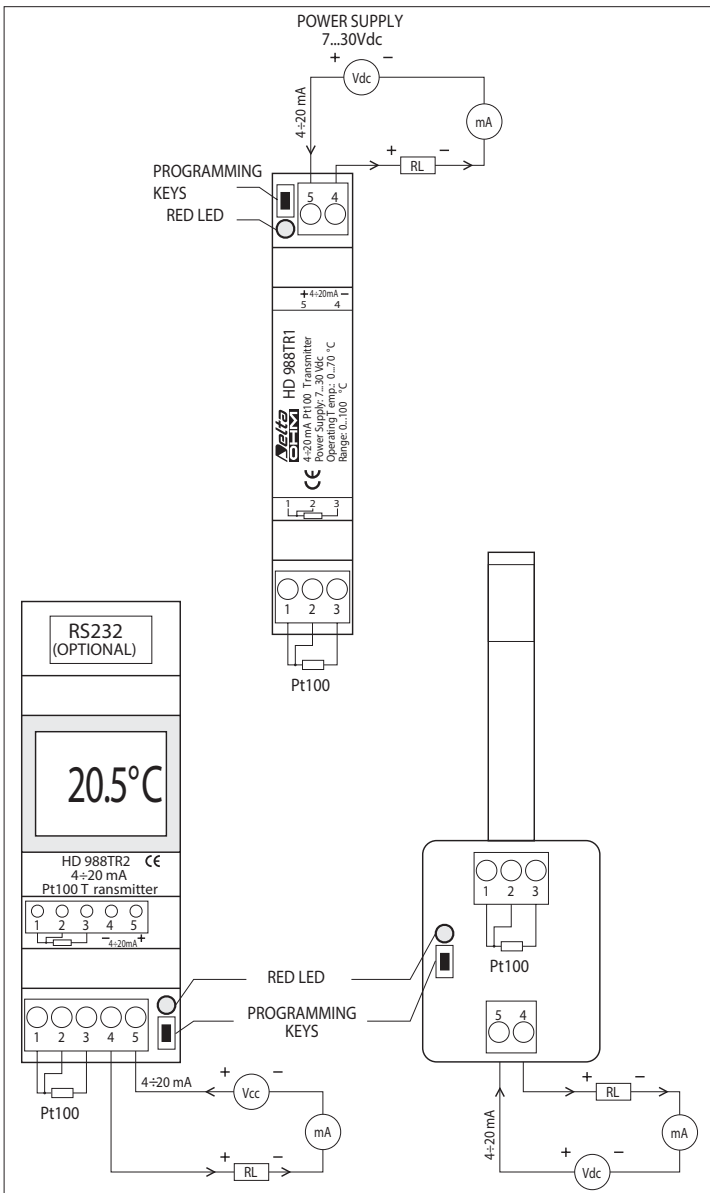


Fig.5

PROGRAMMING KEYS



ORDERING CODES

HD788TR1: Configurable temperature transmitter with 4...20 mA output. Measuring range $-200...+650\text{ }^{\circ}\text{C}$, minimum range $25\text{ }^{\circ}\text{C}$. Standard configuration $0...100\text{ }^{\circ}\text{C}$. 2 or 3 wires Pt100 sensor. Electronics operating temperature $-20...+70\text{ }^{\circ}\text{C}$. Assembled in a round container with dimensions and connections in accordance with DIN 43760, $\varnothing 43 \times h. 22.5\text{ mm}$.

HD788TR1-I: Configurable **opto insulated** temperature transmitter with 4...20 mA output. Measuring range $-200...+650\text{ }^{\circ}\text{C}$, minimum range $25\text{ }^{\circ}\text{C}$. Standard configuration $0...100\text{ }^{\circ}\text{C}$. 2 or 3 wires Pt100 sensor. Electronics operating temperature $-20...+70\text{ }^{\circ}\text{C}$. Assembled in a round container with dimensions and connections in accordance with DIN 43760, $\varnothing 43 \times h. 22.5\text{ mm}$.

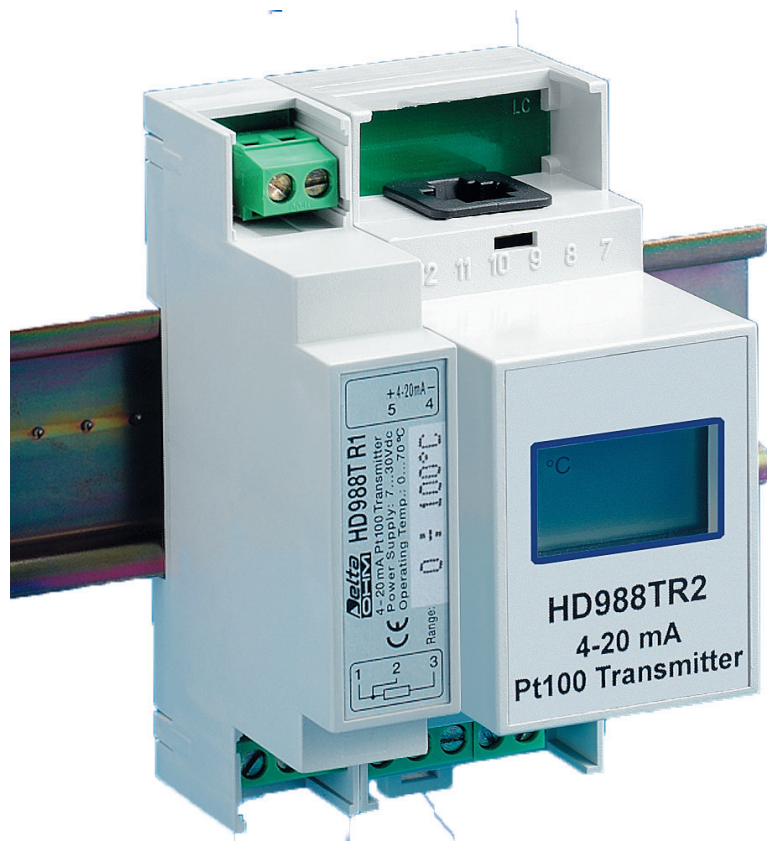
HD786TR1: Configurable temperature transmitter with output 4...20 mA. Measuring range $-200...+650\text{ }^{\circ}\text{C}$, minimum range $25\text{ }^{\circ}\text{C}$. Standard configuration $0...100\text{ }^{\circ}\text{C}$. Electronics operating temperature $-20...+70\text{ }^{\circ}\text{C}$. Container $65 \times 58 \times 35\text{ mm}$. **Wall mounting**, complete with Pt100 probe $\varnothing 14, L = 90\text{ mm}$.

HD786TR2: Configurable temperature transmitter with output 4...20 mA. Measuring range $-200...+650\text{ }^{\circ}\text{C}$, minimum range $25\text{ }^{\circ}\text{C}$. Standard configuration $0...100\text{ }^{\circ}\text{C}$. Electronics operating temperature $-20...+70\text{ }^{\circ}\text{C}$. Container $65 \times 58 \times 35\text{ mm}$. **Wall mounting**, complete with Pt100 probe $\varnothing 3, L = 55\text{ mm}$.

HD988TR1: Configurable temperature transmitter with 4...20 mA output. Measuring range $-200...+650\text{ }^{\circ}\text{C}$, minimum range $25\text{ }^{\circ}\text{C}$. Standard configuration $0...100\text{ }^{\circ}\text{C}$. 2 or 3 wires Pt100 sensor. Electronics operating temperature $-20...+70\text{ }^{\circ}\text{C}$. **Case for DIN rail 35 mm, 1 module (17.5 mm)**.

HD988TR1-I: Configurable **opto insulated** temperature transmitter with 4...20 mA output. Measuring range $-200...+650\text{ }^{\circ}\text{C}$, minimum range $25\text{ }^{\circ}\text{C}$. Standard configuration $0...100\text{ }^{\circ}\text{C}$. 2 or 3 wires Pt100 sensor. Electronics operating temperature $-20...+70\text{ }^{\circ}\text{C}$. **Case for DIN rail 35 mm, 1 module (17.5 mm)**.

HD988TR2: Configurable temperature transmitter with a $3\frac{1}{2}$ digit display (figure height 10 mm), output 4...20 mA. Measuring range: $-200...+650\text{ }^{\circ}\text{C}$, minimum range $25\text{ }^{\circ}\text{C}$. Standard configuration $0...100\text{ }^{\circ}\text{C}$. 2 or 3 wires Pt100 sensor. Electronics operating temperature $-20...+70\text{ }^{\circ}\text{C}$. **Case for DIN rail 35 mm, 2 modules (35 mm)**.





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Documento Nr. / Mese-Anno: **5094 / 07.2019**
Document-No. / Month-Year:

Si dichiara con la presente, in qualità di produttore e sotto la propria responsabilità esclusiva, che i seguenti prodotti sono conformi ai requisiti di protezione definiti nelle direttive del Consiglio Europeo:
We declare as manufacturer herewith under our sole responsibility that the following products are in compliance with the protection requirements defined in the European Council directives:

Codice prodotto: **HD788TR1 / HD788TR1-I**
Product identifier:

Descrizione prodotto: **Trasmettitore di temperatura con uscita 4.20 mA per sensori Pt100**
Product description: **Temperature transmitter with 4.20 mA output for Pt100 sensors**

I prodotti sono conformi alle seguenti Direttive Europee:
The products conform to following European Directives:

Directive / Directives	Directiva EMC / EMC Directive
2014/30/EU	Directiva EMC / EMC Directive
2014/35/EU	Directiva bassa tensione / Low Voltage Directive
2011/65/EU - 2015/863/EU	RoHS / RoHS

Norme armonizzate applicate o riferimento a specifiche tecniche:
Applied harmonized standards or mentioned technical specifications:

Norme armonizzate / Harmonized standards	Requisiti di sicurezza elettrica / Electrical safety requirements
EN 61010-1:2010	Requisiti di sicurezza elettrica / Electrical safety requirements
EN 61326-1:2013	Requisiti EMC / EMC requirements
EN 50581:2012	RoHS / RoHS

Il produttore è responsabile per la dichiarazione rilasciata da:
The manufacturer is responsible for the declaration released by:

Johannes Overhues
Amministratore delegato
Chief Executive Officer

Caselle di Selvazzano, 19/07/2019




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We declare as manufacturer herewith under our sole responsibility that the following products are in compliance with the protection requirements defined in the European Council directives:

Codice prodotto: **HD786TR1 / HD786TR2**
Product identifier:

Descrizione prodotto: **Trasmettitore di temperatura con uscita 4.20 mA**
Product description: **Temperature transmitter with 4.20 mA output**

I prodotti sono conformi alle seguenti Direttive Europee:
The products conform to following European Directives:

Directive / Directives	Directiva EMC / EMC Directive
2014/30/EU	Directiva EMC / EMC Directive
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Caselle di Selvazzano, 19/11/2019




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We declare as manufacturer herewith under our sole responsibility that the following products are in compliance with the protection requirements defined in the European Council directives:

Codice prodotto: **HD988TR1 / HD988TR1-I / HD988TR2**
Product identifier:

Descrizione prodotto: **Trasmettitori di temperatura con uscita 4.20 mA per sensori Pt100**
Product description: **Temperature transmitters with 4.20 mA output for Pt100 sensors**

I prodotti sono conformi alle seguenti Direttive Europee:
The products conform to following European Directives:

Directive / Directives	Directiva EMC / EMC Directive
2014/30/EU	Directiva EMC / EMC Directive
2014/35/EU	Directiva bassa tensione / Low Voltage Directive
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WARRANTY

Delta OHM is required to respond to the "factory warranty" only in those cases provided by Legislative Decree 6 September 2005 - n. 206. Each instrument is sold after rigorous inspections; if any manufacturing defect is found, it is necessary to contact the distributor where the instrument was purchased from. During the warranty period (24 months from the date of invoice) any manufacturing defects found will be repaired free of charge. Misuse, wear, neglect, lack or inefficient maintenance as well as theft and damage during transport are excluded. Warranty does not apply if changes, tampering or unauthorized repairs are made on the product. Solutions, probes, electrodes and microphones are not guaranteed as the improper use, even for a few minutes, may cause irreparable damages.

Delta OHM repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product. For any dispute, the competent court is the Court of Padua. The Italian law and the "Convention on Contracts for the International Sales of Goods" apply.

TECHNICAL INFORMATION

The quality level of our instruments is the result of the continuous product development. This may lead to differences between the information reported in the manual and the instrument you have purchased. In case of discrepancies and/or inconsistencies, please write to sales@deltaohm.com. Delta OHM reserves the right to change technical specifications and dimensions to fit the product requirements without prior notice.

DISPOSAL INFORMATION



Electrical and electronic equipment marked with specific symbol in compliance with 2012/19/EU Directive must be disposed of separately from household waste. European users can hand them over to the dealer or to the manufacturer when purchasing a new electrical and electronic equipment, or to a WEEE collection point designated by local authorities. Illegal disposal is punished by law.

Disposing of electrical and electronic equipment separately from normal waste helps to preserve natural resources and allows materials to be recycled in an environmentally friendly way without risks to human health.

