

HD778TR1, HD978TR1, HD978TR2, HD778TCAL



HD778TR1, HD978TR1, HD978TR2
4...20 mA CONFIGURABLE THERMOCOUPLE TRANSMITTERS
HD778TCAL
THERMOCOUPLE GENERATOR

HD778TR1, HD978TR1 and HD978TR2 are 4...20 mA two-wired configurable passive transmitters with microprocessor for K, J, T and N type thermocouple sensors.

They convert the voltage value generated by the thermocouple into a linear current signal in the range 4...20 mA.

The use of digital devices allows obtaining an excellent precision and stability in time. User can set the 4...20 mA output into any temperature range in the measuring range of the single thermocouple with a minimum range of 50 °C.

The range and type of thermocouple are set by simply using one button.

A led indicates the alarm situation (broken or not connected sensor) and it helps user during the programming. Moreover, transmitters are protected against polarity inversions.

HD778TR1 is specifically designed to be installed in DIN B type connection heads, HD978TR1 and HD978TR2 are suitable for mounting on 35 mm DIN rails. Beyond 4...20 mA output, HD978TR2 has a 3 1/2 digit (height 10 mm) display which allows displaying the measured temperature.

Technical specifications @ 25°C and 24Vdc			
INPUT	HD778TR1	HD978TR1	HD978TR2
Sensor	Thermocouple type K, J, T and N		
Connection	2 wires passive transmitter		
Measuring range	Thermocouple K: -200 °C...+1200 °C Thermocouple J: -200 °C...+800 °C Thermocouple T: -200 °C...+300 °C Thermocouple N: -200 °C...+1200 °C		
Linearization	EN 60584-1-2 ASTM E 230 - ANSI (MC96-1)		
Default range	Tc = K - Range = 0...1000 °C		
Minimum measuring range	50 °C		
Conversion speed	2 measures per second		
Accuracy	±0.04%FS ±0.04% of the reading or 0.5 °C (the greater of the two values)		
Operating temperature of the cold junction	-30...+80 °C	0...+70 °C	
Operating temperature	-30...+80 °C	0...+70 °C	
Storage temperature	-40...+80°C		
OUTPUT			
Type of output (note 1)	4...20 mA (or 20...4 mA) two wires 22 mA if sensor is broken or not connected		
Resolution	4 µA	4 µA Display: 0.1°C T<200 °C 1°C T>200 °C	
Power voltage	9...30 Vdc (protection against polarity inversion)		
Sensitivity to Vdc power voltage variations	0.4 µA/V		
Load resistance	$R_{L\text{ Max}} = (Vdc-9)/0.022$ $R_{L\text{ Max}} = 680\Omega$ with Vdc = 24 Vdc		
Input/output galvanically insulation	50 Vdc (verified at 250 V)		
Red led	It turns on while programming, when the probe is broken or not connected		
Heating time	2 minutes		

Note 1 - If the measured temperature T goes out of the T1...T2 (T1<T2) set range, the transmitters linearly regulate the current for T<T1 and T>T2 for an interval of 10 °C. (See the fig.2).

Fig.1 - Mechanical dimensions

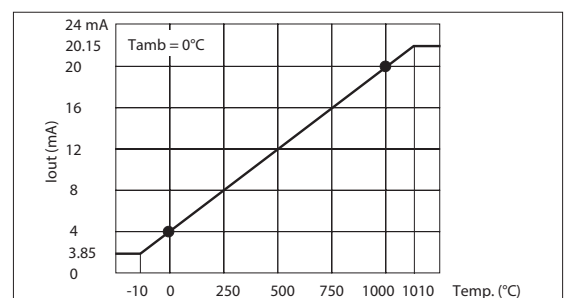
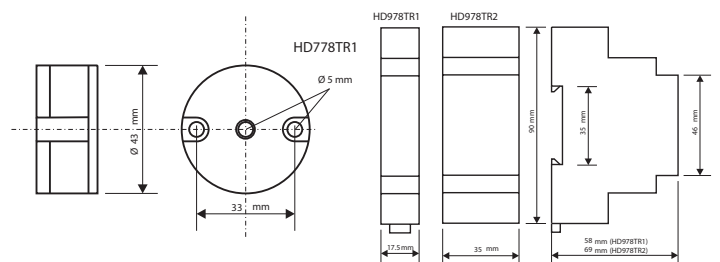


Fig. 2 - 0...1000 °C current output according to temperature

INSTALLATION AND CONNECTION

Fig. 1 shows the mechanical dimensions of the HD778TR1 HD978TR1 HD978TR2 transmitter and highlights the holes of 5 mm diameter for fastening the DIN head and the central hole for the entrance of the wires in the thermocouple.

The width of the HD978TR1 is one DIN (17,5 mm) module, the HD978TR2 is a 2 DIN (35 mm) modules. The working temperature should be within the operating temperature declared. Fig. 3 and 4 report the wiring diagrams of HD778TR1, HD978TR1 and HD978TR2. In order to obtain the maximum precision, the connection to the thermocouple should not exceed 3 meters long. In the diagrams reported, the RL (Load) symbol represents any device introduced in the current loop, that is to say any indicator, controller, data logger or recorder.

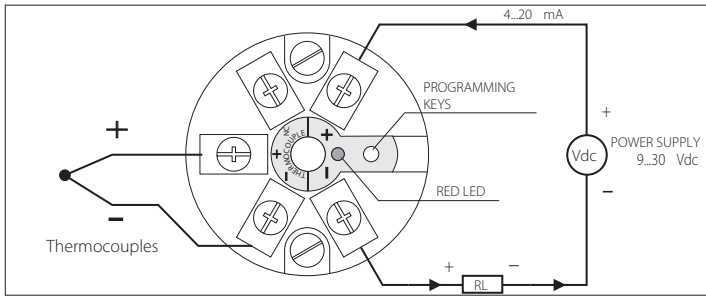


Fig.3 - connection diagram of the HD778TR1

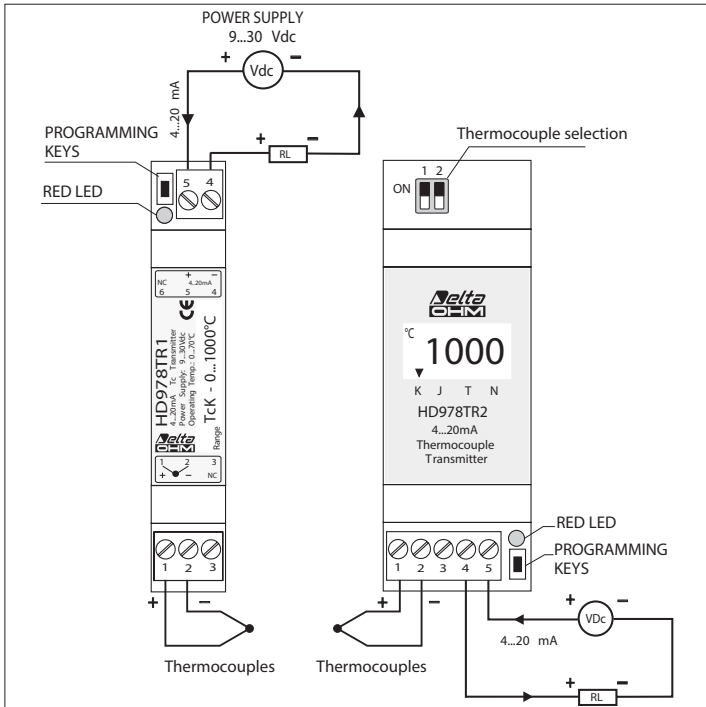


Fig.4 - connection diagrams of HD978TR1 and HD978TR2

CHOICE OF THE THERMOCOUPLE

The transmitter accepts four types of thermocouple. The thermocouple set is highlighted by the number of flashes of the led when power is supplied.

N° of led flashes	Type of thermocouple
1	K
2	J
3	T
4	N

Transmitters come with the default set K thermocouple and range 4...20 mA = 0...1000 °C. User can change the thermocouple type and the operating range according to the following procedure.

Note - after changing the thermocouple type the operating range should be programmed.

HD778TR1 and HD978TR1

Giving power to the transmitter, the led flashes for a number of times equal to the type of thermocouple previously configured.

In order to change the setting, remove and reapply supply to the transmitter by keeping the button pressed. This way you enter the programming for choosing the type of thermocouple: if you chose the thermocouple K, the led flashes once.

If you release the button and press it again within 10 seconds, the led flashes twice: thermocouple J has been chosen.

If you press the button within 10 seconds, the led flashes 3 times: thermocouple T has been chosen.

If you press the button within 10 seconds, the led flashes 4 times: thermocouple N has been chosen.

If you press the button within 10 seconds again, the led flashes once indicating that you chose thermocouple K again and the cycle re-starts.

In order to save the selected type of thermocouple, wait for 15 seconds without touching any key: the transmitter saves the type of thermocouple and exits programming, the led flashes for the number of times equal to the type of thermocouple selected.

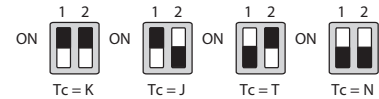
If you changed the type of thermocouple, you have to re-programme the operating range: see paragraph "Programming of the operating range".

HD978TR2

This transmitter has a double dip-switch for selecting the type of thermocouple. The selection must be set before powering the transmitter and is acquired when the instrument is on: a change in the dip-switch when the instrument is powered has no effect until the next power cycle.

Procedure:

when the instrument is off, select the type of thermocouple by setting the switches as shown in the figure below.



By powering the transmitter, the led flashes for a number of times equal to the type of thermocouple selected.

If you changed the type of thermocouple, you have to re-programme the operating range: see paragraph "Programming the operating range".



Programming of the operating range

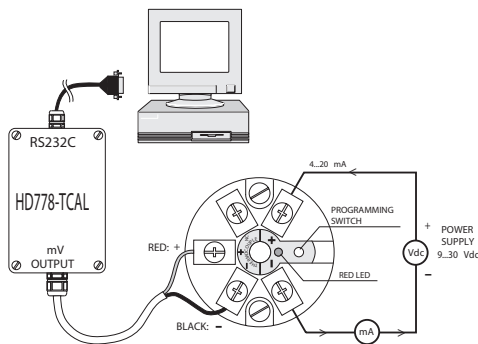
Transmitters HD778TR1, HD978TR1 and HD978TR2 are supplied by default with K type thermocouple and range 0...1000 °C.

The user can set a different range according to his requirements with a minimum span of 50 °C.

The correspondence between the read temperature and the output current can be direct (e.g. 4 mA = 0 °C and 20 mA = 1000 °C) or inverse (e.g. 4 mA = 1000 °C and 20 mA = 0 °C).

Acquire the following tools for programming:

- 9...30 Vdc direct current power source,
- thermocouple calibrator,
- copper connection cables,
- precision ammeter with 0...25 mA minimum range.



Instead of the thermocouple calibrator, you can use the Delta OHM HD778TCAL: this instrument has to be connected to a serial port of the PC and, by means of a proper software, automates all the steps described below for programming the operating range.

If you have a thermocouple calibrator, the steps are:

- in order to set the type of thermocouple, proceed as described in the paragraph 'Choice of Type of thermocouple' in the previous page.
- The voltage values generated by the calibrator must be uncompensated.
- The setting must be done with the instrument already powered.
- Set the calibrator with the output of the desired type of thermocouple (K, J, T or N), connect the calibrator to the transmitter thermocouple input paying attention to polarity.
- Set the calibrator so that it generates the voltage corresponding to the temperature at 4 mA, wait for 30 seconds for the voltage to stabilise.
- Press and hold the button until the led flashes. Release the button. The instrument has acquired the first value of the transmitter working range, the led keeps on flashing. The instrument is now awaiting the value of the full scale range.
- Set the calibrator in order to generate a voltage corresponding to the temperature at 20 mA.
- Press and hold the button until the led stops flashing.
- Release the button and wait 20 seconds, without changing the calibrator's data, so that the transmitter saves the calibration data and is ready for working normally. The operation ends with a flashing of the led.
- The instrument has acquired the second point corresponding to the range you want to set and is working normally.
- The minimum span accepted by the instrument is 50 °C. If the user tries to insert a second value T2 with $(T2-T1) < 50$, after entering the first value T1 of the range, the instrument does not accept it and remains in standby while the led flashing continuously.

The HD778TCAL is supplied with its software. Connected to the HD778TCAL serial output of a PC, the user can configure the transmitter by following the instructions on the screen.

ORDERING CODES

HD778TR1: Configurable 4...20 mA / 20...4 mA 2-wire temperature transmitter for K, J, T, N thermocouples, minimum amplitude range 50 °C, in a container for DIN B 43760 heads. Standard configuration 0...1000 °C, thermocouple type K. Electronics operating temperature -30...+80 °C. Configurable with HD778TCAL.

HD978TR1: Configurable 4...20 mA / 20...4 mA 2-wire temperature transmitter for K, J, T, N thermocouples, minimum amplitude range 50 °C, in a container for 35 mm DIN rail connection, dimension 1 module. Standard configuration 0...1000 °C, thermocouple type K. Electronics operating temperature -20...+70 °C. Configurable with HD778TCAL.

HD978TR2: Configurable 4...20 mA / 20...4 mA 2-wire temperature transmitter for K, J, T, N thermocouples, amplitude range 50 °C, in a container for 35 mm DIN rail connection, dimension 2 modules, with 3 1/2 digit display, figure height 10 mm, Standard configuration 0...1000 °C, thermocouple type K. Electronics operating temperature -20...+70 °C. Configurable with HD778TCAL.

HD778TCAL: Power generator in the range -60...+60 mV, regulated by PC through RS232C serial port, DELTALOG7 (downloadable from Delta OHM website) software for setting K, J, T and N thermocouple transmitters.





**DICHIARAZIONE DI CONFORMITÀ UE
EU DECLARATION OF CONFORMITY**

Delta Ohm S.r.l. a socio unico – Via Marconi 5 – 35030 Caselle di Selvazzano – Padova – ITALY

Documento Nr. / Mese.Anno: **5095 / 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: **HD778TR1**
Product identifier :

Descrizione prodotto: **Trasmittitore di temperatura con uscita 4..20 mA per termocoppie**
Product description :
Temperature transmitter with 4..20 mA output for thermocouples

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

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

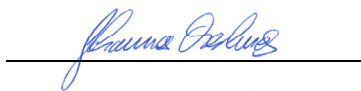
Norme armonizzate applicate o riferimento a specifiche tecniche:
Applied harmonized standards or mentioned technical specifications:

Norme armonizzate / Harmonized standards	
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



Questa dichiarazione certifica l'accordo con la legislazione armonizzata menzionata, non costituisce tuttavia garanzia delle caratteristiche.
This declaration certifies the agreement with the harmonization legislation mentioned, contained however no warranty of characteristics.



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EU DECLARATION OF CONFORMITY**

Delta Ohm S.r.l. a socio unico – Via Marconi 5 – 35030 Caselle di Selvazzano – Padova – ITALY

Documento Nr. / Mese.Anno: **5187 / 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: **HD978TR1 / HD978TR2**
Product identifier :

Descrizione prodotto: **Trasmittitore di temperatura con uscita 4..20 mA per termocoppie**
Product description :
Temperature transmitter with 4..20 mA output for thermocouples

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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.

