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SIGNAL CONVERTERS / AMPLIFIERS WITH 4÷20mA OR 0÷10Vdc OUTPUT
CONFIGURABLE WITH HD788-TCAL BY PC THROUGH RS232C

HD978TR3 and **HD978TR4** are signal converters/amplifiers that can be configured using mV input. The mV input signal range can be configured from -10mV to +60mV through a button, by using the HD778-TCAL simulator and the DeltaLog7 software or a gauge with mV output. HD978TR3 has a 4…20mA current output. HD978TR4 has a 0…10Vdc voltage output, with 0…1Vdc, 0…5Vdc and 1…5Vdc outputs available upon request.

A led signals the alarm situations and helps the user during the programming phases. The tool is also protected against polarity inversion.

The input and the output are electrically isolated so as to eliminate the problems caused by the reciprocal influence of the devices originating in the disturbances caused across the various grounding/earthing routes.

The tool is housed in a 2 DIN module container (width 35 mm) with normalized connection for 35 mm omega bars.

The 4…20mA current output stage of HD978TR3 is a two-wired passive type and supplies power to the converter through the same current loop.

TECHNICAL INFORMATION @ 25°C AND 24Vdc

| IMPUT	HD 978TR3	HD 978TR4
Measurement range	-10mV … +60mV which can be configured	
Default range	0...20 mV	
Minimum measurement range	2 mV	
Imput impedance	> 1 MΩ	
Speed of conversión	2 measurements per second	
Accuracy	± 0,04 % FS ± 20 µV	
Operating temperature	-30...70 ºC	
Storage temperature	-40...80 ºC	
Relative humidity	0...90 % HR without condensation	
OUTPUT	**HD 978TR3**	**HD 978TR4**
Type of output (note 1)	4...20 mA (or 20...4 mA) two-wired22 mA, in case of unconnected input	0 … 10Vdc (0…1Vdc, 0…5Vdc, 1…5Vdc upon request)
Resolution	4 µA	20 µV
Power	9...30Vdc for the 4…20mA current output	15…30Vdc (4mA) for the 0 … 10Vdc current output, 10…30Vdc (4mA) for the other outputs
Protection against polarity inversion	40 V max	
Sensitivity to Vcc power voltage variations	0,4 µA/V	2 µV/V
ResisteLoad resistance	RL Max = (Vcc-0,9)/0,22 RL Max = 625 Ώ co Vcc = 24 V	> 10 MΩ
Input/output galvanic isolation	50 Vcc (checked at 250V)	
Red led	Turns on during the programming phase if the input is unconnected or outside the programmed scale.	
Warm-up time	2 minutes	
Thermal shift	0,02 %FS/ºC	

Note 1: If the measured voltage V goes out of the V1...V2 (V1<V2) set range, the transmitters linearly regulate the output for V<V1 and V>V2 for an interval of 0.1mV. (See the diagrams of the outputs.)

Installation and connection

Fig. 1 shows the mechanical dimensions of HD978TR3 and TR4: the container's width is 2 DIN modules (35 mm). Fig. 5 outlines the HD978TR3 connection scheme to a Delta Ohm pyranometer. Fig. 6 shows the typical HD978TR4 connection. In order to obtain the maximum precision, the connection concerning the input should not exceed 3 meters in length and must be carried out using a shielded cable. We also recommend not laying the wiring near power signal cables (electric engines, induction furnaces, inverters, etc.) The working temperature must be included in the defined range of function.
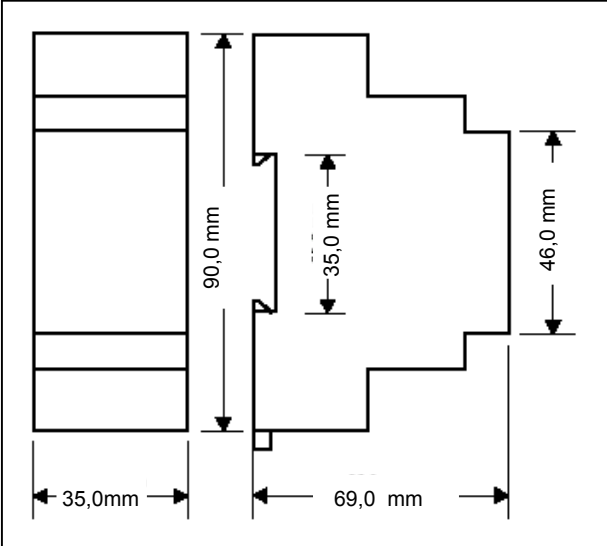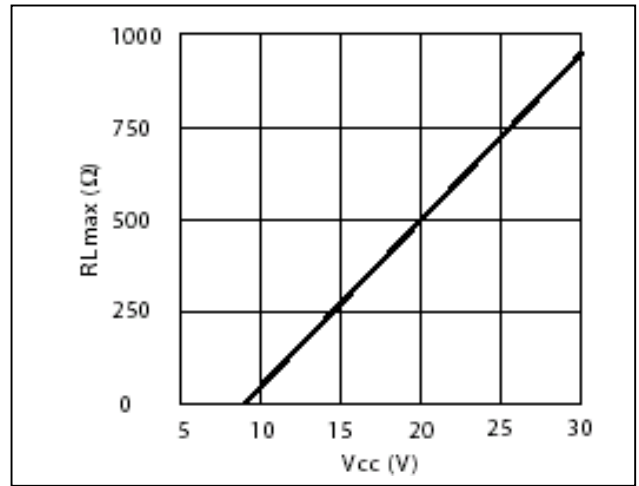

Fig. 1
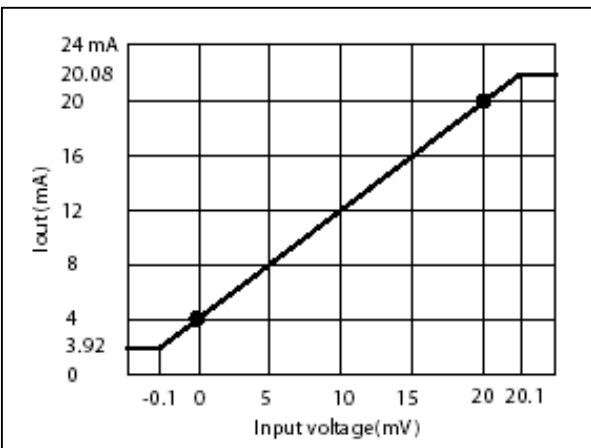
**Fig. 2** HD978TR3: input range 0…20mV, output current with relation to input voltage
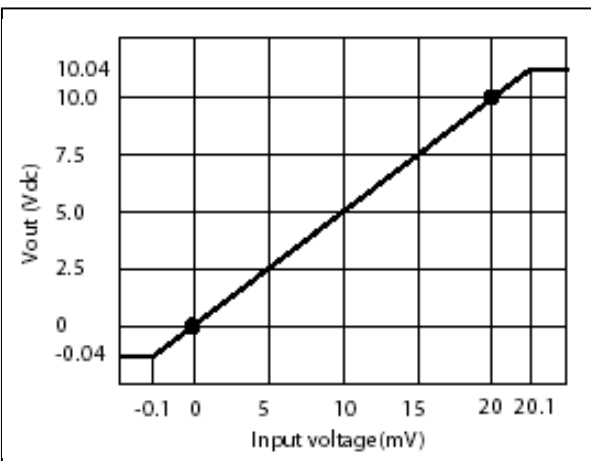
Fig. 3 Input range 0…20mV, output voltage with relation to input voltage

Fig. 4 Load resistance with relation to power supply (output 4…20mA)

In the diagrams attached, the RL(Load) symbol represents any device inserted in the current loop, that is to say, an indicator, a controller, a data logger or a register.
The two clamps marked EARTH are connected internally between themselves and are used, as you can see in the schemes, to connect the earth terminal coming, for example, from the pyranometer to the system's grounding.
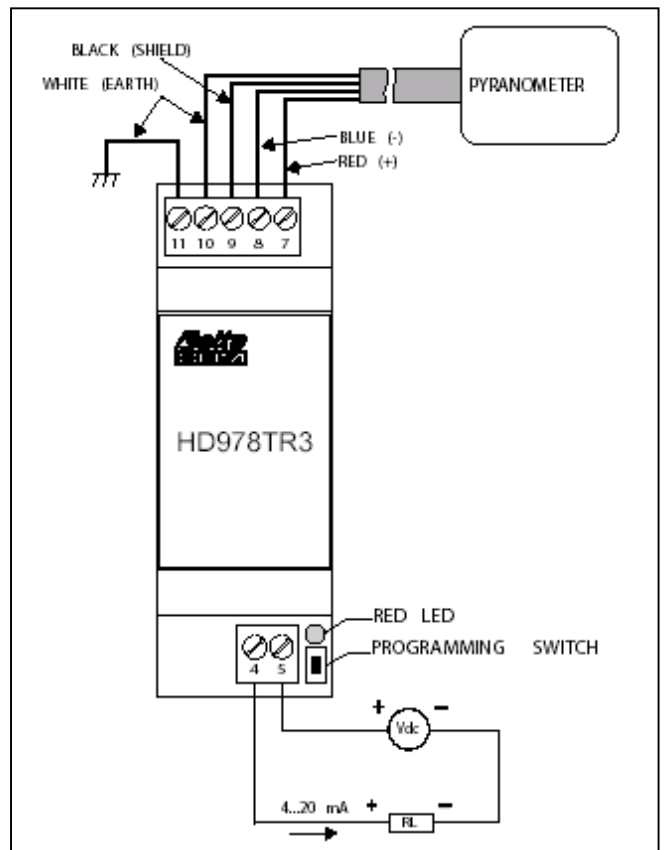
Fig. 5 Connection diagram of the HD978TR3 to a pyranometer.

The response curves of the tools are reported in figures 2 (HD978TR3 current output) and 3 (HD978TR4 voltage output). Fig. 7 outlines, as an example, the connection used in order to read the voltage detected across a direct current shunt: the CONVERTER ensures the galvanic isolation between the device and the voltage or current output. Furthermore the fact that it can be configured allows the best correlation between read voltage and amplified output to be obtained. We recommend collecting the signal by using a shielded cable and connecting the shield (braid) to clamp 9
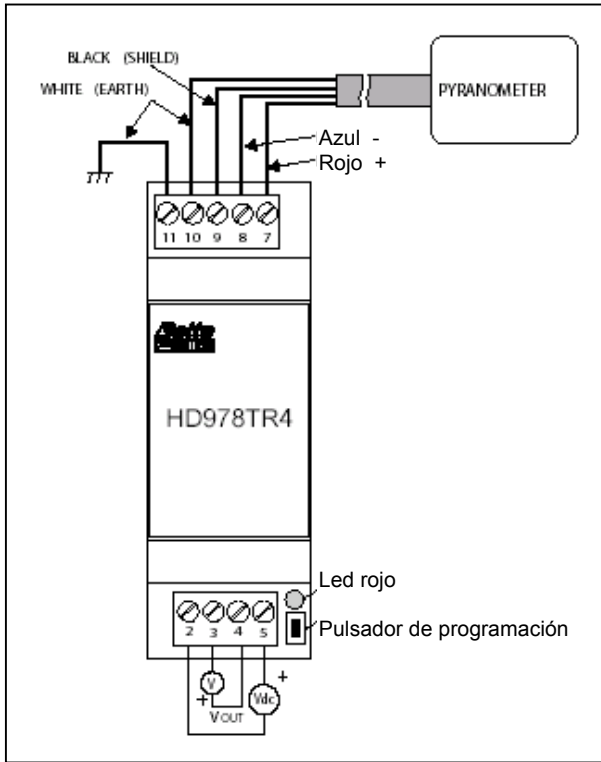
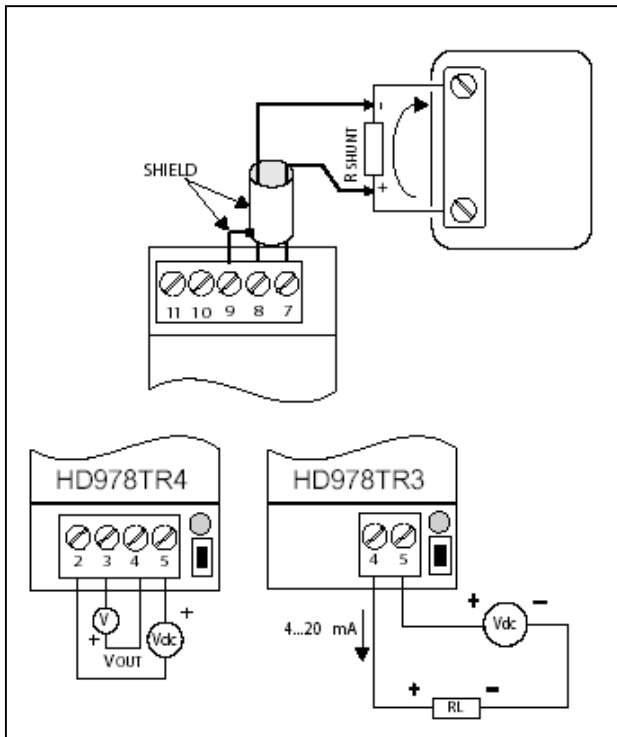**Fig. 6** Connection diagram of the HD978TR4 to pyranometer

Fig. 7

Programming the range of functioning.
HD978TR3 and HD978TR4 converters are supplied with a default range of 0…20mV . The user can set a different input range according to his requirements, with a minimum span of 2mV. The correspondence between the read current and the current or voltage output can be direct (e.g. 0mV = 4mA and 20mV = 20mA) or inverse (e.g. 0mV = 20mA and 20mV = 4mA).

Avail yourself of the following programming tools:
• Direct current power source of suitable value (see the table of characteristics),
• Gauge with mV output,
• Connection cables,
• Precision ammeter with 0...25 mA minimum range or 0…10Vdc voltmeter.

The set up process must be carried out with the device already turned on. Set the gauge in order to generate the voltage corresponding to the output at the beginning of the converter scale (4mA or 0V according to the models), paying attention to the polarity. Wait 30 seconds until the voltage stabilizes.

Press and keep the button pressed until the led starts blinking. Release the button. The device acquires the first value of the transmitter work range, and the led continues blinking. The tool now waits for the second data of the end of scale range.
Set the gauge so that it generates the voltage corresponding to the end of scale range (20mA or 10Vdc).

Press and keep the button pressed until the led stops blinking. Release the button and wait 20 seconds, without modifying the gauge data, so that the transmitter memorizes the calibration data and is ready to function normally. The operation is complete when the led blinks once.The device has acquired the second point corresponding to the range you wish to configure and starts to function normally
The minimum span value accepted by the device is 2mV. If, after entering the first value V1 of the range, the user tries to enter a second value V2 with V2-V1 lower than 2mV, the device does not accept it and remains in the waiting status with the led continuing to blink.
Note: The **HD778-TCAL** Delta Ohm can be used, in place of the current/voltage gauge. This device must be connected to the PC's serial port, and by using the special DELTALOG7 software it automates all the steps described below for the programmed range of functioning.
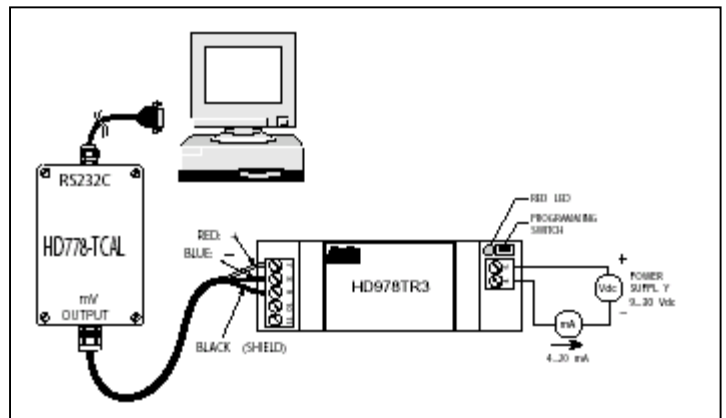
HD778-TCAL is provided with its software. After it has been connected by the programmer to a serial port on the PC, the operator can configure the HD978TR3 (4…20mA o 20…4mA current) or HD978TR4 (0…10Vdc or 10…Vdc voltage) by following the instructions on the screen.