ELECTRONIC WEIGHING
ados
PESATURA ELETTRONICA

Weight transmitter T020E
Version: T020E-V T020E-A T020E-S
Analog output 0-10V/4-20mA
Serial out RS232/RS485

Installation and instruction manual

① display
② **INC** key (increases)
③ **DEC** key (decreases)
④ **ENT** key (confirms)
⑤ **ESC** key (cancels)
⑥ terminasl

With the present document
ADOS S.r.l., Via Lazio 25, 20090 Buccinasco (Mi)
Declares that this T020E fully complies to the essential requirements
EN 61000-6-4 e EN 61000-6-2
Accordino to EC directive EMC 2004/108/CEE

Power supply	9-48 VDC / VAC
Accuracy	0.01% of the full scale
Linearity	0.01% of the full scale
Thermal Drift	0.005% / °C
Consumption	max 250 mA a 12 VDC (3 VA)
Working temperature	from –10 °C to +40 °C
Relative humidity	• 95% not condensated in the case of version for DIN bars • not relevant to the versions in IP66 box
Load cells excitation	5 V with protection against short circuits and with reference to internal voltage
Number of cells connectable (4 conductors)	4 350 Ω cells
Analog signal	from 0.5 to 2.5 mV/V
Conversion rate	55 conversions / second
Display Graduation	10000
Display increments	1-2-5-10-20
Display	5 LED digits
Digital otputs	2 relè 1 CO (SPDT) 3A at 250 VAC or 3A at 30 VDC
Digital input	Optoisolated 24VDC
Serial output	RS232 or RS485 (selectable)
Analog output	0-10V or 4-20 mA (selectable)
Dimensions	• mm 95 x 85 x 65 (version for DIN bars) • mm 110 x 110 x 70 (version in IP66 box)

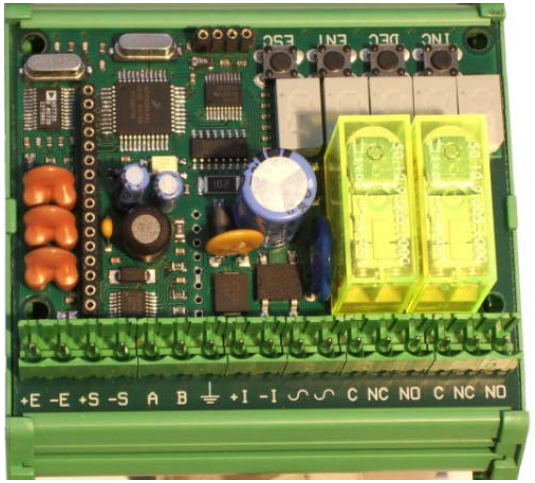
1. START UP OF THE INSTRUMENT

For a correct start up of the instrument it is necessary to carry out the following operations:

- set up or check the electrical connections (see paragraph 2)
- set the weighing rate (see paragraphs 3 and 4)
- calibrate the weights (see paragraph 5)

2. ELECTRICAL CONNECTIONS

The instrument must be connected according to the indications in the following table:



Load cell wiring	+E	+ EXCITATION (RED)			
	-E	- EXCITATION (BLACK)			
	+S	+ SIGNAL (GREEN)			
	-S	- SIGNAL (WHITE)			
		RS232	**RS485**	**0-10**	**4-20**
Output	A	TX	A-485	0-10 V	4-20mA
	B	RX	B-485		
	⏚	SGND		Common	Common
Tare input	+I	+12/24VDC			
	-I	0VDC			
Power supply	~	9-48 VDC / VAC			
	~	9-48 VDC / VAC			
Relè outputs	C	COMMON relè 1			
	NC	N.C. relè 1			
	NO	N.O. relè 1			
	C	COMMON relè 2			
	NC	N.C. relè 2			
	NO	N.O. relè 2			

In the case where the apparatus uses more than one load cell, the cells must be wired to a specific junction box (ADOS model 1308), and the output must be connected to the terminals of T020E.
The use of shielded cable for the wiring of the load cells, the analog output signal lines and the serial lines is highly recommended.

The load cell colour code in the above tabel is that used on standard ADOS cells. Check carefully that the conductors function correctly in the case where special ADOS cells or other brands of cells are used.

ATTENTION

- *the incorrect connection of the wires or the inversion of poles on the power supply may damage the apparatus*
- *the connection wires must not be connected to dangerous power supplies*

3.SETTING OF WEIGHING SCALE

The numeric value of the weight on the display consists of the multiplication of two parameters: DIVIS AND SENSI, with the possibility to set the number of DECIMALS required.

The number of divisions represents the number of steps that the weighing rate is divided into; the more divisions set the easier it will be possible to recognise small variations in weight.
The accuracy value represents the value associated with each step of the weighing rate, and it should be chosen in order to reach the required weighing rate.
The decimal values are needed to set the position of the point on the weight display, in order to read the weight value in the correct measure unit.

EXAMPLE: in order to obtain a weigh rate from 0 to 20000 units, it is necessary to set a value of 10000 divisions with an accuracy of 2 units per division (10000 x 2 = 20000). In this way the weight will be visualised in increments of 2. Another solution, though less efficient, is that of setting a value of 2000 divisions with an accuracy of 10 units per division: this however means that the recognisable minimal variation in weight would be inferior.
In the case where the full scale weight is 20000 kg, if the decimals are set at 0.0, the value displayed would go from 0.0 to 2000.0 with increments of 0.2 kg.

DIVISIS		*SENSI'*		*DECIM*
1000		1		0
2000		2		0.0
3000	X	5	:	0.00
4000		10		0.000
5000		20		0.0000
10000		50		

The values available are:
N.B.: if it is not possible to obtain the desired weighing rate with the combination of values available relating to divisions and accuracy, the value should be rounded up: for example, in the case of a weighing rate from 0 to 7000 the nearest obtainable would be 8000

4. CONFIGURATION OF PARAMETERS

☞ to access configuration press **ENT**

☞ press **ENT** again to access the configuration parameters or press **ESC** to cancel

the name of the first parameter available will appear on the display (for example the number of divisions)

☞ use the **INC** and **DEC** keys to proceed to the next or previous parameter

☞ once the required parameter has been identified, modifications can be made by pressing **ENT**

the parameter value will appear on the display and the name of the parameter will flash intermittently.

☞ use the **INC** and **DEC** keys to change the parameter values (press the key for more than 3 seconds to activate the automatic repetition option)

☞ press **ENT** to confirm the set value or press **ESC** to cancel

The configuration parameters available are as follows::

DIVIS	number of divisions (1000 - 2000 - 3000 – 4000 – 5000 - 10000)
SENSI	accuracy values (1 - 2 - 5 - 10 - 20 - 50)
DECIM	number of decimals on the display (0 - 0.0 - 0.00 - 0.000 - 0.0000)
MEDIE	Number of data used for the dynamic average (OFF - 2 - 4 - 8 - 16 – 32 - 64)
FUNR1	Relay number 1 functions (ON - FAIL – POS G – NEG G – POS N – NEG N)
SETR1	Setpoint value of relay number 1 (from 0 to the full scale value)
FUNR2	Relay number 2 functions (ON - FAIL – POS G – NEG G – POS N – NEG N)
SETR2	Setpoint value of relay number 2 (from 0 to the full scale value)
SERIA	Setting of the serial port (OFF - CONT - BIDIR)
LINE	Selection of serial line type (RS232 – RS485)
BAUD	baudrate of the serial port (1200 - 2400 - 4800 - 9600 - 19200)
ID485	Address for RS-485 (da 0 a 32)

The meaning of the **DIVIS**, **SENSI**, and **DECIM** parameters is explained in paragraph 3.

MEDIE

This parameter is used for the digital filtering of the weight signal, in order to reduce to a minimum the undesired effects due to for example mechanical vibrations which affect the weighing system.
The higher the parameter value, the higher the capacity to filter the undesired fluctuation, even if this causes an increase in the delay of visualising the variations in the weight signal.
Pressing the **OFF** key excludes the filter option.

FUNR1 – FUNR2

ON: the relay is continuously excited; this option may be used to check that the instrument is being powered
(excitation of the relay only stops due to the lack of power)
FAIL: excitation of the relay is interrupted when there is an electrical fault in the +/- signal wires of the load cells.
NEG G: the relay is *deenergized* only if the weight value is lower or equal to the preset value (see **SETR1** and **SETR2** parameters)
The set reacts independently from the zeroed value (by tare input).
POS G: the relay is *deenergized* only if the weight value is higher or equal to the preset value (see **SETR1** and **SETR2** parameters).
The set reacts independently from the zeroed value (by tare input).
NEG N: the relay is *deenergized* only if the weight value is lower or equal to the preset value (see **SETR1** and **SETR2** parameters)
POS N: the relay is *deenergized* only if the weight value is higher or equal to the preset value (see **SETR1** and **SETR2** parameters).

SETR1 – SETR2

This value represents the threshold used for the POS and NEG options of the relay. The preset value ranges from zero to the full scale.

SERIA

This parameter is used to set the serial port modes.
OFF: the serial port is not used
CONT: continuous serial transmission is enabled by the ASCII ADOS protocol string
BIDIR: transmission is enabled by serial request of the ASCII ADOS protocol string

LINE

This parameter is used to set the physical interface mode: RS485 or RS232.

ID485

This parameter is used to set the address required for the identification of the instrument on a multipoint line RS-485.

BAUD

This parameter is used to set the communication speed on the serial line.

The transmission parameters of the line are:

8 data bit i – **NO** parity – **1** stop bit

5. CALIBRATION OF WEIGHTS

After setting the desired weight range it is necessary to carry out the two apparatus calibration phases:

- zero calibration (see paragraph 5.1)
- full scale calibration (see paragraph 5.2)

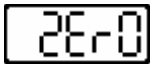
5.1 Zero Calibration

check that there is no weight loaded on the weighing system (zero kg)

press **ENT** and then **INC** until the following word appears on the display

to continue with the calibration press **ENT**, to cancel press **ESC**

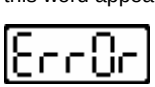
press the **INC** key or the **DEC** key until the display shows the following word



to carry out the zero calibration press **ENT** (and wait), to cancel press **ESC**

if this word appears

it means that the zero calibration has been successful; if this word appears



CHECK THE PROBLEM AND REPEAT THE CALIBRATION

it means that the calibration was not successful
(for example due to an error in installation or connection of the load cells)

ATTENTION
Only if the zero calibration has been successfully terminated is it possible to continue with the full scale calibration

5.2 Full scale calibration

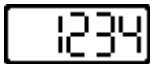
load the weighing system with a sample weight of which the exact weight is known, the same or as close as possible to the preset full scale value

press **ENT** and then **INC** until the following word appears

to procede with the calibration option press **ENT**, to cancel press **ESC**

press **INC** or **DEC** until the following word appears

to carry out the full scale calibration option press **ENT**, to cancel press **ESC**



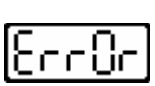
at this point a casual absolute value is visualised (1234 in the example), which must be replaced with the value of the sample weight which was loaded onto the weighing system.

using the **INC** and **DEC** keys change the value until it corresponds to the value of the sample weight

to procede with the full scale calibration press **ENT**, to cancel the operation press **ESC**

if this word appears

it means that the full scale calibration has been successful; if this appears



CHECK THE PROBLEM AND REPEAT THE CALIBRATION

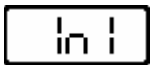
it means that the calibration was not successful
(for example due to an error in installation or connection of the load cells)

ATTENTION
The weighing system may only be used if both calibration options have been concluded successfully

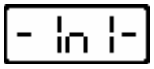
6. SYSTEM INITIALIZATION

This option resets the default factory settings and the calibration values .

press the **ENT** key and then the **INC** key until the following word appears on the display



to proceed with the initiating of the instrument press **ENT**, to cancel press **ESC**



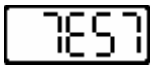
confirm the operation by pressing **ENT** again, or cancel by pressing **ESC**

at this point the instrument has been initialised and the display shows a blinking value.

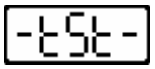
After system initialization the display blinks as indicate the not calibration status.

7. TEST

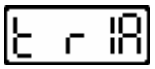
press the **ENT** key and then the **INC** key until the following word appears on the display



to proceed with the instrument test option **ENT**, to cancel press **ESC**



to start the test procedure press **ENT**, to cancel press **ESC**

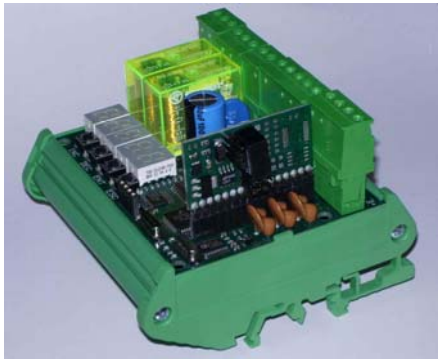


at this point the instrument will activate relays number 1 and 2 alternately, whilst on the analog output a “saw tooth” ramp ranging from the minimum value to the maximum value

to exit the test option press **ESC**

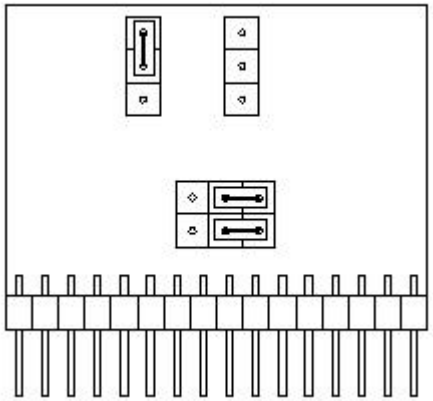
8. SERIAL OUTPUT (HW selection)

The serial line is available in both the RS232 and RS485 mode.

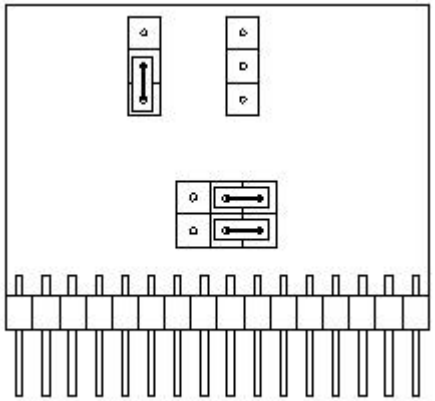


Serial board insertion mode

RS485



RS232



8.1 SERIAL PROTOCOL ASCII ADOS

The T020E instrument handles the serial communications in two different ways:

- BIDIRECTIONAL SLAVE
  The instrument sends the ASCII data string only after receiving the request from a device connected on the line acting as the master
  The master may interrogate individually the various slaves connected to the line each identified by a different ID 485 (only RS-485), or a single slave on the line (both RS-232 and RS-485).

- CONTINUOUS TRANSMISSION
  The instrument continuously transmits the ACII data string without request to a single instrument (RS-232) or to one or more instruments (RS-485).

8.2 Weight Request String Format

The ASCII string for the weight request differs in length according to the ID485 parameter values as seen in the following cases:

- **ID485 = 0 (5 characters in length)**

1° character [STX]	(Hex 02) fixed
2° character [WEIGHT]	<P> (Hex 50) fixed
3° character [CHK 1]	from <0> (Hex 30) to <9> (Hex 39) or from <A> (Hex 41) to <F> (Hex 46) to indicate the higher part of the checksum (see paragraph 6.3)
4° character [CHK 2]	from <0> (Hex 30) to <9> (Hex 39) or from <A> (Hex 41) to <F> (Hex 46) to indicate the lower part
5° character	<CR> (Hex 0D) fixed

- **ID485 > 0 (7 characters in length)**

1° character [STX]	(Hex 02) fixed
2° character [ID485 D]	from <0> (Hex 30) to <9> (Hex 39) to indicate the tens of the set ID485 value
3° character [ID485 U]	from <0> (Hex 30) to <9> (Hex 39) to indicate the units of the set ID485 value
4° character [WEIGHT]	<P> (Hex 50) fixed
5° character [CHK 1]	from <0> (Hex 30) to <9> (Hex 39) or from <A> (Hex 41) to <F> (Hex 46) to indicate the higher part of the checksum (see paragraph 6.3)
6° character [CHK 2]	from <0> (Hex 30) to <9> (Hex 39) or from <A> (Hex 41) to <F> (Hex 46) to indicate the lower part
7° character	<CR> (Hex 0D) fixed

8.3 Format of the string transmitted by T020E

The ACII string transmitted by the instrument is the same for both bidirectional and continuous transmission.
The length of the sting differs according to the ID485 parameter value, as seen in the following cases:

- **ID485 = 0 (16 characters in length)**

1° character	<STX> (Hex 02) fixed
2° character [SIGNAL]	<SPACE> (Hex 20) if the weight value is positive <-> (Hex 2D) if the weight value is negative
3° character [WEIGHT 1]	from <0> (Hex 30) to <9> (Hex 39) to indicate the numeric weight value with an eventual decimal point <.> (Hex 2E) or <SPACE> (Hex 20) to cancel the insignificant zeros in front of the number
4° character [WEIGHT 2]	as above
5° character [WEIGHT 3]	as above
6° character [WEIGHT 4]	as above
7° character [WEIGHT 5]	as above
8° character [WEIGHT 6]	as above
9° character [WEIGHT 7]	as above
10° character	<SPACE> (Hex 20) fixed
11° character	<SPACE> (Hex 20) fixed
12° character [STATUS]	<SPACE> (Hex 20) if the instrument is in a normal operative status <F> (Hex 43) if the instrument is in FAIL status <S> (Hex 53) if the instrument is in configuration phase
13° character [CHK 1]	from <0> (Hex 30) to <9> (Hex 39) or from <A> (Hex 41) to <F> (Hex 46) to indicate the higher part of the checksum (for the calculation of the checksum see paragraph 6.3)
14° character [CHK 2]	from <0> (Hex 30) to <9> (Hex 39) or from <A> (Hex 41) to <F> (Hex 46) to indicate the lower part of the checksum
15° character	<CR> (Hex 0D) fixed
16° character	<LF> (Hex 0A) fixed

- **ID485 > 0 (18 characters in length)**

1° character [STX]	(Hex 02) fixed
2° character [ID485 D]	from <0> (Hex 30) to <9> (Hex 39) to indicate the tens of the set ID485 value
3° character [ID485 U]	from <0> (Hex 30) to <9> (Hex 39) to indicate the units of the set ID485 value
4° character [SIGNAL]	<SPACE> (Hex 20) if the weight value is positive <-> (Hex 2D) if the weight value is negative
5° character [WEIGHT 1]	from <0> (Hex 30) to <9> (Hex 39) to indicate the numeric weight value with an eventual decimal point <.> (Hex 2E) or <SPACE> (Hex 20) to cancel the insignificant zeros in front of the number
6° character [WEIGHT 2]	as above
7° character [WEIGHT 3]	as above
8° character [WEIGHT 4]	as above
9° character [WEIGHT 5]	as above
10° character [WEIGHT 6]	as above
11° character [WEIGHT 7]	as above
12° character	<SPACE> (Hex 20) fixed
13° character	<SPACE> (Hex 20) fixed
14° character [STATUS]	<SPACE> (Hex 20) if the instrument is in a normal operative status <F> (Hex 43) if the instrument is in FAIL status <S> (Hex 53) if the instrument is in configuration phase
15° character [CHK 1]	from <0> (Hex 30) to <9> (Hex 39) or from <A> (Hex 41) to <F> (Hex 46) to indicate the higher area of the checksum (for the calculation of the checksum see paragraph 6.3)
16° character [CHK 2]	from <0> (Hex 30) to <9> (Hex 39) or from <A> (Hex 41) to <F> (Hex 46) to indicate the lower area of the checksum
17° character	<CR> (Hex 0D) fixed
18° character	<LF> (Hex 0A) fixed

8.4 Calculation of the checksum

The two ASCII characters which identify the checksum must be calculated in the following way:

1. Calcolate the XOPR binary of all the characters from the 1° to the 12° included in the case of strings of 16 characters (ID485 = 0) or to the 14° included in the case of strings of 18 characters (ID485 > 0).

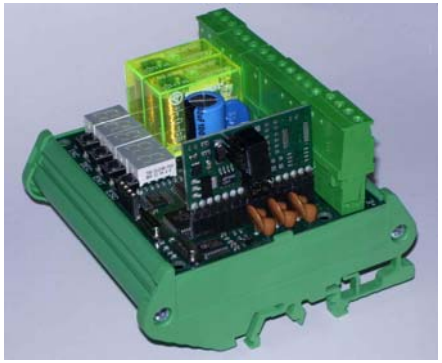
2. Separate the XOR values obtained into a high area (first 4 bit) and a low area (last 4 bit)

3. Code the high area according to the ASCII hex table, which will become the character written in position [CHK 1] (13° character in the case of a string of 16 characters, 15° in the case of a string of 18 characters).
For example the binary value 5 (0101) will become character <5> (Hex 35), or the binary value B (1011) will become character capital <B> (Hex 42).

4. Code the lower area according to the ASCII hex table, which will become the character written in position [CHK 2] (14° character in the case of a string of 16 characters, 16° in the case of a string of 18 characters).
(see previous example)

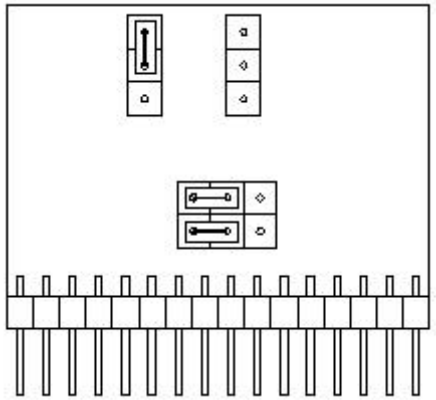
9. ANALOG OUTPUT (HW selection)

The analog output is available in both the 0-10Vand 4-20 mA mode.

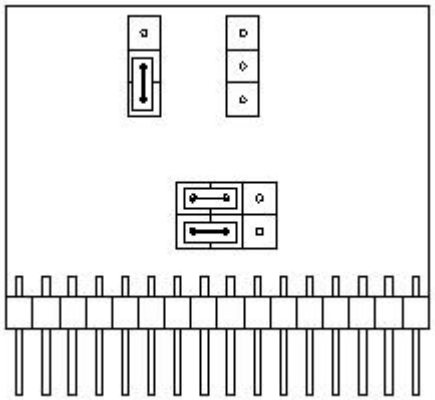


Analog board insertion mode

0-1 0V



4-20 mA



9.1 Analog output compensation

The analog output compensation options are identical for output at **0-10 V** voltage and at **4-20 mA** current.

The compensation of the analog output foresees 3 phases:
1. setting of the analog range (see paragraph 9.2)
2. zero compensation (see paragraph 9.3)
3. full scale compensation (see paragraph 9.4)

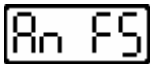
The first phase defines the weight value which shall correspond to the maximum value of the analog output.
For example the full scale weight could be 5000, but the maximum value of the analog output (10 V and 20 mA) may be set at 3000.
In this way for weight values from 0 to 3000 the analog output will move from 0 to 10 V (or from 4 to 20 mA); for higher values the output will remain set at maximum. In the same way, for negative weight values the analog output will remain set at minimum.
The second phase is used to adjust the analog output so that that the zero (minimum possible value) is exactly at 0 V or 4 mA.
The third phase is used to adjust the analog output so that the span (maximum possible value) is exactly at 10 V or 20 mA.

9.2 Setting of the analog range

☞ press **ENT** and then press **INC** until the following word appears

☞ to proceed with the setting of the analog range option press **ENT**, to cancel press **ESC**

☞ press **INC** or press **DEC** until the following writing appears



☞ to proceed with the setting of the analog range option press **ENT**, to cancel press **ESC**

at this point the full scale weight value is visualised (5000 in the example), which must be replaced with the setting of the weight value which corresponds to the maximum analog output.

☞ using the **INC** and **DEC** keys change the values until the desired values are visualised

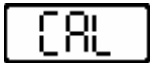
☞ to confirm the visualised value press **ENT**, to cancel press **ESC**

9.3 Zero analog compensation

⚠ To proceed it is necessary to connect a tester to the analog output terminals of the instrument, making sure they are connected correctly.

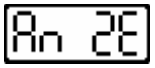
Preset the tester to measure the voltage and current according to the type of T020E output

☞ press the **ENT** key and then the **INC** key until the following word appears on the display



☞ to proceed with the zero compensation of the analog output press **ENT**, to cancel press **ESC**

☞ press the **INC** key or the **DEC** key until the display shows the following word



☞ to proceed with the zero compensation of the analog output press **ENT**, to cancel press **ESC**

at this point a numeric value is visualised, proportional to the voltage or current output value read on the tester

☞ use the **INC** and **DEC** keys to change the value until the tester displays exactly 0 V or 4 mA

☞ to confirm the displayed value press **ENT**, to cancel press **ESC**

9.4 Full scale analog compensation

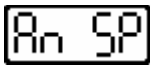
⚠ To proceed it is necessary to connect a tester to the analog output terminals of the instrument, making sure they are connected correctly.

Preset the tester to measure the voltage and current according to the type of T020E output

☞ press the **ENT** key and then the **INC** key until the following word appears on the display

☞ to proceed with the full scale compensation of the analog output press **ENT**, to cancel press **ESC**

☞ press the **INC** key or the **DEC** key until the display shows the following word



☞ to proceed with the full scale compensation of the analog output press **ENT**, to cancel press **ESC**

at this point a numeric value is visualised, proportional to the voltage or current output value read on the tester

☞ use the **INC** and **DEC** keys to change the value until the tester displays exactly 10 V or 20 mA

☞ to confirm the displayed value press **ENT**, to cancel press **ESC**

10. INGRESSO DI AZZERAMENTO

The T020E is equipped with tare input.
The function is activated when the input goes from open to close position. To allow the function use a voltage from 12 to 24 VDC to close the input.
The tare function has effect on the serial output and on the relay thresholds (except for **POS G - NEG G** setting**)**.

☞ The value of total zeroed load can be checked locally on the transmitter by pressing the key **INC**: while the key is pressed the zeroed load value is showed on display.
The zeroed value will lose in case of power off.

IMPORTANT

Keep this instruction manual for consultation by all personnel authorised to operate the instrument for as long as the instrument remains in service.
Additional copies may be ordered from ADOS service centres.
If additional technical information or clarification is required, contact an ADOS service centre.

Revisions = Text underlined & corsive

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Prima Ricerca & Sviluppo

CERTIFICATO DI CONFORMITA'
CERTIFICATE OF CONFORMITY

Ref. n. 07.273
alle prescrizioni tecniche contenute nelle seguenti Norme e/o specifiche tecniche
according to the technical requirements of the following Standard and/or technical specifications

EN 61000-6-4 (2001)
EN 61000-6-2 (2001)

che conferiscono presunzione di conformità ai requisiti di protezione stabiliti dalle Direttive CEE n.
- 2004/108/CE

which give compliance with the protection requirements stated by Directive n. 2004/108/CE

Identificazione del prodotto: *T020E*
Product identification :

Descrizione prodotto: *DIGITAL WEIGHT TRANSMITTER OVERLOAD CONTROL UNIT*
Product description:

Rif. Rapporto tecnico di prova: *EMC.TR. 07.1498*
Ref. Technical test report:

Rilasciato a: *ADOS SRL*
Emitted to: *Via Lazio 25 – 20090 Baccinasco – MI Italy*

Si richiama l'attenzione del Costruttore che il presente Certificato consente di apporre sul prodotto sopradescritto la marcatura di conformità CE e di redigere la Dichiarazione di conformità CE quando sono soddisfatte tutte le altre disposizioni della sopraccitata Direttiva e, qualora sia disciplinato da altre direttive relative ad aspetti diversi e che prevedono l'apposizione della stessa marcatura, di tutte queste altre direttive.
This certificate allows the firm to affix on the above mentioned product the CE marking and to prepare the EC Declaration of conformity when are fulfilled all other requirements of the aforementioned Directive and, where the same product is the subject of other Directives providing for the CE marking, when complies with the relevant requirements of those other Directives.

Faloppio, 06/12/2007

Sig. Giovanni Molteni
Laboratory Manager

European Notified Body and European Competent Body
Prima Ricerca & Sviluppo Srl soggetta a direzione e coordinamento da parte della Giovanni Maspero & C. S.p.A. – C.f. 02634780130
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