TLI40

MICROPROCESSOR BASED DIGITAL ELECTRONIC INDICATOR

OPERATING INSTRUCTIONS

12/01 - Code: ISTR_M_TLI40_E_03_--

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FOREWORD

This manual contains the information necessary for the product to be installed correctly and also instructions for its maintenance and use; we therefore recommend that the utmost attention is paid to the following instructions.
Though this manual has been issued with the greatest care, ASCON TECNOLOGIC will not take any responsibility deriving from its use.
The same applies to each person or Company involved in the issuing of this manual.

ASCON TECNOLOGIC reserves the right to make any formal or functional changes at any moment and without any notice.

INDEX

1 - INSTRUMENT DESCRIPTION

1.1 - GENERAL DESCRIPTION

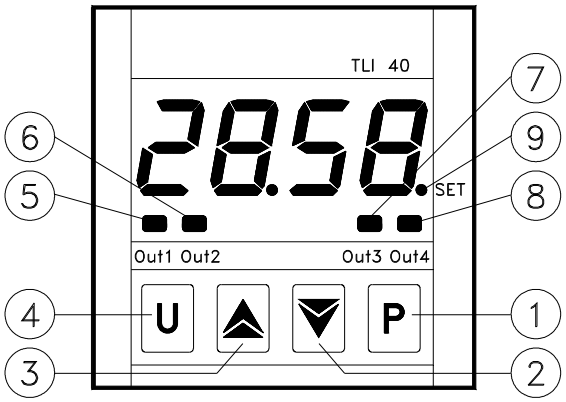
TLI 40 is a digital microprocessor-based indicator.
The input is programmable and accepts:
Temperature probes
- Thermocouples J,K,S,B,C,E,L,N,R,T
- Thermo-resistances PT100,
- Thermistors PTC and NTC
- Infrared sensors mod. ASCON TECNOLOGIC IRS

Normalized analogue signals
- 0/4..20 mA, 0/1..5 V, 0/2..10 V, 0..50/60 mV, 12..60 mV

Potentiometer
- with resistance > 1 KΩ

The instrument can have up to 4 alarm outputs : relay type or can drive solid state relays type (SSR).
One of this output can be analogue type (0/4..20 mA o 0/2..10 V) and used as measurement retransmission output.
The instrument can be equipped with a programmable digital input as an alternative to output OUT4.
Furthermore, the instrument allows for RS485 serial communication using MODBUS-RTU communication protocol and a transmission speed up to 38.400 baud.
The process value is visualized on 4 red displays, while the output status is indicated by 4 LED displays.
Other important available functions are: maximum end minimum peak memory, Hold function, zero calibration (resetting) function and/or auto-ranging for potentiometer input, programmable sampling rate (from 8 to 64 sampl./sec.), parameters protection on different levels.

1.2 - FRONT PANEL DESCRIPTION



1 - Key P : This is used to access the programming parameters and to confirm selection.
2 - Key DOWN : This is used to decrease the values to be set and to select the parameters. If the key is held down, the user returns to the previous programming level until he exits the programming mode. Outside the programming mode it permits visualisation of the minimum peak measure.
3 - Key UP : This is used to in.crease the values to be set and to select the parameters. If the key is held down, the user returns to the previous programming level until he exits the programming mode. Outside the programming mode it permits visualisation of the maximum peak measure.
4 - Key U : This is a key with a function programmable by par. "USrb".
5 - Led OUT1 : indicates the state of output OUT1
6 - Led OUT2 : indicates the state of output OUT2
7 - Led OUT3 : indicates the state of output OUT3
8 - Led OUT4 : indicates the state of output OUT4
9 - Led SET : when flashing, it indicates access to the programming mode.

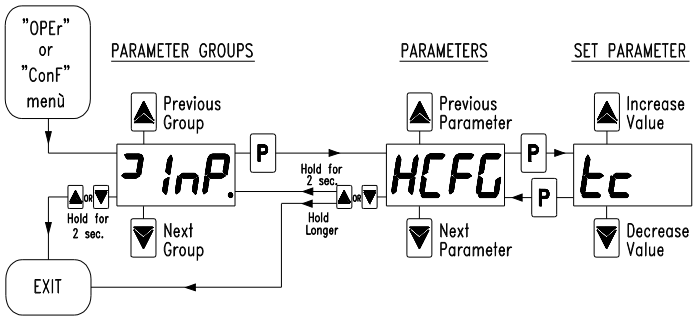
2 - PROGRAMMING

2.1 - PARAMETERS PROGRAMMING

By pushing key "P" and holding it down for approx. 2 sec. it is possible to enter into the main selection menu.
Using the "UP" or DOWN" keys, it is then possible to roll over the selections:

"OPEr"	to enter into the operating parameters menu
"ConF"	to enter into the configuration parameters menu
"rEt"	to exit from the selection and come back to normal functioning

Once the desired item has been selected, push key "P" to confirm.
Selecting "OPEr" and "ConF" gives the possibility of accessing other menus containing additional parameters and more precisely :
"OPEr" – Operating parameters Menu: it's accessible without password, and can contain all the desired parameters (see par. 2.2).
"ConF" – Configuration parameters Menu: this contains all the operating parameters and the functioning configuration parameters. To enter the menu a PASSWORD is required.
To enter the menu **"ConF"**, select the option "ConF" and press the key "P", the display will now show "0".
At this request, enter, using keys "UP" and "DOWN", the number reported on the last page of this manual and push key "P".
If an incorrect password is entered, the instrument returns to the previous state.
If the password is correct, the display will visualise the code identifying the first group of parameters ("**InP**") and with keys "UP" and "DOWN" it will be possible to select the desired group of parameters (see parameters table).
Once the desired group of parameters has been selected, the code identifying the first parameter of the selected group will be visualised by pushing the "P" key.
Again using the "UP" and "DOWN" keys, it is possible to select the desired parameter and, if the key "P" is pressed, the display will alternatively show the parameter's code and its programming value, which can be modified by using the "UP" or "DOWN" keys.
Once the desired value has been programmed, push key "P" once more: the new value will be memorised and the display will show only the code of the selected parameter.
By using the "UP" or "DOWN" keys, it is then possible to select a new parameter (if present) and modify it as described above.
To select another group of parameters, keep the "UP" or "DOWN" key pressed for approx. 2 sec., afterwards the display will return to visualise the code of the group of parameters.
Release the key and by using the "UP" and "DOWN" keys, it will be possible to select a new group.
To exit the programming mode, no key should be pressed for approx. 20 seconds, or keep the "UP" or "DOWN" pressed until exit from the programming mode is obtained.



2.2 - PARAMETERS PROGRAMMING LEVELS

The menu **"ConF"** (protected by password) contains all the parameters, however it is possible to program all desired parameters in the menu **"OPEr"** (without protection by password) by following this procedure:
Enter the menu "ConF" and select the parameter to be made programmable or not programmable in the menu "OPEr".
Once the parameter has been selected, if the LED SET is switched off, this means that the parameter is programmable only in the menu "ConF", if instead the LED is on, this means that the parameter is also programmable in the menu "OPEr".

To modify the visibility of the parameter, push key "U" : the LED SET will change its state indicating the parameter accessibility level (on = menu "OPEr" and "ConF"; off = menu "ConF" only).
To enter the menu **"OPEr"**, select the option "OPEr" and press the key "P".
The display will now show the code identifying the first group of parameters present and by pressing the "UP" and "DOWN" keys it will be possible to select the group of parameters to be modified.
The programming and exit modes for the "OPEr" menu are the same as those described for menu "ConF".

2.3 - FAST PROGRAMMING OF THE ALARM THRESHOLDS

If the alarm outputs are used this procedure permits rapid programming of the the alarm thresholds.
This procedure is possible only if the relative parameters of alarm threshold are present in "OPEr" menu.
The possible modification of these value, with the procedure described, is instead subordinate to what is programmed in par. **"Edit"** (contained in the group " **PAn** ").
This parameter can be programmed as :
= AE : The alarm thresholds can be modified
= AnE : The alarm thresholds can be visualized on the dispay but cannot be modified
Once you have configure the alarm thresholds as "OPEr" parameters to visualize or visualize and program the value push key "P" then release it during the normal state of the instrument.
The display will visualise **"AL n"** (where n is the number of the first configured alarm) alternatively to the programmed value.
To modify the value, press "UP" key to increase it or the "DOWN" key to decrease it (this is possible only if "Edit"=AE).
These keys change the value one digit at a time but if they are pressed for more than one second, the value increases or decreases rapidly and, after two seconds in the same condition, the changing speed increases in order to allow the desired value to be reached rapidly.

Once the desired value has been reached, by pushing key P it is possible to exit by the fast programming mode or it is possible to visualise the other alarm thresholds.
To exit the fast alarm thresholds programming it is necessary to push key P, after the visualisation of the last threshold, or alternatively, if no key is pressed for approx. 15 seconds, the display will return to normal functioning automatically.

3 - INFORMATION ON INSTALLATION AND USE

3.1 - PERMITTED USE

The instrument has been projected and manufactured as a measuring and control device to be used according to EN61010-1 for the altitudes operation until 2000 ms.
The use of the instrument for applications not expressly permitted by the above mentioned rule must adopt all the necessary protective measures.
The instrument CANNOT be used in dangerous environments (flammable or explosive) without adequate protection.
The installer must ensure that EMC rules are respected, also after the instrument installation, if necessary using proper filters.
Whenever a failure or a malfunction of the device may cause dangerous situations for persons, thing or animals, please remember that the plant has to be equipped with additional devices which will guarantee safety.

3.2 – MECHANICAL MOUNTING

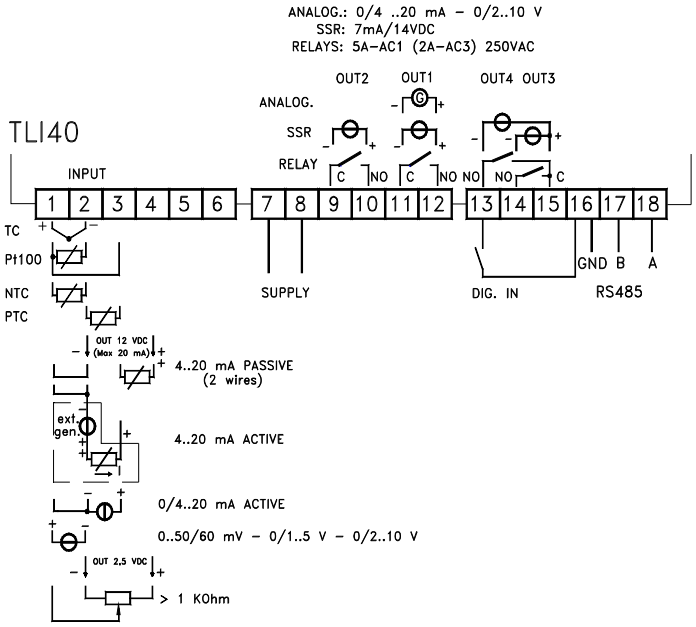
The instrument, in DIN case 48 x 48 mm, is designed for flush-in panel mounting.
Make a hole 45 x 45 mm and insert the instrument, fixing it with the provided special bracket.
We recommend that the gasket is mounted in order to obtain the front protection degree as declared. Avoid placing the instrument in environments with very high humidity levels or dirt that may create condensation or introduction of conductive substances into the instrument.
Ensure adequate ventilation to the instrument and avoid installation in containers that house devices which may overheat or which may cause the instrument to function at a higher temperature than the one permitted and declared.
Connect the instrument as far away as possible from sources of electromagnetic disturbances such as motors, power relays, relays, solenoid valves, etc.
The instrument can be removed from its housing from the front side : it is recommended that the instrument be disconnected from the power supply when it is necessary to carry out this operation.

3.3 - ELECTRICAL CONNECTION

Carry out the electrical wiring by connecting only one wire to each terminal, according to the following diagram, checking that the power supply is the same as that indicated on the instrument and that the load current absorption is no higher than the maximum electricity current permitted.
As the instrument is built-in equipment with permanent connection inside housing, it is not equipped with either switches or internal devices to protect against overload of current: the installation will include a two-phase circuit-breaker, placed as near as possible to the instrument, and located in a position that can easily be reached by the user and marked as instrument disconnecting device which interrupts the power supply to the equipment.
It is also recommended that all the electrical circuits connected to the instrument must be protect properly, using devices (ex. fuses) proportionate to the circulating currents.
It is strongly recommended that cables with proper insulation, according to the working voltages and temperatures, be used.
Furthermore, the input cable of the probe has to be kept separate from line voltage wiring. If the input cable of the probe is screened, it has to be connected to the ground with only one side.
We recommend that a check should be made that the parameters are those desired and that the application functions correctly before connecting the outputs to the actuators so as to avoid malfunctioning that may cause irregularities in the plant that could cause damage to people, things or animals.

Ascon Tecnologic s.r.l. and its legal representatives do not assume any responsibility for any damage to people, things or animals deriving from violation, wrong or improper use or in any case not in compliance with the instrument's features.

3.4 - ELECTRICAL WIRING DIAGRAM



4 - FUNCTIONS

4.1 – MEASURING AND VISUALIZATION

All the parameters referring measurements are contained in the group **"InP".**
By using par. **"HCFG",** it is possible to select the input signal type which may come: from a thermocouple (tc), a thermo-resistance or a thermistor (rtd), from a transducer with normalised analogue signal in current (I), in tension or from potentiometer (UoLt) or also from a signal coming from the communication serial line of the instrument (SEr).
Once the signal type has been selected, it is necessary to set the type of input probe on par. **"SEnS",** which can be :
- for thermocouples J (J), K (CrAL), S (S), B (b), C (C), E (E), L (L), N (n), R (r), T (t) or for infrared sensors serie ASCON TECNOLOGIC IRS – A range - with linearization J (Ir.J) or K (Ir.CA)
- for thermoresistances Pt100 IEC (Pt1) or thermistors PTC KTY81-121 (Ptc) or NTC 103AT-2 (ntc)
- for normalised signals in current 0..20 mA (0.20) or 4..20 mA (4.20)
- for normalised signals in tension 0..50 mV (0.50), 0..60 mV (0.60), 12..60 mV (12.60), 0..5 V (0.5), 1..5 V (1.5), 0..10 V (0.10), 2..10 V (2.10) or from potentiometer (Pot) with resistance > 1 KΩ.

The possibility to use the input with a potentiometer is subordinate to have the auxiliary output supply at 2,5 VDC (see instrument ordering code at par. 7.6).
We recommend that the instrument be switched on and off whenever these parameters are modified, in order to obtain a correct measurement.
For the instruments with input for normalised signals or for potentiometer it is possible to select the sampling rate through par. **"SaSP".**
The parameter can be programmed as:
= 8: 8 sampl./sec. with resolution better than 32.000 steps.
= 16:16 sampl./sec. with resolution better than 16.000 steps.
= 32: 32 sampl./sec. with resolution better than 8.000 steps.
= 64: 64 sampl./sec. with resolution better than 4.000 steps.
For the instruments with input for temperature probes (tc, rtd) it is possible to select the unit of measurement (°C, °F) through par. **"Unit",** and the desired resolution (0=1 °; 1=0,1°) through par. **"dP"**.
Instead, with regards to the instruments with normalised analogue input signals or potentiometers, it is first necessary to program the

desired resolution on par. **"dP"** (0=1; 1=0,1; 2=0,01; 3=0,001) and then, on par. **"SSC"**, the value that the instrument must visualise at the beginning of the scale (0/4 mA, 0/12 mV, 0/1 V o 0/2 V) and, on par. **"FSC",** the value that the instrument must visualise at the end of the scale (20 mA, 50 mV, 60 mV, 5 V or 10 V).
Only for the instruments with potentiometer input, the parameters "SSC" and "FSC" determines the measurement range and the parameter **"0.Pot"** determines the zero value (inside the range "SSC" ... "FSC").
Always for the instruments with potentiometer input it is possible to effect the input setting through auto-ranging (see functioning of key "U") in this case the values of the parameters "SSC", "FSC" and "0.Pot" are automatically calculated by the instrument.
In the case of infrared sensors (TECNOLOGIC IRS-"A" range), by programming the sensor as "Ir.J" or "Ir.CA", the par. "**rEFL**" is also present and it allows the correction of possible measuring errors caused by the environment lighting and by the reflectivity of the material. This parameter should be programmed with a high value if the material to be measured is particularly bright / reflective and must be reduced if the surface is particularly dark / not reflective, keeping in mind however that for most materials, the recommended value is within 1.00 and 0.80.
The instrument allows for measuring calibration, which may be used to recalibrate the instrument according to application needs, by using par. **"OFSt"** and **"rot".**
Programming par. "rot"=1,000, in par. "OFSt" it is possible to set a positive or negative offset that is simply added to the value read by the probe before visualisation, which remains constant for all the measurements.
If instead, it is desired that the offset set should not be constant for all the measurements, it is possible to operate the calibration on any two points.
In this case, in order to decide which values to program on par. "OFSt" and "rot", the following formulae must be applied :

"rot" = (D2-D1) / (M2-M1) "OFSt" = D2 - ("rot" x M2)

where:
M1 =measured value 1
D1 = visualisation value when the instrument measures M1
M2 =measured value 2
D2 = visualisation value when the instrument measures M2
It then follows that the instrument will visualise :

DV = MV x "rot" + "OFSt"

where: DV = visualised value MV= measured value
Example 1: It is desired that the instrument visualises the value effectively measured at 20° but that, at 200°, it visualises a value lower than 10° (190°).
Therefore : M1=20 ; D1=20 ; M2=200 ; D2=190
"rot" = (190 - 20) / (200 - 20) = 0,944
"OFSt" = 190 - (0,944 x 200) = 1,2
Example 2: It is desired that the instrument visualises 10° whilst the value actually measured is 0°, but, at 500° it visualises a 50° higher value (550°).
Therefore : M1=0 ; D1=10 ; M2=500 ; D2=550
"rot" = (550 - 10) / (500 - 0) = 1,08
"OFSt" = 550 - (1,08 x 500) = 10
By using par. **"FiL"** it is possible to program time constant of the software filter for the input value measured, in order to reduce noise sensitivity (increasing the time of reading).
Using par. **"diSP",** located in the group **"]PAn",** it is possible to set normal visualization of the display which can be the measure (dEF) or the alarm threshold AL1, 2, 3 or 4 (AL1, AL2, AL3 or AL4).

4.2 - PEAK VALUES MEMORIZATION AND HOLD FUNCTION

The instrument memorizes the highest and lowest peak measurement values.
To visualize such values simply press the **UP** key to visualize the highest peak or the **DOWN** key for the lowest peak during normal operation of the instrument.
When the instrument is switched off, such values are always re-set. However, it is also possible to re-set these values if the instrument is switched on by using the U key that has been suitably programmed (see par. U key with function "USrb" = r.Pic) or through the suitably programmed digital input (see par. digital input with function "dIF" = r.Pic).
Again, using the U key or the suitably programmed digital input, it is possible to visualize the difference between the two peaks on the display (see par. U key and digital input with function "USrb" = d.Pic and "dIF" = d.Pic).
Besides the function of the peak values, the instrument also has a HOLD function through which it is possible to lock the visualization of the display on the measured value.
This function can be operated using the U key or the suitably programmed digital input (see par. U key and digital input with function "USrb" = Hold and "dIF" = Hold).
When the HOLD function is actived, the instrument works on the alarms in operation depending on the memorized measurement.

4.3 - OUTPUT CONFIGURATION

The instrument's outputs (if present) can be programmed by entering the group of parameters **"]O1", "]O2", "]O3", "]O4"**, where different parameters (depending on the type of outputs –digital or analogue- available on the instrument) are located.
Note: In the following examples, the number of outputs is generically indicated with **n**

- DIGITAL OUTPUTS relay or SSR type :

Within the selected group only the par. **"OnF"** will be present**.**
This parameter can be set for the following functions :
= ALno : Alarm output normally open
= ALnc : Alarm output normally closed
= OFF : Output deactivated
The coupling [outputs number – alarms number] can be effectuated in the group relative to the alarm ("]AL1","]AL2", "]AL3" or "]AL4").

- ANALOGICAL OUTPUTS 0/4..20 mA or 0/2..10 V (only OUT1):

The parameter **"Aor1"** will present within the group "]O1", with which it is possible to set the beginning of the scale used for the output.
This parameter will therefore be set at:
= 0 : if one intends to use the beginning of the scale as equal to 0 (0 mA if the output is 0/4...20 mA, or 0 V if the output is 0/2...10 V)
= no_0 : if one intends to use the beginning of the scale other than 0 (4 mA if the output is 0/4...20 mA, or 2 V if the output is 0/2...10 V)
The parameter **"Ao1F"** will be present by which it is possible to configure the function of the analogical output as:
= r.inP : measurement retransmission output
= r.SEr : output led by serial communication line of the instrument
= OFF : deactivated output
In the case that the analogical output function should be configured for the retransmission of the signal, it is therefore necessary to programme another two parameters which set the minimum and maximum reference values.
Therefore, in these cases, set the parameter **"Ao1L"** with the value that the instrument must provide the minimum value (0/4 mA or 0/2 V) in output and the value to which the instrument must provide the maximum value (20 mA o 10 V) to the parameter **"Ao1H"** in output.

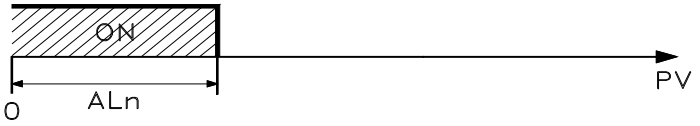
4.4 – ALARM FUNCTION (AL1, AL2, AL3, AL4)

4.4.1 – ALARM OUTPUT CONFIGURATION

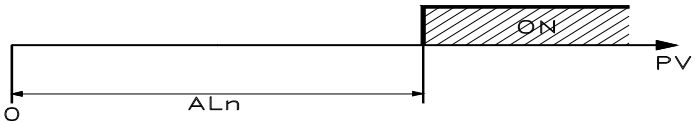
The alarms depend on the measured value (AL1, AL2, AL3, AL4) and before setting them to work, it is necessary to know which output the alarm has to correspond to.
First of all it is necessary to configure in the groups of parameters **"]O "**, the parameters relative to the outputs required as alarm ("O1F" , "O2F" ,"O3F" ,"O4F"), programming the parameter relating to the desired output as follows :
= ALno if the alarm output has to be ON when the alarm is active, while it is OFF when the alarm is not active
= ALnc if the alarm output has to be ON when the alarm is not active, while it is OFF when the alarm is active
Note: In the following examples the alarm's number is generally indicated as **n**
Access the group **"]ALn",** relating to the alarm to be set and program which output the alarm signal must be sent to on par. **"OALn"**.
The alarm functioning is instead defined by parameters :
"ALnt " – ALARM TYPE

"Abn" – ALARM CONFIGURATION
"ALn" – ALARM THRESHOLD
"ALnL" – LOW ALARM THRESHOLD (for band alarm) OR MINIMUM SET OF ALn ALARM THRESHOLD (for low or high alarm)
"ALnH" - HIGH ALARM THRESHOLD (for band alarm) OR MAXIMUM SET OF ALn ALARM THRESHOLD (for low or high alarm)
"HALn" - ALARM HYSTERESIS
"ALnd" – ALARM ACTIVATION DELAY (in sec.)
"ALni" – ALARM BEHAVIOUR IN THE EVENT OF MEASUREMENT ERROR

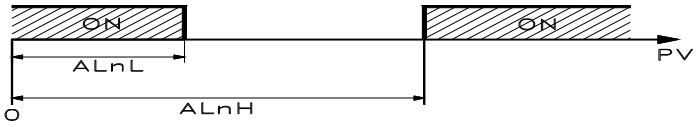
"ALnt" – ALARM TYPE : the alarm output can behave in six different ways.
LoAb = ABSOLUTE LOW ALARM: The alarm is activated when the process value goes below the alarm threshold set on parameter "ALn". With this mode is possible to program the minimum and the maximum set of "ALn" by "ALnL" and "ALnH" parameters.



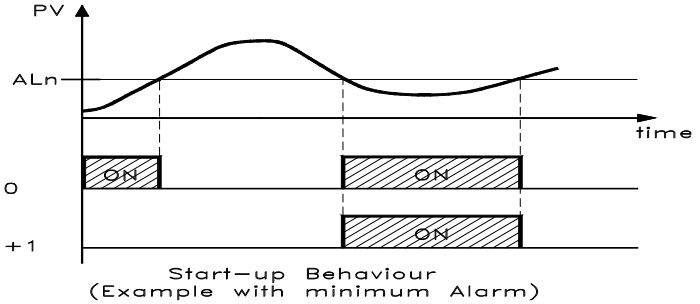
HiAb = ABSOLUTE HIGH ALARM: The alarm is activated when the process value goes higher than the alarm threshold set on parameter "ALn". With this mode is possible to program the minimum and the maximum set of "ALn" by "ALnL" and "ALnH" parameters.



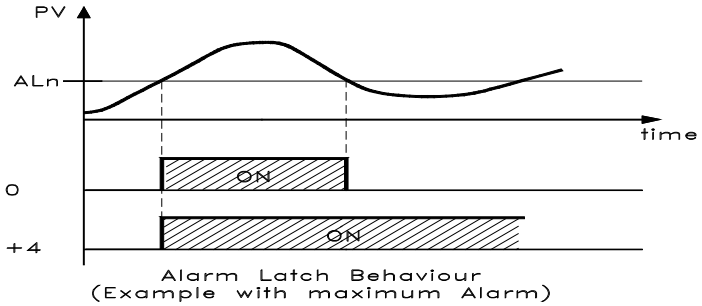
LHAb = ABSOLUTE BAND ALARM: The alarm is activated when the process value goes under the alarm threshold set on parameter "ALnL" or goes higher than the alarm threshold set on parameter "ALnH".



"**Abn" - ALARM CONFIGURATION:** This parameter can assume a value between 0 and 15.
The number to be set, which will correspond to the function desired, is obtained by adding the values reported in the following descriptions :
ALARM BEHAVIOUR AT SWITCH ON: the alarm output may behave in two different ways, depending on the value added to par. "Abn".
+0 = NORMAL BEHAVIOUR: The alarm is always activated when there are alarm conditions.
+1 = ALARM NOT ACTIVATED AT SWITCH ON: If, when switched on, the instrument is in alarm condition, the alarm is not activated. It will be activated only when the process value is in non-alarm conditions and then back in alarm conditions.



ALARM DELAY: the alarm output may behave in two different ways depending on the value added to par. "Abn".
+0 = ALARM NOT DELAYED: The alarm is immediately activated when the alarm condition occurs.
+2 = ALARM DELAYED: When the alarm condition occurs, delay counting begins, as programmed on par. "ALnd" (expressed in sec.) and the alarm will be activated only after the elapsing of that time.
ALARM LATCH: : the alarm output may behave in two different ways depending on the value added to par. "Abn".
+ 0 = ALARM NOT LATCHED: The alarm remains active in alarm conditions only.
+ 4 = ALARM LATCHED: The alarm is active in alarm conditions and remains active even when these conditions no longer exist, until the correctly programmed key "U", ("USrb"=Aac) has been pushed.

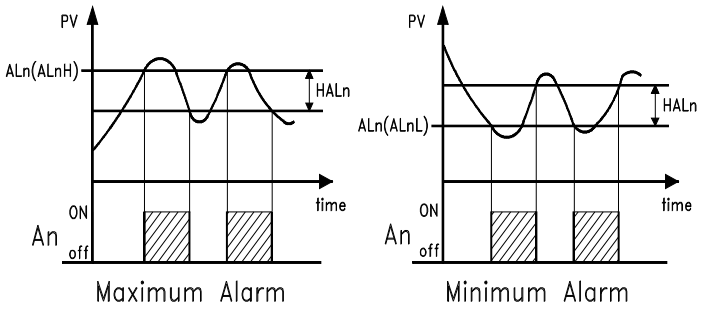


ALARM AKNOWLEDGEMENT: : the alarm output may behave in two different ways depending on the value added to par. "Abn".
+ 0 = ALARM NOT AKNOWLEDGED: The alarm always remains active in alarm conditions.
+ 8 = ALARM AKNOWLEDGED: The alarm is active in alarm conditions and can be deactivated by key "U" if properly programmed ("USrb"=ASi), and also if alarm conditions still exist.

"ALni" - ALARM ACTIVATION IN CASE OF MEASUREMENT ERROR: This allows one to establish how the alarm have behave in the event of a measurement error (yES=alarm active; no=alarm deactivated).

4.4.2 - ALARMS HYSTERESIS

The alarm function depend s on alarm hysteresis (par. "HALn"), which works in asymmetric way.
In the event of low alarm, the alarm will be activated when the process value goes below the alarm threshold value and will be deactivated when it goes above the alarm threshold + "HALn" ; in case of high alarm, the alarm will be activated when the process value goes above the alarm threshold value and will be deactivated when it goes below the alarm threshold - "HALn".



For the band alarms, the example of the low alarm is applicable to the low threshold ("ALnL") while the example of the high alarm is applicable to the high threshold ("ALnH").

4.5 - FUNCTIONING OF KEY "U"

The function of key "U" can be set through par. **"USrb"** contained in the group **""[]PAn".**
The parameter can be programmed as :
= noF : no function
= Aac : Pushing the key for 1 sec. at least, it is possible to acknowledge the alarm. (see par. 4.4.1)
= ASi : Pushing the key for 1 sec. at least, it is possible to acknowledge an active alarm (see par. 4.4.1)
= HoLd: Pushing the key the measurement taken at that moment is blocked (N.B.: not the reading on the display, therefore the indication may stabilise itself with a delay that is proportional to the measuring filter). With the hold function turned on, the instrument carries out control according to the memorised measurement.

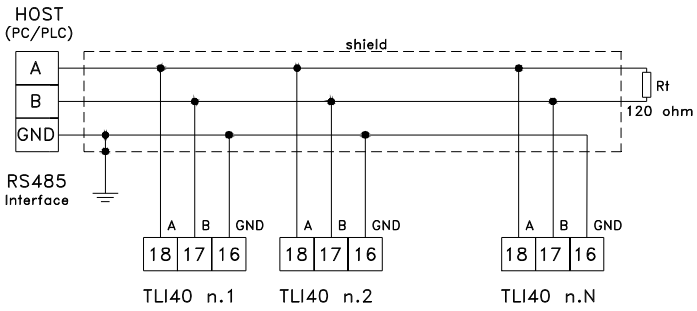
Releasing the key, the instrument starts normal measurement acquisition once more.
= d.Pic: Pressing the key, the maximum variation of the measurement recorded since the instrument was switched on is visualized on the display (highest peak - lowest peak).
= 0.Pot: For the instruments equipped with a potentiometer input, it is possible to set the "zero" value with this function. Pressing the key for at least 1 sec., the display will show the writing **"0.Pot"** for approx. 1 sec, and then "0", assuming the value measured in that instant as 0 .
= r.Pic: Pressing the key, the highest and lowest peak values are re-set.
= r.P0P: For the instruments equipped with potentiometer input, it is possible to set the "zero" value and contemporarily re-set the highest and lowest peak values with this function . Pressing the key for at least 1 sec., the display will show the writing **"r.P0P"** for approx. 1 sec., and then "0", assuming the value measured in that instant as 0 and re-setting the memorized peak values.
= t.Pot: For the instruments equipped with potentiometer input, with this function it is possible to set the points of measurement of the potentiometer by means of auto-ranging procedure through which the parameters "SSC", "FSC" and "0.Pot." are automatically re-calculated.
Pressing the key for at least 1 sec., the display will show **"P1"** alternatively to the value of the first point of setting. Now, position the potentiometer at the first point of setting and program the value desired for that point using the UP and DOWN keys. Once the value has been set, press the P key : the instrument will memorize the value and the display will show **"P2"** alternatively to the value of the second point of setting. Position the potentiometer at the second point of setting and program the value desired for that point using the UP and DOWN keys. Pressing the P key, the second value is also acquired and the instrument will automatically exit from the self-learning mode, re-calculating the measuring range.

4.6 – DIGITAL INPUT

The instrument can also be equipped (in alternative to OUT4) with a digital input whose function can be set by the parameter **"diF"** contained in the group **"]InP".**
The parameter can be programmed as:
= noF : the input does not carry out any function
= AaC : By closing the contact connected to the digital input, it is possible to reset a memorised alarm (see par. 4.4.1)
= ASi: By closing the contact connected to the digital input, it is possible to silence an active alarm (see par. 4.4.1)
= HoLd: By closing the contact connected to the digital input the measurement taken at that moment is blocked (N.B.: not the reading on the display, therefore the indication may stabilise itself with a delay that is proportional to the measuring filter). With the hold function turned on, the instrument carries out control according to the memorised measurement. By opening the contact, the instrument starts normal measurement acquisition once more.
= r.Pic: By closing the contact connected to the digital input the highest and lowest peak values are re-set.
= 0.Pot: For the instruments equipped with a potentiometer input, it is possible to set the "zero" value with this function. By closing the contact connected to the digital input assuming the value measured in that instant as 0 .
= r.P0P: For the instruments equipped with potentiometer input, it is possible to set the "zero" value and contemporarily re-set the highest and lowest peak values with this function . By closing the contact connected to the digital input assuming the value measured in that instant as 0 and re-setting the memorized peak values.

4.7 - RS 485 SERIAL INTERFACE

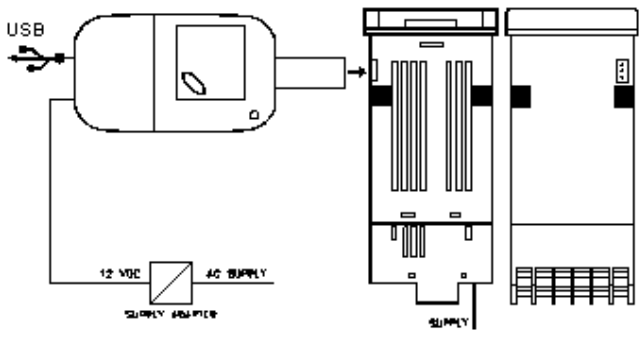
The instrument can be equipped with a RS 485 serial communication interface, by means of which it is possible to connect the regulator with a net to which other instruments (regulators of PLC) are connected, all depending typically on a personal computer used as plant supervisor. Using a personal computer it is possible to acquire all the function information and to program all the instrument's configuration parameters. The software protocol adopted for TLI40 is a MODBUS RTU type, widely used in several PLC and supervision programs available on the market (TLI protocol manual is available on request).
The interface circuit allows the connection of up to 32 instruments on the same line.
To maintain the line in rest conditions a 120 Ohm resistance (Rt) must be connected to the end of the line.
The instrument is equipped with two terminals called A and B which have to be connected with all the namesake terminals of the net. For the wiring operation they must be interlaced with a double cable (telephonic type) and all the GND terminals must be connected to the ground. Nevertheless, particularly when the net results very long or noised and being present potential differences between the GND terminals, it is advisable to adopt a screened cable wired as in the drawing.



If the instrument is equipped with a serial interface, the parameters to be programmed are the following, all present in the parameters group **"]SEr"** :
"Add" : Address of the station. Set a different number for each station, from 1 to 255.
"baud" : Transmission speed (baud-rate), programmable from 1200 to 38400 baud. All the stations have to have the same transmission speed.
"PACS" : Programming access. If programmed as "LoCL" this means that the instrument is only programmable from the keyboard, if programmed as "LorE" it is programmable both from the keyboards and serial line.
If an attempt is made to enter the programming from the keyboard whilst a communication through the serial port is in progress the instrument will visualise **"buSy"** to indicate the busy state.

4.8 - PARAMETERS CONFIGURATION BY "A01"

It is possible the transfer from and toward the instrument of the functioning parameters through the device **A01** with 5 poles connector.
This device A01 it's mainly useable for the serial programming of the instruments which need to have the same parameters configuration or to keep a copy of the programming of an instrument and allow its rapid retransmission.
The same device can connect the instrument via USB to a PC and through the proper configuration software tools "TECNOLOGIC UniversalConf", it's possible to configure the operating parameters.
To use the device A01 it's necessary that the device or instrument are being supplied.



For additional info, please have a look at the A01 instruction manual.

5 - PROGRAMMABLE PARAMETERS

Here following are described all the parameters available on the instrument. Some of them could be not present or because they are depending on the type of instrument or because they are automatically disabled as unnecessary.

5.1 - PARAMETERS TABLE

Group "InP" (parameters relative to the measure input)

Par.		Description	Range	Def.	Note
1	**HCFG**	Input type	tc / rtd / I / UoLt / SEr	tc	
2	**SaSP**	Sampling rate in case of input with V / I or Pot signals	8-16-32-64	8	
3	**SEnS**	Probe type	tc : J / CrAL / S / Ir.J / Ir.CA rtd : Pt1 / Ptc / ntc I : 0.20 / 4.20 UoLt : 0.50 / 0.60 / 12.60 / 0.5 / 1.5 / 0.10 / 2.10 / Pot	J	
4	**rEFL**	Reflection coefficient for IRS sensors	0.10 ÷ 1.00	1.00	
5	**SSC**	Low scale limit in case of input with V/I signals	-1999 ÷ FSC	0	
6	**FSC**	High scale limit in case of input with V/I signals	SSC ÷ 9999	0	
7	**0.Pot**	Zero value with potentiometer input	SSC ÷ FSC	0	
8	**dP**	Number of decimal figures	tc/rtd : 0 / 1 UoLt / I / SEr: 0 ÷ 3	0	
9	**Unit**	Temperature unit of measurement	tc/rtd : °C / °F	°C	
10	**FiL**	Input digital filter	0FF÷ 20.0 sec.	0.2	
11	**OFSt**	Measuring Offset	-1999 ÷ 9999	0	
12	**rot**	Rotation of the measuring straight line	0.000 ÷ 2.000	1.000	
13	**dIF**	Digital input function	noF / Aac / ASi / HoLd / r.Pic / 0.Pot / r.P0P	noF	

Group "O1" (parameters relative to output 1)

Par.		Description	Range	Def.	Note
14	**O1F**	Functioning of output 1 if digital type	ALno / ALnc Ser / OFF	ALno	
15	**Aor1**	Beginning of output 1 scale if analogical type	0 / no_0	0	
16	**Ao1F**	Functioning of output 1 if analogue type	r.inP / r.SEr OFF	r.inP	
17	**Ao1L**	Minimum reference for analogical output 1 for signal retransmission	-1999 ÷ Ao1H	0	
18	**Ao1H**	Maximum reference for analogical output 1 for signal retransmission	Ao1L ÷ 9999	0	

Group "O2" (parameters relative to output 2)

Par.		Description	Range	Def.	Note
19	**O2F**	Functioning of output 2	ALno / ALnc Ser / OFF	ALno	

Group "O3" (parameters relative to output 3)

Par.		Description	Range	Def.	Note
20	**O3F**	Functioning of output 3	ALno / ALnc Ser / OFF	ALno	

Group "O4" (parameters relative to output 4)

Par.		Description	Range	Def.	Note
21	**O4F**	Functioning of output 4	ALno / ALnc Ser / OFF	ALno	

Group "AL1" (parameters relative to alarm AL1)

Par.		Description	Range	Def.	Note
22	**OAL1**	Output where alarm AL1 is addressed	Out1 / Out2 Out3 / Out4 OFF	OFF	
23	**AL1t**	Alarm AL1 type	LoAb / HiAb LHAb	LoAb	
24	**Ab1**	Alarm AL1 functioning	0 ÷ 15	0	
25	**AL1**	Alarm AL1 threshold	AL1L÷ AL1H	0	
26	**AL1L**	Low threshold band alarm AL1 or Minimum set alarm AL1 for high or low alarm	-1999 ÷ AL1H	-1999	
27	**AL1H**	High threshold band alarm AL1 or Maximum set alarm AL1 for high or low alarm	AL1L ÷ 9999	9999	
28	**HAL1**	Alarm AL1 hysteresis	OFF ÷ 9999	1	
29	**AL1d**	Activation delay of alarm AL1	OFF ÷ 9999 sec.	OFF	
30	**AL1i**	Alarm AL1 activation in case of measuring error	no / yES	no	

Group "AL2" (parameters relative to alarm AL2)

Par.		Description	Range	Def.	Note
31	**OAL2**	Output where alarm AL2 is addressed	Out1 / Out2 Out3 / Out4 OFF	OFF	
32	**AL2t**	Alarm AL2 type	LoAb / HiAb LHAb	LoAb	
33	**Ab2**	Alarm AL2 functioning	0 ÷ 15	0	
34	**AL2**	Alarm AL2 threshold	AL2L÷ AL2H	0	
35	**AL2L**	Low threshold band alarm AL2 or Minimum set alarm AL2 for high or low alarm	-1999 ÷ AL2H	-1999	
36	**AL2H**	High threshold band alarm AL2 or Maximum set alarm AL2 for high or low alarm	AL2L ÷ 9999	9999	
37	**HAL2**	Alarm AL2 hysteresis	OFF ÷ 9999	1	
38	**AL2d**	Activation delay of alarm AL2	OFF ÷ 9999 sec.	OFF	
39	**AL2i**	Alarm AL2 activation in case of measuring error	no / yES	no	

Group "AL3" (parameters relative to alarm AL3)

Par.		Description	Range	Def.	Note
40	**OAL3**	Output where alarm AL3 is addressed	Out1 / Out2 Out3 / Out4 OFF	OFF	
41	**AL3t**	Alarm AL3 type	LoAb / HiAb LHAb	LoAb	
42	**Ab3**	Alarm AL3 functioning	0 ÷ 15	0	
43	**AL3**	Alarm AL3 threshold	AL3L÷ AL3H	0	
44	**AL3L**	Low threshold band alarm AL3 or Minimum set alarm AL3 for high or low alarm	-1999 ÷ AL3H	-1999	
45	**AL3H**	High threshold band alarm AL3 or Maximum set alarm AL3 for high or low alarm	AL3L ÷ 9999	9999	
46	**HAL3**	Alarm AL3 hysteresis	OFF ÷ 9999	1	
47	**AL3d**	Activation delay of alarm AL3	OFF ÷ 9999 sec.	OFF	

48	**AL3i**	Alarm AL3 activation in case of measuring error	no / yES	no	

Group "AL4" (parameters relative to alarm AL4)

Par.		Description	Range	Def.	Note
49	**OAL4**	Output where alarm AL4 is addressed	Out1 / Out2 Out3 / Out4 OFF	OFF	
50	**AL4t**	Alarm AL4 type	LoAb / HiAb LHAb	LoAb	
51	**Ab4**	Alarm AL4 functioning	0 ÷ 15	0	
52	**AL4**	Alarm AL4 threshold	AL4L÷ AL4H	0	
53	**AL4L**	Low threshold band alarm AL4 or Minimum set alarm AL4 for high or low alarm	-1999 ÷ AL4H	-1999	
54	**AL4H**	High threshold band alarm AL4 or Maximum set alarm AL4 for high or low alarm	AL4L ÷ 9999	9999	
55	**HAL4**	Alarm AL4 hysteresis	OFF ÷ 9999	1	
56	**AL4d**	Activation delay of alarm AL4	OFF ÷ 9999 sec.	OFF	
57	**AL4i**	Alarm AL4 activation in case of measuring error	no / yES	no	

Group "PAn" (parameters relative to the user interface)

Par.		Description	Range	Def.	Note
58	**USrb**	Functioning of key "U"	noF / Aac ASi / HoLd d.Pic / 0.Pot / r.Pic / r.P0P / t.Pot	noF	
59	**diSP**	Variable visualized on the display	dEF / AL1 AL2 / AL3 / AL4	dEF	
60	**Edit**	Fast programming of alarms threshold	AE / AnE	AE	

Group "SEr" (parameters relative to the serial communication)

Par.		Description	Range	Def.	Note
61	**Add**	Station address in case of serial communication	0 … 255	1	
62	**baud**	Transmission speed (Baud rate)	1200 / 2400 / 9600 / 19.2 / 38.4	9600	
63	**PACS**	Access at the programming through serial port	LoCL / LorE	LorE	

5.2 - PARAMETERS DESCRIPTION

GROUP " InP" (PARAMETERS RELATIVE TO THE INPUTS): These permit the definition of visualization modes of the variable measured by the probe.

HCFG – INPUT TYPE : This permits selection of the input type : thermocouples (tc), thermo-resistances or thermistors (rtd), normalized signals in current (I), in voltage or potentiometer (UoLt) or a measurement coming from the serial line (SEr).

SaSP - SAMPLING RATE IN CASE OF INPUT WITH V/I OR POTENTIOMETER SIGNALS: For the instruments with input for normalised signals or for potentiometer This permits selection of the sampling rate . The parameter can be programmed as:
= 8: 8 sampl./sec. with resolution better than 32.000 steps.
= 16:16 sampl./sec. with resolution better than 16.000 steps.
= 32: 32 sampl./sec. with resolution better than 8.000 steps.
= 64: 64 sampl./sec. with resolution better than 4.000 steps.

SEnS – PROBE TYPE: Depending on what is programmed on par. "HCFG" this permits the type of probe to be selected :
- for thermocouples ("HCFG"=tc): J (J), K (CrAL), S (S), B (b), C (C), E (E), L (L), N (n), R (r), T (t), or for TECNOLOGIC infrared sensors IRS series range A with linearization J (Ir.J) or K (Ir.CA)
- thermoresistances/thermistors ("HCFG"=rtd): Pt100 IEC (Pt1) or thermistors PTC KTY81-121 (Ptc) or NTC 103AT-2 (ntc)
- normalized signals in current ("HCFG"=I): 0..20 mA (0.20) or 4..20 mA (4.20)
- normalized signals in voltage ("HCFG"=UoLt): 0..50 mV (0.50), 0..60 mV (0.60), 12..60 mV (12.60), 0..5 V (0.5), 1..5 V (1.5), 0..10 V (0.10) or 2..10 V (2.10), or potentiometer (Pot) with resistance > 1 KΩ.

rEFL - REFLECTION COEFFICIENT FOR IRS SENSORS: this can be used only when "SEnS" = Ir.J or Ir.CA and allows any measuring errors caused by the environment's lighting and the reflexivity of the material to be corrected. Set this parameter to a high value when the material to be measured is particularly light/reflective and reduce it when the surface is especially dark/non-reflective , keeping in mind however that for most materials, the recommended value is between 1.00 and 0.80.

SSC – LOW SCALE LIMIT IN EVENT OF INPUT WITH V/I SIGNALS : This is the value the instrument has to visualise when the minimum value that can be measured on the scale (0/4 mA, 0/12 mV, 0/1 V or 0/2 V) is present at the output.

FSC – HIGH SCALE LIMIT IN EVENT OF INPUT WITH V/I SIGNALS : This is the value the instrument has to visualise when the maximum value that can be measured on the scale (20 mA, 50 mV, 60 mV, 5 V or 10 V) is present at the input.

0.Pot - ZERO VALUE FOR POTENTIOMETER INPUT: This is only usable when "SEnS" = Pot and allows the value to be established within the range SSC... FSC, for which the indication of the instrument is 0.

dP – NUMBER OF DECIMAL FIGURES: This allows determination of the measuring resolution as 1 (0), 0.1 (1), 0.01 (2), 0.001 (3). In the case of temperature probes the allowed resolutions are 1° (0) and 0.1° (1).

Unit – TEMPERTURE UNIT OF MEASUREMENT : When the temperature is measured by temperature probes, this parameter permits definition if the visualisation is expressed as degree Centigrade (°C) or Fahrenheit (°F).

Filt – INPUT DIGITAL FILTER : This permits programming of the constant of time of the software filter referring to the measured input value (in sec.) in order to reduce noise sensitivity (increasing the time of reading).

OFSt – MEASURING OFFSET: Positive or negative Offset which is added to the value measured by the probe.

rot – ROTATION OF THE MEASURING STRAIGHT LINE: In this way the offset programmed on par. "OFSt" is not constant for all measurements. By programming "rot"=1.000, the value "OFSt" is simply added to the value read by the probe before visualisation and it remains constant for all the measurements. If instead one does not want the programmed offset to be constant for all the measurements, it is possible to carry out calibration on two desired values.

In this case, to define the values to be programmed on par. "OFSt" and "rot", it is necessary to enforce the following formulae :

"rot" = (D2-D1) / (M2-M1) **"OFSt" = D2 - ("rot" x M2)**

where: M1 =measured value 1; D1 = visualisation value when the instrument measures M1
M2 =measured value. 2; D2 = visualisation value when the instrument measures M2
It then follows that the instrument will visualise : **DV = MV x "rot" + "OFSt"**
where: DV = visualised value; MV= measured value

dIF - DIGITAL INPUT FUNCTION: this allows the digital input function to be defined as:
= noF : the input does not carry out any function
= Aac : By closing the contact connected to the digital input it is possible to reset a memorised alarm
= ASi :By closing the contact connected to the digital input it is possible to silence an active alarm
= HoLd : By closing the contact connected to the digital input the measurement taken at that moment is blocked (N.B.: not the reading on the display, therefore the indication may stabilise itself with a delay that is proportional to the measuring filter). With the hold function turned on, the instrument carries out control according to the memorised measurement. By opening the contact, the instrument starts normal measurement acquisition once more.

= r.Pic:By closing the contact connected to the digital input the values of higher and lower peaks are reset.
= 0.Pot: For the instruments equipped with potentiometer input, with this function it is possible to set the “zero” value. By closing the contact connected to the digital input the instrument will set as 0 the value measured in that instant.
= r.P0P: For the instruments equipped with potentiometer input, with this function it is possible to set the “zero” value and contemporarily reset the higher and lower peaks values. By closing the contact connected to the digital input the instrument will set as 0 the value measured in that instant and resetting the memorized peaks values.

GROUP “] O1” (PARAMETERS RELATIVE TO OUTPUT OUT1): They permit to program the output OUT1 functioning.
O1F – FUNCTIONING OF OUTPUT OUT 1 DIGITAL TYPE: This defines the functioning of output OUT 1 as: alarm output as normally open (ALno), output alarm normally closed (ALnc), output not used (OFF).
Aor1 - BEGINNING OF OUTPUT SCALE 1 ANALOGICAL TYPE: This allows the beginning of the analogical output OUT1 to be set. This parameter will therefore be set with: "0" if one intends to use the beginning of the scale as being equal to 0 (0 mA, or 0 V) or "no_0" if one intends to use the beginning of the scale as being other than 0 (4 mA, or 2 V).
Ao1F - ANALOGICAL OUTPUT OUT1 FUNCTION: This determines the function of the OUT 1 output as: measurement retransmission output (r.inP), output guided by the instrument’s serial communications line (rSEr), output not used (OFF).
Ao1L - MINIMUM REFERENCE FOR ANALOGICAL OUTPUT OUT 1 FOR SIGNAL RETRANSMISSION: in the event that the analogical output function is configured for the retransmission of the signal, set this parameter with the value to which the instrument must supply the minimum value in output (0/4 mA or 0/2 V)
Ao1H - MAXIMUM REFERENCE FOR ANALOGICAL OUTPUT OUT 1 FOR SIGNAL RETRANSMISSION: in the event that the analogical output function is configured for the retransmission of the signal, set this parameter with the value to which the instrument must supply the maximum value in output (20 mA or 10 V).

GROUP “] O2” (PARAMETERS RELATIVE TO OUTPUT OUT2): They permit to program the output OUT2 functioning.
O2F - FUNCTIONING OF OUTPUT OUT 2 DIGITAL TYPE: Equal to “O1F” but referred to output OUT2.

GROUP “] O3” (PARAMETERS RELATIVE TO OUTPUT OUT3): They permit to program the output OUT3 functioning.
O3F – FUNCTIONING OF OUTPUT OUT 3 DIGITAL TYPE: Equal to “O1F” but referred to OUT3.

GROUP “] O4” (PARAMETERS RELATIVE TO OUTPUT OUT4): They permit to program the output OUT4 functioning.
O4F – FUNCTIONING OF OUTPUT OUT 4 DIGITAL TYPE: Equal to “O1F” but referred to OUT4.

GROUP “]AL1” (PARAMETERS RELATIVE TO ALARM AL1): These permit setting of the process alarm AL1 function.
OAL1 – OUTPUT WHERE ALARM AL1 IS ADDRESSED: It defines to which output the alarm AL1 has to be addressed.
AL1t – ALARM AL1 TYPE: permits the choice of behaviour for alarm A1, by 3 different selections:
= LoAb – ABSOLUTE LOW ALARM : The alarm is activated when the process value goes below the alarm threshold set on parameter "AL1".
= HiAb - ABSOLUTE HIGH ALARM: The alarm is activated when the process value goes above the alarm threshold set on parameter "AL1".
= LHAb - ABSOLUTE BAND ALARM: The alarm is activated when the process value goes below the alarm threshold set on parameter "AL1L" or goes higher than alarm set on parameter "AL1H".
Ab1 – ALARM AL1 FUNCTION: This permits definition of alarm AL1 functions, by entering a number between 0 and 15. The number to be programmed, that corresponds to the desired function, is obtained adding the values reported in the following description :

ALARM BEHAVIOUR AT SWITCH ON:
+0 = NORMAL BEHAVIOUR: The alarm is always activated when there are alarm conditions.
+1 = ALARM NOT ACTIVATED AT SWITCH ON: If, at switch on, the instrument is in alarm condition, the alarm is not activated. It will be activated only when the process value goes beyond and then returns to alarm conditions.
ALARM DELAY:
+0 = ALARM NOT DELAYED: The alarm is immediately activated when the alarm condition occurs.
+2 = ALARM DELAYED: When the alarm condition occurs, delay counting starts as programmed on par. “ALnd” (expressed in sec.) and the alarm will be activated only after this time has elapsed.
ALARM LATCH: :
+ 0 = ALARM NOT LATCHED: The alarm remains active in alarm conditions only.
+ 4 = ALARM LATCHED: The alarm is active in alarm conditions and remains active even if these conditions no longer exist, until the correctly programmed key “U” (“USrb”=Aac) has been pushed
ALARM AKNOWLEDGEMENT: :
+ 0 = ALARM NOT AKNOWLEDGED: The alarm remains always active in alarm conditions.
+ 8 = ALARM AKNOWLEDGED: The alarm is active in alarm conditions and can be deactivated through key “U” if properly programmed (“USrb”=ASi), also if alarm conditions still exist.
AL1 – ALARM AL1 THRESHOLD : Alarm AL1 threshold for low and high alarms.
AL1L – LOW ALARM AL1 : Alarm AL1 low threshold when the alarm is a band type or minimum set of AL1 alarm threshold when the alarm is low or high type.
AL1H – HIGH ALARM AL1: Alarm AL1 high threshold when the alarm is a band type or maximum set of AL1 alarm threshold when the alarm is low or high type.
HAL1 - ALARM AL1 HYSTERESIS: Asymmetrical semi-band relative to alarm AL1 threshold which defines the deactivation value of alarm AL1.
AL1d – ACTIVATION DELAY OF ALARM AL1: This permits definition of alarm delay activation AL1 when the delay function on par. “Ab1” is activated.
AL1i – ALARM AL1 ACTIVATION IN CASE OF MEASUREMENT ERROR: This permits a definition of measurement error conditions, i.e whether the alarm has to be active ("yES") or not ("no").

GROUP “]AL2” (PARAMETERS RELATIVE TO ALARM AL2): These permit the setting of the process alarm AL2 functions.
OAL2 - OUTPUT WHERE ALARM AL2 IS ADDRESSED: this defines on which output the alarm AL2 has to be addressed.
AL2t - ALARM AL2 TYPE: Similar to “AL1t” but referring to alarm AL2.
Ab2 - ALARM AL2 FUNCTIONING: Similar to “Ab1t” but referring to alarm AL2.
AL2 - ALARM AL2 THRESHOLD : Similar to “AL1” but referring to alarm AL2.
AL2L - LOW ALARM AL2 : Similar to “AL1L” but referring to alarm AL2.
AL2H - HIGH ALARM AL2 : Similar to “AL1H” but referring to alarm AL2.
HAL2 - ALARM AL2 HYSTERESIS: Similar to “HAL1” but referring to alarm AL2.
AL2d - ACTIVATION DELAY OF ALARM AL2: Similar to “AL1d” but referring to alarm AL2.
AL2i - ALARM AL2 ACTIVATION IN CASE OF MEASUREMENT ERROR: Similar to “AL1i” but referring to alarm AL2.

GROUP “]AL3” (PARAMETERS RELATIVE TO ALARM AL3): These permit the setting of the process alarm AL3.
OAL3 - OUTPUT WHERE ALARM AL3 IS ADDRESSED: It defines on which output the alarm AL3 has to be addressed.
AL3t - ALARM AL3 TYPE: Similar to “AL1t” but referring to alarm AL3.
Ab3 - ALARM AL3 FUNCTIONING: Similar to “Ab1t” but referring to alarm AL3.

AL3- ALARM AL3 THRESHOLD : Similar to “AL1” but referring to alarm AL3.
AL3L - LOW ALARM AL3 : Similar to “AL1L” but referring to alarm AL3.
AL3H - HIGH ALARM AL3 : Similar to “AL1H” but referring to alarm AL3.
HAL3 - ALARM AL3 HYSTERESIS: Similar to “HAL1” but referring to alarm AL3.
AL3d - ACTIVATION DELAY OF ALARM AL3: Similar to “AL1d” but referring to alarm AL3.
AL3i - ALARM AL3 ACTIVATION IN CASE OF MEASUREMENT ERROR: Similar to “AL1i” but referring to alarm AL3.

GROUP “]AL4” (PARAMETERS RELATIVE TO ALARM AL4): These permit the setting of the process alarm AL4.
OAL4 - OUTPUT WHERE ALARM AL4 IS ADDRESSED: It defines on which output the alarm AL4 has to be addressed.
AL4t - ALARM AL4 TYPE: Similar to “AL1t” but referring to alarm AL4.
Ab4 - ALARM AL4 FUNCTIONING: Similar to “Ab1t” but referring to alarm AL4.
AL4 - ALARM AL4 THRESHOLD : Similar to “AL1” but referring to alarm AL4.
AL4L - LOW ALARM AL4 : Similar to “AL1L” but referring to alarm AL4.
AL4H - HIGH ALARM AL4 : Similar to “AL1H” but referring to alarm AL4.
HAL4 - ALARM AL4 HYSTERESIS: Similar to “HAL1” but referring to alarm AL4.
AL4d - ACTIVATION DELAY OF ALARM AL4: Similar to “AL1d” but referring to alarm AL4.
AL4i - ALARM AL4 ACTIVATION IN CASE OF MEASUREMENT ERROR: Similar to “AL1i” but referring to alarm AL4.

GROUP “]PAn” (PARAMETERS RELATIVE TO THE USER INTERFACE) : This contains the parameters relative to the key U and display functions.
Usrb - KEY U FUNCTION : Decides which function is associated to key U. The possible selections are :
= noF : no function
= Aac : Pushing the key for 1 sec. at least, it is possible to acknowledge the alarm.
= ASi : Pushing the key for 1 sec. at least, it is possible to acknowledge an active alarm
= HoLd: Pushing the key the measurement taken at that moment is blocked. With the hold function turned on, the instrument carries out control according to the memorised measurement. Releasing the key, the instrument starts normal measurement acquisition once more.
= d.Pic: Pressing the key, on the display it is visualized the maximum variation of the measure recorded since the instrument has been switched on (higher peak - lower peak).
= 0.Pot: For the instruments equipped with potentiometer input, with this function it is possible to set the “zero” value. Pressing the key for at least 1 sec., the display will show, for approx. 1 sec., the label "0.Pot" and then "0", assuming as 0 the value measured in that instant.
= r.Pic: Pressing the key the values of higher and lower peaks are reset.
= r.P0P: For the instruments equipped with potentiometer input, with this function it is possible to set the “zero” value and contemporarily reset the higher and lower peaks values. Pressing the key for at least 1 sec., the display will show, for approx. 1 sec., the label "r.P0P" and then "0", assuming as 0 the value measured in that instant and resetting the memorized peaks values.
= t.Pot: For the instruments equipped with potentiometer input, with this function it is possible to set the points of measure of the potentiometer by means of an auto-ranging procedure through which the parameters “SSC", "FSC" and "0.Pot." are automatically re-calculated. Pressing the key for at least 1 sec., the display will show "P1" alternatively to the value of the first point of setting. Now, please position the potentiometer in the first point of setting and program the value desired for that point using the UP and DOWN keys. Once the value has been set, press the P key : the instrument will memorize the value and the display will show "P2" alternatively to the value of the second point of setting. Please position the potentiometer in the second point of setting and program the value desired for that point using the UP and DOWN keys. Pressing the P key, also the second value is acquired and the instrument will automatically exit from the auto-ranging mode, re-calculating the measuring range.
diSP - VARIABLE VISUALISED ON THE DISPLAY : Parameter trough which it’s possible to decide what is visualised on the display : the process variable (= dEF) or the alarm thresholds AL1, 2, 3 or 4 (= AL1, AL2, AL3 or AL4).
Edit - FAST PROGRAMMING OF ALARMS THERESHOLDS: This decides which are the alarms Sets that can be programmed by the fast procedure. The parameter can be programmed as :
= AE : The alarm thresholds can be modified.
= AnE : The alarm thresholds can be visualized on the dispay but cannot be modified.

GROUP “]SEr” (PARAMETERS RELATIVE TO THE SERIAL COMMUNICATION): If the instrument is equipped with RS485 serial communication these parameters allow device configuration for communication.
Add – STATION ADDRESS IN CASE OF SERIAL COMMUNICATION : This is used to set the instrument address in the communication net. Programme a different number for each station, from 1 to 255.
baud – TRANSMISSION SPEED (BAUD RATE): Set the data transmission speed of the network to which the instrument is connected. The possible selections are 1200, 2400, 9600, 19.2 (19200), 38.4 (38400).
All stations must have the same transmission speed.
PACS ACCESS TO PROGRAMMING THROUGH SERIAL PORT : Programming access. If programmed as "LoCL" this means that the instrument can only be programmed from the keyboard, if programmed as "LorE" it can be programmed from both the keyboards and serial line.

6 - PROBLEMS, MAINTENANCE AND GUARANTEE

6.1 - ERROR SIGNALLING

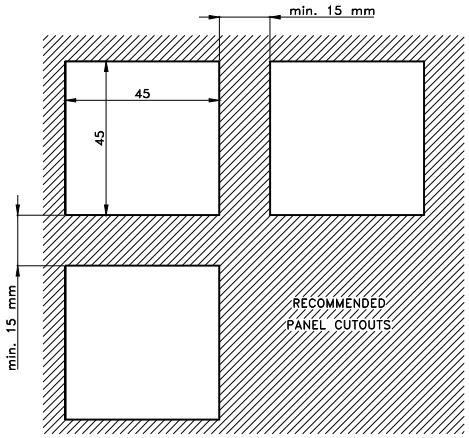
Error	Reason	Action
- - - -	Probe interrupted	Verify the correct connection between probe and instrument and then verify the correct functioning of the probe
uuuu	The measured variable is under the probe’s limits (under-range)	
oooo	The measured variable is over the probe’s limits (over-range)	
ErEP	Possible anomaly of the EEPROM memory	Push key “P”

In error conditions, the instrument provides to activates the desired alarms, if the relative parameters “ALni” have been programmed = yES.

6.2 - CLEANING
We recommend cleaning of the instrument with a slightly wet cloth using water and not abrasive cleaners or solvents which may damage the instrument.

6.3 - GUARANTEE AND REPAIRS

The instrument is under warranty against manufacturing flaws or faulty material, that are found within 18 months from delivery date.
The guarantee is limited to repairs or to the replacement of the instrument.
The eventual opening of the housing, the violation of the instrument or the improper use and installation of the product will bring about the immediate withdrawal of the warranty's effects.
In the event of a faulty instrument, either within the period of warranty, or further to its expiry, please contact our sales department to obtain authorisation for sending the instrument to our company.
The faulty product must be shipped to TECNOLOGIC with a detailed description of the faults found, without any fees or charge for Tecnologic, except in the event of alternative agreements.



7 - TECHNICAL DATA

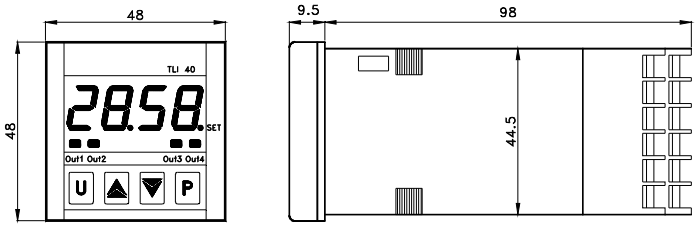
7.1 – ELECTRICAL DATA

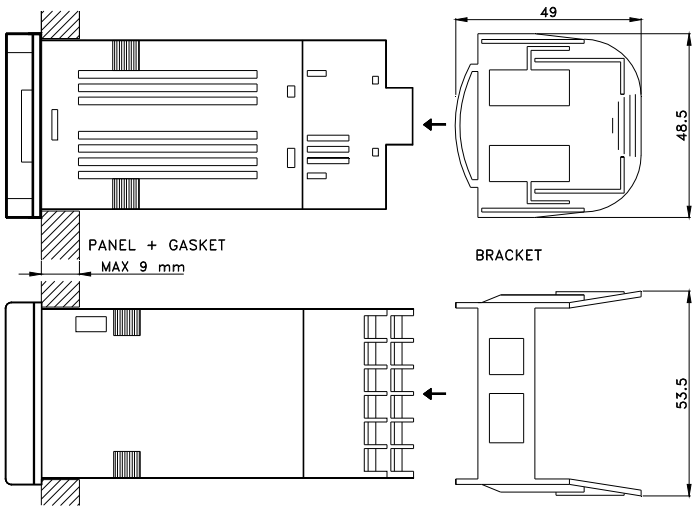
Power supply: 24 VAC/VDC, 100... 240 VAC +/- 10%
Frequency AC: 50/60 Hz
Power consumption: 8 VA approx.
Input/s: 1 input for temperature probes: tc J,K,S ; RTD Pt 100 IEC; PTC KTY 81-121 (990 Ω @ 25 °C); NTC 103AT-2 (10KΩ @ 25 °C) or mV signals 0...50 mV, 0...60 mV, 12 ...60 mV or normalized signals 0/4...20 mA, 0/1...5 V , 0/2...10 V or potentiometer with resistance > 1 KΩ; 1 digital input for free voltage contact
Impedance normalized signals input: 0/4..20 mA: 51 Ω;
mV and V: 1 MΩ
Output/s: Up to 4 digital outputs. Relay SPST-NO (5 A-AC1, 2 A-AC3 / 250 VAC) ; or in tension to drive SSR (7mA/ 14VDC).
Up to 1 (OUT1) analogue output: 0/4 ..20 mA or 0/2 ..10 V.
Auxiliary supply output: 12 VDC / 20 mA Max. or 2,5 VDC / 2,5 mA Max. for potentiometer input.
Electrical life for relay outputs: 100000 operat.
Installation category: II
Measurement category: I
Protection class against electric shock: Class II for Front panel
Insulation: Reinforced insulation between the low voltage section (supply and relay outputs) and the front panel; Reinforced insulation between the low voltage section (supply and relay outputs) and the extra low voltage section (inputs, analogue outputs, SSR outputs); analogue and SSR outputs optoisolated respect to the input. 50 V insulation between RS485 and extra low voltage section.

7.2 – MECHANICAL DATA

Housing: Self-extinguishing plastic, UL 94 V0
Dimensions: 48 x 48 mm DIN, depth 98 mm
Weight: 190 g approx.
Mounting: Flush in panel in 45 x 45 mm hole
Connections: 2 x 1 mm^2 screw terminals block
Degree of front panel protection : IP 65 mounted in panel with gasket
Pollution situation: 2
Operating temperature: 0 ... 50 °C
Operating humidity: 30 ... 95 RH% without condensation
Storage temperature: -10 ... +60 °C

7.3 – MECHANICAL DIMENSIONS, PANEL CUT-OUT AND MOUNTING [mm]





7.4 – FUNCTIONAL FEATURES

Sampling rate: For normalized signals or potentiometer input programmable from 8 to 64 sampl./sec.
Measurement range: according to the used probe (see range table)
Measurement Resolution: For normalized signals or potentiometer input in order to the programmed sampling rate as 32000 steps (8 sampl./sec.), 16000 steps (16 sampl./sec.), 8000 steps (32 sampl./sec.), 4000 steps (64 sampl./sec.).
Display resolution: according to the probe used 1/0,1/0,01/0,001
Overall accuracy: +/- 0,15 % fs
Max. cold junction compensation drift (in tc) : 0,04 °C/°C with operating temperature 0 ... 50 °C after warm-up of 20 min.
Sampling rate: 130 ms.
Serial Interface : RS485 insulated
Communication protocol: MODBUS RTU (JBUS)
Baud rate: Programmable from 1200 ... 38400 baud
Display: Display: 4 digit, Red h 12 mm
Compliance: ECC directive EMC 2004/108/CE (EN 61326), ECC directive LV 2006/95/CE (EN 61010-1)

7.5 - MEASURING RANGE TABLE

INPUT	"dP" = 0	"dP"= 1, 2, 3
tc J **"HCFG" = tc** **"SEnS" = J**	-160 ... 1000 °C - 256 ... 1832 °F	-160.0 ... 999.9 °C -199.9 ... 999.9 °F

tc K "HCFG" = tc "SEnS" = CrAl	-270 ... 1370 °C - 454 ... 2498 °F	-199.9 ... 999.9 °C -199.9 ... 999.9 °F
tc S "HCFG" = tc "SEnS" = S	-50 ... 1760 °C -58 ... 3200 °F	-50.0 ... 999.9 °C -58.0 ... 999.9 °F
tc B "HCFG" = tc "SEnS" = b	72 ... 1820 °C 162 ... 3308 °F	72.0 ... 999.9 °C 162.0 ... 999.9 °F
tc E "HCFG" = tc "SEnS" = E	-150 ... 750 °C -252 ... 1382 °F	-150.0 ... 999.9 °C -199.9 ... 999.9 °F
tc L "HCFG" = tc "SEnS" = L	-150 ... 900 °C -252 ... 1652 °F	-150.0 ... 900.0 °C -199.9 ... 999.9 °F
tc N "HCFG" = tc "SEnS" = n	-270 ... 1300 °C -454 ... 2372 °F	-199.9 ... 999.9 °C -199.9 ... 999.9 °F
tc R "HCFG" = tc "SEnS" = r	-50 ... 1760 °C -58 ... 3200 °F	-50.0 ... 999.9 °C -58.0 ... 999.9 °F
tc T "HCFG" = tc "SEnS" = t	-270 ... 400 °C -454 ... 752 °F	-199.9 ... 400.0 °C -199.9 ... 752.0 °F
tc C "HCFG" = tc "SEnS" = C	0 ... 2320 °C 32 ... 4208 °F	0.0 ... 999.9 °C 32.0 ... 999.9 °F
TECNOLOGIC IRS range "A" "HCFG" = tc "SEnS"= Ir.J - Ir.CA	-46 ... 785 °C -50 ... 1445 °F	-46.0 ... 785.0 °C -50.8 ... 999.9 °F
Pt100 (IEC) "HCFG" = rtd "SEnS" = Pt1	-200 ... 850 °C -328 ... 1562 °F	-99.9 ... 850.0 °C -99.9 ... 999.9 °F
PTC (KTY81-121) "HCFG" = rtd "SEnS" = Ptc	-55 ... 150 °C -67 ... 302 °F	-55.0 ... 150.0 °C -67.0 ...302.0 °F
NTC (103-AT2) "HCFG" = rtd "SEnS" = ntc	-50 ... 110 °C -58 ... 230 °F	-50.0 ... 110.0 °C -58.0 ... 230.0 °F
0..20 mA "HCFG" = I "SEnS" = 0.20	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
4..20 mA "HCFG" = I "SEnS" = 4.20	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
0 ... 50 mV "HCFG" = UoLt "SEnS" = 0.50	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
0 ... 60 mV "HCFG" = UoLt "SEnS" = 0.60	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
12 ... 60 mV "HCFG" = UoLt "SEnS" = 12.60	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
0 ... 5 V "HCFG" = UoLt "SEnS" = 0.5	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
1 ... 5 V "HCFG" = UoLt "SEnS" = 1.5	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
0 ... 10 V "HCFG" = UoLt "SEnS" = 0.10	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
2 ... 10 V "HCFG" = UoLt "SEnS" = 2.10	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
Potentiometer (> 1 KΩ) "HCFG" = UoLt "SEnS" = Pot	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999

7.6 - INSTRUMENT ORDERING CODE

TLI 40 a b c d e f g h ii

a : POWER SUPPLY
L = 24 VAC/VDC
H = 100 ... 240 VAC
b : OUTPUT OUT1
- = None
R = Relay
O = Voltage VDC for SSR
C = Analogue 0/4 ..20 mA
V = Analogue 0/2 .. 10 V
c : OUTPUT OUT2
- = None
R = Relay
O = Voltage VDC for SSR
d : OUTPUT OUT3
- = None
R = Relay
O = Voltage VDC for SSR
e : OUTPUT OUT4
- = None
R = Relay
O = Voltage VDC for SSR
f : COMMUNICATION INTERFACE
S = RS 485 Serial interface
I = RS 485 Serial Interface + digital input
- = No interface
g : SENSORS OUTPUT SUPPLY
A = 12 VDC
B = 2,5 VDC (Potentiometer input)
h : OPTIONAL PROBES
- = None
ii = SPECIAL CODES

Note :
- The output OUT4 must be the same type as OUT3.
- The digital input can only be present as an alternative to the output OUT4.

TLI 40 PASSWORD = 381