

# TLK 38 A

## MICROPROCESSOR-BASED DIGITAL ELECTRONIC CONTROLLER



### OPERATING INSTRUCTIONS Vr. 01 (ENG) - cod.: ISTR 06465

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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, TECNOLOGIC S.p.A. will not take any responsibility deriving from its use.

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#### 1 - INSTRUMENT DESCRIPTION

##### 1.1 - GENERAL DESCRIPTION

TLK 38 A is a digital microprocessor-based controller with ON/OFF control and one output: relay type or can drive solid state relays type (SSR).

The process value is visualized on 4 red displays, while the output status is indicated by 1 LED.

Depending on the model required the input accept:

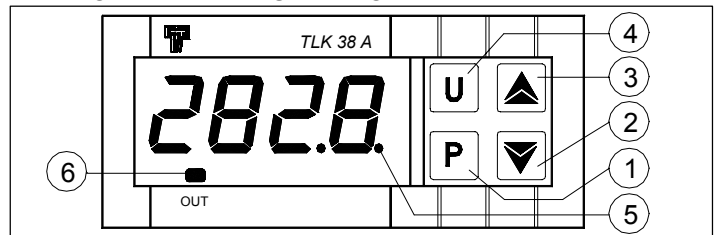
**C**: Thermocouples temperature probes (J,K,S and TECNOLOGIC IRS Infrared sensors), mV signals (0..50/60 mV, 12..60 mV), Thermoresistances PT100.

**E**: Thermocouples temperature probes (J,K,S and TECNOLOGIC IRS Infrared sensors), mV signals (0..50/60 mV, 12..60 mV), Thermistors PTC and NTC.

**I**: normalized analogue signals 0/4..20 mA

**V**: normalized analogue signals 0..1 V, 0/1..5 V, 0/2..10 V

##### 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.

**3 - Key UP**: This is used to increase 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 output control power.

**4 - Key U**: It can be used to modify the visibility of the parameters in "ConF" menu (see par. 2.3).

**5 - Led SET** : It indicates access to the programming mode and parameter programming level.

**6 - Led OUT** : indicates the state of output OUT

## 2 - PROGRAMMING

### 2.1 - FAST PROGRAMMING OF THE SET POINT

Push key "P", then release it and the display will visualise "SP 1" alternatively to the programmed value.

To modify the value, press "UP" key to increase it or the "DOWN" key to decrease it.

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 alternatively, if no key is pressed for approx. 15 seconds, the display will return to normal functioning automatically.

Set Point "SP1" can be programmed with a value that is between the value programmed on par. "SPLL" and the one programmed on par. "SPHL".

### 2.2 - 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:

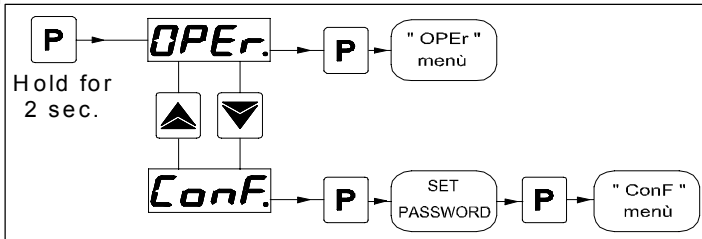
"OPER"	to enter into the operating parameters menu
"ConF"	to enter into the configuration parameters menu (PASSWORD is required)

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: this normally contains the Set Point "SP1" parameter but it can contain all the desired parameters (see par. 2.3).

**"ConF"** - Configuration parameters Menu: this contains all the operating parameters and the functioning configuration parameters.



**ATTENTION:** The instrument is programmed in factory with all the parameters, to exception of the Set Point "SP1", programmable in the menu "ConF" to the purpose to prevent wrong accidental programming from non experienced consumers.

To enter the menu "ConF" select the option "ConF", press the key "P" and the display will 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 exit from programming mode.

If the password is correct, the display will visualise the code identifying the first group of parameters ("SP ") and with keys "UP" and "DOWN" it will be possible to select the desired group of parameters.

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.

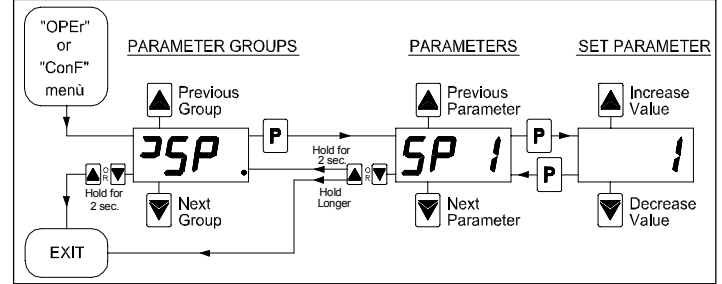
By using the "UP" or "DOWN" keys, it is then possible to select a new parameter (if present) and modify it as described above.

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.

The programming and exit modes for the "OPER" menu are the same as those described for menu "ConF" with the difference that to access the menu "OPER" the Password is not required.



### 2.3 - PARAMETERS PROGRAMMING LEVELS

The menu "OPER" normally contains the parameter "SP1"; however it is possible to make all desired parameters appear or disappear on this level, 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).

The Set Point "SP1" will only be visible on the Set Point fast programming level (described in par. 2.1) if are present in the menu "OPER".

## 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 case 33 x 75 mm, is designed for flush-in panel mounting.

Make a hole 29 x 71 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.

### 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 an overload protection and 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 the supply of all the electrical circuits connected to the instrument must be protected 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.

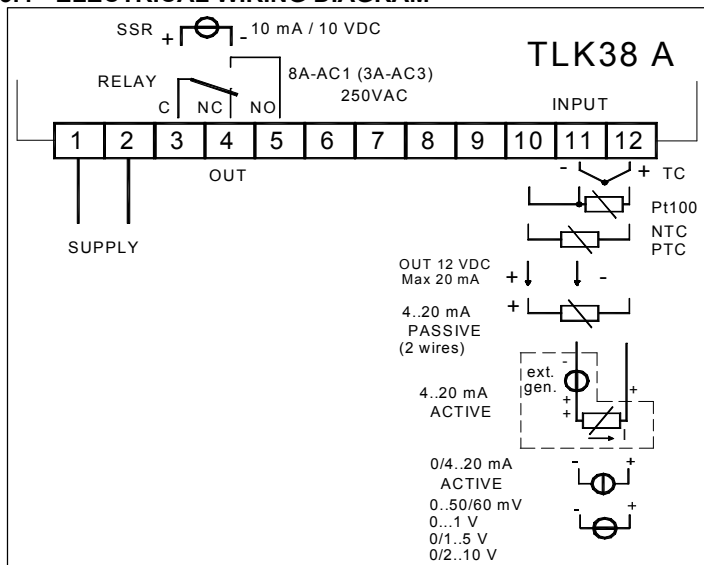
Furthermore, the input cable of the probe has to be kept separate from line voltage wiring. If the input cable of the probe is screened, it has to be connected to the ground with only one side.

Whether the instrument is 12 V version it's recommended to use an external transformer TCTR, or with equivalent features, and to use only one transformer for each instrument because there is no insulation between supply and input.

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.

**Tecnologic S.p.A. 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".

Depending on the model required the input accept:

**C**: Thermocouples temperature probes (J,K,S and TECNOLOGIC IRS Infrared sensors), mV signals (0..50/60 mV, 12..60 mV), Thermoresistances PT100.

**E**: Thermocouples temperature probes (J,K,S and TECNOLOGIC IRS Infrared sensors), mV signals (0..50/60 mV, 12..60 mV), Thermistors PTC and NTC.

**I**: normalized analogue signals 0/4..20 mA

**V**: normalized analogue signals 0..1 V, 0/1..5 V, 0/2..10 V

Depending on the model, using par. "SEnS", it's possible to select the type of input probe, which can be:

- for thermocouples J (J), K (CrAl), S (S) or for infrared sensors serie TECNOLOGIC IRTC1 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..1 V (0.1), 0..5 V (0.5), 1..5 V (1.5), 0..10 V (0.10) or 2..10 V (2.10).

- for normalised signals in tension 0..50 mV (0.50), 0..60 mV (0.60), 12..60 mV (12.60).

We recommend to switch on and off the instrument when these parameters are modified, in order to obtain a correct measuring.

For the instruments with input for temperature probes (tc, rtd) it's possible to select, through par. "Unit", the unit of measurement (°C, °F) and, through par. "dP" (Pt100, PTC and NTC only) the desired resolution (0=1°; 1=0,1°).

Instead, with regards to the instruments with normalised analogue input signals, 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).

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:

$$DV = MV \times \text{"rot"} + \text{"OFSt"}$$

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).

In case of measurement error, the instrument supplies the power as programmed on par. "OPE".

This power will be =0 (OUT off) , = 100 (OUT on with "Func" = HEAt), =-100 (OUT on with "Func" = CoolL), or calculated according to a cycle time equal to 20 sec. (e.g. In the event of probe error with ON/OFF control and "OPE"=50, the control output will be activated for 10 sec., then it will be deactivated for 10 sec. and so on until the measurement error remains.).

#### 4.2 - ON/OFF CONTROL

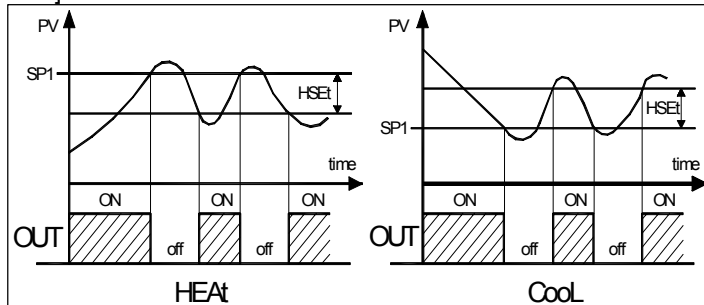
All the parameters referring to the ON/OFF control are contained in the group "rEG".

This type of control works on the output depending on the measure, on the Set Point "SP 1", on the functioning mode "Func" and on the hysteresis "HSEt".

The instrument carries out an ON/OFF control with asymmetrical hysteresis.

The control works in the following way : in the case of reverse action, or heating ("Func"=HEAt), it deactivates the output, when the process value reaches [SP 1] and is then activated again when the process value goes below value [SP - HSEt].

Vice versa, in case of direct action or cooling ("Func"=CoolL), it deactivates the output, when the process value reaches [SP] and is activated again when the process value goes above value [SP + HSEt].



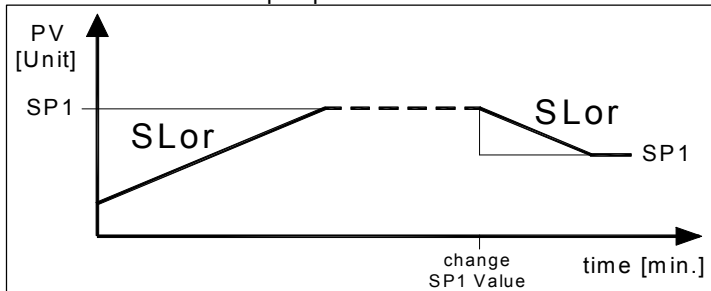
#### 4.3 - REACHING OF THE SET POINT AT CONTROLLED SPEED

All the parameters referring to the ramps functioning are contained in the group "rEG".

It is possible to reach the set point in a predetermined time (in any case longer than the time the plant would naturally need). This could be useful in those processes (heating or chemical treatments, etc.) where the set point has to be reached gradually, in a predetermined time.

The function is determined by the following parameter :

"SLor" - Gradient of ramp expressed in unit/minute



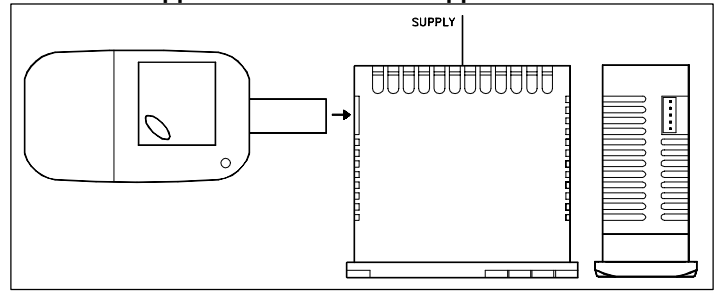
Example with start from values lower than SP 1 and with decreasing of SP 1.

#### 4.4 - PARAMETERS CONFIGURATION BY "KEY01"

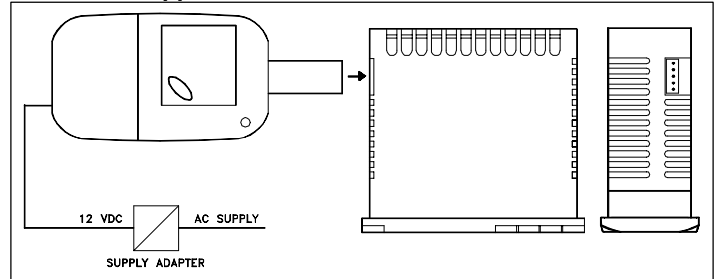
The instrument is equipped with a connector that allows the transfer from and toward the instrument of the functioning parameters through the device **TECNOLOGIC KEY01** with **5 poles** connector. This device it's mainly useable for the serial programming of the instruments which need to have the same parameters configuration or to keep a copy of the programming of an instrument and allow its rapid retransmission.

To use the device KEY01 it's necessary that the device or instrument are being supplied.

#### Instrument supplied and device not supplied



#### Instrument supplied from the device



To transfer the configuration of an instrument into the device (**UPLOAD**) it is necessary to proceed in the following way:

- 1) position both dip switch of KEY 01 in the **OFF** mode.
- 2) connect the device to the instrument TLK plugging the special connector.
- 3) verify that the instrument or the device are supplied
- 4) observe the indication led on the device KEY 01: if it results green this means that a configuration is already loaded on the device while if it results green blinking or red blinking this means that it has not been loaded any valid configuration on the device .
- 5) press the button placed on the device.
- 6) observe the indication led : after having pressed the button, the led becomes red and therefore, at the end of the data transfer, it becomes green.
- 7) now it is possible to disconnect the device.

To transfer the configuration loaded on the device onto an instrument of the same family (**DOWNLOAD**), it is necessary to proceed in the following way:

- 1) position both dip switch of KEY 01 in the **ON** mode.
- 2) connect the device to an instrument TLK having the same features of the one from which has been downloaded the desired configuration, plugging the special connector.
- 3) verify that the instrument or the device are supplied
- 4) observe the indication led on the device KEY 01: it has to result green, because if the led results green blinking or red blinking, this means that on the device it has not been downloaded any valid configuration and therefore it's useless to continue.
- 5) if the les results green, press the button placed on the device.
- 6) observe the indication led : after having pressed the button, the led becomes red and therefore, at the end of the data transfer, it becomes green.
- 7) now it is possible to disconnect the device.

For additional info, please have a look at the KEY01 instruction manual.

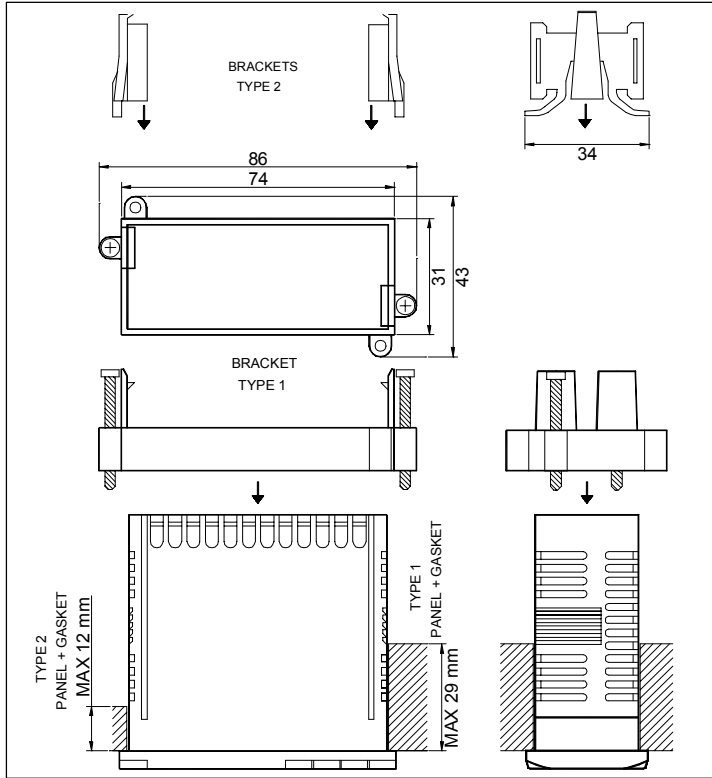
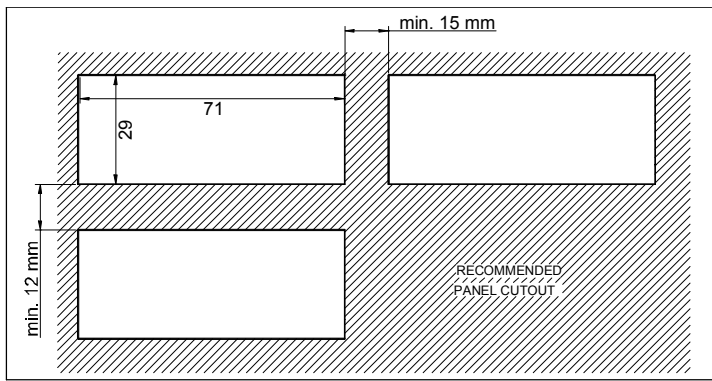
#### 5 - PROGRAMMABLE PARAMETERS TABLE

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.

Group "1 SP" (parameters relative to the Set Point)

Par.	Description	Range	Def.	Note
1	<b>SP1</b> Set Point	SPLL ÷ SPHL	0	
2	<b>SPLL</b> Low Set Point	-1999 ÷ SPHL	-1999	
3	<b>SPHL</b> High Set Point	SPLL ÷ 9999	9999	





0..20 mA "SEnS" = 0.20	-1999 ... 9999	-199.9 ... 999.9	
4..20 mA "SEnS" = 4.20			
0 ... 50 mV "SEnS" = 0.50			
0 ... 60 mV "SEnS" = 0.60			
12 ... 60 mV "SEnS" = 12.60			
0 ... 1 V "SEnS" = 0.1			-1.999 ... 9.999
0 ... 5 V "SEnS" = 0.5			
1 ... 5 V "SEnS" = 1.5			
0 ... 10 V "SEnS" = 0.10			
2 ... 10 V "SEnS" = 2.10			

## 7.6 - INSTRUMENT ORDERING CODE

TLK38 a b c --A

### a : POWER SUPPLY

F = 12 VAC/VDC

L = 24 VAC/VDC

H = 100... 240 VAC

### b : INPUT

C = thermocouples (J, K, S, I.R.), mV, thermoresistances (Pt100)

E = thermocouples (J, K, S, I.R.), mV, thermistors (PTC, NTC)

I = normalized signals 0/4..20 mA

V = normalized signals 0..1 V, 0/1..5 V, 0/2..10 V.

### c : OUTPUT

R = Relay

O = VDC for SSR

## 7.4 - FUNCTIONAL FEATURES

Control: ON/OFF

Measurement range: according to the used probe (see range table)

Display resolution: according to the probe used 1/0,1/0,01/0,001

Overall accuracy: +/- 0,5 % fs (+/- 1% for tc S)

Max cold junction compensation drift (in tc) : 0,1 °C/°C with operating temperature 0 ... 50 °C after warm-up of 20 min.

Sampling rate: 130 ms.

Display: 4 Digit Red h 12 mm

Compliance: ECC directive EMC 89/336 (EN 61326), ECC directive LV 73/23 and 93/68 (EN 61010-1)

## 7.5 - MEASURING RANGE TABLE

INPUT	"dP" = 0	"dP" = 1, 2, 3
tc J "SEnS" = J	0 ... 1000 °C 32 ... 1832 °F	----
tc K "SEnS" = CrAl	0 ... 1370 °C 32 ... 2498 °F	----
tc S "SEnS" = S	0 ... 1760 °C 32 ... 3200 °F	----
Pt100 (IEC) "SEnS" = Pt1	-200 ... 850 °C -328 ... 1562 °F	-199.9 ... 850.0 °C -199.9 ... 999.9 °F
PTC (KTY81-121) "SEnS" = Ptc	-55 ... 150 °C -67 ... 302 °F	-55.0 ... 150.0 °C -67.0 ... 302.0 °F
NTC (103-AT2) "SEnS" = ntc	-50 ... 110 °C -58 ... 230 °F	-50.0 ... 110.0 °C -58.0 ... 230.0 °F

# TLK 38 A PASSWORD = 381