EWTQ 905

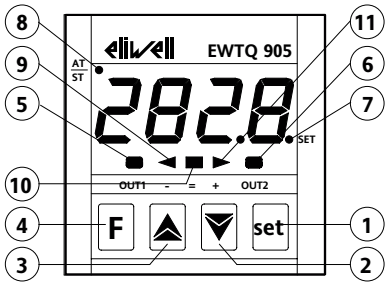
digital temperature regulator 48x48

cod. 9IS23045
rel. 1/04

GENERAL DESCRIPTION

EWTQ 905 is a “single loop” digital microprocessor-based controller, with ON/OFF, Neutral Zone ON/OFF, PID single action, PID dual action (direct and reverse) control and with **AUTO-TUNING FAST** function and **SELF-TUNING** function for PID control.
The process value is visualized on 4 red displays, while the output status is indicated by 2 LED displays.
The instrument is equipped with a 3 LED programmable shift indexes.
The instrument can have up to 2 outputs: relay type or can drive solid state relays type (SSR).
Depending on the model required the input accept:

- C: Thermocouples temperature probes (J,K), mV signals (0..50/60 mV, 12..60 mV), Thermoresistances PT100.
- E : Thermocouples temperature probes (J,K), 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..5V, 0/2..10 V



USER INTERFACE

1 - Key set : 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 F : This is a key that can be set to : Activate Auto-tuning and Self-tuning functions;In “ConF” mode can be used to change parameters’ visibility
5 - Led OUT1 : indicates the state of output OUT1
6 - Led OUT2 : indicates the state of output OUT2
7 - Led SET : when flashing, it indicates access to the programming mode.
8 - Led AT/ST : indicates that the Self-tuning function is activated (light on) or that Auto-tuning (flashing) is in progress.
9 - Led – Shift index: indicates that the process value is lower than the one programmed on par. “AdE”.
10 - Led = Shift index: indicates that the process value is within the range [SP+AdE ... SP-AdE]
11 - Led + Shift index: indicates that the process value is higher than the one set on par. “AdE”.

PROGRAMMING

FAST PROGRAMMING OF THE SET POINT

This procedure permits rapid programming of the Set Point (SP1) and possibly the alarm thresholds (AL1).

- Push key set, then release it and the display will visualise “SP1” alternatively to the programmed value.

To modify the value, press “UP” key to increase it or the “DOWN” key to decrease it.
PLEASE NOTE: 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 set it is possible to exit by the fast programming mode or it is possible to visualise the alarm thresholds.
- To exit the fast Set programming it is necessary to push key set, after the visualisation of the last Set Point, or alternatively, if no key is pressed for approx. 15 seconds, the display will return to normal functioning automatically.

PARAMETER PROGRAMMING

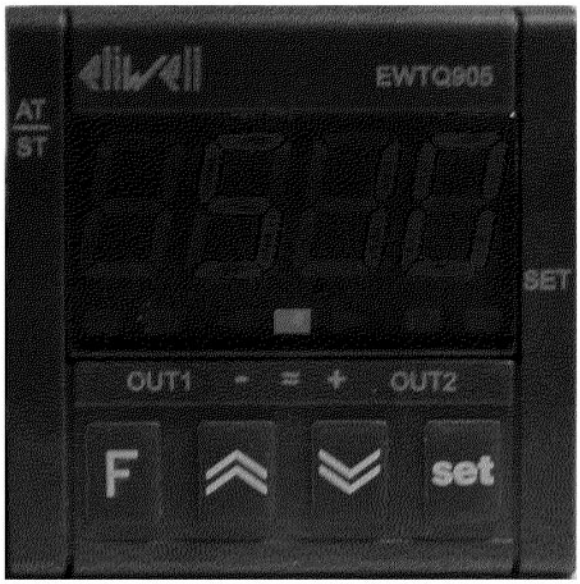
By pushing key set and holding it down for approx. 2 sec. it is possible to enter into the main selection menu.
Using the "UP" or DOWN” keys, it is then possible to roll over the selections:

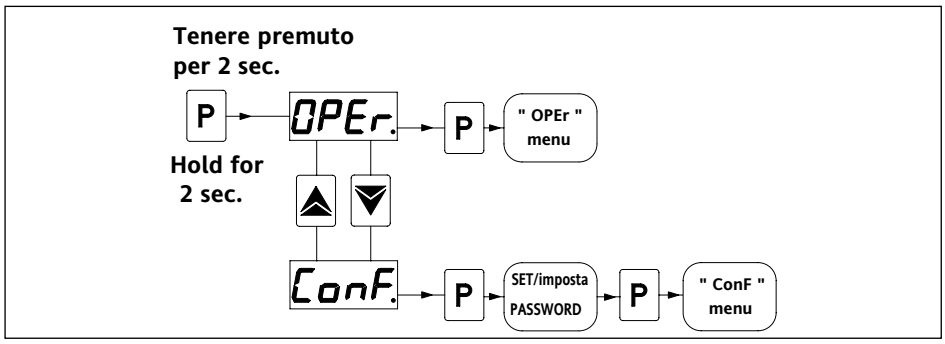
- "OPEr" to enter into the operating parameters menu;
- "ConF" to enter into the configuration parameters menu;

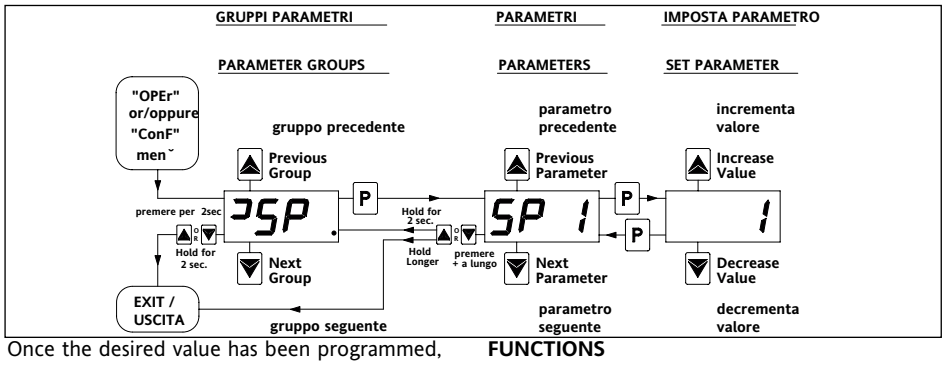
Once the desired item has been selected, push key set to confirm.
Selecting "OPEr" and "ConF" gives the possibility of accessing other menus containing additional parameters and more precisely :

- "OPEr" - Operating parameters Menu: this normally contains the Set Point parameters but it can contain all the desired parameters.
- "ConF" - Configuration parameters Menu: this contains all the operating parameters and the functioning configuration parameters.

To enter the menu “OPEr”, select the option “OPEr” and press the key set and the display will now show “0”.
By pressing the “UP” and “DOWN” keys please set number (password) **381 (see last page)** and press “set” key.
If the password is not correct the instrument will return in previous regulation status.
If the password is correct the display will show the parameter’s code (“]SP “) (first parameters’ group). Again using the “UP” and “DOWN” keys, it is possible to select the desired group of parameters.







Once the desired value has been programmed, push key set 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 setressed 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 (if present).
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.
To enter the menu "ConF" a PASSWORD is required.
At this request, enter, using keys “UP” and “DOWN”, the number reported on the last page of this manual and push key set.
If an incorrect password is entered, the instrument returns to the previous control state.
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
The programming and exit modes for the “ConF” menu are the same as those described for menu “OPEr”.

PARAMETERS PROGRAMMING LEVELS
The menu “OPEr” normally contains the parameters used to program the Set Point; 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”.

FUNCTIONS
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), mV signals (0..50/60 mV, 12..60 mV), Thermoresistances PT100.
- E : Thermocouples temperature probes (J,K), 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)
- for thermoresistances Pt100 IEC (Pt1)
- for 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 x “rot” + “OFSt”**
where: DV = visualised value MV= measured value

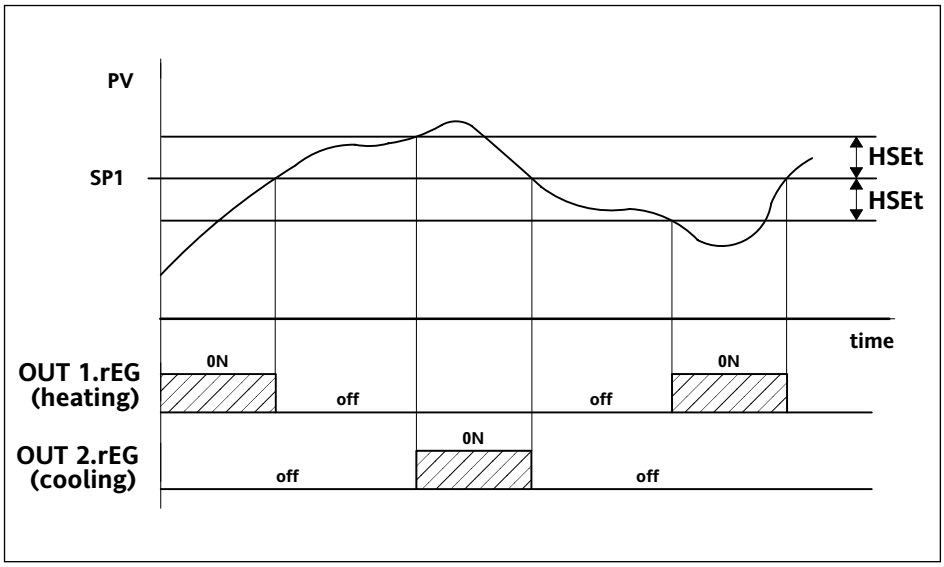
Example 1: It is desired that the instrument visualises the value effectively measured at 20° but that, at 200°, it visualises a value lower than 10° (190°).
Therefore : M1=20 ; D1=20 ; M2=200 ; D2=190
“rot” = (190 - 20) / (200 - 20) = 0,944
“OFSt” = 190 - (0,944 x 200) = 1,2

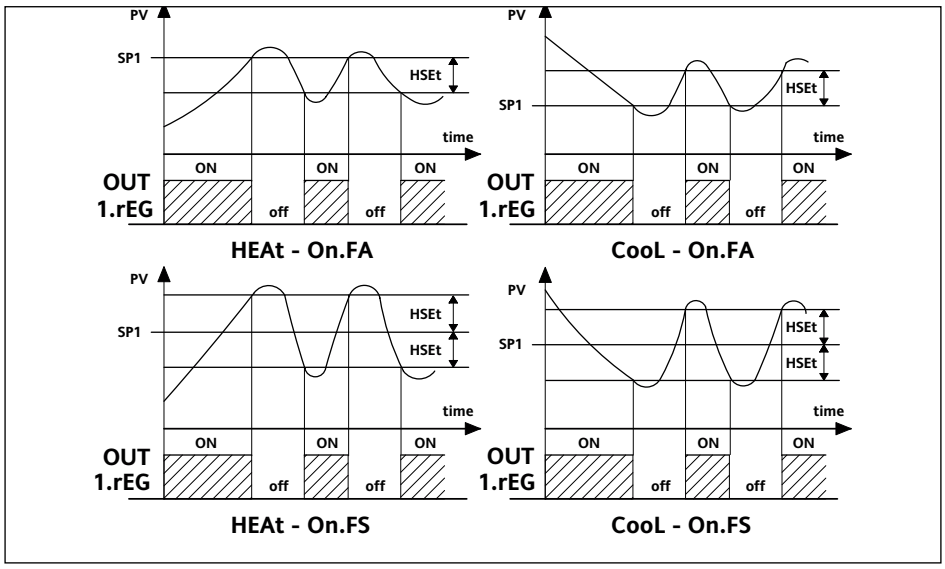
Example 2: It is desired that the instrument visualises 10° whilst the value actually measured is 0°, but, at 500° it visualises a 50° higher value (550°).
Therefore : M1=0 ; D1=10 ; M2=500 ; D2=550
“rot” = (550 - 10) / (500 - 0) = 1,08
“OFSt” = 550 - (1,08 x 500) = 10

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).
In case of measurement error, the instrument supplies the power as programmed on par. “OPE”.
This power will be calculated according to cycle time programmed for the PID controller, while for the ON/OFF controllers the cycle time is automatically considered to be 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.).
Again in the group “]PAn” the par. “AdE” is present that defines the 3 led shift index functioning.
The lighting up of the green led = indicates that the process value is within the range [SP+AdE ... SP-AdE], the lighting up of the led – indicates that the process value is lower than [SP-AdE] and the lighting up of the led + indicates that the process value is higher than [SP+AdE].

OUTPUTS CONFIGURATION
The instrument's outputs can be programmed by entering the group of parameters "]Out, where the relative parameters "O1F" and "O2F" (depending on the number of outputs available on the instrument) are located.
The outputs can be set for the following functions :
• Main control output (1.rEG)
• Secondary control output (2.rEG)
• Alarm output normally open (ALno)
• Alarm output normally closed (ALnc)
• Alarm output normally closed with led reverse indication (ALni)
• Output deactivated (OFF)
The coupling outputs number outputs – number alarms can be made in the group referring to the alarm to the alarm ("]AL1").

ON/OFF CONTROL (1REG)
All the parameters referring to the ON/OFF control are contained in the group "]rEG".
This type of control can be obtained by programming par."Cont" = On.FS or = On.FA and works on the output programmed as 1.rEG, depending on the measure, on the active Set Point "SP", on the functioning mode "Func" and on the hysteresis "HSEt".
The instrument carries out an ON/OFF control with symmetric hysteresis if "Cont" = On.FS or with asymmetrical hysteresis if "Cont" = On.Fa.
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 + HSEt] in case of symmetrical hysteresis, or [SP] in case of asymmetrical hysteresis and is then activated again when the process value goes below value [SP - HSEt].
Vice versa, in case of direct action or cooling ("Func"=CooL), it deactivates the output, when the process value reaches [SP - HSEt] in case of symmetrical hysteresis, or [SP] in case of asymmetrical hysteresis and is activated again when the process value goes above value [SP + HSEt].

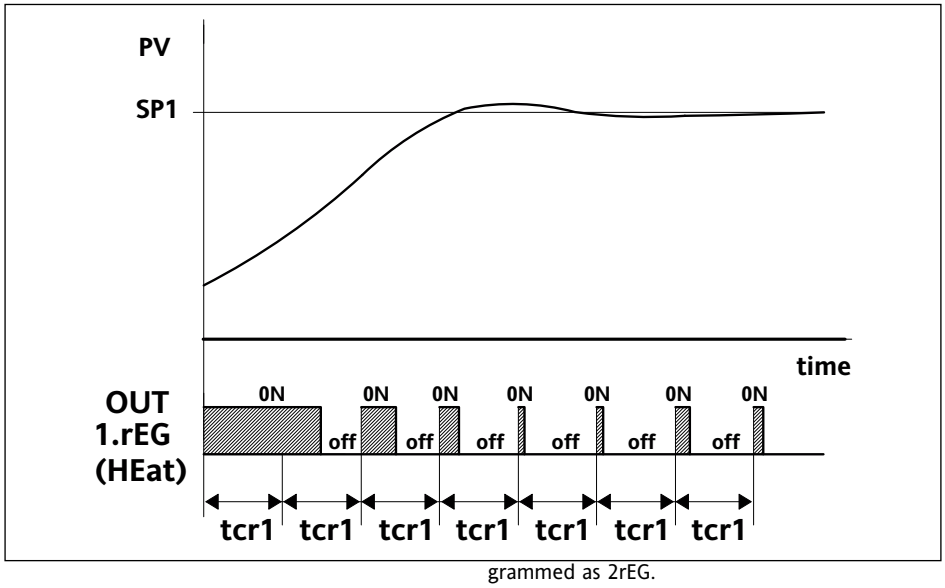




NEUTRAL ZONE ON/OFF CONTROL (1REG - 2REG)
All the parameters referring to Neutral Zone ON/OFF control are contained in the group "]rEG".
This type of control can be obtained when 2 outputs are programmed respectively as 1rEG and 2rEG and the par. "Cont" = nr .
The Neutral Zone control is used to control plants in which there is an element which causes a positive increase (ex. Heater, humidifier, etc.) and an element which causes a negative increase (ex. Cooler, de-humidifier, etc).
The control functions works on the programmed outputs depending on the measurement, on the active Set Point "SP" and on the hysteresis "HSEt".
The control works in the following way : it deactivates the outputs when the process value reaches the Set Point and it activates the output 1rEG when the process value goes below value [SP - HSEt], or it activates the output 2rEG when the process value goes above [SP + HSEt].
Consequently, the element causing a positive increase has to be connected to the output programmed as 1rEG while the element causing a negative increase has to be connected to the output programmed as 2rEG.
If 2rEG output is used to control compressor is possible to use the "Compressor Protection" function that has the meaning to avoid compressor "short cycles".
This function allows a control by time on the output 2rEG activation, independently by the temperature control request.
The protection is a "delayed after deactivation" type.
This protection permits to avoid the output activation for a time programmable on par. "CPdt" (expressed in sec.); the output activation will occurs only after the elapsing of time "CPdt".
The time programmed on parameter "CPdt" is counted starting from the last output deactivation.
Obviously, whether during the time delay caused by the compressor protection function, the regulator request should stop, the output activation foreseen after time "CPdt" would be erased.
The function is not active programming "CPdt" =OFF.
The led relative to 2rEG output blinks during the phases of output activation delay, caused by "Compressor Protection" function.

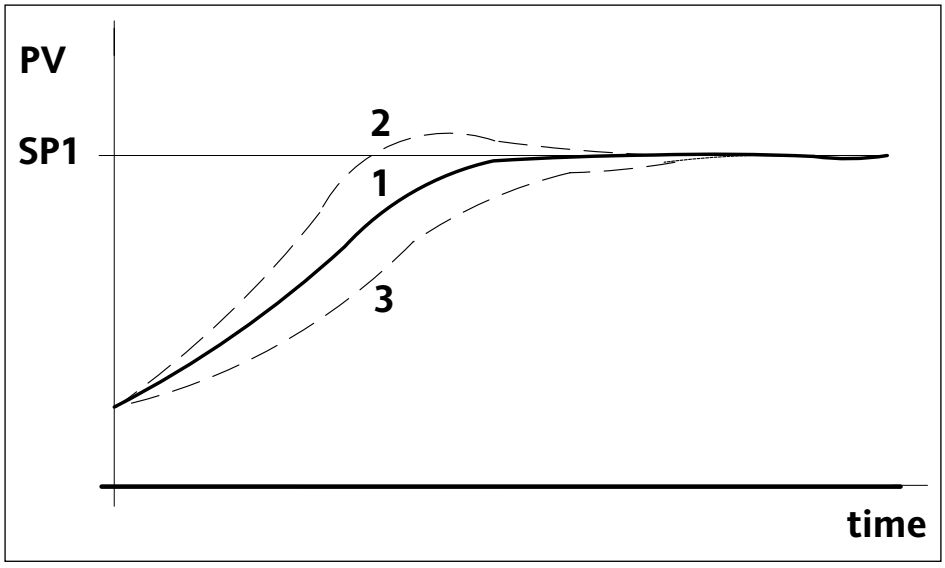
SINGLE ACTION PID CONTROL (1REG)
All the parameters referring to PID control are contained in the group "]rEG".
The Single Action PID control can be obtained by programming par."Cont" = Pid and works on the output 1rEG depending on the active Set Point "SP", on the functioning mode "Func" and on the instrument's PID algorithm with two degree of freedom.

In order to obtain good stability of the process variable, in the event of fast processes, the cycle time "tcr1" has to have a low value with a very frequent intervention of the control output.
In this case use of a solid state relay (SSR) is recommended for driving the actuator.



The Single Action PID control algorithm foresees the setting of the following parameters :
"Pb" – Proportional Band
"tcr1" – Cycle time of the output 1rEG
"Int" – Integral Time
"rS" – Manual Reset (if "Int =0 only)
"dEr" – Derivative Time
"FuOC" - Fuzzy Overshoot Control
This last parameter allows the variable overshoots at the start up of the process or at the changing of the Set Point to be avoided.
Please remember that a low value on this parameter reduces the overshoot while a high value increase it.

1: Value "FuOC" OK
2: Value "FuOC" too high
3: Value "FuOC" too low



DOUBLE ACTION PID CONTROL (1REG - 2REG)
All the parameters referring to PID control are contained in the group "]rEG".
The Double Action PID control is used to control plants where there is an element which causes a positive increase (ex. Heating) and an element which causes a negative increase (ex. Cooling).
This type of control can be obtained when 2 outputs are programmed respectively as 1rEG and 2rEG and the par. "Cont" = Pid.
The element causing a positive increase has to be connected to the output programmed as 1rEG while the element causing a negative increase has to be connected to the output programmed as 2rEG.
The Double Action PID control works on the outputs 1rEG and 2rEG depending on the active Set Point "SP" and on the instrument's PID algorithm with two degrees of freedom.
In order to obtain good stability of the process variable, in case of fast processes, the cycle times "tcr1" and "tcr2" have to have a low value with a very frequent intervention of the control outputs.
In this case use of solid state relays (SSR) to drive the actuators is recommended.
The Double Action PID control algorithm needs the programming of the following parameters :
• "Pb" – Proportional Band
• "tcr1" – Cycle time of the output 1rEG
• "tcr 2" – Cycle time of the output 2rEG
• "Int" – Integral Time
• "rS" – Manual Reset (if "Int =0 only)
• "dEr" – Derivative Time
• "FuOC" - Fuzzy Overshoot Control
• "Prat" - Power Ratio or relation between power of the element controlled by output 2rEG and power of the element controlled by output 1rEG.

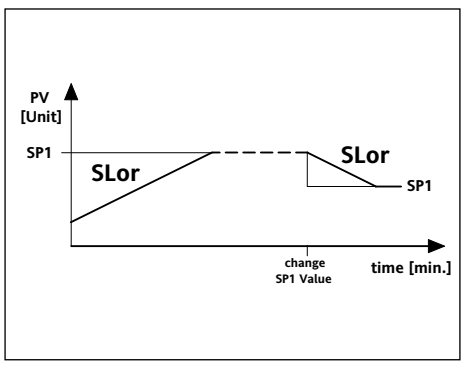
AUTOTUNING AND SELFTUNING FUNCTIONS
All the parameters referring to the AUTO-TUNING and SELF-TUNING functions are contained in the group "]rEG".
The AUTO-TUNING and SELF-TUNING functions permit the automatic tuning of the PID controller.
The AUTO-TUNING function permits the calculation of thePID parameters by means of a FAST type tuning cycle and, at the end of this operation, the parameters are stored into the instrument's memory and remain constant during control.
The SELF-TUNING function (rule based "TUNE-IN") instead allows control monitoring and the continuous calculation of the parameters during control.
Both functions automatically calculate the following parameters :
"Pb" – Proportional Band
"tcr1" – Cycle time of the output 1rEG
"Int" – Integral Time
"dEr" – Derivative Time
"FuOC" - Fuzzy Overshoot Control
and, for the Double Action PID control, also :
"tcr 2" – Cycle time of the output 2rEG
"Prat" - Ratio P 2rEG/ P 1rEG

To activate the AUTO-TUNING function proceed as follows :
1) Program and activate the desired Set Point.
2) Program par. "Cont" =Pid.
3) Program par. "Func" according to the process to be controlled through output 1rEG.
4) Program an output as 2rEG if the instrument controls a plant with double action
5) Program par. "Auto" as:
- "1" – if auto-tuning is desired automatically, each time the instrument is switched on, on the condition that the process value is lower (with "Func" =HEAt) than [SP- |SP/2|] or higher (with "Func" =CooL) than [SP+ |SP/2|].
- "2" – if auto-tuning is desired automatically, the next time the instrument is switched on, on the condition that the process value is lower (with "Func" =HEAt) than [SP- |SP/2|] or higher (with "Func" =CooL) than [SP+ |SP/2|], and once the tuning is finished, the par. "Auto" is automatically swapped to the OFF state
- "3" - if manual auto-tuning is desired, by selecting par. "tunE" in the main menu or by correctly programming key F as "USrb" = tunE. In this case the auto-tuning starts without any control on the process value condition. It is recommended to use this option, starting the auto-tuning when the process value is as far as possible from the Set Point because, in order to feature the Auto-tuning FAST with its best performances , it is preferable to respect this condition.
- "4" - if it's desired to activate the autotuning automatically at the end of programmed Soft-Start cycle. The Autotuning will start at the condition that the process value is lower (with "Func" =HEAt) than [SP- |SP/2|] or higher (with "Func" =CooL) than [SP+ |SP/2|].
6) Exit from the parameter programming.
7) Connect the instrument to the controlled plant.
8) Activate the Auto-tuning by selecting par. "tunE" in the main menu (or by correctly programming key F).
At this point the Auto-tuning function is activated and is indicated by the flashing led AT/ST.
The regulator carries out several operations on the connected plant in order to calculate the most suitable PID parameters.
If "Auto" = 1 or "Auto" = 2, and if, at the Auto-tuning start, the condition for the lower process value is not found (with "Func" =HEAt) than [SP- |SP/2|] or higher (with "Func" =CooL) than [SP+ |SP/2|], the display will show "ErAt" and the instrument will be swapped to normal control conditions according to the previously programmed parameters.
The Auto-tuning cycle duration has been limited to 12 hours maximum.
If Auto-tuning is not completed within 12 hours, the instrument will show "noAt" on the display.
In case of probe error, the instrument automati-

cally stops the cycle in progress.
The values calculated by Auto-tuning are automatically stored in the instrument's memory at the end of the correct PID parameters tuning.
To activate the SELF-TUNING function proceed as follows
1) Program and activate the desired Set Point.
2) Program par. "Cont" =Pid.
3) Program par. "Func" according to the process to be controlled through output 1rEG.
4) Program an output as 2rEG if the instrument controls a dual-action plant
5) Program par. "SELF" = yES
6) Exit from the parameter programming.
7) Connect the instrument to the controlled plant.
8) Activate Self-tuning selecting par. "tunE" in the main menu (or by correctly programming key F).
When the Self-tuning function is active, the led AT/ST is permanently lit up and all the PID parameters ("Pb", "Int", "dEr", etc.) are no longer visualized.
To stop the Auto-tuning cycle or deactivate the Self-tuning function select one of the control types : "rEG", "OPLO" or "OFF" from the menu "SEL". If the instrument is switched off during Auto-tuning or with the Self-tuning function activated, these functions will remain activated the next time it is switched on.

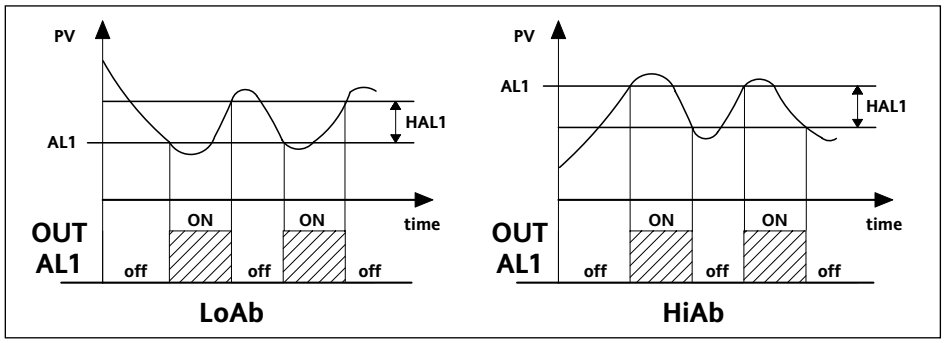
DYNAMIC SET POINT (RISE RAMP)
All the parameters referring to the ramps functioning are contained in the group "]rEG".
It is possible to reach the set point in a predetermined time (in any case longer than the time the plant would naturally need). This could be useful in those processes (heating or chemical treatments, etc.) where the set point has to be reached gradually, in a predetermined time.
Once the instrument has reached the first Set Point (SP1) it is possible to have automatic switching to the second Set Point (SP2) after a set time, thus obtaining a simple automatic thermic cycle.
These functions are available for all the programmable controls (PID single and double action, ON/OFF and Neutral Zone ON/OFF).
The function is determined by the following parameter:
"SLor" - Gradient of rise ramp (Process value < Set point) expressed in unit/minute.
Note: In case of PID control, if Auto-tuning is desired whilst the ramp function is active, this will not be carried out until the tuning cycle has been completed.
It is therefore recommended that Auto-tuning be started avoiding activating the ramp function and, once the tuning is finished, deactivate Auto-tuning ("Auto" = OFF), program the desired ramps and, if it automatic tuning is desired, enable the Self-tuning function.

Examples with starts from values lower than SP and with decreasing of SP.



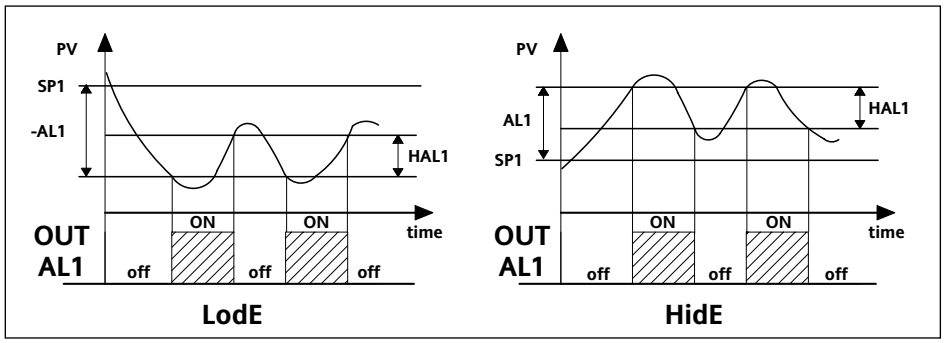
ALARM FUNCTIONING (AL1)
The alarm is depending on the process value (AL1) and before to set his functioning it's necessary to establish to which output the alarm has to correspond to.
First of all it's necessary to configure, in the parameters group "]Out", the parameters relative to the outputs required as alarm ("O1F" , "O2F") programming the parameter relative to the desired output as follows :
= ALno if the alarm output has to be ON when the alarm is active, while it's OFF when the alarm is not active
= ALnc if the alarm output has to be ON when the alarm is not active, while it's OFF when the alarm is active
= ALni if the alarm output has to be ON when the alarm is not active, while it is OFF when the alarm is active but with reverse led indication (led ON= alarm OFF).
Have now access at the group "]AL1", and program on par. "OAL1" , to which output the alarm signal has to be sent.
The alarm functioning is instead defined by parameters (see **Group "]AL1" (parameters relative to alarm AL1**):

"AL1t" – ALARM TYPE : the alarm output can behave in six different ways.



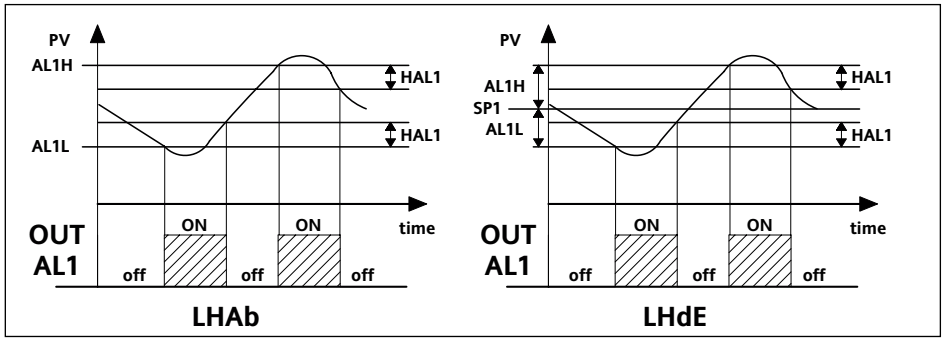
LoAb = ABSOLUTE LOW ALARM: The alarm is activated when the process value goes below the alarm threshold set on parameter "AL1". With this mode is possible to program the minimum and the maximum set of "AL1" by "AL1L" and "AL1H" parameters.

HiAb = ABSOLUTE HIGH ALARM: The alarm is activated when the process value goes higher than the alarm threshold set on parameter "AL1". With this mode is possible to program the minimum and the maximum set of "AL1" by "AL1L" and "AL1H" parameters.



LHAb = ABSOLUTE BAND ALARM: The alarm is activated when the process value goes under the alarm threshold set on parameter "AL1L" or goes higher than the alarm threshold set on parameter "AL1H".

LodE = DEVIATION LOW ALARM: The alarm is activated when the process value goes below the value [SP + AL1]. With this mode is possible to program the minimum and the maximum set of "AL1" by "AL1L" and "AL1H" parameters.



HidE = DEVIATION HIGH ALARM: The alarm is activated when the process value goes above the value [SP + AL1]. With this mode is possible to program the minimum and the maximum set of "AL1" by "AL1L" and "AL1H" parameters.

LHdE = DEVIATION BAND ALARM: The alarm is activated when the process value goes below the value [SP + AL1L] or goes above than the value [SP + AL1H]

USE CONDITIONS
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.

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.

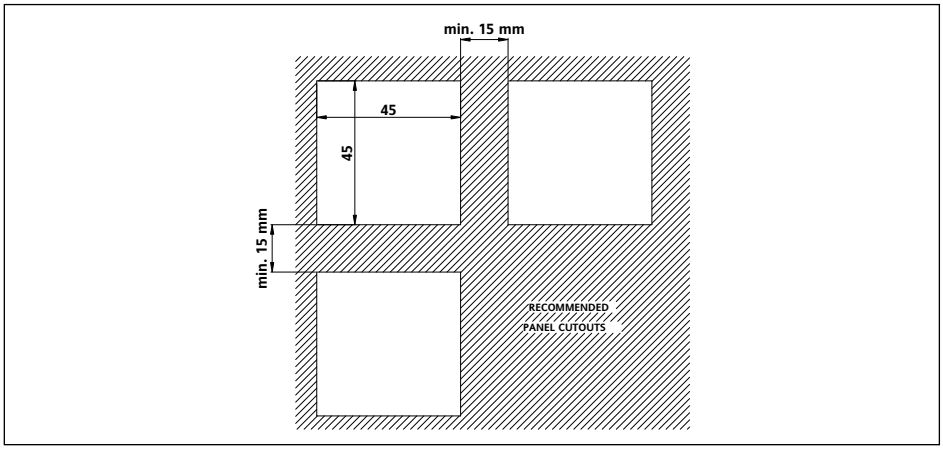
ELECTRICAL CONNECTIONS
Warning! Never work on electrical connections when the machine is switched on.
The instrument is equipped with screw terminal boards for connection of electrical cables (one conductor only per terminal for power connections): for the capacity of the terminals, see the label on the instrument. The relay contacts are voltage free.
Do not exceed the maximum current allowed; in case of higher loads, use an appropriate contactor. Make sure that power supply voltage meets the instrument voltage.
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.

TECHNICAL DATA - ELECTRICAL DATA
Power supply: 24, 115, 230 VAC, 24 VAC/VDC, 100... 240 VAC +/- 10%
Frequency AC: 50/60 Hz
Power consumption: 5 VA approx.
Input/s: 1 input for temperature probes: tc J,K; RTD Pt 100 IEC; PTC KTY 81-121 (990 W @ 25 °C); NTC 103AT-2 (10KW @ 25 °C) or mV signals 0...50 mV, 0...60 mV, 12 ...60 mV or normalized signals 0/4...20 mA, 0..1 V, 0/1...5 V , 0/2...10 V.
Normalized signals input impedance: 0/4..20 mA: 51 W; mV and V: 1 MW
Output/s: Up to 2 outputs. Relay SPST-NO (8 A-AC1, 3 A-AC3 / 250 VAC) ; or in tension to drive SSR (8mA/ 8VDC).
Auxiliary supply output: 10 VDC / 20 mA Max.
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, SSR outputs); No insulation between input and SSR outputs.

MECHANICAL DATA
Housing: Self-extinguishing plastic, UL 94 V0
Dimensions: 48 x 48 mm DIN, depth 98 mm
Weight: 225 g approx.
Mounting: Flush in panel in 45 x 45 mm hole
Connections: 2 x 1 mm2 screw terminals block
Degree of front panel protection : IP 54 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

FUNCTIONAL FEATURES
Control: ON/OFF, single and double action PID
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
Sampling rate: 130 ms.
Display: 4 Digit Red h 12 mm

PANEL CUT-OUT



PLEASE NOTE: The technical data included in this document, related to measurement (range, accuracy, resolution, etc.) refer to the instrument itself, and not to its equipment such as, for example, sensors.
This means, for example, that sensor(s) error(s) shall be added to the instrument's one.

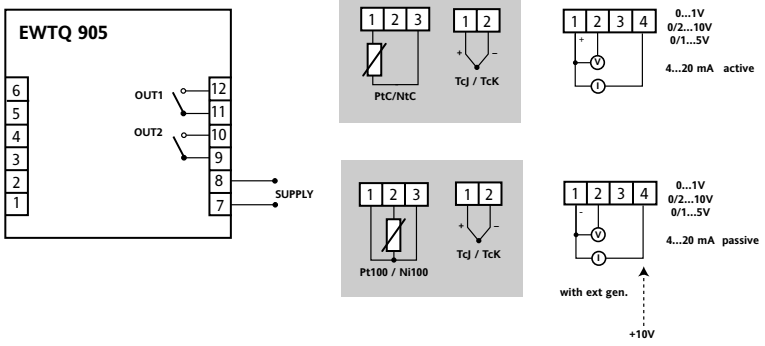
LIABILITY AND RESIDUAL RISKS
Eliwell & Controlli srl shall not be liable for any damages deriving from:
- installation/use other than that prescribed and, in particular, that which does not comply with safety standards anticipated by regulations and/or those given herein;
- use on boards which do not guarantee adequate protection against electric shock, water or dust under the conditions of assembly applied;
- use on boards which allow access to dangerous parts without the use of tools;
- tampering with and/or alteration of the products;

DISCLAIMER

PARAMETERS TABLE

Par.	Description		Range	Def.
Group "]SP" (parameters relative to the Set Point)				
1	SP1	Set Point	SPLL ÷ SPHL	0
2	SPLL	Low Set Point	-1999 ÷ SPHL	-1999
3	SPHL	High Set Point	SPLL ÷ 9999	9999
Group "]InP" (parameters relative to the measure input)				
4	SEnS	Probe type	input C : J / CrAL / S / Ir.J / Ir.CA / Pt1 / 0.50 / 0.60 / 12.60 input E : J / CrAL / S /Ir.J / Ir.CA / Ptc/ ntc / 0.50 / 0.60 / 12.60 input I : 0.20 / 4.20 input V : 0.1 /0.5 / 1.5 / 0.10 / 2.10	J Ptc 4.20 0.10
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	dP	Number of decimal figures	Pt1 / Ptc / ntc: 0 / 1 norm sig.: 0 ÷ 3	0
8	Unit	Temperature unit of measurement	°C / °F	°C
9	FiL	Input digital filter	0FF÷ 20.0 sec.	0.1
10	OFSt	Measuring Offset	-1999 ÷ 9999	0
11	rot	Rotation of the measuring straight line	0.000 ÷ 2.000	1.000
12	OPE	Output power in case of measuring error	-100 ÷ 100%	0
Group "]Out" (parameters relative to the outputs)				
13	O1F	Functioning of output 1 1.rEG / 2.rEG ALno / ALnc ALni / OFF	1.rEG	
14	O2F	Functioning of output 2	1.rEG / 2.rEG ALno / ALnc ALni / OFF	ALno
Group "]AL1" (parameters relative to alarm AL1)				
15	OAL1	Output where alarm AL1 is addressed	Out1 / Out2 /OFF	Out2
16	AL1t	Alarm AL1 type	LoAb / HiAb LHAb / LodE HidE / LHdE	LoAb
17	AL1	Alarm AL1 threshold	AL1L÷ AL1H	0
18	AL1L	Low threshold band alarm AL1 or Minimum set alarm AL1 for high or low alarm	-1999 ÷ AL1H	-1999
19	AL1H	High threshold band alarm AL1 or Maximum set alarm AL1 for high or low alarm	AL1L ÷ 9999	9999
20	HAL1	Alarm AL1 hysteresis	OFF ÷ 9999	1
21	AL1d	Activation delay of alarm AL1	OFF ÷ 9999 sec.	OFF
22	AL1i	Alarm AL1 activation in case of measuring error	no / yES	no
Group "]rEG" (parameters relative to the control)				
23	Cont	Control type	Pid / On.FA On.FS / nr	Pid
24	Func	Functioning mode output 1rEg	HEAt / CooL	HEAt
25	HSEt	Hysteresis of ON/OFF control	0 ÷ 9999	1
26	CPdt	Compressor Protection time for 2.rEG	OFF÷ 9999sec.	0
27	Auto	Autotuning Fast enable	OFF / 1 / 2 / 3 / 4	1
28	SELF	Selftuning enable	no / yES	no
29	Pb	Proportional band	0 ÷ 9999	50
30	Int	Integral time	OFF ÷ 9999 sec.	200
31	dEr	Derivative time	OFF÷ 9999 sec.	50
32	FuOc	Fuzzy overshoot control	0.00 ÷ 2.00	0,5
33	tcr1	Cycle time of output 1rEg	0.1 ÷ 130.0 sec.	20,0
34	Prat	Power ratio 2rEg / 1rEg	0.01 ÷ 99.99	1.00
35	tcr2	Cycle time of 2rEg	0.1 ÷ 130.0 sec.	10.0
36	rS	Manual reset	-100.0÷100.0 %	0.0
37	SLor	Gradient of rise ramp	0.00 ÷ 99.99 / InFunit/min.	InF
Group "]PAn" (parameters relative to the user interface)				
38	AdE	Shift value for the shift index functioning	OFF...9999	2

EWTQ 905 WIRING DIAGRAM



TERMINALS

INPUTS

1 - 2	TCJ/TCK	1 +; 2 -
2 - 3	Pt100/Ni100	
1 - 2	TCJ/TCK	1 +; 2 -
1 - 2 - 3	PtC/NtC	
1 - 2	0...1V; 0/1...5V; 0/2...10V	1 +;
1 - 2	0/4...20mA active	1 +;
1 - 4	4...20mA passive	4+ (+10Vdc)

OUTPUTS

7 - 8	SUPPLY	
9 - 10	OUT2	9 COMMON; 10 N.O.
11 - 12	OUT1	11 COMMON; 12 N.O.

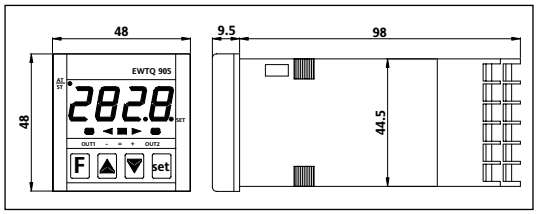
ALARMS

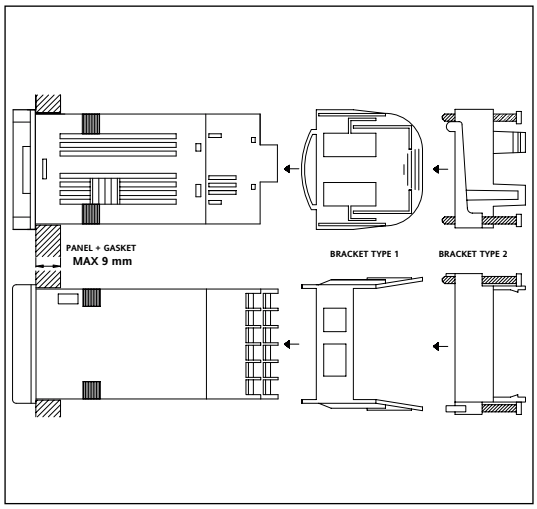
In error conditions, the instrument provides an output power as programmed on par “OPE” and activates the desired alarms, if the relative parameters “ALni” have been programmed = yES.

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)	
ErAt	Auto-tuning not possible because the process value is higher (with “Func” =HEAt) than [SP- |SP/2|] or lower (with “Func” =CooL) than [SP+ |SP/2|].	Restart Auto-tuning when the process value conditions allow it
noAt	Auto-tuning not finished within 12 hours	Check the working of probe and actuator and try again to start Auto-tuning
ErEP	Possible anomaly of the EEPROM memory	Push key set

MECHANICAL DIMENSIONS, PANEL CUT-OUT AND MOUNTING [MM]





MEASURING RANGE

MEASURING RANGE TABLE

INPUT	parameter SenS=	available on models:	input “dP” = 0	input “dP”= 1, 2, 3
tc J	J	C,E	0 ... 1000 °C 32 ... 1832 °F	- - - -
tc K	CrAl	C,E	0 ... 1370 °C 32 ... 2498 °F	- - - -
Pt100 (IEC)	Pt1	C,E	-200 ... 850 °C -328 ... 1562 °F	-199.9 ... 850.0 °C -199.9 ... 999.9 °F
PTC (KTY81-121)	Ptc	E	-55 ... 150 °C -67 ... 302 °F	-55.0 ... 150.0 °C -67.0 ...302.0 °F
NTC (103-AT2)	ntc	E	-50 ... 110 °C -58 ... 230 °F	-50.0 ... 110.0 °C -58.0 ... 230.0 °F
0..20 mA	0.20	I	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
4..20 mA	4.20	I	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
0 ... 50 mV	0.50	C,E	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
0 ... 60 mV	0.60	C,E	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
12 ... 60 mV	12.60	C,E	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
0 ... 1 V	0.1	V	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
0 ... 5 V	0.5	V	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
1 ... 5 V	1.5	V	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
0 ... 10 V	0.10	V	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999
2 ... 10 V	2.10	V	-1999 ... 9999	-199.9 ... 999.9 -19.99 ... 99.99 -1.999 ... 9.999

EWTQ 905 PASSWORD = 381

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