



EWTN 970

PID temperature controller

WHAT IT IS

The EWTN 970 programmable digital thermostat is based on a powerful microprocessor. It is manufactured by applying the Surface Mount Technology (SMT) in order to ensure high reliability and noise protection.

The device has one output with selectable ON-OFF or PID action to control temperature.

A version with two PID control outputs, i.e. one for the heater and one for a refrigeration element, is also available.

HOW IT IS MADE

- **ABS self-extinguishing plastic housing**
- **Front panel size: 48x96 mm, depth 100 mm (1/8 DIN)**
- **All controls are located on front panel**
- **Main output C1: 1 SPDT relay output rated 6(2)A 250VA or static relay output (SSR) rated 0/24 VC 25 mA**
- **Secondary output C2 (optional): 1 SPDT relay output rated 6(2)A 250VA or static relay output (SSR) rated 0/24 VC 25 mA**
- **Heater Breaker output (optional): 1 N.O. relay output 6(2)A 250VA or static relay output (SSR) rated 0/24 VC 25 mA**
- **Alarms (optional): 2 N.O. relay outputs 6(2)A 250VA or static relay output (SSR) rated 0/24 VC 25 mA**
- **Inputs: Pt100, TC (J, K) all selectable;**
- **Heater Breaker input (optional): Amp. Tr. 100 A/200 mA (TAG00101).**
- **Accuracy: 0.5 % (RTD) or 0.7% (Tc) of full scale.**
- **Power supply: 90...240 VA or 24**

DESCRIPTION

The EWTN 970 programmable digital thermostat is based on a powerful microprocessor. It is manufactured by applying the Surface Mount Technology (SMT) in order to ensure high reliability and noise protection.

The controller has one output with selectable ON-OFF or PID action to control temperature.

A version with two PID control outputs, i.e. one for the heater and one for a refrigeration element, is also available. The parameters concerning PID control can be calculated by the controller itself thanks to the AUTO-TUNE function, which can be selected while in programming mode.

The controller has two alarm outputs, whose triggering values and operation modes can be fully programmed by using the front keypad.

Housing size is 48x96 mm (1/8 DIN format).

FRONT KEYPAD

P: key used to enter parameter programming mode.

Once you have accessed this mode, this key permits confirming the value entered and moving on to the following parameter.

▲ (UP): active during parameter programming only.

Key to increase the value of the flashing digit. Every time you press it, the digit will increase by one unit.

<< (LEFT): key used to shift the digit that can be changed (flashing).

C1/C2: LED's associated with the status of the main outputs.

AL1/AL2: LED's associated with the status of the temperature alarm outputs.

HB: LED associated with the status of the Heater Breaker alarm output (amperometric overcurrent control of resistors).

PARAMETER PROGRAMMING

To access parameter programming mode, press and hold the "P" key for a few seconds. The label of the first parameter ("SEtP") will be shown on the "PV" display, while the corresponding value will be shown on the "SV" display. The first digit on the right will blink to indicate that it can be changed by using the key "UP".

To shift to a different digit to be changed, press "<<". To confirm the value of the displayed parameter and move on to the following one, press "P" once again.

For safety reasons, parameters are divided into two groups:

FIRST-LEVEL PARAMETERS, which can be accessed by the User by following the above described procedure.

SECOND-LEVEL PARAMETERS, which can be accessed only after entering the correct password when the label "PASS" is displayed during programming.

BASIC OPERATION

The most direct procedure to set the controller to work is the following:

a) power the controller, after checking its rating plate. If the sensor is not connected, the display will show an error message; check for proper sensor connection.

b) Enter programming mode and define the operating set point through parameter "SEtP".

c) Enter the second-level parameter programming mode and enable the auto-tune function by using the parameter "Auto", set parameter "CON1" to PID control and select the type of sensor used through parameter "SEnS".

d) Exit programming mode and wait for the auto-tune function to finish storing all operating parameters.

Once the controller is ready to start regulating, you can optimize the settings of the remaining parameters.

DESCRIPTION OF PARAMETERS

SEtP: SEtPoint.

Triggering threshold of the main regulation output.

HSEt: Hysteresis SEtpoint

Operating differential (hysteresis) of the main output. This parameter is enabled only when ON-OFF control is selected through parameter "Cont".

AL1: ALarm 1.

Alarm 1 triggering threshold.

HAL1: Hysteresis ALarm 1.

Differential (hysteresis) for alarm 1.

AL2: ALarm 2.

Alarm 2 triggering threshold.

HAL2: ALarm 2 Hysteresis.

Differential (hysteresis) for alarm 2.

AL1L: ALarm 1 Low.

Triggering threshold for low alarm 1 (for window alarm).

AL1H: ALarm 1 High.

Triggering threshold for high alarm 1 (for window alarm).

AL2L: ALarm 2 Low.

Triggering threshold for low alarm 2 (for window alarm).

AL2H: ALarm 2 High.

Triggering threshold for high alarm 2 (for window alarm).

ALHb: ALarm Heater breaker.
Heater breaker alarm threshold.

PASS: PASSword.

By entering number 0381, you can access the following "second level parameters".

Alarms

rL1: reLay alarm 1.

Operating mode of alarm 1.

rL2: reLay alarm 2.

Operating mode of alarm 2.

rLHB: reLay Heater Breaker.

Operating mode of Heater Breaker relay.

FAIL: FAILure.

If the controller fails:

rL1 = alarm 1 relay active;

rL2 = alarm 2 relay active;

rL12 = alarm 1 and 2 relays active;

no = no active relay (standard).

dAL1: disabling ALarm 1.

Disables relay alarm 1; the corresponding LED will blink but the alarm 1 relay output will not trigger.

dAL2: disabling ALarm 2.

Disables relay alarm 2, see "dAL1".

ALPr: ALarm Protection.

If enabled, this parameter will hide the alarm parameters at second level after password.

Set point limits

SPLL: SetPoint Low Limit.

Low set point setting limit

Permissible values: -999 to SPHL.

SPHL: SetPoint High Limit.

High set point setting limit.

Permissible values: SPLL to 9999.

PID control

CON1: CONtrol 1.

Type of function of the main regulation output.

Pid = Pid control;

OnOf = ON-OFF operation.

NOTE: in the case of 2-output controllers, this parameter will have no effect, as both outputs are enabled for PID control only.

Func: Function.

Type of control action.

Heat = heating;

Cool = cooling.

Auto: Auto-tune

Enables the AUTO-TUNE function.

LoSP = AUTO-TUNE function is enabled up to 70% of set point;

SP = AUTO-TUNE function is enabled up to set point value (recommended setting); no = no AUTO-TUNE function.

This parameter is active only if PID control has been selected.

PID parameter setting

These parameters are enabled only when Cont = Pid.

Pb: Proportional band.

It is the proportional band around the Set point within which the controller operates with proportional action. It is expressed in degrees and its standard value is 100.

Int: Integral time.

It is expressed in seconds and its standard value is 500.

dEr: dErivative time.

It is expressed in seconds and its standard value is 30.

tcr1: time cycle relay 1.

Cycle time for control output 1; it is expressed in seconds and its standard value is 500.

It is indicated as "tcr" in case a single control output C1 is present.

Prat: Power ratio.

Heating power to cooling power ratio applied to C1 and C2 relays (2-output controllers only).

tcr2: time cycle relay 2.

Cycle time for control output 2; it is the interval between two subsequent relay trips.

rS: manual reSet.

It operates on the position of the proportional band. A setting of 50% indicates the proportional band is around the set point, 100% indicates that the whole proportional band is above the set point, and 0% that the proportional band is completely below set point. Its standard value is 50%.

Display read-out

Unit: Unit of measurement.

C = degrees Centigrade;

F = degrees Fahrenheit;

AbS = degrees Kelvin (AbSolute).

SEnS: SEnSor type.

Type of sensor used. The minimum and maximum display values for each sensor are shown below. Exceeding such values, an error message will be displayed.

OFFt: OFFset.

Display calibration. This parameter permits carrying out a sensor readout calibration before the cycle starts. Standard value 0.

FiLt: FiLter.

Constant of the digital filter; the higher the value of this parameter, the lower the noise sensitivity and the slower the response speed of the system. Standard value 1.

ALARM MANAGEMENT

Active alarm

The value of the first digit starting from the right in the alarm configuration code defines whether the relay output is closed or open during an alarm condition.

Alarm active with output:

0 = open relay, SSR = 0 Volt;

1 = closed relay, SSR = 24 Volt.

Operation at start up

The value of the second digit starting from the right determines the behavior of the alarm relay at start up:

0 = alarm relay enabled when alarm is active;

1 = alarm relay disabled until the alarm zone is reached.

Alarm storage

The value of the third digit starting from the right allows storing an alarm condition. Therefore the relay will remain active even if the alarm has ceased. In this case, to reset the alarm press key "<<".

0 = alarm storage disabled;

1 = alarm storage enabled.

Alarm Type

The fourth digit starting from the right defines the alarm type:

0 = absolute low alarm;

1 = absolute high alarm;

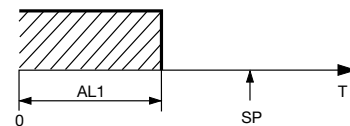
2 = absolute window alarm;

3 = relative low alarm;

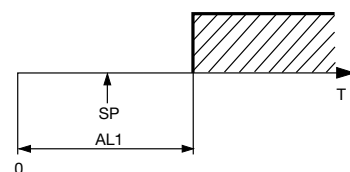
4 = relative high alarm;

5 = relative window alarm.

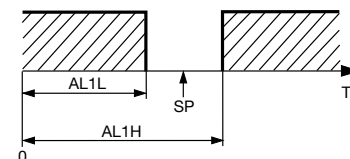
LOW ALARM: output is activated when the temperature drops below the alarm threshold ("AL1" or "AL2").



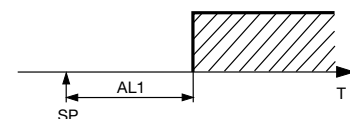
HIGH ALARM: output is activated when the temperature exceeds the alarm threshold ("AL1" or "AL2").



WINDOW ALARM: output is activated when the temperature drops below the alarm threshold "AL1L" ("AL2L") or exceeds the alarm threshold "AL1H" ("AL2H").



RELATIVE ALARM: if the alarm is relative, the triggering threshold is given by the algebraic addition of the set point and the defined threshold value ("AL1" or "AL2").



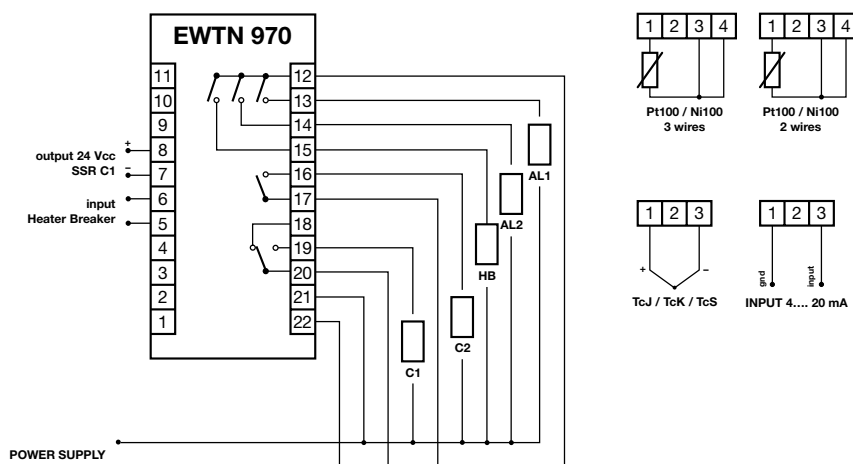
In case of selection of the same window alarm, absolute or relative, two window alarms will coincide with one of the selected type (maximum values "AL1" and "AL2") both for "rL1" and "rL2", as no different band values can be selected.

AUTO-TUNE

The AUTO-TUNE function allows the instrument to automatically select the best values for PID control: proportional band, integrative and proportional time, cycle time.

Due to the complexity of applications and the difficulty thereof to select the correct values, we recommend the use of AUTO-TUNE for the first setup; values thus ob-

CONNECTIONS



tained can then be modified by the User in case the automatic setting does not provide the required results.

To select this function enter second level parameter programming mode and select "SP" on the Auto parameter; after the end of programming two LED's will blink on the lower display, indicating the search is in progress. After the end of the automatic search the instrument begins operating according to the stored parameters. In certain applications, the temperature could suffer significant variations when the AUTO-TUNE function is in progress. Set the AUTO-TUNE function to "LoSP". The message "no Auto" indicates a fault; in such case turn the instrument on and off. If the AUTO-TUNE function is not completed in 4 hours the display will show "tout Auto" (time out).

DOUBLE OUTPUT

This configuration does not include ON/OFF regulation on C1 and C2 main outputs.

Parameter "Func1" defines the operation of output C1, while output C2 will automatically operate in the opposite way. Both outputs share the PID parameters; the only exception is the value of parameters "tcr1/2", which are different for each output.

The "Prat" (Power ratio) is a special feature

of 2 - output controllers: it is the ratio between the cooling power of the system (controlled by the C2 output) and the heating power (controlled by C1) and permits EWTN 970 to assess the power difference between the two outputs. Setting this parameter to 0 disables output C2, setting it to 1 means equal power on the two outputs.

HEATER BREAKER (optional)

This function controls the load current up to 100 A. EWTN 970 shall be connected to an amperometric transformer code: TAG00101. The load current can be displayed by pressing "<<".

The alarm threshold can be programmed through the "ALHb" parameter, and the relay output logic through "rLHb":

nC = normally closed, open during an alarm condition;

nO = normally open, closed during an alarm condition.

DISPLAYED MESSAGES

When an error occurs, display P will show a message to identify its origin; additionally, through parameter "FAIL" one or both alarm outputs can be enabled.

Error messages:

"- - -": broken sensor;

"uuuu": temperature has dropped below the low limit of the sensor in use;

"oooo": temperature has increased over the high limit of the sensor in use. If a trouble has interrupted the autotune function, the flashing message "no Auto" will be displayed. If the autotune function cannot be completed before a time-out period of 4 hour elapses, the flashing message "tout auto" will be displayed.

"Err EEPPr": the instrument was turned off during programming. In this case, press keys "P" and "<<" at the same time, and then return to programming mode.

INSTALLATION

The instrument is designed for panel mount: drill a 45x92 mm hole and insert the instrument, then fix it with its special

bracket.

The permissible operating temperature ranges from 0 to 55 °C with maximum non-condensing relative humidity of 95%. The input cables for thermocouples or thermal resistors should be routed away from load wires.

The rating of internal relay contacts is 6A 250 Vac resistive. Should the load exceed such ratings, use a suitable external contactor.

TECHNICAL DATA

Housing: ABS self-extinguishing plastic.

Dimensions: front panel 48x96 mm, depth 100 mm (1/8 DIN).

Installation: panel mount with holding bracket; hole 45x92 mm.

Connections: on Faston 6,3 mm terminal block.

Display: digit height 7.5 mm.

Controls: located on front panel.

Data storage: non-volatile memory (EEPROM).

Ambient temperature: 0...55 °C.

Storage temperature: -10...60 °C.

Ambient Relative Humidity: 30...95%, non-condensing.

Main output C1: 1 SPDT relay rated 6(2)A 250VA or static (SSR) relay rated 0/24 Vc/25 mA.

Secondary output C2 (optional): 1 SPDT relay rated 6(2)A 250VA or static (SSR) relay rated 0/24 Vc/25 mA.

Heater breaker output (optional): 1 N.O. relay output rated 6(2)A 250VA or static (SSR) relay 0/24 Vc/25 mA.

Alarms (optional): 2 N.O. relay outputs rated 6(2)A 250V AC or static relays (SSR) rated 0/24 Vc/25 mA.

Inputs: Pt100, Tc (J, K) selectable; optional input 0/4...20 mA or 0/1...5 V. Golden contacts on terminal block for optimum signal transfer.

Heater breaker input (optional): Amp. Tr. 100 A/200 mA (TAG00101).

Accuracy: 0.5 % (RTD) or 0.7% (Tc) of full scale.

Power supply: 90...240 VA or 24 VA/C, 50/60 Hz.

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