KRD7

CONTROLLER AND MINI-PROGRAMMER WITH SPEED CONTROL

Engineering Manual

22/06 - Code: ISTR_M_KRD7_E_01_--

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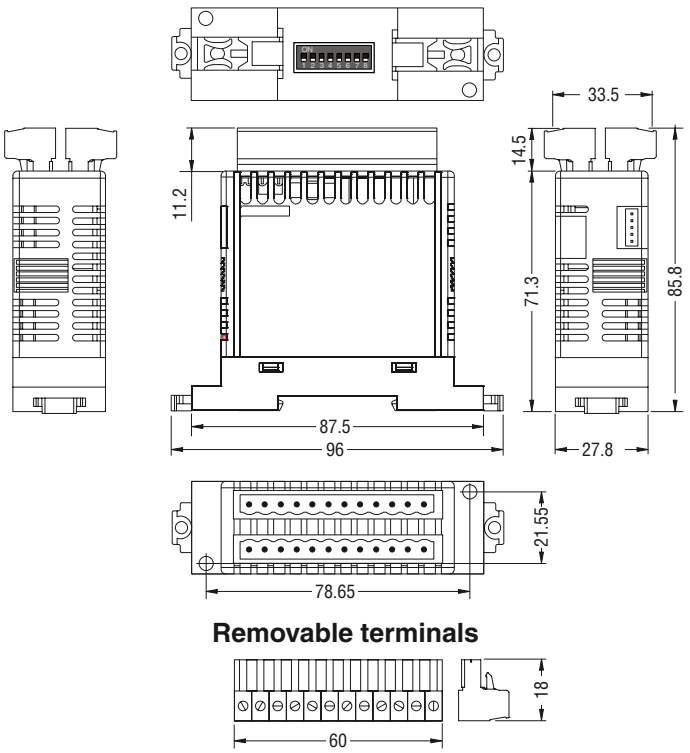
1 OUTLINE DIMENSIONS (mm)

1.1 Dimensions

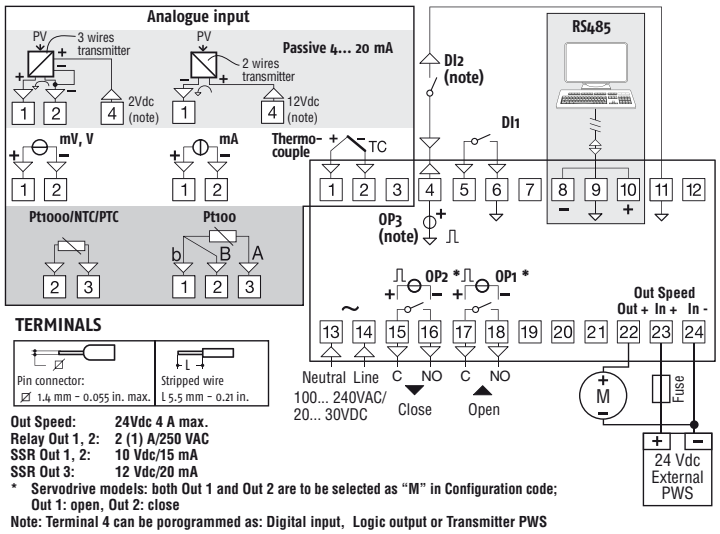


1.2 Mounting requirements

This instrument is intended for permanent installation, for indoor use only, in an electrical panel, specific for DIN rail mounting. Select a mounting location having the following characteristics:

1. It should be easily accessible;
2. There is minimum vibrations and no impact;
3. There are no corrosive gases;
4. There are no water or other fluids (i.e. condensation);
5. The ambient temperature is in accordance with the operative temperature (0... 50°C);
6. The relative humidity is in accordance with the instrument specifications (20... 85%);

2 CONNECTION DIAGRAM

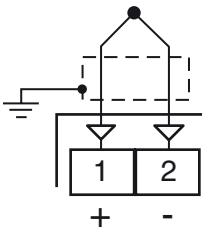


2.1 General notes about wiring

1. Do not run input wires together with power cables.
2. External components (like zener barriers, etc.) connected between sensor and input terminals may cause errors in measurement due to excessive and/or not balanced line resistance or possible leakage currents.
3. When a shielded cable is used, the protection shield must be connected to ground at one side only.
4. Pay attention to the line resistance, a high line resistance may cause measurement errors.

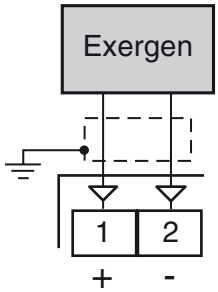
2.2 Inputs

2.2.1 Thermocouple Input



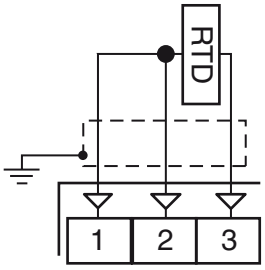
External resistance: 100Ω max., maximum error 25 μV.
Cold junction: automatic compensation between 0... 50°C.
Cold junction accuracy: 0.05°C/°C after a warm-up of 20 minutes.
Input impedance: > 1 MΩ.
Calibration: According to EN 60584-1.
Note: For TC wiring use proper compensating cable preferable shielded.

2.2.2 Infrared Sensor Input



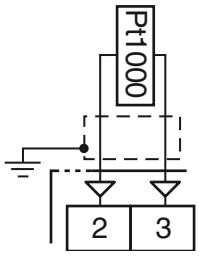
External resistance: Not relevant.
Cold junction: Automatic compensation between 0... 50°C.
Cold junction accuracy: 0.05°C/°C.
Input impedance: > 1 MΩ.

2.2.3 RTD Pt 100 Input



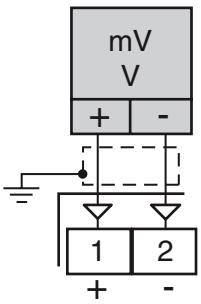
Input circuit: Current injection (150 µA).
Line resistance: Automatic compensation up to 20Ω/wire with maximum error ±0.1% of the input span.
Calibration: According to EN 60751/A2.
Note: The resistance of the 3 wires must be the same.

2.2.4 RTD Pt 1000, NTC and PTC Input



Line resistance: Not compensated.
Pt 1000 input circuit: Current injection (15 µA).
Pt 1000 calibration: According to EN 60751/A2.

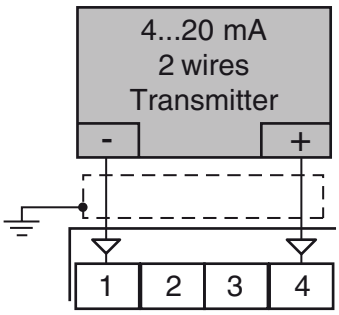
2.2.5 V and mV Input



Input impedance: > 1 MΩ for mV Input
500 kΩ for Volt Input.

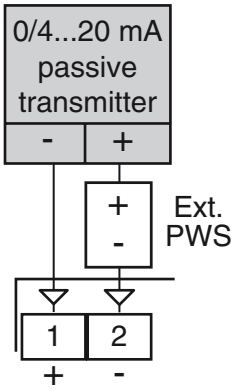
2.2.6 mA Input

0/4... 20 mA input wiring for passive transmitter using the auxiliary pws

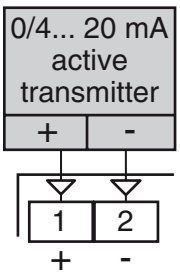


Input impedance: < 53Ω.
Internal auxiliary PWS: 12 VDC (±10%), 20 mA max..

0/4... 20 mA input wiring for passive transmitter using an external pws



0/4... 20 mA input wiring for active transmitter

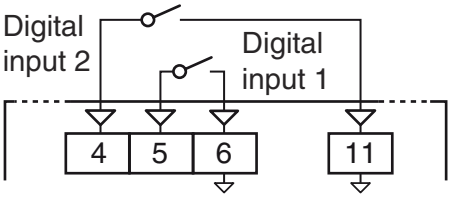


2.2.7 Logic Inputs

Safety notes:

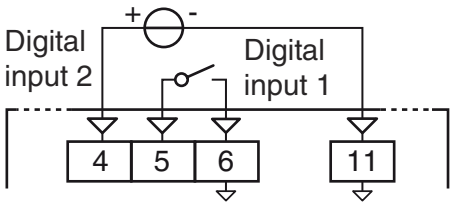
- Do not run logic input wiring together with power cables;
- The instrument needs 150 ms to recognize a contact status variation;
- Logic inputs are **NOT** isolated from the measuring input. A double or reinforced insulation between logic inputs and power line must be ensured by the external elements.

Logic input driven by dry contact



Maximum contact resistance: 100Ω.
Contact rating: DI1 = 10 V, 6 mA;
DI2 = 12 V, 30 mA.

Logic inputs driven by 24 VDC



Logic status 1: 6... 24 VDC;
Logic status 0: 0... 3 VDC.

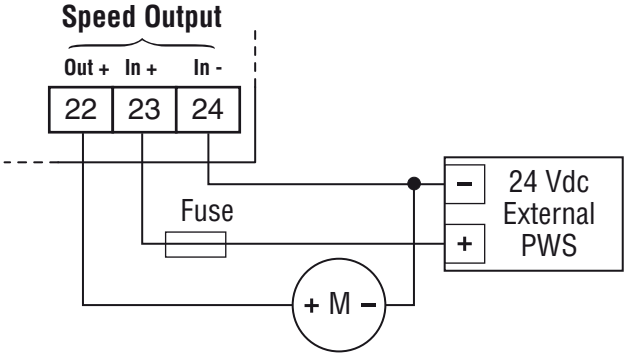
2.3 Outputs

Safety notes:

- To avoid electrical shocks, connect power line at last.
- For supply connections use No. 16 AWG or larger wires rated for at least 75°C.
- Use copper conductors only.
- SSR outputs are not isolated. A reinforced isolation must be assured by the external solid state relays.
- For SSR, mA and V outputs if the line length is longer than 30 m use a shielded wire.

Before connecting the output actuators, we recommend to configure the parameters to suit your application (e.g.: input type, Control strategy, alarms, etc.).

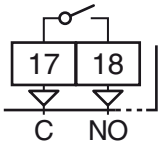
2.3.1 SPEED Output



Voltage rating: 12 to 24 VDC
Current rating: Max 4 A.

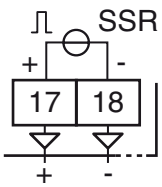
2.3.2 Output 1 (OP1)

Relay Output



OP1 contact rating: - 2 A /250 V cosφ =1
- 1 A /250 V cosφ =0.4
Operation: 1 x 10^5

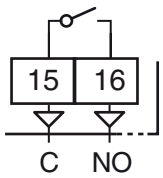
SSR Output



Logic level 0: Vout < 0.5 VDC
Logic level 1: 12 V ± 20%, 15 mA max.

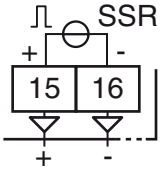
2.3.3 Output 2 (OP2)

Relay Output



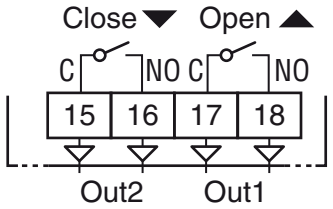
OP1 contact rating: - 2 A /250 V cosφ = 1
- 1 A /250 V cosφ = 0.4
Operation: 1 x 10^5

SSR Output



Logic level 0: Vout < 0.5 VDC
Logic level 1: 12 V ± 20%, 15 mA max.

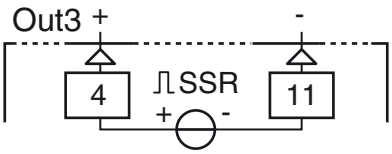
2.3.4 Output 1 and Output 2 Servomotor Drive



OP2/3 contact rating: - 2 A /250 V cosφ = 1;
- 1 A /250 V cosφ = 0.4.
Operation: 1 x 10^5.

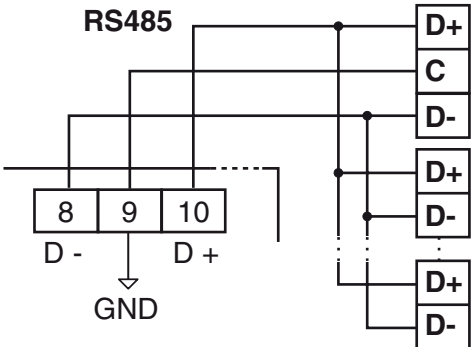
2.3.5 Output 3 (OP3)

SSR Output



Logic level 0: Vout < 0.5 VDC;
Logic level 1: 12 V ± 20%, 20 mA max..
Note: Overload protected.

2.4 Serial Interface



Interface type: Isolated (50 V) RS-485;
Voltage levels: According to EIA standard;
Protocol type: MODBUS RTU;
Byte format: 8 bit with no parity;
Stop bit: 1 (one);
Baud rate: Programmable between 1200... 38400 baud;
Address: Programmable between 1... 255.

Notes: 1. RS-485 interface allows to connect up to 30 devices with one remote master unit.

2. The cable length must not exceed 1.5 km at 9600 baud.

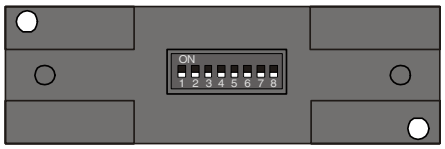
3. Follows the description of the signal sense of the voltage appearing across the interconnection cable as defined by EIA for RS-485:

a The "A" terminal of the generator shall be negative with respect to the "B" terminal for a binary 1 (MARK or OFF) state;

b The "A" terminal of the generator shall be positive with respect to the "B" terminal for a binary 0 (SPACE or ON).

4. This instrument allows to set serial link parameters (address and baud rate) in two different way:

a **Programmable parameters:** all dip switches present in the back side of the instrument must be set to OFF:



The instrument uses the values programmed in [139] Add and [140] bAud parameters;

b **Fixed parameters:** the switches present in the back side of the instrument must be set according to the following table:

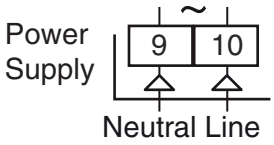
DIP switch	Function
1	Address bit 0
2	Address bit 1
3	Address bit 2
4	Address bit 3
5	Address bit 4
6	Address bit 5
7	Baudrate bit 0
8	Baudrate bit 1

In other words:
- "Address" is a 6 bit binary word and uses a standard codification; e.g.: address 23 will be set by setting to ON the switches 5, 3, 2 and 1 (16 + 4 + 2 + 1 = 23);
- The baud rate is a 2 bit binary word, its values are described by the following table:

Switch 7	Switch 8	Baud rate
OFF	OFF	2400
ON	OFF	9600
OFF	ON	19200
ON	ON	38400

Parameters [139] Add and [140] bAud become read only.

2.5 Power Supply



Supply Voltage: - 24 VAC/DC (±10%)
- 100... 240 VAC (-15... +10%)

Notes: 1. Before connecting the instrument to the power line, make sure that line voltage is equal to the voltage shown on the identification label;

2. The polarity of the power supply has no importance;

3. The power supply input is NOT fuse protected. Please, provide a T type 1A, 250 V fuse externally.

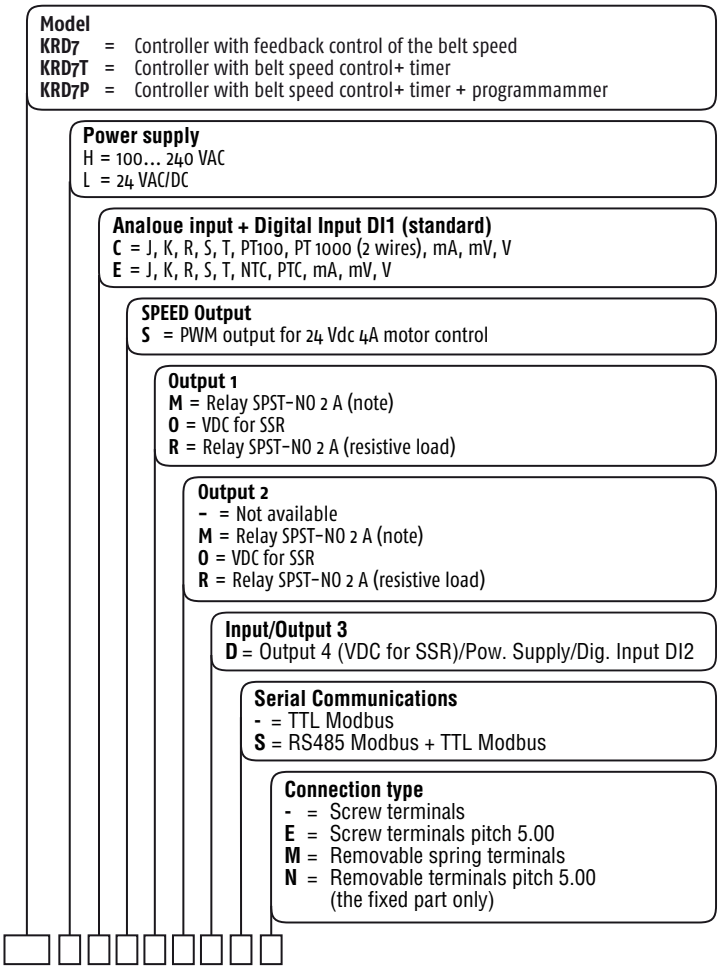
4. When the instrument is powered by the A01 key, the outputs are NOT supplied and the instrument can show the ouLd (Out 4 Overload) indication.

3 TECHNICAL CHARACTERISTICS

Case: Plastic, self-extinguishing degree: V-0 according to UL 94;
Terminals protection: IP20 according to EN 60070-1;
Installation: Rear panel on DIN rail;
Terminal block: 24 M3 screw terminals, for cables from 0.25... 2.5 mm^2 (AWG 22... AWG 14) with connection diagrams;
Dimensions: 75 x 33 depth 75.5 mm (2.97 x 1.3 depth 2.97 in.)
Weight: 180 g max..
Power supply: • 24 VAC/DC (±10% of the nominal value);
• 100... 240 VAC (-15... +10% of the nominal value);
Power consumption: 5 VA max.;
Insulation voltage: 2.3 kV rms according to EN 61010-1;
Sampling time: 130 ms;
Resolution: 30000 counts;
Total Accuracy: ±0.5% F.S.V. ±1 digit @ 25°C of room temperature;
Temperature drift: It is part of the global accuracy;
Installation category: II;
Pollution category: 2;
Operating temperature: 0... 50°C (32... 122°F);
Storage temperature: -30... +70°C (-22... +158°F);
Humidity: 20... 85% RH, not condensing;

Electromagnetic compatibility and safety requirements
Compliance: directive EMC 2004/108/CE (EN 61326-1), directive LV 2006/95/CE (EN 61010-1).

4 HOW TO ORDER



Note: For servomotor drive, both **Output 1** and **Output 2** codes must be selected as "**M**".

5 CONFIGURATION INFORMATION

5.1 Brief description

The KRD7 is a product that is able to control the speed of a DC motor and a process variable (e.g. a temperature) at the same time. The DC motor control maintains the programmed speed also in presence of load or power supply variations without the necessity of an additional speed sensor.
In parallel, the device can perform a PID or an ON/OFF control of an independent process variable. The two actions are independent but it is also possible to create specific correlations between them.
As an example it is possible to create 4 recipes. A recipes is the relation between a Setpoint and a speed.
The most common example is the pizza oven conveyor process. A cooking is the combination of one temperature and one time so we can call it “recipes”.
In a conveyor oven the “speed” and the “time” are related but the end-users are habit to set a time (not a speed).
The KRD7 can manage a time and set the speed in order to obtain the desired time.
The relationship between speed and time is easily programmable (by the OEM) using a semi-automatic calibration system.
The ability to manage a 3 point valve (servomotor control output) completes the applicability of this products.

5.2 Factory reset - Default parameters loading procedure

Sometimes, e.g. when you re-configure an instrument previously used for other works or from other people or when you have made too many errors during configuration and you decided to re-configure the instrument, it is possible to restore the factory configuration.
This action allows to put the instrument in a pre-set condition (the same it was at the first power ON).
The default data are those typical values loaded in the instrument prior to ship it from factory.
The instrument performs a process control associated with the speed control.
To load the factory default parameter set it is sufficient to send to parameter [19A] at decimal address 19 the value:

-48 1

The procedure is complete.

Note: The list of all parameters and corresponding default values is available at the end of the operating mode description.

5.3 Introduction

When the instrument is powered ON, starts immediately working in accordance to the parameters values loaded in its memory. The instrument behaviour and its performance are governed by the value of the stored parameters.
At first power ON the instrument uses a “default” parameters set (factory parameters set); this set is a generic one (e.g. a TC J input is programmed).

⚠ **Before connecting the output actuators**, we recommend to configure the parameters to suit your application (e.g.: input type, Control strategy, alarms, etc.).

⚠ Do not change the **[6] Unit (Engineering Unit)** value during process control as the temperature values inserted by the user (thresholds, limits etc.) are not automatically rescaled by the instrument.

6 CONFIGURATION PROCEDURE

6.1 Instrument behaviour at Power ON

At Power ON the instrument can start in one of the following modes depending on its configuration:

Auto mode without program functions

- [126] dSPu address 10365 = 0 and the instrument has been powered down in Auto mode,
  or
- [126] dSPu address 10365 = 1;
  and
- [125] Pr.St address 10364 = 0;
- The instrument is performing the standard closed loop control.

Manual mode (oPLo)

- [126] dSPu address 10365 = 0 and the instrument has been powered down in Man mode,
  or
- [126] dSPu address 10365 = 2;
- The instrument does not perform Automatic control;
- The control output is equal to 0% and it can be modified by [27B] address 592.

Stand by mode (StbY)

- [126] dSPu address 10365 = 0 and the instrument has been powered down in Stand by mode,
  or
- [126] dSPu address 10365 = 3;
- The instrument performs NO control at all (the control outputs are OFF);
- The instrument is working as an analogue to digital converter.

Auto mode with automatic program start up

- [126] dSPu address 10365 = 0 or 1;
- [101] Pr.F address 10340 = 1 or 2.

The motor starts with the same speed that was set at power OFF

- [47] SPdP address 10286 = 0.

The motor does NOT start waiting a start command

- [47] SPdP address 10286 = 1.

The motor starts with speed 0 until the controlled value reaches the desired value

- [47] SPdP address 10286 = 2.

We define all the above described conditions as “**Standard mode**”.

6.2 Configuration mode

The controller can be fully configured with the “*winlogteclit*” program through the Serial Communication port.

6.3 Configuration parameter list

In the following pages we will describe all the parameters of the instrument.

⚠ The instrument only shows the parameters applicable to its hardware options in accordance with the specific instrument configuration
(i.e.: Setting AL 1t [Alarm 1 type] to nonE [not used], all parameters related to alarm 1 will be skipped).

inP Group - Main and auxiliary input configuration

[1] address 10240 - SEnS
Input type

Available: Always.

- When the code of the input type is equal to c (see the "*How to order*" paragraph).

J	TC J	(-50... +1000°C/-58... +1832°F);
crAL	TC K	(-50... +1370°C/-58... +2498°F);
S	TC S	(-50... +1760°C/-58... +3200°F);
r	TC R	(-50... +1760°C/-58... +3200°F);
t	TC T	(-70... +400°C/-94... +752°F);
ir.J	Exergen IRS J	(-46... +785°C/-50... +1445°F);
ir.cA	Exergen IRS K	(-46... +785°C/-50... +1445°F);
Pt1	RTD Pt 100	(-200... +850°C/-328... +1562°F);
Pt10	RTD Pt 1000	(-200... +850°C/-328... +1562°F);
0.60	0... 60 mV linear;	
12.60	12... 60 mV linear;	
0.20	0... 20 mA linear;	
4.20	4... 20 mA linear;	
0.5	0... 5 V linear;	
1.5	1... 5 V linear;	
0.10	0... 10 V linear;	
2.10	2... 10 V linear.	

- When the code of the input type is equal to e (see the "*How to order*" paragraph).

J	TC J	(-50... +1000°C/-58... +1832°F);
crAL	TC K	(-50... +1370°C/-58... +2498°F);
S	TC S	(-50... +1760°C/-58... +3200°F);
r	TC R	(-50... +1760°C/-58... +3200°F);
t	TC T	(-70... +400°C/-94... +752°F);
ir.J	Exergen IRS J	(-46... +785°C/-50... +1445°F);
ir.cA	Exergen IRS K	(-46... +785°C/-50... +1445°F);
Ptc	PTC	(-55... +150°C/-67... +302°F);
ntc	NTC	(-50... +110°C/-58... +230°F);
0.60	0... 60 mV linear;	
12.60	12... 60 mV linear;	
0.20	0... 20 mA linear;	
4.20	4... 20 mA linear;	
0.5	0... 5 V linear;	
1.5	1... 5 V linear;	
0.10	0... 10 V linear;	
2.10	2... 10 V linear.	

Notes: 1. When a TC input is selected and a decimal figure is programmed (see the next parameter) the max. displayed value becomes 999.9°C or 999.9°F.

2. All changes to SEnS parameter setting forces **[2] dP** = **0** and changes all parameters related with **dP** (e.g. Setpoints, proportional band, etc.).

[2] address 10241 - dP
Decimal point position

Available: Always.

Range:
- When [1] SenS = Linear input: 0... 3.
- When [1] SenS different from linear input: 0 or 1.

⚠ All changes to **[2] dP** cause a change to all parameters related with it (e.g.: Setpoints, proportional band, etc.).

[3] address 10242 - SSc
Initial scale read-out for linear inputs

Available: When a linear input is selected by [1] SenS.

Range: -1999... 9999.

Notes: 1. SSc allows the scaling of the analogue input to set the minimum displayed/measured value.
The instrument is able to display the measured value until it reaches a value of 5% lower than SSc, below which shows the Underrange message.

2. It is possible to set an initial scale read-out higher then the full scale read-out in order to obtain a reverse read-out scaling
E.g.: 0 mA = 0 mBar, 20 mA = -1000 mBar (vacuum).

[4] address 10243 - FSc
Full scale read-out for linear input

Available: When a linear input is selected by [1] SenS.

Range: -1999... 9999

Notes: 1. FSc allows the scaling of the analogue input to set the maximum displayed/measured value. The instrument is able to display the measured value until it reaches a value of 5% higher than [4] FSc, above which shows the Overrange message.

2. It is possible to set a full scale read-out lower than the initial scale read-out in order to obtain a reverse read-out scaling.
E.g.: 0 mA = 0 mBar, 20 mA = -1000 mBar (vacuum).

[5] address 10244 - unit
Engineering unit

Available: When a temperature sensor is selected by [1] SenS parameter.

Range: **0** **°C** Celsius degrees (Centigrade);
1 **°F** Fahrenheit degrees.

⚠ At **[5] unit** parmeter change the instrument does not rescale the temperature values inserted by the user (thresholds, limits etc.).

[6] address 10245 - FiL
Digital filter on the measured value

Available: Always.

Range: **0** oFF No filter;
0.1... 20.0 s.

Note: This is a first order digital filter applied on the measured value. For this reason it affects the measured value, the control action and the alarms behaviour.

[7] address 10246 - inE
Sensor Out of Range type that enables the safety output value

Available: Always.

Range: **0** **our** When an overrange or an underrange is detected, the output power is forced to the value set at [8] oPE parameter.
1 **or** When an overrange is detected, the output power is forced to the value set at [8] oPE parameter.
2 **ur** When an underrange is detected, the output power is forced to the value set at [8] oPE parameter.

[8] address 10247 - oPE
Safety output value

Available: Always.
Range: -100... 100% (of the output).
Notes: 1. When the instrument is programmed with one control action only (heat or cool), setting a value outside of the available output range, the instrument uses 0 (zero).
E.g.: When **heat** action only has been programmed, and oPE is equal to -50% (cooling) the instrument uses 0 (zero).
2. When ON/OFF control is programmed and an out of range is detected, the instrument performs the safety output value using a fixed cycle time equal to 20 seconds.

[9] address 10248 - io3.F
I/O3 function selection

Available: Always.
Range:
0 on **Out3 is always ON** as is used to power a 2/3 wires transmitter;
1 out3 Used as digital Out3;
2 dG2.c Digital input 2 for dry contacts;
3 dG2.U Digital input 2 driven by 12... 24 VDC.

Notes: 1. Setting [9] io3.F = dG2.C or dG2.U, the [20] O3F parameter becomes not visible while [12] diF2 parameter becomes visible.
2. Setting [9] io3F = on the [20] O3F parameter and the [12] diF2 parameter becomes NOT visible.
3. Setting [9] io3F different from dG2.c or dG2.U, the instrument forces [12] diF2 = nonE. If [11] diF1 was equal to SP4 or UPDN [11] diF1 is forced to nonE.
4. Changing [9] io3F = **on** to [9] io3F = **Out3** makes the [20] O3F to become visible and equal to nonE.

[10] address 10249 - rEcS
Enable Recipes (control + speed coupling)

Available: Always.
Range:
0 no Control and speed are independent;
1 YES A Control and speed are related;

Note: When [10] rEcS = YES the Setpoint selection automatically selects also a speed with the following rule:
SP1 + Sd.t1 (speed or time 1),
SP2 + Sd.t2 (speed or time 2),
SP3 + Sd.t3 (speed or time 3),
SP4 + Sd.t4 (speed or time 4).

[11] address 10250 - diF1
Digital input 1 function

Available: Always.
Range:
0 none No function;
1 AAc Alarm Reset [status];
2 ASi Alarm acknowledge (ACK) [status];
3 hoLd Hold of the measured value [status];
4 Stby Stand by mode of the instrument [status]. When the contact is closed the instrument operates in stand by mode;
5 oPLo Manual mode;
6 hEco HEAt with SP1 and CooL with SP2 [status] (see "*Note about digital inputs*");
7 Strt Timer Run/Hold/Reset [transition]. A short closure allows to start timer execution and to suspend it while a long closure (longer than 10 seconds) allows to reset the timer;
8 t.run Timer Run [transition]. A short closure allows to start timer execution;
9 t.rES Timer reset [transition]. A short closure allows to reset timer count;
10 t.r.h Timer run/hold [Status]:
- Contact close = timer RUN;
- Contact open = timer Hold.

11 t.r.r Timer run/reset [status];
12 t.r.r.b Timer run/reset with a special "lock" at the end of the time count (in order to restart the time count, the instrument must detect a run command coming from serial link or digital input 2);
13 P.run Program Run [transition]. The first closure allows to start program execution but a second closure restarts the program execution from the beginning;
14 P.rES Program Reset [transition]. A contact closure allows to reset program execution;
15 P.r.h.t Program Hold [transition]. The first closure allows to hold program execution and a second closure continue program execution;
16 P.r.h.S Program Run/Hold [status]. When the contact is closed the program is running;
17 P.r.r Program Run/Reset [status].
- Contact closed - Program run;
- Contact open - Program reset;

18 Sdr.S SPEED/TIME run/stop [status]:
- Contact closed = Run,
- Contact open = Stop;

19 Sdr.t SPEED/TIME run/stop [transition]
20 ch.SP Sequential Setpoint selection [transition] (see "*Note about digital inputs*");
21 ch.Sd Sequential SPEED selection [transition];
22 SP14 Binary selection of the Setpoint made by digital input 1 (less significant bit) and digital input 2 (most significant bit) [status];
23 Sd14 Binary selection of the SPEED made by digital input 1 (less significant bit) and digital input 2 (most significant bit) [status].

Notes: 1. When [12] diF2 is not available, items 22 and 23 are not visible.
2. When [10] rEcS = YES (recipes are used):
- 20, 21, 22 and 23 selections select the recipe:
  recipe 1 = SP1 + Sd.t1 (speed or time 1),
  recipe 2 = SP2 + Sd.t2 (speed or time 2),
  recipe 3 = SP3 + Sd.t3 (speed or time3),
  recipe 4 = SP4 + Sd.t4 (speed or time 4).
- [52] n.SPd = Number of used speeds defines the number of recipes used and forces also the value of the [84] nSP (number of Setpoints available) parameter;
- [84] nSP - Number of used Setpoints defines the number of used recipes and forces also the value of the [52] n.SPd (number of speed available) parameter;
- [57] A.Sd.t - Active speed/time selection defines the recipe actually used and forces the value of [91] A.SP - Active Setpoint selection parameter;
- [91] A.SP - Active Setpoint selection defines the recipe actually used and forces the value of [57] A.Sd.t - Active speed/time selection parameter.

[12] address 10251 - diF2
Digital input 2 function

Available: When [9] Io3.F = diG2.

Range:
- **0 none** No function;
- **1 AAc** Alarm Reset [status];
- **2 ASi** Alarm acknowledge (ACK) [status];
- **3 hoLd** Hold of the measured value [status];
- **4 Stby** Stand by mode of the instrument [status]. When the contact is closed the instrument operates in stand by mode;
- **5 oPLo** Manual mode;
- **6 hEco** HEAt with SP1 and CooL with SP2 [status] (see "*Note about digital inputs*");
- **7 Strt** Timer Run/Hold/Reset [transition]. A short closure allows to start timer execution and to suspend it while a long closure (longer than 10 seconds) allows to reset the timer;
- **8 t.run** Timer Run [transition]. A short closure allows to start timer execution;
- **9 t.rES** Timer reset [transition]. A short closure allows to reset timer count;
- **10 t.r.h** Timer run/hold [Status]:
  - Contact close = timer RUN;
  - Contact open = timer Hold.
- **11 t.r.r** Timer run/reset [status];
- **12 t.r.r.b** Timer run/reset with a special "lock" at the end of the time count (in order to restart the time count, the instrument must detect a run command coming from serial link or digital input 2);
- **13 P.run** Program Run [transition]. The first closure allows to start program execution but a second closure restarts the program execution from the beginning;
- **14 P.rES** Program Reset [transition]. A contact closure allows to reset program execution;
- **15 P.r.h.t** Program Hold [transition]. The first closure allows to hold program execution and a second closure continue program execution;
- **16 P.r.h.S** Program Run/Hold [status]. When the contact is closed the program is running;
- **17 P.r.r** Program Run/Reset [status].
  - Contact closed - Program run;
  - Contact open - Program reset;
- **18 Sdr.S** SPEED/TIME run/stop [status]:
  - Contact closed = Run,
  - Contact open = Stop;
- **19 Sdr.t** SPEED/TIME run/stop [transition]
- **20 ch.SP** Sequential Setpoint selection [transition] (see "*Note about digital inputs*");
- **21 ch.Sd** Sequential SPEED selection [transition];
- **22 SP14** Binary selection of the Setpoint made by digital input 1 (less significant bit) and digital input 2 (most significant bit) [status];
- **23 Sd14** Binary selection of the SPEED made by digital input 1 (less significant bit) and digital input 2 (most significant bit) [status].

Notes: 1. When [10] diF1 or [11] diF2 (e.g. diF1) is equal to **6** - **hEco** the instrument operates as follows:
- When the contact is open, the control action is **Heating** and the active Setpoint is **SP**.
- When the contact is closed, the control action is **Cooling** and the active Setpoint is **SP2**.

2. When [10] diF1 = 20, [11] diF2 is forced to 20 and cannot perform another function.

3. When [11] diF1 = [12] diF2 = 20, the SP Setpoint selection will be in accordance with the following table:

Digital Input 1	Digital Input 2	Operative Setpoint
OFF	OFF	Setpoint 1
ON	OFF	Setpoint 2
OFF	ON	Setpoint 3
ON	ON	Setpoint 4

4. When [10] diF1 is equal to 21, [11] diF2 is forced to 21 (up.du) and cannot perform another function.

5. When the "*Sequential Setpoint selection*" has been chosen (diF1/diF2 = 18), every closure of the logic input increases the SPAt (active Setpoint) value by one step. The selection is cyclic:
SP -> **SP2** -> **SP3** -> **SP4**.

6. When [10] rEcS = YES (recipes are used):
- 20, 21, 22 and 23 selections will select the recipe:
  recipe 1 = SP1 + Sd.t1 (speed or time 1),
  recipe 2 = SP2 + Sd.t2 (speed or time 2),
  recipe 3 = SP3 + Sd.t3 (speed or time3),
  recipe 4 = SP4 + Sd.t4 (speed or time 4).
- [52] n.SPd = Number of used speed - parameter will define the number of used recipes and it will force also the value of the [84] nSP - Number of Setpoint available - parameter.
- [84] nSP - Number of used Setpoints - parameter will define the number of used recipes and it will force also the value of the [52] n.SPd - number os speed available - parameter.
- [57] A. Sd.t - Active speed/time selection - parameter will define the recipe actually used and it will force the value of [91] A.SP - Active Setpoint selection - parameter.
- [91] A.SP - Active Setpoint selection - parameter will define the recipe actually used and it will force the value of [57] A.Sd.t - Active speed/time selection - parameter.

[13] address 10252 - di.A
Digital Inputs Action

Available: Always.

Range:
- **0** DI1 Direct action, DI2 (if configured) Direct action;
- **1** DI1 Reverse action, DI2 (if configured) Direct action;
- **2** DI1 Direct action, DI2 (if configured) Reverse action;
- **3** DI1 Reverse action, DI2 (if configured) Reverse action.

Group - Output parameters

[14] address 10253 - o1.F
Out 1 function

Available: Always.

Range:
- **0 none** Output not used. With this setting the status of this output can be driven directly from serial link;
- **1 H.reg** Heating output;
- **2 c.rEG** Cooling output;
- **3 AL** Alarm output;
- **4 t.out** Timer output;
- **5 t.HoF** Timer out - OFF in Hold;
- **6 P.End** Program end indicator;
- **7 P.HLd** Program hold indicator;
- **8 P. uit** Program wait indicator;
- **9 P.run** Program run indicator;
- **10 P.Et1** Program Event 1;
- **11 P.Et2** Program Event 2;
- **12 or.bo** Out-of-range or burn out indicator;
- **13 P.FAL** Power failure indicator;
- **14 bo.PF** Out-of-range, Burnout and Power failure indicator;
- **15 St.bY** Stand By status indicator.
- **16 diF1** Repeats the digital input 1 status;
- **17 diF2** Repeats the digital input 2 status;
- **18 On** Out1 always ON;
- **19 riSP** Inspection request.

Notes:
1. When two or more outputs are programmed in the same way, these outputs will be driven in parallel.
2. The power failure indicator will be reset when the instrument detect an alarm reset command from digital input or serial link.
3. When no control output is programmed, all the relative alarm (when present) are forced to nonE (not used).

⚠ When using the servomotor control, **both** **Out1** and **Out2** are to be selected as Heating or Cooling [(o1F = o2F = 1 (heating) **or** o1F = o2F = 2(cooling); Parameter **[56] cont** must be set as **3pt**.

[15] address 10254 - o1.AL
Alarms linked to Out1

Available: When [14] o1F = AL.

Range: 0... 63 with the following rules:
- **+1** Alarm 1;
- **+2** Alarm 2;
- **+4** Alarm 3;
- **+8** Loop break alarm;
- **+16** Sensor break (burn out);
- **+32** Overload on Out 3 (short circuit on Out 3).

Example 1: Setting 3 (2 + 1) the output will be driven by the alarm 1 and 2 (OR condition).

Example 2: Setting 13 (8 + 4 + 1) the output will be driven by alarm 1 + alarm 3 + loop break alarm.

[16] address 10255 - o1.Ac
Out 1 Action

Available: When [14] o1F is different from nonE.

Range:
- **0 dir** Direct action;
- **1 rEV** Reverse action;
- **2 dir.r** Direct action with reverse "*LED*" indication;
- **3 rev.r** Reverse action with reverse"*LED*" indication.

Notes:
1. **Direct action**: the output repeats the status of the driven element.
   Example: The output is an alarm output with direct action. When the alarm is ON, the relay will be energized (logic output 1).
2. **Reverse action**: the output status is the opposite of the status of the driven element.
   Example: the output is an alarm output with reverse action. When the alarm is OFF, the relay will be energized (logic output 1). This setting is usually named "fail-safe" and it is generally used in dangerous process in order to generate an alarm when the instrument power supply goes OFF or the internal watchdog starts.

[17] address 10256 - o2F
Out 2 function

Available: When the instrument has out 2 option.

Range:
- **0 none** Output not used. With this setting the status of this output can be driven directly from serial link;
- **1 H.reg** Heating output;
- **2 c.rEG** Cooling output;
- **3 AL** Alarm output;
- **4 t.out** Timer output;
- **5 t.HoF** Timer out - OFF in Hold;
- **6 P.End** Program end indicator;
- **7 P.HLd** Program hold indicator;
- **8 P. uit** Program wait indicator;
- **9 P.run** Program run indicator;
- **10 P.Et1** Program Event 1;
- **11 P.Et2** Program Event 2;
- **12 or.bo** Out-of-range or burn out indicator;
- **13 P.FAL** Power failure indicator;
- **14 bo.PF** Out-of-range, Burnout and Power failure indicator;
- **15 St.bY** Stand By status indicator.
- **16 diF1** Repeats the digital input 1 status;
- **17 diF2** Repeats the digital input 2 status;
- **18 On** Out2 always ON;
- **19 riSP** Inspection request.

For other details see [14] O1F parameter.

⚠ When using the servomotor control, **both** **Out1** and **Out2** are to be selected as Heating or Cooling [(o1F = o2F = 1 (heating) **or** o1F = o2F = 2(cooling); Parameter **[56] cont** must be set as **3pt**.

[18] address 10257 - o2.AL
Alarms linked to Out2

Available: When [17] o2F = AL.

Range: 0... 63 with the following rule:
- **+1** Alarm 1;
- **+2** Alarm 2;
- **+4** Alarm 3;
- **+8** Loop break alarm;
- **+16** Sensor break (burn out);
- **+32** Overload on Out3 (short circuit on Out3).

For more details see [15] o1.AL parameter.

[19] address 10258 - o2.Ac
Out 2 action

Available: When [17] o2F is different from nonE.

Range:
- **0 dir** Direct action;
- **1 rEV** Reverse action;
- **2 dir.r** Direct action with reverse "*LED*" indication;
- **3 rev.r** Reverse action with reverse"*LED*" indication.

For more details see [16] o1.Ac parameter.

[20] address 10259 - o3F
Out 3 function

Available: When [9] Io3F = Out 3.

Range:
- **0 none** Output not used. With this setting the status of this output can be driven directly from serial link;
- **1 H.reg** Heating output;
- **2 c.rEG** Cooling output;
- **3 AL** Alarm output;
- **4 t.out** Timer output;
- **5 t.HoF** Timer out - OFF in Hold;
- **6 P.End** Program end indicator;
- **7 P.HLd** Program hold indicator;
- **8 P. uit** Program wait indicator;
- **9 P.run** Program run indicator;
- **10 P.Et1** Program Event 1;
- **11 P.Et2** Program Event 2;
- **12 or.bo** Out-of-range or burn out indicator;
- **13 P.FAL** Power failure indicator;
- **14 bo.PF** Out-of-range, Burnout and Power failure indicator;
- **15 St.bY** Stand By status indicator.

For other details see [14] O1F parameter.

[21] address 10260 - o3.AL
Alarms linked to Out3

Available: When [9] Io3F = Out3 and [20] o3F = 3.

Range: 0... 63 with the following rule:
- **+1** Alarm 1;
- **+2** Alarm 2;
- **+4** Alarm 3;
- **+8** Loop break alarm;
- **+16** Sensor break (burn out);
- **+32** Overload on Out3 (short circuit on Out3).

For more details see [15] o1.AL parameter.

[22] address 10261 - o3Ac
Out 3 action

Available: When [9] Io3F = Out3 and [20] o3F is different from nonE.

Range:
- **0 dir** Direct action;
- **1 rEV** Reverse action;
- **2 dir.r** Direct action with reverse "*LED*" indication;
- **3 rev.r** Reverse action with reverse"*LED*" indication.

For more details see [16] o1.Ac parameter.

AL1 Group - Alarm 1 parameters

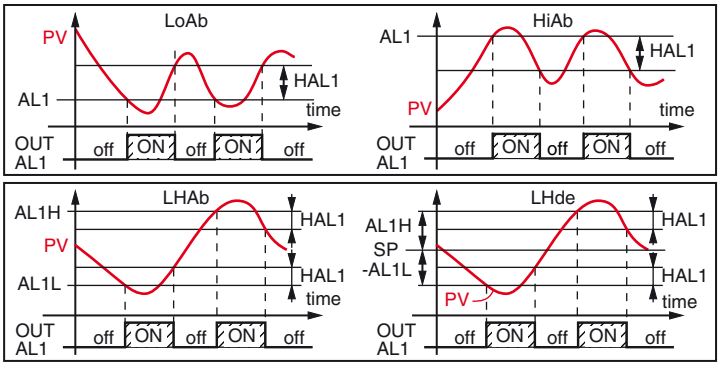
[23] address 10262 - AL1t
Alarm 1 type

Available: Always.

Range:
- When one or more outputs are programmed as control output:
  - **0 nonE** Alarm not used;
  - **1 LoAb** Absolute low alarm;
  - **2 HiAb** Absolute high alarm;
  - **3 LHAo** Absolute band alarm with alarm indication out of the band;
  - **4 LHAi** Absolute band alarm with alarm indication inside the band;
  - **5 SE.br** Sensor break;
  - **6 LodE** Deviation low alarm (relative);
  - **7 HidE** Deviation high alarm (relative);
  - **8 LHdo** Relative band alarm with alarm indication out of the band;
  - **9 LHdi** Relative band alarm with alarm indication inside the band;

When no output is programmed as control output;
- **0 nonE** Alarm not used;
- **1 LoAb** Absolute low alarm;
- **2 HiAb** Absolute high alarm;
- **3 LHAo** Absolute band alarm with alarm indication out of the band;
- **4 LHAi** Absolute band alarm with alarm indication inside the band;
- **5 SE.br** Sensor break.

Notes: 1. The relative and deviation alarms are "relative" to the operative Setpoint value.



2. The sensor break alarm (SE.br) is active when the code 10001 is send to variable 1B at hexadecimal address 200H (512 decimal).

[24] address 10263 - Ab1
Alarm 1 function

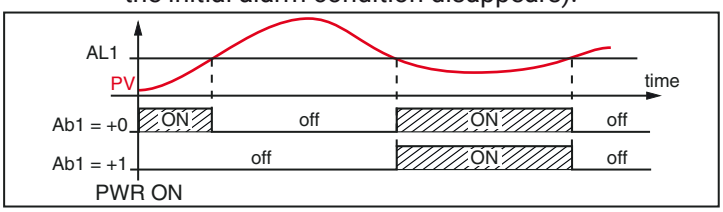
Available: When [23] AL1t is different from nonE.

Range: 0... 15 with the following rule:
- **+1** Not active at power ON;
- **+2** Latched alarm (manual reset);
- **+4** Acknowledgeable alarm;
- **+8** Relative alarm not active at Setpoint change.

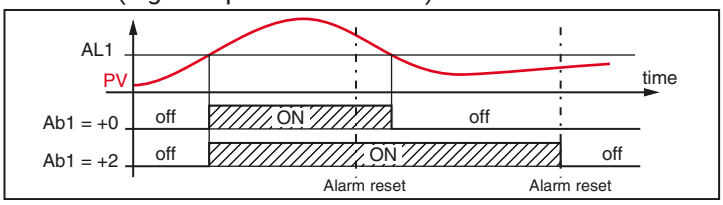
Example: Setting Ab1 equal to 5 (1 + 4) the alarm 1 will be "Not active at power ON" and "Acknowledgeable".

Notes: 1. The "Not active at power ON" selection allows to inhibit the alarm function at instrument power ON or when the instrument detects a transfer from:
- Manual mode (oplo) to auto mode;
- Stand-by mode to auto mode.

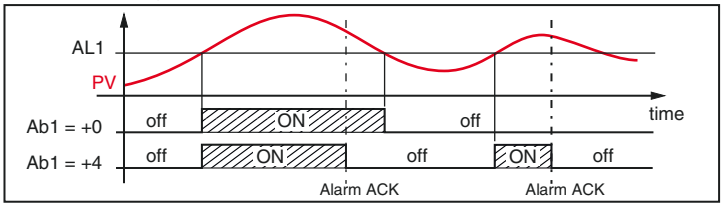
The alarm will be automatically enabled when the measured value reaches, for the first time, the alarm threshold ±hysteresis (in other words, when the initial alarm condition disappears).



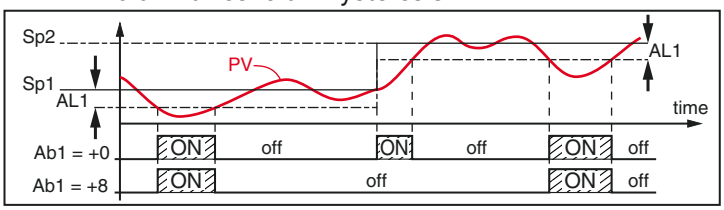
2. A "*Latched alarm*" (manual reset) is an alarm that remains active even if the conditions that generated the alarm no longer persist. Alarm reset can be done only by an external command (digital inputs or serial link).



3. An "*Acknowledgeable*" alarm is an alarm that can be reset even if the conditions that generated the alarm are still present. Alarm acknowledge can be done only by an external command (digital inputs or serial link).



4. A "*Relative alarm not active at Setpoint change*" is an alarm that masks the alarm condition after a Setpoint change until process variable reaches the alarm threshold ± hysteresis.



5. The instrument does not store in EEPROM the alarm status. For this reason, the alarm status will be lost if a power down occurs.

[25] address 10264 - AL1L

- ***For High and low alarms, AL1L is the low limit of the AL1 threshold***
- ***For band alarm, AL1L is the low alarm threshold***

Available: When [23] AL1t is different from nonE or [23] AL1t is different from SEbr.

Range: From -1999 to [26] AL1H engineering units.

[26] address 10265 - AL1H

- ***For High and low alarms, AL1H is the high limit of the AL1 threshold***
- ***For band alarm, AL1 is the high alarm threshold***

Available: When [23] AL1t is different from nonE or [23] AL1t is different from SEbr.

Range: From [25] AL1L to 9999 engineering units.

[27] address 10266 - AL1 Alarm 1 threshold

Available: When:
[23] AL1t = LoAb - Absolute low alarm;
[23] AL1t = HiAb - Absolute high alarm;
[23] AL1t = LodE - Deviation low alarm (relative);
[23] AL1t = Hide - Deviation high alarm (relative).

Range: From [25] AL1L to [26] AL1H engineering units.

[28] address 10267 - HAL1 Alarm 1 hysteresis

Available: When [23] AL1t is different from nonE or [23] AL1t is different from SEbr.

Range: 1... 9999 engineering units.

Notes: 1. The hysteresis value is the difference between the Alarm threshold value and the point the Alarm automatically resets.

2. When the alarm threshold plus or minus the hysteresis is out of input range, the instrument will not be able to reset the alarm.
Example: Input range 0... 1000 (mBar).
- Setpoint equal to 900 (mBar);
- Deviation low alarm equal to 50 (mBar);
- Hysteresis equal to 160 (mBar) the theoretical reSetpoint is 900 - 50 + 160 = 1010 (mBar) but this value is out of range.
  The reset can be made only by turning the instrument OFF, removing the condition that generated the alarm and then turn the instrument ON again.

3. All band alarms use the same hysteresis value for both thresholds;

4. When the hysteresis of a band alarm is bigger than the programmed band, the instrument will not be able to reset the alarm.
Example: Input range 0... 500 (°C).
- Setpoint equal to 250 (°C);
- Relative band alarm;
- Low threshold equal to 10 (°C);
- High threshold equal to 10 (°C);
- Hysteresis equal to 25 (°C).

[29] address 10268 - AL1d Alarm 1 delay

Available: When [23] AL1t is different from nonE.

Range: 0 oFF;
1... 9999 seconds.

Note: The alarm goes ON only when the alarm condition persists for a time longer than [29] AL1d time but the reset is immediate.

[30] address 10269 - AL1o Alarm 1 enabling during Stand-by mode and out of range indications

Available: When [23] AL1t is different from nonE.

Range: 0 Never;
1 During stand by;
2 During overrange and underrange;
3 During overrange, underrange and stand-by.

AL2 Group - Alarm 2 parameters

[31] address 10270 - AL2t Alarm 2 type

Available: Aways

Range: • When one or more outputs are programmed as control output:
0 nonE Alarm not used;
1 LoAb Absolute low alarm;
2 HiAb Absolute high alarm;
3 LHAo Absolute band alarm with alarm indication out of the band;
4 LHAi Absolute band alarm with alarm indication inside the band;

5 SE.br Sensor break;
6 LodE Deviation low alarm (relative);
7 HidE Deviation high alarm (relative);
8 LHdo Relative band alarm with alarm indication out of the band;
9 LHdi Relative band alarm with alarm indication inside the band;

- When no output is programmed as control output;

0 nonE Alarm not used;
1 LoAb Absolute low alarm;
2 HiAb Absolute high alarm;
3 LHAo Absolute band alarm with alarm indication out of the band;
4 LHAi Absolute band alarm with alarm indication inside the band;
5 SE.br Sensor break.

Note: The relative alarm are "*relative*" to the current Setpoint (this may be different from the Target Setpoint if you are using the ramp to Setpoint function).

[32] address 10271 - Ab2
Alarm 2 function

Available: When [31] AL2t is different from nonE.
Range: 0... 15 with the following rule:
+1 Not active at power ON;
+2 Latched alarm (manual reset);
+4 Acknowledgeable alarm;
+8 Relative alarm not active at Setpoint change.
Example: Setting Ad2 equal to 5 (1 + 4) the alarm 2 will be "*Not active at power ON*" and "*Acknowledgeable*".
Note: For other details see [24] Ab1 parameter.

[33] address 10272 - AL2L

- ***For High and low alarms, AL2L is the low limit of the AL2 threshold***
- ***For band alarm, AL2L is the low alarm threshold***

Available: When [31] AL2t is different from nonE or [31] AL2t is different from SEbr.
Range: -1999 to [34] AL2H engineering units.

[34] address 10273 - AL2H

- ***For High and low alarms, AL2H is the high limit of the AL2 threshold***
- ***For band alarm, AL2H is the high alarm threshold***

Available: When [31] AL2t is different from nonE or [31] AL2t is different from SEbr.
Range: From [33] AL2L to 9999 engineering units.

[35] address 10274 - AL2
Alarm 2 threshold

Available: When:
[31] AL2t = LoAb Absolute low alarm;
[31] AL2t = HiAb Absolute high alarm;
[31] AL2t = LodE Deviation low alarm (relative);
[31] AL2t = Hide Deviation high alarm (relative).
Range: From [33] AL2L to [34] AL2H engineering units.

[36] address 10275 - HAL2
Alarm 2 hysteresis

Available: When [31] AL2t is different to nonE or [31] AL2t is different from SEbr.
Range: 1... 9999 engineering units.
Note: For other details see [28] HAL1 parameter.

[37] address 10276 - AL2d
Alarm 2 delay

Available: When [31] AL2t different from nonE.
Range: **0** oFF;
1... 9999 seconds.
Note: The alarm goes ON only when the alarm condition persist for a time longer than [37] AL2d time but the reset is immediate.

[38] address 10277 - AL2o
Alarm 2 enabling during Stand-by mode and out of range indications

Available: When [31] AL2t different from **nonE**.
Range: **0** Never;
1 During stand by;
2 During overrange and underrange;
3 During overrange, underrange and stand-by.

AL3 Group - Alarm 3 parameters

[39] address 10278 - AL3t
Alarm 3 type

Available: Always.
Range:

- When one or more outputs are programmed as control output:

0 nonE Alarm not used;
1 LoAb Absolute low alarm;
2 HiAb Absolute high alarm;
3 LHAo Absolute band alarm with alarm indication out of the band;
4 LHAi Absolute band alarm with alarm indication inside the band;
5 SE.br Sensor break;
6 LodE Deviation low alarm (relative);
7 HidE Deviation high alarm (relative);
8 LHdo Relative band alarm with alarm indication out of the band;
9 LHdi Relative band alarm with alarm indication inside the band;

When no output is programmed as control output;
0 nonE Alarm not used;
1 LoAb Absolute low alarm;
2 HiAb Absolute high alarm;
3 LHAo Absolute band alarm with alarm indication out of the band;
4 LHAi Absolute band alarm with alarm indication inside the band;
5 SE.br Sensor break.

Note: The relative alarm are "*relative*" to the current Setpoint (this may be different to the Target Setpoint if you are using the ramp to Setpoint function).

[40] address 10279 - Ab3
Alarm 3 function

Available: When [39] AL3t is different from nonE.
Range: 0... 15 with the following rule:
+1 Not active at power ON;
+2 Latched alarm (manual reset);
+4 Acknowledgeable alarm;
+8 Relative alarm not active at Setpoint change.
Example: Setting Ad3 equal to 5 (1 + 4) the alarm 3 will be "*Not active at power ON*" and "*Acknowledgeable*".
Note: For other details see [24] Ab1 parameter.

[41] address 10280 - AL3L

- ***For High and low alarms, AL3L is the low limit of the AL3 threshold***
- ***For band alarm, AL3L is the low alarm threshold***

Available: When [39] AL3t is different from nonE or [39] AL3t is different from SEbr.

Range: -1999 to [42] AL3H engineering units.

[42] address 10281 - AL3H

- ***For High and low alarms, AL3H is the high limit of the AL3 threshold***
- ***For band alarm, AL3H is the high alarm threshold***

Available: When [39] AL3t is different from nonE or [39] AL3t is different from SEbr.

Range: From [41] AL3L to 9999 engineering units.

[43] address 10282 - AL3
Alarm 3 threshold

Available: When:

- [39] AL3t = LoAb Absolute low alarm;
- [39] AL3t = HiAb Absolute high alarm;
- [39] AL3t = LodE Deviation low alarm (relative);
- [39] AL3t = Hide Deviation high alarm (relative).

Range: From [41] AL3L to [42] AL3H engineering units.

[44] address 10283 - HAL3
Alarm 3 hysteresis

Available: When [39] AL3t is different from nonE or [39] AL3t is different from SEbr.

Range: 1... 9999 engineering units.

Note: For other details see [28] HAL1 parameter.

[45] address 10284 - AL3d
Alarm 3 delay

Available: When [39] AL3t different from **nonE**.

Range: 0 oFF;
1... 9999 seconds.

Note: The alarm goes ON only when the alarm condition persist for a time longer than [45] AL3d time but the reset is immediate.

[46] address 10285 - AL3o
Alarm 3 enabling during Stand-by mode and out of range indications

Available: When [39] AL3t is different from nonE or [39] AL3t is different from SEbr.

Range: 0 Never;
1 During stand by;
2 During overrange and underrange;
3 During overrange, underrange and stand-by.

SPEd group - Speed control

[47] address 10286 - SPd.P
Behaviour of the speed output at power ON

Available: Always.

Range: 0 AS.Pr Starts with the same speed that was set at power OFF;
1 OFF.A Starts with speed equal to zero and waits for a start command (from digital input or serial link);
2 OFF.b Starts with speed equal to zero and waits until the controlled value reaches SP + SPd.b (see the next parameter).

[48] address 10287 - SPd.b
Band to enable speed control (Speed band)

Available: When [47] SPd.P is equal to 2 (oFFb).

Range: 0 OFF
1... 9999 engineering units.

Note: When [47] SPd.P = 1 (oFFb) the enabling band is always active. In other words, if the masured value goes out of the programmed band, the speed output will go to zero until the measured value returns inside the programmed band.

[49] address 10288 - SPd.t
Unit of the speed/time variable

Available: Always.

Range: 0 PErc Shown as an output %;
1 tinE Shown as a time;
2 E.U. Shown in engineering units (km/h, m/s, l/min).

[50] address 10289 - Sd.dF
Speed decimal figure

Available: When [49] SPd.t is different PErc.

Range: 0... 3.

[51] address 10290 - SPd.r
Speed reference - Set the time or the speed detected when the output is 100%

Available: When [49] SPd.t is different than PErc.

Range:

- When [49] Spd.t = PErc this parameter is masked;
- When [49] Spd.t = t inE 00.01...99.59 (mm.ss);
- When [49] Spd.t = EU, 0... 9999 E.U..

Notes: 1. The difference between a time indication and a speed (speed, flow, other) indication is:
Time The value assigned to [51] SPd.r is the minimum time and the values assigned to [53] Sd.t1, [54]Sd.t2, [55]Sd.t3 and [56]Sd.t4 must be **HIGHER** than [51] SPd.r.
E.U. The value assigned to [51] SPd.r is the maximum speed and the [53] Sd.t1, [54] Sd.t2, [55]Sd.t3 and [56]Sd.t4 must be **LOWER** than [51] SPd.r;

2. This output can be considered as a linear output where the initial scale is ever 0 (engine stopped) while the full scale is the maximum speed (in engineering units) or the minimum time (detected when the engine operate at 100%). The decimal figure allows to the OEM to define the E.U.;

3. When the self-calibration is used ([58] Sd.cA parameter) the time measured by the instrument will be memorized in this parameter ([51] SPd.r).

[52] address 10291 - n.SPd
Number of used speed/time

Available: Always
Range: 1... 4.
Note: When [10] rEcS = YES (the recipes are used), the [52] n.SPd (= number of used speed/time) defines the number of recipes used and forces the value of [84] nSP - number of used SP.

[53] address 10292 - Sd.t1
Speed/time 1

Available: Always.
Range:
- When [49] Spd.t = PErc, 0... 100%;
- When [49] Spd.t = t.mE, 00.01... 99.59 (mm.ss);
- When [49] Spd.t = EU, 0... 9999 E.U..

[54] address 10293 - Sd.t2
Speed/time 2

Available: Always.
Range:
- When [49] Spd.t = PErc, 0... 100%;
- When [49] Spd.t = t.mE, 00.01... 99.59 (mm.ss);
- When [49] Spd.t = EU, 0... 9999 E.U..

[55] address 10294 - Sd.t3
Speed/time 3

Available: Always.
Range:
- When [49] Spd.t = PErc, 0... 100%;
- When [49] Spd.t = t.mE, 00.01... 99.59 (mm.ss);
- When [49] Spd.t = EU, 0... 9999 E.U..

[56] address 10295 - Sd.t4
Speed/time 4

Available: Always.
Range:
- When [49] Spd.t = PErc, 0... 100%;
- When [49] Spd.t = t.mE, 00.01... 99.59 (mm.ss);
- When [49] Spd.t = EU, 0... 9999 E.U..

[57] address 10296 - A.Sd.t
Active speed/time

Available: Always
Range:
- Sd.t1;
- Sd.t2;
- Sd.t3;
- Sd.t4.

Note: When [10] rEcS = YES (the recipes are used):
- The [57] A.Sd.t (= active speed/time) defines the recipe in use and forces the value of [91] A.SP - Active Setpoint;
- The [91] A.SP (= active Setpoint) defines the recipe in use and forces the value of [57] A. Sd.t (active speed/time).

[58] address 10297 - Sd.cA
Speed calibration - Minimum time self-calibration

Available: When [49] SPd.t is equal to t.mE.
Range: YES/no.

LbA group - Loop break alarm

General note about LBA alarm

The LBA operate as follows: applying the 100% of the power output to a process, the process variable, after some time due to the process inertia, begins to change in a known direction (increases for an heating action or decreases for a cooling action).
Example: If I apply 100% of the power output to a furnace, the temperature must go up unless one of the component in the loop is faulty (heater, sensor, power supply, fuse, etc.).
The same philosophy can be applied to the minimum power. In our example, when I turn OFF the power to a furnace, the temperature must go down, if not the SSR is in short circuit, the valve is jammed, etc..
LBA function is automatically enabled when the PID requires the maximum or the minimum power.
When the process response is slower than the programmed limit the instrument generates an alarm.

Notes: 1. When the instrument is in manual mode, the LBA function is disabled.
2. When LBA alarm is ON the instrument continues to perform the standard control. If the process response comes back into the programmed limit, the instrument automatically resets the LBA alarm.
3. This function is available only when the programmed control algorithm is equal to PID (Cont = PID).

[59] address 10298 - LbAt
LBA time

Available: When [63] Cont = PID.
Range: **0 oFF** LBA not used;
1... 9999 seconds.

[60] address 10299 - LbSt
Delta measure used by LBA during Soft start

Available: When [59] LbAt is different from oFF.
Range: **0 oFF** LBA is inhibited during soft start;
1... 9999 engineering units.

[61] address 10300 - LbAS
Delta measure used by loop break alarm (Loop Break Alarm step)

Available: When [59] LbAt is different from oFF.
Range: 1... 9999 engineering units.

[62] address 10301 - LbcA
Condition for LBA enabling

Available: When [59] LbAt is different from oFF.
Range:
0 uP Enabled when the PID requires the maximum power only;
1 dn Enabled when the PID requires the minimum power only;
2 both Enabled in both condition (when the PID requires the max. or the min. power).

LBA application example:
LbAt (LBA time) = 120 seconds (2 minutes);
LbAS (delta LBA) = 5°C.
The machine has been designed in order to reach 200°C in 20 minutes (20°C/min). When the PID demands the 100% power, the instrument starts the time count.
During time count if the measured value increases more than 5°C, the instrument restarts the time count. Otherwise, if the measured value does not reach the programmed delta (5°C in 2 minutes), the instrument activates the alarm.

rEG group - Control parameters

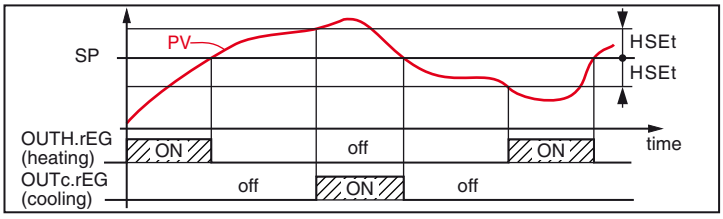
The rEG group will be available only when at least one output is programmed as control output (H.rEG or C.rEG).

[63] address 10302 - cont
Control type

Available: When at least one output is programmed as control output (H.rEG or C.rEG).

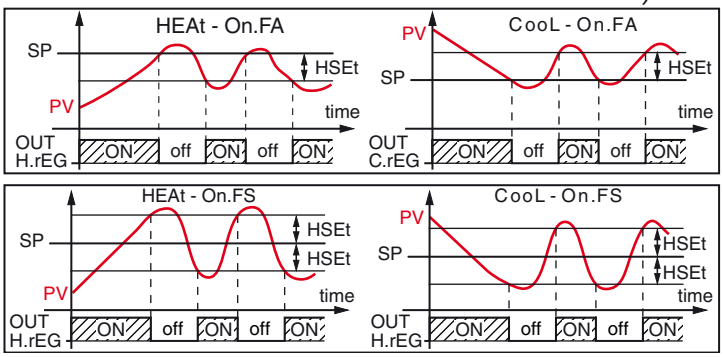
Range: • When two control actions (heat & cool) are programmed:

0 Pid PID (heat and cool);
1 nr Heat/Cool ON/OFF control with neutral zone;



• When one control action (heat or cool) is programmed:

0 Pid PID (heat or cool);
1 On.FA ON/OFF asymmetric hysteresis;
2 On.FS ON/OFF symmetric hysteresis;
3 3Pt Servomotor control (available when Out1 and Out2 have been ordered as "**M**").



Notes: 1. ON/OFF control with asymmetric hysteresis:
- OFF when PV ≥ SP;
- ON when PV ≤ (SP - hysteresis).

2. ON/OFF control with symmetric hysteresis:
- OFF when PV ≥ (SP + hysteresis);
- ON when PV ≤ (SP - hysteresis).

[64] address 10303 - Auto
Auto tune selection

Ascon Tecnologic has developed three auto-tune algorithms:
- Oscillating auto-tune;
- Fast auto-tune;
- EvoTune.

1. The **oscillating** auto-tune is the usual auto-tune and:
- It is more accurate;
- Can start even if PV is close to the Setpoint;
- Can be used even if the Setpoint is close to the ambient temperature.

2. The **fast type** is suitable when:
- The process is very slow and you want to be operative in a short time;
- When an overshoot is not acceptable;
- In multi-loop machinery where the fast method reduces the calculation error due to the effect of the other loops.

3. The **EvoTune** type is suitable when:
- You have no information about your process;
- You can not be sure about the end user skills;
- You desire an auto tune calculation independently from the starting conditions (e.g. Setpoint change during tune execution, etc).

Note: Fast auto-tune can start only when the measured value (PV) is lower than (SP + 1/2SP).

Available: When [56] cont = PId.

Range: -4... 8 where:

-4 Oscillating auto-tune with automatic restart at all Setpoint changes;
-3 Oscillating auto-tune with manual start;
-2 Oscillating auto-tune with automatic start at the first power ON only;
-1 Oscillating auto-tune with automatic restart at all power ON;
0 Not used;
1 Fast auto tuning with automatic restart at all power ON;
2 Fast auto-tune with automatic start at the first power ON only;
3 FAST auto-tune with manual start;
4 FAST auto-tune with automatic restart at all Setpoint changes.
5 EvoTune with automatic restart at all power ON;
6 EvoTune with automatic start at the first power ON only;
7 EvoTune with manual start;
8 EvoTune with automatic restart at all SP changes.

Note: All auto-tunes are inhibited during program execution.

[65] address 10304 - tunE
Manual start of the auto-tune

Available: When [63] cont = PId.

Range: **0 oFF** The instrument is not performing the auto-tune;
1 on The instrument is performing the auto-tune.

[66] address 10305 - HSEt
Hysteresis of the ON/OFF control

Available: When [63] cont is different from PId.

Range: 0... 9999 engineering units.

[67] address 10306 - cPdt
Time for compressor protection

Available: When [63] cont = nr.

Range: **0 OFF** Protection disabled;
1... 9999 seconds.

[68] address 10307 - Pb
Proportional band

Available: When [63] cont = PId.

Range: 1... 9999 engineering units.

Note: This value is calculated by the auto-tune functions.

[69] address 10308 - ti
Integral time

Available: When [63] cont = PID.

Range: **OFF** Integral action excluded;
1... 9999 seconds;
inF Integral action excluded.

Note: This value is calculated by the auto-tune functions.

[70] address 10309 - td
Derivative time

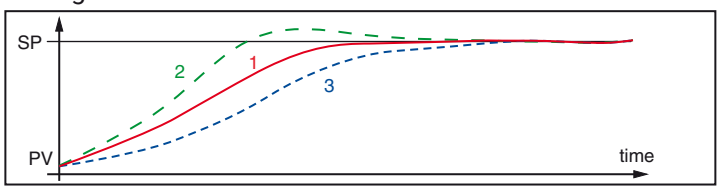
Available: When [63] cont = PID.

Range: **oFF** Derivative action excluded;
1... 9999 seconds.

Note: This value is calculated by the auto-tune functions.

[71] address 10310 - Fuoc
Fuzzy overshoot control

This parameter reduces the overshoot usually present at instrument start up or after a Setpoint change and it will be active only in this two cases.
Setting a value between 0.00 and 1.00 it is possible to slow down the instrument action during Setpoint approach.
Setting **Fuoc = 1** this function is disabled.



Available: When [63] cont = PID.
Range: 0... 2.00.
Note: Fast auto-tune calculates the Fuoc parameter while the oscillating tune sets it equal to 0.5.

[72] address 10311 - tcH
Cycle time of the heating output

Available: When at least one output is programmed in order to be the heating output (H.rEG), [63] cont = PID.
Range: 1.0... 130.0 seconds.

[73] address 10312 - rcG
Power ratio between heating and cooling action (relative cooling gain)

The instrument uses the same PID parameter set for heat and for cool action but the efficiency of the two actions are usually different.
This parameter allows to define the ratio between the efficiency of the heating system and the efficiency of the cooling one.
An example will help us to explain you the philosophy.
Consider one loop of a plastic extruder. The working temperature is equal to 250°C.
When you want to increase the temperature from 250 to 270°C (ΔT = 20°C) using 100% of the heating power (resistor), you will need 60 seconds.
On the contrary, when you want to decrease the temperature from 250 to 230°C (ΔT = 20°C) using 100% of the cooling power (fan), you will need 20 seconds only.
In our example the ratio is equal to 60/20 = 3 ([67] rcG = 3) and it say that the efficiency of the cooling system is 3 time more efficient of the heating one.
Available: When two control action are programmed (H.rEG **and** c.rEG) and [63] cont = PID
Range: 0.01... 99.99
Note: This value is calculated by the auto-tune functions.

[74] address 10313 - tcc
Cycle time of the cooling output

Available: When at least one output is programmed in order to be the cooling output (c.rEG), [63] cont = PID
Range: 1.0... 130.0 seconds.

[75] address 10314 - rS
Manual reset (integral pre-load)

rS allows to drastically reduce the undershoot due to a hot restart. When your process is steady, the instrument operates with a steady power output (e.g.: 30%).
If a short power down occurs, the process restarts with a process variable close to the Setpoint while the instrument starts with an integral action equal to zero.
Setting a manual reset equal to the average power output (in our example 30%) the instrument will start with a power output equal to the value it will use at steady state (instead of zero) and the undershoot will become very little (in theory equal to zero).
Available: When [63] cont = PID.
Range: -100.0... +100.0%.

[76] address 10315 - Str.t
Servomotor stroke time (servo mode only)

Available: When [63] cont = 3PtS.
Range: 5... 1000 seconds;

[77] address 10316 - db.S
Servomotor dead band (servo mode only)

Available: When [63] cont = 3PtS.
Range: 0.0... 10.0.

[78] address 10317 - oP.L
Minimum power output

Available: When [63] cont = PID.
Range: -100 to oP.H %.

[79] address 10318 - oP.H
Maximum power output

Available: When [63] cont = **PID**.
Range: oP.L to 100 %.

[80] address 10319 - od
Delay at power ON

Available: When at least one output is programmed as control output.
Range: **0** **oFF** Function not used;
0.01... 99.59 hh.mm.
Notes: 1. This parameter defines the time during which (after a power ON) the instrument remains in stand by mode before to start all other function (control, alarms, program, etc.).
2. When a program with automatic start at power ON and od function are programmed, the instrument performs od function before to start the program execution.
3. When an auto-tune with automatic start at power ON and od function are programmed, the auto-tune will start at the end of od delay.

[81] address 10320 - St.P
Maximum power output used during soft start

Available: When at list one output is programmed as control output.
Range: -100... +100%.
Notes: 1. When St.P parameter have a positive value, the limit will be applied to the heating output(s) only.
2. When St.P parameter have a negative value, the limit will be applied to the cooling output(s) only.
3. When a program with automatic start at power ON and soft start function are programmed, the instrument performs the soft start and then the program

function.

4. The auto-tune function will be performed after soft start function.
5. The Soft start function is available also when ON/OFF control is used.

[82] address 10321 - SSt
Soft start time

Available: When at list one output is programmed as control output.

Range: **oFF** Function not used;
0.01... 7.59 hh.mm;
inF Soft start always active.

[83] address 10322 - SS.tH
Threshold for soft start disabling

Available: When at list one output is programmed as control output.

Range: -1999... 9999 engineering units.

Notes:
1. When the power limiter has a positive value (the limit is applied to the heating action) the soft start function will be aborted when the measured value is greater or equal to SS.tH parameter.
2. When the power limiter has a negative value (the limit is applied to the cooling action) the soft start function will be aborted when the measured value is lower or equal to SS.tH parameter.

SP Group - Setpoint parameters

The SP group will be available only when at least one output is programmed as control output (H.rEG or C.rEG).

[84] address 10323 - nSP
Number of used Setpoints

Available: When at least one output is programmed as control output.

Range: 1... 4.

Notes:
1. When you change the value of this parameter, the instrument operates as follows:
   - [91] A.SP parameter will be forced to SP.
   - The instrument verifies that all used Setpoint are within the limits programmed by [85] SPLL and [86] SPHL. If an SP is out of this range, the instrument forces it to the maximum acceptable value.
2. When [10] rEcS = YES (the recipes are used), the [84] nSP - number of used SP - parameter will define the number of used recipes and it will force the value of [52] n.SPd - number of used speed/time - parameter.

[85] address 10324 - SPLL
Minimum Setpoint value

Available: When at least one output is programmed as control output.

Range: From -1999 to [86] SPHL engineering units.

Notes:
1. When you change the [85] SPLL value, the inst. rument checks all local Setpoints (SP, SP2, SP3 and SP4 parameters) and all Setpoints of the program ([105] Pr.S1, [110] Pr.S2, [115] Pr.S3, [120] Pr.S4 parameters). If an SP is out of this range, the instrument forces it to the maximum acceptable value;
2. A [85] SPLL change produces the following actions:
   - When [92] SP.rt = SP the remote Setpoint is forced to be equal to the active Setpoint.
   - When [92] SP.rt = trim the remote Setpoint is forced to zero.
   - When [92] SP.rt = PErc the remote Setpoint is forced to zero.

[86] address 10325 - SPHL
Maximum Setpoint value

Available: When at least one output is programmed as control output.

Range: From [85] SPLL to 9999 engineering units.

Note: For other details see [85] SPLL parameter.

[87] address 10326 - SP
Setpoint 1

Available: When at least one output is programmed as control output.

Range: From [85] SPLL to [86] SPHL engineering units.

[88] address 10327 - SP2
Setpoint 2

Available: When at least one output is programmed as control output and [84] nSP ≥ 2.

Range: From [85] SPLL to [86] SPHL engineering units.

[89] address 10328 - SP3
Setpoint 3

Available: When at least one output is programmed as control output and [84] nSP ≥ 3.

Range: From [85] SPLL to [86] SPHL engineering units.

[90] address 10329 - SP4
Setpoint 4

Available: When at least one output is programmed as control output and [84] nSP = 4.

Range: From [85] SPLL to [86] SPHL engineering units.

[91] address 10330 - A.SP
Selection of the active Setpoint

Available: When at least one output is programmed as control output.

Range: From SP to [84] nSP.

Notes:
1. SP2, SP3 and SP4 selection will be shown only when the relative Setpoint is enabled (see [84] nSP parameter).
2. When [10] rEcS = YES (the recipes are used), the [91] A.SP - active Setpoint- will define the recipe in use and it will forced the value of [57] A. Sd.t - active speed/time - paramter.
3. When [10] rEcS = YES (the recipes are used), the [57] A.Sd.t (= active speed/time) will define the recipe in use and it will force the value of [91] A.SP - Active Setpoint.

[92] address 10331 - SP.rt
Remote Setpoint type

These instruments will communicate with each other, using RS 485 serial interface without a PC. An instrument can be set as a Master while the other are (as usual) Slave units. The Master unit can send his operative Setpoint to the slave units. In this way, for example, it is possible to change simultaneously the Setpoint of 20 instruments by changing the Setpoint of the master unit (e.g. hot runner application). [92] SP.rt parameter defines how the slaves units will use the value coming from serial link.

Available: When at least one output is e programmed as control output and the serial interface is present.

Range:
- **0 rSP** The value coming from serial link is used as remote Setpoint (RSP).
- **1 trin** The value coming from serial link will be algebraically added to the local Setpoint selected by A.SP and the sum becomes the operative Setpoint.
- **2 PErc** The value coming from serial will be scaled on the input range and this value will be used as remote Setpoint.

Note: A [92] SPrt change produces the following actions:
- When [92] SP.rt = rSP - the remote Setpoint is forced to be equal to the active Setpoint;
- When [92] SP.rt = trin - the remote Setpoint is forced to zero;
- When [92] SP.rt = PErc - the remote Setpoint is forced to zero.

Example: A 6 zone reflow-oven for PCB. The master unit sends its Setpoint value to 5 other zones (slave controllers). The Slave zones use it as a Setpoint trim.
The first zone is the master zone and it uses a Setpoint equal to 210°C.
The second zone has a local Setpoint equal to -45°C.
The third zone has a local Setpoint equal to -45 (°C).
The fourth zone has a local Setpoint equal to -30.
The fifth zone has a local Setpoint equal to +40.
The sixth zone has a local Setpoint equal to +50.
In this way, the thermal profile will be the following:
- Master SP = 210°C;
- Second zone SP = 210 -45 = 165°C;
- Third zone SP = 210 -45 = 165°C;
- Fourth zone SP = 210 - 30 = 180°C;
- Fifth zone SP = 210 + 40 = 250°C;
- Sixth zone SP = 210 + 50 = 260°C.

Changing the SP of the master unit, all the other slave units will immediately change their operative Setpoint.

[93] address 10332 - SP.Lr
Local/remote Setpoint selection

Available: When at list one output is programmed as control output.

Range:
- **0 Loc** Local Setpoint selected by [91] A.SP;
- **1 rEn** Remote Setpoint (from serial link).

[94] address 10333 - SP.u
Rate of rise for positive Setpoint change (ramp up)

Available: When at list one output is e programmed as control output.

Range: 0.01... 99.99 units per minute;
inF Ramp disabled (step transfer).

[95] address 10334 - SP.d
Rate of rise for negative Setpoint change (ramp down)

Available: When at list one output is e programmed as control output.

Range: 0.01... 99.99 units per minute;
inF Ramp disabled (step transfer).

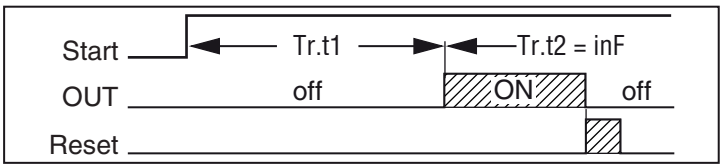
General note about remote Setpoint:
When the remote Setpoint (RSP) with trim action is programmed, the local Setpoint range becomes:
from [85] SPLL + RSP to [86] SPHL - RSP.

⊐tin group - Timer function parameters

Five timer types are available:

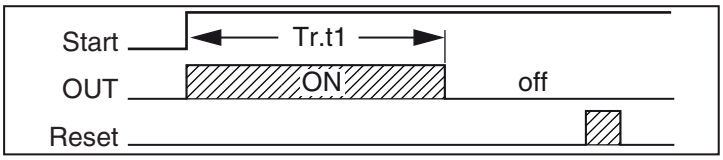
Delayed start with a delay time and a "**end of cycle**" time.

- Setting tr.t2 = Inf the timer out remains in ON condition until a reset command is detected.

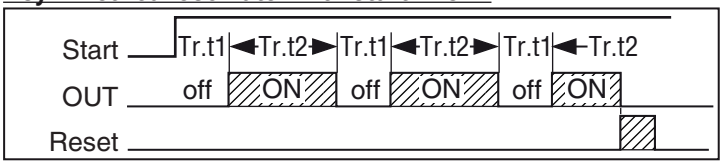


Delayed start at power ON with a delay time and a "**end of cycle**" time.

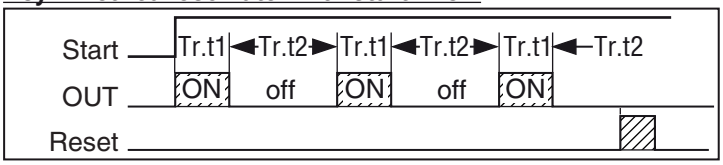
Feed-through



Asymmetrical oscillator with start in OFF



Asymmetrical oscillator with start in ON



Notes: 1. The instrument can receive the start, hold and reset commands by logic inputs and/or by serial link.
2. An HOLD command can suspend the time count.

[96] address 10335 - tr.F
Independent timer function

Available: Always.

Range:
0 nonE Timer not used;
1 i.d.A Delayed start timer;
2 i.uP.d Delayed start at power ON;
3 i.d.d Feed-through timer;
4 i.P.L Asymmetrical oscillator with start in OFF;
5 i.L.P Asymmetrical oscillator with start in ON.

[97] address 10336 - tr.u
Engineering unit of the time

Available: When [96] tr.F is different from nonE.

Range:
0 hh.nn Hours and minutes;
1 nn.SS Minutes and seconds;
2 SSS.d Seconds and tenth of seconds.

Note: When the timer is running, you can see the value of this parameter but you can NOT modify it.

[98] address 10337 - tr.t1
Time 1

Available: When [96] tr.F is different from nonE.

Range: When [97] tr.u = hh.nn = 00.01... 99.59;
When [97] tr.u = nn.SS = 00.01... 99.59;
When [97] tr.u = SSS.d = 000.1... 995.9.

[99] address 10338 - tr.t2
Time 2

Available: When [96] tr.F is different from nonE.

Range: **0 oFF**;
When [97] tr.u = hh.nn = 00.01... 99.59 + inF;
When [97] tr.u = nn.SS = 00.01... 99.59 + inF;
When [97] tr.u = SSS.d = 000.1... 995.9 + inF.

Note: Setting [99] tr.t2 = inF, the second time can be stopped by a reset command only.

[100] address 10339 - tr.St
Timer status

Available: When [96] Tr.F is different from nonE.

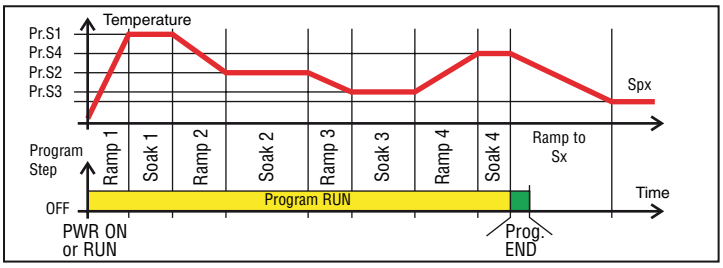
Range:
0 run Timer Run;
1 HoLd Timer Hold;
2 rES Timer reset.

Note: This parameter allows to manage timer execution by a parameter (without digital inputs).

PrG Group - Programmer function parameters

These instruments are able to perform a Setpoint profile compounded of 4 groups of 2 steps (8 step total).
The first step is a ramp (used to reach the desired Setpoint), the second is a soak (on the desired Setpoint).
When a RUN command is detected the instrument aligns the operative Setpoint to the measured value and starts to execute the first ramp.
In addition, each soak is equipped with a wait band which suspends the time count when the measured value goes out of the defined band (guaranteed soak).
Moreover, for each segment it is possible to define the status of two events. An event can drive an output and make an action during one or more specific program steps.
Some additional parameters allow to define the time scale, the automatic RUN conditions and the instrument behaviour at the end of the program.

Notes: 1. All steps can be modified during program execution.
2. During program execution the instrument stores the segment currently in use and, by a 30 minutes interval, stores also the elapsed time of the soaks.
If a power down occurs during program execution, at the next power ON the instrument is able to continue the program execution starting from the segment in progress at power down and, if the segment was a soak, it is also capable to restart from the soak time minus the stored elapsed time.
In order to obtain this features, the [126] dSPu (Instrument status at power ON) parameter must be set to RSPr.
If [126] dSPu value is different from RSPr, the memorization function will be inhibited.



[101] address 10340 - Pr.F
Programmer action at Power ON

Available: Always.

Range:
0 nonE Program not used;
1 S.uP.d Start at power ON with first step in stand by;
2 S.uP.S Start at power ON;
3 u.diG Start at RUN command detection only;
4 U.dG.d Start at RUN command detection with a first step in stand by.

[102] address 10341 - Pr.u
Soaks time unit

Available: When [101] Pr.F is different from nonE:

Range:
0 hh.nn Hours and minutes;
1 nn.SS Minutes and seconds.

Note: During program execution, this parameter can not be modified.

[103] address 10342 - Pr.E
Instrument behaviour at the End of the program execution

Available: When [101] Pr.F is different from nonE.

Range:
- **0 cnt** Continue (the instrument will use the Setpoint of the last soak until a reset command is detected);
- **1 SPAt** Go to the Setpoint selected by [91] A.SP parameter;
- **2 St.bY** Go in stand by mode.

Notes:
1. Setting [103] Pr.E = cnt the instrument operates as follows: at program end, it uses the Setpoint of the last soak.
2. When a reset command is detected, it goes to the Setpoint selected by [91] A.SP parameter. The transfer will be a step transfer or a ramp according to the [94] SP.u (maximum rate of rise for positive Setpoint change) and [95] SPd (maximum rate of rise for negative Setpoint change).
3. Setting [103] Pr.E = SPAt the instrument goes immediately to the Setpoint selected by [91] A.SP parameter. The transfer will be a step transfer or a ramp according to the [94] SP.u (maximum rate of rise for positive Setpoint change) and [95] SPd (maximum rate of rise for negative Setpoint change).

[104] address 10343 - Pr.Et
Time of the End program indication

Available: When [101] Pr.F is different from nonE.

Range:
- **0 oFF** Function not used;
- 00.01... 99.59 minutes and seconds;
- **inF** Forced to ON.

Note: Setting [104] Pr.Et = inF the end program indication goes OFF only when a reset command or a new RUN command is detected.

[105] address 10344 - Pr.S1
Setpoint of the first soak

Available: When [101] Pr.F is different from nonE or [101] Pr.F is different from SuPd.

Range: From [85] SPLL to [86] SPHL.

[106] address 10345 - Pr.G1
Gradient of the first ramp

Available: When [101] Pr.F is different from nonE or [101] Pr.F is different from SuPd.

Range:
- 0.1... 999.9 engineering units per minute;
- **inF** Step transfer.

[107] address 10346 - Pr.t1
Time of the first soak

Available: When [101] Pr.F is different from nonE.

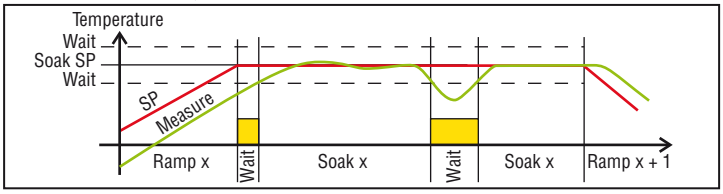
Range: 0.00... 99.59 Soak time units.

[108] address 10347 - Pr.b1
Wait band of the first soak

Available: When [101] Pr.F is different from nonE or [101] Pr.F is different from SuPd.

Range:
- **0 OFF**;
- 1... 9999 engineering units.

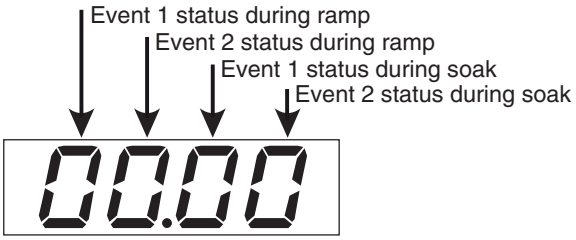
Note: The wait band suspends the time counting when the measured value goes out of the defined band (guaranteed soak).



[109] address 10348 - Pr.E1
Events of the first group

Available: When [101] Pr.F is different from nonE or [101] Pr.F is different from SuPd.

Range: 00.00... 11.11 where:
- **0** Event OFF;
- **1** Event ON.



Display	Ramp		Soak	
	Event 1	Event 2	Event 1	Event 2
00.00	off	off	off	off
10.00	on	off	off	off
0 1.00	off	on	off	off
1 1.00	on	on	off	off
00.10	off	off	on	off
10.10	on	off	on	off
0 1.10	off	on	on	off
1 1.10	on	on	on	off
00.0 1	off	off	off	on
10.0 1	on	off	off	on
0 1.0 1	off	on	off	on
1 1.0 1	on	on	off	on
00.1 1	off	off	on	on
10.1 1	on	off	on	on
0 1.1 1	off	on	on	on
1 1.1 1	on	on	on	on

[110] address 10349 - Pr.S2
Setpoint of the second soak

Available: When [101] Pr.F is different from nonE.

Range:
- From [85] SPLL to [86] SPHL;
- **oFF** Program end.

Note: It is not necessary to configure all steps. When you use for example 2 groups only, it is sufficient to set the Setpoint of the third group equal to OFF. The instrument will mask all the following parameters of the programmer.

[111] address 10350 - Pr.G2
Gradient of the second ramp

Available: When [101] Pr.F is different from nonE and [110] Pr.S2 is different from oFF.

Range: 0.1... 999.9 engineering units per minute;
inF Step transfer.

[112] address 10351 - Pr.t2
Time of the second soak

Available: When [101] Pr.F is different from nonE and [110] Pr.S2 is different from oFF.

Range: 0.00... 99.59 Soak time units.

[113] address 10352 - Pr.b2
Wait band of the second soak

Available: When [101] Pr.F is different from nonE and [110] Pr.S2 is different from oFF.

Range: **0** **OFF**;
1... 9999 engineering units.

Note: For more details see [108] Pr.b1 parameter.

[114] address 10353 - Pr.E2
Events of the second group

Available: When [101] Pr.F is different from nonE and [110] Pr.S2 is different from oFF.

Range: 00.00... 11.11 where:
0 Event OFF;
1 Event ON.

For more details see [109] Pr.E1 parameter.

[115] address 10354 - Pr.S3
Setpoint of the third soak

Available: When [101] Pr.F is different from nonE and [110] Pr.S2 is different from oFF.

Range: From [85] SPLL to [86] SPHL;
oFF Program end.

Note: For more details see [101] Pr.S1 parameter.

[116] address 10355 - Pr.G3
Gradient of the third ramp

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF and [115] Pr.S3 is different from oFF.

Range: 0.1... 999.9 engineering units per minute;
inF Step transfer.

[117] address 10356 - Pr.t3
Time of the third soak

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF and [115] Pr.S3 is different from oFF.

Range: 0.00... 99.59 time units.

[118] address 10357 - Pr.b3
Wait band of the third soak

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF and [115] Pr.S3 is different from oFF.

Range: **0** **OFF**;
1... 9999 engineering units.

Note: For more details see [108] Pr.b1 parameter.

[119] address 10358 - Pr.E3
Events of the third group

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF and [115] Pr.S3 is different from oFF.

Range: 00.00... 11.11 where:
0 Event OFF;
1 Event ON.

Note: For more details see [109] Pr.E1 parameter.

[120] address 10359 - Pr.S4
Setpoint of the fourth soak

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF and [115] Pr.S3 is different from oFF.

Range: From [85] SPLL to [86] SPHL;
oFF Program end.

Note: For more details see [101] Pr.S1 parameter.

[121] address 10360 - Pr.G4
Gradient of the fourth ramp

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF and [115] Pr.S3 is different from oFF and [120] Pr.S4 is different from oFF.

Range: 0.1... 999.9 enginering units per minute;
inF Step transfer.

[122] address 10361 - Pr.t4
Time of the fourth soak

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF, [1115] Pr.S3 is different from oFF and [120] Pr.S4 is different from oFF.

Range: 0.00... 99.59 Soak time units.

[123] address 10362 - Pr.b4
Wait band of the fourth soak

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF, [115] Pr.S3 is different from oFF and [120] Pr.S4 is different from oFF.

Range: **0** **OFF**;
1... 9999 engineering units.

Note: For more details see [108] Pr.b1 parameter.

[124] address 10363 - Pr.E4
Event of the fourth segment

Available: When [101] Pr.F is different from nonE, [110] Pr.S2 is different from oFF, [115] Pr.S3 is different from oFF and [120] Pr.S4 is different from oFF.

Range: 00.00... 11.11 where:
0 Event OFF;
1 Event ON.

Note: For more details see [109]Pr.E1 parameter.

[125] address 10364 - Pr.St
Program status

Available: When [101] Pr.F is different from nonE.

Range: **0** **run** Program Run;
1 **HoLd** Program Hold;
2 **rES** Program reset.

Note: This parameter allows to manage program execution by a parameter.

PAn group - Operator HMI

[126] address 10365 - dSPu
Status of the instrument at power ON

Available: Always.

Range:
- **0 AS.Pr** Starts in the same way it was prior to the power down;
- **1 Auto** Starts in Auto mode;
- **2 oP.0** Starts in manual mode with a power output equal to zero;
- **3 St.bY** Starts in stand-by mode.

Notes: 1. When you change the value of [127] oPr.E, the instrument forces [128] oPEr parameter equal to Auto.

2. During program execution the instrument stores the segment currently in use and, by a 30 min interval, it stores also the elapsed time of the soaks. If a power down occurs during program execution, at the next power ON the instrument is able to continue the program execution starting from the segment in progress at power down and, if the segment was a soak, it is also capable to restart from the soak time minus the stored elapsed time. In order to obtain this features, the [126] dSPu - Status of the instrument at power ON parameter must be set to ASPr. If the [126] dSPu parameter is different from ASPr The memorization function is inhibited.

[127] address 10366 - oPr.E
Operative modes enabling

Available: Always.

Range:
- **0 ALL** All modes will be selectable by the next parameter;
- **1 Au.oP** Auto and manual (oPLo) mode only will be selectable by the next parameter;
- **2 Au.Sb** Auto and Stand-by modes only will be selectable by the next parameter.

Note: Manual changing the value of [127] oPr.E, the instrument forces parameter [128] oPEr = AuTo.

[128] address 10367 - oPEr
Operative mode selection

Available: Always.

Range:
- When [127] oPr.E = ALL:
  Auto Auto mode;
  oPLo Manual mode;
  St.bY Stand by mode.
- When [127] oPr.E = AuoP:
  Auto Auto mode;
  oPLo Manual mode.
- When [127] oPr.E = AuSb:
  Auto Auto mode;
  St.bY Stand by mode.

Ser group - Serial link parameter

[129] address 10368 - Add
Instrument address

Available: Always.

Range: **0 oFF** Serial interface not used;
1... 254.

[130] address 10369 - bAud
Baud rate

Available: When [129] Add different from oFF.

Range:
- **0 1200** 1200 baud;
- **1 2400** 2400 baud;
- **2 9600** 9600 baud;
- **3 19.2** 19200 baud;
- **4 38.4** 38400 baud.

COn Group - Consumption parameters

[131] address 10370 - Co.tY
Count type

Available: Always.

Range:
- **0** oFF (Not used);
- **1** Total worked days: Number of hours the instrument is turned ON divided by 24.
- **2** Total worked hours: Number of hours that the instrument is turned ON.
- **3** Total worked days with threshold: Number of hours the instrument is turned ON divided by 24, the controller is forced in stand-by when Co.ty value reaches the threshold set in [132] h.Job.
- **4** Total worked hours with threshold: number of hours that the instrument is turned ON, the controller is forced in stand-by when Co.ty value reaches the threshold set in [132] h.Job.
- **5** Totalizer of control relay worked days: Number of hours the control relay has been in ON condition, divided by 24.
- **6** Totalizer of control relay worked hours: Number of hours the control relay has been in ON condition.
- **7** Totalizer of control relay worked days with threshold: Number of hours the control relay has been in ON condition divided by 24, the controller is forced in stand-by when Co.ty value reaches the threshold set in [132] h.Job.
- **8** Totalizer of control relay worked hours with threshold: Number of hours the control relay has been in ON condition, the controller is forced in stand-by when Co.ty value reaches the threshold set in [132] h.Job.

Note: Selections 1 to 8 represent an internal count: these modes calculate the instrument work in hours or days. When the count reaches the threshold set with parameter [132] h.Job the output set as 19 = r.SP will go to 1. The count reset (with r.SP cancellation) can be done only by changing the threshold value - parameter [132] h.Job.

Using counting methods 6, 7, the count reset causes the controller to exit the stand-by status returning to the control status.

[132] address 10371 - h.Job
Threshold of the working period

Available: When [140] Co.tY = totd or [140] Co.tY = totH.

Range: **0 oFF** Threshold not used;
1... 9999 days when [131] Co.tY = 4;
1... 9999 hours when [131] Co.tY = 5.

[133] address 10372 - t.Job
Worked time (not resettable)

Available: Always.

Range: 1... 9999 days.

CAL group - User calibration group

This function allows to calibrate the complete measuring chain and to compensate the errors due to:

- Sensor location;
- Sensor class (sensor errors);
- Instrument accuracy.

[134] address 10373 - AL.P Adjust Low Point

Available: Always.
Range: -1999... (AH.P - 10) engineering units.
Note: The minimum difference between AL.P and AH.P is equal to 10 Engineering Units.

[135] address 10374 - AL.o Adjust Low Offset

Available: Always.
Range: -300... +300 engineering units.

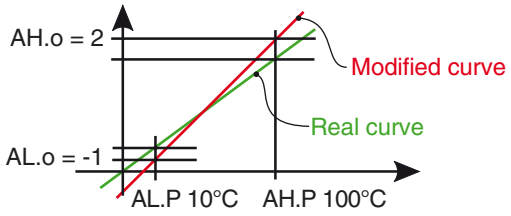
[136] address 10375 - AH.P Adjust High Point

Available: Always.
Range: From (AL.P + 10) to 9999 engineering units.
Note: The minimum difference between AL.P and AH.P is equal to 10 Engineering Units.

[137] address 10386 - AH.o Adjust High Offset

Available: Always.
Range: -300... +300 Engineering Units.
Example: Environmental chamber with an operative range: 10... 100°C.

1. Insert in the chamber a reference sensor connected with a reference instrument (usually a calibrator).
2. Start the control of the instrument, and set a Setpoint equal to the minimum value of the operative range (e.g.: 10°C). When the temperature in the chamber is steady, take note of the temperature measured by the reference system (e.g.: 9°C).
3. Set [134] AL.P = 10 (low working point) and [135] ALo = -1 (it is the difference between the reading of the instrument and the reading of the reference system). Note that after this set the measured value of the instrument is equal to the measured value of the reference system.
4. Set a Setpoint equal to the maximum value of the operative range (e.g. 100°C). When the temperature in the chamber is steady, take note of the temperature measured by the reference system (e.g. 98°C).
5. Set [136] AH.P = 100 (low working point) and [137] AHo = +2 (it is the difference between the reading of the instrument and the reading of the reference system). Note that after this set the measured value of the instrument is equal to the measured value of the reference system.



The most important step of the configuration procedure is completed.

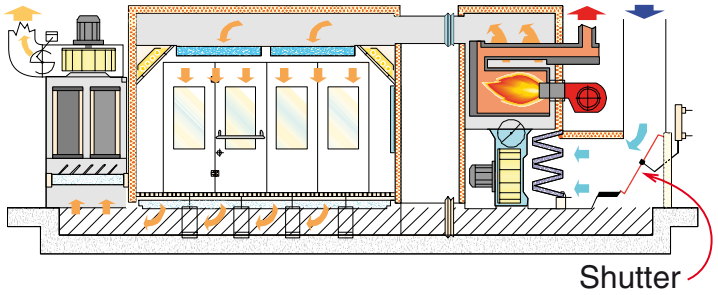
7 OPERATIVE MODES

7.1 Automatic Mode

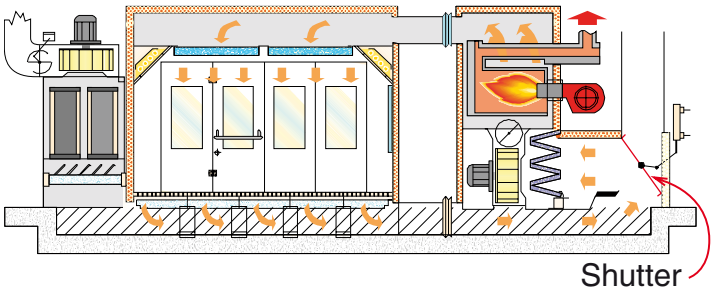
7.1.1 The programmer function

Application Example 1: Spray Paint Drying Booth

When the operator is in the booth and painting the car, the internal temperature must be 20°C and the air, used for booth ventilation, comes from outside.

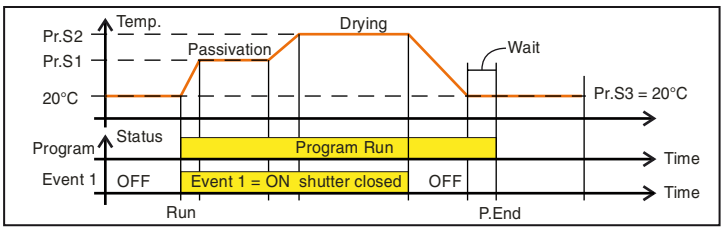


During the passivation and drying phases, the operator is out of the booth and the system closes the air shutter and recycles the internal air in order to reduce the power consumption.



When the drying time is finished, before the operator is allowed to enter into the boot, you must be sure that:

1. The air in the booth has been refreshed. The temperature is lower than a limit.
   So that you need a profile like the one that follows:



Out 1 = H.rEG (heating output)
Out 2 = P.Et1 (program event 1)
Out 3 = P.run (program running)
Pr.E1and Pr.E2 = 10.10
(event 1 goes ON during ramp 1, soak 1, ramp 2 and soak 2)
When the program is running the door is locked

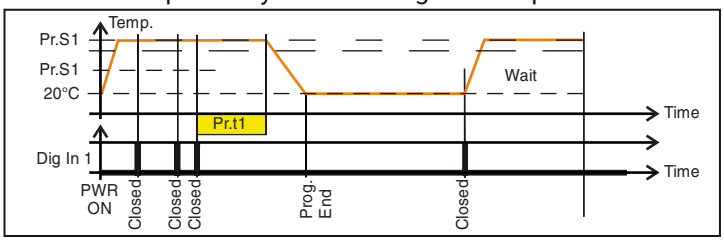
Application Example 2: edge bending machine with glue tank (for wood)

At the working temperature the hot melt rapidly oxidizes and runs down from the “dispenser”.
For this reason, when the machine does not work for a certain time, it is suitable to move the temperature of the dispenser to a lower value to idle.
In this cases the configuration is the following:

Out 1 = h.reg (heating output)
Out 2 = AL (alarm used to enable the dragger)
diF.1 = P.run (digital input 1 used for Program run/restart)
Pr.F = S.uP.S (start at power ON)

Pr.E = cnt (Instrument behaviour at the end of the program execution = continue).

Connect a proximity switch to Dig. In 1 for panel detection.



When a new panel is detected before the end of the first soak time, the program restarts and the Setpoint remains equal to Pr.S1.

If no panel is detected, the instrument goes to Pr.S2 (idle temp) and remain there until a new panel arrives.

7.2 Manual mode

This operative mode allows you to deactivate automatic control and manually program the percentage power output to the process.

When manual control is selected, the instrument starts to operate with the same power output as the last one supplied by automatic mode and can be modified through the serial link.

In case of ON/OFF control, 0% corresponds to the deactivated output while any value different from 0 corresponds to the activated output.

As in the case of visualization, the programmable values range from H100 (100% output power with reverse action) to C100 (100% output power with direct action).

Notes: 1. During manual mode, the alarms are operative.

2. If you set manual modes during program execution, the program will be frozen and it will restart when the instrument will come back to Auto mode.

3. If you set manual modes during self-tune execution, the self- tune function will be aborted.

4. During manual mode, all functions not related with the control (wattmeter, independent timer, “worked time”, etc) continue to operate normally.

7.3 Stand by mode

This operative mode also deactivates the automatic control but forces the control output to zero.

In this mode the instrument operates as an indicator.

Notes: 1. During stand by mode, the relative alarms are disabled while the absolute alarms are operative or not according to the ALxo (Alarm x enabling during Stand-by mode) parameter setting.

2. If you set stand by mode during program execution, the program will be aborted.

3. If you set stand by mode during self-tune execution, the self- tune function will be aborted.

4. During stand by mode, all functions not related with the control (wattmeter, independent timer, “worked time”, etc) continue to operate normally.

5. When the instrument is swapped from stand by to auto modes, the instrument will start automatically the alarm masking, the soft start functions and the auto-tune (if programmed).

8 GENERAL NOTES

8.1 Proper use

Every possible use not described in this manual must be consider as a improper use.
This instrument is in compliance with EN 61010-1 “Safety requirements for electrical equipment for measurement, control and laboratory use”; for this reason it could not be used as a safety equipment.

⚠ Whenever a failure or a malfunction of the control device may cause dangerous situations for persons, thing or animals, please remember that the plant has to be equipped with additional safety devices.

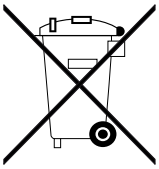
⚠ Ascon Tecnologic S.r.l. and its legal representatives do not assume any responsibility for any damage to people, things or animals deriving from violation, wrong or improper use or in any case not in compliance with the instrument’s features.

8.2 Maintenance

This instrument does not requires periodical recalibration and it have no consumable parts so that no particular maintenance is required.
Sometimes it is advisable to clean the instrument.

1. **SWITCH THE EQUIPMENT OFF** (power supply, relay output, etc.).
2. Using a vacuum cleaner or a compressed air jet (max. 3 kg/cm^2) remove all deposits of dust and dirt which may be present on the case and on the internal circuits being careful not to damage the electronic components.
3. To clean external plastic or rubber parts use only a cloth moistened with:
   - Ethyl Alcohol (pure or denatured) [C_2H_5OH] or
   - Isopropyl Alcohol (pure or denatured) [$(CH_3)_2CHOH$] or
   - Water (H_2O).
4. Make sure that there are no loose terminals.
5. Before turning ON the instrument make sure it is perfectly dry.
6. Apply the power supply to the instrument.

8.3 Disposal



The appliance (or the product) must be disposed of separately in compliance with the local standards in force on waste disposal.

9 WARRANTY

This product is under warranty against manufacturing defects or faulty materials that are found within 18 months from delivery date. The warranty is limited to repairs or to the replacement of the instrument.
The tampering of the instrument or an improper use of the product will bring about the immediate withdrawal of the warranty 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 Ascon Tecnologic with a detailed description of the faults found, without any fees or charge for Ascon Tecnologic, except in the event of alternative agreements.

10 ACCESSORIES

The instrument has a lateral socket into which a special tool can be inserted.
This tool, named **A01**, allows:

- To store a complete instrument configuration and to use it for other instruments.
- To transfer a complete instrument configuration to a PC or from a PC to an instrument
- To transfer from a PC to an instrument a complete instrument configuration
- To transfer a configuration from an A01 to another one.
- To test serial interface of the instruments and to help the OEM during machine start up.

Note: When the instrument is powered by the A01 key, the outputs are NOT supplied.

Appendix A
COMMUNICATION PROTOCOL

The complete manual of the Modbus protocol can be found - free of charge - at:
www.ascintecnologic.com

ADDRESS MAP

All Kube instruments use only words:

Initial address		Final address		Meaning
Hex	Dec	Hex	Dec	
1	1	35	53	Group of variables common to all new Ascon Tecnologic's instruments: numeric values calculated and dinamically updated. Available in read and write operations
200	512	250	592	Group of variables compatible with the old Ascon Tecnologic's instruments (before Kube series): numeric values calculated and dinamically updated. Available in read and write operations
280	640	332	803	Configuration parameters: Numeric and symbolic values. Available in read and write operations
800	2048	82C	2092	Instrument identification parameters
2800	10240	28A3	10403	Repetition of the configuration parameters: Numeric and symbolic values. Available in read and write operations
CF08	53000	CF5E	53086	Instrument identification parameters for the new instruments. Read only

A.1 Common Variables

no.	Address		Description	Dec. Point	R/W
	Hex	Dec			
1A	1	1	**PV: Measured value** **Note:** When a measuring error is detected the instrument sends: - 10000 = Underrange - 10000 = Overrange - 10001 = Overflow of the A/D converter - 10003 = Variable not available	dP	R
2A	2	2	**Number of decimal digits of the measured value**	0	R
3A	3	3	**Operative set point (value)**	dP	R
4A	4	4	**Power output** **Range:** -100.00... 100.00 (%) **Note:** This parameter is ever writeable but it will be active only when the instrument operates in Manual mode.	2	R/W
5A	5	5	**Active set point selection** 0 SP 1 SP 2 2 SP 3 3 SP 4	0	R/W
6A	6	6	**SP** **Range:** SPLL... SPLH	dP	R/W
7A	7	7	**SP 2** **Range:** SPLL... SPLH	dP	R/W
8A	8	8	**SP 3** **Range:** SPLL... SPLH	dP	R/W
9A	9	9	**SP 4** **Range:** SPLL... SPLH	dP	R/W
10A	A	10	**Alarms status** bit 0 Alarm 1 status bit 1 Alarm 2 status bit 2 Alarm 3 status bit 3... 8 Reserved bit 9 LBA status bit 10 Power failure indicator bit 11 Generic error bit 12 Overload alarm bit 13... 15 Reserved	0	R

no.	Address		Description	Dec. Point	R/W
	Hex	Dec			
11A	B	11	**Outputs status (physical outputs)** bit 0 Output 1 status bit 1 Output 2 status bit 3 Output 3 status bit 4... 15 Reserved When an output is driven by serial link, the relative bit remains equal to 0.	0	R
12A	C	12	**Instrument status** bit 0 Automatic bit 1 Manual bit 2 Standby bit 3 Remote Set point (temporary) used bit 4 Auto-tuning active bit 5 Reserved bit 6 Reserved bit 7 Reserved bit 8 Soft start running bit 9 Ramp for set point change (up or down) running bit 10 Delay at start up (▫▫) running bit 11 Reserved bit 12 Measure status (0 = OK; 1 = error). bit 13 Speed calibration running bit 14÷15 Reserved	0	R
13A	D	13	**Alarms reset** 0 Not reset 1 Reset	0	R/W
14A	E	14	**Alarms acknowledge** 0 Not acknowledged 1 Acknowledged	0	R/W
15A	F	15	**Control status** 0 Automatic 1 Manual 2 Stand-by	0	R/W
16A	10	16	**Remote (temporary) set point (from serial link)** **Range:** SPLL... SPLH **Note:** The remote set point is stored in RAM	dP	R/W
17A	11	17	**Auto tuning activation** 0 Not active 1 Active	0	R/W
18A	12	18	**Power output used when a measuring error is detected** **Range:** -100... 100 **Note:** This value is stored in RAM	0	R/W
19A	13	19	**Default parameters loading.** -481 Default parameter loading.	0	R/W
20A	14	20	**Parameters table identification code** **Range:** 0... 65535 **Note:** The word is composed by two parts: - Low byte – Version of the parameter table - High byte – Version of the family protocol	0	R
21A	15	21	**Instrument identification code** 35 KR7 (and KRD7) 36 KM7 37 KX7	0	R
22A	1A	26	**Time to end of running program segment** **Range:** 0... 9959 (hh.mm or mm.ss) **Note:** When the program is not active, the return value is 0.	0	R
23A	1B	27	**Manual autotuning start request pending for Od or Soft start** 0 No pending request waiting for the execution; 1 Pending request waiting for the execution	0	R
24A	1C	28	**Autotuning start request pending for setpoint change for Od or Soft start** 0 No pending request waiting for the execution; 1 Pending request waiting for the execution	0	R
25A	1D	29	**% Current speed**	0	R
26A	31	49	**RUN/STOP command for Speed output** 0 stop 1 start	0	R/W

no.	Address		Description	Dec. Point	R/W
	Hex	Dec			
27A	32	50	**Speed calibration phase made by keyboard** 0 no 1 wait 2 ON 3 END	0	R
28A	33	51	**Speed calibration phase made by serial link** 0 no 1 wait 2 ON 3 END	0	R/W
29A	34	52	**Active speed in E.U.**		R
30A	35	53	**Mode selected** 0 FULL 1 SPEED		R

A.2 Group of variables compatible with the old Ascon Tecnologic's instruments (before Kube series)

no.	Address		Description	Dec. Point	R/W
	Hex	Dec			
1B	0200	512	**PV: Measured value** As Modbus address 1	dP	R
2B	0201	513	**Number of decimal figure of the measured value** As Modbus address 2	0	R
3B	0202	514	**Power output** As Modbus address 4	2	R
4B	0203	515	**Power output of the heating output** **Range:** 0... 100.00 (%)	2	R
5B	0204	516	**Power output of the cooling output** **Range:** 0... 100.00 (%)	2	R
6B	0205	517	**Alarm 1 status** 0 OFF 1 ON	0	R
7B	0206	518	**Alarm 2 status** 0 OFF 1 ON	0	R
8B	0207	519	**Alarm 3 status** 0 OFF 1 ON	0	R
9B	0208	520	**Operative set point** As Modbus address 3	DP	R
10B	020A	522	**LBA status** 0 OFF 1 ON	0	R
11B	020E	526	**Overload alarm status** 0 OFF 1 ON	0	R
12B	020F	527	**Controller status** 0 Stand-by 1 Auto 2 Tuning 3 Manual	0	R
13B	0224	548	**Status/remote control of the Output 1** 0 OFF 1 ON **Note:** This parameter is writeable when out 1 is "not used" by the controller (o1F output 1 function = nonE). This parameter is stored in RAM	0	R/W
14B	0225	549	**Status/remote control of the Output 2** 0 OFF 1 ON **Note:** This parameter is writeable when out 2 is "not used" by the controller (o2F output 2 function = nonE). This parameter is stored in RAM	0	R/W
15B	0226	550	**Status/remote control of the Output 3** 0 OFF 1 ON **Note:** This parameter is writeable when out 3 is "not used" by the controller (o3F output 3 function = nonE). This parameter is stored in RAM	0	R/W

no.	Address		Description	Dec. Point	R/W
	Hex	Dec			
16B	0240	576	**Digital input 1 status** 0 OFF 1 ON **Note:** Digital input 1status can be read from the serial port even if the input is not used by the controller	0	R
17B	0241	577	**Digital input 2 status** 0 OFF 1 ON **Note:** Digital input 2 status can be read from the serial port even if the input is not used by the controller	0	R
18B	0244	580	**Program status** 0 Not configured 1 Reset (not running) 2 Run 3 Hold 4 Wait (system) 5 End (system) 6 Hold + Wait (system) 7 Continue	0	R/W
19B	0245	581	**Timer status** 0 Not configured 1 Reset (stop) 2 Run 3 Hold 4 End (Read only)	0	R/W
20B	0246	582	**Program step in execution** 0 Program not active 1 ramp step 1 2 soak step 1 3 ramp step 2 4 soak step 2 5 ramp step 3 6 soak step 3 7 ramp step 4 8 soak step 4 9 END	0	R
21B	0247	583	**Remaining time to program end** **Range:** 0... 65535 (minutes when Pru = hh.mm, seconds when Pru = mm.ss) **Note:** When the program is not running the return code is 0	2	R
22B	248	584	**Program events status** 0 > E1 = 0 E2 = 0 1 > E1 = 1 E2 = 0 2 > E1 = 0 E2 = 1 3 > E1 = 1 E2 = 1	0	R
23B	249	585	**Remaining time to the timer end** **Range:** 0... 65535 (Hours when trU = hh.mm, Minutes when trU = mm.ss)	2	R
			0... 9959 (Tenth of seconds when trU = sss.d) **Note:** When the timer is not active the return code is 0.	1	
24B	24A	586	**Working time:** The meaning of this parameter is defined by the COty parameter setting. CO.ty = 0 OFF; CO.ty = 1 or 2 Total worked days; CO.ty = 3 or 4 Total worked hours; CO.ty = 5 or 6 Totalizer of control relay worked days; CO.ty = 7 or 8 Totalizer of control relay worked hours.	0	R
25B	24B	587	**Duration of first program ramp** **Range:** 0... 9999 s	0	R
26B	24C	588	**Days counted with the controller Powered ON** **Range:** 0... 9999	0	R
27B	250	592	**Power output when the instrument is in manual mode** **Range:** -10000... 10000 (%)	2	R/W

A.3 Instrument identification parameters

no.	Address		Description	Dec. Point	R/W
	Hex	Dec			
1	800	2048	**Instrument identification code 1** **Range: AB.** A – Identifies instrument family by protocol list code; B – Identifies the protocol list version.	0	R
2	801	2049	**Instrument identification code 2** **Range: CD.** C – Identifies the “Special versions”; D – Instrument type.	0	R
3	802	2050	**Reserved**	0	R
4	803	2051	**Reserved**	0	R
5	804	2052	**Reserved**	0	R
6	805	2053	**Reserved**	0	R
7	806	2054	**Reserved**	0	R
8	807	2055	**Reserved**	0	R
9	808	2056	Instrument Firmware Revision - First part	0	R
10	809	2057	Instrument Firmware Revision - Second part	0	R
11	80A	2058	Model Code – Instrument type 1 **Range:** 0x4B = ‘K’	0	R
12	80B	2059	Model Code – Instrument type 2 **Range:** 0x4D = ‘M’ - KM 0x52 = ‘R’ - KR 0x58 = ‘X’ - KX	0	R
13	80C	2060	Model Code – Instrument type 3 0x37 = ‘7’ - KM7, KR7, KX7	0	R
14	80D	2061	Model Code – Optional functions **Range:** 0x2D = ‘-’ - No functions 0x54 = ‘T’ - Timer 0x50 = ‘P’ - Timer + Programmer	0	R
15	80E	2062	Model Code – Power supply type **Range:** 0x48 = ‘H’ - 110... 240 Vac/Vdc 0x4C = ‘L’ - 24 Vac/Vdc	0	R
16	80F	2063	Model Code – Measure input type **Range:** 0x43 = ‘C’ - Tc, Pt100, Pt1000, mA, mV, V + Digital Input 1 0x45 = ‘E’ - Tc, PTC, NTC, mA, mV, V + Digital Input 1	0	R
17	810	2064	Model Code – SPEED Output **Range:** 0x53 = ‘S’ - Speed control for a 24 VDC 4 A motor	0	R
18	811	2065	Model Code – Output 1 type **Range:** 0x2D = ‘-’ - Not present 0x4D = ‘M’ - Servomotor command relay 0x4F = ‘O’ - SSR 0x52 = ‘R’ - Relay	0	R
19	812	2066	Model Code – Output 2 type **Range:** 0x2D = ‘-’ - Not present 0x4D = ‘M’ - Servomotor command relay 0x4F = ‘O’ - SSR 0x52 = ‘R’ - Relay	0	R
20	813	2067	Model Code – Output 3 type **Range:** 0x43 = ‘D’ - Output 4 (VDC for SSR)/Sensor Power Supply/Digital Input DI2	0	R
21	814	2068	Model Code – Serial communication type **Range:** 0x2D = ‘-’ - TTL 0x53 = ‘S’ - Rs485 Modbus	0	R
22	815	2069	Model Code – Terminal type **Range:** 0x2D = ‘-’ - Standard (screw terminals not removable) 0x45 = ‘E’ - Removable screw terminals 0x4D = ‘M’ - Removable spring terminals 0x4E = ‘N’ - Removable terminals (the fixed part only)	0	R
23	816	2070	**Model Code – Reserved**	0	R
24	817	2071	**Model Code – Reserved**	0	R
25	818	2072	**Model Code – Reserved**	0	R
26	819	2073	**Model Code – Reserved**	0	R
27	81A	2074	**Model Code – Reserved**	0	R
28	81B	2075	**Model Code – Reserved**	0	R
29	81C	2076	**Model Code – Reserved**	0	R

no.	Address		Description	Dec. Point	R/W
	Hex	Dec			
30	81D	2077	**Model Code – Reserved**	0	R
31	81E	2078	**Model Code – Reserved**	0	R
32	81F	2079	**Model Code – Reserved**	0	R
33	820	2080	**Model Code – Reserved**	0	R
34	821	2081	**Model Code – Reserved**	0	R
35	822	2082	**Model Code – Reserved**	0	R
36	823	2083	**Model Code – Reserved**	0	R
37	824	2084	**Model Code – Reserved**	0	R
38	825	2085	**Model Code – Reserved**	0	R
39	826	2086	Serial Number – First part (LL)	0	R
40	827	2087	Serial Number – Second part (L)	0	R
41	828	2088	Serial Number – Third part (H)	0	R
42	829	2089	Serial Number – Fourth part (HH)	0	R
43	82A	2090	Calibration Date – Day **Range:** 1... 31	0	R
44	82B	2091	Calibration Date – Month **Range:** 1... 12	0	R
45	82C	2092	Calibration Date – Year	0	R

A.4 Configuration parameters

A.4.1 inP GROUP - Main and auxiliary input configuration

no.	Param.	Address		Description	Values	Dec. Point	Def.	R/W
		Hex	Dec					
1	SEnS	280 2800	640 10240	Model C (Pt100, Pt1000) see the "*How to order*" paragraph	0 J TC J (-50... +1000°C/-58... +1832°F) 1 crAL TC K (-50... +1370°C/-58... +2498°F) 2 S TC S (-50... +1760°C/-58... +3200°F) 3 r TC R (-50... +1760°C/-58... +3200°F) 4 t TC T (-70... +400°C/-94... +752°F) 5 ir.J IRS J (-46... +785°C/-50... +1445°F) 6 ir.cA IRS K (-46... +785°C/-50... +1445°F) 7 Pt1 RTD Pt100 (-200... +850°C/-328... +1562°F) 8 Pt10 RTD Pt1000 (-200... +850°C/-328... +1562°F) 9 0.60 0... 60 mV 10 12.60 12... 60 mV 11 0.20 0... 20 mA 12 4.20 4... 20 mA 13 0.5 0... 5 V 14 1.5 1... 5 V, 15 0.10 0... 10 V 16 2.10 2... 10 V	0	J	R/W
				Model E (Ptc, Ntc) see the "*How to order*" paragraph	0 J TC J (-50... +1000°C/-58... +1832°F) 1 crAL TC K (-50... +1370°C/-58... +2498°F) 2 S TC S (-50... +1760°C/-58... +3200°F) 3 r TC R (-50... +1760°C/-58... +3200°F) 4 t TC T (-70... +400°C/-94... +752°F) 5 ir.J IRS J (-46... +785°C/-50... +1445°F) 6 ir.cA IRS K (-46... +785°C/-50... +1445°F) 7 Ptc PTC (-55... +150°C/-67... +302°F); 8 ntc NTC (-50... +110°C/-58... +230°F); 9 0.60 0... 60 mV 10 12.60 12... 60 mV 11 0.20 0... 20 mA 12 4.20 4... 20 mA 13 0.5 0... 5 V 14 1.5 1... 5 V, 15 0.10 0... 10 V 16 2.10 2... 10 V			
2	dp	281 2801	641 10241	Decimal Point Position (linear inputs)	0... 3	0	0	R/W
				Decimal Point Position (different than linear inputs)	0/1			
3	SSC	282 2802	642 10242	Initial scale read-out for linear inputs	-1999... 9999	dP	0	R/W
4	FSc	283 2803	643 10243	Full Scale Readout for linear inputs	-1999... 9999	dP	1000	R/W

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	Def.	R/W
5	unit	284 2804	644 10244	Engineering unit	0 C °C 1 F °F	0	°C	R/W
6	Fil	285 2805	645 10245	Digital filter on the measured value **Note:** This filter affects the control action, the PV retransmission and the alarms action.	0 OFF 1... 200 (seconds)	1	1.0	R/W
7	inE	286 2806	646 10246	Sensor error used to enable the safety output value	0 or Over range 1 ou Under range 2 our Over and under range	0	our	R/W
8	oPE	287 2807	647 10247	Safety output value (% of the output)	-100... 100	0	0	R/W
9	io3.F	288 2808	648 10248	I/O 3 function	0 dG2c Digital input 2 driven by contact, 1 G2U Digital input 2 driven by voltage; 2 on Output used as PWS for TX; 3 out3 Digital output 3.	0	out3	R/W
10	rEcS	289 2809	649 10249	Recipes enable (temperature + speed)	0 no 1 YES	0		R/W
11	diF1	28A 280A	650 10250	Digital Input 1 function	0 nonE No function; 1 AAc Alarm Reset [status]; 2 ASi Alarm acknowledge (ACK) [status]; 3 hoLd Hold of the measured value [status]; 4 Stby Stand by mode [status]; 5 oPLo Manual mode (open loop)[status]; 6 hEco HEAt + SP1 and CooL + SP2 [status]; 7 Strt Timer Run/Hold/Reset [transition]; 8 t.run Timer Run [transition]; 9 t.rES Timer reset [transition]; 10 t.r.h Timer run/hold [status]; 11 t.r.r Timer run/reset [status]; 12 t.r.r.b Timer run/reset with a “lock” at end of the time count; 13 P.run Program Run [transition]; 14 P.rES Program Reset [transition]; 15 P.r.h.t Program Hold [transition]; 16 P.r.h.S Program Run/Hold [status]; 17 P.r.r Program Run/Reset [status]; 18 Sdr.S SPEED/TIME run/stop [status]; 19 Sdr.t SPEED/TIME run/stop [transition]; 20 ch.SP Sequential Setpoint select [transition]; 21 ch.Sd Sequential SPEED select [transition]; 22 SP14 Binary Setpoint selection [status]; 23 Sd14 Binary SPEED selection [status].	0	oFF	R/W
12	diF2	28B 280B	651 10251	Digital Input 2 function		0	oFF	R/W
13	di.A	28C 280C	652 10252	Digital Inputs Action **Note:** The addrs related to this parameter are inserted after the last parameter set [157] tSd2	0 DI1 direct action, DI2 direct action; 1 DI1 reverse action, DI2 direct action; 2 DI1 direct action, DI2 reverse action; 3 DI1 reverse action, DI2 reverse action.	0	0	R/W

A.4.2 Out group

no.	Param.	Address		Description	Values	Dec. Point	Def.	R/W
		Hex	Dec					
14	o1F	28D 280D	653 10253	Out1 function	0 none Output not used; 1 H.reg Heating output; 2 c.rEG Cooling output; 3 AL Alarm output; 4 t.out Timer output; 5 t.HoF Timer out - OFF in Hold; 6 P.End Program end indicator; 7 P.HLd Program hold indicator; 8 P.uit Program wait indicator; 9 P.run Program run indicator; 10 P.Et1 Program Event 1; 11 P.Et2 Program Event 2; 12 or.bo Out-of-range or burn out indicator; 13 P.FAL Power failure indicator; 14 bo.PF Out-of-range, Burnout and Power failure indicator; 15 St.bY Stand By status indicator; 16 diF1 Repeats the digital input 1 status; 17 diF2 Repeats the digital input 2 status; 18 On Out2 always ON; 19 riSP Inspection request.	0	H.reG	R/W
15	o1AL	28E 280E	654 10254	Alarms linked to Out1	0... 63 +1 Alarm 1 +2 Alarm 2 +4 Alarm 3 +8 Loop break alarm +16 Sensor Break +32 Overload on output 3	0	AL1	R/W
16	o1Ac	28F 280F	655 10255	Out1 action	0 dir Direct action 1 rEUReverse action 2 dir.r Direct with reversed LED 3 ReU.r Reverse with reversed LED	0	dir	R/W
17	o2F	290 2810	656 10256	Out2 function	See the values of 13 = o1F parameter	0	AL	R/W
18	o2AL	291 2811	657 10257	Alarms linked to Out2	See the values of 16 = o1AL parameter	0	AL1	R/W
19	o2Ac	292 2812	658 10258	Out2 action	See the values of 17 = o1Ac parameter	0	dir	R/W
20	o3F	293 2813	659 10259	Out3 function	0 none Output not used; 1 H.reg Heating output; 2 c.rEG Cooling output; 3 AL Alarm output; 4 t.out Timer output; 5 t.HoF Timer out - OFF in Hold; 6 P.End Program end indicator; 7 P.HLd Program hold indicator; 8 P.uit Program wait indicator; 9 P.run Program run indicator; 10 P.Et1 Program Event 1; 11 P.Et2 Program Event 2; 12 or.bo Out-of-range or burn out indicator; 13 P.FAL Power failure indicator; 14 bo.PF Out-of-range, Burnout and Power failure indicator; 15 St.bY Stand By status indicator;.	0	AL	R/W
21	o3AL	294 2814	660 10260	Alarms linked to Out3	See the values of 16 = o1AL parameter	0	AL2	R/W
22	o3Ac	295 2815	661 10261	Out3 action	See the values of 17 = o1Ac parameter	0	dir	R/W

A.4.3 AL1 group

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	Def.	R/W
23	AL1t	296 2816	662 10262	Alarm 1 type	0 nonE Alarm not used; 1 LoAb Absolute low alarm; 2 HiAb Absolute high alarm; 3 LHAo Windows alarm in alarm outside the windows; 4 LHAI Windows alarm in alarm inside the windows; 5 SE.br Sensor Break; 6 LodE Deviation low alarm (relative); 7 HidE Deviation high alarm (relative); 8 LHdo Relative band alarm in alarm out of the band; 9 LHdi Relative band alarm in alarm inside the band.	0	HiAb	R/W
24	Ab1	297 2817	663 10263	Alarm 1 function	0... 15: +1 Not active at power ON; +2 Latched alarm (manual reset); +4 Acknowledgeable alarm; +8 Relative alarm not active at set point change.	0	0	R/W
25	AL1L	298 2818	664 10264	For High and Low alarms: low limit of the AL1 threshold; For band alarm: low alarm threshold	From -1999 to AL1H (E.U.)	dP	-1999	R/W
26	AL1H	299 2819	665 10265	For High and Low alarms: high limit of the AL1 threshold; For band alarm: high alarm threshold	From AL1L to 9999 (E.U.)	dP	9999	R/W
27	AL1	29A 281A	666 10266	AL1 threshold	From AL1L to AL1H (E.U.)	dP	0	R/W
28	HAL1	29B 281B	667 10267	AL1 hysteresis	1... 9999 (E.U.)	dP	1	R/W
29	AL1d	29C 281C	668 10268	AL1 delay	0 OFF 1... 9999 (s)	0	oFF	R/W
30	AL1o	29D 281D	669 10269	AL1 enabling during Stand-by mode and out of range conditions	0 AL1 disabled during Stand by and out of range 1 AL1 enabled in stand by mode 2 AL1 enabled in out of range 3 AL1 enabled in stand by mode and out of range	0	0	R/W

A.4.4 AL2 group

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	Def.	R/W
31	AL2t	29E 281E	670 10270	Alarm 2 type	0 nonE Alarm not used; 1 LoAb Absolute low alarm; 2 HiAb Absolute high alarm; 3 LHAo Windows alarm in alarm outside the windows; 4 LHAI Windows alarm in alarm inside the windows; 5 SE.br Sensor Break; 6 LodE Deviation low alarm (relative); 7 HidE Deviation high alarm (relative); 8 LHdo Relative band alarm in alarm out of the band; 9 LHdi Relative band alarm in alarm inside the band.	0	Loab	R/W
32	Ab2	29F 281F	671 10271	Alarm 2 function	0... 15: +1 Not active at power ON; +2 Latched alarm (manual reset); +4 Acknowledgeable alarm; +8 Relative alarm not active at set point change.	0	0	R/W
33	AL2L	2A0 2820	672 10272	For High and Low alarms: low limit of the AL2 threshold; For band alarm: low alarm threshold	From -1999 to AL2H (E.U.)	dP	-1999	R/W
34	AL2H	2A1 2821	673 10273	For High and Low alarms: high limit of the AL2 threshold; For band alarm: high alarm threshold	From AL2L to 9999 (E.U.)	dP	9999	R/W
35	AL2	2A2 2822	674 10274	AL2 threshold	From AL2L to AL2H (E.U.)	dP	0	R/W
36	HAL2	2A3 2823	675 10275	AL2 hysteresis	1... 9999 (E.U.)	dP	1	R/W
37	AL2d	2A4 2824	676 10276	AL2 delay	0 OFF 1... 9999 (s)	0	oFF	R/W

no.	Param.	Address		Description	Values	Dec. Point	Def.	R/W
		Hex	Dec					
38	AL2o	2A5 2825	677 10277	AL2 enabling during Stand-by mode and out of range conditions	0 AL2 disabled during Stand by and out of range 1 AL2 enabled in stand by mode 2 AL2 enabled in out of range 3 AL2 enabled in stand by mode and out of range	0	0	R/W

A.4.5 AL3 group

no.	Param.	Address		Description	Values	Dec. Point	Def.	R/W
		Hex	Dec					
39	AL3t	2A6 2826	678 10278	Alarm 3 type	0 nonE Alarm not used; 1 LoAb Absolute low alarm; 2 HiAb Absolute high alarm; 3 LHAo Windows alarm in alarm outside the windows; 4 LHAI Windows alarm in alarm inside the windows; 5 SE.br Sensor Break; 6 LodE Deviation low alarm (relative); 7 HidE Deviation high alarm (relative); 8 LHdo Relative band alarm in alarm out of the band; 9 LHdi Relative band alarm in alarm inside the band.	0	nonE	R/W
40	Ab3	2A7 2827	679 10279	Alarm 3 function	0... 15: +1 Not active at power ON; +2 Latched alarm (manual reset); +4 Acknowledgeable alarm; +8 Relative alarm not active at set point change.	0	0	R/W
41	AL3L	2A8 2828	680 10280	For High and Low alarms: low limit of the AL3 threshold; For band alarm: low alarm threshold	From -1999 to AL3H (E.U.)	dP	-1999	R/W
42	AL3H	2A9 2829	681 10281	For High and Low alarms: high limit of the AL3 threshold; For band alarm: high alarm threshold	From AL3L to 9999 (E.U.)	dP	9999	R/W
43	AL3	2AA 282A	682 10282	AL3 threshold	From AL3L to AL3H (E.U.)	dP	0	R/W
44	HAL3	2AB 282B	683 10283	AL3 hysteresis	1... 9999 (E.U.)	dP	1	R/W
45	AL3d	2AC 282C	684 10284	AL3 delay	0 OFF 1... 9999 (s)	0	oFF	R/W
46	AL3o	2AD 282D	685 10285	AL3 enabling during Stand-by mode and out of range conditions	0 AL3 disabled during Stand by and out of range 1 AL3 enabled in stand by mode 2 AL3 enabled in out of range 3 AL3 enabled in stand by mode and out of range	0	0	R/W

A.4.6 SPEd group

no.	Param.	Address		Description	Values	Dec. Point	Def.	R/W
		Hex	Dec					
47	Spd.P	2AE 282E	686 10286	Type of Start at Power ON	0 AS.Pr Starts with the same speed that was set at power OFF. 1 OFF.A Starts with speed equal to zero and waits for a start command; 2 OFF.b Starts with speed equal to zero and waits until the controlled value reaches SP + SPd.b	0		R/W
48	Spd.b	2AF 282F	687 10287	Band to enable speed control	0 OFF 1... 9999 engineering units.	dP		R/W
49	Spd.t	2B0 2830	688 10288	Unit of the speed/time variable	0 PErc Shown as an output %; 1 tinE Shown as a time; 2 E.U. Shown in engineering units (km/h, m/s, l/min).	0		R/W
50	Sd.dF	2B1 2831	689 10289	Speed decimal figure	0... 3	0		R/W
51	Spd.r	2B2 2832	690 10290	Speed reference - Set the time or the speed detected when the output is 100%	If [49] Spd.t = PErC this parameter is masked; If [49] Spd.t = t inE 00.01...99.59 (mm.ss); If [49] Spd.t = EU, 0... 9999 E.U..	2 Sd.dF		R/W
52	n.SPd	2B3 2833	691 10291	Number of used speed/time	1... 4	0		R/W

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	Def.	R/W
53	Sd.t1	2B4 2834	692 10292	Speed/time 1	If [49] Spd.t = PErC 0... 100%; If [49] Spd.t = t imE 00.01...99.59 (mm.ss); If [49] Spd.t = EU, 0... 9999 E.U..	0 2 Sd.dF		R/W
54	Sd.t2	2B5 2835	693 10293	Speed/time 2	If [49] Spd.t = PErC 0... 100%; If [49] Spd.t = t imE 00.01...99.59 (mm.ss); If [49] Spd.t = EU, 0... 9999 E.U..	0 2 Sd.dF		R/W
55	Sd.t3	2B6 2836	694 10294	Speed/time 3	If [49] Spd.t = PErC 0... 100%; If [49] Spd.t = t imE 00.01...99.59 (mm.ss); If [49] Spd.t = EU, 0... 9999 E.U..	0 2 Sd.dF		R/W
56	Sd.t4	2B7 2837	695 10295	Speed/time 4	If [49] Spd.t = PErC 0... 100%; If [49] Spd.t = t imE 00.01...99.59 (mm.ss); If [49] Spd.t = EU, 0... 9999 E.U..	0 2 Sd.dF		R/W
57	A.Sd.	2B8 2838	696 10296	Active speed/time	1... 4	0		R/W
58	Sd.cA	2B9 2839	697 10297	Speed calibration - Minimum time self-calibration	0 YES 1 NO	0		R/W

A.4.7 LBA group - Loop Break Alarm Parameters

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	Def.	R/W
59	LbAt	2BA 283A	698 10298	LBA time	0 OFF 1... 9999 (s)	0	oFF	R/W
60	LbSt	2BB 283B	699 10299	Delta measure used by LBA during Soft start	0 OFF 1... 9999 (E.U.)	dP	10	R/W
61	LbAS	2BC 283C	700 10300	Delta measure used by LBA	1...9999 (E.U.)	dP	20	R/W
62	LbcA	2BD 283D	701 10301	Condition for LBA enabling	0 uP Active when Pout 100% 1 dn Active when Pout -100% 2 both Active in both cases	0	both	R/W

A.4.8 rEG group - Control Parameters

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	Def.	R/W
63	cont	2BE 283E	702 10302	Control type with 2 control actions (heat & cool) programmed	0 Pid PID 1 nr Heat/Cool ON/OFF control with neutral zone	0	Pid	R/W
				Control type with 1 control action (heat or cool) programmed	0 Pid PID 1 On.FA ON/OFF asymmetric hysteresis 2 On.FS ON/OFF symmetric hysteresis		7	
				Control type with 1 control action (heat or cool) programmed with Servomotor control (3 points valve)	0 Pid PID 1 On.FA ON/OFF asymmetric hysteresis 2 On.FS ON/OFF symmetric hysteresis 3 3Pt Servomotor control (no feedback)		oFF	
64	Auto	2BF 283F	703 10303	Autotuning selection	-4 Oscillating auto-tune with automatic restart at power ON and after all point change; -3 Oscillating auto-tune with manual start; -2 Oscillating -tune with auto-matic start at 1st power ON only; -1 Oscillating auto-tune with auto-matic restart at all power ONs; 0 Not used; 1 Fast auto tuning with automatic restart at all power ONs; 2 Fast auto-tune with automatic start at 1st power ON only; 3 FAST auto-tune with manual start; 4 FAST auto-tune with automatic restart at power ON and after a set point change; 5 Evo-tune with automatic restart at all power ONs; 6 Evo-tune with automatic start at 1st power ON only; 7 Evo-tune with manual start; 8 Evo-tune with automatic restart at power ON and after a set point change.	0	1	R/W
65	tunE	2C0 2840	704 10304	Manual start of the Autotuning	0 oFF Autotuning Not active 1 on Autotuning Active	0	oFF	R/W

no.	Param.	Address		Description	Values	Dec. Point	Def.	R/W
		Hex	Dec					
66	HSEt	2C1 2841	705 10305	Hysteresis of the ON/OFF control	1... 9999 (E.U.)	dP	1	
67	cPdt	2C2 2842	706 10306	Time for compressor protection	0 OFF 1... 9999 (S)	0	oFF	R/W
68	Pb	2C3 2843	707 10307	Proportional band	1... 9999 (E.U.)	dP	50	
69	ti	2C4 2844	708 10308	Integral time	0 OFF 1... 9999 (S)	0	200	R/W
70	td	2C5 2845	709 10309	Derivative time	0 OFF 1... 9999 (S)	0	50	R/W
71	Fuoc	2C6 2846	710 10310	Fuzzy overshoot control	0... 200	2	0.50	R/W
72	tcH	2C7 2847	711 10311	Heating output cycle time	10... 1300 (s)	1	20.0	R/W
73	rcG	2C8 2848	712 10312	Power ratio between heating and cooling action	1... 9999	2	1.00	R/W
74	tcc	2C9 2849	713 10313	Cooling output cycle time	1... 1300 (s)	1	20.0	R/W
75	rS	2CA 284A	714 10314	Manual reset (Integral preload)	-1000... +1000 (%)	1	0.0	R/W
76	Str.t	2CB 284B	715 10315	Servomotor stroke time	5... 1000 seconds	0	60	R/W
77	db.S	2CC 284C	716 10316	Servomotor dead band	0.0... 10.0	1	0.5	R/W
78	oP.L	2CD 284D	717 10317	Minimum power output	-100 to oP.H%	0	oFF	R/W
79	oP.H	2CE 284E	718 10318	Maximum power output	Op.l to 100%	0	0	R/W
80	od	2CF 284F	719 10319	Delay at power ON	0.00 oFF 0.01... 99.59 (hh.mm)	0		R/W
81	St.P	2D0 2850	720 10320	Maximum power output used during soft start	-100... 100 (%)	0		R/W
82	SSt	2D1 2851	721 10321	Soft start time	0 oFF 0.01... 7.59 (h.mm)/8.00 = inF (always ON)	2	oFF	R/W
83	SS.tH	2D2 2852	722 10322	Threshold for soft start disabling	-2000 oFF 1... 9999 (E.U.)	dP	9999	R/W

A.4.9 SP group - Set point parameters

no.	Param.	Address		Description	Values	Dec. Point	Def.	R/W
		Hex	Dec					
84	nSP	2D3 2853	723 10323	Number of used set points	1... 4	0	1	R/W
85	SPLL	2D4 2854	724 10324	Minimum set point value	From -1999 to SPHL	dP	-1999	R/W
86	SPHL	2D5 2855	725 10325	Maximum set point value	From SPLL to 9999	dP	9999	R/W
87	SP	2D6 2856	726 10326	Set point 1	From SPLL to SPLH	dP	0	R/W
88	SP 2	2D7 2857	727 10327	Set point 2	From SPLL to SPLH	dP	0	R/W
89	SP 3	2D8 2858	728 10328	Set point 3	From SPLL to SPLH	dP	0	R/W
90	SP 4	2D9 2859	729 10329	Set point 4	From SPLL to SPLH	dP	0	R/W
91	A.SP	2DA 285A	730 10330	Selection of the active set point	0 SP 1 SP 2 2 SP 3 3 SP 4	0	1	R/W

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	Def.	R/W
92	SP.rt	2DB 285B	731 10331	Remote set point type	0 RSP The value coming from serial link is used as remote set point 1 trin The value will be added to the local set point selected by A.SP and the sum becomes the operative set point 2 PErc The value will be scaled on the input range and this value will be used as remote SP	0	trin	R/W
93	SPLr	2DC 285C	732 10332	Local/remote set point selection	0 Loc local 1 rEn remote	0	Loc	R/W
94	SP.u	2DD 285D	733 10333	Rate of rise for **POSITIVE** set point change (ramp UP)	0.01... 99.99/inF Engineering units per minute	2	inF	R/W
95	SP.d	2DE 285E	734 10334	Rate of rise for **NEGATIVE** set point change (ramp DOWN)	0.01... 99.99/inF Engineering units per minute	2	inF	R/W

A.4.10 TIN group - Timer function parameters

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	Def.	R/W
96	tr.F	2DF 285F	735 10335	Independent timer function	0 nonE Timer not used 1 i.d.A Delayed start timer 2 i.uP.d Delayed start at power ON 3 i.d.d Feed-through timer 4 i.P.L Asymmetrical oscillator with start OFF 5 i.L.P Asymmetrical oscillator with start ON	0	none	R/W
97	tr.u	2E0 2860	736 10336	Timer time unit	0 hh.nn Hours and minutes 1 nn.SS Minutes and seconds 2 SSS.d Second and tenth of seconds	0	nn.ss	R/W
98	tr.t1	2E1 2861	737 10337	Time 1	When tr.u = 0: 1... 9959 (hh.mm) When tr.u = 1: 1... 9959 (mm.ss)	2		R/W
					When tr.u = 2: 1... 9959 (tenth of seconds)	1		
99	tr.t2	2E2 2862	738 10338	Time 2	When tr.u = 0: 0 (oFF)/1... 9959/inF (hh.mm) When tr.u = 1: 0 (oFF)/1... 9959/inF (mm.ss)	2		R/W
					When tr.u = 2: 0000 (oFF)/1... 9959/inF (tenth of seconds)	1		
100	tr.St	2E3 2863	739 10339	Timer status	0 rES Timer reset 1 run Timer run 2 HoLd Timer hold	0	res	R/W

A.4.11 PRG group - Programmer function parameters

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	Def.	R/W
101	Pr.F	2E4 2864	740 10340	Program action at power ON	0 nonE Programmer not used 1 S.uP.d Start at power ON with 1st step in stand-by 2 S.uP.S Start at power ON 3 u.diG Start at Run command detection only 4 u.dG.d Start at Run command with 1st step in stand-by	0	nonE	R/W
102	Pr.u	2E5 2865	741 10341	Soaks time unit	0 hh.nn Hours and minutes 1 nn.SS Minutes and seconds	0	hh.nn	R/W
103	Pr.E	2E6 2866	742 10342	Instrument behaviour at the end of the program execution	0 cnt Continue 1 A.SP Go to the set point selected by A.SP 2 St.by Go to stand-by mode	0	A.SP	R/W
104	Pr.Et	2E7 2867	743 10343	Time of the end program indication	0 oFF 1... 9959/inF minutes and seconds	2	oFF	R/W
105	Pr.S1	2E8 2868	744 10344	Set point of the first soak	From SPLL to SPHL -8000 Program End	dP	0	R/W
106	Pr.G1	2E9 2869	745 10345	Gradient of the first ramp	1... 10000/inF (Step transfer) - Engineering Unit/minute	1	inF	R/W
107	Pr.t1	2EA 286A	746 10346	Time of the 1st soak	0.00... 99.59 (hh.mm or mm.SS)	2	0.10	R/W
108	Pr.b1	2EB 286B	747 10347	Wait band of the 1st soak	0 oFF 1... 9999 (E.U.)	0	oFF	R/W
109	Pr.E1	2EC 286C	748 10348	Events of the 1st group	0000... 1111	2	00.00	R/W
110	Pr.S2	2ED 286D	749 10349	Set point of the 2nd soak	From SPLL to SPHL -8000 Program End	dP	0	R/W

no.	Param.	Address		Description	Values	Dec. Point	Def.	R/W
		Hex	Dec					
111	Pr.G2	2EE 286E	750 10350	Gradient of the 2nd ramp	1... 10000/inF (Step transfer) - Engineering Unit/minute	1	inF	R/W
112	Pr.t2	2EF 286F	751 10351	Time of the 2nd soak	0.00... 99.59 (hh.mm or mm.SS)	2	0.10	R/W
113	Pr.b2	2F0 2870	752 10352	Wait band of the 2nd soak	0 oFF 1... 9999 (E.U.)	0	oFF	R/W
114	Pr.E2	2F1 2871	753 10353	Events of the 2nd group	0000... 1111	2	00.00	R/W
115	Pr.S3	2F2 2872	754 10354	Set point of the 3rd soak	From SPLL to SPHL -8000 Program End	dP	0	R/W
116	Pr.G3	2F3 2873	755 10355	Gradient of the 3rd ramp	1... 10000/inF (Step transfer) - Engineering Unit/minute	1	inF	R/W
117	Pr.t3	2F4 2874	756 10356	Time of the 3rd soak	0.00... 99.59 (hh.mm or mm.SS)	2	0.10	R/W
118	Pr.b3	2F5 2875	757 10357	Wait band of the 3rd soak	0 oFF 1... 9999 (E.U.)	0	oFF	R/W
119	Pr.E3	2F6 2876	758 10358	Events of the 3rd group	0000... 1111	2	00.00	R/W
120	Pr.S4	2F7 2877	759 10359	Set point of the 4th soak	From SPLL to SPHL -8000 Program End	dP	0	R/W
121	Pr.G4	2F8 2878	760 10360	Gradient of the 4th ramp	1... 10000/inF (Step transfer) - Engineering Unit/minute	1	inF	R/W
122	Pr.t4	2F9 2879	761 10361	Time of the 4th soak	0.00... 99.59 (hh.mm or mm.SS)	2	0.10	R/W
123	Pr.b4	2FA 287A	762 10362	Wait band of the 4th soak	0 oFF 1... 9999 (E.U.)	0	oFF	R/W
124	Pr.E4	2FB 287B	763 10363	Events of the 4th group	0000... 1111	2	00.00	R/W
125	Pr.St	2FC 287C	764 10364	Program status	0 rES Program reset 1 run Program start 2 HoLd Program hold	0	rES	R/W

A.4.12 PAn group - Operator HMI parameters

no.	Param.	Address		Description	Values	Dec. Point	Def.	R/W
		Hex	Dec					
126	dSPu	2FD 287D	765 10365	Instrument status at power ON	0 AS.Pr Starts in the same way it was prior to the power down 1 Auto Starts in Auto mode 2 oP.0 Starts in manual mode with a power output equal to zero 3 St.bY Starts in stand-by mode	0	AS.Pr	R/W
127	oPr.E	2FE 287E	766 10366	Operative modes enabling	0 ALL All modes can be selected only by oPEr parameter 1 Au.oP Auto and manual (oPLo) mode can be selected only by oPEr parameter 2 Au.Sb Auto and Stand-by modes can be selected only by oPEr parameter	0	ALL	R/W
128	oPEr	2FF 287F	767 10367	Operative mode selection	0 Auto Auto mode 1 oPLo Manual mode 2 St.bY Stand by mode	0	Auto	R/W

A.4.13 Ser group - Serial link parameters

no.	Param.	Address		Description	Values	Dec. Point	Def.	R/W
		Hex	Dec					
129	Add	300 2880	768 10368	Instrument address	0 oFF 1... 254	0	1	R/W
130	bAud	301 2881	769 10369	baud rate	0 1200 1200 baud 1 2400 2400 baud 2 9600 9600 baud 3 19.2 19200 baud 4 38.4 38400 baud	0	9600	R/W

A.4.14 COn group - Consumption parameters

no.	Param.	Address		Description	Values	Dec. Point	Def.	R/W
		Hex	Dec					
131	Co.tY	302 2882	770 10370	Measurement type	0 oFF (Not used) 1 Instantaneous power (kW) 2 Power consumption (kW/h) 3 Energy used during program execution. This measure starts from zero when a program runs end stops at the end of the program. A new program execution will reset the value 4 Total worked days with threshold. It is the number of hours that the instrument is turned ON divided for 24 5 Total worked hours with threshold. It is the number of hours that the instrument is turned ON	0	oFF	R/W
132	h.Job	303 2883	771 10371	Threshold of the working period	0 oFF 1... 9999	0	0	R/W
133	t.Job	304 2884	772 10372	Worked days (not resettable)	0... 9999	0	0	R

A.4.15 CAl group - User calibration parameters

no.	Param.	Address		Description	Values	Dec. Point	Def.	R/W
		Hex	Dec					
134	AL.P	305 2885	773 10373	Adjust Low Point	From -1999 to (AH.P - 10) (E.U.)	dP	0	R/W
135	AL.o	306 2886	774 10374	Adjust Low Offset	-300... +300 (E.U.)	dP	0	R/W
136	AH.P	307 2887	775 10375	Adjust High Point	From (AL.P + 10)... 9999 (E.U.)	dP	9999	R/W
137	AH.o	308 2888	776 10376	Adjust High Offset	-300... +300 (E.U.)	dP	0	R/W