KRD50

CONTROLLER PROGRAMMER

DIFFUSION Service
TOUTE LA RÉGULATION

REGULATION - MESURE - INSTRUMENTATION - AUTOMATISME
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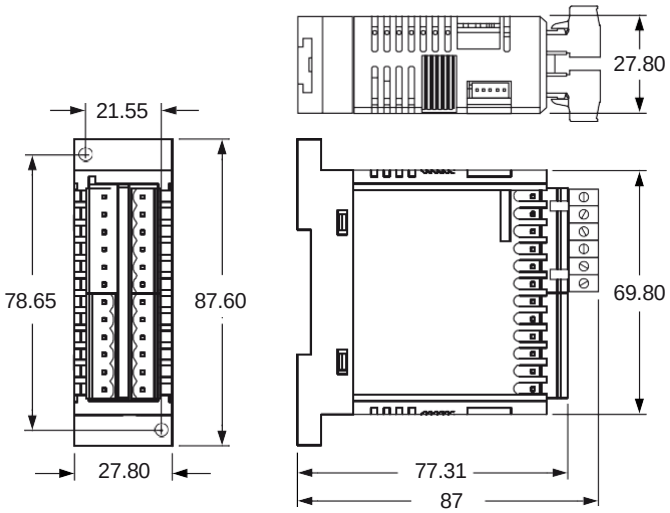
OUTLINE DIMENSIONS (mm)

1.1 Dimensions



1.2 Mounting requirements

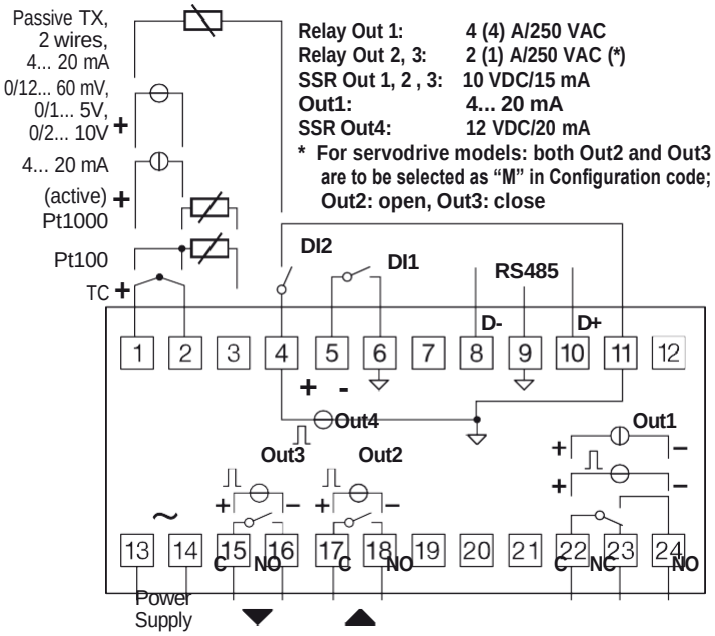
This instrument is intended for permanent installation, indoor use only, in an electrical panel which encloses the instrument, the terminals and wirings specific for a DIN rail mounting.

Select a mounting location having the following characteristics:

1. It should be easily accessible;
2. There are minimum vibrations and no impacts;
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%);

The instrument can be mounted on a DIN rail or wall.

2. CONNECTION DIAGRAM

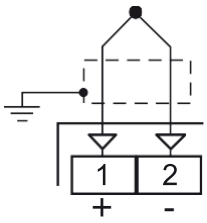


2.1 General notes about wiring

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 shielded cable is used, the protective shield must be grounded at one point 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.

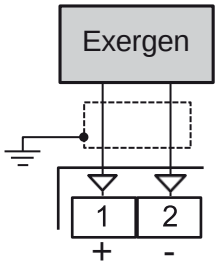
Cold junction accuracy: 0.05°C/°C after a warm-up of 20 minutes.

Input impedance: > 1 MΩ.

Calibration: According to EN 60584-1.

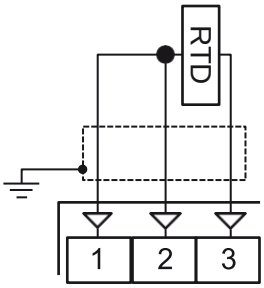
Note: For TC wiring use proper compensating cable preferable shielded.

2.2.2 Infrared Sensor Input



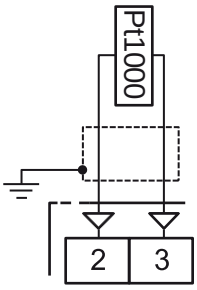
External resistance: Not relevant.
Cold junction: automatic compensation between 0 ÷ 50°C.
Cold junction accuracy: 0.05°C/°C.
Input impedance: > 1 MΩ.

2.2.3 RTD Pt 100 Input



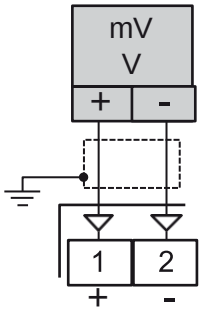
Input circuit: Current injection (150 µA).
Line resistance: Automatic compensation up to 20Ω/wire with maximum error ±0.1% of the input span.
Calibration: According to EN 60751/A2.
Note: The resistance of the 3 wires must be the same.

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.

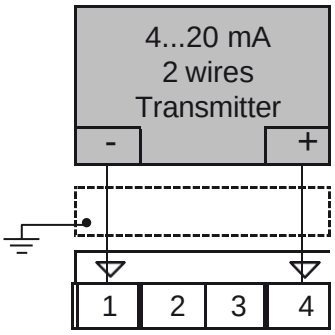
2.2.5 V and mV Input



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

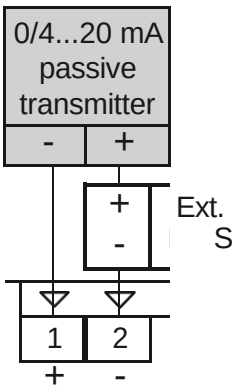
2.2.6 mA Input

0/4 ÷ 20 mA Input wiring for passive transmitter using the auxiliary pws

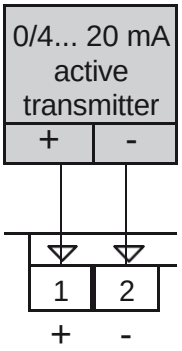


Input impedance: < 53Ω.
Internal auxiliary PWS: 12 VDC (±10%), 20 mA max..

0/4 ÷ 20 mA Input wiring for passive transmitter using an external pws



0/4 ÷ 20 mA Input wiring for active transmitter

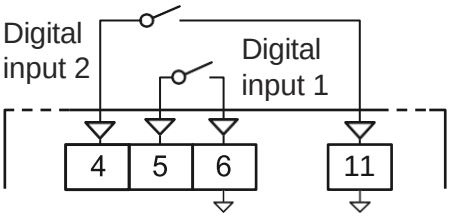


2.2.7 Logic Inputs

Safety notes:

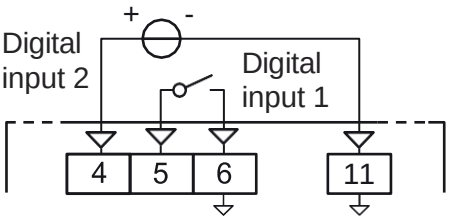
- Do not run logic input wiring together with power cables;
- The instrument needs 150 ms to recognize a contact status variation;
- Logic inputs are **NOT** isolated by the measuring input. A double or reinforced isolation between logic inputs and power line must be assured by the external elements.

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

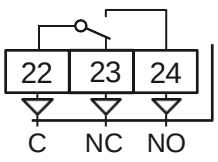
Safety notes:

- 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 Output 1 (OP1)

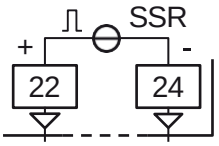
Relay Output



OP1 contact rating: - 4 A /250 V cos$\chi\pi$ =1
- 2 A /250 V cos$\chi\pi$ =0.4

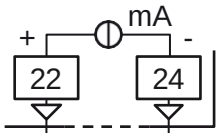
Operation: 1 x 10^5

SSR Output



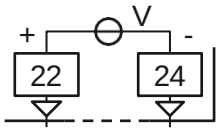
Logic level 0: Vout < 0.5 VDC
Logic level 1: 12 V ± 20%, 15 mA max.

Current Analogue Output



mA output: 0/4 ÷ 20 mA, galvanically isolated, RL max. 600Ω.

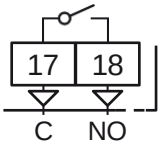
Voltage Analogue Output



V output: 0/2 ÷ 10 V, galvanically isolated, RL min.: 500Ω.

2.3.2 Output 2 (OP2)

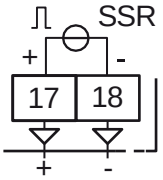
Relay Output



OP1 contact rating: - 2 A /250 V cos$\chi\pi$ = 1
- 1 A /250 V cos$\chi\pi$ = 0.4

Operation: 1 x 10^5

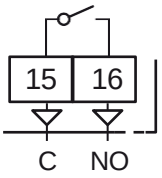
SSR Output



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

2.3.3 Output 3 (OP3)

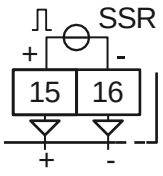
Relay Output



OP1 contact rating: - 2 A /250 V cos$\chi\pi$ = 1
- 1 A /250 V cos$\chi\pi$ = 0.4

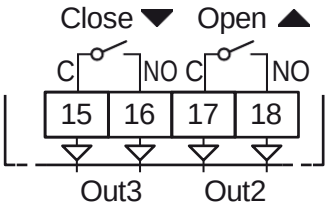
Operation: 1 x 10^5

SSR Output



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

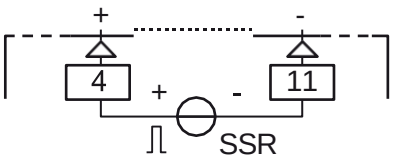
2.3.4 Output 2 and Output 3 Servomotor Drive



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

2.3.5 Output 4 (OP4)

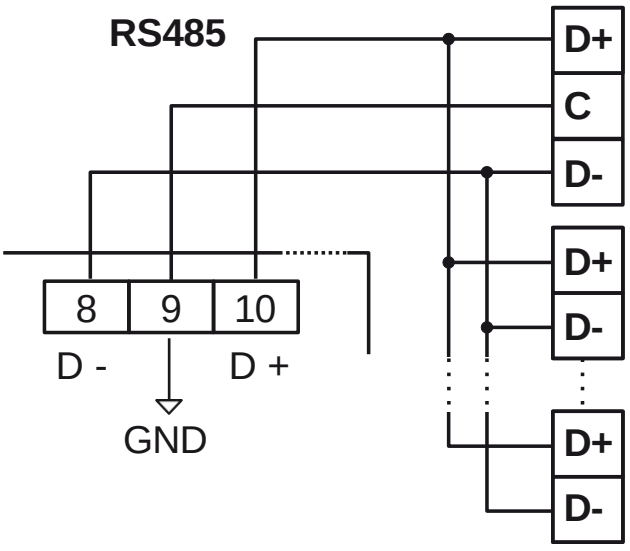
SSR Output



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

Note: Overload protected.

2.4 Serial Interface

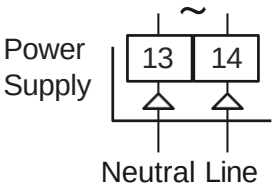


Interface type: Isolated (50 V) RS-485;
Voltage levels: According to EIA standard;
Protocol type: MODBUS RTU;
Byte format: 8 bit with no parity;
Stop bit: 1 (one);
Baud rate: Programmable between 1200 ÷ 38400 baud;
Address: Programmable between 1 ÷ 255.

Notes: 1. RS-485 interface allows to connect up to 30 devices with one remote master unit.
2. The cable length must not exceed 1500 m 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 must be negative with respect to the "B" terminal for a binary 1 (MARK or OFF) state;
B The "A" terminal of the generator must be positive with respect to the "B" terminal for a binary 0 (SPACE or ON).
4. This instrument allows to set serial communications parameters (address and baud rate) through serial communications or the A01 key.

If the serial communications parameters are modified through the serial port, after each parameter saved change the terminal-instrument dialogue is interrupted by the difference caused by the changes made.
To restore the serial interface communications, modify the terminal settings according to the setting changes made to the instrument.

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 diagram;

Dimensions: (H x L x D): 75 x 33 x 75.5 mm (2.95 x 1.30 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:

- Simple insulation (models with Power supply 24 VAC/DC);
- 3000 Vrms according to EN 61010-1 (models with 100 ÷ 240 VAC/DC of Power Supply),

Sampling time: 130 ms;

Resolution: 30000 counts;

Total Accuracy: ±0.5% F.S.V. ±1 digit @ 25°C of room temperature;

Electromagnetic compatibility and safety requirements

Compliance: EMC 2004/108/CE (EN 61326-1) directive, LV 2006/95/CE (EN 61010-1) directive;

Installation category: II;

Pollution category: 2;

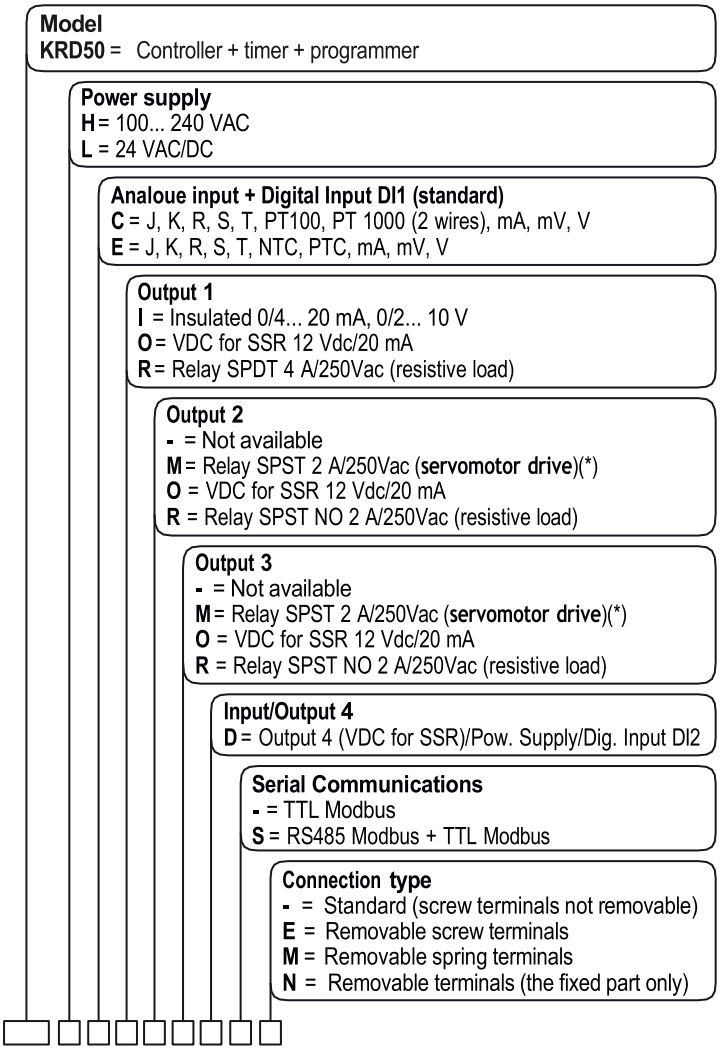
Temperature drift: It is part of the global accuracy;

Operating temperature: 0 ÷ 50°C (32 ÷ 122°F);

Storage temperature: -30 ÷ +70°C (-22 ÷ +158°F);

Humidity: 20 ÷ 85% RH, not condensing.

4. HOW TO ORDER



Note: For servomotor drive, both **Output 2** and **Output 3** codes must be selected as "**M**".

5.1 Introduction

When the instrument is powered, it starts immediately to work according to the parameters values loaded in its memory.

The instrument behaviour and its performance are governed by the value of the stored parameters.

At the first start up the instrument uses a "*default*" parameter set (factory parameter 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 **[5] 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.

To change these parameters you need to enter the "Configuration mode".

5.2 Instrument behaviour at Power ON

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

Auto mode without program functions.
– [12B] address 527 = 1;
– [19B] address 580 = 0 or 1;
– The instrument is performing the standard closed loop control.

Manual mode (oPLo).
– [12B] address 527 = 3;
– The instrument does not perform Automatic control;
– The control output is equal to 0% and it can be modified by [26B] address 592.

Stand by mode (St.bY).
– [12B] address 527 = 0;
– The instrument does not perform any control (the control outputs are OFF);
– The instrument is working as an indicator (analogue to digital converter).

Auto mode with automatic program start up
– [12B] address 527 = 1;
– [19B] address 580 different from 0, 1 or 7.
– We define all the above described conditions as "***Standard Display***".

5.3 Factory reset

5.3.1 Default parameters loading procedure

Sometime, e.g. to 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 defined condition (same it was at first power ON).

The default data are those typical values loaded in the instrument prior to ship it from the factory.

To load the factory default parameter set it is sufficient to send to the [19A] address 19 the `-481` value.

Note: The complete list of the default parameters is available in **Appendix A**.

5.4 Parameters configuration

In the following pages we are going to describe all the instrument parameters. However, the instrument shows only the parameters applicable to its hardware options in accordance with the specific instrument configuration [i.e. setting `AL1t` (Alarm 1 type) to `nonE` (not used), all parameters related to alarm 1 will be skipped].

] inP Group - Main and auxiliary input configuration

[1] SEnS - Input type (address 10240)

Available: Always.

Range: • When the code of the input type is equal to `c` (see "*How to order*" paragraph).

0	TC J	(0 ÷ 1000°C/32 ÷ 1832°F);
1	TC K	(0 ÷ 1370°C/32 ÷ 2498°F);
2	TC S	(0 ÷ 1760°C/32 ÷ 3200°F);
3	TC R	(0 ÷ 1760°C/32 ÷ 3200°F);
4	TC T	(0 ÷ 400°C/32 ÷ 752°F);
5	TC N	(0 ÷ 1000°C/32 ÷ 1832°F);
6	Exergen IRS J	(0 ÷ 1000°C/32 ÷ 1832°F);
7	Exergen IRS K	(0 ÷ 1370°C/32 ÷ 2498°F);
8	RTD Pt 100	(-200 ÷ +850°C/-328 ÷ +1562°F);
9	RTD Pt 1000	(-200 ÷ +850°C/-328 ÷ +1562°F);
10	0 ÷ 60 mV linear;	
11	12 ÷ 60 mV linear;	
12	0 ÷ 20 mA linear;	
13	4 ÷ 20 mA linear;	
14	0 ÷ 5 V linear;	
15	1 ÷ 5 V linear;	
16	0 ÷ 10 V linear;	
17	2 ÷ 10 V linear.	

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

0	TC J	(0 ÷ 1000°C/32 ÷ 1832°F);
1	TC K	(0 ÷ 1370°C/32 ÷ 2498°F);
2	TC S	(0 ÷ 1760°C/32 ÷ 3200°F);
3	TC R	(0 ÷ 1760°C/32 ÷ 3200°F);
4	TC T	(0 ÷ 400°C/32 ÷ 752°F);
5	TC N	(0 ÷ 1000°C/32 ÷ 1832°F);
6	Exergen IRS J	(0 ÷ 1000°C/32 ÷ 1832°F);
7	Exergen IRS K	(0 ÷ 1370°C/32 ÷ 2498°F);
8	PTC	(-55 ÷ 150°C/-67 ÷ 302°F);
9	NTC	(-50 ÷ 110°C/-58 ÷ 230°F);
10	0 ÷ 60 mV linear;	
11	12 ÷ 60 mV linear;	
12	0 ÷ 20 mA linear;	
13	4 ÷ 20 mA linear;	
14	0 ÷ 5 V linear;	
15	1 ÷ 5 V linear;	
16	0 ÷ 10 V linear;	
17	2 ÷ 10 V linear.	

Notes: 1. When a TC or RTD 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 force [2] dP = 0 and this causes a change to all parameters related with dP (e.g. Set Points, proportional band, etc.).

[2] dP - Decimal point position (address 10241)

Available: Always.
Range: When [1] SenS = Linear input: 0 ÷ 3.
When [1] SenS different from linear input: 0 or 1.
Note: All changes to decimal point position cause a change to all parameters related with it (e.g.: Set Points, proportional band, etc.).

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

Available: When a linear input is selected by [1] SenS.
Range: -1999 ÷ 9999.
Notes: 1. SSc defines, for linear inputs, the value that is to be displayed when the instrument measures the minimum measurable 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 than the full scale read-out in order to obtain a reverse read-out scaling.
E.g.:
0 mA = 0 mBar and 20 mA = -1000 mBar (vacuum).

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

Available: When a linear input is selected by [1] SenS.
Range: -1999 ÷ 9999
Notes: 1. FSc defines, for linear inputs, the value that is to be displayed when the instrument measures the maximum measurable value.
The instrument is able to display the measured value until it reaches a value of 5% higher than 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 and 20 mA = -1000 mBar (vacuum).

[5] unit - Engineering unit (address 10244)

Available: When a temperature sensor is selected by [1] SenS parameter.
Range: 0 °c = Celsius;
1 °F = Fahrenheit.
An engineering unit modification **DOES NOT** produce the automatic re-scaling of all parameters related with the engineering unit (e.g. alarm thresholds, proportional band, etc.).

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

Available: Always.
Range: 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 will affect the measured value but also the control action and the alarms behaviour.

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

Available: Always.
Range: 0 When an overrange or an underrange is detected, the power output will be forced to the value of [8] oPE parameter;
1 When an overrange is detected, the power output will be forced to the value of [8] oPE parameter;
2 When an underrange is detected, the power output will be forced to the value of [8] oPE parameter.

[8] oPE - Safety output value (address 10247)

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 will use zero (0).
E.g.: When heat action only has been programmed, and oPE is equal to -50% (cooling) the instrument will use the zero (0) value.
2. When ON/OFF control is programmed and an out of range is detected, the instrument will perform the safety output value using a fixed cycle time equal to 20 seconds.

[9] io4.F - I/O4 function selection (address 10248)

Available: Always.
Range: 0 **on** (Out4 forced to ON - used as a transmitter power supply);
1 **out4** (Used as digital output 4);
2 **dG2.c** (Digital input 2 for dry contact);
3 **dG2.U** (Digital input 2 driven by 12 ÷ 24 VDC).
Notes: 1. Setting [9] io4.F = dG2.C or dG2U, the parameter [24] O4F becomes not visible while [11] diF2 parameter becomes visible.
2. Setting [9] io4F = on the [24] O4F parameter and the [11] diF2 parameter will NOT be visible.
3. Setting [9] io4F different than dG2.c or dG2.U, the instrument forces [12] diF2 parameter to `nonE`. If [11] diF1 was equal to (12, 13 or 15) it will be forced to `nonE`.
4. Changhing [9] io4F = on to [9] io4F = Out4 makes parameter [24] O4F visible equal to `nonE`.

[10] diF1 - Digital input 1 function (address 10249)

Available: Always.
Range: 0 No function;
1 Alarm Reset [status];
2 Alarm acknowledge (ACK) [status];
3 Hold of the measured value [status];
4 Stand by mode of the instrument [status]. With contact closed the instrument operates in stand by mode;
5 Manual mode;
6 Program Run [transition]. The 1st closure starts the program execution,the 2nd one restarts the program execution from the beginning;
7 Program Reset [transition]. A contact closure resets the program execution;
8 Program Hold [transition]. The 1st closure holds the program execution, the 2nd one restarts the program execution;

9 Program Run/Hold [status]. When the contact is closed the program is running;
10 Program Run/Reset [status]:
- Contact closed - Program run;
- Contact open - Program reset;

11 SP1/SP2 selection [status];
12 Binary Set Point selection made by digital input 1 (less significant bit) and digital input 2 (most significant bit)[status];
13 Reserved;
14 Program 1/2 selection [staus];
15 Binary program selection (1 ÷ 4)[transition].

[11] diF2 - Digital input 2 function (address 10250)

Available: When [9] Io4.F = diG2.
Range: **oFF** No function;
1 Alarm Reset [status];
2 Alarm acknowledge (ACK) [status];
3 Hold of the measured value [status];
4 Stand by mode of the instrument [status]. With contact closed the instrument operates in stand by mode;
5 Manual mode;
6 Program Run [transition]. The 1st closure starts the program execution,the 2nd one restarts the program execution from the beginning;
7 Program Reset [transition]. A contact closure resets the program execution;
8 Program Hold [transition]. The 1st closure holds the program execution, the 2nd one restarts the program execution;
9 Program Run/Hold [status]. When the contact is closed the program is running;
10 Program Run/Reset [status]:
- Contact closed - Program run;
- Contact open - Program reset;

11 SP1/SP2 selection [status];
12 Binary Set Point selection made by digital input 1 (less significant bit) and digital input 2 (most significant bit)[status];
13 Reserved;
14 Program 1/2 selection [staus];
15 Binary program selection (1 ÷ 4)[transition].

Notes: 1. When [10] diF1 = 12, [11] diF2 setting is forced to 12 and diF2 cannot perform another function.
2. When [10] diF1 = [11] diF2 = 12 the Set Point selection will be:

Dig. In1	Dig. In2	Operative Set Point selected
Off	Off	Set Point 1
On	Off	Set Point 2
Off	On	Set Point 3
On	On	Set Point 4

3. When [10] diF1 is equal to 15, [11] diF2 setting is forced to 15 and cannot perform another function.
4. When [10] diF1= [11] diF2 = 15, the program selection will be:

Dig. In1	Dig. In2	Program selected
Off	Off	Program 1
On	Off	Program 2
Off	On	Program 3
On	On	Program 4

[12] di.A - Digital Inputs Action (address 10251)

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.

] out Group - Output parameters

[13] o1.t - Out1 type (address 10252)

Available: When Out1 is a linear output.
Range: **0** 0-20 (0 ÷ 20 mA);
1 4-20 (4 ÷ 20 mA);
2 0-10 (0 ÷ 10 V);
3 2-10 (2 ÷ 10 V).

[14] o1.F - Out1 function (address 10253)

Available: Always.
Range:
- When Out1 is a linear output:

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 r.inP (measured value analogue retransmission);
4 r.Err [measured error (PV - SP) analogue re-transmission];
5 r.SP (operative Set Point analogue retransmission);
6 r.SEr (analogue retransmission of a value coming from serial link);

- When Out1 is a digital output (relay or SSR):

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 P.End (Program end indicator);
5 P.HLd (Program hold indicator);
6 P. uit (Program wait indicator);
7 P.run (Program run indicator);
8 P.Et1 (Program Event 1);
9 P.Et2 (Program Event 2);
10 or.bo (Out-of-range or burn out indicator);
11 P.FAL (Power failure indicator);
12 bo.PF (Out-of-range, Burnout and Power failure indicator);
13 St.By (Stand By status indicator);
14 diF1 (Repeates the digital input 1 status);
15 diF2 (Repeates the digital input 2 status);
16 on (Out1 always ON).

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

[15] A.o1L - Initial scale value of the analogue retransmission (address 10254)

Available: When Out1 is a linear output and [14] o1.F is equal to `r.IMP`, `r.Err`, `r.SP` or `r.SEr`.

Available: -1999 to [16] Ao1H.

[16] A.o1H - Full scale value of the analogue retransmission (address 10255)

Available: When Out1 is a linear output and [14] o1.F is equal to `r.IMP`, `r.Err`, `r.SP` or `r.SEr`.

Range: [15] Ao1L to 9999.

[17] o1.AL - Alarms linked up with Out1 (address 10256)

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 Out4 (short circuit on Out4).

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.

[18] o1.Ac - Out1 action (address 10257)

Available: When [14] o1F is different than `nonE`.

Range:

- **0** dir (direct action);
- **1** rEU (reverse action);
- **2** dir.r (direct action with reverse LED indication);
- **3** rEU.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.

[19] o2F - Out2 function (address 10258)

Available: When the instrument has Out2 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** P.End (Program end indicator);
- **5** P.HLd (Program hold indicator);
- **6** P. uit (Program wait indicator);
- **7** P.run (Program run indicator);
- **8** P.Et1 (Program Event 1);
- **9** P.Et2 (Program Event 2);
- **10** or.bo (Out-of-range or burn out indicator);
- **11** P.FAL (Power failure indicator);
- **12** bo.PF (Out-of-range, Burnout and Power failure indicator);
- **13** St.By (Stand By status indicator);
- **14** diF1 (Repeates the digital input 1 status);
- **15** diF2 (Repeates the digital input 2 status);
- **16** on (Out2 always ON).

For other details see [14] o1.F parameter.

When a servomotor control is desired, **both Out2** and **Out3** are to be selected as Heating or Cooling (o2F = o3F = HrEG **or** o2F = o3F = c rEG).
Parameter **[56] cont** must be set as **3pt**.

[20] o2.AL - Alarms linked up with Out2 (address 10259)

Available: When [19] 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 Out4 (short circuit on Out4).

For more details see [17] o1.AL parameter.

[21] o2Ac - Out2 action (address 10260)

Available: When [19] o2F is different than `nonE`.

Range:

- **0** dir (direct action);
- **1** rEU (reverse action);
- **2** dir.r (direct action with reverse LED indication);
- **3** rEU.r (reverse action with reverse LED indication).

For more details see [18] o1.Ac parameter.

[22] o3F - Out3 function (address 10261)

Available: When the instrument has Out3 option.

- **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** P.End (Program end indicator);
- **5** P.HLd (Program hold indicator);
- **6** P. uit (Program wait indicator);
- **7** P.run (Program run indicator);
- **8** P.Et1 (Program Event 1);
- **9** P.Et2 (Program Event 2);
- **10** or.bo (Out-of-range or burn out indicator);
- **11** P.FAL (Power failure indicator);
- **12** bo.PF (Out-of-range, Burnout and Power failure indicator);
- **13** St.By (Stand By status indicator);
- **14** diF1 (Repeates the digital input 1 status);
- **15** diF2 (Repeates the digital input 2 status);
- **16** on (Out3 always ON).

When a servomotor control is desired, **both Out2** and **Out3** are to be selected as Heating or Cooling (o2F = o3F = HrEG **or** o2F = o3F = crEG).
Parameter **[56] cont** must be set as **3pt**.

For other details see [14] o1.F parameter.

[23] o3.AL - Alarms linked up with Out3 (address 10262)

Available: When [21] o3F = 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 Out4 (short circuit on Out4).

For more details see [17] o1.AL parameter.

[24] o3.Ac - Out3 action (address 10263)

Available: When [20] o3F is different than `nonE`.

Range: 0 dir (direct action);
1 rEU (reverse action);
2 dir.r (direct action with reverse LED indication);
3 rEU.r (reverse action with reverse LED indication).

For more details see [18] o1.Ac parameter.

[25] o4F - Out4 function (address 10264)

Available: When the [9] io4.F = Out4.

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 P.End (Program end indicator);
5 P.HLd (Program hold indicator);
6 P. uit (Program wait indicator);
7 P.run (Program run indicator);
8 P.Et1 (Program Event 1);
9 P.Et2 (Program Event 2);
10 or.bo (Out-of-range or burn out indicator);
11 P.FAL (Power failure indicator);
12 bo.PF (Out-of-range, Burnout and Power failure indicator);
13 St.By (Stand By status indicator);
14 diF1 (Repeates the digital input 1 status);
15 diF2 (Repeates the digital input 2 status);
16 on (Out4 always ON).

For other details see [14] o1.F parameter.

[26] o4.AL - Alarms linked up with Out4 (address 10265)

Available: When [24] o4F = 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 Out4 (short circuit on Out4).

For more details see [17] o1.AL parameter.

[27] o4.Ac - Out4 action (address 10266)

Available: When [25] o4F is different than `nonE`.

Range: 0 dir (direct action);
1 rEU (reverse action);
2 dir.r (direct action with reverse LED indication);
3 rEU.r (reverse action with reverse LED indication).

For more details see [18] o1.Ac parameter.

] AL1 Group - Alarm 1 parameters

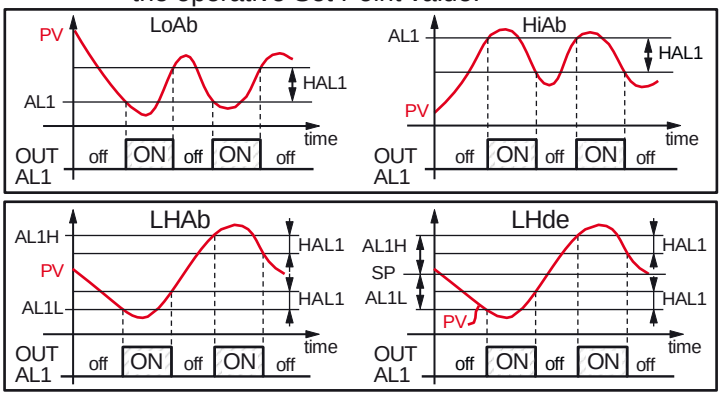
[28] AL1t - Alarm 1 type (address 10267)

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 Set Point value.



2. The (SE.br) sensor break alarm will be ON when the display shows ------- indication.

[29] Ab1 - Alarm 1 function (address 10268)

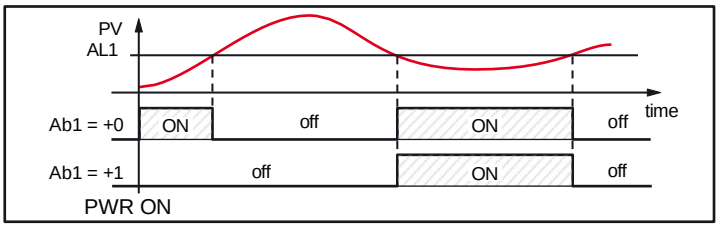
Available: When [28] AL1t is different than `nonE`.

Range: 0 ÷ 15 with the following rule:
+1 Not active at power up;
+2 Latched alarm (manual reset);
+4 Acknowledgeable alarm;
+8 Relative alarm not active at Set Point change.

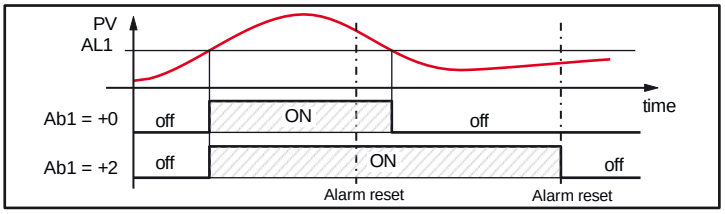
Example: Setting Ab1 equal to 5 (1 + 4),alarm 1 will be “*not active at power up*” and “*Acknowledgeable*”.

Notes: 1. The “*not active at power up*” selection allows to inhibit the alarm function at instrument power up or when the instrument detects a transfer from:
• Manual mode (`oplo`) to auto mode;
• Stand-by mode to auto mode.

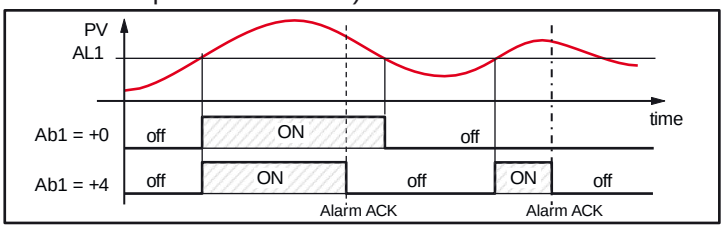
The alarm will be automatically enabled when the measured value reaches, for the first time, the alarm threshold ±hysteresis (in other words, when the initial alarm condition disappears).



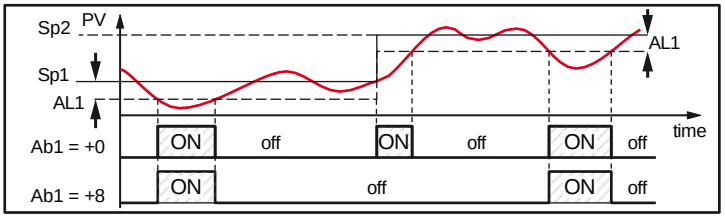
2. A "*Latched alarm*" (manual reset) is an alarm that will remain active even if the conditions that generated the alarm no longer persist. Alarm reset can be done only by an external command (digital inputs or serial link).



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).



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



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

[30] AL1L - For High and low alarms is the low limit of the AL1 threshold - For band alarm is the Al1 low alarm threshold (address 10269)

Available: When [28] AL1t is different than `nonE` or [28] AL1t is different than `SE.br`.

Range: From -1999 to [30] AL1H engineering units.

[31] AL1H - For High and low alarms is the high limit of the AL1 threshold - For band alarm is the AL1 high alarm threshold (address 10270)

Available: When [28] AL1t is different than `nonE` or [28] AL1t is different than `SE.br`.

Range: From [30] AL1L to 9999 engineering units.

[32] AL1 - Alarm 1 threshold (address 10271)

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

Range: From [30] AL1L to [31] AL1H engineering units.

[33] HAL1 - Alarm 1 hysteresis (address 10272)

Available: When [28] AL1t is different than `nonE` or [28] AL1t is different than `SE.br`.

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).
– Set Point equal to 900 (mBar);
– Deviation low alarm equal to 50 (mBar);
– Hysteresis equal to 160 (mBar)
the theoretical reset point 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 generates the alarm and then turn the instrument ON again.
– All band alarms use the same hysteresis value for both thresholds;
– 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).
– Set Point equal to 250 (°C);
– Relative band alarm;
– Low threshold equal to 10 (°C);
– High threshold equal to 10 (°C);
– Hysteresis equal to 25 (°C).

[34] AL1d - Alarm 1 delay (address 10273)

Available: When [28] AL1t is different than `nonE`.

Range: From oFF (0) to 9999 seconds.

Note: The alarm goes ON only when the alarm condition persists for a time longer than [34] AL1d time but the reset is immediate.

[35] AL1o - Alarm 1 enabled in Stand-by mode and out of range indications (address 10274)

Available: When [28] AL1t is different than `nonE`.

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

] AL2 Group - Alarm 2 parameters

[36] AL2t - Alarm 2 type (address 10275)

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 Set Point (this may be different from the Target setpoint if you are using the ramp to Set Point function).

[37] Ab2 - Alarm 2 function (address 10276)

Available: When [36] AL2t is different than `nonE`.

Range: 0 ÷ 15 with the following rule:
+1 Not active at power up;
+2 Latched alarm (manual reset);
+4 Acknowledgeable alarm;
+8 Relative alarm not active at Set Point change.

Example: Setting Ab2 equal to 5 (1 + 4) the alarm 2 will be "*Not active at power up*" and "*Acknowledgeable*".

Note: For other details see [28] Ab1 parameter.

[38] AL2L - For High and low alarms is the low limit of the AL2 threshold - For band alarm is the AL2 low alarm threshold (address 10277)

Available: When [36] AL2t is different than `nonE` or [36] AL2t is different than `SE.br`.

Range: -1999 to [39] AL2H engineering units.

[39] AL2H - For High and low alarms, it is the high limit of the AL2 threshold - For band alarm is high alarm threshold (address 10278)

Available: When [36] AL2t is different than `nonE` or [36] AL2t is different than `SE.br`.

Range: From [38] AL2L to 9999 engineering units.

[40] AL2 - Alarm 2 threshold (address 10279)

Available: When:
[36] AL2t = LoAb Absolute low alarm;
[36] AL2t = HiAb Absolute high alarm;
[36] AL2t = LodE Deviation low alarm (relative);
[36] AL2t = Hide Deviation high alarm (relative);

Range: From [38] AL2L to [39] AL2H engineering units.

[41] HAL2 - Alarm 2 hysteresis (address 10280)

Available: When [36] AL2t is different than `nonE` or [36] AL2t is different than `SE.br`.

Range: 1 ÷ 9999 engineering units.

Note: For other details see [33] HAL1 parameter.

[42] AL2d - Alarm 2 delay (address 10281)

Available: When [36] AL2t different form `nonE`.

Range: From oFF (0) to 9999 seconds.

Note: The alarm goes ON only when the alarm condition persist for a time longer than [42] AL2d time but the reset is immediate.

[43] AL2o - Alarm 2 enabling in Stand-by mode and out of range indications (address 10282)

Available: When [36] 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

[44] AL3t - Alarm 3 type (address 10283)

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 Set Point (this may be different to the Target Set Point if you are using the ramp to Set Point function).

[45] Ab3 - Alarm 3 function (address 10284)

Available: When [43] AL3t is different than `nonE`.

Range: 0 ÷ 15 with the following rule:
+1 Not active at power up;
+2 Latched alarm (manual reset);
+4 Acknowledgeable alarm;
+8 Relative alarm not active at Set Point change.

Example: Setting Ad3 equal to 5 (1 + 4) the alarm 3 will be "*Not active at power up*" and "*Acknowledgeable*".

For other details see [29] Ab1 parameter.

[46] AL3L - For High and low alarms is the low limit of the AL3 threshold - For band alarm is the AL3 low alarm threshold (address 10285)

Available: When [44] AL3t is different than `nonE` or [44] AL3t is different than `SE.br`.

Range: -1999 to [47] AL3H engineering units.

[47] AL3H - For High and low alarms is the high limit of the AL3 threshold - For band alarm is the AL3 low alarm threshold (address 10286)

Available: When [44] AL3t is different than nonE or [44] AL3t is different than SE.br.

Range: From [46] AL3L to 9999 engineering units.

[48] AL3 - Alarm 3 threshold (address 10287)

Available: When:

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

Range: From [46] AL3L to [47] AL3H engineering units.

[49] HAL3 - Alarm 3 hysteresis (address 10288)

Available: When [44] AL3t is different than nonE or [44] AL3t is different than SE.br.

Range: 1 ÷ 9999 engineering units.

Note: For other details see [32] HAL1 parameter.

[50] AL3d - Alarm 3 delay (address 10289)

Available: When [44] AL3t different form nonE.

Range: From oFF (0) to 9999 seconds.

Note: The alarm goes ON only when the alarm condition persist for a time longer than [50] AL3d time but the reset is immediate.

[51] AL3o - Alarm 3 enabling in Stand-by mode and out of range indications (address 10290)

Available: When [44] AL3t is different than nonE or [44] AL3t is different than SE.br.

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

] 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 a 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).

[52] LbAt - LBA time (address 10291)

Available: When [56] Cont = PID

Range:
- oFF = LBA not used;
- 1 ÷ 9999 seconds.

[53] LbSt - Delta measure used by LBA during Soft start (address 10292)

Available: When [52] LbAt is different than oFF.

Range:
- oFF = loop break alarm is inhibit during soft start
- 1 ÷ 9999 engineering units.

[54] LbAS - Delta measure used by loop break alarm (loop break alarm step)(address 10293)

Available: When [52] LbAt is different than oFF.

Range: From 1 to 9999 engineering units.

[55] LbcA - Condition for LBA enabling (address 10294)

Available: When [52] LbAt is different than 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 maximum or the minimum 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 PID demands 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 will generate the alarm.

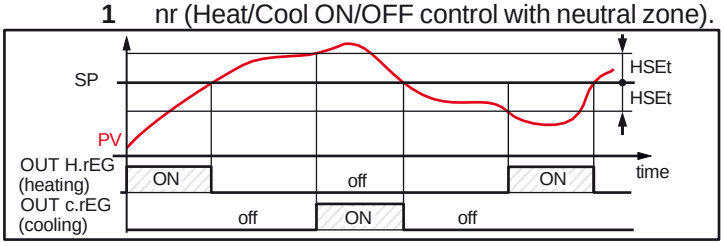
] rEG group - Control parameters

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

[56] cont - Control type (address 10295)

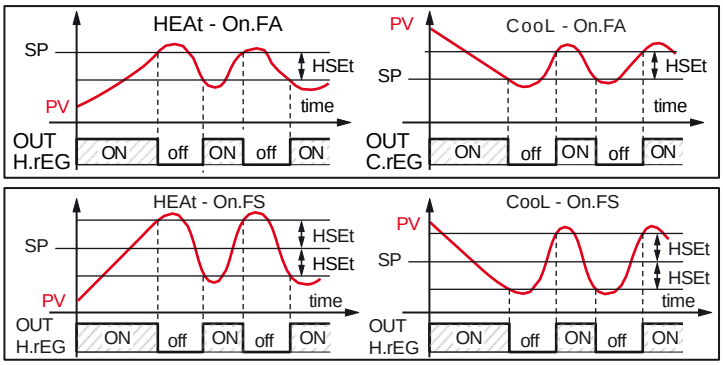
Available: When at least one output is programmed as control output (H.rEG or C.rEG).

Range: When two control action (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 Output 2 and Output 3 have been ordered as "**M**")].

When a servomotor control is desired, **both Out2** and **Out3** are to be selected as Heating or Cooling (o2F = o3F = HrEG **or** o2F = o3F = c rEG).
Parameter **[56] cont** must be set as **3pt**.



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

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

[57] Auto - Auto tune selection (address 10296)

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 Set Point;
- Can be used even if the Set Point 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. Set Point 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 Set Point changes;
-3 Oscillating auto-tune with manual start;
-2 Oscillating auto-tune with automatic start at the 1st power up only;
-1 Oscillating auto-tune with automatic restart at all power ups;
0 Not used;
1 Fast auto tuning with automatic restart at all power ups;
2 Fast auto-tune with automatic start at 1st power up only;
3 FAST auto-tune with manual start;
4 FAST auto-tune with automatic restart at all SP changes.
5 EvoTune with automatic restart at all power ups;
6 EvoTune with automatic start at 1st power up only;
7 EvoTune with manual start;
8 EvoTune with automatic restart at all SP changes.

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

[58] tunE - Auto-tune manual start (address 10297)

Available: When [56] cont = PID.

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

[59] HSEt - Hysteresis of the ON/OFF control (address 10298)

Available: When [56] cont is different than PID.

Range: 0 ÷ 9999 engineering units.

[60] Pb - Proportional band (address 10299)

Available: When [56] cont = PID.

Range: 1 ÷ 9999 engineering units.

Note: Auto-tune functions calculate this value.

[61] ti - Integral time *(address 10300)*

Available: When [56] cont = PID.

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

Note: Auto-tune functions calculate this value.

[62] td - Derivative time (address 10301)

Available: When [56] cont = PID.

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

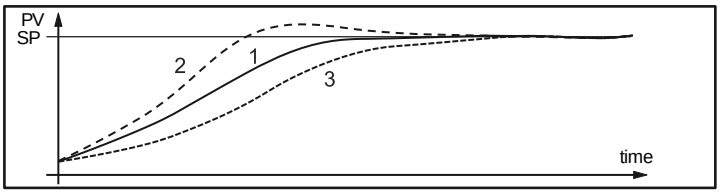
Note: Auto-tune functions calculate this value.

[63] Fuoc - Fuzzy overshoot control (address 10302)

This parameter reduces the overshoot usually present at instrument start up or after a Set Point 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 Set Point approach.

Setting **Fuoc = 1** this function is disabled.



Available: When [56] cont = PID.

Range: 0 ÷ 2.00.

Note: Fast auto-tune calculates the Fuoc parameter while the oscillating one sets it equal to 0.5.

[64] tcH - Cycle time of the heating output (address 10303)

Available: When at least one output is programmed in order to be the heating output (H.rEG), [56] cont = PID

Range: 1.0 ÷ 130.0 seconds.

[65] rcG - Power ratio between heating and cooling action (relative cooling gain) *(address 10304)*

The instrument uses the same PID parameter set for heat and for cool action but the efficiency of the two actions is usually different.

This parameter allows to define the ratio between the efficien-

cy of the heating system and the efficiency of the cooling one.

An example will help us to explain 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 (ᚦT = 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 (ᚦT = 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 ([65] 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 actions are programmed (H.rEG and c.rEG) and [55] cont = PID.

Range: 0.01 ÷ 99.99.

Note: Auto-tune functions calculate this value.

[66] tcc - Cycle time of the cooling output (address 10305)

Available: When at least one output is programmed in order to be the cooling output (c.rEG), [56] cont = PID.

Range: 1.0 ÷ 130.0 seconds.

[67] rS - Manual reset (integral pre-load) (address 10306)

It 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 Set Point 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 [56] cont = PID.

Range: -100.0 ÷ +100.0%.

[68] Str.t - Servomotor stroke time (address 10307)

Available: When [56] cont = 3Pt.

Range: 5 ÷ 1000 seconds.

[69] db.S - Servomotor dead band (address 10308)

Available: When [56] cont = 3Pt.

Range: 0.0 ÷ 10.0.

[70] od - Delay at power up (address 10309)

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

Range: oFF Function not used;
0.01 ÷ 99.59 hh.mm.

Notes: 1. This parameter defines the time during which (after a power up) the instrument remains in stand by mode before to start all other functions (control, alarms, program, etc.).

2. When a program with automatic start at power up 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 up and “od” function are programmed, the autotune will start at the end of “od” delay.

[71] St.P - Max. power output used during soft start (address 10310)

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 up and soft start function are programmed, the instrument performs the soft start and than 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 contro l is used.

[72] SSt - Soft start time (address 10311)

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.

[73] SS.tH - Threshold for soft start disabling (address 10312)

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

Range: -1999 ÷ 9999 engineering units.

Notes: 1. When the power limiter have 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 have 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 - Set Point parameters

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

[74] nSP - Number of used Set Points (address 10313)

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

Range: 1 ÷ 4.

Note: When you change the value of this parameter, the instrument operates as follows:

- [81] A.SP parameter will be forced to SP.
- The instrument verifies that all used Set Point are within the limits programmed by [75] SPLL and [76] SPHL. If an SP is out of this range, the instrument forces it to the maximum acceptable value.

[75] SPLL - Minimum Set Point value (address 10314)

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

Range: From -1999 to [76] SPHL engineering units.

Notes: 1. When you change the [75] SPLL value, the instrument checks all local Set Points (SP, SP2, SP3 and SP4 parameters) and all the program Set Points ([95] Pr.S1, [100] Pr.S2, [105] Pr.S3, [110] Pr.S4 parameters). If an SP is out of this range, the instrument forces it to the max. acceptable value.

2. A [75] SPLL change produces the following actions:

- When [82] SP.rt = SP the remote Set Point will be forced to be equal to the active Set Point;
- When [82] SP.rt = trim the remote Set Point will be forced to zero;
- When [82] SP.rt = PErc the remote Set Point will be forced to zero.

[76] SPHL - Maximum Set Point value (address 10315)

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

Range: From [75] SPLL to 9999 engineering units.

Note: For other details see [75] SPLL parameter.

[77] SP - Set Point 1 (address 10316)

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

Range: From [75] SPLL to [76] SPHL engineering units.

[78] SP 2 - Set Point 2 (address 10317)

Available: When at least one output is programmed as control output and [74] nSP $\geq$ 2.

Range: From [75] SPLL to [76] SPHL engineering units.

[79] SP 3 - Set Point 3 (address 10318)

Available: When at least one output is programmed as control output and [74] nSP $\geq$ 3.

Range: From [75] SPLL to [76] SPHL engineering units.

[80] SP 4 - Set Point 4 (address 10319)

Available: When at least one output is programmed as control output and [74] nSP = 4.

Range: From [75] SPLL to [76] SPHL engineering units.

[81] A.SP - Selection of the active Set Point (address 10320)

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

Range: From 1 to [74] nSP.

Notes: 1. A [81] A.SP change produces the following actions:

- When [82] SP.rt = SP - the remote Set Point will be forced to be equal to the active Set Point;
- When [82] SP.rt = trin - the remote Set Point will be forced to zero;
- When [82] SP.rt = PErc - the remote Set Point will be forced to zero.

2. SP2, SP3 and SP4 selection will be shown only when the relative Set Point is enabled (see [74] nSP parameter).

[82] SP.rt - Remote Set Point type (address 10321)

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 Slave units. The Master unit can send his operative Set Point to the slave units.

In this way, for example, it is possible to change simultaneously the Set Point of 20 instruments by changing the Set Point of the master unit (e.g. hot runner application).

SP.rt parameter defines how the slaves units will use the value coming from serial link.

Parameter [100] tr.SP [selection of the value to be retransmitted (Master)] parameter allows to define the value sent by master unit.

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 Set Point (RSP)];

1 **trin** (the value coming from serial link will be algebraically added to the local Set Point selected by A.SP and the sum becomes the operative Set Point);

2 **PErc** (the value coming from serial will be scaled on the input range and this value will be used as remote Set Point).

Note: A [82] SPrt change produces the following actions:

- When [82] SP.rt = rSP - the remote Set Point will be forced to be equal to the active Set Point;
- When [82] SP.rt = trin - the remote Set Point will be forced to zero;
- When [82] SP.rt = PErc - the remote Set Point will be forced to zero.

Example: A 6 zone reflow-oven for PCB.

The master unit sends its Set Point value to 5 other zones (slave controllers).

The Slave zones use it as a Set Point trim.

The first zone is the master zone and it uses a Set Point equal to 210°C.

The second zone has a local Set Point equal to -45°C.

The third zone has a local Set Point equal to -45 (°C).

The fourth zone has a local Set Point equal to -30.

The fifth zone has a local Set Point equal to +40.

The sixth zone has a local Set Point 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 Set Point.

[83] SPLr - Local/remote Set Point selection (address 10322)

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

Range: 0 **Loc** (Local Set Point selected by [81] A.SP);

1 **rEn** [Remote Set Point (coming from serial link)].

[84] SP.u - Rate of rise for positive Set Point change (ramp up)(address 10323)

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).

[85] SP.d - Rate of rise for negative Set Point change (ramp down)(address 10324)

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 Set Point

When the remote Set Point (RSP) with trim action is programmed, the local Set Point range becomes the following: from [75] SPLL+ RSP to [76] SPHL - RSP.

] PAn group - Operator HMI

[86] RESERVED (address 10325)

[87] PRESERVED (address 10326)

[88] RESERVED (address 10327)

[89] RESERVED (address 10328)

[90] RESERVED (address 10329)

[91] RESERVED (address 10330)

[92] RESERVED (address 10331)

[93] FiLd - Filter on the displayed value (address 10332)

Available: Always.

Range: **0.0** **oFF** (Filter disabled);
0.1 ÷ 20.0 engineering units.

Note: This is a “window filter” related to the Set Point; is applied to the displayed value only and has no effect on the other instrument functions (control, alarms, etc.).

[94] RESERVED (address 10333)

[95] dSPu - Instrument Status at power up (address 10334)

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 [96] oPr.E, the instrument forces [97] oPEr parameter equal to Auto.

2. During program execution the instrument stores the segment currently in use and, by a 30 minutes interval, it stores also the elapsed time of the soak.

If a power down occurs during program execution, at the next power up 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 *[95] dSPu - Status of the instrument at power up* parameter must be set to AS.Pr.

If the [95] dSPu parameter is different than AS.Pr the storing function is inhibited.

[96] oPr.E - Operative modes enabling (address 10335)

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: Changing the value of [96] oPr.E, the instrument forces [97] oPEr parameter to Auto.

[97] oPEr - Operative mode selection (address 10336)

Available: Always.

Range:
- When [96] oPr.E = ALL:
  0 **Auto** (auto mode);
  1 **oPLo** (manual mode);
  2 **St.bY** (stand by mode);
- When [96] oPr.E = Au.oP:
  0 **Auto** (auto mode);
  1 **oPLo** (manual mode);
- When [96] oPr.E = Au.Sb:
  0 **Auto** (auto mode);
  2 **St.bY** (stand by mode).

] Ser group - Serial link parameters

[98] Add - Instrument address (address 10337)

Available: Always.

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

[99] bAud - Baud rate (address 10338)

Available: When [98] Add different from oFF.

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

[100] trSP - Selection of the value to be retransmitted (Master) (address 10339)

Available: When [98] Add different from oFF.

Range: **0** **nonE** [Retransmission not used (the instrument is a slave)];
1 **rSP** (The instrument becomes a Master and retransmits the operative Set Point);
2 **PErc** (The instrument becomes a Master and retransmits the power output).

Note: For more details see [82] SP.rt (Remote Set Point type) parameter.

] 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.

[101] AL.P- Adjust Low Point (address 10340)

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.

[102] AL.o - Adjust Low Offset (address 10341)

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

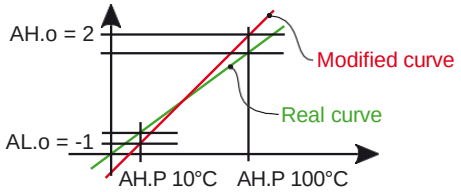
[103] AH.P - Adjust High Point (address 10342)

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.

[104] AH.o- Adjust High Offset (address 10343)

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

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 Set Point 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 [101] AL.P = 10 (low working point) and [102] AL.o = -1 (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 Set Point 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 [103] AH.P = 100 (low working point) and [104] AHo = +2 (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.



Note: Parameters from [105] to [125] are reserved.

] PrG Group - Programmer function parameters

These instruments are equipped with 2 pages of 4 program each (8 programs total).

Each program is composed by 6 groups of 2 steps each (12 steps total)

The first step is a ramp (used to reach the desired Set Point), the second is a soak (on the desired Set Point).

When a RUN command is detected the instrument aligns the operative Set Point to the measured value and starts to execute the first ramp of the selected program.

When you need a program with more than 12 segments it is possible to link the selected program with the next one.

Example:

You are preparing the Page 1, Program 1 but you need 20 steps.

At the end of the 12 segments of Program 1 you will find a parameter “[164] P1.c2 – Program 1 continue on Program 2”; setting YES you will link Program 1 with Program 2.

Now you can program the 8 steps (of Program 2) necessary to complete your profile.

Running Program 1, the instrument performs the first program followed by the 8 steps of program 2.

In addition, every 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, the repetition number 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 1 minute interval, it stores also the elapsed time of the soaks. If a power down occurs during program execution, at the next power up 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 elapsed time memorized.

In order to obtain this features, the [95] dSPu “Status of the instrument at power up” parameter must be set to `AS.Pr`.

If [95] dSPu value is different than `AS.Pr`, the storing function will be inhibited.

The structure of the programmer parameters is based on:

– 1 group with the “global” parameters [PrG group](page selection, active program selection status of the active program, etc.).

– 1 group for every program (Page 1: Pr1, Pr2, Pr3 and Pr4 and Page 2: Pr5, Pr6, Pr7, Pr8).

NOTE VERY WELL:
In paragraph 4 we will described all parameters related with the programmer and their action during program execution.

OPERATIVE MODES

As we said at paragraph 5.1, when the instrument is powered ON, starts immediately to operate according to the stored parameters value.

In other words, the instrument has one status only, the “run time” status.

During “run time” we can force the instrument to operate in three different modes: Automatic mode, Manual mode, or Stand by mode:

In Auto mode without program functions

– [12B] address 527 = 1;
– [19B] address 580 = 0 or 1;
– The instrument drives automatically the control output according to the parameter value set and the Set Point/ measured value.

In Manual mode (oPLo)

– [12B] address 527 = 3
– The instrument does not perform Automatic control and the instrument allows you to set manually the control output power.
– No Automatic action will be made.

In Stand by mode

– [12B] address 527 = 0;
– The instrument does not perform any control (the control outputs are OFF);
– The instrument is working as an indicator (analogue to digital converter).

As we have seen, it is always possible to modify the value assigned to a parameter independently from the operative modes selected.

In Auto mode with automatic program start up

– [12B] address 527 = 1;
– [19B] address 580 different from 0, 1 or 7;
– The instrument perform the control following the programmed SP profile.

THE PROGRAM FUNCTIONS

7.1 How to Edit (create or modify) a program

Preliminary note: Each Program parameters is divided in 5 logical groups (`PrG`, `Pr1`, `Pr2`, `Pr3` and `Pr4` or `PrG` , `Pr5`, `Pr6`, `Pr7` and `Pr8`). The first one (PrG) includes the parameter necessary to manage the program running (or to select the program to run), while the other includes all editing parameters related with a specific program (Pr1 for program 1, etc.).

These instruments are equipped with 8 programs divided into 2 pages of 4 programs each.

For this reason we have Program 1 to program 4 when page 1 is selected and Program 5 to 8 when page 2 is selected.

To select a program:

– Enter in PrG group:
– Select the desired “page”;
– Select the desired “program”.

] PrG Group - Programmer function parameters

[126] PAGE- Selection of the active program page (address 10365)

Available: Always.
Range: 1 or 2
Note: During program execution this parameter can NOT be changed.

[127] Pr.n - Active program (address 10366)

Available: Always.
Range: From 1 to 8.
Note: During program execution this parameter can NOT be changed.

[128] Pr.St- Status of the active program (address 10367)

Available: Always.
Range: 0 **rES** (program Reset);
1 **run** (program Start);
2 **HoLd** (program Hold);
3 **cnt** [continue (read only)].

] Pr1 Group - Program 1

[129] P1.F - Program 1 action at power up (address 10368)

Available: Always:
Range: 0 **nonE** (Program not used);
1 **S.uP.d** (Start at power up with 1st step in stand by);
2 **S.uP.S** (Start at power up);
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).

[130] P1.u - Engineering units of the soaks (address 10369)

Available: When [129] P1.F is different than `nonE`.
Range: hh.nn Hours and minutes;
nn.SS Minutes and seconds.
Note: During program execution, this parameter can not be changed.

[131] P1.E - Instrument behaviour at End of program 1 execution (address 10370)

Available: When [129] P1.F is different than `nonE` .
Range: 0 **cnt** [Continue (the instrument uses the Set Point of the last soak until a reset command is detected)];
1 **SPAt** (Go to the Set Point selected by [81] A.SP parameter);
2 **St.bY** (Go in stand by mode).

Notes: 1. Setting [131] P1.E = cnt at program end the instrument uses the Set Point of the last soak. When a reset command is detected it will go to the Set Point selected by [81] A.SP parameter.
2. Setting [131] P1.E = SPAt at program end the instrument goes to the Set Point selected by [81] A.SP parameter. The transfer will be a step transfer or a ramp according to the [84] SP.u (maximum rate of rise for positive Set Point change) and [85] SPd (maximum rate of rise for negative Set Point change).
3. Setting [131] P1.E = St.by at program end the

instrument goes immediately in Stand-by mode (control outputs go to OFF and the instrument operate as an indicator).

[132] P1.nE- Execution number (address 10371)

Available: When [129] P1.F is different than nonE.

Range: 1 to 999 execution;
1000 **inF** (Indefinitely).

Note: Setting [132] P1.nE = inF the program execution will be repeated until a reset command is detected.

[133] P1.Et- Time of the End program indication (address 10372)

Available: When [129] P1.F is different than nonE.

Range: **0** **oFF** (Function not used);
00.01 ÷ 99.59 minutes and seconds;
100 **inF** (Indefinitely ON).

Note: Setting [133] P1.Et = inF the end program indication goes OFF only when a reset command or a new RUN command is detected.

[134] P1.S1- Set Point of the 1st soak (address 10373)

Available: When [129] P1.F is different than nonE or [129] P1.F is different than S.uP.d.

Range: From [75] SPLL to [76] SPHL.

[135] P1.G1- Gradient of the 1st ramp (address 10374)

Available: When [129] P1.F is different than nonE or [129] P1.F is different than S.uP.d.

Range: 0.1 ÷ 999.9 engineering units per minute;
1000.0 **inF** (Step transfer).

[136] P1.t1- Time of the 1st soak (address 10375)

Available: When [129] P1.F is different than nonE.

Range: 0.00 ÷ 99.59 Time units.

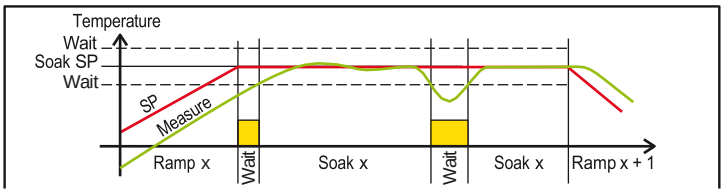
Note: Setting a time equal to zero, the instrument uses the wait band before to go to the next step.

[137] P1.b1 - Wait band of the 1st soak (address 10376)

Available: When [129] P1.F is different than nonE or [129] P1.F is different than S.uP.d.

Available: OFF ÷ 9999 engineering units.

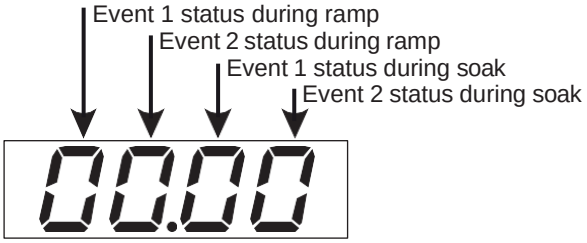
Note: The wait band suspends the time counting when the measured value goes out of the defined band (guaranteed soak).



[138] P1.E1 - Events of the 1st group (address 10377)

Available: When [129] Pr.F is different than nonE or [129] Pr.F is different than S.UP.d.

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
01.00	off	on	off	off
11.00	on	on	off	off
00.10	off	off	on	off
10.10	on	off	on	off
01.10	off	on	on	off
11.10	on	on	on	off
00.01	off	off	off	on
10.01	on	off	off	on
01.01	off	on	off	on
11.01	on	on	off	on
00.11	off	off	on	on
10.11	on	off	on	on
01.11	off	on	on	on
11.11	on	on	on	on

[139] P1.S2 - Set Point of the 2nd soak (address 10378)

Available: When [129] P1.F is different than nonE.

Range: From [75] SPLL to [76] SPHL;
-8000 **OFF** (Program end).

Note: It is not necessary to configure all steps.
Using, for example, 2 groups only, it is sufficient to set the Set Point of the third group equal to OFF.
The instrument will mask all the following parameters of the program in editing.

[140] P1.G2- Gradient of the 2nd ramp (address 10379)

Available: When [129] P1.F is different than nonE and [139] P1.S2 is different than oFF.

Range: 0.1 ÷ 999.9 engineering units per minute;
1000.0 Step transfer.

[141] P1.t2- Time of the 2nd soak (address 10380)

Available: When [129] P1.F is different than nonE and [139] P1.S2 is different than oFF.

Range: 0.00 ÷ 99.59 time units.

Note: Setting a time equal to zero, the instrument uses the wait band before to go to the next step.

[142] P1.b2 - Wait band of the 2nd soak (address 10381)

Available: When [129] P1.F is different than nonE and [139] P1.S2 is different than oFF.

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

Note: For more details see [137] P1.b1 parameter.

[143] P1.E2- Events of the 2nd group (address 10382)

Available: When [129] P1.F is different than nonE and [139] P1.S2 is different than oFF.

Range: 00.00 ÷ 11.11 where:
00 Event OFF;
01 Event ON.

Note: For more details see [138] P1.E1 parameter.

[144] P1.S3- Set Point of the 3rd soak (address 10383)

Available: When [129] P1.F is different than nonE and [139] P1.S2 is different than oFF.

Range: From [75] SPLL to [76] SPHL;
-8000 OFF (Program end).

Note: For more details see [139]P1.S2 parameter.

[145] P1.G3 - Gradient of the 3rd ramp (address 10384)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF and
[144] P1.S3 is different than oFF.
Range: 0.1 ÷ 999.9 engineering units per minute;
1000.0 Step transfer.

[146] P1.t3 - Time of the 3rd soak (address 10385)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF and
[144] P1.S3 is different than oFF.
Range: 0.00 ÷ 99.59 time units.
Note: Setting a time equal to zero, the instrument uses the wait band before to go to the next step.

[147] P1.b3 - Wait band of the 3rd soak (address 10386)

Available: When [129] P1.F is different than nonE,
[134] P1.S2 is different than oFF and
[139] P1.S3 is different than oFF.
Range: OFF ÷ 9999 engineering units.
Note: For more details see [137]P1.b1 parameter.

[148] P1.E3 - Events of the 3rd group (address 10387)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF and
[144] P1.S3 is different than oFF.
Range: 00.00 ÷ 11.11 where:
00 Event OFF;
01 Event ON.
Note: For more details see [138]P1.E1 parameter.

[149] P1.S4 - Set Point of the 4th soak (address 10388)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF and
[144] P1.S3 is different than oFF.
Range: From [75] SPLL to [76] SPHL;
-8000 OFF (Program end).
Note: For more details see [139]P1.S2 parameter.

[150] P1.G4 - Gradient of the 4th ramp (address 10389)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF,
[144] P1.S3 is different than oFF and
[149] P1.S4 is different than oFF
Range: 0.1 ÷ 999.9 enginering units per minute;
1000.0 Step transfer.

[151] P1.t4 - Time of the 4th soak (address 10390)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF,
[144] P1.S3 is different than oFF and
[149] P1.S4 is different than oFF.
Range: 0.00 ÷ 99.59 time units.

[152] P1.b4 - Wait band of the 4th soak (address 10391)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF,
[144] P1.S3 is different than oFF and
[149] P1.S4 is different than oFF.
Range: From OFF to 9999 engineering units.
Note: For more details see [137] P1.b1 parameter.

[153] P1.E4 - Event of the 4th segment (address 10392)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF,
[144] P1.S3 is different than oFF and
[149] P1.S4 is different than oFF.
Range: 00.00 ÷ 11.11 where:
00 Event OFF;
01 Event ON.
Note: For more details see [138] P1.E1 parameter.

[154] P1.S5 - Set Point of the 5th soak (address 10393)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF,
[144] P1.S3 is different than oFF and
[149] P1.S4 is different than oFF.
Range: From [75] SPLL to [76] SPHL;
-8000 OFF (Program end).
Note: For more details see [139] P1.S2 parameter.

[155] P1.G5 - Gradient of the 5th ramp (address 10394)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF,
[144] P1.S3 is different than oFF,
[149] P1.S4 is different than oFF and
[154] P1.S5 is different than oFF.
Range: 0.1 ÷ 999.9 enginering units per minute;
1000.0 Step transfer.

[156] P1.t5 - Time of the 5th soak (address 10395)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF,
[144] P1.S3 is different than oFF,
[149] P1.S4 is different than oFF and
[154] P1.S5 is different than oFF.
Range: 0.00 ÷ 99.59 time units.

[157] P1.b5 - Wait band of the 5th soak (address 10396)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF,
[144] P1.S3 is different than oFF,
[149] P1.S4 is different than oFF and
[154] P1.S5 is different than oFF.
Range: From OFF to 9999 engineering units.
Note: For more details see [137] P1.b1 parameter.

[158] P1.E5 - Event of the 5th segment (address 10397)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF,
[144] P1.S3 is different than oFF,
[149] P1.S4 is different than oFF and
[154] P1.S5 is different than oFF.
Range: 00.00 ÷ 11.11 where:
00 Event OFF;
01 Event ON.
Note: For more details see [138]P1.E1 parameter.

[159] P1.S6 - Set Point of the 6th soak (address 10398)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF,
[144] P1.S3 is different than oFF,
[149] P1.S4 is different than oFF and
[154] P1.S5 is different than oFF.
Range: From [75] SPLL to [76] SPHL;
-8000 OFF (Program end).
Note: For more details see [139]P1.S2 parameter.

[160] P1.G6- Gradient of the 6th ramp (address 10399)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF,
[144] P1.S3 is different than oFF,
[149] P1.S4 is different than oFF,
[154] P1.S5 is different than oFF and
[159] P1.S6 is different than oFF.
Range: 0.1 ÷ 999.9 enginering units per minute;
1000.0 Step transfer.

[161] P1.t6- Time of the 6th soak (address 10400)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF,
[144] P1.S3 is different than oFF,
[149] P1.S4 is different than oFF,
[154] P1.S5 is different than oFF and
[159] P1.S6 is different than oFF.
Range: 0.00 ÷ 99.59 time units.

[162] P1.b6- Wait band of the 6th soak (address 10401)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF,
[144] P1.S3 is different than oFF,
[149] P1.S4 is different than oFF,
[154] P1.S5 is different than oFF and
[159] P1.S6 is different than oFF.
Range: From OFF to 9999 engineering units.
Note: For more details see [137] P1.b1 parameter.

[163] P1.E6- Event of the 6th segment (address 10402)

Available: When [129] P1.F is different than nonE,
[139] P1.S2 is different than oFF,
[144] P1.S3 is different than oFF,
[149] P1.S4 is different than oFF,
[154] P1.S5 is different than oFF and
[159] P1.S6 is different than oFF.
Range: 00.00 ÷ 11.11 where:
00 Event OFF;
01 Event ON.
Note: For more details see [138]P1.E1 parameter.

[164] P1.c2 - Program 1 continues on program 2 (address 10403)

Available: When [129] P1.F is different than nonE.
Range: 0 **no** (Program 1 is ended);
1 **YES** (Program 1 will continue on program 2).

] Pr2 Group - Program 2

The same descriptions made for Pr1 (Program 1) parameters can be applied to the Pr2 parameters with the exception of the prefix that changes from P1.xx to P2.xx (Program 2).

For more details see Pr1 group.

] Pr3 Group - Program 3

The same descriptions made for Pr1 (Program 1) parameters can be applied to the Pr3 parameters with the exception of the prefix that changes from P1.xx to P3.xx (Program 3).

For more details see Pr1 group.

] Pr4 Group - Program 4

The same descriptions made for Pr1 (program 1) can be applied to the Pr4with the exception of:

a) The prefix that changes from P1.xx to P4.xx (Program 4).
b) The last program of each page could NOT continue on the next program (because we do not have a fifth program).

For more details see Pr1 group.

] Pr5 Group - Program 5

The same descriptions made for Pr1 (Program 1) parameters can be applied to the Pr5 parameters with the exception of the prefix that changes from P1.xx to P5.xx (Program 5).

For more details see Pr1 group.

] Pr6 Group - Program 6

The same descriptions made for Pr1 (Program 1) parameters can be applied to the Pr6 parameters with the exception of the prefix that changes from P1.xx to P6.xx (Program 6).

For more details see Pr1 group.

] Pr7 Group - Program 7

The same descriptions made for Pr1 (Program 1) parameters can be applied to the Pr7 parameters with the exception of the prefix that changes from P1.xx to P7.xx (Program 7).

For more details see Pr1 group.

] Pr8 Group - Program 8

The same descriptions made for Pr1 (program 1) can be applied to the Pr8 with the exception of:

a) The prefix that changes from P1.xx to P8.xx (Program 8).
b) The last program of each page could NOT continue on the next program (because we do not have a ninth program).

For more details see Pr1 group.

7.2 How to Link two (or more) programs

Program linking can give you more advantages:

A) When you need a program with more than 12 segments you can link the selected program with the next one.
In this way it is possible to obtain “profile” with 24, 36 or 48 steps.

B) Another reason is the possibility to use different time bases in the same “profile”.

C) When you link more programs you can start the execution from the desired one.

E.g.: To link Pr1 (pre-heat with 1 execution only), Pr2 (first part of a heat treatment with 4 executions) and Pr3 (second part of the heat treatment with 2 executions), you can:

I) RUN program 1; the instrument performs in sequence Pr1, Pr2 and Pr3; One time only.
II) RUN program 2; the instrument performs Pr2 and Pr3 Pr4 times before ending.
III) RUN program 3; the instrument will perform Pr3 2 times before ending.

In a realistic application example the pre-heat phase is important at power up only (aimed to reduces the thermal stress of the oven during start up). For this reason you can program Pr1 for start at power up (at power up the instrument

will perform all phases) and then all next treatments of the day will be made running Pr2 (with 1 execution only).

In the following example we create a profile using a Pre-heat of 4 segment and a treatment phase using 18 segments

Now we can built the profile proceeding as follows:

1. Select Page 1;
2. Select the Program 1;
3. Set the desired RUN type (P1.F = S.UP.S);
4. Set the first time base (P1.u = mm.SS);
5. Set the desired program end (e.g. P1.E = A.SP);
6. Set the desired execution number (P1 nE = 1);
7. Set the first 2 groups of parameters (2 ramps and 2 soaks).

Now, the pre-heat phase is finished.

8. End this phase by setting the next parameter (P1.S3) equal to OFF (P1.S3 = OFF)

The instrument will mask all parameters of the Pr1 after P1.S3 exception made for the parameter P1.c2 (program 1 continue on program 2.

9. Set P1.C2 equal to YES.
10. Select Pr2.
11. Enter in Pr2.
12. Set the specific RUN type (P2.F = U.diG).
13. Set the time base (P2.u = hh.nn).
14. Set the program end (P2.E = A.SP).
15. Set the execution number (P2 nE = 1).
16. Set the all segments (6 ramps and 6 soaks).
17. Set P2.C3 equal to YES (continue on Pr3).
18. Select Pr3.
19. Enter in Pr3;
20. Set the specific RUN type (e.g. P3.F = U.diG).
21. Set the time base (P3.u = hh.nn).
22. Set the desired program end (P3.E = A.SP).
23. Set the execution number (P3 nE = 1).
24. Set all necessary segments (3 ramps and 3 soaks).

Now, the treatment phases is finished.

25. End this phase by setting the next parameter (P3.S4) equal to OFF (P3.S4 = OFF).
26. Set P3.C4 equal to no (do NOT continue on Pr4).

Now you can set Page = 1, set Pr.n = 1 (Program 1), turn off the ovens and load it with the first set of objects to be treated during the next day.

The next day you can turn on the oven; the instrument will perform the pre-heat and the complete treatment of the material.

At the end of the treatment the oven operates according to P3.E setting (in our example it maintains the temperature set by SP).

Remove the material already treated.

Load a new set.

Set Pr.n =2 (Program 2)

Set [128] Pr.St = 1(RUN)

The instrument will perform only the complete treatment (Pr2 followed by Pr3) of the material.

7.3 How to Run a program

The Run program command can be submitted to the instrument sending: [128] Pr.St = 1 (run).

7.4 How to Hold a program

This function temporarily stops a running program by a manual action.

While the program is Hold, the Set Point update and time count are stopped and the instrument operates as a controller with fixed Set Point.

The HOLD mode may be activated sendig to the instrument: [128] Pr.St = 2 (HoLd).

7.4.1 Differences between HOLD and WAIT mode

Both functions temporarily stop a running program but the Hold function requires a manual action (when you want to start and to stop it) while the Wait function is an automatic function (and it can be start and stop automatically only).

The WAIT mode starts automatically when, during a soak, the measured value is out of the wait band programmed for it and it will be stopped when the measured value reaches the wait band.

When a program is in Hold, the decimal point of the LSD of the lower display flashes fast and the [128] Pr.St parameter shows `HoLd`.

When a program is in Wait, the decimal point of the LSD of the lower display will flash slow and the [128] Pr.St parameter shows `run`.

7.5 How to Abort/Reset a running program

To permanently stop a running profile, it is sufficient to set [128] Pr.St parameter 0 = rES;

Note: When a program is aborted, the instrument operates as follows:

- If the “Program end” (Px.E) has been programmed as A.SP or cnt, the instrument returns to Automatic mode using the SP selected by A.SP.
- If the “Program end” (Px.E) has been programmed as St.bY, the instrument returns to Stand by mode.

7.5.1 Manual mode during program execution

The manual mode HOLD the program execution.

When the instrument returns to the Auto mode, the program execution will automatically continue.

7.5.2 Stand-by mode during program execution

The Stand-by mode Aborts the program execution.

7.5.3 Program behaviour when a power OFF occurs during program execution

During program execution the instrument stores the segment currently in use and, by a 1 minute interval, it stores also the elapsed time of the soaks and the remaining repetition(s).

If a power down occurs during program execution, at the next power up the instrument is able to continue the program execution and make all remaining repetitions 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 elapsed time memorized.

In order to obtain this features, the “[95] dSPu - (Status of the instrument at power up”) parameter must be set to “AS.Pr”. If the “[95] dSPu” parameter is different than “AS.Pr” The memorization function is inhibited.

8.1 Proper use

Every possible use not described in this manual must be considered 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 coud 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 require 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.

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’s effects.

In the event of a faulty instrument, either within the period of warranty, or further to its expiry, please contact our sales department to obtain authorisation for sending the instrument to our company.

The faulty product must be shipped to 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.

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 and the instrument can show the `ouLd` (Out4 Overload) indication.

Appendix A

] inP GROUP - Main and auxiliary input configuration

no.	Param.	Description	Dec. Point	Values	Default
1	SEnS	Sensor selection (according to the HW)			
		Model C	0	J TC J (0 ÷ 1000°C/32 ÷ 1832°F), crAL TC K (0 ÷ 1370°C/32 ÷ 2498°F); S TC S (0 ÷ 1760°C/32 ÷ 3200°F); r TC R (0 ÷ 1760°C/32 ÷ 3200°F); t TC T (0 ÷ 400°C/32 ÷ 752°F); n TC N (0 ÷ 1000°C/32 ÷ 1832°F); ir.J Exergen IRS J (0 ÷ 1000°C/32 ÷ 1832°F); ir.cA Exergen IRS K (0 ÷ 1370°C/32 ÷ 2498°F); Pt1 RTD Pt 100 (-200 ÷ +850°C/-328 ÷ +1562°F); Pt10 RTD Pt 1000 (-200 ÷ +500°C/-328 ÷ +932°F); 0.60 0 ÷ 60 mV; 12.60 12 ÷ 60 mV; 0.20 0 ÷ 20 mA; 4.20 4 ÷ 20 mA; 0.5 0 ÷ 5 V; 1.5 1 ÷ 5 V, 0.10 0 ÷ 10 V; 2.10 2 ÷ 10 V.	J
		Model E		J TC J (0 ÷ 1000°C/32 ÷ 1832°F); crAL TC K (0 ÷ 1370°C/32 ÷ 2498°F); S TC S (0 ÷ 1760°C/32 ÷ 3200°F); r TC R (0 ÷ 1760°C/32 ÷ 3200°F); t TC T (0 ÷ 400°C/32 ÷ 752°F); n TC N (0 ÷ 1000°C/32 ÷ 1832°F); ir.J Exergen IRS J (0 ÷ 1000°C/32 ÷ 1832°F); ir.cA Exergen IRS K (0 ÷ 1370°C/32 ÷ 2498°F); Ptc PTC (-55 ÷ +150°C/-67 ÷ +302°F); ntc NTC (-50 ÷ +110°C/-58 ÷ +230°F); 0.60 0 ÷ 60 mV; 12.60 12 ÷ 60 mV; 0.20 0 ÷ 20 mA; 4.20 4 ÷ 20 mA; 0.5 0 ÷ 5 V; 1.5 1 ÷ 5 V, 0.10 0 ÷ 10 V; 2.10 2 ÷ 10 V.	
2	dp	Decimal Point Position (linear inputs)	0	0 ÷ 3	0
		Decimal Point Position (no linear inputs)		0/1	
3	SSc	Initial scale read-out for linear inputs	dp	-1999 ÷ 9999	0
4	FSc	Full Scale Readout for linear inputs	dp	-1999 ÷ 9999	1000
5	unit	Engineering unit		°C/°F	°C
6	Fil	Digital filter on the measured value	1	0 (= OFF)/0.1 ÷ 20.0 s	1.0
7	inE	Sensor error used to enable the safety output value		or Over range; ou Under range; our Over and under range.	our
8	oPE	Safety output value (% of the output)		-100 ÷ 100	0
9	IO4.F	I/O 4 function		on Output used as PWS for TX; out4 Output 4 (digital output 4); dG2c Digital input 2 driven by contact; dG2U Digital input 2 driven by voltage.	out4
10	diF1	Digital Input 1 function		oFF Not used; 1 Alarm reset; 2 Alarm acknowledge (ACK); 3 Hold of the measured value; 4 Stand by mode; 5 Manual mode; 6 Program RUN; 7 Program Reset; 8 Program Hold; 9 Program Run/Hold; 10 Program Run/Reset; 11 SP1 - SP2 selection; 12 SP1/SP2/SP3/SP4 binary selection; 13 RESERVED 14 Program 1/2 selection [staus] 15 Program 1/2/3/4 binary selection [transition]	oFF
11	diF2	Digital Input 2 function			oFF
12	di.A	Digital Inputs Action (DI2 only if configured)		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

] Out group

no.	Param.	Description	Dec. Point	Values	Default
13	o1t	Output 1 type (when Out1 is an analogue output)		0-20 0 ÷ 20 mA; 4-20 4 ÷ 20 mA; 0-10 0 ÷ 10 V; 2-10 2 ÷ 10 V.	0-20
14	o1F	Out1 function (when Out1 is a linear output)	0	NonE Output not used; H.rEG Heating output; c.rEG Cooling output; r.inP Measure retransmission; r.Err Error (sp - PV) retransmission; r.SP Set Point retransmission ; r.SEr Serial value retransmission.	H.reG
		Out1 function (when Out1 is a digital output)	0	NonE Output not used; H.rEG Heating output; c.rEG Cooling output; AL Alarm output; P.End Program end indicator; P.HLd Program hold indicator; P.uit Program wait indicator; P.run Program run indicator; P.Et1 Program Event 1; P.Et2 Program Event 2; or.bo Out-of-range or Burnout indicator; P.FAL Power failure indicator; bo.PF Out-of-range, Burnout and Power failure indicator; St.bY Stand by status indicator; diF.1 Out1 repeats the digital input 1 status; diF.2 Out1 repeats the digital input 2 status; on Out1 always ON.	
15	Ao1L	Initial scale value of the analog retransmission	dP	-1999 ÷ Ao1H	-1999
16	Ao1H	Full scale value of the analog retransmission	dP	Ao1L ÷ 9999	9999
17	o1AL	Alarms linked up with the Out1	0	0 ÷ 63: +1 Alarm 1; +2 Alarm 2; +4 Alarm 3; +8 Loop break alarm; +16 Sensor Break; +32 Overload on output 4.	AL1
18	o1Ac	Out1 action	0	dir Direct action; rEU Reverse action; dir.r Direct with reversed LED; ReU.r Reverse with reversed LED.	dir
19	o2F	Out2 function	0	NonE Output not used; H.rEG Heating output; c.rEG Cooling output; AL Alarm output; P.End Program end indicator; P.HLd Program hold indicator; P.uit Program wait indicator; P.run Program run indicator; P.Et1 Program Event 1; P.Et2 Program Event 2; or.bo Out-of-range or Burnout indicator; P.FAL Power failure indicator; bo.PF Out-of-range, Burnout and Power failure indicator; St.bY Stand by status indicator; diF.1 Out2 repeats the digital input 1 status; diF.2 Out2 repeats the digital input 2 status; on Out2 always ON.	AL
20	o2AL	Alarms linked up with the Out2	0	0 ÷ 63: +1 Alarm 1; +2 Alarm 2; +4 Alarm 3; +8 Loop break alarm; +16 Sensor Break; +32 Overload on output 4.	AL1
21	o2Ac	Out2 action	0	dir Direct action; rEU Reverse action; dir.r Direct with reversed LED; ReU.r Reverse with reversed LED.	dir

no.	Param.	Description	Dec. Point	Values	Default
22	o3F	Out3 function	0	NonE Output not used; H.rEG Heating output; c.rEG Cooling output; AL Alarm output; P.End Program end indicator; P.HLd Program hold indicator; P.uit Program wait indicator; P.run Program run indicator; P.Et1 Program Event 1; P.Et2 Program Event 2; or.bo Out-of-range or Burnout indicator; P.FAL Power failure indicator; bo.PF Out-of-range, Burnout and Power failure indicator; St.bY Stand by status indicator; diF.1 Out3 repeats the digital input 1 status; diF.2 Out3 repeats the digital input 2 status; on Out3 always ON.	AL
23	o3AL	Alarms linked up with the Out3	0	0 ÷ 63: +1 Alarm 1; +2 Alarm 2; +4 Alarm 3; +8 Loop break alarm; +16 Sensor Break; +32 Overload on output 4.	AL2
24	o3Ac	Out3 action	0	dir Direct action; rEU Reverse action; dir.r Direct with reversed LED; ReU.r Reverse with reversed LED.	dir
25	o4F	Out4 function	0	NonE Output not used; H.rEG Heating output; c.rEG Cooling output; AL Alarm output; P.End Program end indicator; P.HLd Program hold indicator; P.uit Program wait indicator; P.run Program run indicator; P.Et1 Program Event 1; P.Et2 Program Event 2; or.bo Out-of-range or Burnout indicator; P.FAL Power failure indicator; bo.PF Out-of-range, Burnout and Power failure indicator; St.bY Stand by status indicator.	AL
26	o4AL	Alarms linked up with the Out4	0	0 ÷ 63: +1 Alarm 1; +2 Alarm 2; +4 Alarm 3; +8 Loop break alarm; +16 Sensor Break; +32 Overload on output 4.	AL1 + AL2
27	o4Ac	Out4 action	0	dir Direct action; rEU Reverse action; dir.r Direct with reversed LED; ReU.r Reverse with reversed LED.	dir

] AL1 group

no.	Param.	Description	Dec. Point	Values	Default
28	AL1t	Alarm 1 type	0	nonE Alarm not used; LoAb Absolute low alarm; HiAb Absolute high alarm; LHAo Absolute band alarm, alarm ON outside the band; LHAi Absolute band alarm, alarm ON inside the band; SE.br Sensor Break; LodE Deviation low alarm (relative); HidE Deviation high alarm (relative); LHdo Relative band alarm, alarm ON outside the band; LHdi Relative band alarm, alarm ON inside the band.	HiAb
29	Ab1	Alarm 1 function	0	0 ÷ 15: +1 Not active at power up; +2 Latched alarm (manual reset); +4 Acknowledgeable alarm; +8 Relative alarm not active at Set Point change.	0

no.	Param.	Description	Dec. Point	Values	Default
30	AL1L	- For High and low alarms is the low limit of the AL1 threshold; - For band alarm is the AL1 low alarm threshold	dp	From -1999 to AL1H (E.U.)	-1999
31	AL1H	- For High and low alarms is the high limit of the AL1 threshold; - For band alarm is the AL1 high alarm threshold	dp	From AL1L to 9999 (E.U.)	9999
32	AL1	AL1 threshold	dp	From AL1L to AL1H (E.U.)	0
33	HAL1	AL1 hysteresis	dp	1 ÷ 9999 (E.U.)	1
34	AL1d	AL1 delay	0	From 0 (oFF) to 9999 (s)	oFF
35	AL1o	Alarm 1 enabling during Stand-by mode and out of range conditions	0	0 Alarm 1 disabled during Stand by and out of range; 1 Alarm 1 enabled in stand by mode; 2 Alarm 1 enabled in out of range condition; 3 Alarm 1 enabled in stand by mode and in overrange condition.	0

] AL2 group

no.	Param.	Description	Dec. Point	Values	Default
36	AL2t	Alarm 2 type	0	nonE Alarm not used; LoAb Absolute low alarm; HiAb Absolute high alarm; LHAo Absolute band alarm, alarm ON outside the band; LHAi Absolute band alarm, alarm ON inside the band; SE.br Sensor Break; LodE Deviation low alarm (relative); HidE Deviation high alarm (relative); LHdo Relative band alarm, alarm ON outside the band; LHdi Relative band alarm, alarm ON inside the band.	Loab
37	Ab2	Alarm 2 function	0	0 ÷ 15: +1 Not active at power up; +2 Latched alarm (manual reset); +4 Acknowledgeable alarm; +8 Relative alarm not active at Set Point change.	0
38	AL2L	- For High and low alarms is the low limit of the AL2 threshold; - For band alarm is the AL2 low alarm threshold	dp	From -1999 to AL2H (E.U.)	-1999
39	AL2H	- For High and low alarms is the high limit of the AL2 threshold; - For band alarm is the AL2 high alarm threshold	dp	From AL2L to 9999 (E.U.)	9999
40	AL2	AL2 threshold	dp	From AL2L to AL2H (E.U.)	0
41	HAL2	AL2 hysteresis	dp	1 ÷ 9999 (E.U.)	1
42	AL2d	AL2 delay	0	From 0 (oFF) to 9999 (s)	oFF
43	AL2o	Alarm 2 enabling during Stand-by mode and out of range conditions	0	0 Alarm 2 disabled during Stand by and out of range; 1 Alarm 2 enabled in stand by mode; 2 Alarm 3 enabled in out of range condition; 3 Alarm 3 enabled in stand by mode and in overrange condition.	0

] AL3 group

no.	Param.	Description	Dec. Point	Values	Default
44	AL3t	Alarm 3 type	0	nonE Alarm not used; LoAb Absolute low alarm; HiAb Absolute high alarm; LHAo Absolute band alarm, alarm ON outside the band; LHAi Absolute band alarm, alarm ON inside the band; SE.br Sensor Break; LodE Deviation low alarm (relative); HidE Deviation high alarm (relative); LHdo Relative band alarm, alarm ON outside the band; LHdi Relative band alarm, alarm ON inside the band.	nonE
45	Ab3	Alarm 3 function	0	0 ÷ 15: +1 Not active at power up; +2 Latched alarm (manual reset); +4 Acknowledgeable alarm; +8 Relative alarm not active at Set Point change.	0

no.	Param.	Description	Dec. Point	Values	Default
46	AL3L	- For High and low alarms is the low limit of the AL3 threshold; - For band alarm is the AL3 low alarm threshold	dp	From -1999 to AL3H (E.U.)	-1999
47	AL3H	- For High and low alarms is the high limit of the AL3 threshold; - For band alarm is the AL3 high alarm threshold	dp	From AL3L to 9999 (E.U.)	9999
48	AL3	AL3 threshold	dp	From AL3L to AL3H (E.U.)	0
49	HAL3	AL3 hysteresis	dp	1 ÷ 9999 (E.U.)	1
50	AL3d	AL3 delay	0	From 0 (oFF) to 9999 (s)	oFF
51	AL3o	Alarm 3 enabling during Stand-by mode and out of range conditions	0	0 Alarm 3 disabled during Stand by and out of range; 1 Alarm 3 enabled in stand by mode; 2 Alarm 3 enabled in out of range condition; 3 Alarm 3 enabled in stand by mode and in overrange condition.	0

] LBA group - Loop Break Alarm Parameters

no.	Param.	Description	Dec. Point	Values	Default
52	LbAt	LBA time	0	From 0 (oFF) to 9999 (s)	oFF
53	LbSt	Delta measure used by LBA during Soft start	dP	From 0 (oFF) to 9999 (E.U.)	10
54	LbAS	Delta measure used by LBA	dP	1 ÷ 9999 (E.U.)	20
55	LbcA	Condition for LBA enabling	0	uP Active when Pout = 100%; dn Active when Pout = -100%; both Active in both cases.	both

] rEG group - Control Parameters

no.	Param.	Description	Dec. Point	Values	Default
56	cont	Control type	0	Pid PID (heat and/or); On.FA ON/OFF asymmetric hysteresis; On.FS ON/OFF symmetric hysteresis; nr Heat/Cool ON/OFF control with neutral zone; 3Pt Servomotor control (available only when **Output 2** and **Output 3** have been ordered as "**M**").	Pid
57	Auto	Autotuning selection	0	-4 Oscillating auto-tune with automatic restart at power up and after Set Point change; -3 Oscillating auto-tune with manual start; -2 Oscillating -tune with automatic start at the first power up only; -1 Oscillating auto-tune with automatic restart at every power up; 0 Not used; 1 Fast auto tuning with automatic restart at every power up; 2 Fast auto-tune with automatic start the first power up only; 3 FAST auto-tune with manual start; 4 FAST auto-tune with automatic restart at power up and after Set Point change; 5 Evo-tune with automatic restart at every power up; 6 Evo-tune with automatic start the first power up only; 7 Evo-tune with manual start; 8 Evo-tune with automatic restart at power up and after a Set Point change.	7
58	tunE	Manual start of the Autotuning	0	oFF Not active; on Active.	oFF
59	HSEt	Hysteresis of the ON/OFF control	dP	0 ÷ 9999 (E.U.)	1
60	Pb	Proportional band	dP	1 ÷ 9999 (E.U.)	50
61	ti	Integral time	0	0 (oFF)/1 ÷ 9999 (s)/inF (integral time excluded)	200
62	td	Derivative time	0	0 (oFF)/1 ÷ 9999 (s)	50
63	Fuoc	Fuzzy overshoot control	2	0.00 ÷ 2.00	0.50
64	tcH	Heating output cycle time	1	0.1 ÷ 130.0 (s)	20.0
65	rcG	Power ratio between heating and cooling action	2	0.01 ÷ 99.99	1.00
66	tcc	Cooling output cycle time	1	0.1 ÷ 130.0 (s)	20.0
67	rS	Manual reset (Integral pre-load)	1	-100.0 ÷ +100.0 (%)	0.0
68	Str.t	Servomotor stroke time	0	5 ÷ 1000 (s)	60
69	db.S	Servomotor dead band	1	0.0 ÷ 10.0	0.5
70	od	Delay at power up	2	From 0.00 (oFF) to 99.59 (hh.mm)	oFF

no.	Param.	Description	Dec. Point	Values	Default
71	St.P	Maximum power output used during soft start	0	-100 ÷ 100 (%)	0
72	SSt	Soft start time	2	- 0.00 (oFF); - 0.01 ÷ 7.59 (hh.mm); - inF (always ON).	oFF
73	SS.tH	Threshold for soft start disabling	dP	-1999 ÷ +9999 (E.U.)	9999

] SP group - Set Point parameters

no.	Param.	Description	Dec. Point	Values	Default
74	nSP	Number of used Set Points	0	1 ÷ 4	1
75	SPLL	Minimum Set Point value	dP	From -1999 to SPHL	-1999
76	SPHL	Maximum Set Point value	dP	From SPLL to 9999	9999
77	SP	Set Point 1	dP	From SPLL to SPLH	0
78	SP 2	Set Point 2	dP	From SPLL to SPLH	0
79	SP 3	Set Point 3	dP	From SPLL to SPLH	0
80	SP 4	Set Point 4	dP	From SPLL to SPLH	0
81	A.SP	Selection of the active Set Point	0	From 1 (SP 1) to nSP	1
82	SP.rt	Remote Set Point type	0	RSP The value coming from serial link is used as remote Set Point; trin The value will be added to the local Set Point selected by A.SP and the sum becomes the operative Set Point; PErc The value will be scaled on the input range and this value will be used as remote SP.	trin
83	SPLr	Local/remote Set Point selection	0	Loc Local; rEn Remote.	Loc
84	SP.u	Rate of rise for **POSITIVE** Set Point change (ramp UP)	2	0.01 ÷ 99.99 Eng. units per minute/inF (ramp disabeld)	inF
85	SP.d	Rate of rise for **NEGATIVE** Set Point change (ramp DOWN)	2	0.01 ÷ 99.99 Eng. units per minute/inF (ramp disabeld)	inF

] PAn group - Operator HMI parameters

no.	Param.	Description	Dec. Point	Values	Default
86	RESERVED				
...	...				
91	RESERVED				
92	fiLd	Filter on the displayed value	1	oFF (filter disabled) 0.1 ÷ 20.0 (E.U.)	oFF
93	RESERVED				
94	dSPu	Instrument status at power ON		AS.Pr Starts in the same way it was prior to the power down; Auto Starts in Auto mode; oP.0 Starts in manual mode with a power output equal to zero; St.bY Starts in stand-by mode.	AS.Pr
95	oPr.E	Operative modes enabling		ALL All modes will be selectable by the next parameter; Au.oP Auto and manual (oPLo) mode only will be selectable by the next parameter; Au.Sb Auto and Stand-by modes only will be selectable by the next parameter.	ALL
96	oPEr	Operative mode selection		If oPr.E = ALL: - Auto = Auto mode; - oPLo = Manual mode; - St.bY = Stand by mode. If oPr.E = Au.oP: - Auto = Auto mode; - oPLo = Manual mode. If oPr.E = Au.Sb: - Auto = Auto mode; - St.bY = Stand by mode.	Auto

] Ser group - Serial link parameters

no.	Param.	Description	Dec. Point	Values	Default
97	Add	Instrument address		oFF; 1 ÷ 254.	1
98	bAud	baud rate		1200 1200 baud; 2400 2400 baud; 9600 9600 baud; 19.2 19200 baud; 38.4 38400 baud.	9600
99	trSP	Selection of the value to be retransmitted (Master)		nonE Retransmission not used (the instrument is a slave); rSP The instrument becomes a Master and retransmits the operative Set Point; PErc The instrument become a Master and it retransmits the power output.	nonE

] CAl group - User calibration parameters

no.	Param.	Description	Dec. Point	Values	Default
100	AL.P	Adjust Low Point		From -1999 to (AH.P - 10) in engineering units	0
101	AL.o	Adjust Low Offset		-300 ÷ +300 (E.U.)	0
102	AH.P	Adjust High Point		From (AL.P + 10) to 9999 (E.U.)	9999
103	AH.o	Adjust High Offset		-300 ÷ +300	0

Parameters between numbers 105 and 125 are reserved for factory use.

] PRG group - Programmer function parameters

no.	Param.	Description	Dec. Point	Values	Default
126	PAGE	Active program page election		1 ÷ 2	
127	Pr.n	Active program		1 ÷ 4	
128	Pr.St	Active program Status		rES Program reset; run Program Start; HoLd Program Hold; cnt Continue (read only).	

] Pr1 Group - Program 1

no.	Param.	Description	Dec. Point	Values	Default
129	P1.F	Program 1 - Action at power up	0	nonE Programmer not used; S.uP.d Start at power up with a first step in stand-by; S.uP.S Start at power up; u.diG Start at Run command detection only; u.dG.d Start at Run command with a first step in stand-by.	nonE
130	P1.u	Program 1 - Engineering unit of the soaks	2	hh.nn Hours and minutes; nn.SS Minutes and seconds.	hh.nn
131	P1.E	Program 1 - Instrument behaviour at the end of the program execution	0	cnt Continue; SPAt Go to the Set Point selected by A.SP; St.by Go to stand-by mode.	A.SP
132	P1.nE	Program 1 - Number of executions	0	1 ÷ 999 times/inF indefinitely	
133	P1.Et	Program 1 - Time of the end program indication	2	0.00 (oFF)/0.01 ÷ 99.59 nn.ss/inF (steady ON)	oFF
134	P1.S1	Program 1 - Set Point of the first soak	dP	From SPLL to SPHL	0
135	P1.G1	Program 1 - Gradient of the first ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
136	P1.t1	Program 1 - Time of the 1st soak	2	0.00 ÷ 99.59 time units	0.10
137	P1.b1	Program 1 - Wait band of the 1st soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
138	P1.E1	Program 1 - Events of the 1st group	2	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
139	P1.S2	Program 1 - Set Point of the 2nd soak	dP	OFF or from SPLL to SPHL	0
140	P1.G2	Program 1 - Gradient of the 2nd ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
141	P1.t2	Program 1 - Time of the 2nd soak	2	0.00 ÷ 99.59 time units	0.10
142	P1.b2	Program 1 - Wait band of the 2nd soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
143	P1.E2	Program 1 - Events of the 2nd group	2	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
144	P1.S3	Program 1 - Set Point of the 3rd soak	dP	OFF or from SPLL to SPHL	0
145	P1.G3	Program 1 - Gradient of the 3rd ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
146	P1.t3	Program 1 - Time of the 3rd soak	2	0.00 ÷ 99.59 time units	0.10

no.	Param.	Description	Dec. Point	Values	Default
147	P1.b3	Program 1 - Wait band of the 3rd soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
148	P1.E3	Program 1 - Events of the 3rd group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
149	P1.S4	Program 1 - Set Point of the 4th soak	dP	OFF or from SPLL to SPHL	0
150	P1.G4	Program 1 - Gradient of the 4th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
151	P1.t4	Program 1 - Time of the 4th soak	2	0.00 ÷ 99.59 time units	0.10
152	P1.b4	Program 1 - Wait band of the 4th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
153	P1.E4	Program 1 - Events of the 4th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
154	P1.S5	Program 1 - Set Point of the 5th soak	dP	OFF or from SPLL to SPHL	0
155	P1.G5	Program 1 - Gradient of the 5th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
156	P1.t5	Program 1 - Time of the 5th soak	2	0.00 ÷ 99.59 time units	0.10
157	P1.b5	Program 1 - Wait band of the 5th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
158	P1.E5	Program 1 - Events of the 5th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
159	P1.S6	Program 1 - Set Point of the 6th soak	dP	OFF or from SPLL to SPHL	0
160	P1.G6	Program 1 - Gradient of the 6th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
161	P1.t6	Program 1 - Time of the 6th soak	2	0.00 ÷ 99.59 time units	0.10
162	P1.b6	Program 1 - Wait band of the 6th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
163	P1.E6	Program 1 - Events of the 6th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
164	P1.c2	Program 1 - Continues on program 2	0	no Program 1 is ended; YES program 1 will continue on program 2.	

] Pr2 Group - Program 2

no.	Param.	Description	Dec. Point	Values	Default
165	P2.F	Program 2 - Action at power up	0	nonE Programmer not used; S.uP.d Start at power up with a first step in stand-by; S.uP.S Start at power up; u.diG Start at Run command detection only; u.dG.d Start at Run command with a first step in stand-by.	nonE
166	P2.u	Program 2 - Engineering unit of the soaks	2	hh.nn Hours and minutes; nn.SS Minutes and seconds.	hh.nn
167	P2.E	Program 2 - Instrument behaviour at the end of the program execution	0	cnt Continue; SPAt Go to the Set Point selected by A.SP; St.by Go to stand-by mode.	A.SP
168	P2.nE	Program 2 - Number of executions	0	1 ÷ 999 times/inF indefinitely	
169	P2.Et	Program 2 - Time of the end program indication	2	0.00 (oFF)/0.01 ÷ 99.59 nn.ss/inF (steady ON)	oFF
170	P2.S1	Program 2 - Set Point of the first soak	dP	From SPLL to SPHL	0
171	P2.G1	Program 2 - Gradient of the first ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
172	P2.t1	Program 2 - Time of the 1st soak	2	0.00 ÷ 99.59 time units	0.10
173	P2.b1	Program 2 - Wait band of the 1st soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
174	P2.E1	Program 2 - Events of the 1st group	2	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
175	P2.S2	Program 2 - Set Point of the 2nd soak	dP	OFF or from SPLL to SPHL	0
176	P2.G2	Program 2 - Gradient of the 2nd ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
177	P2.t2	Program 2 - Time of the 2nd soak	2	0.00 ÷ 99.59 time units	0.10
178	P2.b2	Program 2 - Wait band of the 2nd soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
179	P2.E2	Program 2 - Events of the 2nd group	2	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
180	P2.S3	Program 2 - Set Point of the 3rd soak	dP	OFF or from SPLL to SPHL	0
181	P2.G3	Program 2 - Gradient of the 3rd ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
182	P2.t3	Program 2 - Time of the 3rd soak	2	0.00 ÷ 99.59 time units	0.10
183	P2.b3	Program 2 - Wait band of the 3rd soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
184	P2.E3	Program 2 - Events of the 3rd group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
185	P2.S4	Program 2 - Set Point of the 4th soak	dP	OFF or from SPLL to SPHL	0
186	P2.G4	Program 2 - Gradient of the 4th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
187	P2.t4	Program 2 - Time of the 4th soak	2	0.00 ÷ 99.59 time units	0.10
188	P2.b4	Program 2 - Wait band of the 4th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
189	P2.E4	Program 2 - Events of the 4th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
190	P2.S5	Program 2 - Set Point of the 5th soak	dP	OFF or from SPLL to SPHL	0
191	P2.G5	Program 2 - Gradient of the 5th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
192	P2.t5	Program 2 - Time of the 5th soak	2	0.00 ÷ 99.59 time units	0.10
193	P2.b5	Program 2 - Wait band of the 5th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF

no.	Param.	Description	Dec. Point	Values	Default
194	P2.E5	Program 2 - Events of the 5th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
195	P2.S6	Program 2 - Set Point of the 6th soak	dP	OFF or from SPLL to SPHL	0
196	P2.G6	Program 2 - Gradient of the 6th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
197	P2.t6	Program 2 - Time of the 6th soak	2	0.00 ÷ 99.59 time units	0.10
198	P2.b6	Program 2 - Wait band of the 6th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
199	P2.E6	Program 2 - Events of the 6th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
200	P2.c3	Program 2 - Continues on program 3	0	no Program 2 is ended; YES Program 2 will continue on program 3.	

] Pr3 Group - Program 3

no.	Param.	Description	Dec. Point	Values	Default
201	P3.F	Program 3 - Action at power up	0	nonE Programmer not used; S.uP.d Start at power up with a first step in stand-by; S.uP.S Start at power up; u.diG Start at Run command detection only; u.dG.d Start at Run command with a first step in stand-by.	nonE
202	P3.u	Program 3 - Engineering unit of the soaks	2	hh.nn Hours and minutes; nn.SS Minutes and seconds.	hh.nn
203	P3.E	Program 3 - Instrument behaviour at the end of the program execution	0	cnt Continue; SPAt Go to the Set Point selected by A.SP; St.by Go to stand-by mode.	A.SP
204	P3.nE	Program 3 - Number of executions	0	1 ÷ 999 times/inF indefinitely	
205	P3.Et	Program 3 - Time of the end program indication	2	0.00 (oFF)/0.01 ÷ 99.59 nn.ss/inF (steady ON)	oFF
206	P3.S1	Program 3 - Set Point of the first soak	dP	From SPLL to SPHL	0
207	P3.G1	Program 3 - Gradient of the first ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
208	P3.t1	Program 3 - Time of the 1st soak	2	0.00 ÷ 99.59 time units	0.10
209	P3.b1	Program 3 - Wait band of the 1st soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
210	P3.E1	Program 3 - Events of the 1st group	2	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
211	P3.S2	Program 3 - Set Point of the 2nd soak	dP	OFF or from SPLL to SPHL	0
212	P3.G2	Program 3 - Gradient of the 2nd ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
213	P3.t2	Program 3 - Time of the 2nd soak	2	0.00 ÷ 99.59 time units	0.10
214	P3.b2	Program 3 - Wait band of the 2nd soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
215	P3.E2	Program 3 - Events of the 2nd group	2	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
216	P3.S3	Program 3 - Set Point of the 3rd soak	dP	OFF or from SPLL to SPHL	0
217	P3.G3	Program 3 - Gradient of the 3rd ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
218	P3.t3	Program 3 - Time of the 3rd soak	2	0.00 ÷ 99.59 time units	0.10
219	P3.b3	Program 3 - Wait band of the 3rd soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
220	P3.E3	Program 3 - Events of the 3rd group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
221	P3.S4	Program 3 - Set Point of the 4th soak	dP	OFF or from SPLL to SPHL	0
222	P3.G4	Program 3 - Gradient of the 4th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
223	P3.t4	Program 3 - Time of the 4th soak	2	0.00 ÷ 99.59 time units	0.10
224	P3.b4	Program 3 - Wait band of the 4th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
225	P3.E4	Program 3 - Events of the 4th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
226	P3.S5	Program 3 - Set Point of the 5th soak	dP	OFF or from SPLL to SPHL	0
227	P3.G5	Program 3 - Gradient of the 5th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
228	P3.t5	Program 3 - Time of the 5th soak	2	0.00 ÷ 99.59 time units	0.10
229	P3.b5	Program 3 - Wait band of the 5th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
230	P3.E5	Program 3 - Events of the 5th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
231	P3.S5	Program 3 - Set Point of the 6th soak	dP	OFF or from SPLL to SPHL	0
232	P3.G5	Program 3 - Gradient of the 6th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
233	P3.t5	Program 3 - Time of the 6th soak	2	0.00 ÷ 99.59 time units	0.10
234	P3.b5	Program 3 - Wait band of the 6th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
235	P3.E5	Program 3 - Events of the 6th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
236	P3.c4	Program 3 - Continues on program 4	0	no Program 3 is ended; YES Program 3 will continue on program 4.	

] Pr4 Group - Program 4

no.	Param.	Description	Dec. Point	Values	Default
237	P4.F	Program 4 - Action at power up	0	nonE Programmer not used; S.uP.d Start at power up with a first step in stand-by; S.uP.S Start at power up; u.diG Start at Run command detection only; u.dG.d Start at Run command with a first step in stand-by.	nonE
238	P4.u	Program 4 - Engineering unit of the soaks	2	hh.nn Hours and minutes; nn.SS Minutes and seconds.	hh.nn
239	P4.E	Program 4 - Instrument behaviour at the end of the program execution	0	cnt Continue; SPAt Go to the Set Point selected by A.SP; St.by Go to stand-by mode.	A.SP
240	P4.nE	Program 4 - Number of executions	0	1 ÷ 999 times/inF indefinitely	
241	P4.Et	Program 4 - Time of the end program indication	2	0.00 (oFF)/0.01 ÷ 99.59 nn.ss/inF (steady ON)	oFF
242	P4.S1	Program 4 - Set Point of the first soak	dP	From SPLL to SPHL	0
243	P4.G1	Program 4 - Gradient of the first ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
244	P4.t1	Program 4 - Time of the 1st soak	2	0.00 ÷ 99.59 time units	0.10
245	P4.b1	Program 4 - Wait band of the 1st soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
246	P4.E1	Program 4 - Events of the 1st group	2	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
247	P4.S2	Program 4 - Set Point of the 2nd soak	dP	OFF or from SPLL to SPHL	0
248	P4.G2	Program 4 - Gradient of the 2nd ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
249	P4.t2	Program 4 - Time of the 2nd soak	2	0.00 ÷ 99.59 time units	0.10
250	P4.b2	Program 4 - Wait band of the 2nd soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
251	P4.E2	Program 4 - Events of the 2nd group	2	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
252	P4.S3	Program 4 - Set Point of the 3rd soak	dP	OFF or from SPLL to SPHL	0
253	P4.G3	Program 4 - Gradient of the 3rd ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
254	P4.t3	Program 4 - Time of the 3rd soak	2	0.00 ÷ 99.59 time units	0.10
255	P4.b3	Program 4 - Wait band of the 3rd soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
256	P4.E3	Program 4 - Events of the 3rd group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
257	P4.S4	Program 4 - Set Point of the 4th soak	dP	OFF or from SPLL to SPHL	0
258	P4.G4	Program 4 - Gradient of the 4th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
259	P4.t4	Program 4 - Time of the 4th soak	2	0.00 ÷ 99.59 time units	0.10
260	P4.b4	Program 4 - Wait band of the 4th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
261	P4.E4	Program 4 - Events of the 4th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
262	P4.S5	Program 4 - Set Point of the 5th soak	dP	OFF or from SPLL to SPHL	0
263	P4.G4	Program 4 - Gradient of the 5th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
264	P4.t5	Program 4 - Time of the 5th soak	2	0.00 ÷ 99.59 time units	0.10
265	P4.b5	Program 4 - Wait band of the 5th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
266	P4.E5	Program 4 - Events of the 5th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
267	P4.S6	Program 4 - Set Point of the 6th soak	dP	OFF or from SPLL to SPHL	0
268	P4.G6	Program 4 - Gradient of the 6th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
269	P4.t6	Program 4 - Time of the 6th soak	2	0.00 ÷ 99.59 time units	0.10
270	P4.b6	Program 4 - Wait band of the 6th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
271	P4.E6	Program 4 - Events of the 6th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00

] Pr5 Group - Program 5

no.	Param.	Description	Dec. Point	Values	Default
272	P5.F	Program 5 - Action at power up	0	nonE Programmer not used; S.uP.d Start at power up with a first step in stand-by; S.uP.S Start at power up; u.diG Start at Run command detection only; u.dG.d Start at Run command with a first step in stand-by.	nonE
273	P5.u	Program 5 - Engineering unit of the soaks	2	hh.nn Hours and minutes; nn.SS Minutes and seconds.	hh.nn
274	P5.E	Program 5 - Instrument behaviour at the end of the program execution	0	cnt Continue; SPAt Go to the Set Point selected by A.SP; St.by Go to stand-by mode.	A.SP
275	P5.nE	Program 5 - Number of executions	0	1 ÷ 999 times/inF indefinitely	
276	P5.Et	Program 5 - Time of the end program indication	2	0.00 (oFF)/0.01 ÷ 99.59 nn.ss/inF (steady ON)	oFF
277	P5.S1	Program 5 - Set Point of the first soak	dP	From SPLL to SPHL	0

no.	Param.	Description	Dec. Point	Values	Default
278	P5.G1	Program 5 - Gradient of the first ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
279	P5.t1	Program 5 - Time of the 1st soak	2	0.00 ÷ 99.59 time units	0.10
280	P5.b1	Program 5 - Wait band of the 1st soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
281	P5.E1	Program 5 - Events of the 1st group	2	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
282	P5.S2	Program 5 - Set Point of the 2nd soak	dP	OFF or from SPLL to SPHL	0
283	P5.G2	Program 5 - Gradient of the 2nd ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
284	P5.t2	Program 5 - Time of the 2nd soak	2	0.00 ÷ 99.59 time units	0.10
285	P5.b2	Program 5 - Wait band of the 2nd soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
286	P5.E2	Program 5 - Events of the 2nd group	2	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
287	P5.S3	Program 5 - Set Point of the 3rd soak	dP	OFF or from SPLL to SPHL	0
288	P5.G3	Program 5 - Gradient of the 3rd ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
289	P5.t3	Program 5 - Time of the 3rd soak	2	0.00 ÷ 99.59 time units	0.10
290	P5.b3	Program 5 - Wait band of the 3rd soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
291	P5.E3	Program 5 - Events of the 3rd group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
292	P5.S4	Program 5 - Set Point of the 4th soak	dP	OFF or from SPLL to SPHL	0
293	P5.G4	Program 5 - Gradient of the 4th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
294	P5.t4	Program 5 - Time of the 4th soak	2	0.00 ÷ 99.59 time units	0.10
295	P5.b4	Program 5 - Wait band of the 4th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
296	P5.E4	Program 5 - Events of the 4th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
297	P5.S5	Program 5 - Set Point of the 5th soak	dP	OFF or from SPLL to SPHL	0
298	P5.G5	Program 5 - Gradient of the 5th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
299	P5.t5	Program 5 - Time of the 5th soak	2	0.00 ÷ 99.59 time units	0.10
300	P5.b5	Program 5 - Wait band of the 5th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
301	P5.E5	Program 5 - Events of the 5th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
302	P5.S6	Program 5 - Set Point of the 6th soak	dP	OFF or from SPLL to SPHL	0
303	P5.G6	Program 5 - Gradient of the 6th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
304	P5.t6	Program 5 - Time of the 6th soak	2	0.00 ÷ 99.59 time units	0.10
305	P5.b6	Program 5 - Wait band of the 6th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
306	P5.E6	Program 5 - Events of the 6th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
307	P5.c6	Program 5 - Continues on program 6	0	no Program 5 is ended; YES Program 5 will continue on program 6.	

] Pr6 Group - Program 6

no.	Param.	Description	Dec. Point	Values	Default
308	P6.F	Program 6 - Action at power up	0	nonE Programmer not used; S.uP.d Start at power up with a first step in stand-by; S.uP.S Start at power up; u.diG Start at Run command detection only; u.dG.d Start at Run command with a first step in stand-by.	nonE
309	P6.u	Program 6 - Engineering unit of the soaks	2	hh.nn Hours and minutes; nn.SS Minutes and seconds.	hh.nn
310	P6.E	Program 6 - Instrument behaviour at the end of the program execution	0	cnt Continue; SPAt Go to the Set Point selected by A.SP; St.by Go to stand-by mode.	A.SP
311	P6.nE	Program 6 - Number of executions	0	1 ÷ 999 times/inF indefinitely	
312	P6.Et	Program 6 - Time of the end program indication	2	0.00 (oFF)/0.01 ÷ 99.59 nn.ss/inF (steady ON)	oFF
313	P6.S1	Program 6 - Set Point of the first soak	dP	From SPLL to SPHL	0
314	P6.G1	Program 6 - Gradient of the first ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
315	P6.t1	Program 6 - Time of the 1st soak	2	0.00 ÷ 99.59 time units	0.10
316	P6.b1	Program 6 - Wait band of the 1st soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
317	P6.E1	Program 6 - Events of the 1st group	2	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
318	P6.S2	Program 6 - Set Point of the 2nd soak	dP	OFF or from SPLL to SPHL	0
319	P6.G2	Program 6 - Gradient of the 2nd ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
320	P6.t2	Program 6 - Time of the 2nd soak	2	0.00 ÷ 99.59 time units	0.10
321	P6.b2	Program 6 - Wait band of the 2nd soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
322	P6.E2	Program 6 - Events of the 2nd group	2	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
323	P6.S	Program 6 - Set Point of the 3rd soak	dP	OFF or from SPLL to SPHL	0
324	P6.G3	Program 6 - Gradient of the 3rd ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF

no.	Param.	Description	Dec. Point	Values	Default
325	P6.t3	Program 6 - Time of the 3rd soak	2	0.00 ÷ 99.59 time units	0.10
326	P6.b3	Program 6 - Wait band of the 3rd soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
327	P6.E3	Program 6 - Events of the 3rd group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
328	P6.S4	Program 6 - Set Point of the 4th soak	dP	OFF or from SPLL to SPHL	0
329	P6.G4	Program 6 - Gradient of the 4th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
330	P6.t4	Program 6 - Time of the 4th soak	2	0.00 ÷ 99.59 time units	0.10
331	P6.b4	Program 6 - Wait band of the 4th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
332	P6.E4	Program 6 - Events of the 4th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
333	P6.S5	Program 6 - Set Point of the 5th soak	dP	OFF or from SPLL to SPHL	0
334	P6.G5	Program 6 - Gradient of the 5th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
335	P6.t5	Program 6 - Time of the 5th soak	2	0.00 ÷ 99.59 time units	0.10
336	P6.b5	Program 6 - Wait band of the 5th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
337	P6.E5	Program 6 - Events of the 5th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
338	P6.S6	Program 6 - Set Point of the 6th soak	dP	OFF or from SPLL to SPHL	0
339	P6.G6	Program 6 - Gradient of the 6th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
340	P6.t6	Program 6 - Time of the 6th soak	2	0.00 ÷ 99.59 time units	0.10
341	P6.b6	Program 6 - Wait band of the 6th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
342	P6.E6	Program 6 - Events of the 6th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
343	P6.c3	Program 6 - Continues on program 7	0	no Program 6 is ended; YES Program 6 will continue on program 7.	

Pr7 Group - Program 7

no.	Param.	Description	Dec. Point	Values	Default
344	P7.F	Program 7 - Action at power up	0	nonE Programmer not used; S.uP.d Start at power up with a first step in stand-by; S.uP.S Start at power up; u.diG Start at Run command detection only; u.dG.d Start at Run command with a first step in stand-by.	nonE
345	P7.u	Program 7 - Engineering unit of the soaks	2	hh.nn Hours and minutes; nn.SS Minutes and seconds.	hh.nn
346	P7.E	Program 7 - Instrument behaviour at the end of the program execution	0	cnt Continue; SPAt Go to the Set Point selected by A.SP; St.by Go to stand-by mode.	A.SP
347	P7.nE	Program 7 - Number of executions	0	1 ÷ 999 times/inF indefinitely	
348	P7.Et	Program 7 - Time of the end program indication	2	0.00 (oFF)/0.01 ÷ 99.59 nn.ss/inF (steady ON)	oFF
349	P7.S1	Program 7 - Set Point of the first soak	dP	From SPLL to SPHL	0
350	P7.G1	Program 7 - Gradient of the first ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
351	P7.t1	Program 7 - Time of the 1st soak	2	0.00 ÷ 99.59 time units	0.10
352	P7.b1	Program 7 - Wait band of the 1st soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
353	P7.E1	Program 7 - Events of the 1st group	2	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
354	P7.S2	Program 7 - Set Point of the 2nd soak	dP	OFF or from SPLL to SPHL	0
355	P7.G2	Program 7 - Gradient of the 2nd ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
356	P7.t2	Program 7 - Time of the 2nd soak	2	0.00 ÷ 99.59 time units	0.10
357	P7.b2	Program 7 - Wait band of the 2nd soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
358	P7.E2	Program 7 - Events of the 2nd group	2	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
359	P7.S3	Program 7 - Set Point of the 3rd soak	dP	OFF or from SPLL to SPHL	0
360	P7.G3	Program 7 - Gradient of the 3rd ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
361	P7.t3	Program 7 - Time of the 3rd soak	2	0.00 ÷ 99.59 time units	0.10
362	P7.b3	Program 7 - Wait band of the 3rd soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
363	P7.E3	Program 7 - Events of the 3rd group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
364	P7.S4	Program 7 - Set Point of the 4th soak	dP	OFF or from SPLL to SPHL	0
365	P7.G4	Program 7 - Gradient of the 4th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
366	P7.t4	Program 7 - Time of the 4th soak	2	0.00 ÷ 99.59 time units	0.10
367	P7.b4	Program 7 - Wait band of the 4th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
368	P7.E4	Program 7 - Events of the 4th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
369	P7.S5	Program 7 - Set Point of the 5th soak	dP	OFF or from SPLL to SPHL	0
370	P7.G5	Program 7 - Gradient of the 5th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
371	P7.t5	Program 7 - Time of the 5th soak	2	0.00 ÷ 99.59 time units	0.10

no.	Param.	Description	Dec. Point	Values	Default
372	P7.b5	Program 7 - Wait band of the 5th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
373	P7.E5	Program 7 - Events of the 5th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
374	P7.S6	Program 7 - Set Point of the 6th soak	dP	OFF or from SPLL to SPHL	0
375	P7.G6	Program 7 - Gradient of the 6th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
376	P7.t6	Program 7 - Time of the 6th soak	2	0.00 ÷ 99.59 time units	0.10
377	P7.b6	Program 7 - Wait band of the 6th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
378	P7.E6	Program 7 - Events of the 6th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
379	P7.c3	Program 7 - Continues on program 8	0	no Program 7 is ended; YES Program 7 will continue on program 8.	

] Pr8 Group - Program 8

no.	Param.	Description	Dec. Point	Values	Default
380	P8.F	Program 8 - Action at power up	0	nonE Programmer not used; S.uP.d Start at power up with a first step in stand-by; S.uP.S Start at power up; u.diG Start at Run command detection only; u.dG.d Start at Run command with a first step in stand-by.	nonE
381	P8.u	Program 8 - Engineering unit of the soaks	2	hh.nn Hours and minutes; nn.SS Minutes and seconds.	hh.nn
382	P8.E	Program 8 - Instrument behaviour at the end of the program execution	0	cnt Continue; SPAt Go to the Set Point selected by A.SP; St.by Go to stand-by mode.	A.SP
383	P8.nE	Program 8 - Number of executions	0	1 ÷ 999 times/inF indefinitely	
384	P8.Et	Program 8 - Time of the end program indication	2	0.00 (oFF)/0.01 ÷ 99.59 nn.ss/inF (steady ON)	oFF
385	P8.S1	Program 8 - Set Point of the first soak	dP	From SPLL to SPHL	0
386	P8.G1	Program 8 - Gradient of the first ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
387	P8.t1	Program 8 - Time of the 1st soak	2	0.00 ÷ 99.59 time units	0.10
388	P8.b1	Program 8 - Wait band of the 1st soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
389	P8.E1	Program 8 - Events of the 1st group	2	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
390	P8.S2	Program 8 - Set Point of the 2nd soak	dP	OFF or from SPLL to SPHL	0
391	P8.G2	Program 8 - Gradient of the 2nd ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
392	P8.t2	Program 8 - Time of the 2nd soak	2	0.00 ÷ 99.59 time units	0.10
393	P8.b2	Program 8 - Wait band of the 2nd soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
394	P8.E2	Program 8 - Events of the 2nd group	2	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
395	P8.S3	Program 8 - Set Point of the 3rd soak	dP	OFF or from SPLL to SPHL	0
396	P8.G3	Program 8 - Gradient of the 3rd ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
397	P8.t3	Program 8 - Time of the 3rd soak	2	0.00 ÷ 99.59 time units	0.10
398	P8.b3	Program 8 - Wait band of the 3rd soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
399	P8.E3	Program 8 - Events of the 3rd group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
400	P8.S4	Program 8 - Set Point of the 4th soak	dP	OFF or from SPLL to SPHL	0
401	P8.G4	Program 8 - Gradient of the 4th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
402	P8.t4	Program 8 - Time of the 4th soak	2	0.00 ÷ 99.59 time units	0.10
403	P8.b4	Program 8 - Wait band of the 4th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
404	P8.E4	Program 8 - Events of the 4th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
405	P8.S5	Program 8 - Set Point of the 5th soak	dP	OFF or from SPLL to SPHL	0
406	P8.G5	Program 8 - Gradient of the 5th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
407	P8.t5	Program 8 - Time of the 5th soak	2	0.00 ÷ 99.59 time units	0.10
408	P8.b5	Program 8 - Wait band of the 5th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
409	P8.E5	Program 8 - Events of the 5th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00
410	P8.S6	Program 8 - Set Point of the 6th soak	dP	OFF or from SPLL to SPHL	0
411	P8.G6	Program 8 - Gradient of the 6th ramp	1	0.1 ÷ 999.9 (E.U./minute)/inF= Step transfer	inF
412	P8.t6	Program 8 - Time of the 6th soak	2	0.00 ÷ 99.59 time units	0.10
413	P8.b6	Program 8 - Wait band of the 6th soak	dP	From 0 (oFF) to 9999 (E.U.)	oFF
414	P8.E6	Program 8 - Events of the 6th group	0	00.00 ÷ 11.11 (0 = event OFF; 1 = event ON)	00.00

Appendix B

B. COMMUNICATION PROTOCOL

B.1 Preface

Ascon Tecnologic uses ModBUS® RTU communication protocol.

It is a royalty free protocol that is easy to be implemented.

For ModBus RTU a vast literature is available (also in internet).

The ModBus protocol represents the data in hexadecimal format.

All the communication strings end with a CRC type check sum (CRC = Cyclic Redundancy Check).

Each device connected to a line must have a unique address.

The protocol allows one master only and up to 255 slaves.

Only the Master unit can start the transmission by sending the address of the unit and the command to execute. Only the unit that has the specified address, answers to the master.

The transmission characteristics are usually programmable:

Device address: From 1 to 255;

baud rate: bit per second.

Byte format:
- 1 start bit;
- 8 data bitis;
- 2 final bits composed as follows:
  - 1 parity bit (even or odd);
  - 1 stop bit;

or

  - no parity bit;
  - 2 stop bits.

The instrument allows to configure:

– address (1 – 254);

– Baud rate (1200 – 2400 – 9600 – 19200 – 38400).

The byte format is fixed: 8 bits without parity and 1 stop bit.

This document is intended to describe the KRD50 controllers using the MODBUS protocol in their communication capability and is mainly directed to technicians, system integrators and software developers.

B.2 Physical connection

B.2.1 Interface

Kube series controllers are provided with a RS485 serial communication interface, insulated so that any problem arising from ground potential is removed.

While at rest, the instruments are in a receive condition and are revert to transmission after a correct message has been decoded that matches the configured address.

B.2.2 Line

The instruments are equipped with 2 terminals named A and B.

The connection between Kube s has to be carried on in parallel, i.e. all A terminals have to be connected between them so as B terminals.

A termination resistor of 120Θ is required to maintain the quiescent condition on the line.

Adopted baud rates range 1200 ÷ 38400 baud, that is very satisfactory for application performances, yet very slow for RS485 interface. This fact allows the wiring of the line with a medium quality twisted pair cable: total capacity of the line should not exceed 200 nF.

The line can be up to 1000 meters in length.

B.3 Communication protocol

The protocol adopted by instrument is a subset of the widely used MODBUS RTU (JBUS, AEG Schneider Automation, Inc. registered trademark) protocol, so that connections are easy for many commercial PLCs and supervisory programs.

For users needing to develop their own communications software, all information is available as well as implementation hints.

The MODBUS RTU (JBUS) communication functions implemented in Kube series are:

Function 3 Read n register;
Function 6 Preset one register;
Function 16 Preset multiple registers.

These functions allow the supervisory program to read and modify any data of the controller. The communication is based on messages sent by the master station (host) to the slave stations (KRD50) and viceversa. The slave station that recognises the message as sent to it, analyses the content and, if it is formally and semantically correct, generates a reply message directed back to the master.

The communication process involves five types of messages:

From master to slave	From slave to master
Function 3: read n registers request	Function 3: read n registers reply
Function 6: preset one register request	Function 6: preset one register reply
Function 16: preset multiple registers request	Function 16: preset multiple registers reply
	Exception reply (as reply to all functions in abnormal conditions)

Every a message contains four fields:

- ◊ Slave address (from 1 to 255): MODBUS RTU (JBUS) reserves address 0 for broadcasting messages and it is implemented in the Kube series;
- ◊ Function code: contains 3, 6 or 16 for specified functions;
- ◊ Information field: contains data like word address and word value as required by the function in use;
- ◊ Control word: a cyclic redundancy check (CRC) performed with particular rules for CRC16.

The characteristics of the asyncronous transmission are 8 bits, no parity, one stop bit.

B.3.1 Function code 3: read multiple registers (maximum 16 registers)

This function code is used by the master to read a group of sequential registers present in the slave.

Master request	
Data	Byte
Slave address (1 ÷ 255)	1
Function code (3)	1
First register address (MSB = Most Significant Byte)	1
First register address (LSB = less Significant Byte)	1
Number of requested registers (MSB)	1
Number of requested registers (LSB)	1
CRC-16 (LSB)	1
CRC-16 (MSB)	1

Slave reply	
Data	Byte
Slave address (1 ÷ 255)	1
Function code (3)	1
Byte number (n)	1
Data	n
CRC-16 (LSB)	1
CRC-16 (MSB)	1

In the “Data” field the values of the requested registers are presented in word format [2 bytes]: the first byte represent the MSB (Most Significant Byte) while the second byte represent the LSB (Less Significant Byte). This mode will be the same for all requested locations.

Example: The master requires to address 1 slave device the value of locations 25 and 26 (0x19 and 0x1A).

Master request	
Data	Byte (Hex)
Slave address	01
Function code (3 = read)	03
First register address (MSB)	00
First register address (LSB)	19
Number of requested registers (MSB)	00
Number of requested registers (LSB)	02
CRC-16 (LSB)	15
CRC-16 (MSB)	CC

Slave reply	
Data	Byte (Hex)
Slave address	01
Function code (3 = read)	03
Byte number	04
Value of the first register (MSB)	00
Value of the first register (LSB)	0A
Value of the second register (MSB)	00
Value of the second register (LSB)	14
CRC-16 (LSB)	DA
CRC-16 (MSB)	3E

The slave replay means: The value of the location 25 = 10 (0x000A hexadecimal)
The value of the location 26 = 20 (0x0014 hexadecimal)

B.3.2 Function code 6: write a single word (one location)

Master request	
Data	Byte (Hex)
Slave address	01
Function code (6)	06
Register address (MSB)	03
Register address (LSB)	02
Value to write (MSB)	00
Value to write (LSB)	0A
CRC-16 (MSB)	A8
CRC-16 (LSB)	49

Slave reply	
Data	Byte (Hex)
Slave address (1-255)	1
Function code (6)	1
Register address (MSB)	1
Register address (LSB)	1
Written value (MSB)	1
Written value (LSB)	1
CRC-16 (MSB)	1
CRC-16 (LSB)	1

Example:The master unit asks to the slave 1 to write in the memory location 770 (0x302) the value 10 (0x0A).

Master request	
Data	Byte (Hex)
Slave address	01
Function code (6)	06
Register address (MSB)	03
Register address (LSB)	02
Value to write (MSB)	00
Value to write (LSB)	0A
CRC-16 (MSB)	A8
CRC-16 (LSB)	49

Slave reply	
Data	Byte (Hex)
Slave address	01
Function code (6)	06
Register address (MSB)	03
Register address (LSB)	02
Written value (MSB)	00
Written value (LSB)	0A
CRC-16 (MSB)	A8
CRC-16 (LSB)	49

B.3.3 Function code 16: preset multiple registers (maximum 16 registers)

This function code allows to preset 16 registers at a time.

Master request	
Data	Byte (Hex)
Slave address (1-254)	1
Function code (16)	1
First register address (MSB)	1
First register address (LSB)	1
Number of requested registers (MSB)	1
Number of requested registers (LSB)	1
Byte count	1
Values	n
CRC-16 (LSB)	1
CRC-16 (MSB)	1

Slave reply	
Data	Byte (Hex)
Slave address (1-254)	1
Function code (16)	1
First register address (MSB)	1
First register address (LSB)	1
Number of written registers (MSB)	1
Number of written registers (LSB)	1
CRC-16 (LSB)	1
CRC-16 (MSB)	1

Example: The master unit requires to the slave 1 to write in the registers 10314 (0x284A) and 10315 (0x284B) the values 100 (0x64) and 200 (oxC8)

Master request	
Data	Byte (Hex)
Slave address	01
Function code (16)	10
First register address (MSB)	28
First register address (LSB)	4A
Number of requested registers (MSB)	00
Number of requested registers (LSB)	02
Byte count	4
Value 1 (MSB)	00
Value 1 (LSB)	64
Value 2 (MSB)	00
Value 2 ((LSB)	C8
CRC-16 (LSB)	C9
CRC-16 (MSB)	A8

Slave reply	
Data	Byte (Hex)
Slave address	01
Function code (16)	10
First register address (MSB)	28
First register address (LSB)	4A
Number of written registers (MSB)	00
Number of written registers (LSB)	02
CRC-16 (LSB)	69
CRC-16 (MSB)	BE

B.3.4 The exception reply

Kube instruments reply with an exception when the request is formally correct, but cannot be satisfied standing particular situations; the reply contains a code indicating the cause of the missing regular reply, the frame is:

Exception replay	
Data	Byte (Hex)
Slave address	1
Function code	1
Error code	1
CRC-16 (LSB)	1
CRC-16 (MSB)	1

Kube series adopts a subset of MODBUS RTU (JBUS) exception code:

– unknown function code 1
– invalid memory address 2
– invalid data field 3
– controller not ready 6

B.3.5 Cyclic redundancy check (CRC)

CRC is a check word that permits to verify the integrity of a message.

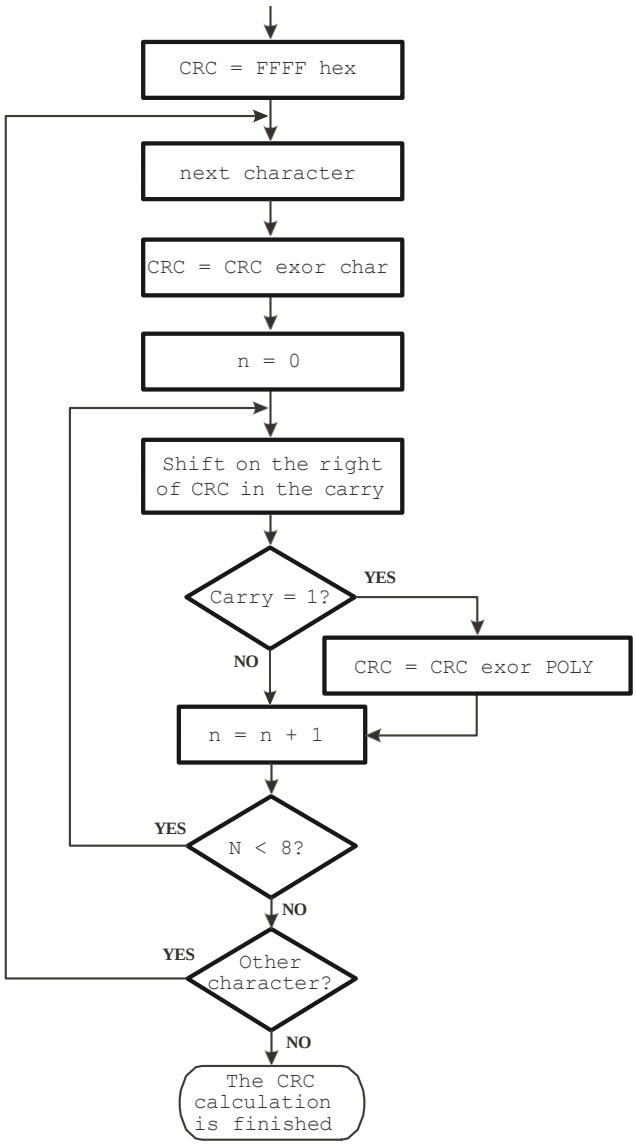
Every message, sent or received, has in the two last characters the CRC check word.

After receiving a request, the controller checks the validity of the received message comparing the received CRC with the calculated one.

When a reply is ready the controller calculates the CRC word and adds two characters to the prepared message.

CRC calculation is performed on every character of the message, excluding the last two.

Being MODBUS RTU (JBUS) compatible, Kube series controllers adopt an identical algorithm for CRC calculation, sketched in following diagram:



The polinomial adopted by MODBUS RTU (JBUS) is 1010 0000 0000 0001.

Note: The first transmitted character of the CRC word is the least significant between calculated bytes.

Follows a “C” language subrutine that calculates the CRC-16.

```
/* ------------------------------------------------------------------------------------------
crc_16      CRC-16 calculation

Input:
      buffer:     character string on which CRC is calculated
      length:     string length in bytes

Output:     crc_16
------------------------------------------------------------------------------------------ */
unsigned int crc_16 (unsigned char *buffer, unsigned int length)
{
      unsigned int i, j, temp_bit, temp_int, crc;
      crc = 0xFFFF;
      for (i = 0; i < length; i++ ){
            temp_int = (unsigned char) *buffer++;
            crc ^= temp_int;
            for ( j = 0; j < 8; j++ ) {
                  temp_bit = crc & 0x0001;
                  crc >>= 1;
                  if ( temp_bit != 0 )
                        crc ^= 0xA001;
            }
      }
      return (crc);
}
```

Note: All numerical values in the format 0x... are expressed in hexadecimal format.

B.4 Data exchange

This section contains information about data exchanged with Kube series controllers concerning numerical and not numerical data, with their formats and limits.

B.4.1 Some definitions

All exchanged data are in the form of 16 bit words.

Two types of data are distinguished: numerical and symbolic (or not numerical).

Numerical data represents the value of a quantity (e.g. the measured variable, the set point).

Symbolic data represents a particular value in a set of values (e.g. the thermocouple type in the set of available ones: J, K, S ...).

Both types are coded as integers number : signed numbers for numerical and unsigned numbers for symbolic.

A numerical data, coded as an integer, is coupled with appropriate number of decimal digits to represent a quantity with the same engineering units adopted aboard the instrument.

Numerical data are in fixed point representation; however we make a distinction between two kinds of data:

◊ The first kind has determined and unmodifiable decimal point position;

◊ The second has programmable decimal point position (dP parameter).

B.4.2 Memory zones

All readable and writable data appear to be allocated as 16 bit words in the memory of the instrument.

The memory map has three zones:

◊ Varaibles,

◊ Parameters,

◊ Instrument identification code.

Following parameters explore the characteristics of each zone.

B.4.3 Variables zones

In this zone there is a collection of main Kube controller variables, it is a group of frequently computed or updated data residing in volatile memory.

B.4.4 Most important changes

A) During parameter modification ***by push-button***, the serial interface continue to operate without any “limit” (you can see by serial link the value of all parameters and you can set it also).

B) When you write a value in a location the instrument will operate as follows:

B.1) If you write a value within parameter range, the instrument will accept it; the new value will be memorized and the instrument will send back the standard answer.

B.2) If you try to write a value OUT of parameter range, the instrument will refuse the new value; the new value will NOT be registered and the instrument will send an exception message to the master.

B.5 Address map

All Kube instruments use only words:

Initial address		Final address		Meaning
Hex	Dec	Hex	Dec	
1	1	1D	29	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	31B	795	Configuration parameters: Numeric and symolic values. Available in read and write operations
2800	10240	289B	10395	Repetition of the configuration parameters: Numeric and symbolic values. Available in read and write operations

B.5.1 Common Variables

no.	Address		Description	Dec. Point	r/w
	Hex.	Dec.			
0A	0	0	Broadcast enabling 0x44BB = broadcast enabled 0x55AA = broadcast disabled	0	w
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		r
2A	2	2	Number of decimal figures 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 operate 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 feilure indicator bit 11 = Generic error bit 12 = Overload alarm bit 13 ÷15 = reserved	0	r
11A	B	11	Outputs status (physical outputs) bit 0 = Output 1 status bit 1 = Output 2 status bit 3 = Output 3 status bit 4 = Output 4 status bit 5÷15 = Reserved When a linear output is driven by serial link, the relative bit will remain equal to 0.	0	r

no.	Address		Description	Dec. Point	r/w
	Hex.	Dec.			
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 (od) running bit 11 = Program running bit 12 = Measure status (0 = OK while 1 = error). bit 13÷15 = Reserved	0	r
13A	D	13	Alarms reset 0 = Not resetted 1 = Resetted	0	r/w
14A	E	14	Alarms acknowledge 0 = Not acknowledge 1 = acknowledge	0	r/w
15A	F	15	Control status 0 Automatic 1 Manual 2 Stand-by	0	r/w
16A	10	16	Remote set point (temporary) (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	RESERVED	0	r
21A	15	21	RESERVED	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 **Range:** 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 **Range:** 0 = No pending request waiting for the execution; 1 = Pending request waiting for the execution	0	r
25A	1D	29	Value to be retransmitted on the analogue Output **Range:** Ao1L ÷ Ao1H	0	r/w

B.5.2 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 address 1	dP	r
2B	0201	513	Number of decimal figure of the measured value As address 2	0	r
3B	0202	514	Power output As 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

no.	Address		Description	Dec. Point	r/w
	Hex.	Dec.			
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 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		
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 1 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 1 function = nonE). This parameter is stored in RAM	0	r/w
16B	0227	551	Status/remote control of the Output 4 0 OFF 1 ON **Note:** This parameter is writeable when out 4 is “not used” by the controller (o4F output 1 function = nonE). This parameter is stored in RAM	0	r/w
17B	0240	576	Digital input 1 status 0 OFF 1 ON **Note:** Digital input 1 status can be read from the serial port even if the input is not used by the controller	0	r/w
18B	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/w
19B	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
20B	0245	581	8 RESERVED	0	r/w

no.	Address		Description	Dec. Point	r/w
	Hex.	Dec.			
21B	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 ramp - step 5 10 soak - step 5 11 ramp - stem 6 12 soak - step 6 13 END	0	r
22B	0247	583	Remaining time to program end **Range:** 0 ÷ 65535 (minutes when [96] Pru=hh.mm, seconds when [96] Pru=mm.ss) **Note:** When the program is not running the return code is 0	2	r
23B	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
24B	249	585	RESERVED	2	r
25B	24A	586	RESERVED	0	r
26B	24B	587	Duration of first program ramp **Range:** 0 ÷ 9999 s	0	r
27B	24C	588	RESERVED	0	r
28B	24D	589	Simple program actually in esecution. **Range:** 1 ÷ 4 When a complec program is running it can be different from the active program.		
28B	250	592	Power output when the instrument is in manual mode **Range:** -10000 ÷ 10000 (%)	2	r/w

B.5.3 Parameters Setting: Addresses form 280 hex (640 dec) and 2800 hex (10240 dec)

] inP GROUP - Main and auxiliary input configuration

no.	Param.	Address		Description	Values	Dec. Point	r/w
		Hex	Dec				
1	SEnS	2800	10240	Model C (Pt100, Pt1000)	0 TC J (0 ÷ 1000°C/32 ÷ 1832°F), 1 TC K (0 ÷ 1370°C/32 ÷ 2498°F); 2 TC S (0 ÷ 1760°C/32 ÷ 3200°F); 3 TC R (0 ÷ 1760°C/32 ÷ 3200°F); 4 TC T (0 ÷ 400°C/32 ÷ 752°F); 5 TC N (0 ÷ 1000°C/32 ÷ 1832°F); 6 Exergen IRS J (0 ÷ 1000°C/32 ÷ 1832°F); 7 Exergen IRS K (0 ÷ 1370°C/32 ÷ 2498°F); 8 RTD Pt 100 (-200 ÷ +850°C/-328 ÷ +1562°F); 9 RTD Pt 1000 (-200 ÷ +500°C/-328 ÷ +932°F); 10 0.60 0 ÷ 60 mV; 11 12.60 12 ÷ 60 mV; 12 0.20 0 ÷ 20 mA; 13 4.20 4 ÷ 20 mA; 14 0.5 0 ÷ 5 V; 15 1.5 1 ÷ 5 V; 16 0.10 0 ÷ 10 V; 17 2.10 2 ÷ 10 V.	0	r/W
				Model C (PTC, NTC)	0 TC J (0 ÷ 1000°C/32 ÷ 1832°F), 1 TC K (0 ÷ 1370°C/32 ÷ 2498°F); 2 TC S (0 ÷ 1760°C/32 ÷ 3200°F); 3 TC R (0 ÷ 1760°C/32 ÷ 3200°F); 4 TC T (0 ÷ 400°C/32 ÷ 752°F); 5 TC N (0 ÷ 1000°C/32 ÷ 1832°F); 6 Exergen IRS J (0 ÷ 1000°C/32 ÷ 1832°F); 7 Exergen IRS K (0 ÷ 1370°C/32 ÷ 2498°F); 8 PTC (-55 ÷ 150°C/-67 ÷ +302°F); 9 NTC (-50 ÷ 110°C/-58 ÷ +230°F); 10 0.60 0 ÷ 60 mV; 11 12.60 12 ÷ 60 mV; 12 0.20 0 ÷ 20 mA; 13 4.20 4 ÷ 20 mA; 14 0.5 0 ÷ 5 V; 15 1.5 1 ÷ 5 V; 16 0.10 0 ÷ 10 V; 17 2.10 2 ÷ 10 V.		
2	dp	2801	10241	Decimal Point Position (linear inputs)	0 ÷ 3	0	r/w
				Decimal Point Position (different than linear inputs)	0 or 1		
3	SSC	2802	10242	Initial scale read-out for linear inputs	-1999 ÷ 9999	dP	r/w
4	FSc	2803	10243	Full Scale Readout for linear inputs	-1999 ÷ 9999	dP	r/w
5	unit	2804	10244	Engineer unit	0 C = °C 1 F = °F	0	r/w
6	Fil	2805	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	r/w
7	inE	2806	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	r/w
8	oPE	2807	10247	Safety output value (% of the output)	-100 ÷ 100	0	r/w
9	IO4.F	2808	10248	I/O 4 function	0 on = Output used as PWS for TX, 1 out4 = Output 4 (digital output 4), 2 dG2c = Digital input 2 driven by contact, 3 dG2U = Digital input 2 driven by voltage	0	r/w

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	r/w
10	diF1	2809	10249	Digital Input 1 function	0 oFF = Not used, 1 Alarm reset, 2 Alarm acknowledge (ACK), 3 Hold of the measured value, 4 Stand by mode, 5 Manual mode, 6 Program Start, 7 Program Reset, 8 Program Hold, 9 Program Run/Hold, 10 Program Run/Reset, 11 SP1 - SP2 selection, 12 SP1 to SP4 binary selection, 13 Remote Up and Down 14 Program 1/2 selection 15 Program 1..4 selection	0	r/w
11	diF2	280A	10250	Digital Input 2 function	0 oFF = Not used, 1 Alarm reset, 2 Alarm acknowledge (ACK), 3 Hold of the measured value, 4 Stand by mode, 5 Manual mode, 6 Program Start, 7 Program Reset, 8 Program Hold, 9 Program Run/Hold, 10 Program Run/Reset, 11 SP1 - SP2 selection, 12 SP1 to SP4 binary selection, 13 Remote Up and Down 14 Program 1/2 selection 15 Program 1..4 selection	0	r/w
12	di.A	280B	10251	Digital input action	0 DI1 direct, DI2 direct 1 DI1 reverse, DI2 direct 2 DI1 direct, DI2 reverse 3 DI1 reverse, DI2 reverse	0	r/w

] Out group

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	r/w
13	o1t	280C	10252	Output 1 type (when Out 1 is an analogue output)	0 0-20 = 0 ÷ 20 mA 1 4-20 = 4 ÷ 20 mA 2 0-10 = 0 ÷ 10 V 3 2-10 = 2 ÷ 10 V	0	r/w
14	o1F	280D	10253	Out 1 function (when Out 1 is a linear output)	0 NonE = Output not used 1 H.rEG = Heating output 2 c.rEG = Cooling output 3 r.inP = Measure retransmission 4 r.Err = Error (sp - PV) retransmission 5 r.SP = Set point retransmission 6 r.SEr = Serial value retransmission	0	r/w
				Out 1 function (when Out1 is a digital output)	0 NonE = Output not used 1 H.rEG = Heating output 2 c.rEG = Cooling output 3 AL = Alarm output 4 P.End = Program end indicator 5 P.HLd = Program hold indicator 6 P.uit = Program wait indicator 7 P.run = Program run indicator 8 P.Et1 = Program Event 1 9 P.Et2 = Program Event 2 10 or.bo = Out-of-range or burn out indicator 11 P.FAL = Power failure indicator 12 bo.PF = Out-of-range, burn out and Power failure indicator 13 St.bY = Stand by status indicator 14 diF.1 = The output repeats the digital input 1 status 15 diF.2 = The output repeats the digital input 2 status 16 on = Out 1 always ON		

no.	Param.	Address		Description	Values	Dec. Point	r/w
		Hex	Dec				
15	Ao1L	280E	10254	Initial scale value of the analog retrans-mission	-1999 to Ao1H	dp	r/w
16	Ao1H	280F	10255	Full scale value of the analog retrans-mission	Ao1L to 9999	dp	r/w
17	o1AL	2810	10256	Alarms linked up with the out 1	0 ÷ 63 +1 Alarm 1 +2 Alarm 2 +4 Alarm 3 +8 Loop break alarm +16 Sensor Break +32 Overload on output 4	0	r/w
18	o1Ac	2811	10257	Out 1 action	0 dir = Direct action 1 rEU = Reverse action 2 dir.r = Direct with reversed LED 3 ReU.r = Reverse with reversed LED	0	r/w
19	o2F	2812	10258	Out 2 function	See the values of [14] o1F parameter	0	r/w
20	o2AL	2813	10259	Alarms linked up with the out 2	See the values of [17] o1AL parameter	0	r/w
21	o2Ac	2814	0260	Out 2 action	See the values of [18] o1Ac parameter	0	r/w
22	o3F	2815	10261	Out 3 function	See the values of [14] o1F parameter	0	r/w
23	o3AL	2816	10262	Alarms linked up with the out 3	See the values of [17] o1AL parameter	0	r/w
24	o3Ac	2817	10263	Out 3 action	See the values of [18] o1Ac parameter	0	r/w
25	o4F	2818	10264	Out 4 function	See the values of [14] o1F parameter	0	r/w
26	o4AL	2819	10265	Alarms linked up with the out 4	See the values of [17] o1AL parameter	0	r/w
27	o4Ac	281A	10266	Out 4 action	See the values of [18] o1Ac parameter	0	r/w

] AL1 group

no.	Param.	Address		Description	Values	Dec. Point	r/w
		Hex	Dec				
28	AL1t	281B	10267	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	r/w
29	Ab1	281C	10268	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	r/w
30	AL1L	281D	10269	- For High and low alarms is the low limit of the AL1 threshold; - For band alarm is the AL1 low alarm threshold	From -1999 to AL1H (E.U.)	dP	r/w
31	AL1H	281E	10270	- For High and low alarms is the high limit of the AL1 threshold; - For band alarm is the AL1 high alarm threshold	From AL1L to 9999 (E.U.)	dP	r/w
32	AL1	281F	10271	AL1 threshold	From AL1L to AL1H (E.U.)	dP	r/w
33	HAL1	2820	10272	AL1 hysteresis	1 ÷ 9999 (E.U.)	dP	r/w
34	AL1d	2821	10273	AL1 delay	From 0 (oFF) to 9999 (s)	0	r/w
35	AL1o	2822	10274	Alarm 1 enabling during Stand-by mode and out of range conditions	0 Alarm 1 disabled during Stand by and out of range 1 Alarm 1 enabled in stand by mode 2 Alarm 1 enabled in out of range condition 3 Alarm 1 enabled in stand by mode and in over range condition	0	r/w

] AL2 group

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	r/w
36	AL2t	2823	10275	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	r/w
37	Ab2	2824	10276	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	r/w
38	AL2L	2825	10277	- For High and low alarms is the low limit of the AL2 threshold; - For band alarm is the AL2 low alarm threshold	From -1999 to AL2H (E.U.)	dP	r/w
39	AL2H	2826	10278	- For High and low alarms is the high limit of the AL2 threshold; - For band alarm is the AL2 high alarm threshold	From AL2L to 9999 (E.U.)	dP	r/w
40	AL2	2827	10279	AL2 threshold	From AL2L to AL2H (E.U.)	dP	r/w
41	HAL2	2828	10280	AL2 hysteresis	1 ÷ 9999 (E.U.)	dP	r/w
42	AL2d	2829	10281	AL2 delay	From 0 (oFF) to 9999 (s)	0	r/w
43	AL2o	282A	10282	Alarm 2 enabling during Stand-by mode and out of range conditions	0 Alarm 2 disabled during Stand by and out of range 1 Alarm 2 enabled in stand by mode 2 Alarm 2 enabled in out of range condition 3 Alarm 2 enabled in stand by mode and in over range condition	0	r/w

] AL3 group

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	r/w
44	AL3t	282B	10283	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	r/w
45	Ab3	282C	10284	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	r/w
46	AL3L	282D	10285	- For High and low alarms is the low limit of the AL3 threshold; - For band alarm is the AL3 low alarm threshold	From -1999 to AL3H (E.U.)	dP	r/w
47	AL3H	282E	10286	- For High and low alarms is the high limit of the AL3 threshold; - For band alarm is the AL3 high alarm threshold	From AL3L to 9999 (E.U.)	dP	r/w
48	AL3	282F	10287	AL3 threshold	From AL3L to AL3H (E.U.)	dP	r/w
49	HAL3	2830	10288	AL3 hysteresis	1 to 9999 (E.U.)	dP	r/w
50	AL3d	2831	10289	AL3 delay	From 0 (oFF) to 9999 (s)	0	r/w
51	AL3o	2832	10290	Alarm 3 enabling during Stand-by mode and out of range conditions	0 Alarm 3 disabled during Stand by and out of range 1 Alarm 3 enabled in stand by mode 2 Alarm 4 enabled in out of range condition 3 Alarm 4 enabled in stand by mode and in over range condition	0	r/w

] LBA group - Loop Break Alarm Parameters

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	r/w
52	LbAt	2833	10291	LBA time	From 0 (oFF) to 9999 (s)	0	
53	LbSt	2834	10292	Delta measure used by LBA during Soft start	From 0 (oFF) to 9999 (E.U.)	dP	
54	LbAS	2835	10293	Delta measure used by LBA	1 ÷ 9999 (E.U.)	dP	
55	LbcA	2836	10294	Condition for LBA enabling	0 uP = Active when Pout = 100% 1 dn = Active when Pout = -100% 2 both = Active in both cases	0	

] rEG group - Control Parameters

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	r/w
56	cont	2837	10295	**Control type:** when one heating **and** one cooling output are programmed.	0 Pid = PID (heat and/or cool) 1 nr = Heat/Cool ON/OFF control with neutral zone	0	r/w
				Control type: when heating **or** cooling output are programmed and no servomotor control can **not** programmed.	0 Pid > PID (heat and/or cool) 1 On.FA > ON/OFF asymmetric hysteresis 2 On.FS > ON/OFF symmetric hysteresis		
				Control type: when heating **or** cooling output are programmed and servomotor control can programmed.	0 Pid > PID (heat and/or cool) 1 On.FA > ON/OFF asymmetric hysteresis 2 On.FS > ON/OFF symmetric hysteresis 3 3Pt. > open loop 3 point valve control (no feedback)		
57	Auto	2838	10296	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 automatic start at 1st 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 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 every power ON 6 Evo-tune with automatic start at first 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	r/w
58	tunE	2839	10297	Manual start of the Autotuning	0 oFF = Autotuning Not active 1 on = Autotuning Active	0	r/w
59	HSEt	283A	10298	Hysteresis of the ON/OFF control	0 ÷ 9999 (E.U.)	dP	
60	Pb	283B	10299	Proportional band	1 ÷ 9999 (E.U.)	dP	
61	ti	283C	10300	Integral time	0 (oFF) 1 ÷ 9999 (s)	0	r/w
62	td	283D	10301	Derivative time	0 (oFF) 1 ÷ 9999 (s)	0	r/w
63	Fuoc	283E	10302	Fuzzy overshoot control	0 ÷ 200	2	r/w
64	tcH	283F	10303	Heating output cycle time	10 ÷ 1300 (s)	1	r/w
65	rcG	2840	10304	Power ratio between heating and cooling action	1 ÷ 9999	2	r/w
66	tcc	2841	10305	Cooling output cycle time	1 ÷ 1300 (s)	1	r/w
67	rS	2842	10306	Manual reset (Integral pre-load)	-1000 ÷ +1000 (%)	1	r/w
68	Str.t	2843	10307	Servomotor stroke time	5 ÷ 1000 seconds	0	r/w
69	db.S	2844	10308	Servomotor dead band	0.0 ÷ 10.0	1	r/w
70	od	2845	10309	Delay at power ON	0 Function not used 0.01 ÷ 99.59 hh.mm	2	r/w
71	St.P	2846	10310	Maximum power output used during soft start	-100 ÷ +100 (%)	0	r/w
72	SSt	2847	10311	Soft start time	0 Function not used 0.01 ÷ 7.59 hh.mm 8.00 Soft start always active	2	r/w
73	SS.tH	2848	10312	Threshold for soft start disabling	-2000 (oFF) -1999 ÷ 9999 (E.U.)	dP	r/w

] SP group - Set point parameters

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	r/w
74	nSP	2849	10313	Number of used set points	1 ÷ 4	0	r/w
75	SPLL	284A	10314	Minimum set point value	From -1999 to SPHL	dP	r/w
76	SPHL	284B	10315	Maximum set point value	From SPLL to 9999	dP	r/w
77	SP	284C	10316	Set point 1	From SPLL to SPLH	dP	r/w
78	SP 2	284D	10317	Set point 2	From SPLL to SPLH	dP	r/w
79	SP 3	284E	10318	Set point 3	From SPLL to SPLH	dP	r/w
80	SP 4	284F	10319	Set point 4	From SPLL to SPLH	dP	r/w
81	A.SP	2850	10320	Selection of the active set point	0 SP 1 SP 2 2 SP 3 3 SP 4	0	r/w
82	SP.rt	2851	10321	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	r/w
83	SPLr	2852	10322	Local/remote set point selection	0 Loc = local 1 rEn = remote	0	r/w
84	SP.u	2853	10323	Rate of rise for **POSITIVE** set point change (ramp UP)	0.01 ÷ 99.99 (inF) Eng. units per minute	2	r/w
85	SP.d	2854	10324	Rate of rise for **NEGATIVE** set point change (ramp DOWN)	0.01 ÷ 99.99 (inF) Eng. units per minute	2	r/w

] PAn group - Operator HMI parameters

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	r/w
86		2855	10325	RESERVED			
87		2856	10326	RESERVED			
88		2857	10327	RESERVED			
89		2858	10328	RESERVED			
90		2859	10329	RESERVED			
91		285A	10330	RESERVED			
92		285B	10331	RESERVED			
93	fiLd	285C	10332	Filter on the displayed value	0 oFF (filter disabled) to 100	Dp	r/w
94		285D	10333		RESERVED		
95	dSPu	285E	10334	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	r/w
96	oPr.E	285F	10335	Operative modes enabling	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	0	r/w
97	oPEr	2860	10336	Operative mode selection	0 Auto = Auto mode 1 oPLo = Manual mode 2 St.bY = Stand by mode	0	r/w

Ser group - Serial link parameters

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	r/w
98	Add	2861	10337	Instrument address	0 (oFF) 1 ÷ 254	0	r/w
99	bAud	2862	10338	baud rate	0 2400 = 2400 baud 1 9600 = 9600 baud 2 19.2 = 19200 baud 3 38.4 = 38400 baud	0	r/w
100	trSP	2863	10339	Selection of the value to be retransmitted (Master)	0 nonE = Retransmission not used (the instrument is a slave) 1 rSP = The instrument becomes a Master and retransmits the operative set point 2 PErc = The instrument become a Master and it retransmits the power output	0	r/w

CAl group - User calibration parameters

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	r/w
101	AL.P	2864	10340	Adjust Low Point	From -1999 to (AH.P - 10) (E.U.)	dP	r/w
102	AL.o	2865	10341	Adjust Low Offset	-300 ÷ +300 (E.U.)	dP	r/w
103	AH.P	2866	10342	Adjust High Point	From (AL.P + 10) to 9999 (E.U.	dP	r/w
104	AH.o	2867	10343	Adjust High Offset	-300 ÷ +300 (E.U.)	dP	r/w

PRG group - Programmer function parameters

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	r/w
126	PAGE	287D	10365	Program page selection **Note:** While a program is running, this parameter cannot be changed	1 ÷ 2	0	r/w
127	Pr.n	287E	10366	Program selection **Note:** While a program is running, this parameter cannot be changed	1 ÷ 4	0	r/w
128	Pr.St	287F	10367	Status of the selected program	0 = rES > Program reset 1 = run > Program start 2 = HoLd > Program hold 3 = cont > Continue (read only)	dP	r/w

P1.F group - Program 1 parameters

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	r/w
129	P1.F	2880	10368	Program 1, 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	r/w
130	P1.u	2881	10369	Engineering unit of program 1 soaks **Note:** While program 1 is running, this parameter cannot be changed	0 hh.nn = Hours and minutes 1 nn.SS = Minutes and seconds	0	r/w
131	P1.E	2882	10370	Instrument behaviour at the end of program 1 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	r/w
132	P1.nE	2883	10371	Program 1, Execution number	1 to 100 = inf		
133	P1.Et	2884	10372	Time of the end program 1 indication	From 0 (oFF) to 9959 (inF) minutes and seconds	2	r/w
134	P1.S1	2885	10373	Program 1 - Set point of the first soak	From SPLL to SPHL -8000 Program End	dP	r/w
135	P1.G1	2886	10374	Program 1 - Gradient of the first ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
136	P1.t1	2887	10375	Program 1 - Time of the 1st soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
137	P1.b1	2888	10376	Program 1 - Wait band of the 1st soak	0 (oFF) 1 ÷ 9999 (E.U.)	0	r/w
138	P1.E1	2889	10377	Program 1 - Events of the 1st group	0000 ÷ 1111	2	r/w

no.	Param.	Address		Description	Values	Dec. Point	r/w
		Hex	Dec				
139	P1.S2	288A	10378	Program 1 - Set point of the 2nd soak	From SPLL to SPHL -8000 Program End	dP	r/w
140	P1.G2	288B	10379	Program 1 - Gradient of the 2nd ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
141	P1.t2	288C	10380	Program 1 - Time of the 2nd soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
142	P1.b2	288D	10381	Program 1 - Wait band of the 2nd soak	0 (oFF) 1. ÷ 9999 (E.U.)	0	r/w
143	P1.E2	288E	10382	Program 1 - Events of the 2nd group	0000 ÷ 1111	2	r/w
144	P1.S3	288F	10383	Program 1 - Set point of the 3rd soak	From SPLL to SPHL -8000 Program End	dP	r/w
145	P1.G3	2890	10384	Program 1 - Gradient of the 3rd ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
146	P1.t3	2891	10385	Program 1 - Time of the 3rd soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
147	P1.b3	2892	10386	Program 1 - Wait band of the 3rd soak	0 (oFF) 1. ÷ 9999 (E.U.)	0	r/w
148	P1.E3	2893	10387	Program 1 - Events of the 3rd group	0000 ÷ 1111	2	r/w
149	P1.S4	2894	10388	Program 1 - Set point of the 4th soak	From SPLL to SPHL -8000 Program End	dP	r/w
150	P1.G4	2895	10389	Program 1 - Gradient of the 4th ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
151	P1.t4	2896	10390	Program 1 - Time of the 4th soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
152	P1.b4	2897	10391	Program 1 - Wait band of the 4th soak	0 (oFF) 1 ÷ 9999 (E.U.)	0	r/w
153	P1.E4	2898	10392	Program 1 - Events of the 4th group	0000 ÷ 1111	2	r/w
154	P1.S5	2899	10393	Program 1 - Set point of the 5th soak	From SPLL to SPHL -8000 Program End	dP	r/w
155	P1.G5	289A	10394	Program 1 - Gradient of the 5rd ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
156	P1.t5	289B	10395	Program 1 - Time of the 5rd soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
157	P1.b5	289C	10396	Program 1 - Wait band of the 5rd soak	0 (oFF) 1. ÷ 9999 (E.U.)	0	r/w
158	P1.E5	289D	10397	Program 1 - Events of the 5rd group	0000 ÷ 1111	2	r/w
159	P1.S6	289E	10398	Program 1 - Set point of the 6th soak	From SPLL to SPHL -8000 Program End	dP	r/w
160	P1.G6	289F	10399	Program 1 - Gradient of the 5rd ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
161	P1.t6	28A0	10400	Program 1 - Time of the 5rd soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
162	P1.b6	28A1	10401	Program 1 - Wait band of the 5rd soak	0 (oFF) 1. ÷ 9999 (E.U.)	0	r/w
163	P1.E6	28A2	10402	Program 1 - Events of the 5rd group	0000 ÷ 1111	2	r/w
164	P1.c2	28A3	10403	Program 1 continue on program 2	0 = no 1 = YES	0	r/w

P2.F group - Program 2 parameters

no.	Param.	Address		Description	Values	Dec. Point	r/w
		Hex	Dec				
165	P2.F	28A4	10404	Program 2, 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	r/w
166	P2.u	28A5	10405	Engineering unit of program 2 soaks **Note:** While program 2 is running, this parameter cannot be changed	0 hh.nn = Hours and minutes 1 nn.SS = Minutes and seconds	0	r/w
167	P2.E	28A6	10406	Instrument behaviour at the end of program 2 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	r/w
168	P2.nE	28A7	10407	Program 2, Execution number	1 to 1000 =inf		
169	P2.Et	28A8	10408	Time of the end program 2 indication	From 0 (oFF) to 9959 (inF) minutes and seconds	2	r/w
170	P2.S1	28A9	10409	Program 2 - Set point of the first soak	From SPLL to SPHL -8000 Program End	dP	r/w

no.	Param.	Address		Description	Values	Dec. Point	r/w
		Hex	Dec				
171	P2.G1	28AA	10410	Program 2 - Gradient of the first ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
172	P2.t1	28AB	10411	Program 2 - Time of the 1st soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
173	P2.b1	28AC	10412	Program 2 - Wait band of the 1st soak	0 (oFF) 1 ÷ 9999 (E.U.)	0	r/w
174	P2.E1	28AD	10413	Program 2 - Events of the 1st group	0000 ÷ 1111	2	r/w
175	P2.S2	28AE	10414	Program 2 - Set point of the 2nd soak	From SPLL to SPHL -8000 Program End	dP	r/w
176	P2.G2	28AF	10415	Program 2 - Gradient of the 2nd ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
177	P2.t2	28B0	10416	Program 2 - Time of the 2nd soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
178	P2.b2	28B1	10417	Program 2 - Wait band of the 2nd soak	0 (oFF) 1. ÷ 9999 (E.U.)	0	r/w
179	P2.E2	28B2	10418	Program 2 - Events of the 2nd group	0000 ÷ 1111	2	r/w
180	P2.S3	28B3	10419	Program 2 - Set point of the 3rd soak	From SPLL to SPHL -8000 Program End	dP	r/w
181	P2.G3	28B4	10420	Program 2 - Gradient of the 3rd ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
182	P2.t3	28B5	10421	Program 2 - Time of the 3rd soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
183	P2.b3	28B6	10422	Program 2 - Wait band of the 3rd soak	0 (oFF) 1. ÷ 9999 (E.U.)	0	r/w
184	P2.E3	28B7	10423	Program 2 - Events of the 3rd group	0000 ÷ 1111	2	r/w
185	P2.S4	28B8	10424	Program 2 - Set point of the 4th soak	From SPLL to SPHL -8000 Program End	dP	r/w
186	P2.G4	28B9	10425	Program 2 - Gradient of the 4th ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
187	P2.t4	28BA	10426	Program 2 - Time of the 4th soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
188	P2.b4	28BB	10427	Program 2 - Wait band of the 4th soak	0 (oFF) 1 ÷ 9999 (E.U.)	0	r/w
189	P2.E4	28BC	10428	Program 2 - Events of the 4th group	0000 ÷ 1111	2	r/w
190	P2.S5	28BD	10429	Program 2 - Set point of the 5th soak	From SPLL to SPHL -8000 Program End	dP	r/w
191	P2.G5	28BE	10430	Program 2 - Gradient of the 5rd ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
192	P2.t5	28BF	10431	Program 2 - Time of the 5rd soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
193	P2.b5	28C0	10432	Program 2 - Wait band of the 5rd soak	0 (oFF) 1. ÷ 9999 (E.U.)	0	r/w
194	P2.E5	28C1	10433	Program 2 - Events of the 5rd group	0000 ÷ 1111	2	r/w
195	P2.S6	28C2	10434	Program 2 - Set point of the 6th soak	From SPLL to SPHL -8000 Program End	dP	r/w
196	P2.G6	28C3	10435	Program 2 - Gradient of the 5rd ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
197	P2.t6	28C4	10436	Program 2 - Time of the 5rd soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
198	P2.b6	28C5	10437	Program 2 - Wait band of the 5rd soak	0 (oFF) 1. ÷ 9999 (E.U.)	0	r/w
199	P2.E6	28C6	10438	Program 2 - Events of the 5rd group	0000 ÷ 1111	2	r/w
200	P2.c3	28C7	10439	Program 2 continue on program 3	0 = no 1 = YES	0	r/w

P3.F group - Program 3 parameters

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	r/w
201	P3.F	28C8	10440	Program 3, 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	r/w
202	P3.u	28C9	10441	Engineering unit of program 3 soaks **Note:** While program 3 is running, this parameter cannot be changed	0 hh.nn = Hours and minutes 1 nn.SS = Minutes and seconds	0	r/w
203	P3.E	28CA	10442	Instrument behaviour at the end of program 3 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	r/w
204	P3.nE	28CB	10443	Program 3, Execution number	1 to 1000 = inf		
205	P3.Et	28CC	10444	Time of the end program 3 indication	From 0 (oFF) to 9959 (inF) minutes and seconds	2	r/w
206	P3.S1	28CD	10445	Program 3 - Set point of the first soak	From SPLL to SPHL -8000 Program End	dP	r/w
207	P3.G1	28CE	10446	Program 3 - Gradient of the first ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
208	P3.t1	28CF	10447	Program 3 - Time of the 1st soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
209	P3.b1	28D0	10448	Program 3 - Wait band of the 1st soak	0 (oFF) 1 ÷ 9999 (E.U.)	0	r/w
210	P3.E1	28D1	10449	Program 3 - Events of the 1st group	0000 ÷ 1111	2	r/w
211	P3.S2	28D2	10450	Program 3 - Set point of the 2nd soak	From SPLL to SPHL -8000 Program End	dP	r/w
212	P3.G2	28D3	10451	Program 3 - Gradient of the 2nd ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
213	P3.t2	28D4	10452	Program 3 - Time of the 2nd soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
214	P3.b2	28D5	10453	Program 3 - Wait band of the 2nd soak	0 (oFF) 1. ÷ 9999 (E.U.)	0	r/w
215	P3.E2	28D6	10454	Program 3 - Events of the 2nd group	0000 ÷ 1111	2	r/w
216	P3.S3	28D7	10455	Program 3 - Set point of the 3rd soak	From SPLL to SPHL -8000 Program End	dP	r/w
217	P3.G3	28D8	10456	Program 3 - Gradient of the 3rd ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
218	P3.t3	28D9	10457	Program 3 - Time of the 3rd soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
219	P3.b3	28DA	10458	Program 3 - Wait band of the 3rd soak	0 (oFF) 1. ÷ 9999 (E.U.)	0	r/w
220	P3.E3	28DB	10459	Program 3 - Events of the 3rd group	0000 ÷ 1111	2	r/w
221	P3.S4	28DC	10460	Program 3 - Set point of the 4th soak	From SPLL to SPHL -8000 Program End	dP	r/w
222	P3.G4	28DD	10461	Program 3 - Gradient of the 4th ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
223	P3.t4	28DE	10462	Program 3 - Time of the 4th soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
224	P3.b4	28DF	10463	Program 3 - Wait band of the 4th soak	0 (oFF) 1 ÷ 9999 (E.U.)	0	r/w
225	P3.E4	28E0	10464	Program 3 - Events of the 4th group	0000 ÷ 1111	2	r/w
226	P3.S5	28E1	10465	Program 3 - Set point of the 5th soak	From SPLL to SPHL -8000 Program End	dP	r/w
227	P3.G5	28E2	10466	Program 3 - Gradient of the 5rd ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
228	P3.t5	28E3	10467	Program 3 - Time of the 5rd soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
229	P3.b5	28E4	10468	Program 3 - Wait band of the 5rd soak	0 (oFF) 1. ÷ 9999 (E.U.)	0	r/w
230	P3.E5	28E5	10469	Program 3 - Events of the 5rd group	0000 ÷ 1111	2	r/w
231	P3.S6	28E6	10470	Program 3 - Set point of the 6th soak	From SPLL to SPHL -8000 Program End	dP	r/w
232	P3.G6	28E7	10471	Program 3 - Gradient of the 5rd ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
233	P3.t6	28E8	10472	Program 3 - Time of the 5rd soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
234	P3.b6	28E9	10473	Program 3 - Wait band of the 5rd soak	0 (oFF) 1. ÷ 9999 (E.U.)	0	r/w
235	P3.E6	28EA	10474	Program 3 - Events of the 5rd group	0000 ÷ 1111	2	r/w
236	P3.c4	28EB	10475	Program 3 continue on program 4	0 = no 1 = YES	0	r/w

] P4.F group - Program 4 parameters

no.	Param.	Address Hex	Address Dec	Description	Values	Dec. Point	r/w
201	P4.F	28EC	10476	Program 4, 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	r/w
202	P4.u	28ED	10477	Engineering unit of program 4 soaks **Note:** While program 4 is running, this parameter cannot be changed	0 hh.nn = Hours and minutes 1 nn.SS = Minutes and seconds	0	r/w
203	P4.E	28EE	10478	Instrument behaviour at the end of program 4 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	r/w
204	P4.nE	28EF	10479	Program 4, Execution number	1 to 1000 = inf		
205	P4.Et	28F0	10480	Time of the end program 4 indication	From 0 (oFF) to 9959 (inF) minutes and seconds	2	r/w
242	P4.S1	28F1	10841	Program 4 - Set point of the first soak	From SPLL to SPHL -8000 Program End	dP	r/w
243	P4.G1	28F2	10482	Program 4 - Gradient of the first ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
244	P4.t1	28F3	10483	Program 4 - Time of the 1st soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
245	P4.b1	28F4	10884	Program 4 - Wait band of the 1st soak	0 (oFF) 1 ÷ 9999 (E.U.)	0	r/w
246	P4.E1	28F5	10485	Program 4 - Events of the 1st group	0000 ÷ 1111	2	r/w
247	P4.S2	28F6	10486	Program 4 - Set point of the 2nd soak	From SPLL to SPHL -8000 Program End	dP	r/w
248	P4.G2	28F7	10487	Program 4 - Gradient of the 2nd ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
249	P4.t2	28F8	10488	Program 4 - Time of the 2nd soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
250	P4.b2	28F9	10489	Program 4 - Wait band of the 2nd soak	0 (oFF) 1. ÷ 9999 (E.U.)	0	r/w
251	P4.E2	28FA	10490	Program 4 - Events of the 2nd group	0000 ÷ 1111	2	r/w
252	P4.S3	28FB	10491	Program 4 - Set point of the 3rd soak	From SPLL to SPHL -8000 Program End	dP	r/w
253	P4.G3	28FC	10492	Program 4 - Gradient of the 3rd ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
254	P4.t3	28FD	10493	Program 4 - Time of the 3rd soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
255	P4.b3	28FE	10594	Program 4 - Wait band of the 3rd soak	0 (oFF) 1. ÷ 9999 (E.U.)	0	r/w
256	P4.E3	28FF	10495	Program 4 - Events of the 3rd group	0000 ÷ 1111	2	r/w
257	P4.S4	2900	10496	Program 4 - Set point of the 4th soak	From SPLL to SPHL -8000 Program End	dP	r/w
258	P4.G4	2901	10497	Program 4 - Gradient of the 4th ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
259	P4.t4	2902	10498	Program 4 - Time of the 4th soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
260	P4.b4	2903	10499	Program 4 - Wait band of the 4th soak	0 (oFF) 1 ÷ 9999 (E.U.)	0	r/w
261	P4.E4	2904	10500	Program 4 - Events of the 4th group	0000 ÷ 1111	2	r/w
262	P4.S5	2905	10501	Program 4 - Set point of the 5th soak	From SPLL to SPHL -8000 Program End	dP	r/w
263	P4.G5	2906	10502	Program 4 - Gradient of the 5rd ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
264	P4.t5	2907	10503	Program 4 - Time of the 5rd soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
265	P4.b5	2908	10504	Program 4 - Wait band of the 5rd soak	0 (oFF) 1. ÷ 9999 (E.U.)	0	r/w
266	P4.E5	2909	10505	Program 4 - Events of the 5rd group	0000 ÷ 1111	2	r/w
267	P4.S6	290A	10506	Program 4 - Set point of the 6th soak	From SPLL to SPHL -8000 Program End	dP	r/w
268	P4.G6	290B	10507	Program 4 - Gradient of the 5rd ramp	1 ÷ 9999 Engineering Unit/minute 10000 (inF = Step transfer)	1	r/w
269	P4.t6	290C	10508	Program 4 - Time of the 5rd soak	0 ÷ 9959 (hh.mm or mm.ss)	2	r/w
270	P4.b6	290D	10509	Program 4 - Wait band of the 5rd soak	0 (oFF) 1. ÷ 9999 (E.U.)	0	r/w
271	P4.E6	290E	10510	Program 4 - Events of the 5rd group	0000 ÷ 1111	2	r/w

Note: Programs 5 to 8 make use of the same addresses of Programs 1 to 4 but the parameter [128] PAGE (address 10365) must be equal to 2.

B.5.4 Identification code zone

This zone provides only information for identifying model, order code and software release of the Kube series instrument.

Starting from the address 0800H it is possibile to read the instrument name (KRD50, etc.) and from the address 0x80A (up to 0x818) it is possibile to read the instrument sales code.

B.6 Performance

After receiving a valid request the instrument prepares the reply, then sends it back to the master station according to the following specifications:

– A minimum time is granted greater or equal 3 characters time (depending on adopted baud rate, allowing line direction reversal);

– The reply is ready to be transmitted in less then 20 ms except in case 3;

A 20 ms silence on the line is necessary to recover from abnormal conditions or erroneous messages; this means that a time less than 20 ms is allowed between any two characters in the same message.