# Serial communication protocol
# ModBUS® for Programmers KM5/KR5/KX5

## this document is related to the firmware version 1.0.0

## Index

# 1 PREFACE

Ascon Tecnologic uses the ModBUS® communication protocol in the RTU variant because it is one of the most widespread in the industrial communication field so as to become practically a standard. ModBUS® is a royalty-free protocol, easy to be implemented for which a vast literature is available, also on Internet.

ModBUS® RTU protocol uses serial communication and represents data in a compact hexadecimal type. The command/data is necessarily followed by a check sum field of type CRC (cyclic redundancy check).

To each connected device is assigned a unique address. The protocol foresees only one Master and up to 255 slaves.

Only the Master unit can start the transmission by sending a command that contains the address of the device with which he wants to communicate and only the latter will execute the command, although also the others receive it.

All commands contain control information, which ensures that the command received is correct.

The transmission characteristics are usually user 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 K_5 Programmer series 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 K_5 programmer controllers using the ModBUS protocol in their communication capability and is mainly directed to technicians, system integrators and software developers.

# 2 PHYSICAL CONNECTION

## 2.1 Interface

The Kube series instruments are equipped with an RS485 interface so they must be connected to a RS485/RS232 converter to be interfaced to a PC supervisor.

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.

## 2.2 Line

The instruments are equipped with 2 terminals named **A** (D+ on the kube series) and **B** (D- on the kube series).

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

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

Adopted baud rates range between 1200... 38400 baud, that is very satisfactory for application performance, 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.

# 3 COMMUNICATION PROTOCOL

The protocol adopted by K_5 Programmer series 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 communication 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 (K_5) 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 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 addresses and word values as required by function in use;

◊ Control word: a cyclic redundancy check (CRC) performed with particular rules for CRC16 (lower byte).

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

## 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(s) | 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 the address 1 the value of the 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)

## 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 |

## 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 |
| | |
| | |
| | |
| | |
| | |

## 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

## 3.5 String Integrity Control (CRC-16 Cyclical redundancy check)

CRC-16 (Cyclic Redundancy Check) is a control word that allows to verify the integrity of a message. Each message, sent or received, contains the control word in the last two characters.

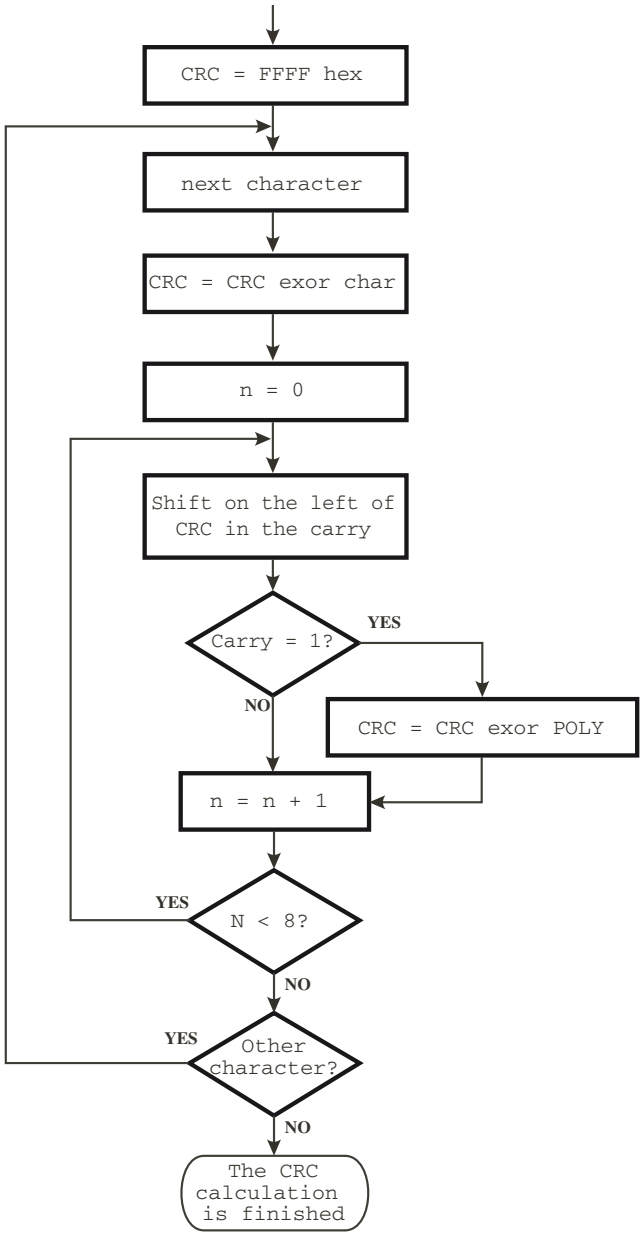
The CRC-16 value is calculated by the transmitting device. The CRC-16 value is queued to the message. The receiving device recalculates the CRC-16, obviously excluding the last two characters of the message. Compares the CRC-16 received with the calculated CRC-16: the two values must (obviously) be the same.

### 3.5.1 CRC-16 calculation procedure

1. Initialize the word (16 bit) used to store the CRC-16 with the value 0xFFFF;
2. Make an exclusive OR (XOR) between the 1st byte of the message and the lower part of the CRC-16 by putting the result in the CRC-16;
3. Move the CRC-16 one position to the right, towards the least significant bit. Entering the value zero in the most significant bit. Examine the least significant bit;
4. If the most significant bit = 0, repeat step 3 (move to another position),
   If the most significant bit = 1, make an exclusive OR (XOR) between the CRC-16 and the polynomial value 0xA001;
5. Repeat steps 3 and 4 until 8 shifts have been made. At this point a whole byte has been processed;
6. Repeat the procedure from step 2 to step 5 for the subsequent bytes of the message;
7. The final content of the CRC-16 word is the value of CRC-16.

The lower part of the word containing the CRC-16 (16 bytes) is always transmitted first, then the upper part.

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 subrutine made with “C” able to calculate the CTC-16.

```
/* ----------------------------------------------------------------
crc_16        calcolo del crc_16

Parametri di ingresso:
      buffer: stringa di caratteri di cui calcolare il CRC-16
      length: numero di bytes della stringa

Questa funzione ritorna il valore di 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.

# 4 DATA EXCHANGE

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

## 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).

## 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.

## 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.

## 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 memorized and the instrument will send an exception message to the master.

These are available data:

# 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 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 instruments (before Kube series): numeric values calculated and dinamically updated. Available in read and write operations |
| 800 | 2048 | 82C | 2092 | Instrument identification parameters |
| 2800 | 10240 | 289B | 10395 | Configuration parameters: Numeric and symbolic values. Available in read and write operations |

## 5.1 Common Variables

| no. | Address | | Description | Dec. Point | r/w |
|---|---|---|---|---|---|
| | Hex | Dec | | | |
| 1A | 1 | 1 | **PV: Measured value**<br>**Note:** When a measuring error is detected the instrument send:<br>• -10000 = Underrange<br>• 10000 = Overrange<br>• 10001 = Overflow of the A/D converter<br>• 10003 = Variable not available | dP | 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**<br>**Range:** -100.00 ÷ 100.00 (%)<br>**Note:** This parameter is ever writeable but it will be active only when the instrument operates in Manual mode. | 2 | r/w |
| 5A | 5 | 5 | **Active set point selection**<br>0 = SP<br>1 = SP 2<br>2 = SP 3<br>3 = SP 4 | 0 | r/w |
| 6A | 6 | 6 | **SP**<br>**Range:** SPLL ÷ SPLH | dP | r/w |
| 7A | 7 | 7 | **SP 2**<br>**Range:** SPLL ÷ SPLH | dP | r/w |
| 8A | 8 | 8 | **SP 3**<br>**Range:** SPLL ÷ SPLH | dP | r/w |
| 9A | 9 | 9 | **SP 4**<br>**Range:** SPLL ÷ SPLH | dP | r/w |
| 10A | A | 10 | **Alarms status**<br>bit 0 = Alarm 1 status<br>bit 1 = Alarm 2 status<br>bit 2 = Alarm 3 status<br>bit 3 ÷ 8 = Reserved<br>bit 9 = LBA status<br>bit 10 = Power failure indicator<br>bit 11 = Generic error<br>bit 12 = Overload alarm<br>bit 13 ÷15 = Reserved | 0 | r |
| 11A | B | 11 | **Outputs status (physical outputs)**<br>bit 0 = Output 1 status<br>bit 1 = Output 2 status<br>bit 3 = Output 3 status<br>bit 4 = Output 4 status<br>bit 5 = Output 5 status<br>bit 6÷15 = Reserved<br>When an 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**<br>bit 0 = Automatic<br>bit 1 = manual<br>bit 2 = Standby<br>bit 3 = Remote Set point (temporary) used<br>bit 4 = Auto-tuning active<br>bit 5 = Self tuning active<br>bit 6 = Reserved<br>bit 7 = Timer running<br>bit 8 = Soft start running<br>bit 9 = Ramp for Set Point change (up or down) running<br>bit 10 = Delay at start up (od) running<br>bit 11 = Program running<br>bit 12 = Measure status (0 = OK while 1 = error).<br>bit 13÷15 = Reserved | 0 | r |
| 13A | D | 13 | **Alarms reset**<br>0 = Not reset<br>1 = Reset | 0 | r/w |
| 14A | E | 14 | **Alarms acknowledge**<br>0 = Not acknowledged<br>1 = Acknowledged | 0 | r/w |
| 15A | F | 15 | **Control status**<br>0 = Automatic<br>1 = Manual<br>2 = Stand-by | 0 | r/w |
| 16A | 10 | 16 | **Remote set point (temporary)(from serial link)**<br>**Range:** SPLL ÷ SPLH<br>**Note:** the remote set point is stored in RAM | dP | r/w |
| 17A | 11 | 17 | **Auto tuning activation**<br>0 = Not active<br>1 = Active | 0 | r/w |
| 18A | 12 | 18 | **Power output used when a measuring error is detected**<br>**Range:** -100 ÷ 100<br>**Note:** This value is stored in RAM | 0 | r/w |
| 19A | 13 | 19 | **Default parameters loading**<br>-481 = Default parameter loading | 0 | r/w |
| 20A | 14 | 20 | **Parameters table identification code**<br>**Range:** 0 ÷ 65535<br>**Note:** The word is composed by two parts:<br>- Low byte – Version of the parameter table<br>- High byte – Version of the family protocoll | 0 | r |
| 21A | 15 | 21 | **Instrument identification code**<br>27 = KM5;<br>28 = KX5;<br>29 = KR5. | 0 | r |
| 26A | 1A | 26 | **Time to end of running program segment**<br>**Range:** 0 ÷ 9959 (hh.mm or mm.ss)<br>**Note:** When the program is not active, the return value is 0. | 0 | r |
| 27A | 1B | 27 | **Manual autotuning start request pending for Od or Soft start**<br>**Range:** 0 = No pending request waiting for the execution;<br>1 = Pending request waiting for the execution | 0 | r |
| 28A | 1C | 28 | **Autotuning start request pending for setpoint change for Od or Soft start**<br>**Range:** 0 = No pending request waiting for the execution;<br>1 = Pending request waiting for the execution | 0 | r |
| 29A | 1D | 29 | **Value to be retransmitted on the analogue Output**<br>**Range:** Ao1L ÷ Ao1H | 0 | r/w |

## 5.2 Group of variables compatible with the old Ascon Tecnologic instruments (before Kube series)

| no. | Address | | Description | Dec. Point | r/w |
|---|---|---|---|---|---|
| | Hex | Dec | | | |
| 1B | 0200 | 512 | **PV : Measured value**<br>As Modbus address 1 | dP | r |
| 2B | 0201 | 513 | **Number of decimal figure of the measured value**<br>As Modbus address 2 | 0 | r |
| 3B | 0202 | 514 | **Power output**<br>As Modbus address 4 | 2 | r |
| 4B | 0203 | 515 | **Power output of the heating output**<br>**Range:** 0 ÷ 100.00 (%) | 2 | r |
| 5B | 0204 | 516 | **Power output of the cooling output**<br>**Range:** 0 ÷ 100.00 (%) | 2 | r |
| 6B | 0205 | 517 | **Alarm 1 status**<br>0 = OFF<br>1 = ON | 0 | r |
| 7B | 0206 | 518 | **Alarm 2 status**<br>0 = OFF<br>1 = ON | 0 | r |
| 8B | 0207 | 519 | **Alarm 3 status**<br>0 = OFF<br>1 = ON | 0 | r |
| 9B | 0208 | 520 | **Operative set point**<br>As Modbus address 3 | dP | r |
| 10B | 020A | 522 | **LBA status**<br>0 = OFF<br>1 = ON | 0 | r |
| 11B | 020E | 526 | **Overload alarm status**<br>0 = OFF<br>1 = ON | 0 | r |
| 12B | 020F | 527 | **Controller status**<br>0 = Stand-by<br>1 = Auto<br>2 = Tuning<br>3 = Manual | 0 | r |
| 13B | 0224 | 548 | **Status/remote control of the Output 1**<br>0 = OFF<br>1 = ON<br>**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**<br>0 = OFF<br>1 = ON<br>**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**<br>0 = OFF<br>1 = ON<br>**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**<br>0 = OFF<br>1 = ON<br>**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**<br>0 = OFF<br>1 = ON<br>**Note:** Digital input 1status 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**<br>0 = OFF<br>1 = ON<br>**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 |

| no. | Address | | Description | Dec. Point | r/w |
|---|---|---|---|---|---|
| | Hex | Dec | | | |
| 19B | 0244 | 580 | **Program status**<br>0 = Not configured<br>1 = Reset (not running)<br>2 = Run<br>3 = Hold<br>4 = Wait (system)<br>5 = End (system)<br>6 = Hold + Wait (system)<br>7 = Continue | 0 | r/w |
| 20B | 0246 | 582 | **Program step in execution**<br>0 = Program not active<br>1 = ramp step 1<br>2 = soak step 1<br>2 = ramp step 2<br>4 = soak step 2<br>5 = ramp step 3<br>6 = soak step 3<br>7 = ramp step 4<br>8 = soak step 4<br>9 = END | 0 | r |
| 21B | 0247 | 583 | **Remaining time to program end**<br>**Range:** 0 ÷ 65535 (minutes when Pru = hh.mm, seconds when Pru = mm.ss)<br>**Note:** When the program is not running the return code is 0 | 2 | r |
| 22B | 248 | 584 | **Program events status**<br>0 > E1 = 0 E2 = 0<br>1 > E1 = 1 E2 = 0<br>2 > E1 = 0 E2 = 1<br>3 > E1 = 1 E2 = 1 | 0 | r |
| 23B | 24B | 587 | **Duration of first program ramp**<br>**Range:** 0 ÷ 9999 s | 0 | r |
| 24B | 24D | 589 | **Simple program running**<br>**Range:** 1 ÷ 4<br>**Note:** In the case of a composite program it can be different from the active program | 0 | r |
| 25B | 24E | 590 | **Number of execution in progress**<br>**Range:** 1 ÷ 100 (number equal to or greater than 100 not quantifiable) | 0 | r |
| 26B | 250 | 592 | **Duration of first program ramp**<br>**Range:** -100.00 ÷ 100.00 (%) | 2 | r/w |

## 5.3 Instrument identification parameters

| no. | Address | | Description | Dec. Point | r/w |
|---|---|---|---|---|---|
| | Hex | Dec | | | |
| 1 | 800 | 2048 | **Reserved** | 0 | r |
| 2 | 801 | 2049 | **Reserved** | 0 | r |
| 3 | 802 | 2050 | **Reserved** | 0 | r |
| 4 | 803 | 2051 | **Reserved** | 0 | r |
| 5 | 804 | 2052 | **Reserved** | 0 | r |
| 6 | 805 | 2053 | **Reserved** | 0 | r |
| 7 | 806 | 2054 | **Reserved** | 0 | r |
| 8 | 807 | 2055 | **Reserved** | 0 | r |
| 9 | 808 | 2056 | **Instrument Firmware Revision** - First part | 0 | r |
| 10 | 809 | 2057 | **Instrument Firmware Revision** - Second part | 0 | r |
| 11 | 80A | 2058 | **Model Code** – Instrument type 1<br>**Range:** 0x4B = 'K' | 0 | r |
| 12 | 80B | 2059 | **Model Code** – Instrument type 2<br>**Range:** 0x4D = 'M' = KM<br>0x52 = 'R' = KR<br>0x58 = 'X' = KX | 0 | r |
| 13 | 80C | 2060 | **Model Code** – Instrument type 3<br>**Range:** 0x31 = '1' = KM1, KR1, KX1<br>0x33 = '3' = KM3, KR3, KX3 | 0 | r |

| no. | Address | | Description | Dec. Point | r/w |
|---|---|---|---|---|---|
| | Hex | Dec | | | |
| 14 | 80D | 2061 | **Model Code** – Optional functions<br>**Range:** 0x2D = '-' = No functions<br>0x54 = 'T' = Timer<br>0x50 = 'P' = Timer + Programmer | 0 | r |
| 15 | 80E | 2062 | **Model Code** – Power supply type<br>**Range:** 0x48 = 'H' = 110 ÷ 240 Vac/Vdc<br>0x4C = 'L' = 24 Vac/Vdc | 0 | r |
| 16 | 80F | 2063 | **Model Code** – Measure input type<br>**Range:** 0x43 = 'C' = Tc, Pt100, Pt1000, mA, mV, V + Digital Input 1<br>0x45 = 'E' = Tc, PTC, NTC, mA, mV, V + Digital Input 1 | 0 | r |
| 17 | 810 | 2064 | **Model Code** – Output 1 type<br>**Range:** 0x49 = 'I' = Analogue Output<br>0x4F = 'O' = SSR<br>0x52 = 'R' = Relay | 0 | r |
| 18 | 811 | 2065 | **Model Code** – Output 2 type<br>**Range:** 0x2D = '-' = Not present<br>0x4D = 'M' = Servomotor command relay<br>0x4F = 'O' = SSR<br>0x52 = 'R' = Relay | 0 | r |
| 19 | 812 | 2066 | **Model Code** – Output 3 type<br>**Range:** 0x2D = '-' = Not present<br>0x4D = 'M' = Servomotor command relay<br>0x4F = 'O' = SSR<br>0x52 = 'R' = Relay | 0 | r |
| 20 | 813 | 2067 | **Model Code** – Output 4 type<br>**Range:** 0x43 = 'D' = Output 4 (VDC for SSR)/Sensor Power Supply/Digital Input DI2 | 0 | r |
| 21 | 814 | 2068 | **Model Code** – Serial communication type<br>**Range:** 0x2D = '-' = TTL<br>0x53 = 'S' = Rs485 Modbus | 0 | r |
| 22 | 815 | 2069 | **Model Code** – Terminal type<br>**Range:** 0x2D = '-' = Standard (screw terminals not removable)<br>0x45 = 'E' = Removable screw terminals<br>0x4D = 'M' = Removable spring terminals<br>0x4E = 'N' = Removable terminals (the fixed part only) | 0 | r |
| 23 | 816 | 2070 | **Model Code – Reserved** | 0 | r |
| 24 | 817 | 2071 | **Model Code – Reserved** | 0 | r |
| 25 | 818 | 2072 | **Model Code – Reserved** | 0 | r |
| 26 | 819 | 2073 | **Model Code – Reserved** | 0 | r |
| 27 | 81A | 2074 | **Model Code – Reserved** | 0 | r |
| 28 | 81B | 2075 | **Model Code – Reserved** | 0 | r |
| 29 | 81C | 2076 | **Model Code – Reserved** | 0 | r |
| 30 | 81D | 2077 | **Model Code – Reserved** | 0 | r |
| 31 | 81E | 2078 | **Model Code – Reserved** | 0 | r |
| 32 | 81F | 2079 | **Model Code – Reserved** | 0 | r |
| 33 | 820 | 2080 | **Model Code – Reserved** | 0 | r |
| 34 | 821 | 2081 | **Model Code – Reserved** | 0 | r |
| 35 | 822 | 2082 | **Model Code – Reserved** | 0 | r |
| 36 | 823 | 2083 | **Model Code – Reserved** | 0 | r |
| 37 | 824 | 2084 | **Model Code – Reserved** | 0 | r |
| 38 | 825 | 2085 | **Model Code – Reserved** | 0 | r |
| 39 | 826 | 2086 | Serial Number – First part (LL) | 0 | r |
| 40 | 827 | 2087 | Serial Number – Second part (L) | 0 | r |
| 41 | 828 | 2088 | Serial Number – Third part (H) | 0 | r |
| 42 | 829 | 2089 | Serial Number – Fourth part (HH) | 0 | r |
| 43 | 82A | 2090 | Calibration Date – Day<br>**Range:** 1 ÷ 31 | 0 | r |
| 44 | 82B | 2091 | Calibration Date – Month<br>**Range:** 1 ÷ 12 | 0 | r |
| 45 | 82C | 2092 | Calibration Date – Year | 0 | r |

## 5.4 Parameters Setting: Addresses form 280 hex (640 dec) and 2800 hex (10240 dec)

### 5.4.1 inP GROUP - Main and auxiliary input configuration

| no. | Par. | Address Hex | Address Dec | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| 1 | SEnS | 2800 | 10240 | Model C (Pt100, Pt1000) | 0 = J = TC J,<br>1 = crAL = TC K,<br>2 = S = TC S,<br>3 = r = TC R,<br>4 = t = TC T,<br>5 = ir.J = IRS J,<br>6 = ir.cA = IRS K,<br>7 = Pt1 = RTD Pt100,<br>8 = Pt10 = RTD Pt1000,<br>9 = 0.60 = 0... 60 mV,<br>10 = 12.60 = 12... 60 mV,<br>11 = 0.20 = 0... 20 mA,<br>12 = 4.20 = 4... 20 mA,<br>13 = 0.5 = 0... 5 V,<br>14 = 1.5 = 1... 5 V,<br>15 = 0.10 = 0... 10 V,<br>16 = 2.10 = 2... 10 V | 0 | r/W |
| | | | | Model E (Ptc, Ntc) | 0 = J = TC J,<br>1 = crAL = TC K,<br>2 = S = TC S,<br>3 = r = TC R,<br>4 = t = TC T,<br>5 = ir.J = IRS J,<br>6 = ir.cA = IRS K,<br>7 = Ptc = TC KTY81-121,<br>8 = ntc = NTC 103-AT2,<br>9 = 0.60 = 0... 60 mV,<br>10 = 12.60 = 12... 60 mV,<br>11 = 0.20 = 0... 20 mA,<br>12 = 4.20 = 4... 20 mA,<br>13 = 0.5 = 0... 5 V,<br>14 = 1.5 = 1... 5 V,<br>15 = 0.10 = 0... 10 V,<br>16 = 2.10 = 2... 10 V | | |
| 2 | dp | 2801 | 10241 | Decimal Point Position | 0... 3 linear inputs<br>0/1 sensors (different than linear inputs) | 0 | r/w |
| 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<br>1 = F = °F | 0 | r/w |
| 6 | Fil | 2805 | 10245 | Digital filter on the measured value<br>**Note:** This filter affects the control action, the PV retransmission and the alarms action. | 0 = Off<br>1... 200 (seconds) | 1 | r/w |
| 7 | inE | 2806 | 10246 | Sensor error used to enable the safety output value | or = Over range<br>ou = Under range<br>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,<br>1 = out4 = Output 4 (digital output 4),<br>2 = dG2c = Digital input 2 driven by contact,<br>3 = dG2U = Digital input 2 driven by voltage | 0 | r/w |

| no. | Par. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 10 | diF1 | 2809 | 10249 | Digital Input 1 function | 0 = oFF = Not used,<br>1 = Alarm reset,<br>2 = Alarm acknowledge (ACK),<br>3 = Hold of the measured value,<br>4 = Stand by mode,<br>5 = Manual mode,<br>6 = Program Start,<br>7 = Program Reset,<br>8 = Program Hold,<br>9 = Program Run/Hold,<br>10 = Program Run/Reset,<br>11 = SP1 - SP2 selection,<br>12 = SP1... SP4 binary selection,<br>13 = Digital inputs in parallel to ▲ and ▼ keys,<br>14 = Program 1 or 2 selection,<br>15 = Program 1, 2, 3 or 4 selection. | 0 | r/w |
| 11 | diF2 | 280A | 10250 | Digital Input 2 function | 0 = oFF = Not used,<br>1 = Alarm reset,<br>2 = Alarm acknowledge (ACK),<br>3 = Hold of the measured value,<br>4 = Stand by mode,<br>5 = Manual mode,<br>6 = Program Start,<br>7 = Program Reset,<br>8 = Program Hold,<br>9 = Program Run/Hold,<br>10 = Program Run/Reset,<br>11 = SP1 - SP2 selection,<br>12 = SP1... SP4 binary selection,<br>13 = Digital inputs in parallel to ▲ and ▼ keys,<br>14 = Program 1 or 2 selection,<br>15 = Program 1, 2, 3 or 4 selection. | 0 | r/w |
| 12 | di.A | 280b | 10251 | Digital Inputs Action<br>**Note:** The addresses related to this parameter are inserted after the last parameter set [157] tSd2 | 0 = DI1 direct action, DI2 (if configured) direct action;<br>1 = DI1 reverse action, DI2 (if configured) direct action;<br>2 = DI1 direct action, DI2 (if configured) reverse action;<br>3 = DI1 reverse action, DI2 (if configured) reverse action. | 0 | R/W |

### 5.4.2 Out group

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 13 | o1t | 280C | 10252 | Output 1 type | 0 = 0-20 = 0-20 mA<br>1 = 4-20 = 4-20 mA<br>2 = 0-10 = 0-10 V<br>3 = 2-10 = 2-10 V | 0 | r/w |

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 14 | o1F | 280D | 10253 | Out 1 function<br>(when Out1 is a digital output) | 0 = NonE = Output not used<br>1 = H.rEG = Heating output<br>2 = c.rEG = Cooling output<br>3 = AL = Alarm output<br>4 = P.End = Program end indicator<br>5 = P.HLd = Program hold indicator<br>6 = P.uit = Program wait indicator<br>7 = P.run = Program run indicator<br>8 = P.Et1 = Program Event 1<br>9 = P.Et2 = Program Event 2<br>10 = or.bo = Out-of-range or burn out indicator<br>11 = P.FAL = Power failure indicator<br>12 = bo.PF = Out-of-range, burn out and Power failure indicator<br>13 = St.bY = Stand by status indicator<br>14 = diF.1 = The output repeats the digital input 1 status<br>15 = diF.2 = The output repeats the digital input 2 status<br>16 = on = Out 1 always ON | 0 | r/w |
| | | | | Out 1 function<br>(when Out 1 is a linear output) | 0 = NonE = Output not used<br>1 = H.rEG = Heating output<br>2 = c.rEG = Cooling output<br>3 = r.inP = Measure retransmission<br>4 = r.Err = Error (sp - PV) retransmission<br>5 = r.SP = Set point retransmission<br>6 = r.SEr = Serial value retransmission | | |
| 15 | Ao1L | 280E | 10254 | Initial scale value of the analog retransmission (KM5 only) | -1999 ... Ao1H | dp | r/w |
| 16 | Ao1H | 280F | 10255 | Full scale value of the analog retransmission (KM5 only) | Ao1L ... 9999 | dp | r/w |
| 17 | o1AL | 2810 | 10256 | Alarms linked up with the out 1 | 0... 63<br>+1 = Alarm 1<br>+2 = Alarm 2<br>+4 = Alarm 3<br>+8 = Loop break alarm<br>+16 = Sensor Break<br>+32 = Overload on output 4 | 0 | r/w |
| 18 | o1Ac | 2811 | 10257 | Out 1 action | 0 = dir = Direct action<br>1 = rEU = Reverse action<br>2 = dir.r = Direct with reversed LED<br>3 = ReU.r = Reverse with reversed LED | 0 | r/w |
| 19 | o2F | 2812 | 10258 | Out 2 function | See the values of 13 = o1F parameter | 0 | r/w |
| 20 | o2AL | 2813 | 10259 | Alarms linked up with the out 2 | See the values of 16 = o1AL parameter | 0 | r/w |
| 21 | o2Ac | 2814 | 10260 | Out 2 action | See the values of 17 = o1Ac parameter | 0 | r/w |
| 22 | o3F | 2815 | 10261 | Out 3 function | See the values of 13 = o1F parameter | 0 | r/w |
| 23 | o3AL | 2816 | 10262 | Alarms linked up with the out 3 | See the values of 16 = o1AL parameter | 0 | r/w |
| 24 | o3Ac | 2817 | 10264 | Out 3 action | See the values of 17 = o1Ac parameter | 0 | r/w |
| 25 | o4F | 2818 | 10264 | Out 4 function | See the values of 13 = o1F parameter | 0 | r/w |
| 26 | o4AL | 2819 | 10265 | Alarms linked up with the out 4 | See the values of 16 = o1AL parameter | 0 | r/w |
| 27 | o4Ac | 281A | 10266 | Out 4 action | See the values of 17 = o1Ac parameter | 0 | r/w |

### 5.4.3 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<br>1 = LoAb = Absolute low alarm<br>2 = HiAb = Absolute high alarm<br>3 = LHAo = Absolute band alarm in alarm outside the band<br>4 = LHAi = Absolute band alarm in alarm inside the band<br>5 = SE.br = Sensor Break<br>6 = LodE = Deviation low alarm (relative)<br>7 = HidE = Deviation high alarm (relative)<br>8 = LHdo = Relative band alarm in alarm out of the band<br>9 = LHdi = Relative band alarm in alarm inside the band | 0 | r/w |

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 29 | Ab1 | 281C | 10268 | Alarm 1 function | 0... 15<br>0 = No function<br>+1 = Not active at power ON<br>+2 = Latched alarm (manual reset)<br>+4 = Acknowledgedable alarm<br>+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<br>- For band alarm, it is 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<br>- For band alarm is 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 | 0 (oFF)/1... 9999 (s) | 0 | r/w |
| 35 | AL1o | 2822 | 10274 | Alarm 1 enabling during Stand-by mode and over/under range conditions | 0 = Alarm 1 disabled during Stand by **and** out of range<br>1 = Alarm 1 enabled in stand by mode<br>2 = Alarm 1 enabled in over/under range condition<br>3 = Alarm 1 enabled in stand by mode and over/under range condition | 0 | r/w |

### 5.4.4 AL2 group

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 36 | AL2t | 2823 | 10275 | Alarm 2 type | 0 = nonE = Alarm not used<br>1 = LoAb = Absolute low alarm<br>2 = HiAb = Absolute high alarm<br>3 = LHAo = Absolute band alarm in alarm outside the band<br>4 = LHAi = Absolute band alarm in alarm inside the band<br>5 = SE.br = Sensor Break<br>6 = LodE = Deviation low alarm (relative)<br>7 = HidE = Deviation high alarm (relative)<br>8 = LHdo = Relative band alarm in alarm out of the band<br>9 = LHdi = Relative band alarm in alarm inside the band | 0 | r/w |
| 37 | Ab2 | 2824 | 10276 | Alarm 2 function | 0... 15<br>0 = No function<br>+1 = Not active at power ON<br>+2 = Latched alarm (manual reset)<br>+4 = Acknowledgedable alarm<br>+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<br>- For band alarm, it is 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<br>- For band alarm is 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 | 0 (oFF)/1... 9999 (s) | 0 | r/w |
| 43 | AL2o | 282A | 10282 | Alarm 2 enabling during Stand-by mode and over/under range conditions | 0 = Alarm 2 disabled during Stand by **and** out of range<br>1 = Alarm 2 enabled in stand by mode<br>2 = Alarm 2 enabled in over/under range condition<br>3 = Alarm 2 enabled in stand by mode and over/under range condition | 0 | r/w |

### 5.4.5 AL3 group

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 44 | AL3t | 282B | 10283 | Alarm 3 type | 0 = nonE = Alarm not used<br>1 = LoAb = Absolute low alarm<br>2 = HiAb = Absolute high alarm<br>3 = LHAo = Absolute band alarm in alarm outside the band<br>4 = LHAi = Absolute band alarm in alarm inside the band<br>5 = SE.br = Sensor Break<br>6 = LodE = Deviation low alarm (relative)<br>7 = HidE = Deviation high alarm (relative)<br>8 = LHdo = Relative band alarm in alarm out of the band<br>9 = LHdi = Relative band alarm in alarm inside the band | 0 | r/w |
| 45 | Ab3 | 282C | 10284 | Alarm 3 function | 0... 15<br>0 = No function<br>+1 = Not active at power ON<br>+2 = Latched alarm (manual reset)<br>+4 = Acknowledgedable alarm<br>+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<br>- For band alarm, it is 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<br>- For band alarm is 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... 9999 (E.U.) | dP | r/w |
| 50 | AL3d | 2831 | 10289 | AL3 delay | 0 (oFF)/1... 9999 (s) | 0 | r/w |
| 51 | AL3o | 2832 | 10290 | Alarm 3 enabling during Stand-by mode and over/under range conditions | 0 = Alarm 3 disabled during Stand by **and** out of range<br>1 = Alarm 3 enabled in stand by mode<br>2 = Alarm 3 enabled in over/under range condition<br>3 = Alarm 3 enabled in stand by mode and over/under range condition | 0 | r/w |

### 5.4.6 LBA group - Loop Break Alarm Parameters

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 52 | LbAt | 2833 | 10291 | LBA time | 0 (oFF)/1... 9999 (s) | 0 | |
| 53 | LbSt | 2834 | 10292 | Delta measure used by LBA during Soft start | 0 (oFF)/1... 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%<br>1 = dn = Active when Pout = -100%<br>2 = both = Active in both cases | 0 | |

### 5.4.7 rEG group - Control Parameters

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 56 | cont | 2837 | 10295 | Control type<br>If at least 1 heating output **and** 1 cooling output are configured | 0 = Pid = PID (heat and/or)<br>1 = nr = Heat/Cool ON/OFF control with neutral zone | 0 | r/w |
| | | | | Control type<br>If only heating **or** cooling outputs are configured without 3 point valve control | 0 = Pid = PID (heat and/or)<br>1 = On.FA = ON/OFF asymmetric hysteresis<br>2 = On.FS = ON/OFF symmetric hysteresis | | |
| | | | | Control type<br>If only heating **or** cooling outputs are configured with 3 point valve control | 0 = Pid = PID (heat and/or)<br>1 = On.FA = ON/OFF asymmetric hysteresis<br>2 = On.FS = ON/OFF symmetric hysteresis<br>3 = 3Pt = Open loop 3 valve control (no feedback) | | |

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 57 | Auto | 2838 | 10296 | Autotuning selection | -4 = Oscillating auto-tune with automatic start at power ON and after set point changes<br>-3 = Oscillating auto-tune with manual start<br>-2 = Oscillating auto-tune with automatic start at first power ON only<br>-1 = Oscillating auto-tune with automatic start at all power ONs<br>0 = Not used<br>1 = Fast auto-tune with automatic start at all power ONs<br>2 = Fast auto-tune with automatic start at first power ON only<br>3 = FAST auto-tune with manual start<br>4 = FAST auto-tune with automatic start at power ON and after set point changes<br>5 = Evo-tune with automatic start at every power ON<br>6 = Evo-tune with automatic start at first power ON only<br>7 = Evo-tune with manual start<br>8 = Evo-tune with automatic start at power ON and after set point changes | 0 | r/w |
| 58 | tune | 2839 | 10297 | Manual start of the Autotuning | 0 = oFF = Autotuning Not active<br>1 = on = Autotuning Active | 0 | r/w |
| 59 | HSEt | 283A | 10298 | Hysteresis of the ON/OFF control | 1... 9999 (E.U.) | dP | r/w |
| 60 | Pb | 283B | 10299 | Proportional band | 1... 9999 (E.U.) | dP | r/w |
| 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... 100 | 2 | r/w |
| 64 | tcH | 283F | 10303 | Heating output cycle time | 2... 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 | 2... 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...100% | 1 | r/w |
| 70 | od | 2845 | 10309 | Delay at power ON | 0.00 (oFF)/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 (oFF)/0.01... 759/800 = inF (h.mm) | 2 | r/w |
| 73 | SS.tH | 2848 | 10312 | Threshold for soft start disabling | -2000 (oFF)/-1999... +9999 (E.U.) | dP | r/w |

### 5.4.8 SP group - Set point parameters

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 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<br>1 = SP 2<br>2 = SP 3<br>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<br>1 = trin = The value is added to the local set point selected by A.SP and the sum becomes the operative set point<br>2 = PErc = The value is 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<br>1 = rEn = remote | 0 | r/w |

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 84 | SP.u | 2853 | 10323 | Rate of rise for **POSITIVE** set point change (ramp UP) | 1... 9999 Engineering units per minute (10000 = inF) | 2 | r/w |
| 85 | SP.d | 2854 | 10324 | Rate of rise for **NEGATIVE** set point change (ramp DOWN) | 1... 9999 Engineering units per minute (10000 = inF) | 2 | r/w |

### 5.4.9 PAn group - Operator HMI parameters

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 86 | PAS2 | 2855 | 10325 | Level 2 password (limited access level) | - oFF (Level 2 not protected by password)<br>- 1... 200 | 0 | r/w |
| 87 | PAS3 | 2856 | 10326 | Level 3 password (complete configuration level) | 3... 200 | 0 | r/w |
| 88 | uSrb | 2857 | 10327 | button function during RUN TIME | 0 = nonE = No function<br>1 = tunE = Auto-tune/self-tune enabling. A single press (longer than 1 second) starts the auto-tune<br>2 = oPLo = Manual mode. The 1st press puts the instrument in manual mode (oPLo) while the 2nd puts the instrument in Auto mode<br>3 = AAc = Alarm reset<br>4 = ASi = Alarm acknowledge<br>5 = chSP = Sequential set point selection<br>6 = St.by = Stand by mode. The 1st press puts the instrument in stand by mode while the 2nd puts the instrument in Auto mode.<br>7 = P.run = Program run<br>8 = P.rES = Program reset<br>9 = P.r.H.r = Program run/hold/reset | 0 | r/w |
| 89 | diSP | 2858 | 10328 | Display management | 0 = nonE = Standard display<br>1 = Pou = Power output<br>2 = PoS = Valve servomotor position<br>3 = SPF = Final set point<br>4 = Spo = Operative set point<br>5 = AL1 = Alarm 1 threshold<br>6 = AL2 = Alarm 2 threshold<br>7 = AL3 = Alarm 3 threshold<br>8 = Pr.tu = - During a soak, the instrument shows the soak elapsed time;<br>- During a ramp the display shows the operative set point. At the end of the program execution, the instrument shows P.End messages alternately with the measured value.<br>- When no program is running, the instrument shows the standard display<br>9 = Pr.td = - During a soak, the instrument shows the soak remaining time (count down).<br>- During a ramp the display shows the operative set point. At the end of the program execution, the instrument shows P.End messages alternately with the measured value.<br>- When no program is running, the instrument shows the standard display.<br>10 = P.t.tu = When the programmer is running, the display shows the total elapsed time. At the end of the program execution, the instrument shows P.End messages alternately with the measured value.<br>11 = P.t.td = When the programmer is running, the display shows the total remaining time (count down). At the end of the program execution, the instrument shows P.End messages alternately with the measured value.<br>12 = PErc = Percent of the power output used during soft start (when the soft start time is equal to infinite, the limit is ever active and it can be used also when ON/OFF control is selected) | | r/w |
| 90 | di.CL | 2859 | 10329 | Display colour | 0 = The display colour changes to point out the actual deviation (PV - SP)<br>1 = Display red (fix)<br>2 = Display green (fix)<br>3 = Display orange (fix) | | |
| 91 | AdE | 285A | 10330 | Deviation for display colour management | 1... 9999 | Dp | r/w |
| 92 | diS.t | 285B | 10331 | Display Timeout | 0 = oFF (display always ON)0001... 9959 (mm.ss) | 2 | r/w |
| 93 | FiLd | 285C | 10332 | Filter on the displayed value | 0 = oFF (filter disabled)/1... 100 | Dp | r/w |

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 94 | Bg.F | 285D | 10333 | Bar graph Function | 0 = nonE = Bargraph not lit<br>1 = Pou = PID Output power (single action: 0... 100%, double action: -100... +100%)<br>2 = PoS = Valve servomotor position<br>3 = Pr.tu = Elapsed time of the program in execution<br>4 = Pr.td = Time to end of the program in execution<br>5 = Pr.tS = Time to end of the program segment in execution | 0 | r/w |
| 95 | DSPu | 285E | 10334 | Instrument status at power ON | 0 = AS.Pr = Starts in the same way it was prior to the power down<br>1 = Auto = Starts in Auto mode<br>2 = oP.0 = Starts in manual mode with a power output equal to zero<br>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<br>1 = Au.oP = Auto and manual (OPLO) mode only will be selectable by the next parameter<br>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<br>1 = oPLo = Manual mode<br>2 = St.bY = Stand by mode | 0 | r/w |

### 5.4.10 Ser group - Serial link parameters

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 98 | Add | 2861 | 10337 | Instrument address | oFF/1... 254 | 0 | r/w |
| 99 | bAud | 2862 | 10338 | baud rate | 0 = 1200 = 1200 baud<br>1 = 2400 = 2400 baud<br>2 = 9600 = 9600 baud<br>3 = 19.2 = 19200 baud<br>4 = 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)<br>1 = rSP = The instrument becomes a Master and retransmits the operative set point<br>2 = PErc = The instrument become a Master and it retransmits the power output as a percentage | 0 | r/w |

### 5.4.11 CAl group - User calibration parameters

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 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)... 9999 (E.U.) | dP | r/w |
| 104 | AH.o | 2867 | 10343 | Adjust High Offset | -300... +300 (E.U.) | dP | r/w |

### 5.4.12 PRG group - Programmer function parameters

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 126 | PAGE | 287D | 10365 | Active program page selection | 1 ÷ 2 | 0 | r/w |
| 127 | Pr.n | 287E | 10366 | Active program | 1 ÷ 4 | 0 | r/w |
| 128 | Pr.St | 287F | 10367 | Active program Status | 0 = rES > Program reset<br>1 = run > Program start<br>2 = HoLd > Program hold<br>3 = cont > Continue (read only) | 0 | r/w |

### 5.4.13 Pr1 Group - Program 1 parameters

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 129 | P1.F | 2880 | 10368 | Program 1 - Action at power ON | 0 = nonE = Programmer not used<br>1 = S.uP.d = Start at power ON, 1st step in stand-by<br>2 = S.uP.S = Start at power ON<br>3 = u.diG = Start at Run command detection only<br>4 = u.dG.d = Start at Run command, 1st step in stand-by | 0 | r/w |
| 130 | P1.u | 2881 | 10369 | Program 1 - Time unit of the soaks | 0 = hh.nn = Hours and minutes<br>1 = nn.SS = Minutes and seconds | 0 | r/w |
| 131 | P1.E | 2882 | 10370 | Program 1 - Instrument behaviour at the end of the program execution | 0 = cnt = Continue<br>1 = SPAt = Go to the set point selected by A.SP<br>2 = Stby = Go to stand-by mode | 0 | r/w |
| 132 | P1.nE | 2883 | 10371 | Program 1 - Number of executions | 1... 99 times/100 = inF (indefinitely) | 0 | r/w |
| 133 | P1.Et | 2884 | 10372 | Program 1 - Time of the end program | 0 (oFF)/001... 9959 mm.ss/10000 = inF (steady ON) | 2 | r/w |
| 134 | P1.S1 | 2885 | 10373 | Program 1 - Set point of the 1st soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 135 | P1.G1 | 2886 | 10374 | Program 1 - Gradient of the 1st ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 136 | P1.t1 | 2887 | 10375 | Program 1 - Time of the 1st soak | 0... 9959 (time unit of the soaks) | 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 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 139 | P1.S2 | 288A | 10378 | Program 1 - Set point of the 2nd soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 140 | P1.G2 | 288B | 10379 | Program 1 - Gradient of the 2nd ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 141 | P1.t2 | 288C | 10380 | Program 1 - Time of the 2nd soak | 0... 9959 (time unit of the soaks) | 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 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 144 | P1.S3 | 288F | 10383 | Program 1 - Set point of the 3rd soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 145 | P1.G3 | 2890 | 10384 | Program 1 - Gradient of the 3rd ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 146 | P1.t3 | 2891 | 10385 | Program 1 - Time of the 3rd soak | 0... 9959 (time unit of the soaks) | 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 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 149 | P1.S4 | 2894 | 10388 | Program 1 - Set point of the 4th soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 150 | P1.G4 | 2895 | 10389 | Program 1 - Gradient of the 4th ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 151 | P1.t4 | 2896 | 10390 | Program 1 - Time of the 4th soak | 0... 9959 (time unit of the soaks) | 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 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 154 | P1.S5 | 2899 | 10393 | Program 1 - Set point of the 5th soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 165 | P1.G5 | 289A | 10394 | Program 1 - Gradient of the 5th ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 156 | P1.t5 | 289B | 10395 | Program 1 - Time of the 5th soak | 0... 9959 (time unit of the soaks) | 2 | r/w |
| 157 | P1.b5 | 289C | 10396 | Program 1 - Wait band of the 5th soak | 0 (oFF)/1... 9999 (E.U.) | 0 | r/w |
| 158 | P1.E5 | 289D | 10397 | Program 1 - Events of the 5th group | 0000... 1111 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 159 | P1.S6 | 289E | 10398 | Program 1 - Set point of the 6th soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 160 | P1.G6 | 289F | 10399 | Program 1 - Gradient of the 6th ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 161 | P1.t6 | 28A0 | 10400 | Program 1 - Time of the 6th soak | 0... 9959 (time unit of the soaks) | 2 | r/w |
| 162 | P1.b6 | 28A1 | 10401 | Program 1 - Wait band of the 6th soak | 0 (oFF)/1... 9999 (E.U.) | 0 | r/w |
| 163 | P1.E6 | 28A2 | 10402 | Program 1 - Events of the 6th group | 0000... 1111 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 164 | P1.c2 | 28A3 | 10403 | Program 1 - Continues on Program 2 | 0 = no = Program 1 is ended<br>1 = YES = Program 1 will continue on program 2 | 0 | r/w |

### 5.4.14 Pr2 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<br>1 = S.uP.d = Start at power ON, 1st step in stand-by<br>2 = S.uP.S = Start at power ON<br>3 = u.diG = Start at Run command detection only<br>4 = u.dG.d = Start at Run command, 1st step in stand-by | 0 | r/w |
| 166 | P2.u | 28A5 | 10405 | Program 2 - Time unit of the soaks | 0 = hh.nn = Hours and minutes<br>1 = nn.SS = Minutes and seconds | 0 | r/w |
| 167 | P2.E | 28A6 | 10406 | Program 2 - Instrument behaviour at the end of the program execution | 0 = cnt = Continue<br>1 = SPAt = Go to the set point selected by A.SP<br>2 = Stby = Go to stand-by mode | 0 | r/w |
| 168 | P2.nE | 28A7 | 10407 | Program 2 - Number of executions | 1... 99 times/100 = inF (indefinitely) | 0 | r/w |
| 169 | P2.Et | 28A8 | 10408 | Program 2 - Time of the end program | 0 (oFF)/001... 9959 mm.ss/10000 = inF (steady ON) | 2 | r/w |
| 170 | P2.S1 | 28A9 | 10409 | Program 2 - Set point of the 1st soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 171 | P2.G1 | 28AA | 10410 | Program 2 - Gradient of the 1st ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 172 | P2.t1 | 28AB | 10411 | Program 2 - Time of the 1st soak | 0... 9959 (time unit of the soaks) | 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 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 175 | P2.S2 | 28AE | 10414 | Program 2 - Set point of the 2nd soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 176 | P2.G2 | 28AF | 10415 | Program 2 - Gradient of the 2nd ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 177 | P2.t2 | 28B0 | 10416 | Program 2 - Time of the 2nd soak | 0... 9959 (time unit of the soaks) | 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 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 180 | P2.S3 | 28B3 | 10419 | Program 2 - Set point of the 3rd soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 181 | P2.G3 | 28B4 | 10420 | Program 2 - Gradient of the 3rd ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 182 | P2.t3 | 28B5 | 10421 | Program 2 - Time of the 3rd soak | 0... 9959 (time unit of the soaks) | 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 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 185 | P2.S4 | 28B8 | 10424 | Program 2 - Set point of the 4th soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 186 | P2.G4 | 28B9 | 10425 | Program 2 - Gradient of the 4th ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 187 | P2.t4 | 28BA | 10426 | Program 2 - Time of the 4th soak | 0... 9959 (time unit of the soaks) | 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 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 190 | P2.S5 | 28BD | 10429 | Program 2 - Set point of the 5th soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 191 | P2.G5 | 28BE | 10430 | Program 2 - Gradient of the 5th ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 192 | P2.t5 | 28BF | 10431 | Program 2 - Time of the 5th soak | 0... 9959 (time unit of the soaks) | 2 | r/w |
| 193 | P2.b5 | 28C0 | 10432 | Program 2 - Wait band of the 5th soak | 0 (oFF)/1... 9999 (E.U.) | 0 | r/w |
| 194 | P2.E5 | 28C1 | 10433 | Program 2 - Events of the 5th group | 0000... 1111 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 195 | P2.S6 | 28C2 | 10434 | Program 2 - Set point of the 6th soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 196 | P2.G6 | 28C3 | 10435 | Program 2 - Gradient of the 6th ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 197 | P2.t6 | 28C4 | 10436 | Program 2 - Time of the 6th soak | 0... 9959 (time unit of the soaks) | 2 | r/w |
| 198 | P2.b6 | 28C5 | 10437 | Program 2 - Wait band of the 6th soak | 0 (oFF)/1... 9999 (E.U.) | 0 | r/w |
| 199 | P2.E6 | 28C6 | 10438 | Program 2 - Events of the 6th group | 0000... 1111 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 200 | P2.c3 | 28C7 | 10439 | Program 2 - Continues on Program 3 | 0 = no = Program 2 is ended<br>1 = YES = Program 2 will continue on program 3 | 0 | r/w |

### 5.4.15 Pr3 Group - Program 3 parameters

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 201 | P3.F | 28C8 | 10440 | Program 3 - Action at power ON | 0 = nonE = Programmer not used<br>1 = S.uP.d = Start at power ON, 1st step in stand-by<br>2 = S.uP.S = Start at power ON<br>3 = u.diG = Start at Run command detection only<br>4 = u.dG.d = Start at Run command, 1st step in stand-by | 0 | r/w |
| 202 | P3.u | 28C9 | 10441 | Program 3 - Time unit of the soaks | 0 = hh.nn = Hours and minutes<br>1 = nn.SS = Minutes and seconds | 0 | r/w |
| 203 | P3.E | 28CA | 10442 | Program 3 - Instrument behaviour at the end of the program execution | 0 = cnt = Continue<br>1 = SPAt = Go to the set point selected by A.SP<br>2 = Stby = Go to stand-by mode | 0 | r/w |
| 204 | P3.nE | 28CB | 10443 | Program 3 - Number of executions | 1... 99 times/100 = inF (indefinitely) | 0 | r/w |
| 205 | P3.Et | 28CC | 10444 | Program 3 - Time of the end program | 0 (oFF)/001... 9959 mm.ss/10000 = inF (steady ON) | 2 | r/w |
| 206 | P3.S1 | 28CD | 10445 | Program 3 - Set point of the 1st soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 207 | P3.G1 | 28CE | 10446 | Program 3 - Gradient of the 1st ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 208 | P3.t1 | 28CF | 10447 | Program 3 - Time of the 1st soak | 0... 9959 (time unit of the soaks) | 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 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 211 | P3.S2 | 28D2 | 10450 | Program 3 - Set point of the 2nd soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 212 | P3.G2 | 28D3 | 10451 | Program 3 - Gradient of the 2nd ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 213 | P3.t2 | 28D4 | 10452 | Program 3 - Time of the 2nd soak | 0... 9959 (time unit of the soaks) | 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 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 216 | P3.S3 | 28D7 | 10455 | Program 3 - Set point of the 3rd soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 217 | P3.G3 | 28D8 | 10456 | Program 3 - Gradient of the 3rd ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 218 | P3.t3 | 28D9 | 10457 | Program 3 - Time of the 3rd soak | 0... 9959 (time unit of the soaks) | 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 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 221 | P3.S4 | 28DC | 10460 | Program 3 - Set point of the 4th soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 222 | P3.G4 | 28DD | 10461 | Program 3 - Gradient of the 4th ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 223 | P3.t4 | 28DE | 10462 | Program 3 - Time of the 4th soak | 0... 9959 (time unit of the soaks) | 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 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 226 | P3.S5 | 28E1 | 10465 | Program 3 - Set point of the 5th soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 227 | P3.G5 | 28E2 | 10466 | Program 3 - Gradient of the 5th ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 228 | P3.t5 | 28E3 | 10467 | Program 3 - Time of the 5th soak | 0... 9959 (time unit of the soaks) | 2 | r/w |
| 229 | P3.b5 | 28E4 | 10468 | Program 3 - Wait band of the 5th soak | 0 (oFF)/1... 9999 (E.U.) | 0 | r/w |
| 230 | P3.E5 | 28E5 | 10469 | Program 3 - Events of the 5th group | 0000... 1111 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 231 | P3.S6 | 28E6 | 10470 | Program 3 - Set point of the 6th soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 232 | P3.G6 | 28E7 | 10471 | Program 3 - Gradient of the 6th ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 233 | P3.t6 | 28E8 | 10472 | Program 3 - Time of the 6th soak | 0... 9959 (time unit of the soaks) | 2 | r/w |
| 234 | P3.b6 | 28E9 | 10473 | Program 3 - Wait band of the 6th soak | 0 (oFF)/1... 9999 (E.U.) | 0 | r/w |
| 235 | P3.E6 | 28EA | 10474 | Program 3 - Events of the 6th group | 0000... 1111 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 236 | P3.c4 | 28EB | 10475 | Program 3 - Continues on Program 3 | 0 = no = Program 3 is ended<br>1 = YES = Program 3 will continue on program 4 | 0 | r/w |

### 5.4.16 Pr4 Group - Program 4 parameters

| no. | Param. | Address | | Description | Values | Dec. Point | r/w |
|---|---|---|---|---|---|---|---|
| | | Hex | Dec | | | | |
| 237 | P4.F | 28EC | 10476 | Program 4 - Action at power ON | 0 = nonE = Programmer not used<br>1 = S.uP.d = Start at power ON, 1st step in stand-by<br>2 = S.uP.S = Start at power ON<br>3 = u.diG = Start at Run command detection only<br>4 = u.dG.d = Start at Run command, 1st step in stand-by | 0 | r/w |
| 238 | P4.u | 28ED | 10477 | Program 4 - Time unit of the soaks | 0 = hh.nn = Hours and minutes<br>1 = nn.SS = Minutes and seconds | 0 | r/w |
| 239 | P4.E | 28EE | 10478 | Program 4 - Instrument behaviour at the end of the program execution | 0 = cnt = Continue<br>1 = SPAt = Go to the set point selected by A.SP<br>2 = Stby = Go to stand-by mode | 0 | r/w |
| 240 | P4.nE | 28EF | 10479 | Program 4 - Number of executions | 1... 99 times/100 = inF (indefinitely) | 0 | r/w |
| 241 | P4.Et | 28F0 | 10480 | Program 4 - Time of the end program | 0 (oFF)/001... 9959 mm.ss/10000 = inF (steady ON) | 2 | r/w |
| 242 | P4.S1 | 28F1 | 10841 | Program 4 - Set point of the 1st soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 243 | P4.G1 | 28F2 | 10482 | Program 4 - Gradient of the 1st ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 244 | P4.t1 | 28F3 | 10483 | Program 4 - Time of the 1st soak | 0... 9959 (time unit of the soaks) | 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 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 247 | P4.S2 | 28F6 | 10486 | Program 4 - Set point of the 2nd soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 248 | P4.G2 | 28F7 | 10487 | Program 4 - Gradient of the 2nd ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 249 | P4.t2 | 28F8 | 10488 | Program 4 - Time of the 2nd soak | 0... 9959 (time unit of the soaks) | 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 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 252 | P4.S3 | 28FB | 10491 | Program 4 - Set point of the 3rd soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 253 | P4.G3 | 28FC | 10492 | Program 4 - Gradient of the 3rd ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 254 | P4.t3 | 28FD | 10493 | Program 4 - Time of the 3rd soak | 0... 9959 (time unit of the soaks) | 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 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 257 | P4.S4 | 2900 | 10496 | Program 4 - Set point of the 4th soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 258 | P4.G4 | 2901 | 10497 | Program 4 - Gradient of the 4th ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 259 | P4.t4 | 2902 | 10498 | Program 4 - Time of the 4th soak | 0... 9959 (time unit of the soaks) | 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 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 262 | P4.S5 | 2905 | 10501 | Program 4 - Set point of the 5th soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 263 | P4.G5 | 2906 | 10502 | Program 4 - Gradient of the 5th ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 264 | P4.t5 | 2907 | 10503 | Program 4 - Time of the 5th soak | 0... 9959 (time unit of the soaks) | 2 | r/w |
| 265 | P4.b5 | 2908 | 10504 | Program 4 - Wait band of the 5th soak | 0 (oFF)/1... 9999 (E.U.) | 0 | r/w |
| 266 | P4.E5 | 2909 | 10505 | Program 4 - Events of the 5th group | 0000... 1111 (0 = event OFF; 1 = event ON) | 2 | r/w |
| 267 | P4.S6 | 290A | 10506 | Program 4 - Set point of the 6th soak | From SPLL to SPHL (E.U)/-8000 = Program end | dP | r/w |
| 268 | P4.G6 | 290B | 10507 | Program 4 - Gradient of the 6th ramp | 1... 9999 (E.U./minute)/10000 = inF (Step transfer) | 1 | r/w |
| 269 | P4.t6 | 290C | 10508 | Program 4 - Time of the 6th soak | 0... 9959 (time unit of the soaks) | 2 | r/w |
| 270 | P4.b6 | 290D | 10509 | Program 4 - Wait band of the 6th soak | 0 (oFF)/1... 9999 (E.U.) | 0 | r/w |
| 271 | P4.E6 | 290E | 10510 | Program 4 - Events of the 6th group | 0000... 1111 (0 = event OFF; 1 = event ON) | 2 | r/w |

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