ÉTUDES ET RÉALISATIONS
ÉLECTRONIQUES / INSTRUMENTATIONS / AUTOMATISME

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ARDETEM®

http://www.ardetem-sfere.com - email : info@ardetem.com

TWO-COLOR DIGITAL PANEL METER

Digital input – 5 digits display

ASCII or MODBUS protocol

DP1485

User manual
Valid for instruments with version 01.xx

■ **Summary**

1. INTRODUCTION

The **DP1485** allows the display, the control and the transmission of data of any measurable magnitudes through a digital data link RS485 (Protocol Modbus or ASCII).
Each device is equipped on front face with a 14mm-high 5 digits 2-color display, with a brightness integrating perfectly in applications in industrial control rooms.

General features

- Complete programming of the display format from the keyboard on front face.
  Display format independent from the ASCII frame: shaping by the device.
- Data formats:
  Modbus: 8 bits with / without parity, 1 start bit, 1 or 2 stop bits.
  ASCII: 7 bits + parity, 1 start bit, 1 or 2 stop bits.
- Data type: ASCII character or real encoded with floating decimal point.
- Slave number programmable from 1 to 255.
- General broadcasting authorized (number 0) (ASCII only).
- Baud rate programmable: 1200, 2400, 4800, 9600 and 19200 bauds.

Galvanic isolation:

3 kV-50 Hz - 1 min between supply and RS485 input

Power supply:

Max. operating range	*Consumption*
20 to 250 VAC - 50/60Hz and 20 to 250 VDC	*3 W max. 6 VA max.*

Use:

- Operating temperature: -20 to 60°C
- Storage temperature: -20 to 70°C
- Use in pollution degree 2 and voltage surge category II or better.
- Max. altitude: 2000m.

Compliance with standards:

- Directive LV 2014/35/UE……EN 61010-1
- Directive EMC 2014/30/UE……...EN 61326-1
- Directive ROHS 2011/65/UE

Programming

- From the keyboard
- By the digital data link in Modbus

Coding:

Type: **DP1485-RG-M**

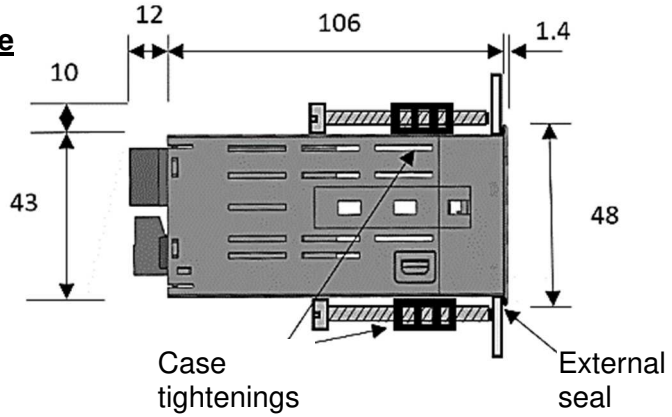
Protocol:
A: ASCII
M: MODBUS

Colour code:
RG: 2-color display, Red/Green
RW: 2-color display, Red/White

2. DIMENSIONS

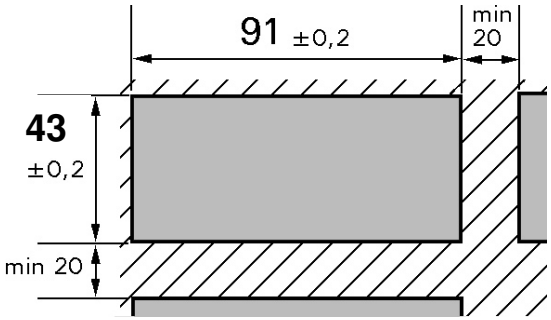
Dimensions of the case

96 x 48 x 119,4 mm
(with terminals)



Mounting in panel

Cut out 43 x 91.2 mm



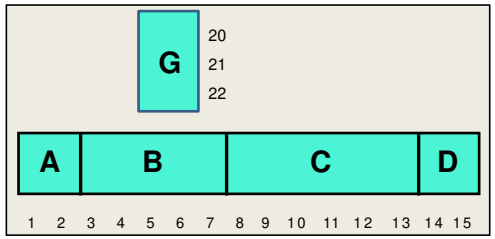
Protection:
Front face: IP65
Housing: IP20
Terminals: IP 20

Housing:
Self-extinguishing case of black UL 94 V0 ABS.
PC UL94 V0. front face
Panel mounting with tightening by 4 screw pads.

Connectors
Removable terminal blocks on rear face for screwed connestings
(2.5mm², flexible or rigid)

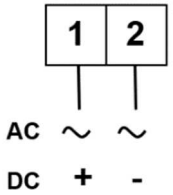
Display:
±10 000 points (14 mm)
Electroluminescent red and green (or red and white)
2 leds for emission and reception of a sequence by the DG1485.

3. CONNECTINGS

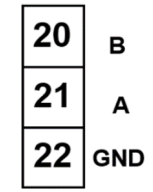


Location of the terminals
(view of case rear side)

SUPPLY (A)



RS485 INPUT (G)



RS485: When should an end of line resistor be added?

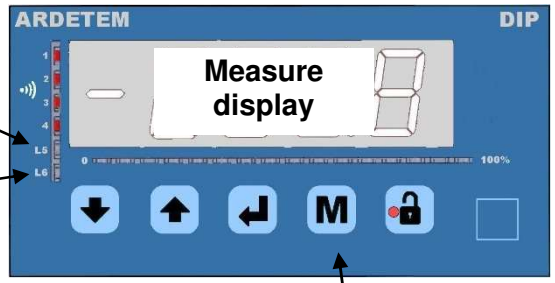
- When the baud rate is low or the communication distance is short, it is recommended not to add an end of line resistor.

- When the baud rate is quick or the communication distance is long it is recommended to add an end of line resistor.

The first and the last terminals of the communication line are usually associated with a 120 Ω resistor.

4. PROGRAMMING

4.1 Communication with the device



Led 5 Reception sequence (if programmed, see p9)

Led 6 Emission sequence (if programmed, see p9)

Access to the main menu **p5**

Reading convention:

——— Move through the main menu

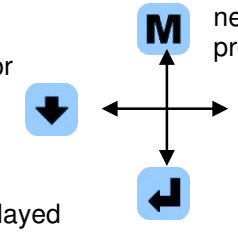
- - - - - - - - - - ▶ Back to the previous menu

⇕ Alternating information display

The display blinks when a choice is possible, or during the setting of a value.

4.2 Orientation through the programming

The dialogue is ensured by 4 keys located on the front face.



Exit from a submenu to access the next menu / access to the programming exit menu.

Move through the menus: downwards, or decrease the value shown.

Move through the menus: upwards, or increase the value shown.

Validation of the displayed parameter or access to a submenu.

Note: In mode programming, the device will automatically switch back to the measure with the previous configuration if no key is pressed during 1 min.

Entering of a parameter:

6888 First start by increasing or decreasing the 1st digit and the sign: from -9 to +9. and

6588 The 2nd from 0 to 9

6528 The 3rd from 0 to 9

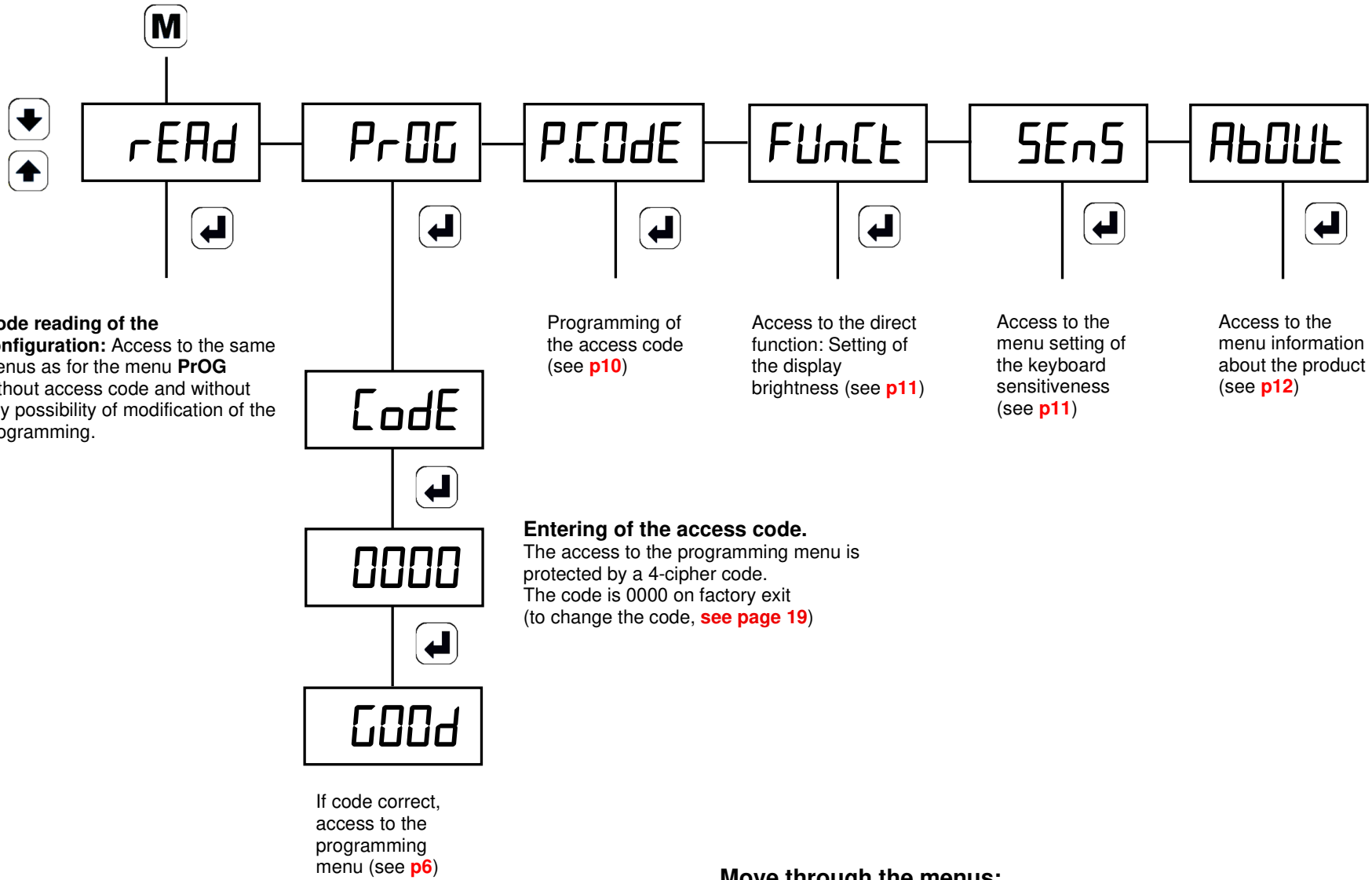
6520 The 4th from 0 to 9

Between each entering, validate the cipher by pressing

- For a signed value the entering begins with the choice of the sign (- or 0 = +).

- For a value with decimal the entering ends by the choice of the decimal point position, which you can move using and .

4.3 Main menu



Mode reading of the configuration: Access to the same menus as for the menu **PrOG** without access code and without any possibility of modification of the programming.

Programming of the access code (see **p10**)

Access to the direct function: Setting of the display brightness (see **p11**)

Access to the menu setting of the keyboard sensitiveness (see **p11**)

Access to the menu information about the product (see **p12**)

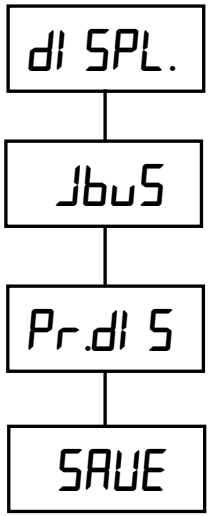
Entering of the access code.
The access to the programming menu is protected by a 4-cipher code.
The code is 0000 on factory exit
(to change the code, **see page 19**)

If code correct, access to the programming menu (see **p6**)

Move through the menus:

- Scroll the menus
- Upwards move / Increase
- Downwards move / Decrease
- Vertical move / Validation
- Menu exit / access

4.4 **Programming menu** *(depending on options)*



Access to the programming of the display factor p7

Access to the communication parameters p8

Access to the programming of the display:
Leds, brightness, color of the digits… p9

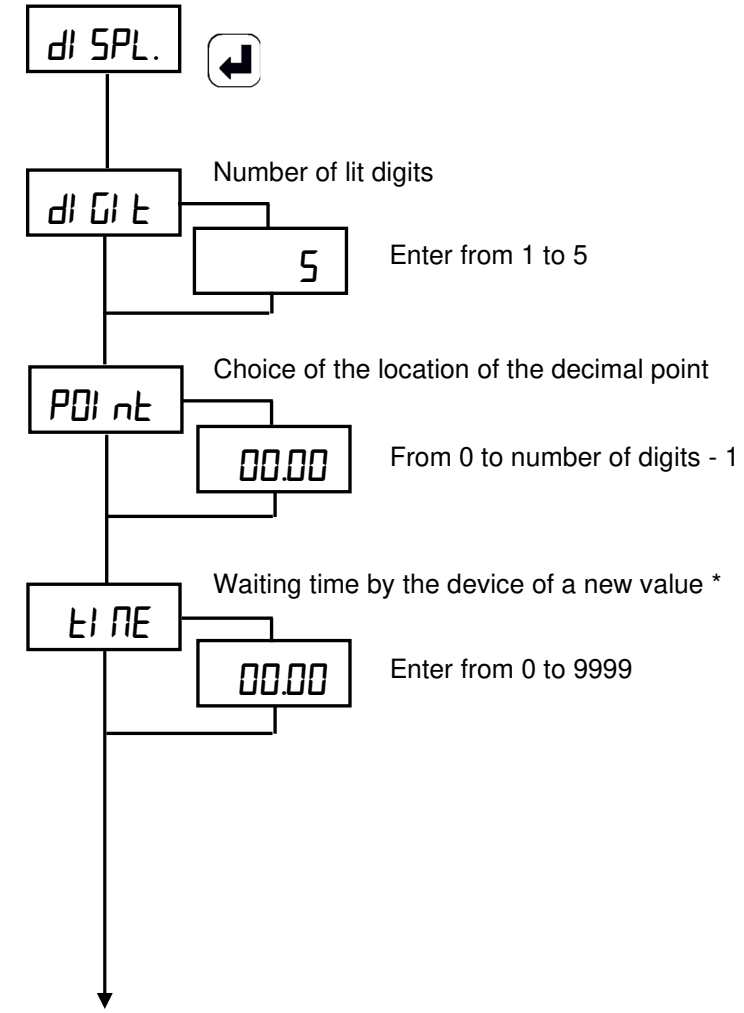
Access to the programming exit menu with
or without saving of the configuration p10

Note:

⇒ Press **M** to come back to the menu 

⇒ In mode programming, the device will automatically switch back to the measure with the previous configuration if no key is pressed during 1min.

4.4.1 Programming of the display

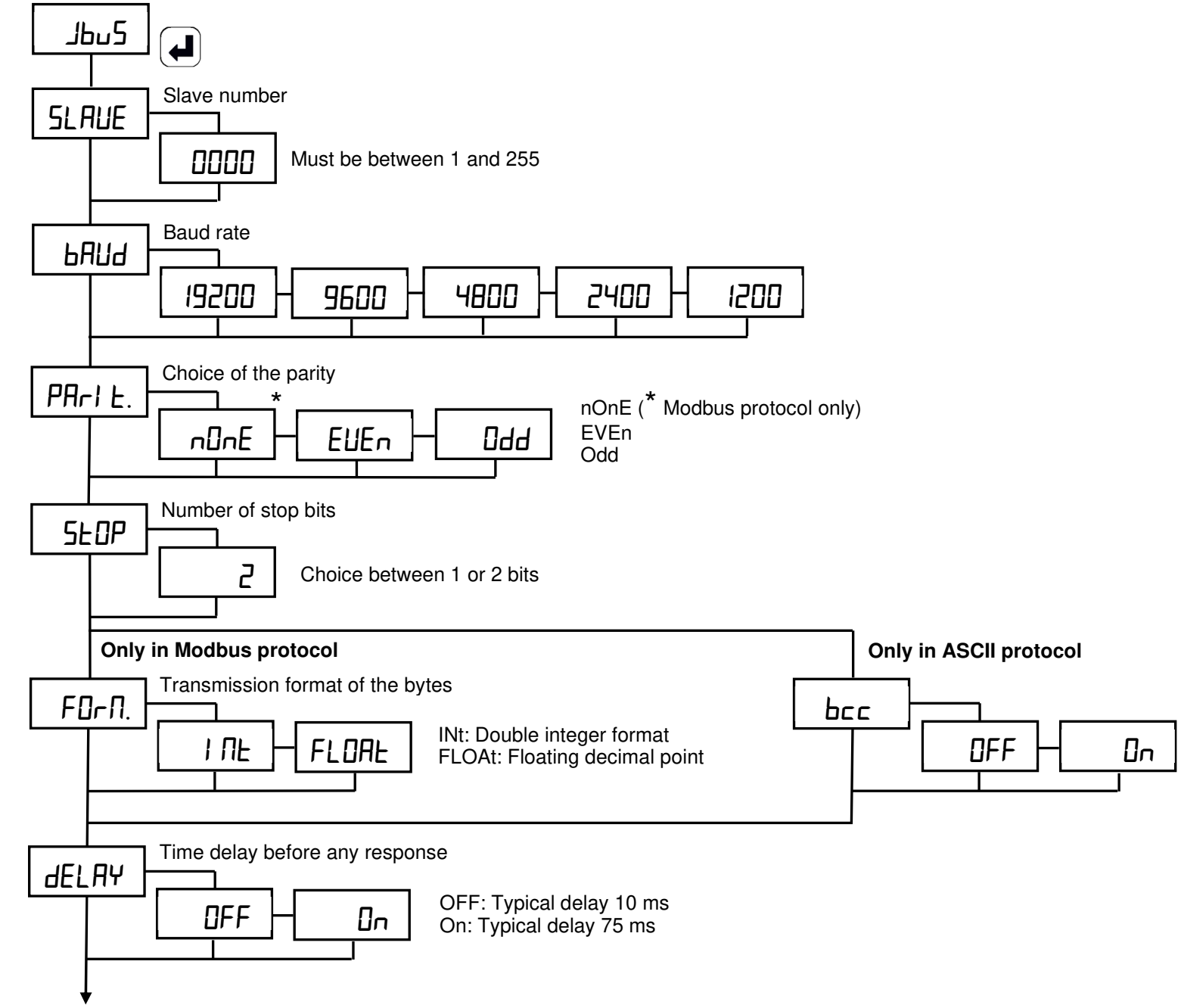


*

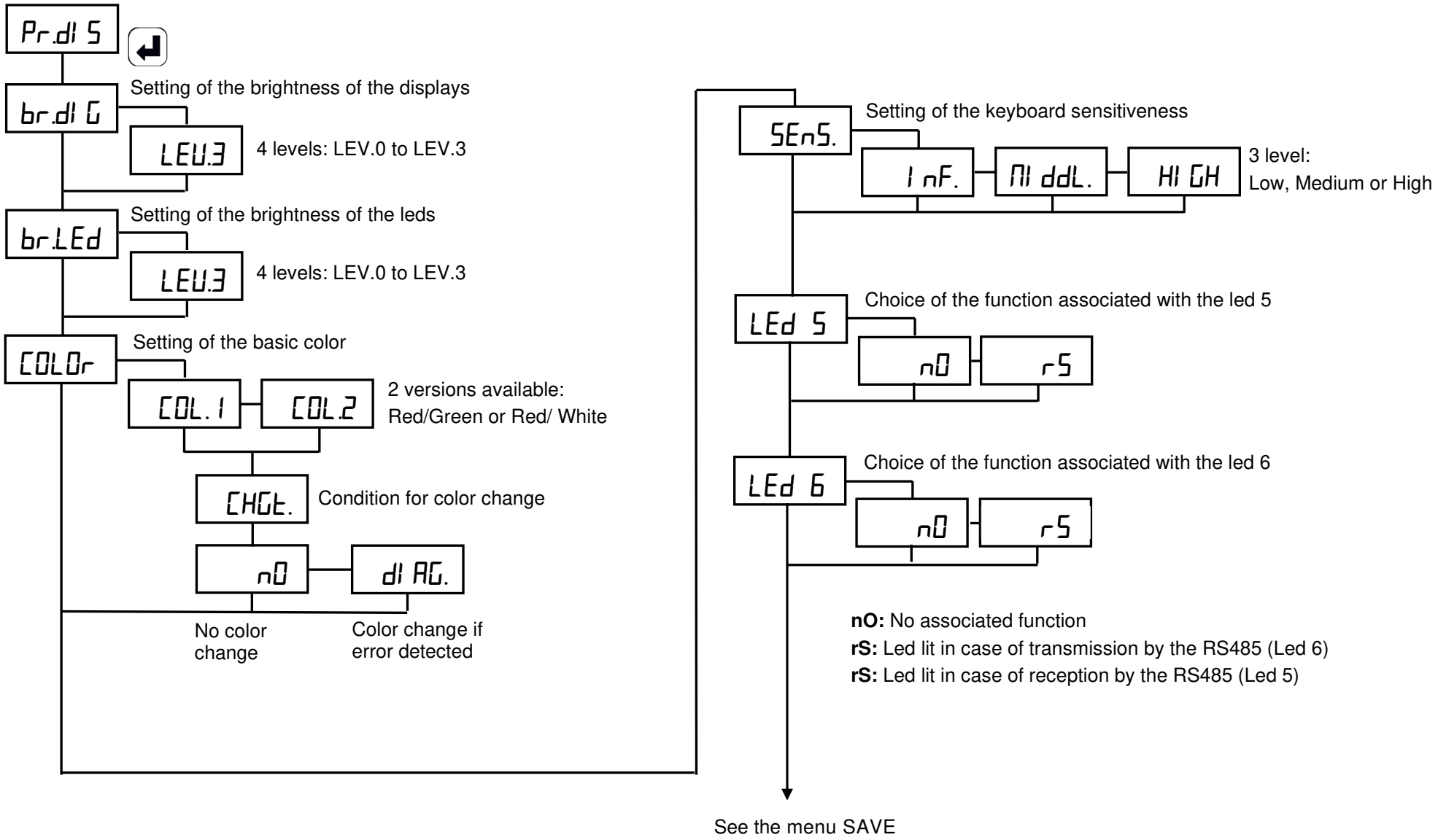
tIME = 0, the device will wait for the entering of a new value for ever.

tIME = x, the device will wait for the entering of a new value for x minutes. Then it will consider that the PLC is stopped and show «D1485» continuously.

4.4.2 Programming of the communication parameters

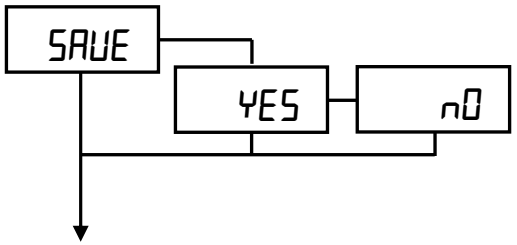


4.4.3 Programming of the leds, the brightness and the colour of the displays



4.4.4 Exit from the programming with or without saving

SAVE

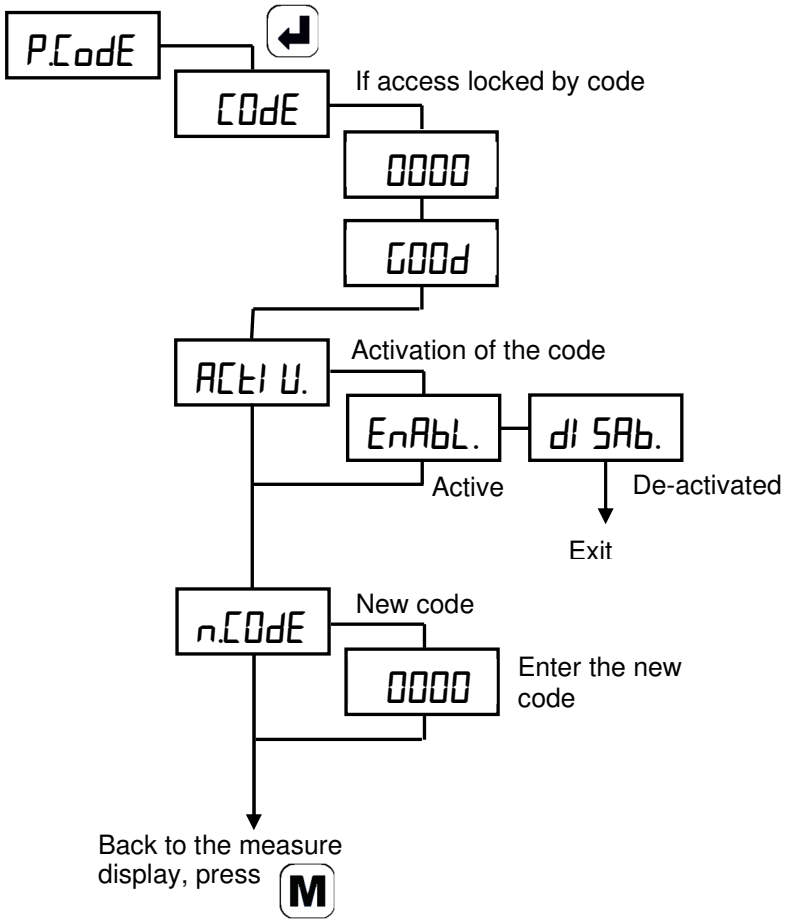


YES: Exit and save the configuration
nO: Exit without saving the configuration

Back to the measure display

4.5 Menu programming of the code

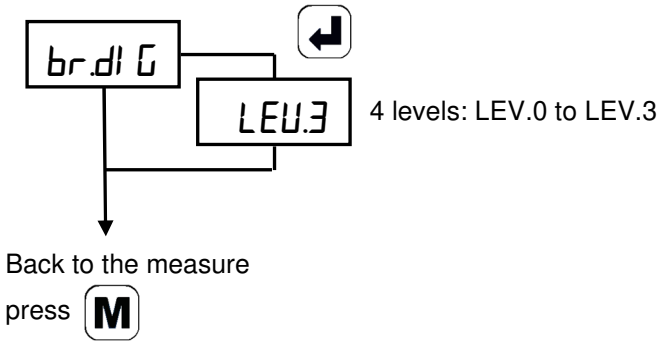
P.CodE



4.6 Menu of the direct functions

FUnCt.

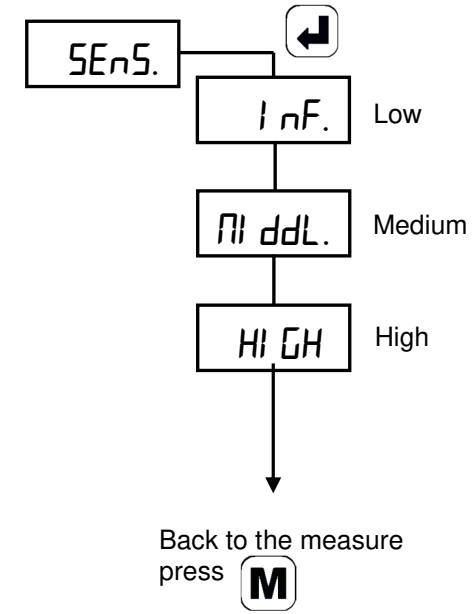
4.6.1 Setting of the brightness of the displays



4.7 Menu sensitiveness

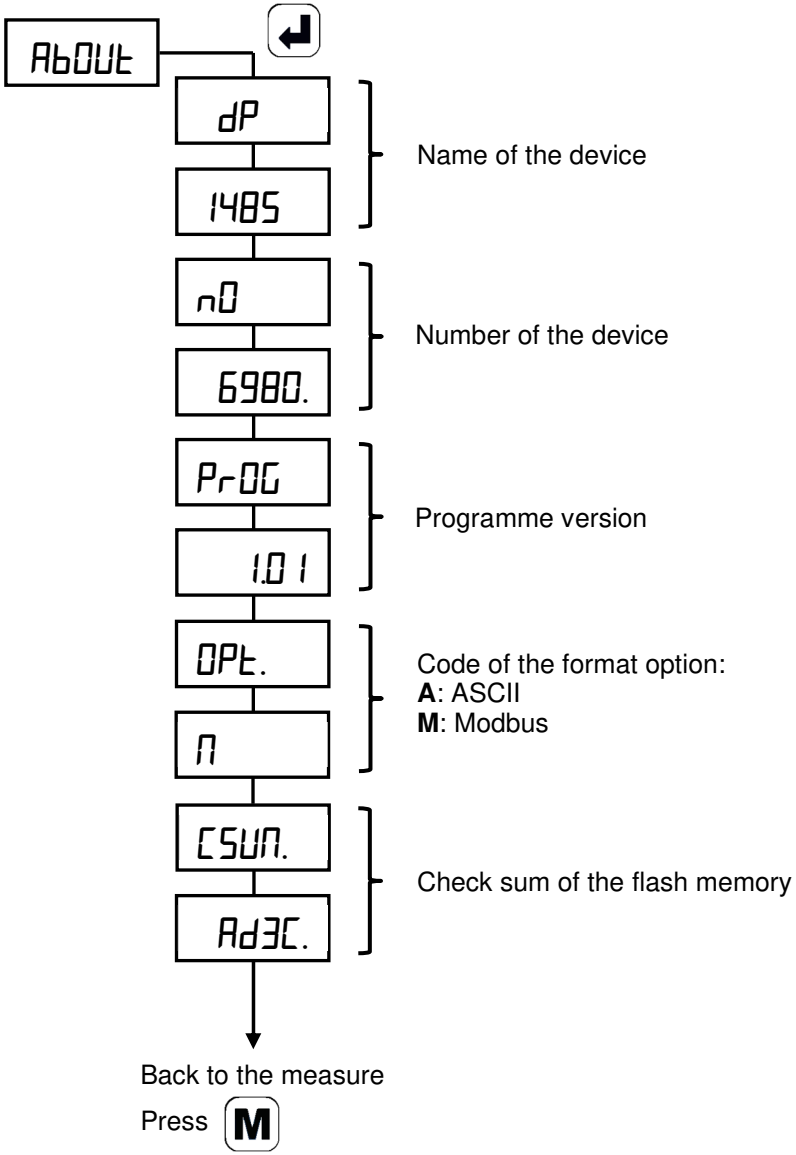
SEnS.

Setting of the keyboard sensitiveness



4.8 Menu ABOUT

Access to the information about the product.



4.9 Display features

Programme on the display the number of digits which will be lit and the maximum number of ciphers after the decimal point. The « master » (PC or PLC), will no longer need to transcribe the format of the messages to be sent.

Example:
A PLC sends to a network of displays encoded messages with the following fixed format: +/- XX.XXX

1- You want to have a maximum display accuracy:

a/ If you programme the display of 1 digit (0 ciphers after the decimal point): The display will show a format overrun for all numbers >9.999, only the numbers < 10 will be shown.

- - - - -

b/ If you programme the display of 2 digits

(0 or 1 cipher after the point):

- x x

c/ If you programme the display of 3 digits

(1 or 2 ciphers after the point):

- x x . x

d/ If you programme the display of 4 digits

(2 or 3 ciphers after the point):

-xx.xx

e/ If you programme the display of 5 digits (3 or 4 ciphers after the point):

xx.xxx	with a number > 0	-xx.xx	with a number < 0

2- If you want to have a display on 4 digits:

a/ If you programme 0 ciphers after the point:

-00xx

b/ If you programme 1 cipher after the point:

-0xx.x

c/ If you programme 2, 3 or 4 ciphers after the point:

-xx.xx	if the number < 0	xx.xx	if the number > 0

4.10 Building of the sequences

4.10.1 ASCII:

Standard sequence: Display of a digital value.

All the sent characters will be encoded in ASCII format 7 bits + 1 parity bit. The sequences will include in the following sending order:

- 1 sequence start Byte
- the slave address in ASCI
- The digits to be displayed encoded in ASCII (for a number <0 start by sending «-» in ASCII, for a number with a decimal point to be set start by sending «.» in ASCII).
- 1 sequence end Byte
- 1 check-sum Byte (do not forget to assign the parity bit).

STX	AdH	AdL	SGN	CIPHER1	CIPHER2	...	ETX	BCC

1 character must be transmitted:
If BCC = ON: transmit the calculated BCC;
If BCC = OFF: transmit any character.

* STX: Sequence start (02 ASCII).
* AdH/AdL: 2 digits in ASCII of the slave number

DO NOT FORGET: always transmit the slave number on 2 characters (example: slave N°3: 30h/33h).

* SGN: Sign of the number «-» (2 Dh ASCII) or «+» (no mandatory) (2Bh ASCII).
* CHIFFREn : Cipher which you want to display, encoded in ASCII or decimal point «.» (2Eh ASCII).
* ETX: end of sequence (03 ASCII).
* BCC: Check-sum = EXCLUSIVE-OR (XOR) between all characters of STX and ETX included (1 character must be transmitted: the calculated BCC if BCC = ON, otherwise any character.

Example of sequence: If you want to display -12.3 on the display N°5, the sequence will be the following (without positioning the parity bits):

0x02	0x30	0x35	0x2D	0x31	0x32	0x2E	0x33	0x03	0x37
STX	ADh	ADI	«-»	«1»	«2»	«.»	«3»	ETX	BCC

Display sequence of a decimal point on a display:

STX	AdH	AdL	0x2C	0x31 à 0x35	ETX	BCC

0x2C: Position command
0x31 to 0x35: Position of the point: 0x31 point on the left-hand digit, 0x35 point on the right-hand digit.

4.10.2 MODBUS protocol

Functions born by the device:

Reading of 1 or 2 words	Function n°3 or 4	Reading of the programming parameters
Reading of 1 word	Function n°6	Writing of the programming code and the parameters
Reading of 2 words	Function n°16	Writing of the value to be displayed

Transmission format:
1 start bit
8 bits with/without parity
1 or 2 stop bits

Reading of N words: (N = 1 or 2): Function N°3 or 4
Request sequence

Slave number	Function 3 or 4	1st word address		Number of words		CR16
		MSB	LSB	MSB	LSB	
1 byte	1 byte	← 2 bytes →		← 2 bytes →		2 bytes

Response sequence

Slave number	Function 3 or 4	Number of read bytes	1st word value		2nd word value		CR16
			MSB	LSB	MSB	LSB	
1 byte	1 byte	1 byte	← 2 bytes →		← 2 bytes →		2 bytes

Writing of 1 word: Function N°6
Request sequence

Slave number	Function 6	Address of the word	Value of the word to be enforced	CR16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Response sequence

Slave number	Function 6	Adress of the word	Value of the word to be enforced	CR16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Writing of N words: (N = 1 or 2): Function N°16
Request sequence

Slave number	Function 16	1st word address	Nbr of words to be enfor.	Nbr of bytes to be enfor.	Value of the words to be enfor.	CR16
1 byte	1 byte	2 bytes	2 bytes	1 byte	n bytes	2 bytes

Response sequence

Slave number	Function 16	1st word address	Number of words to be enforced	CR16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Modbus address of the parameters:

Speed + slave number	0	0	integer	Reading / writing
Number of decimals + number of lit digits	1	2	integer	Reading / writing
Programming code	2	4	integer	Reading / writing
Waiting time	3	6	integer	Reading / writing
Configuration	4	8	integer	Reading / writing
Value to be displayed	11	22	float	Reading / writing

Sequencing of the programming of the device by the PLC:
1st step: Writing of the programming code: 43981 decimals at the Modbus address 2.
2nd step: Writing of the parameter(s)
3rd step: Writing of the programming code
Code without saving of the parameters: 52179 decimals
Code with saving of the parameters: 1111 decimals

Exception codes returned by the device:
Code n°1: Function code unknown
Code n°2: Address incorrect
Code n°3: Data incorrect
Code n°4: Writing impossible at this address or protected by code

Exception sequences:
Response sequence

Slave number	Function requested with the MSB =1	Error code	CR16
1 byte	1 byte	1 byte	2 bytes

Description of the configuration bytes:

Configuration byte of the baud rate:

Modbus address: 0, address of the byte: 0

Most significant bit — Least significant bit

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Format	Time lapse	-	19200 Bauds	1200 Bauds	2400 Bauds	4800 Bauds	9600 Bauds

← 1 single bit at 1 →

Bit 6: Time lapse = 0 Time lapse 20 ms before response
Time lapse = 1 Time lapse 75 ms before response
Bit 7: Format = 0 Transmission of the measures in float format
Format = 1 Transmission of the measures in integer format

Configuration byte of the slave number:

Modbus address: 0, address of the byte: 1

Value from 1 to 255: Slave number programmable from 1 to 255.

Configuration byte of the number of decimals:

Modbus address: 1, address of the byte: 2

Value from 0 to 4 : Number of decimals which can be programmed from 0 to 4. Caution: This number depends on the number of lit digits.
If you programme 3 lit digits you can not have more than 2 decimals.

Configuration byte of the number of lit digits:

Modbus address: 1, address of the byte: 3

Value from 1 to 5: Number of lit digits, programmable from 1 to 5.

Configuration integer:

Modbus address: 4, address of the byte: 8

Bit15 — *Bit0*

0	0	0	0					0	0			Stop	0	0	0

Brightness of the displays 0 to 3
Brightness of the leds 0 to 3
Parity ↓ 0: Without parity, 1: Odd, 2: Even
0: 1 Stop bit, 1: 2 Stops bits

Note: The bits at 0 must be left at 0.

Programming code (integer):

Modbus address: 2, address of the byte: 4

Configuration of the waiting time (integer):

Modbus address: 3, address of the byte: 6

Value from 1 to 9999: Waiting time programmable from 1 to 9999 minutes.
Value 0: No waiting time.

Description of the float format encoded according to IEEE:

	Modbus address		Modbus address + 1	
	Address in byte	Address in byte +1	Address in byte +2	Address in byte +3
Data:	Exponent	← Mantissa →		

Description of the integer format:

	Modbus address		Modbus address +1	
	Address in byte	Address in byte +1	Address in byte +2	Address in byte +3
Data:	MSB	LSB	Additional digit	Point position
	M		N	P

M Signed integer (complement at 2) between -9999 and +9999
N Byte without sign between 0 and 9 (corresponds to 1 more digit on the right hand side).
P Number of decimals between 0 and 4.

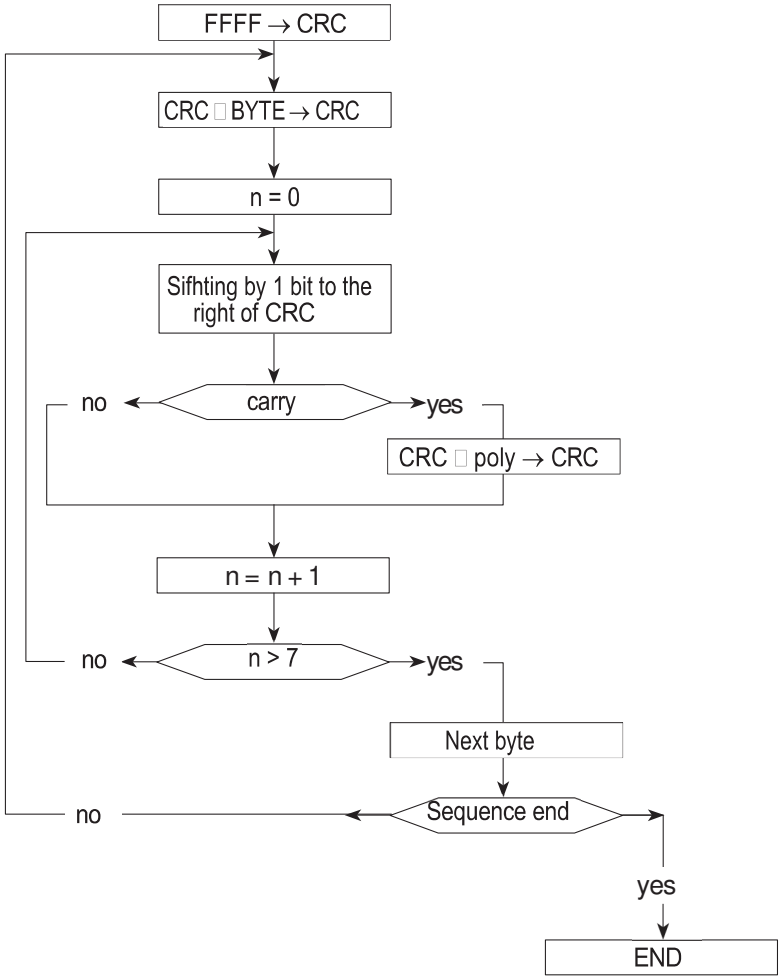
The operation which allows finding back the value of a measure encoded in integer format is the following:
- For 4 significant ciphers: Value = (Mx10) / (10^P) (N is not used)
- For 5 significant ciphers: Value =((Mx10)+N) / (10^P)

Note: 10^P = 10 to the P (power) – *Example* 10^3=10x10x10=1000
Caution: If P = 0, 10^P=1

Sequence example: The value 50.00 is sent to the slave n°2 (real format)
Sequence: 2 - 16 - 0 - 11 - 0 - 2 - 4 - 66 - 72 - 0 - 0 - 41 - 54 (values in decimals)

Sequence example: The value 50.00 is sent to the slave n°2 (integer format)
Sequence: 2 - 16 - 0 - 11 - 0 - 2 - 4 - 0 - 50 - 0 - 1 - 221 - 87 (values in decimals)

CRC 16 calculation algorythm:



Note 1: Ø = exclusive or. **Note 2**: POLY = A001 (hexa). **Note 3**:
The CRC 16 calculation applies to all bytes in the sequence (CRC16 excluded).

Note 4:
Caution! In the CRC 16, the 1st sent byte is the LSB.

Example: Sequence 1-3-0-75-0-2 CRC16 = 180-29 (the values are decimal).

5. ERROR MESSAGES

Err 1	Value set out of range
-----	Value can not be displayed

6. GENERAL WARRANTY TERMS

WARRANTY APPLYING AND DURATION:

This appliance is guaranteed for 1 year for any design or manufacturing defects, under normal operating conditions.

Conditions for processing *:

Processing not under warranty will be submitted to the acceptance of a repair estimate.
The customer will return the products at his charge, and they will be restored to him after processing.
Without a written agreement on the repair estimate within 30 days, the products will not be kept.

** Complete warranty terms and details available on request.*