configurable DPMs
ICO 51 - ICO 101

NT 46026-100D - Ed. 15 MAR 00 instruction manual

This instruction manual concerns the DPMs having the 3.xx program edition

1. Introduction

This 5 000 counts - configurable DPM meets the DIN 43700 concerning the panel cut-out and the European Norm EN 61010-1 relating to safety of the digital measuring instruments.

Changing the configuration enables the DPM to measure DC and AC voltages over four ranges from 500 mV to 400 V and 50 mA DC currents.

Direct display of physical quantity is made by scaling.
Hold measurement by using an external contact.

2. General specifications

Completely configurable by two keys available at front.
Configuration saved on EEPROM (10 000 writings max.).
Reading on red LED (or green in option), 14 mm-high.
Max. display: from - 1 999 to 9 999.
Number of measuring counts: up to 6 000.
Rate: 2.5 measurement per second.
Reference range: 23°C ± 1°C (RH: 45 % to 75 %).
Normal operating range: 0°C to + 50°C (RH: 20 % to 80 % non-condensing).
Operating range limits: - 10°C to + 50°C.
Storage and transport range: - 30°C to + 70°C.
Connection: by unpluggable screw connector.
Currents other than 50 mA may be measured using external accessories.
Scaling: configurable on keypad by determining two couples of counts display/measurement (Affichage/Mesure).
Protection: ICO 51: IP 30.
ICO 101: front: IP 54 ; panel: IP 30 (IP 54 with option).

3. Safety provisions

3.1 IN ACCORDANCE WITH SAFETY STANDARDS

The DPM is constructed and tested according to European Norm EN 61010-1.
Category II. Pollution 2.
Rated voltage: 300 V regarding the earth, except terminals 9 and 10: 600 V.

3.2 FOLLOWING INSTRUCTIONS SUPPLIED WITH THE ACCOMPANYING DOCUMENTS

The DPM is constructed to operate under safety conditions if the instructions supplied in the accompanying documents are followed. Any usage, except those described, may reduce the safety of the operator and then becomes dangerous and prohibited.

3.3 DEFINITION OF THE INSTALLATION CATEGORY

This is also called overvoltage category.
It's the installation classification according to standardized limits for transient overvoltages (IEC Publication 664). Level of these limits depends on the nominal line voltage, regarding the earth, which is present in the unit environment.
The Publication has 4 levels of increasing overvoltage, from CAT I to CAT IV.

3.4 MAINTENANCE

The DPM should be reassembled as explained in the instruction manual. Any incomplete or bad reassemble may be dangerous for the safety of the operator.
The responsible body must check at regular time interval that all the components ensuring safety are not subject to wear and undertake all the necessary steps for preventive operations.
Before the casing is opened, make sure that the measuring leads have been disconnected from the DPM.
The DPM should not be opened up for adjustment, maintenance or repair when live unless this is absolutely essential, in which case this work should be carried out **only by qualified personnel advised of the risk entailed**.

3.5 EMC CONFORMITY

The unit performances meet the standards following:
Conducted and radiated disturbances: EN 55022/1994, class B.
Immunity: EN 50082-1/1992.
Radiated: IEC 801-3/1984. Conducted: IEC 801-4/1988.
Electrostatic discharges: IEC 801-2/1991.

4. Instructions before switching on

Before using the DPM with all the necessary safety, the user must read **carefully** chapter 3 which deals with safety provisions.

5. Connection to the line

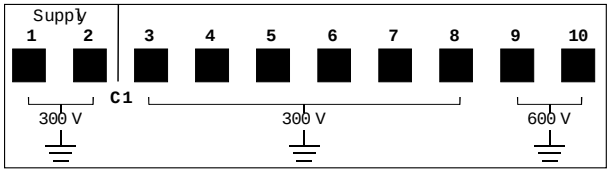
The DPM must always be connected through a safety device (fuse, circuit breaker) to a disconnecting device which isolates the whole set of power wires.
These equipments must be in accordance with the standards. They must provide a breaking capacity compatible with currents and voltages peculiar to the equipment. For parallel connection, follow the rules concerning the circuit setting. They must be placed close to the equipment and well-recognized using an adequate marking.

6. Power requirements

Refer to chapter 16 for changing supply.

Code	Voltages (insulated)	Consumption	C1 ①
2	5 VDC ± 10 %	4 VA	50 V
3	9 VDC to 18 VDC	2 VA	50 V
4	18 VDC to 36 VDC	2 VA	50 V
5	36 VDC to 72 VDC	2 VA	50 V
6	24 VAC ± 10 %	4 VA	250 V
7	115 VAC ± 10 %	4 VA	250 V
8	230 VAC ± 10 %	4 VA	250 V
9	48 VAC ± 10 %	4 VA	250 V

① C1 is the maximum voltage between the two groups of terminals as explained in diagram below.



7. Particular specifications

Stated accuracies are expressed in ± (n % rdg + C) with rdg = reading and C = constant expressed, either as a practical unit or a number of Representation Unit (RU), i.e. the number of units of the last digit. They applied to instruments situated in the reference conditions defined elsewhere after warming up for 20 minutes.

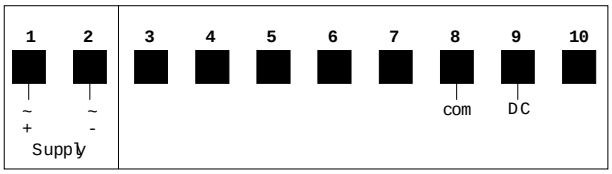
7.1 DC VOLTAGE

7.1.1 Specifications

Range	Resolution	Accuracy over 1 year
500 mV	100 µV	0.1 % + 1
5 V	1 mV	0.1 % + 1
50 V	10 mV	0.1 % + 1
400 V	100 mV	0.1 % + 1

Measurement range: from - 40 % to 110 % of range.
Input resistance:
1 000 MΩ over the 500 mV range..
1 MΩ on the other ranges.
Response time:
- without range changing: < 1 s.
- with range changing: < 2 s.
Normal mode rejection, 50 Hz: > 60 dB over the 500 mV range.
Common mode rejection, 50 Hz: > 110 dB over the 500 mV range.
Temperature coefficient: < 10 % of accuracy/°C.

7.1.2 Connection



7.2 AC VOLTAGE

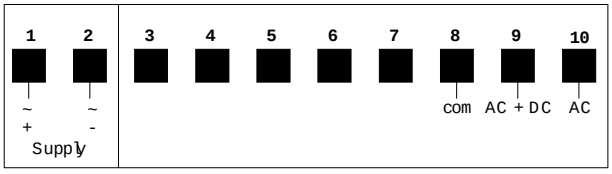
RMS value of an AC signal in AC or AC + DC mode.

7.2.1 Specifications

Range	Reso-lution	Accuracy over 1 year (sinusoidal signal)			
		25 to 500 Hz	0.5 to 1 kHz	1 to 5 kHz	5 to 10 kHz
500 mV	100 µV	0.7 % + 10	3 % + 20		
5 V	1 mV	0.5 % + 6	0.5 % + 6	0.7 % + 10	3 % + 20
50 V	10 mV	0.5 % + 6	0.5 % + 6	0.7 % + 10	0.7 % + 20
400 V	100 mV	0.5 % + 6	0.5 % + 6	0.5 % + 6	0.7 % + 20

Measurement range: from 4 % to 110 % of range.
Input resistance: 1 MΩ.
Crest factor: ≤ 3 full scale or 850 V peak max.
Response time:
- without range changing: < 3 s.
- with range changing: < 5 s.
Max. permissible DC component (AC mode): 200 V DC.
Common mode rejection, 50 Hz : > 70 dB over the 500 mV range.
Crest factor influence (CF):
- 500 mV range: 2 % for CF = 3.
- other ranges: 1 % for CF = 3.
Temperature coefficient: < 10 % of accuracy/°C.
Accuracy with associated DC component (AC + DC mode): add, to the term of the AC accuracy, 1 % of the DC component.

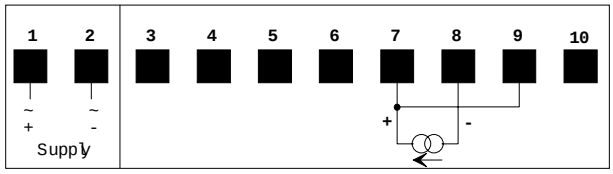
7.2.2 Connection



7.3 TELEMETERING CURRENT (4-20 mA)

Measurement range: 50 mA.
Measurement span: - 40 % to 110 % of range.
Input resistance: 10 Ω.
Max. permissible current: 100 mA.
Scaling can be performed according to the physical quantity to be measured.

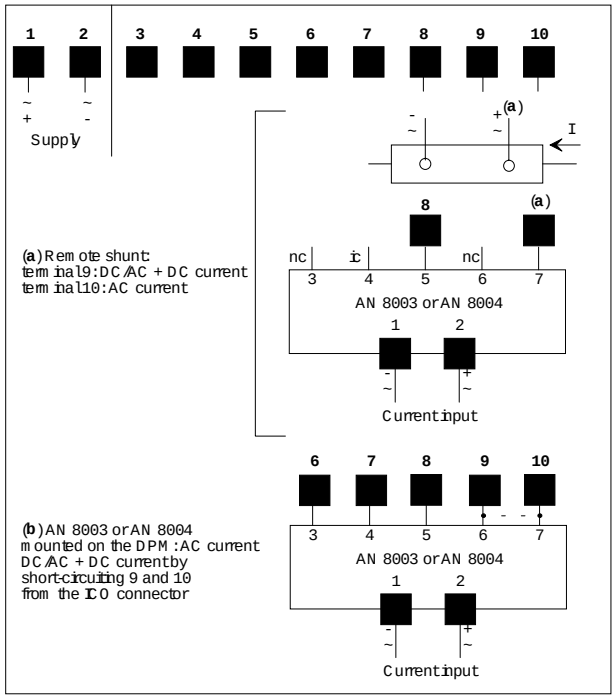
7.3.1 Connection



7.4 DC AND AC CURRENTS

DC and AC currents, with or without associated DC component, are measured by means of an external shunt of appropriate range, whose voltage terminals are connected either to input of the 500 mV AC range or 500 mV DC/AC + DC range of the unit (wire **a** of diagram below).
Scaling can be performed depending on the specifications of the shunt used.
Accessories are supplied for measuring 1 A and 5 A currents:
AN 8003 : 1 A shunt, 100 mV, 0.2 %, max. permissible current: 3 A.
AN 8004 : 5 A shunt, 100 mV, 0.5 %, max. permissible current: 7 A.
Delivered with a 5-pin unpluggable screw connector, they can be mounted either remotely or directly on the DPM connector.

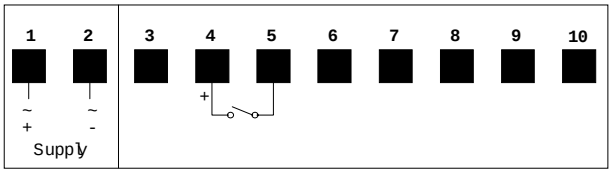
7.4.1 Connection



8. Hold measurement

By connecting terminals 4 and 5.
Several DPMs can be controlled by means of a switch with multiple **insulated contacts**.
This is also may be done by using an opto-isolator per DPM with respect to the polarities (terminal 4 positive, U = 5 V).

8.1 CONNECTION



9. Scaling

This function provides a linear relation, A = aM + b, between display and measurement and is well-suited to measurements of physical quantities.
a and b are computed by the DPM from two couples display/measurement (Affichage/Mesure) entered on the keypad, i.e. A1/M1 and A2/M2.
M1 and M2 can be measured by the DPM if they are unknown.

Note: For example, a 1/10 scale reduction, enables to work on the ± 6 000 counts over the voltage ranges with resolution 10 times less.

10. Autoranging

This function provides automatic switching of range on condition the measurement unit is similar (mV or V). Two groups of ranges are then determined through which autoranging is possible.

Unit	Range
mV	500 5 000
V	5 50 400

Autoranging occurs at 500 and 5 500 counts

Scaling and autoranging cannot be used together.

11. Accessories

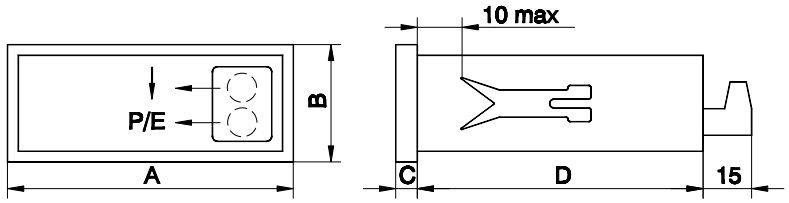
11.1 DELIVERED WITH THE DPM

- A unpluggable female connector, 2 pins for supply.
- An unpluggable female connector, 8 pins.
- An instruction manual.

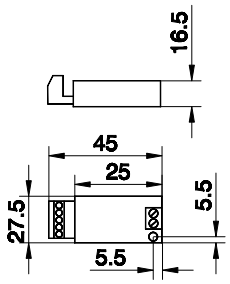
11.2 DELIVERED IN EXTRA

AN 8003: 1 A shunt, 100 mV.
AN 8004: 5 A shunt, 100 mV.

12. Mechanical specifications



	CASING	A	B	C	D	PANEL CUT-OUT
ICO 51	24x72	72	24	5	103	$22.2^{+0.3}_{0}$ x $68.0^{+0.5}_{0}$
ICO 101	48x96	104.5	57.5	7	101	$45.0^{+0.6}_{0}$ x $92.0^{+0.8}_{0}$



Accessory AN xxxx

Weight: 160 g.

13. Warranty

ICO is warranted for one year in respect of defects which under proper use may appear in any parts and which are due to faulty manufacturing materials or workmanship, provided that no unauthorized modifications have been made on the unit.

If the DPM is not operating correctly, it must be returned to the address indicated page 8 or to your local approved agency.

14. Configuration instructions

To program the DPM according to the diagrams described hereafter, remove the front to access the program buttons and be sure the measuring wires are disconnected from the unit.

Delivery conditions: 5 V DC, no scaling.

14.1 READING THE CONFIGURATION

The configuration is stored in a permanent memory (EEPROM) and can be read and/or changed using ↓ and **P/E** keys available after removing the font colored filter. Pressing of these keys is represented as follows:

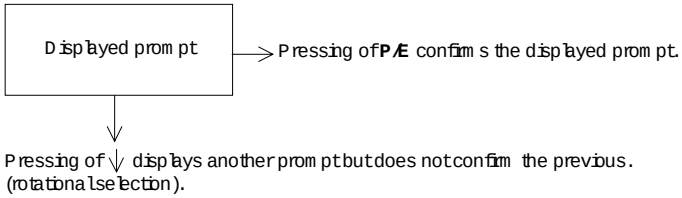
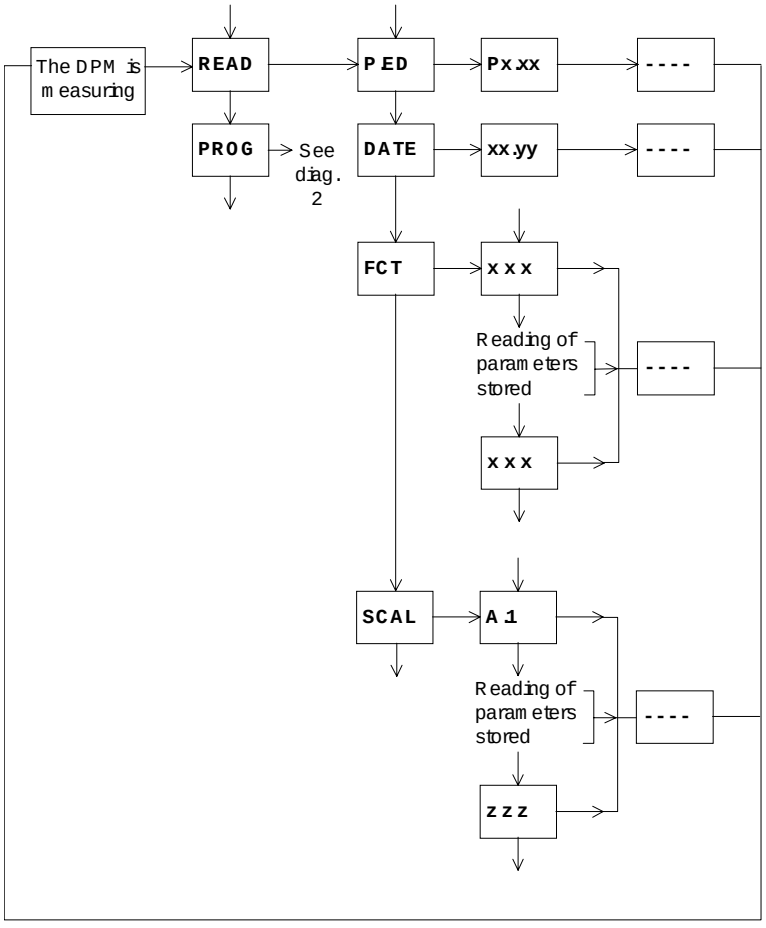


Diagram 1: Reading the configuration	Meaning of the displays

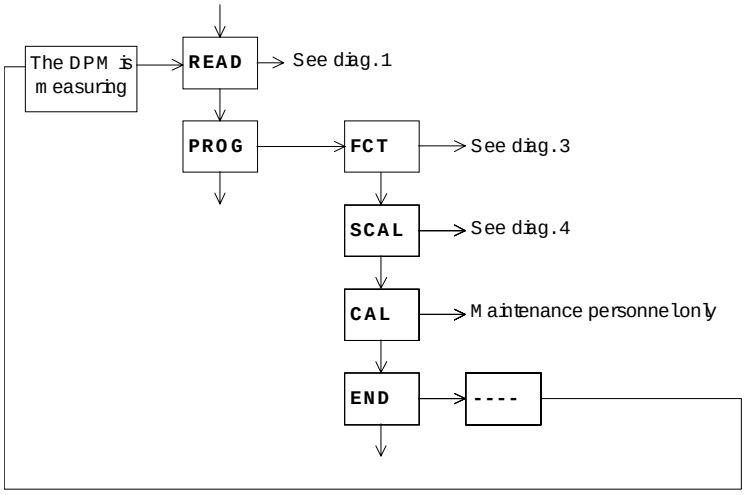


The DPM is measuring		The measurement is performed according to the configuration stored.
READ		Reads the configuration.
P.ED		Displays the program edition.
Pxxx		Check that the edition displayed is that stated in this publication, page 1.
DATE		Displays the date of the last calibration.
xx.yy		Date of the last calibration with xx = year and yy = week.
FCT		Reads the measurement function and parameters stored.
xxx		See paragraph 14.3 for meaning of the displays related to the measurement function used.
SCAL		Displays the scaling parameters.
A.1	zzz	See paragraphe 14.4 for meaning of the displays related to the scaling.
----		for approximately 0.5 s before the DPM automatically returns to measurement.

14.2 ACCESSING THE CONFIGURATION PROGRAMS

The DPM is measuring. Confirm the **PROG** prompt to access the main menu.

Diagram 2: Accessing the configuration programs



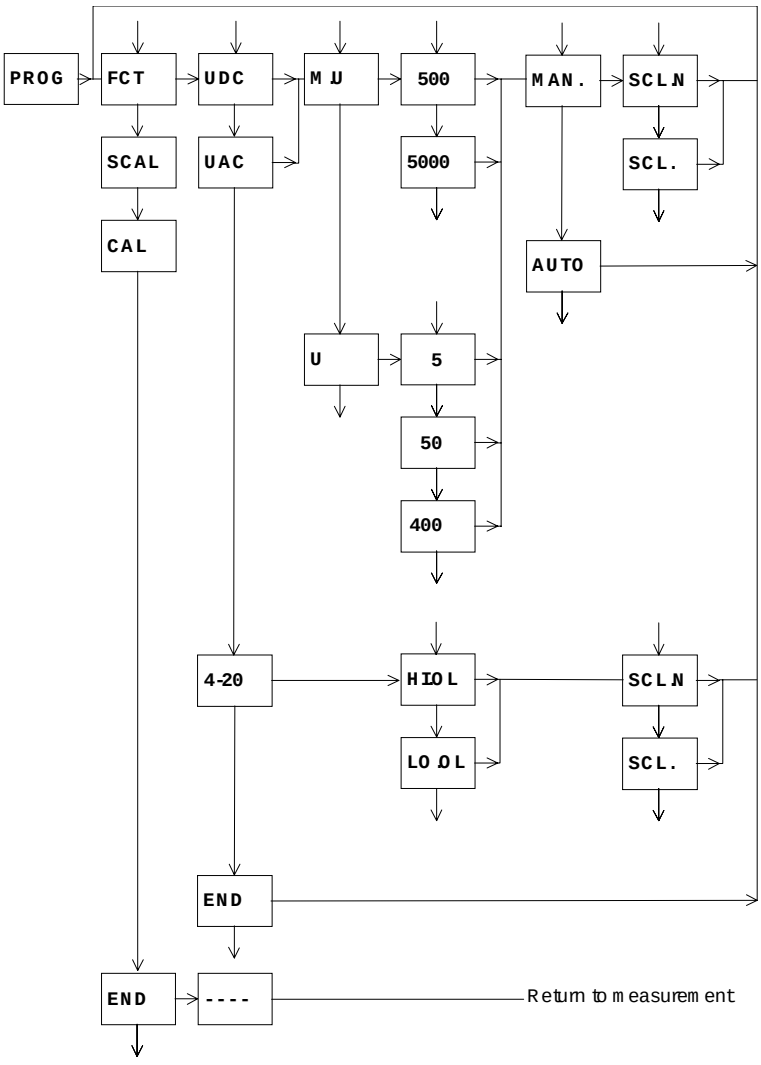
Meaning of the displays

PROG	Access to programming.
Main menu	
FCT	Programs the desired measurement function.
SCAL	Programs the scaling parameters.
CAL	Calibrates the DPM. **Maintenance personnel only.**
END	Return to measurement. Exit from programming.
----	for approximately 0.5 s before the DPM automatically returns to measurement.

14.3 SELECTING THE FUNCTION AND RANGE

Preliminaries: see paragraph 14.2, diagram 2.
Confirm the **FCT** prompt from the main menu.

Diagram 3: Selecting the function and range



Meaning of the displays

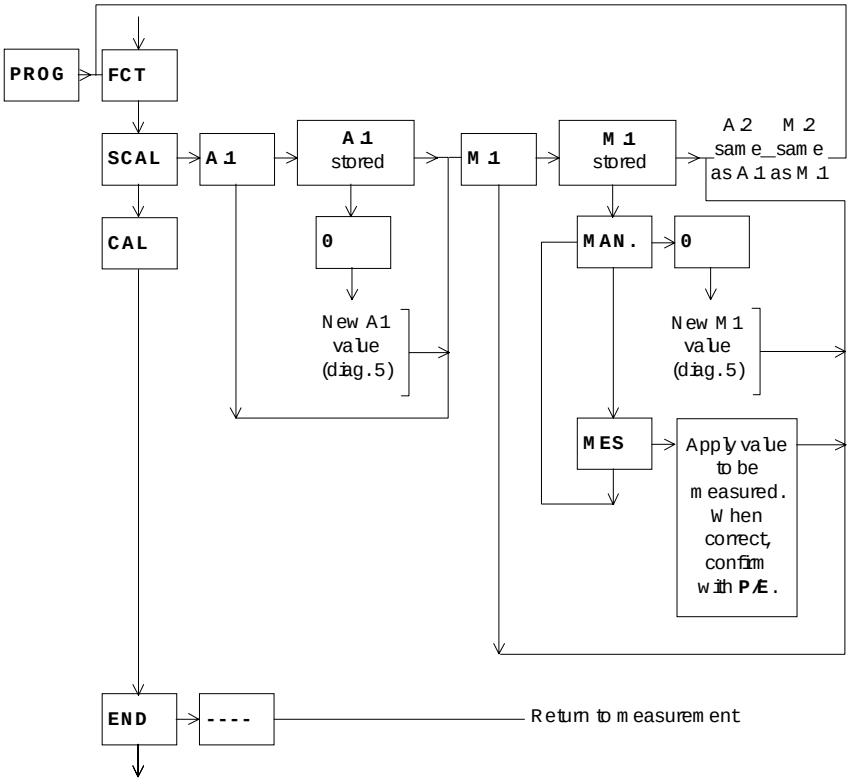
FCT	**Selects the measurement function.** This prompt appears when accessing the configuration program (see diagram 2).
Function menu	
UDC **UAC**	Select the measurement type: -DC (**UDC**) -AC (**UAC**).
4-20	4-20 mA measurement.
MµU **U**	Select the measurement unit: mV (**MµU**) or V (**U**).
500 **5000**	Select the mV range.
5 **50** **400**	Select the V range.
HIOL **LOOL**	4-20 mA measurement. In case of faulty sensor (I< 3.5 mA), the DPM reads (**HIOL**) above 9 999 counts or (**LOOL**) below -9 999 counts.
MAN. **AUTO**	Manual ranging (**MAN.**) or autoranging (**AUTO**), see chapter 10.
SCLN **SCL.**	Scaling OFF (**SCLN**) or ON (**SCL.**), see chapters 9 and 14.4.

Note: With autoranging, scaling is not possible.

14.4 STORAGE OF A NEW SCALING

Preliminaries: see paragraph 14.2, diagram 2.
Confirm the **SCAL** prompt from the main menu. Storage of a new scaling does not involve its setting ON.

Diagram 4: Storage of a new scaling



Meaning of the displays

0 — Enter the new value according to the number subprogram. (see diagram 5).

MAN. — The values of M1 and M2 measurement parameters can be entered manually by the number subprogram (see diagram 5) or .....

MES — applied to the measurement terminals.

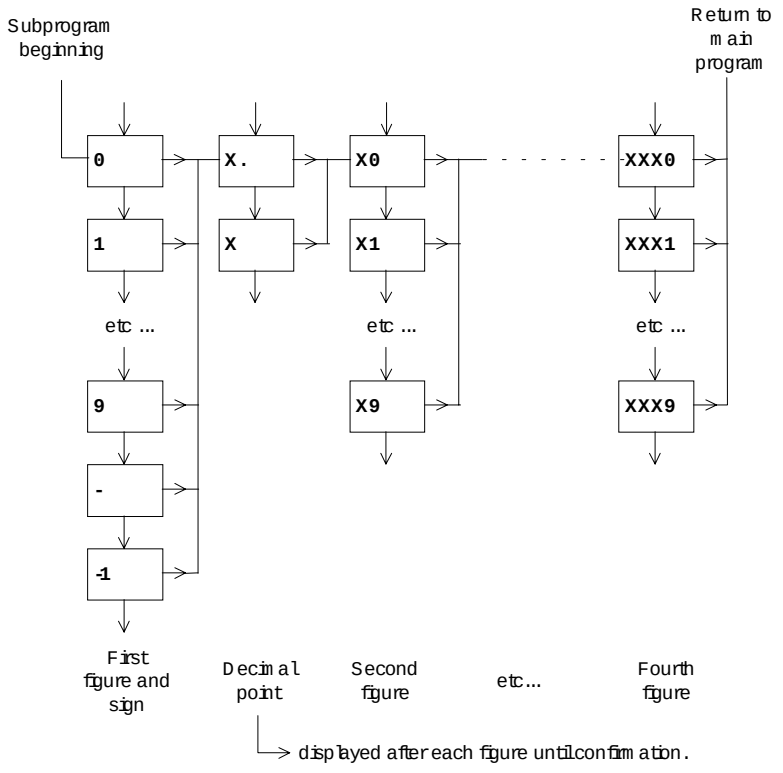
A1 **M1** **A2** **M2**

For A2 and M2 parameters, the procedure is similar to A1 and M1. (See also chapter 9).

The A1 decimal point position is that of the display when the scaling is ON.

14.5 PROGRAMMING A NUMBER AND SIGN

Diagram 5: Programming a number and sign



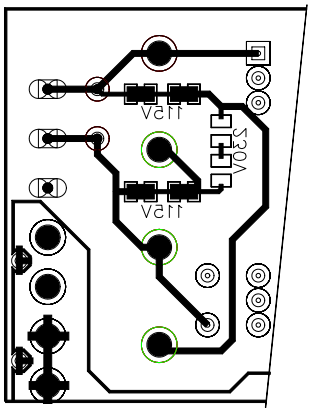
15. Error messages

They are as follows:

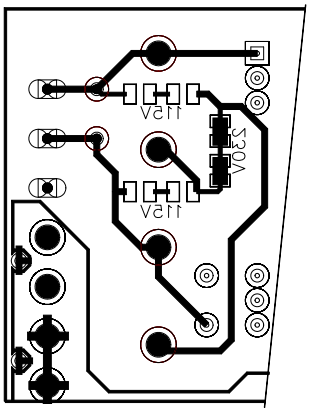
Err.0	Display capacity exceeded: < - 1 999 counts or > + 9 999 counts.
Err.2	I < 3.5 mA over 4-20 mA range.
OL	Overload. Overrange. Wrong connection.

16. Changing supply

- Changing from 230 VAC to 115 VAC and from 48 VAC to 24 VAC



- Changing from 115 VAC to 230 VAC and from 24 VAC to 48 VAC



Notes

AOIP INSTRUMENTATION
B.P 182 - 91006 - EVRY CEDEX - FRANCE
TEL : +33 1 69 36 50 50
FAX : +33 1 60 79 08 37