USER'S MANUAL
series MPO 347-100
MPO 347-01
MPO 347-02
MPO 347-03
MPO 347-04
MPO 347-05
# option µ26

MECT

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INDEX

☑ 1.0 IN GENERAL

The MPO model (ohm input) is an instrument with a 16 bit analogue to digital converter; it is made in 48x96 standard body. The MPO instrument can be requested with fixed scale, with five selectable scales (MPO347 100) or 20Ω with µ26 option (temperature compensation).

The MPO model have interesting features as:

- 4 ½ digit display (± 19999 digits);
- set-up of any reading value with any input value in the requested range;
- maximum or minimum peak-hold;
- programmable digital filter;
- display reset function.

The MPO instrument can be requested with the following options:

- mono-directional or bi-directional (RS232 or RS485) standard or opto-isolated serial output
- up to 4 relay alarms or up to 8 static alarm triggers with standard or opto-isolated static output for normal or window operation completely programmable for value, hysteresis and delay
- current (0÷20mA or 4÷20mA) and voltage (0÷10V) standard or opto-isolated analogue output

1.1 TECHNICAL CHARACTERISTICS

Table 1

Input	19.999 Ω
	199.99 Ω
	1.9999 KΩ
	19.999 KΩ
	199.99 KΩ
Output	exchange relay 250 Vac / 5 A
	static NPN / PNP 30Vdc / 50 mA
Power supply	90 ÷ 260 Vac/Vdc 6VA
	12÷30 Vac/Vdc 6VA
Dimensions	48 x 96 x 120
Piercing template	44.5 mm (height) x 92.5 mm (width)
conv/sec	30 (without filter)

1.2 DISPLAY SIGNALS

Table 2

r.001.0	instrument software release
-OFL-	over-range signal
-UFL-	under-range signal
ErP1	FSL=ISL (same values of the reading)
ErP2	FSI=ISI (same values of the input)
ErP3	FSO=ISO (same values of the output)
ErP4	FS=IS (same values of the analogue output)
ErP5	FS<IS (wrong parameters for analogue output)
Err 1	serial output transmission buffer full (switch off and on the instrument to reset the error)
Err 3	serial output receiver buffer full (switch off and on the instrument to reset the error)
Err 4	fatal error: call assistance

1.3 WIRING DESCRIPTION

KEYBOARD DESCRIPTION

AL : alarm set-up

Exit Reset : allows readout zeroing, or, when in menu program, fast exit.

▲/d.p. : increments blinking digit in menu or decimal point set-up

▶/Print : shifts blinking digit in menu or prints readout

Zero : not used

F.S ↵ : enter in menu

AL + Exit Reset : readout ambient temperature (if option µ26)

[AL] + [F.S ↵] : enter to the menu

LEDS DESCRIPTION

AL1: alarm 1   **IN1:** readout zeroing on
AL2: alarm 2   **IN2:** hold on
o : the simbol "o" before the readout means ohm scale (range 20Ω or 200Ω)

1.4 TERMINAL BOARD DESCRIPTION
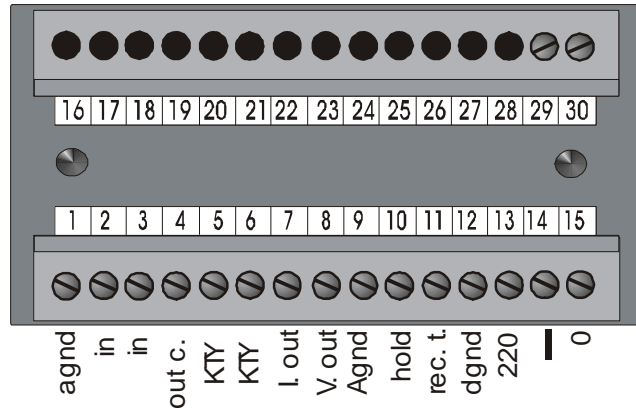
Terminal 4	- out current for readout resistance.
Terminals 5 e 6	- connection KTY (if option µ26)
Terminal 1	- analogue reference
Terminals 2 and 3	- signal input
Terminals 7, 8 and 9	- analogue outputs (if requested)
Terminal 10	- Hold : short-circuiting terminals 10/12 stores observed value
Terminal 11	- Display reset. Terminals 11/12 open: the reading are the same as the programming values. Terminals 11/12 closed: at the moment the terminals are short-circuited the display becomes zeroed (display reset)
Terminals 13, 15	-instrument power supply

1.5 CONNECTION DIAGRAMS MPO M6 SERIE

1) Connections 2 wires

connect terminals as indicated

The shield, if it is used, must be connected to terminal 5

resistance in test

2) Connections 4 wires

The shield, if it is used, must be connected to terminal 5

resistance in test
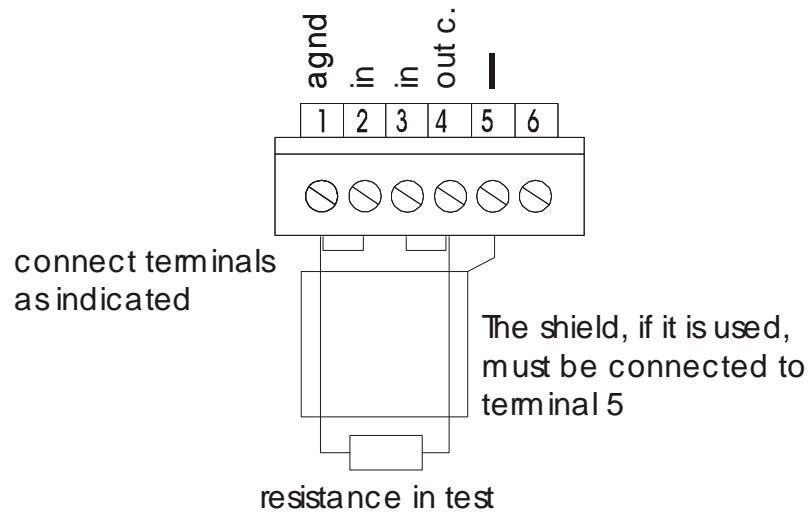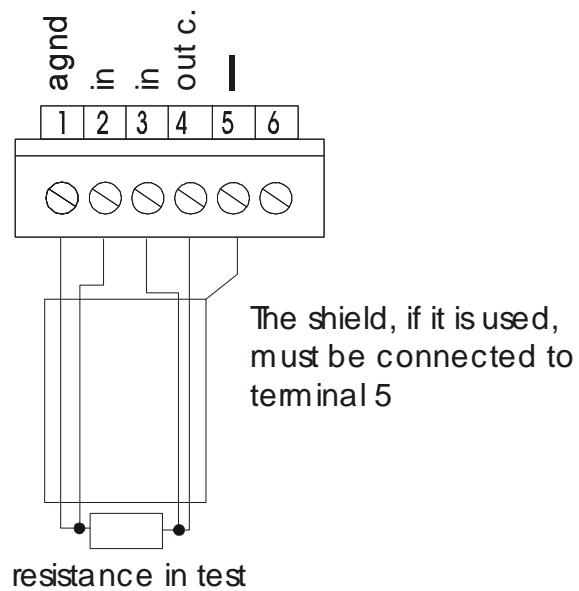
1.6 CONNECTION DIAGRAM 2 RELAY + SERIAL OUTPUT
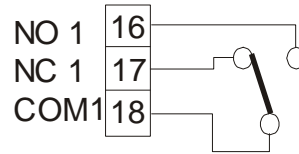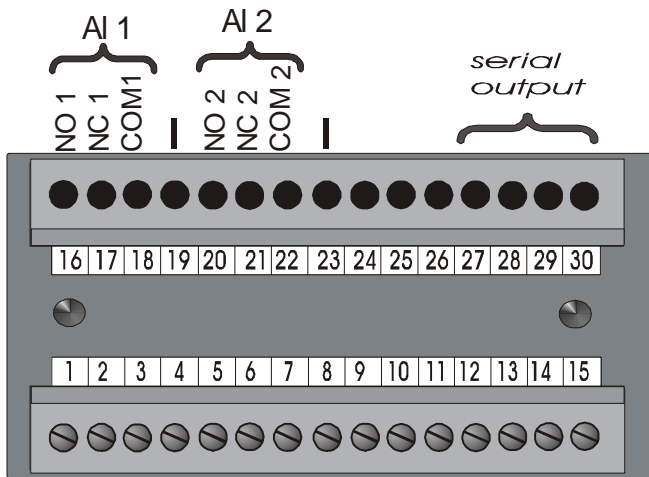
EXCHANGE RELAY:
250 Vac/5A max.

1.7 CONNECTION DIAGRAM - 4 RELAY
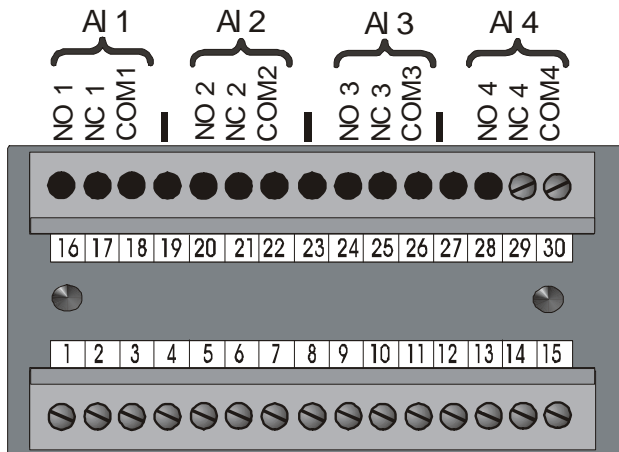
1.8 CONNECTIONS FOR 8 STANDARD OR OPTO-ISOLATED STATIC ALARMS
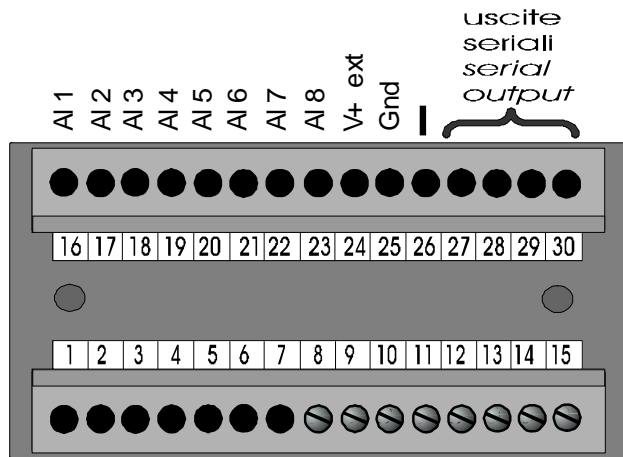
Static output can be requested as follows (with order code):

1)STN/STNO:
Standard or opto-isolated
static NPN output open collector

2)STP/STPO:
Standard or opto-isolated static PNP
output open collector
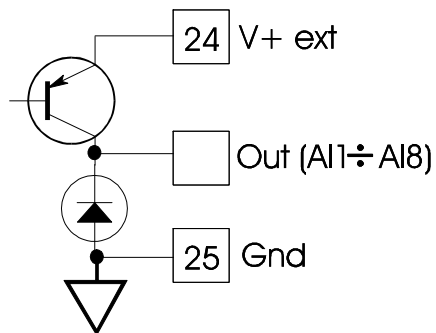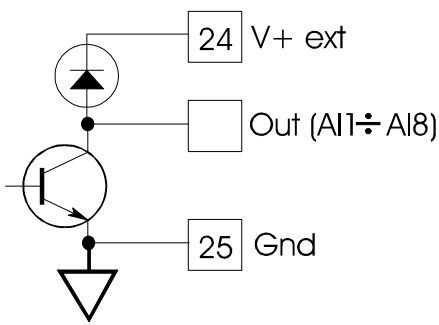
1.9 PROGRAMMING TIPS

- Press [F.S.] + [AL] keys to enter menu.

- To reach a menu item, use the [F.S.] and the [▲ d.p.] key as shown in the menu flow for base instrument and base + option instrument.

- To change a digit, use the [▲ d.p.] key to increment the blinking digit and the [▶ Print] key to shift the blinking digit and confirm by [F.S.] key.

- To select an item use the [▲ d.p.] key and confirm by the [F.S.] key.

- To go to an upper level, use the [▶ Print] key.

- To exit menu, use the [Exit Reset] key: the modified parameters are stored.

1.10 BASE INSTRUMENT MENU FLOW

see "filter function"

see "installation
notes "

see "password function"

see "front keys enabling"

see "terminal 10 and 11
configuration"

see "default parameters"

see "peak-hold
function"

if option
μ26

FIL → nFIL → 128
      dEL → 199
      PEr → 1.99

SCAL
ISI → -19999
ISL → -19999
FSI → 19999
FSL → 19999
OFFS → 0000

19.9o
199o
1.99h
19.9h
199h
AUto

AL + F.S. → PASS → 0000 → OU
                              InP
                              CPAS → 0000
                              AbtA
                              C.nor → n 10 → HoLd Prnt AbAL
                                       n 11 → rES Prnt AbAL
                              dEF → OFF on

PICC → P.OFF P.Ho P.HI P.Lo P.LI

HLd → 19.9
CoFF → 19.9
ALFA → 19.9
nErt → OFF on

AbSP → OFF on
Abrt → OFF on
AbdP → OFF on
AbOF → OFF on

1.11 OPTIONS INSTRUMENT MENU FLOW

see "serial output"

see "simplified installation procedure"

Addr → 001
▲
bAud → 1200
        ▲
       2400
        ▲
       4800
        ▲
       9600

SEL.A → E0.10
▲   ▲
IS → 0000 C0.20
▲   ▲
FS → 19999 C4.20
▲
ISO → 0000
▲
FSO → 19999

ou.rS

SP 1 → 19999
▲
SP 2 → 19999

AL → AL 01
      ▲
     AL 08 → SP 1 → 19999
              ▲
             SP 2 → 19999

ou.An

see "analogue outputs"

SP1 → 19999
▲
rELE → nA
        ▲
       nC
        ▲
       nAF
        ▲
       nCF
        ▲

see "password function"

PASS → 0000

AL + F.S.↵

OU
▲
InP
▲
CPAS
▲

AbtA
▲

C.nOr
▲

dEF
▲

ALL

AL 01
▲
AL 08

see "alarms"

SP2 → 19999
▲
HY → 199
▲
SEL.d → Ec
         ▲
        di
         ▲
        Ec-di
         ▲
        no-dL
         ▲

dEL → 199

see "terminal 10 and 11 configuration"

Instal **2.0 INSTALLATION NOTES**

2.1 SIMPLIFIED INSTALLATION PROCEDURE

1- Connect the instrument as follows:
   pag 7 – base instrument wiring diagram
   pag 8 – input signal wiring diagram
   pag 9, 10 – alarm wiring diagram (if requested).
2- Power up the instrument
3- Front panel keys allow the following set up:

- **With the** ▲/d.p. **key is possible to change the decimal point position.**
   To set up the decimal point position, press the relevant key (it appears "000000") and use the ▲/d.p. key to shift the decimal point in the desired position. When the decimal point is correct, confirm by the F.S ↵ key.

- **With the** AL **key it is possible to set up the alarm values**
   To set up the alarm values use the following table. For further information about the alarm functions, see "Alarm" paragraph.

Table 3

Seq n°	Press key	appears on display	NOTES
1	AL	AL 1	Press the "AL" key to reach the alarm Set-Point items
2	FS ↵	SP 1	First set-point of the alarm 1
3	FS ↵	0 0000	Input the value of alarm 1 ** (confirm with "FS ↵")
4		SP 1	
5	▲	SP 2	Second set-point of alarm1, if request window alarms
6	▸	AL 1	
7	▲	AL 2	Alarm 2
8	FS ↵	SP 1	First set-point of the alarm 2
9	FS ↵	0 0000	Input the value of alarm 2 ** (confirm with "FS ↵")
10		SP 1	
11	▲	SP 2	Second set-point of alarm 2, if request window alarms
12	Exit Reset	Read out	

** to modify the value see the procedure illustrated in the paragraph "SET-UPS" .

- **To lock the front keys or to use other configuration, see the " Front key enabling" paragraph**
- **The instrument is ready to be used**
- **To use the instrument with the "display reset" function, see "display clear function" paragraph**

2.2 COMPLETE INSTALLATION PROCEDURE

Follow this procedure to completely set up the instrument.
1. Look at the following table to change the input and peak hold values
2. To set the alarm set-point parameters see "ALARMS" paragraph (for window alarms, delay and hysteresis)
3. For analogue output set up see "ANALOGUE OUTPUTS" paragraph
4. For serial output set up see "SERIAL OUTPUTS" paragraph
5. Insert, if desired, the access code to the programming menu (see Password function)
6. The instrument is ready to be used
7. To use the instrument with the "display reset" function see "display clear function" paragraph.

Table 4

seq. n°	Press key	appears on display	NOTE
1	FS ↵ + AL	PASS	Press the "FS ↵" + "AL" keys
2	FS ↵	0 0000	Input the personal Password ** (confirm with "FS ↵")
3		Ou	
4	▲	InP	
5	FS ↵	FIL	FILTER PROGRAMMING
6	▲	SCAL	SELECTION OF READING SCALE (only for MPO347 100 model)
7	FS ↵	19.9	Press ▲ key until you will see the requested item: 19.9 o = 19.999Ω 199 o = 199.99Ω 1.99 h = 1.9999KΩ 19.9 h = 19.999KΩ 199 h = 199.99KΩ Auto = autoranging instrument (confirm with "FS ↵")
8		SCAL	
9	▲	ISI	BEGINNING OF INPUT SCALE (not available if SCAL = AUTO)

seq. n°	Press key	appears on display	NOTE
10	FS ↵	0 0000	Resistive value at the beginning scale **(confirm with "FS ↵")
11		ISI	
12	▲	ISL	BEGINNING OF READING SCALE (not available if SCAL = AUTO)
13	FS ↵	00000	Write the value you want to visualize with ISI. **(confirm with "FS ↵")
14		ISL	
15	▲	FSI	END OF INPUT SCALE (not available if SCAL = AUTO)
16	FS ↵	19.999	Write the requested input end of scale **(confirm with "FS ↵")
17		FSI	
18	▲	FSL	END OF READING SCALE (not available if SCAL = AUTO)
19	FS ↵	19999	write the value to be seen with FSI. **(confirm with "FS ↵")
20		FSL	
21	▲	OFFS	OFFSET SUBTRACTED FROM READ OUT
22	FS ↵	00.000	Normally = 0 . **(confirm to "FS ↵")
23		OFFS	
24	▲	PICC	PEAK SET-UP
25	FS ↵	P.OFF	Select the requested Peak function P.OFF = Peak excluded P.h.O. = Maximum peak with programmable reset time P.h.I. = Maximum infinite peak P.L.O. = Minimum peak with programmable reset time P.L.I. = Minimum infinite peak Press ▲ key until you will see the req. item (confirm with " FS ↵")
26		PICC	
27	▲	.HLd	TIME OF PEAK RETENTION
28	FS ↵	19.9	write retention time (0 ÷ 19.9 s) if PhO or PLO selected **(confirm with "FS ↵")
29		.HLd	
30	▲	*COFF*	*TEMPERATURE CORRECTION (opt. µ26)*
31	FS ↵	*00.0*	*If the KTY measured temperature is not correct,*

seq. n°	Press key	appears on display	NOTE
			write a value between ±20.0°C that will be algebraically added to the readout and confirm with "FS ↵".
32		*COFF*	
33	▲	*ALFA*	*TEMPERATURE COEFFICIENT (opz. μ26)*
34	FS ↵	*00426*	*Write the temperature coefficient of the measured material. For the copper use the number: 0.00426. **(confirm with "FS ↵")*
35		*ALFA*	
36	▲	nErt	MEMORIZING DISPLAY CLEAR FUNCTION
37	FS ↵	On	On = memorize the display clear function at the switching off OFF = the instrument looses the display clear function value at the switching off Press "▲" key until you will see the req. item **(confirm with " FS ↵")
38		nErt	
39	Exit Reset	Read out	Procedure to exit from programming area.

** to modify the value set-up see the procedure illustrated in the paragraph "SET-UPS".

2.3 AUTORANGING INSTRUMENT (MPO347 100)

The MPO347 100 instrument can work with a one fixed scale out of 5 in the menu (20 Ω, 200 Ω, 2 KΩ, 20 KΩ e 200 KΩ) or in autoranging mode with automatic scale selection. In autoranging mode, the instruments shows in the display with the highest resolution the measured resistance at the input terminals. With the autoranging mode is no longer possible to use the "ISI", "ISL", "FSI", "FSL" parameters and the decimal point is according to the current working scale. In the autoranging mode the alarm outputs and analogue outputs follow the set value indipendently by the workink scale, and they will be active after 0,5 seconds from the autoscale set up (the 10000 alarm value can work at 10.000Ω, 100.00Ω, ecc.).

2.4 TEMPERATURE COMPENSATION (option μ26)

It is possible to set up the temperature coefficient of the resistance material by means of the menu item ALFA in the 0.00001 to 0.19999 range.
The copper value is 0.00426, the aluminium (98%) is 0.0043 and the iron value is 0.0046. See Table 4 for the complete procedure.
It is necessary to put the KTY sensor near the measured resistance and to connect it as in the wiring diagram figure. A wrong KTY connection show "OPEN" on display

and stop the instrument. The temperature compensation shows the resistance @ 20°C. It is possible to read the measured temperature by means of two keys "AL" + "Exit/Reset" you can correct the temperature value by means of the menu item "COFF" as shown in the Table 4.
EXAMPLE:

      instrument temperature = 20.0°C
      real temperature = 18.0°C
      COFF = -0002.0

2.5 "DISPLAY" CLEAR FUNCTION

"Display clear" means a control that, when functioning, shuts down the display. This shut down is not taken into consideration when the instrument is switched on again or exiting from the programming menu. The function "Display clear" works short-circuiting terminals 11 and 12 or pressing the "Exit\Reset" front key, if it is enabled by the menu. When you start using this function, a zeroing of the visualization is executed and the "In1" led on the front get switched on. The zeroing by this function can be memorized at the switching off of the instrument if the "nErt" menu item is enabled, (see Table 4).

To delete the executed zeroing with the "Display clear" function is necessary to press at the same time the two central keys which indicates the arrows.

The "Display clear" function is used when you have to make many visualization zeroing.

If the application doesn't need many zeroing, it is possible to use the "OFFS" menu item to memorize in the permanent memory the data to zero.

If the instrument is requested with serial outputs, the "display clear" terminal can be configured as transmission of the read-out, (see "Serial output" paragraph).

Practical example.

The instrument is linked with a transducer and it visualizes "100.0" Ω. Linking terminals 11 and 12 we zero the visualization, so the indication will be negative for the values under "100.0" and positive for the values over "100.0" Ω.

2.6 TERMINALS 10 AND 11 CONFIGURATION

Terminals 10 and 11 are normally used for the "hold" and the "display clear" functions, but it is possible to show one of the two terminals (or both) for the transmission of the read out by the menu item "C.nor" if the instrument has a serial output. See the following table:

Table 5

seq. n.	Press key	appears on display	NOTES
1	FS ↵ + AL	PASS	Press the "FS ↵" + "AL" keys
2	FS ↵	0 0000	Input the personal password number ** (confirm with "FS ↵")
3		Ou	
4	▲	InP	
5	▲	C.PAS.	
6	▲	AbtA	ENABLING KEYS
7	▲	CnOr	TERMINAL CONFIGURATION
8	FS ↵	n 10	TERMINAL 10 CONFIGURATION
9	FS ↵	HOLd	HOLd = the terminal works as hold (if closed) Prnt = the terminal is enabled for the transmission of the read out (if closed) AbAL= the terminal disables alarm output (if closed) Select with the "▲" key the requested item and confirm with "FS ↵"
10		n 10	
11	▲	n 11	TERMINAL 11 CONFIGURATION
12	FS ↵	rES	rES = the terminal works as display clear (if closed) Prnt = the terminal is enabled for the transmission of the read out (if closed) AbAL= the terminal disables alarm output (if closed) Select with the "▲" key the requested item and confirm with "FS ↵"
13		n 11	
14	Exit Reset	Read out	Procedure to exit to programming environment

2.7 DEFAULT PARAMETERS (dEF)

Some wrong values in menu programming function can cause the "ERR" display to appear. To reset to factory default parameters you can use the DEF function (see table 5). BE CAREFUL: all previous programmed values will be lost.

Table 6

seq. n.	Press key	appears on display	NOTES
1	FS ↵ +	PASS	Press the "FS ↵" + "AL" keys

seq. n.	Press key	appears on display	NOTES
	AL		
2	FS ↵	0 0000	Input the personal number password ** (confirm with "FS ↵")
3		Ou	
4	▲	InP	
5	▲	C.PAS	
6	▲	AbtA	
7	▲	dEF	DEFAULT PARAMETERS
8	FS ↵	On	Press the "▲" key until appears the "On" item ** (confirm with "FS ↵") The instrument exits from the menu.

** to modify the number set-up see the procedure illustrated in the paragraph "SET-UPS".

2.8 FRONT KEYS ENABLING

The front keys can be disabled in the programming menu. To realize these disable functions follow the table 6.

Table 7

seq. n	Press key	Appears on display	NOTES
1	FS ↵ + AL	PASS	Press FS ↵ + "AL" keys
2	FS ↵	0 0000	Input the personal number password ** (confirm with "FS ↵")
3		Ou	
4	▲	InP	
5	▲	C.PAS	
6	▲	AbtA	ENABLING KEYS
7	FS ↵	AbSP	ENABLING KEY "AL" (for set point)
8	FS ↵	On	On = enabled, OFF= disabled Change the configuration with "▲" key and confirm with " FS ↵" key
9		AbSP	
10	▲	Abrt	ENABLING KEY "Reset" (display clear)
11	FS ↵	On	On = enabled, oFF= disabled Change the configuration with "▲" key and confirm with " FS ↵" key
		Abrt	
12	▲	AbdP	ENABLING KEY "dp" (decimal point)

seq. n	Press key	Appears on display	NOTES
13	FS ↵	On	On = enabled, OFF= disabled Change the configuration with "▲" key and confirm with " FS ↵" key
		AbdP	
14	Exit Reset	Read out	To exit from programming area

3.0 PEAK-HOLD (PICC) FUNCTION

By using the "PICC" function it is possible to store the highest reading (P.h.) or the lowest (P.L.) leaving them continuously on the display (P.h.I. - P.L.I.) or for just a programmable time limit from 0 ÷ 19.9 Sec. using the "HLd" function (P.h.O. - P.L.O.). Peak Hold function is displayed from the blinking flash led on the front panel of the instrument.

If the instrument is requested with the serial output and the hold terminal is configured as transmission of the read out, the "Peak-hold" function cannot be used (see "Serial output" paragraph).

The following two examples describe the main operating methodology of the "PICC" function, while for the complete programming please refer to Table 4.

- EXAMPLE 1

Program in the function "PICC" the "P.h.0." item and in the "HLd" function the time "10.0" s.

The instrument thus programmed will follow the input signal only on the variations that increase the reading value, while, for decreasing readings, the instrument maintains the fixed display for 10 seconds, thereafter the correct value will appear. Obviously, if during the 10 second period the instrument shows an increase in the reading value, the display becomes updated and the time is reset. (See fig A).

- EXAMPLE 2

Programme with the function "PICC" the "P.h.I." item.

The instrument behaves in the same way as the previous one with the difference that the time is not programmable but fixed up to an infinite value.

Also in this case the zeroing of the peak memory can be done by short-circuiting terminals 11 and 12. In the same way can be done the exclusion of this function.
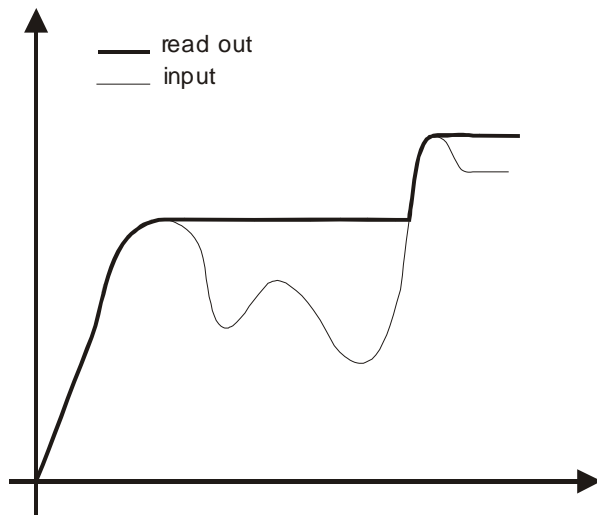
Fig A

4.0 "FILTER" FUNCTION

The MPO M6 series instruments provide the following filtering mode:

1. **n.FIL** : number of averages of the converted value (acts within the window called "del")

2. **dEL** : window within which the averages are taken (the number of averages taken is as programmed at item "n.FIL"). At the displayed number, a delta (dEL) is computed, all numbers converted within this window are averaged out, whereas those exceeding the window immediately update the display after the PER time .

3. **PEr :** time in seconds by which the last averaged value is shown.

When the converted value exceeds the programmed delta value, the dwell (Per) time gets started. If after the dwell (Per) time the converted value falls again within the set delta value window, the old value is not considered for the average, otherwise the display is immediately updated.
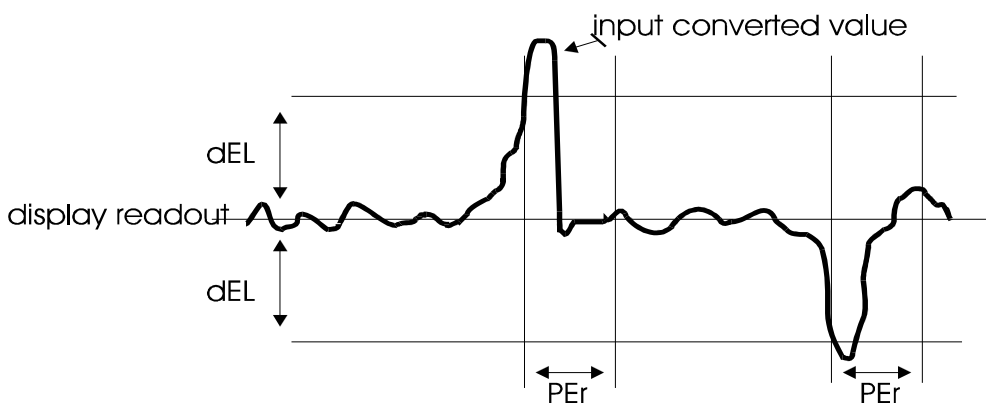
Fig. B

To program those items see the following table.

Table 8

n seq.	Press key	appears on display	NOTE
1	FS ↵ + AL	PASS	Press the "FS ↵" + "AL" keys
2	FS ↵	0 0000	Input the personal Password number if already programmed: see "password Function" ** (confirm with "FS ↵")
3		Ou	
4	▲	InP	
5	FS ↵	FIL	FILTER PROGRAMMING
6	FS ↵	n.FIL	NUMBER OF AVERAGES
7	FS ↵	128	Press key "▲ " until the display shows the number of averages required (0= no filter) Press "FS ↵" to confirm.
8		n.FIL	
9	▲	DEL	DELTA FILTER
10	FS ↵	199	Set the number of digits within the filter is activated. **(Press "FS ↵" to confirm)
11		DEL	
12	▲	Per	TIME OF READING RETENTION
13	FS ↵	1.99	write retention time (0.01÷1.99 s) ** (confirm with "FS ↵")
14		Per	
15	Exit Reset	Read out	To exit from programming area

** to modify the number set-up see the procedure illustrated in the paragraph "SET-UPS".

5.0 ANALOGUE OUTPUTS (option)

The MPO M6 instrument can be ordered with a voltmeter and ammeter standard or opto-isolated analogue output point ("OAM" or "OAT" options).

The flexibility of use and complete programmability make this output an important interface with analogue computer inputs, recorders or repeaters with analogue input . In particular you can choose, by programming the requested output (0÷10V, 0÷20mA, 4÷20mA), the calibration values linked to the required observations. The instrument can supply a maximum voltage of 10V and a current of 20mA, there being no limit to the intermediate values.

To configure the analogue output the user will have to set up the two reading values (IS and FS) and the corresponding output values (ISO and FSO). It is

necessary to take account of the fact that for reading values smaller or greater than those programmed the analogue output will not rise above the values set by the programming parameters ISO and FSO output values.

For greater clarity please check with the paragraph "Notes on the analogue output set-up".

The analogue outputs follow instantaneously the display reading, consequently the are locked when hold is entered on the terminal board and they take account of the numbers zeroed in the terminal board by the function "Display reset".

5.1 TECHNICAL CHARACTERISTICS

Table 9

Analogue Output	0÷10 V - 0÷ 20 mA - 4÷20 mA
Max. impedance for current output	600 Ω
Min. impedance for voltage output	1 KΩ
Max. voltage supplied	10 V
Max. current supplied	20 mA
Resolution	16 bit

5.2 INSTALLATION OF ANALOGUE OUTPUT

To use correctly the analogue output it is necessary to follow carefully these instructions:

1- Follow the connections in FIG D for the voltmeter output or the connections on FIG C for the ammeter output.
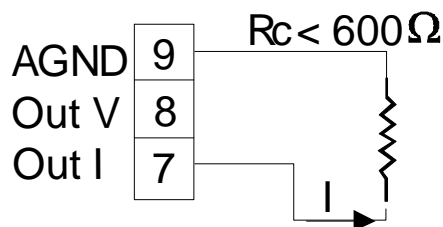
Fig C

Ammeter output
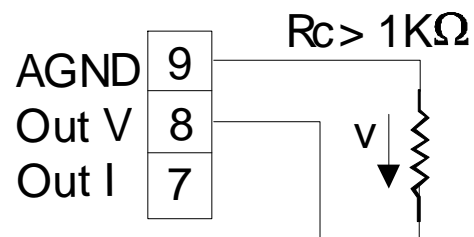
Fig D

Voltmeter output

2- Follow the programming procedure on Table 9 and then check with the examples that follow.

For programming it is necessary to take account of:

ISO (start of output scale) is the value of the analogue output coinciding with the observed digit at the beginning of the initial reading scale (IS). Digit at the input "IS" the display reading value which you want to coincide with initial value of the analogue output (ISO). The programming parameter "ISO" is programmed depending on the type of output chosen. Consequently we can obtain:

- ISO = 00.000 V if voltage output

- ISO = 00.000 mA if ammeter output (for output 4÷20 mA no programming is necessary).

FSO (end of the output scale) is the value of the analogue output which coincides with the programmed number at the item FS. Digit at the "FS" item the display reading value which you want to make to coincide with the final value of the analogue output (FSO).
The menu item "FSO" must be programmed on the basis of the type of output chosen. Therefore we obtain.:

- FSO = 10.000 V if voltage output
- FSO = 20.000 mA if ammeter output (for an output at 4 ÷20 mA no programming is necessary).

Table 10

n seq.	Press key	appears on display	NOTE
1	FS ↵ + AL	PASS	Press the "FS ↵" + "AL" keys
2	FS ↵	0 0000	Input the personal Password number if already programmed see "password Function" ** (confirm with "FS ↵")
3		Ou	
4	FS ↵	ALL	
5	▲	Ou.An	PROGRAMMING ANALOGUE OUTPUTS
6	FS ↵	SEL.A	Selection output type
7	FS ↵	E0.10	E0.10 = voltage output 0÷10 V C0.20 = current output 0÷20 mA C4.20 = current output 4÷20 mA Select the requested item with "▲ " key and confirm with "FS ↵" key
8		SEL.A	
9	▲	IS	START OF READING SCALE
10	FS ↵	0 0000	write the reading value which coincides with ISO ** (confirm with "FS ↵")
11		IS	
12	▲	FS	END OF READING SCALE
13	FS ↵	1 0000	write the reading value which coincides with FSO ** (confirm with "FS ↵")
14		FS	
15	▲	ISO	START OF ANALOGUE OUTPUT SCALE
16	FS ↵	00.000	write the output value which coincides with the reading programmed in "IS". This item has not to be

n seq.	Press key	appears on display	NOTE
			programmed if SEL.A = C4.20. ** (confirm with "FS ↵")
17		ISO	
18	▲	FSO	END OF ANALOGUE OUTPUT SCALE
19	FS ↵	10.000	write the output value which coincides with the programmed reading at "FS". This item has not to be programmed if SEL.A = C4.20. ** (confirm with "FS ↵")
20		FSO	
21	Exit Reset	Read out	Procedure for exiting programming area

** to modify the number set-up see the procedure illustrated in the paragraph "SET-UPS".

5.3 NOTES ON THE SET UP OF ANALOGUE OUTPUTS

• Programme instrument with the following calibration:

AMMETER OUTPUT: 5 mA with reading -500

AMMETER OUTPUT: +15 mA with reading 500

The instrument parameters should be programmed as follows.

> PARAMETERS "OU AN":
> SEL. A   = C0.20
> IS   = -500
> FS   = 500
> ISO   = 5.000 *
> FSO   = 15.000 *

* with display below "-500" the analogue output is fixed to 5 mA; with display above "500" the analogue output is fixed to 15 mA.

• Programme instrument with the following calibration:

AMMETER OUTPUT: 4 mA with reading -500

AMMETER OUTPUT: 20 mA with reading 500

The instrument parameters should be programmed as follows.

> PARAMETERS "OU AN."
> SEL.A   = C 4.20
> IS   = -500
> FS   = 500

* with display below "-500" the analogue output is fixed to 4 mA; with display above "500" the analogue output is fixed to 20mA.

• Programme instrument with the following calibration:

VOLTMETER OUTPUT: 2 V with reading -500

VOLTMETER OUTPUT: 6 V with reading 500

the instrument parameters should be programmed as follows.

PARAMETERS "OU AN.":
SEL.A   = E0.10
IS   = -500
FS   = 500
ISO   = 2.000 *
FSO   = 6.000 *

* with display below "-500" the analogue output is fixed to 2V; with display above "500" the analogue output is fixed to 6V.

6.0 ALARMS (option)

The MPO M6 can be supplied with up to 8, standard or opto-isolated, static NPN or PNP outputs or up to 4 relay alarms and each one can be programmed as follows:
1) Hysteresis from 1 to 200 digits.
2) Delay time from 0 to 200 s configurable in:
   - activation delay
   - de-activation delay
   - activation and de-activation delay
3)   minimum or maximum function
4) Window signal configurable as min. or max.
5) Alarm enabling by terminal (see paragraph "terminal 10 and 11 configuration"

Now, it follows a more detailed description of the programming of these functions.
a) **SP1**   : set up of point of alarm input up to +/- 19999 (see FIG. E). In the case of "Window" trigger "SP1" determines the first switching (see FIG. F).
b) **SP2:** set up of the second switching point of "window" trigger .(see FIG. F).
c) **HY:** Set up of the hysterisis centred on the set point, previously inserted, in the field from 0 ÷ +/- 200 digits.
HYSTERESIS: number of digits that sit between the insertion and de-insertion of the alarm trigger. There are two functioning methods:
   - trigger for simple alarm output (see FIG. E)
   - trigger for "window" alarm output (see FIG. F)
d) **dEL:** Delay set up before the switching on the trigger. This time can be between 0 ÷200 s
The alarms 1 and 2 signal the delay action by means of the flashing led.
e) **SEL.d:** (Delay Type) programming the delay type in the "delay" function.
   - EC: the time set up comes in before activating the exit
   - dI: the time set up comes in before de-activating the exit
   - EC.dI: both EC and DI
   - NO dL: time is switched off
f) **RELE :** By means of the programming function "rele" it is possible to choose the trigger functioning which can be normal or "window".

For normal functioning (SP1), inside the "rele" functioning it is necessary to programme:

- nA: on Max. (normally open)
- nC: on Min. (normally closed)

For "window" functioning two commutation points (SP1 and SP2) are needed and one must choose inside the "rele" function one of these two items:

- nAF: normally open (closed inside the programmed window)
- nCF: normally closed (open inside the programmed window)
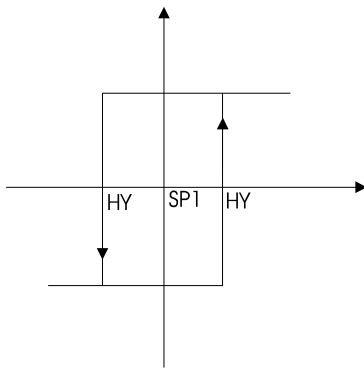
Fig E
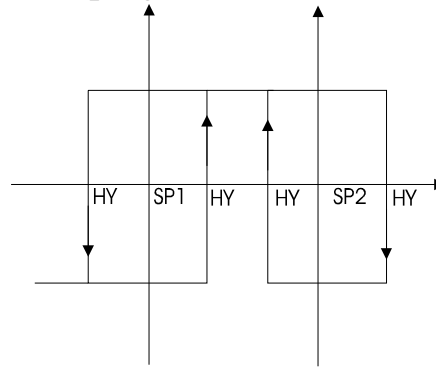
Fig F

6.1 ALARMS SET UP

Alarm values can be set in two different ways: by means of the front key "AL" or by means of standard menu (MENU). First way shows immediately set point values, the second one (MENU) drives you through all parameters of the instrument. The first time you set the instrument, use "MENU" item to set all the parameters of the instrument.

The instrument can be requested with up to 8 static alarms or up to 4 relay alarms. Each alarm can be programmed as minimum, maximum or window function. To set these functions it is necessary to follow next indications and table 10.

- Minimum or Maximum alarm. Select at item "RELE" the item "nA" for maximum or "nC" for minimum function. In this case point of switching is set at "SP1"
- Window alarm. Select at item "RELE" the item "nAF" for maximum or "nCF" for minimum window function. In this case the first point of switching is set at "SP1", while the second at "SP2".

Table 11

n seq.	Press key	appears on display	NOTE
1	FS ↵ + AL	PASS	Press the "FS ↵" + "AL" keys
2	FS ↵	0 0000	Input the personal Password no. **(confirm with "FS ↵")
3		Ou	

n seq.	Press key	appears on display	NOTE
4	FS ↵	ALL	
5	FS ↵	AL1	ALARM PARAMETERS 1
6	FS ↵	S.P.1	SET UP 1^ Minimum or maximum or first switching point for window alarm
7	FS ↵	0 0000	Set SP1. ** (confirm with "FS ↵").
8		S.P.1	
9	▲	rELE	SET UP CONTACT AL.1
10	FS ↵	n.A.	Select type of output n.A. = maximum alarm n.C. = minimum alarm n.A.F.= trigger norm. open window n.C.F.= trigger norm. closed window Choose the requested item with "▲" key and confirm with "FS ↵"
11		rELE	
12	▲	S.P.2	SET UP 2^ ONLY FOR "WINDOW" FUNCTION
13	FS ↵	0 0000	**(confirm with "FS ↵")
14		S.P.2	
15	▲	HY	HYSTERESIS SET UP AL1
16	FS ↵	00 199	(O÷200 digit) **(confirm with "FS ↵")
17		HY	
18	▲	SEL.d	TYPE OF DELAY SET-UP AL1
19	FS ↵	Ec	Select type of functioning Ec = activation delay dI = deactivation delay Ec-dI = activation + deactivation delay nO dL = excluded delay Choose the requested item with "▲" key and confirm with "FS ↵"
20		SEL.d	
21	▲	dEL	DELAY SET UP AL 1
22	FS ↵	00 199	Set a number between 0÷199 s **(confirm with "FS ↵")
23		dEL	
24	▶	AL1	
25	▲	AL2	ALARM 2 PARAMETERS
26	FS ↵	S.P.1	For alarm 2 and subsequent ones follow the same procedure as alarm 1
27	Exit Reset	Read out	Procedure for exiting programming area

** to modify the number set-up see the procedure illustrated in the paragraph "SET-UPS".

After the alarm parameters has been programmed, it is possible to change rapidly the set point values by means of simplified menu (see SIMPLIFIED INSTALLATION PROCEDURE paragraph).

7.0 SERIAL OUTPUT (option)

"MPO M6" series models with 48 x 96 housing can communicate with an host computer along a standard or optoisolate RS232, RS422, RS485 serial line.

Unidirectional serial output

"MPO M6" series instrument with unidirectional standard or optoisolated RS232 output send out the readout value when the " ▸ /Print" key is pressed or by terminal 10 o 11 (if set to :see paragraph "terminal 10 and 11 configuration). Serial output features are listed in the table below, and the wiring diagram is shown in fig G. The output format is as follows:
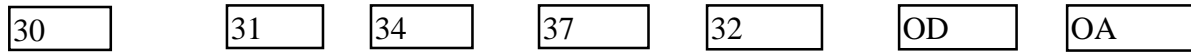
30	31	34	37	32	OD	OA
ten thousands	thousands	hundreds	tens	unity	LF	CR

Bi-directional serial output

It is possible to programme or read the most of the keyboard function of one or more instruments linked with each other (31 max) by this line transmission. All messages are sent and received by means of an ASCII protocol.

Table 12

SERIAL CHARACTERISTICS	
baud rate	9600 4800 2400 1200 (programmable)
start bit	1 bit
Length	8 bit
Stop	1 bit
Parity	no

To use the instruments "MPO M6" models with RS485 or RS422 serial output, you must follow figure "H", for SR232 serial output follow figure "G". Programme the instrument with the address code and realize a supervisor software using the mnemonic codes described in the following pages.

The address code, which must be assigned at the instrument, is the name by which the host computer calls the instrument that must receive or send information by the serial line. To programme the address code and the baud rate (functions programmable only by keyboard) follow the next table.

Table 13

seq. n.	Press key	appears on display	NOTES
1	FS ↵ + AL	PASS	Press the "FS ↵" + "AL" keys
2	FS ↵	0 0000	Input the personal password number ** (confirm with "FS ↵")
3		Ou	
4	FS ↵	ALL	
5	▲	Ou An.	
6	▲	Ou rS	
7	FS ↵	bAUd	BAUD RATE
8	FS ↵	9600	Press the "▲" key until appears the baud-rate ** (confirm with "FS ↵")
9		bAUd	
10	▲	Addr	INSTRUMENT ADDRESS
11	FS ↵	001	Input the instrument address with a number between 001 and 099. **(confirm with "FS ↵")
12		Addr	
13	Exit Reset	Read out	Procedure to exit to programming environment

** to modify the number set-up see the procedure illustrated in the paragraph "SET-UPS".
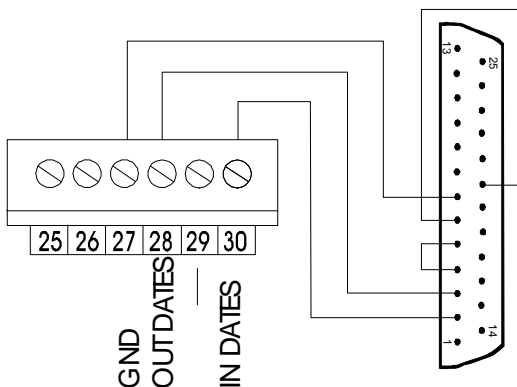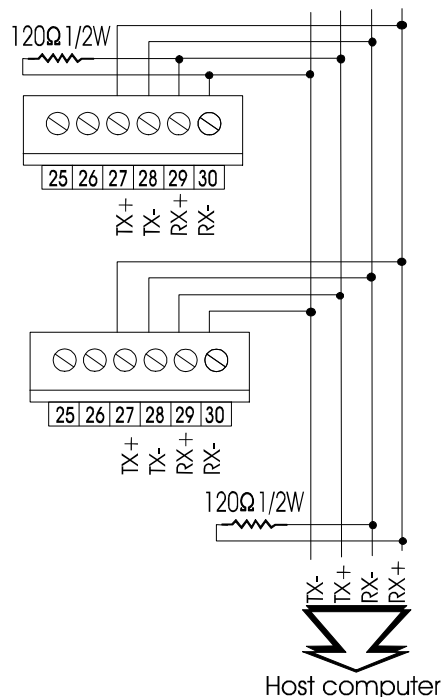
Figure H.(RS232)   **Figure G (RS485)**

7.1 DATA READING FROM HOST TO INSTRUMENT MPO M6

Transmission string set-up.

EOT   GID GID   UID UID   C1 C2   ENQ

EOT = EOT from host indicates start of transmission string
GID = Instrument address: ASCII in decimal code to transmit twice consecutively
UID = Instrument address: in units ASCII to transmit twice consecutively
C1 C2 = mnemonic ASCII code for command to follow (see paragraph "command codes").

EXAMPLE: data transmission string from host to MPO/M6 with address "01" for data request "Reading scale end" (FL).

EOT   0   0   1   1   F   L   ENQ
04   30   30   31   31   46   4C   05   cod. ASCII

The instrument, as soon as receives the first string code transmitted by the host, leaves 400 ms. during which it waits for the completion of the transmission operation. When the 400 ms. operation finishes, or when the data reception is complete, the instrument, depending on the information received, can behave in the following ways :
1. If the data string received presents errors which do not allow address identification then the instrument cannot reply and rejects the information received.
2. The string has a correct address code but it detects other errors: in this case the instrument transmits the ASCII code: NACK (not understood) and rejects the information received.
3. The received data string is totally correct, in this case the instrument transmits the data requested in ASCII format. (see paragraph "Data trasmission from MPO M6 to host")
4. When the complete message is not received before "timeout" (400 ms), the instrument rejects the information received and is ready to receive a new message.

7.2 DATA TRANSMISSION FROM MPO M6 TO HOST

Transmission String configuration

STX   C1 C2   D1 . . . . D8   ETX   BCC

STX =   text beginning
C1 C2 = mnemonic code ASCII relative to command to follow. (see paragraph "command codes").

D1 ÷D8 = digits observed, including negative nos. , also ">", decimal points (if required) and blank or zero for digit not used (the transmitted digits must always be eight)

ATTENTION: the data must always be right justified and in any case the significant numbers cannot be more than five. In the case of positive numbers the sign "+" must not be transmitted.

EXAMPLE: the number -5.6 can be written in two ways

	1) blank	blank	blank	blank	-	5	.	6
	20	20	20	20	2D	35	2E	36
	2) -	0	0	0	0	5	.	6
	2D	30	30	30	30	35	2E	36

EXT = End of text

BCC = Checksum, obtained using EXCLUSIVE OR, of the string transmitted excluding the code "STX" comprising "ETX" in the indicated order.

$$BCC = C1 + C2 + D1 + D2 + D3 + D4 + D5 + D6 + D7 + D8 + ETX$$

EXAMPLE: data string from MPO M6 to host in response to preceding example.

STX	F	L	blank	blank	blank	blank	0	1	0	0	ETX	BCC
02	46	4C	20	20	20	20	30	31	30	30	03	08 cod. ascii

The MPO/M6 after having transmitted the string with the data requested from the host-computer awaits the reply confirming the result of the transmission.

1. The host-computer replies in ASCII: NACK (retransmit the message). The MPO M6 retransmits the data string.

2. The host-computer does not reply. In this case the instrument awaits the next EOT on the network to set up the next communication.

3. The host-computer replies in ASCII: ACK (understood). The instrument awaits new commands.

7.3 DATA WRITING FROM HOST TO MPO M6

Set up of transmission string

EOT   GID GID   UID UID   STX   C1 C2   D1 . . . D8   ETX   BCC

EOT = EOT from host indicates start of transmission string

GID = Instrument address: ASCII code in decimal twice to transmit consecutively

UID = Instrument address: ASCII in units to transmit twice consecutively

C1 C2 = mnemonic ASCII code for command to follow . (see paragraph "command codes").

D1 ÷ D8 = Digits seen. The same rules are valid as those described in the paragraph " data transmission from MPO M6 to host"

BCC = Checksum, obtained using EXCLUSIVE OR, of the transmitted string excluding code "STX" comprising "ETX" in the order indicated

$$BCC = C1 + C2 + D1 + D2 + D3 + D4 + D5 + D6 + D7 + D8 + ETX$$

EXAMPLE: string for writing data from host to MPA MPV/M6 with "01" address.

EOT	0	0	1	1	STX	F	L	blank	blank	blank	blank	0	1	0	0	ETX	BCC
04	30	30	31	31	02	46	4C	20	20	20	20	30	31	30	30	03	08

The instrument starting from the first code received of the data string transmitted by the host, leaves 400 ms during which it waits for the transmission operation to be completed. When the 400 ms operation finishes, or when the data reception is complete, the instrument , depending on the information received, can behave in four different ways :

1. If the data string received presents errors which do not allow address identification, then the instrument cannot reply and rejects the information received.
2. The string has a correct address code but detects other errors: in this case the instrument transmits the ASCII code: NACK (not understood) and rejects the information received.
3. The received data string is totally complete, in which case the instrument stores the information and transmits the code ASCII=ACK (understood)
4. When the complete message is not received before "time-out" (400 ms), the instrument rejects the information received and is ready to receive a new message.

7.4 COMMAND CODES

The codes of the variables used for the MPO M6 instrument programming, are listed in the following Table. Not all the parameters allow the writing from host, in this case the instrument replies "NACK" (read only parameters).

Table 14

COMMAND CODES	COMMAND DESCRIPTION	POSSIBLE OPERATION	DATE CODE
II	ISI	read/write	ASCII ± 19999
IL	ISL	read/write	ASCII ± 19999
FI	FSI	read/write	ASCII ± 19999
FL	FSL	read/write	ASCII ± 19999
OF	OFFS (vis.)	read/write	ASCII ± 19999
PT	P.dEC	read/write	hexadecimal

COMMAND CODES	COMMAND DESCRIPTION	POSSIBLE OPERATION	DATE CODE
	(decimal point)		0 = no point 1 = 1999.9 2 = 199.99 3 = 19.999 4 = 1.9999
SC	SCAL (scale)	read/write	hexadecimal 0 = 19.999 Ω 1 = 199.99 Ω 2 = 1.9999 KΩ 3 = 19.999 KΩ 4 = 199.99 KΩ 5 = auto
PM	PICC (peak hold)	read/write	hexadecimal 0 = POFF 1 = P.ho 2 = P.hi 3 = P.Lo 4 = P.Li
TI	.HLd	read/write	ASCII 0÷19.9
NM	nFIL (filtering number)	read/write	hexadecimal 0 = no filter 1 = 2 2 = 4 3 = 8 4 = 16 5 = 32 6 = 64 7 = 128
SA	dEL (width filter)	read/write	ASCII 0÷199
PE	Per (filter permanence)	read/write	ASCII 0÷1.99
AT	SEL.A (analogue output selection)	read/write	hexadecimal 0 = E0.10 1 = C0.20 2 = C4.20
IU	IS (out an)	read/write	ASCII ± 19999
FU	FS (out an)	read/write	ASCII ± 19999
IO	ISO (out an)	read/write	ASCII ± 19999
FO	FSO (out an)	read/write	ASCII ± 19999
RP	Peak reset	read/write	ASCII ± 19999

COMMAND CODES	COMMAND DESCRIPTION	POSSIBLE OPERATION	DATE CODE
RT	Display clear	write only	
RO	read out (display)	read only	
AL	Alfa Only if µ26 option (write the decimal numbers)	read/write	ASCII 0÷19999
OT	C.oFF Only if µ26 option (temperature offset)	read/write	ASCII 0÷±199
MO	C.nor (terminals 10 and 11 configuration)	read/write	hexadecimal bit 0 and 1 for hold 00=hold 01=print 10=Ab.alarm bit 2 and 3 for rec.tara 00=rec. tara 01=print 10=Ab.alarm
AR	Generic status word	read/write	See "Generic status word" paragraph
A1..A8*	SP1 (AL1÷AL8)	read/write	ASCII ± 19999
B1..B8*	SP2 (AL1÷AL8)	read/write	ASCII ± 19999
H1..H8*	HY (AL1÷AL8)	read/write	ASCII ± 199
D1..D8*	delay(AL1÷AL8)	read/write	ASCII ± 199
W1..W8*	status word alarms	read/write	hexadecimal 0÷F(T.15)

* The code is composed by the letter followed by the number of the alarm to program

7.5 TRANSMISSION OF HEXADECIMAL VALUES

Some values must be transmitted in a 4 digit hexadecimal format. In that case the protocol string must be preceded by the ASCII character ">".
EXAMPLE: the string for reading or writing the decimal point in the position 1999.9 will be:
Blank blank blank > 0001
EXAMPLE FOR READING DECIMAL POINT POSITION
HOST:

	EOT	0	0	1	1	P	T	ENQ
	04	30	30	31	31	50	54	05

INSTRUMENT MPO M6

STX	P	T	blank	blank	blank	>	0	0	0	4	ETX	BCC
02	50	54	20	20	20	3E	30	30	30	34	03	1D

EXAMPLE FOR WRITING DECIMAL POINT POSITION

HOST:

EOT	0	0	1	1	STX	P	T	blank	blank	blank	>	0	0	0	2	ETX

BCC

04	30	30	31	31	02	50	54	20	20	20	3E	30	30	30	32	03

1B

INSTRUMENT MPO M6

ACK

06

7.6 "RO" CODE

In the readout transmission (code "RO") appears also the word that indicates if the instrument is in hold state. In the paragraphs above it has been said that, in normal conditions, the data are transmitted from "D1" to "D8" and particularly"D1" and "D2" are considered "blank". With the instrument in hold state, "D1" gets the H value while "D2" keeps staying "blank".

In the readout transmission (code "RO") with autoranging on appears also the letter "o" for Ω or "k" for KΩ.

7.7 ALARM SETTING

MPO M6 series instruments can have up to 8 alarms with window, delay time and hysteresis. The relevant codes are:

A   reading/writing of SP1
B   reading/writing of SP2
H   reading/writing of hysteresis
D   reading/writing of delay time
W   reading/writing of the status word of the alarm

The code is followed by a number between 1 and 8 indicating the alarm number.

For instance, "H3" means hysteresis for alarm 3 and so on.

The status word W gives the information on the relay status (normal or windowed alarm) and about the kind of delay (excitation or de-excitation).

The alarms' status word accepts hexadecimal numbers from 0 to F as shown in the table below.

Table 15

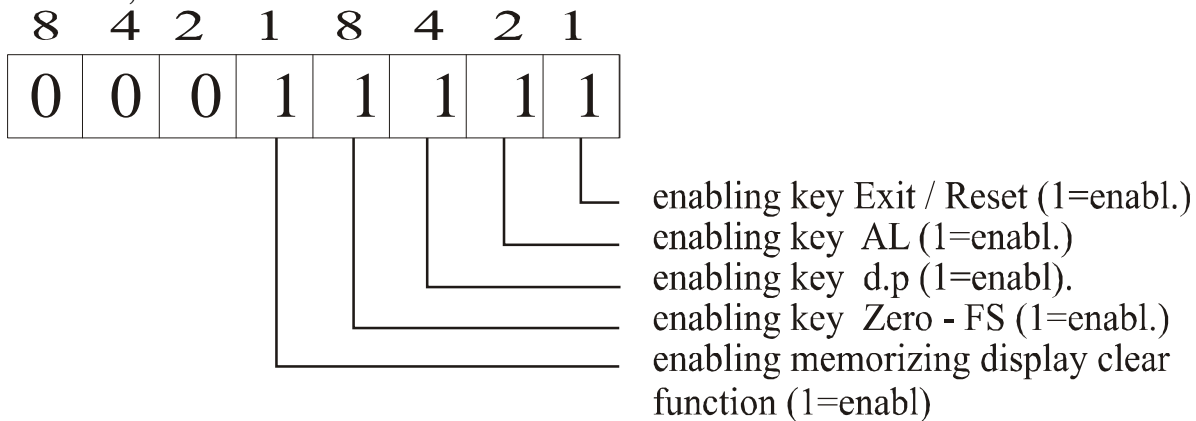| CODE W1÷W8	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
T.DEL	no-dL	no-dL	no-dL	no-dL	EC	EC	EC	EC	di	di	di	di	EC-di	EC-di	EC-di	EC-di
RELAY	NC	NA	NCF	NAF	NC	NA	NCF	NAF	NC	NA	NCF	NAF	NC	NA	NCF	NAF

7.8 PEAK-HOLD RESET

MPO M6 have a peak-hold capability. The peak value can be reset by means of writing the serial code "RP" followed by 0 value.

The peak status of the instrument can be read by means of reading the serial code "RP": a 0 value means that the readout is in program, and a 1 value means that the display is in peak-hold.

7.9 GENERIC STATUS WORD

The status word "AR" allows to enable the front keys by serial, to show terminals 10 and 11 and to enable the display clear memorising. To make the hexadecimal data to transmit, follow the next scheme.

```
 8   4   2   1   8   4   2   1
┌───┬───┬───┬───┬───┬───┬───┬───┐
│ 0 │ 0 │ 0 │ 1 │ 1 │ 1 │ 1 │ 1 │
└───┴───┴───┴───┴───┴───┴───┴───┘
```

enabling key Exit / Reset (1=enabl.)
enabling key AL (1=enabl.)
enabling key d.p (1=enabl).
enabling key Zero - FS (1=enabl.)
enabling memorizing display clear function (1=enabl)

7.10 BASIC PROGRAM

The following basic program shows the reading of the set-point of an instrument by an host computer

```
on error goto 20
cls
open "com1: 9600, n, 8, 1" for random as #1
print #1, chr$(4) + "0" + "0" + "1" + "1" + "S" + "P" + chr$(5)
print "waiting for answer …"
cls
a$ = input$(13, #1)
b$ = mid $(a$, 5, 7)
print
print "read : ";b$
end
20 print "no answer"
resume
```

8.0 PASSWORD FUNCTION

The user can keep the information programmed from possible misuse by using the password function.

The instrument is supplied with password number = 0, but any number between 0 and 9999 can be set up as an access key to modify the operating data (for the operating of personal password numbers see TABLE 16).

The Password is asked for each time the user gains access to the programming menu. The instrument, after receiving the password number can behave in two different ways:

1) **n. correct Pass.** The user can gain access to the programming menu and modify any function or number.

2) **n. false Pass.** The user can only see the numbers programmed but cannot modify them.

ATTENTION. The number that can be programmed at the "c.PASS", code, must be written at "n.PASS" item each time you gain access to the programming menu for the insertion of new variables.

If the user does not remember the exact "secret" number, it is necessary to call the service centre.

Table 16

N seq.	Press key	written on display	NOTE
1	FS ↵	PASS	Press the "FS ↵" key
2	FS ↵	0 0000	** (confirm with "FS ↵")
3		Ou	
4	▲	InP	
5	▲	c. PAS	NUMBER OF PERSONAL PASSWORD
6	FS ↵	0 000	Digit the number of password between 0 and 9999 ** (confirm with "FS ↵")
7		c. PAS	
8	Exit Reset	Read out	Procedure to exit to programming environment

** to modify the number set-up see the procedure illustrated in the paragraph "SET-UPS".

9.0 SET UPS

Instructions for changing and storing programming number

Table 17

n seq.	Key to Press	written on display	NOTE
1		SP1	modification of trigger value
2	FS ↵	0 0000	the display begins with the first blinking number

3	▸	0 0 000	the key " ▸ " moves the blinking number
4	▲	0 1 000	the key " ▲ " increases the blinking number
5	FS ↵	SP1	the number is memorised and the display returns to the chosen item

⚠ 10.0 NOTES

The instrument does not have a power on switch and a fuse, but it immediately switches on when the correct voltage is applied (see the operating voltage on the instrument label). Keep the power line separate from the signals lines.

For security reasons, it is necessary to provide externally a two phases switch and a protective fuse near the instrument with easy access for the user.

Avoid the presence of others power elements, humidity, acid, heat sources, etc..

Mect srl is not responsible for damages to humans or goods for an improper use of the instrument or not conforming to the characteristics of its instrument.

In mect srl there is an help desk office.