USER'S MANUAL
series MP20 101 M1

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ME2097_05
04/12

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1.0 GENERAL POINTS

The instrument of the MP20 series in the M1 type container (96mm depth) can be programmed with the following inputs: 4÷20mA, 0÷20mA, 0÷10V, thermocoupling J (Fe/Co) 0÷600°C, thermocoupling K (Cr/Al) 0÷1200°C, thermocoupling S (Pt/Pt-10%Rh) 0÷1710°C or thermoresistence (PT100r: –40,0÷200,0°C, PT100e: –40÷800°C). The main characteristics are as follows:

- two alarms with exchange relay output
- 18V not regulated for 2 or 3 wires transducer power supply
- 9999 point display
- possibility of programming delay time and hysteresis alarms using hidden menu which is password protected
- possibility of fixed zero setup
- temperature in °C or °F
- programmable analogue output in voltage (0-10V) or current output (0-20mA or 4-20mA)
- RS485 or RS232 serial outputs.
- programmable digital filter
- 40 step to linearize analogue inputs

1.1 TECHNICAL CHARACTERISTICS

Table 1

Visualizzazione	4 (9999) cifre
Stabilità termica	50 ppm/°C
Precisione ingressi DC :	< 0,5%
Precisione ingressi AC	2%
Ingressi utilizzati:	tc J, K,S; RTD Pt100
Input impedance	4÷20 mA imp. ing. 5 Ω 0÷10V imp. ing. 1MΩ Potentiometer input: ∞
Trasducer supply	18Vdc, 20mA
Potentiometer power supply	1,5Vdc
Potentiometer input	Potentiometer from 500Ω to 20KΩ
Cold junction compensation	Automatic
Alarm output	Relay contact 5 A / 250 Vac
Analogue output	0÷10V, 0÷20mA o 4÷20mA: 12 bit of risolution
Carico massimo per uscita in corrente:	300Ω
Carico minimo per uscita in tensione:	1K Ω

Power Supply	90÷260 Vac/Vdc, 20 ÷ 30 Vac/Vdc
Assorbimento	1,5 W
Temperatura max di funzionamento:	50 °C
Altezza cifre:	8 mm (rossi)
Dimension	48 x 48 x 96
Mounting Plate	44.5 mm (altezza) x 44.5 mm (largh.)
Peso	200 gr

1.1.1 DISPLAY SIGNALS

LO: reading less than -2000
HI: reading above 9999
Err: outside input scale or input circuit malfunctioning

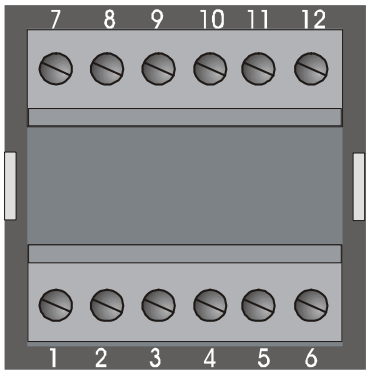
1.2 CONNECTION DESCRIPTIONS

KEYBOARD DESCRIPTION

Display : displayed input
Led ON: alarm 1 active indication (if required)
Led AL: alarm 2 active indication (if required)
Led =: “recovery tara” indication

Key Enter : access to the programming functions
Key Sp : alarm 1 setup
Key AL : alarm 2 setup
Key Exit : recovery tara / Exit from menu

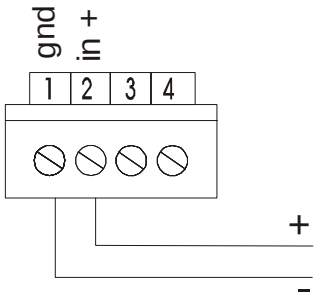
TERMINAL BOARD DESCRIPTION



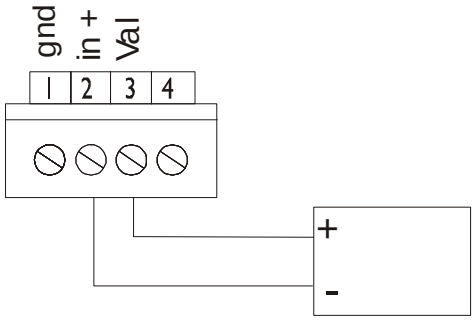
Terminals 1,2 and 3: inputs
Terminal 3: trasducer supply (see Terminal 3 configuration).
Terminals 7, 8: instrument power supply
Terminals 9, 10: NO contact of alarm relay 2
Terminals 11, 12: NO contact of alarm relay 1
Terminals 4,5 e 6: analogue output (option OAP: see related paragraph), or serial output connections (option serial: see related paragraph)

1.2.1 WIRING DIAGRAM FOR CURRENT INPUT

1) Connection for 2 wire transducer



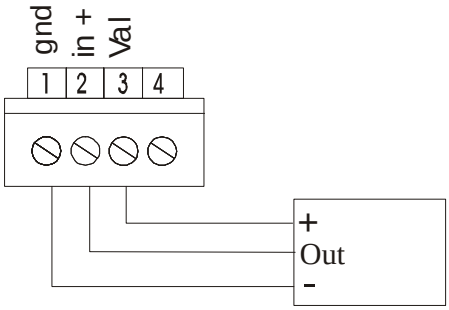
2) Connection for 2 wire transducer



Attention: for the supply voltage on terminal 3 see paragraph "Terminal 3 configuration".

1.2.2 WIRING DIAGRAM FOR VOLTAGE INPUT

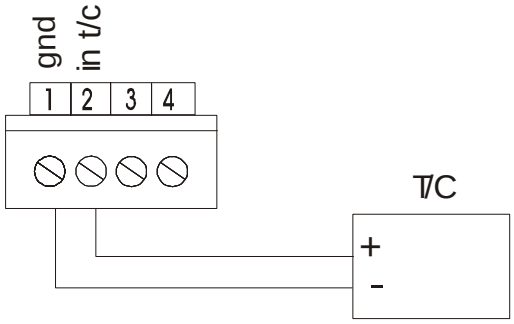
Connection for 3 wire transducer



Attention: for the supply voltage on terminal 3 see paragraph "terminal 3 configuration".

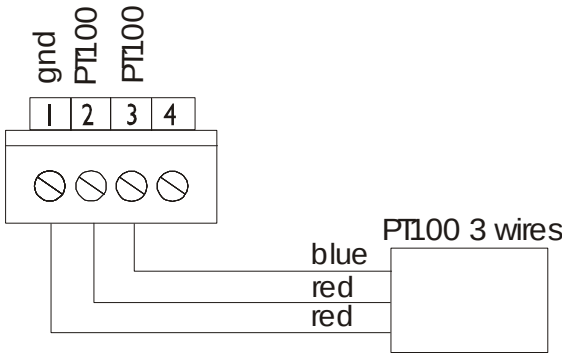
1.2.3 WIRING DIAGRAM FOR THERMOCOUPLING OR THERMORESISTANCE

Connection thermocoupling input

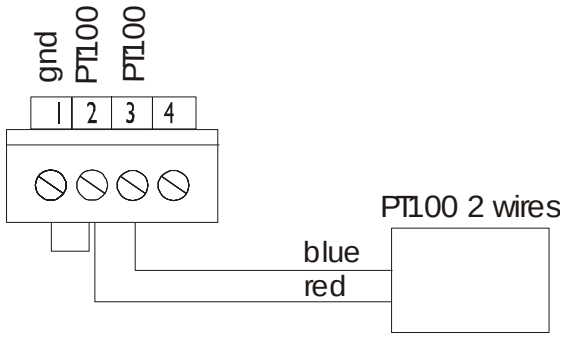


Thermocouplings must be isolated. For thermocoupling connection use only compensated wire for the type of thermocouple in use.
If shielded cable is used, connect the shield to ground at one end only.

Thermoresistance 3 wires



Thermoresistance 2 wires

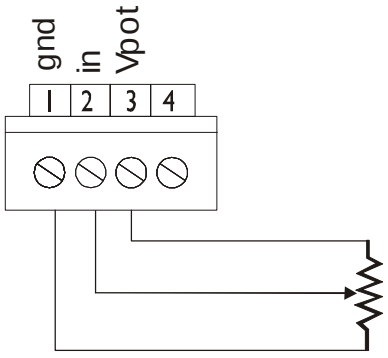


Attention: for connection with PT100 devices see paragraph “terminal 3 configuration”.

For thermoresistance connection pay attention to the line resistance: if too high there may be some errors in readout. Use the same kind of wire for the three connections. If shielded cable is used, connect the shield to ground at one end only.

1.2.4 WIRING DIAGRAM FOR POTENTIOMETER INPUT

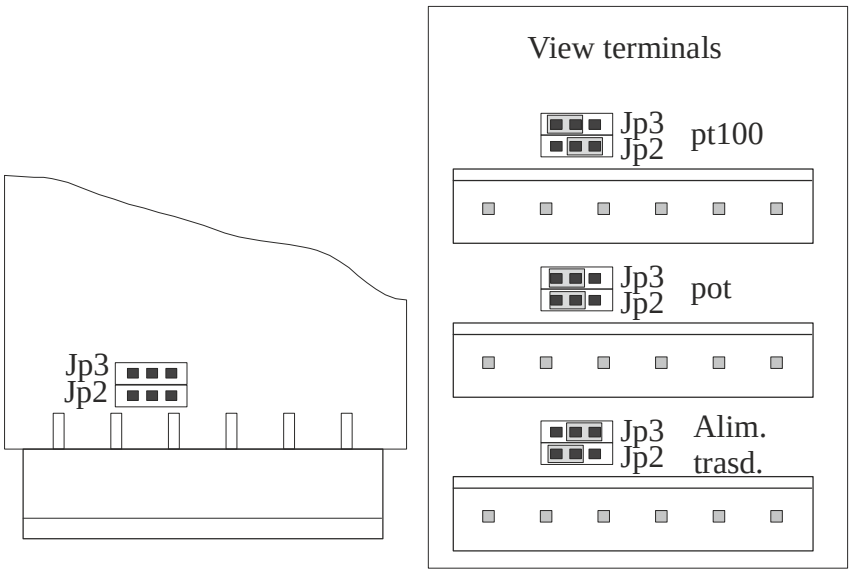
Potentiometer



Attention: for connection with the potentiometer see paragraph “terminal 3 configuration”.

1.3 TERMINAL 3 CONFIGURATION

Open the instrument and through the jumper JP2 and JP3 set the terminal 3 for a PT100 or potentiometer input or for a transducer power supply connection.



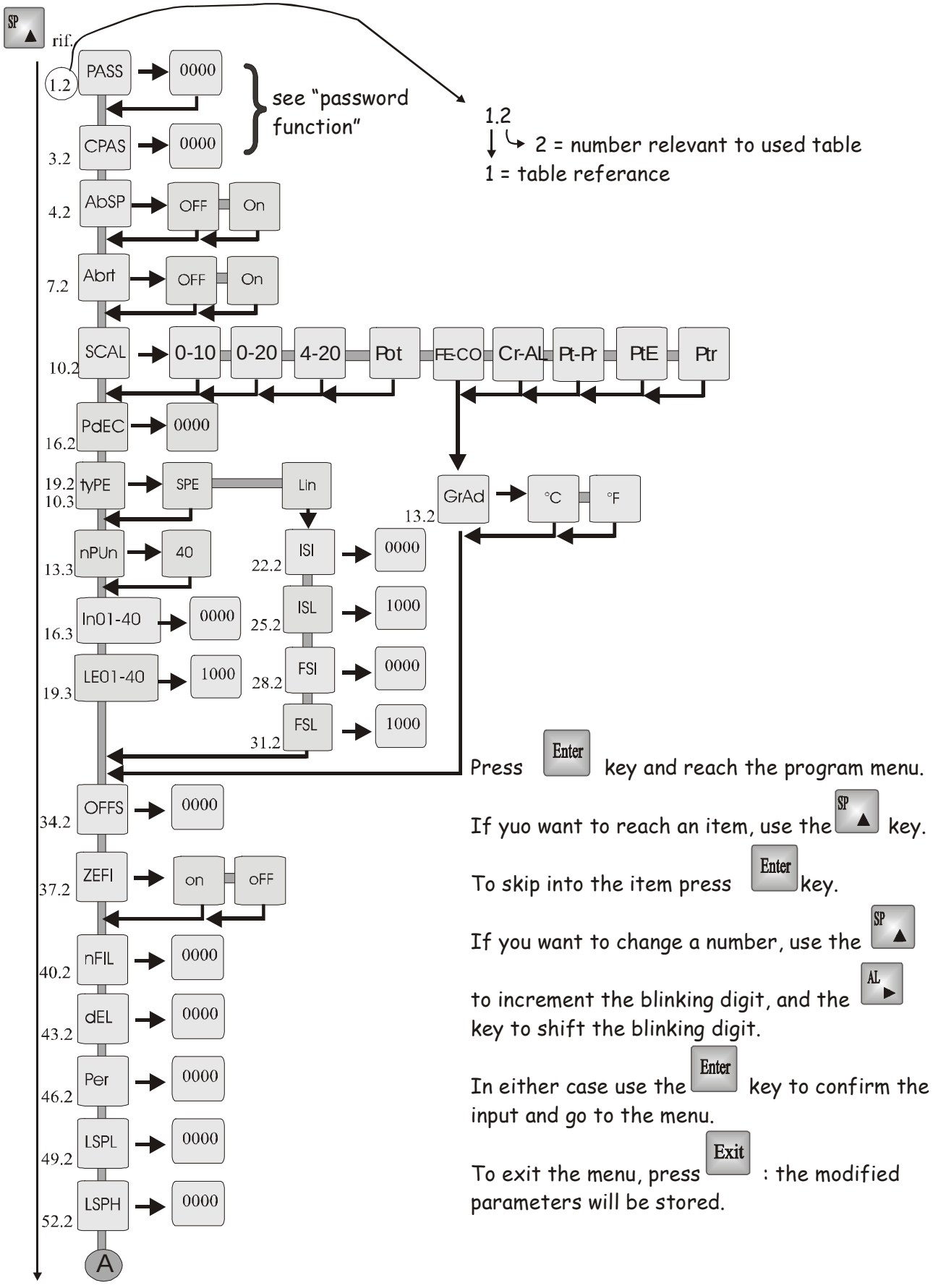
serial output CONNECTIONS

See dedicated paragraph

analogue output CONNECTIONS

See dedicated paragraph

1.4 PROGRAMMING TIPS



Press Enter key and reach the program menu.

If yuo want to reach an item, use the SP key.

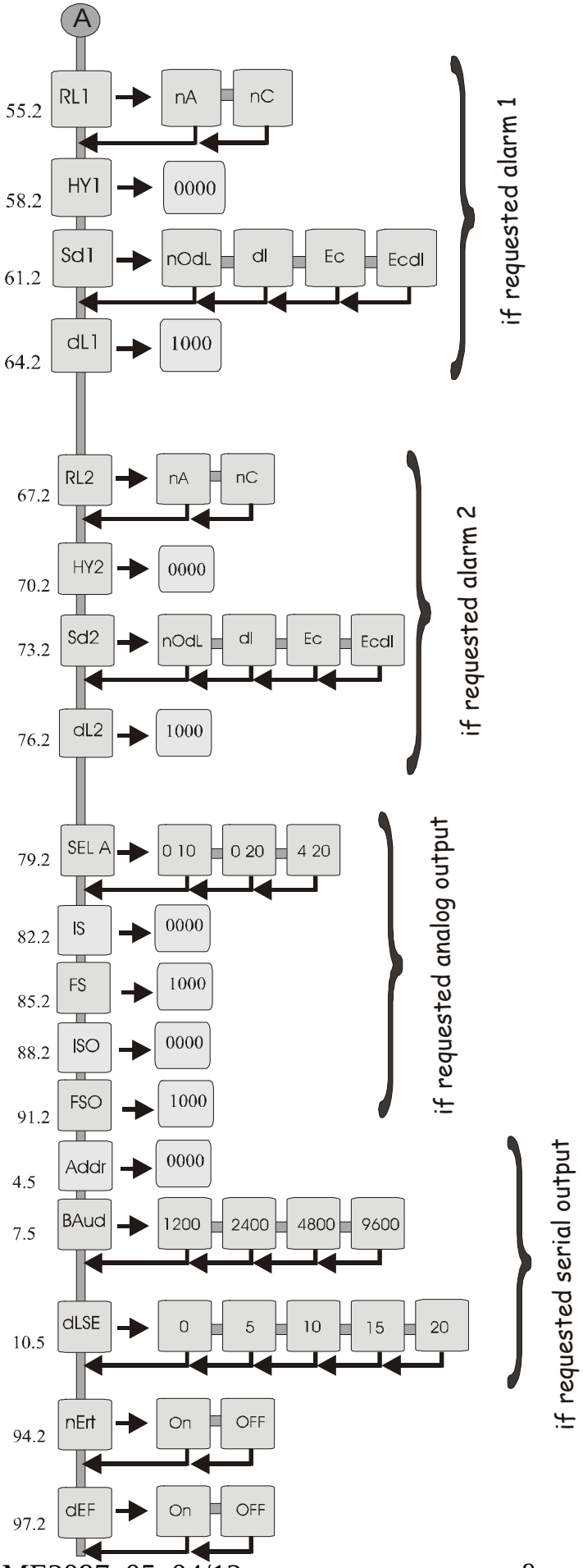
To skip into the item press Enter key.

If you want to change a number, use the SP

to increment the blinking digit, and the AL key to shift the blinking digit.

In either case use the Enter key to confirm the input and go to the menu.

To exit the menu, press Exit : the modified parameters will be stored.


A
55.2
RL1
nA
nC
58.2
HY1
0000
61.2
Sd1
nOdL
dI
Ec
EcdI
64.2
dL1
1000
if requested alarm 1
67.2
RL2
nA
nC
70.2
HY2
0000
73.2
Sd2
nOdL
dI
Ec
EcdI
76.2
dL2
1000
if requested alarm 2
79.2
SEL A
0 10
0 20
4 20
82.2
IS
0000
85.2
FS
1000
88.2
ISO
0000
91.2
FSO
1000
if requested analog output
4.5
Addr
0000
7.5
BAud
1200
2400
4800
9600
10.5
dLSE
0
5
10
15
20
94.2
nErt
On
OFF
97.2
dEF
On
OFF
if requested serial output

2.0 INSTALLATION NOTES

2.1 INSTALLATION PROCEDURE:

1- Execute the connections as indicated at 5, 6, 7 pages.
2- Switch on the instrument
3- Enter in the configuration menu and set the requested scale (see table 2). For voltage or current inputs program the calibration parameters, while for the potentiometer input follow the information in “potentiometer input set up”.
4- Use the 

key to set up alarm value 1 (if requested)
5- Use the 

key to set up alarm value 2 (if requested)
6- The instrument is now ready for use.
7- For automatic zeroing check the “recovery tara” function.
8- To install other input parameters or alarms see the “instrument setup” paragraph
9- To set up the analogue output (if required) see the “analogue output” paragraph.
10- To set up the serial output (if required) see the “serial output” paragraph.

2.2 POTENTIOMETER INPUT SET UP

2.2.1 THEORETICAL EXAMPLE

Check the feasibility of this calibration.
Let us assume that we have to link up a 10 revolution potentiometer and that we have to programme the following reading:
2.5 revolutions reading +100
8 revolutions reading +900
To calculate the data to be programmed in the instrument, it is necessary to take into account the following considerations. The potentiometer to be read is divided hypothetically into 2000 points, this number being aligned with the mechanical condition of the transducer on test. In our example:

$$\frac{\text{10 revolutions}}{\text{2000 points}} = \frac{\text{2.5 revolutions}}{\text{X points}} \; ; \; X = \frac{\text{2.5} * 2000}{10} = 500 \text{ (ISI)}$$

$$\frac{\text{10 revolutions}}{\text{2000 points}} = \frac{\text{8 revolutions}}{\text{X points}} \; ; \; X = \frac{8 * 2000}{10} = 1600 \text{ (FSI)}$$

This application should be programmed as follows:
ISI = 500
ISL = 100
FSI = 1600
FSL = 900

2.2.2 PRACTICAL EXAMPLE

In this example we consider an application for which it is not possible to make a precise calculation of the potentiometer variation, it therefore being necessary to use empirical methods. Let us suppose a linkup of the potentiometer with the instrument and to be able to assign two fixed points to the course of the transducer A and B. The system calibration requires the following data.
POINT A = 250
POINT B = 1500
Switch on the instrument with the calibration values set-up with these numbers:
ISI = 0000
ISL = 0000
FSI = 2000
FSL = 2000
OFFS = 0000
Position the potentiometer in line with point A and note the display reading (ISI), position the transducer in line with point B and note the display reading (FSI). After this operation it is necessary to proceed with the parameter programming by following the indications in this table:

ISI = value noted in coincidence with A	ISL = 250
FSI = value noted in coincidence with B	FSL = 1500

2.3 RECOVERY TARA FUNCTION

The "recovery tare" function is used when the displayed values must be reset. The “recovery tare” function is enabled only for 0-10V, 4-20mA and potentiometer inputs. Resetting the display is obtained by pressing Exit. This operation is indicated by the LED "=" that becomes ON on the front. The menu item "nert" allows the storage of the performed zeroing that will be used starting from the next instrument power up.

2.4 MACHINE OPERATION WITH FIXED ZERO

The instrument can be programmed to visualize the range -1990 ÷ 9990 with the units digit blocked at zero. To set up this function it is necessary to program the hidden menu item “ZEFI” to the ON state (see table 2).

2.5 INSTRUMENT SET UP

Pressing the Enter button to access the configuration menu of the instrument; the configuration menu is password protected. The available configurations are explained in the following table.

IMPORTANT

In order to program the instrument display parameters there are four codes:
ISI, ISL, FSI, and FSL. These menu items allow the setup of the co-ordinates which process the instrument readings. The first co-ordinate is formed by ISI and ISL values. ISI is the initial value of the input scale which coincides with that written in the instrument label (0 mA, 4 mA, 0 V, Etc..) while ISL is the corresponding instrument displayed value. The second coordinate is formed of FSI and FSL. FSI is the full scale input value which coincides with that written on the instrument label (20 mA, 100 mV, 10 V, etc..), while FSL is the corresponding instrument displayed value. After calibrating the instrument it is possible to correct any unbalances in the transducer by using the menu item “OFFS”.

Figure A

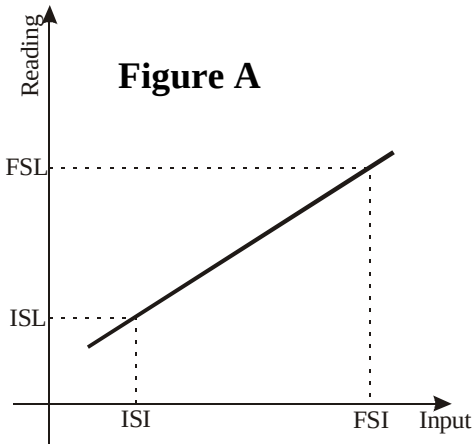


Table 2

N seq.	Touch key	Display value	NOTES
1	Enter	PASS	Touch “Enter” key
2	Enter	0 000	Digit the personal password. **(confirm with “Enter”)
3	▲	CPAS	CHANGE PASSWORD (if required see paragraph)
4	▲	AbSP	SET POINT IN USE
5	Enter	on	on = Set1 and Set2 keys in use off = Set1 and Set2 keys out of use To change use " ▲ " key and confirm with “Enter”
6		AbSP	
7	▲	Abrt	ENABLE RECOVERY TARA
8	Enter	on	on = "Exit" key enabled off = "Exit" key disabled To change use " ▲ " key and confirm with “Enter”
9		Abrt	

N seq.	Touch key	Display value	NOTES
10	▲	SCAL	SELECTION INPUT
11	Enter↵	0 10	0 10 = input 0÷10V 0 20 = input 0÷20mA 4 20 = input 4÷20mA Pot = potentiometer input FeCo = input thermocoupling Fe/CO, CrAL = input thermocoupling Cr/AL, PtPr = input thermocoupling Pt/Pt-Rh10%, PtE = input Pt100 -40÷800°C, Ptr = input Pt100 -40,0÷410,0°C. To change use "▲" key and confirm with "Enter".
12		SCAL	
13	▲	GrAd	SELECTION °C or °F (for temperature input)
14	Enter	°C	To change use "▲" key and confirm with "Enter"
15		GrAd	
16	▲	PdEC	DECIMAL POINT SETUP (for analogue input)
17	Enter	000.0	Touch the key "▲" to set the decimal point and confirm with "Enter"
18		PdEC	
19	▲	tyPE	SELECTION TYPE OF DISPLAY (for analogue inputs)
20	Enter	LIn	LIn = linear display with 4 setup parameters SPE = 40 step display (see paragraph) To change use "▲" key and confirm with "Enter"
21		tyPE	
22	▲	ISI	START INPUT SCALE (for analogue inputs)
23	Enter	0000	Insert the input value with which should represent the initial scale reading. **(confirm with "Enter")
24		ISI	
25	▲	ISL	START READING SCALE (for analogue inputs)
26	Enter↵	0000	Insert the reading value which coincides with the input value. **(confirm with "Enter")
27		ISL	
28	▲	FSI	END INPUT SCALE (for analogue inputs)
29	Enter	1999	Insert the input value with which should represent the END scale reading. **(confirm with "Enter")
30		FSI	

N seq.	Touch key	Display value	NOTES
31	▲	FSL	FULL SCALE READING (for analogue inputs)
32	Enter	1000	Insert the reading value which coincides with the input value. **(confirm with “Enter”)
33		FSL	
34	▲	OFFS	ZEROING
35	Enter	0000	Use this item to effect a zeroing that will be retained in memory. The number written can vary between -200 and 200. **(confirm with “Enter”)
36		OFFS	
37	▲	ZEFI	FIXED ZERO SELECTION (for analogue inputs)
38	Enter↵	on	OFF = standard display ON = fixed zero display. To change use the "▲" key and confirm with “Enter”
39		ZEFI	
40	Enter	n.FIL	AVERAGE NUMBER see paragraph “filter function”
41	Enter	128	Press "▲" until the display shows the number of averages required (0 = no filter). Confirm with "Enter".
42		n.FIL	
43	▲	dEL	DELTA FILTER see paragraph “filter function”
44	Enter	199	Set the number of digits within which you want to trigger the filter. **(confirm with "Enter")
45		dEL	
46	▲	PEr	STAY see paragraph “filter function”
47	Enter	1.99	Set number of stay (0.01 sec to 1.99 sec). **(confirm with "Enter")
48		PEr	
49	▲	LSPL	LOWER LIMIT SETPOINT
50	Enter	0000	Set the minimum alarm allowed value **(confirm with "Enter")
51		LSPL	
52	▲	LSPH	UPPER LIMIT SETPOINT
53	Enter	0000	Set the maximum alarm allowed value **(confirm with "Enter")
54		LSPH	
55	▲	rL1	EXCHANGE RELAY 1 SET UP (if required)

N seq.	Touch key	Display value	NOTES
56	Enter	nA	nA = normal open relay; nC = normal closed relay. To change use the " ▲ " key and confirm with “Enter”
57		rL1	
58	▲	HY1	HYSTERESIS ALARM 1 (if required)
59	Enter	200	Set up required hysteresis (see Fig.B) with a number between 0 and 200 digits. **(confirm with “Enter”)
60		HY1	
61	▲	Sd1	DELAY SELECTION RELAY 1 (if required)

62	Enter	no	no = no delay time;
			EC = switch on delay;
			di = switch off delay;
			ECdi = switch on + off delay
			To change use the " ▲ " key and confirm with “Enter”

63		Sd1	
64	▲	dL1	DELAY TIME ALARM 1 (if required)
65	Enter	20.0	Set up required delay with number which varies between 0 and 20.0 seconds. **(confirm with “Enter”)
66		dL1	
67	▲	rL2	EXCHANGE RELAY 2 SET UP (if required)
68	Enter	nA	nA = normal open relay; nC = normal closed relay. To change use the " ▲ " key and confirm with “Enter”
69		rL2	
70	▲	HY2	HYSTERESIS ALARM 2 (if required)
71	Enter	200	Set up required hysteresis (see Fig.B) with a number between 0 and 200 digits. **(confirm with “Enter”)
72		HY2	
73	▲	Sd2	DELAY SELECTION RELAY 1 (if required)

74	Enter	no	no = no delay time;
			EC = switch on delay;
			di = switch off delay;
			ECdi = switch on + off delay
			To change use the " ▲ " key and confirm with “Enter”

75		Sd2	
76	▲	dL2	DELAY TIME ALARM 2 (if required)

N seq.	Touch key	Display value	NOTES
77	Enter	20.0	Set up required delay with number which varies between 0 and 20.0 seconds. **(confirm with “Enter”)
78		dL2	
79	▲	SEL.A	ANALOGUE OUTPUT SCALE (if required)
80	Enter	4 20	4 20= analogue output 4÷20mA; 0 20= analogue output 0÷20mA; 0 10= analogue output 0÷10. To change use the "▲" key and confirm with “Enter”
81		SEL.A	
82	▲	IS	BEGINNING SCALE READING (analogue output)
83	Enter	0000	Write down the reading value where the analogue scale output begins (ISO). **(confirm with “Enter”)
84		IS	
85	▲	FS	END SCALE READING (ANALOGUE OUTPUT if required)
86	Enter	1000	Write down output value which coincides with analogue end scale value (FSO). **(confirm with “Enter”)
87		FS	
88	▲	ISO	BEGINNING SCALE READING (ANALOGUE OUTPUT if required)
89	Enter	00.00	Write down output value which coincides with “IS” value. **(confirm with “Enter”)
90		ISO	
91	▲	FSO	END SCALE READING (ANALOGUE OUTPUT if required)
92	Enter	10.00	Write down output value which coincides with FS value. **(confirm with “Enter”)
93		FSO	
94	▲	nErt	TARA STORAGE RECOVERY
95	Enter	on	On = stores the tare recovery value at power off OFF = Tara recovery value is lost at power off To change use the "▲" key and confirm with “Enter”
96		nErt	
97	▲	dEF	DEFAULT PARAMETERS (see paragraph)
98	Enter	on	On = default parameter setup; OFF = no defeult parameter set up. To change use "▲" key and confirm with “Enter”

N seq.	Touch key	Display value	NOTES
99		dEF	
100	▲	“measure”	

** To modify the preset number follow the procedure shown under the “SETUP” paragraph.

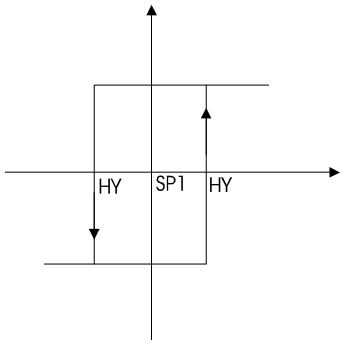


Figure B

2.6 DEFAULT PARAMETERS (dEF)

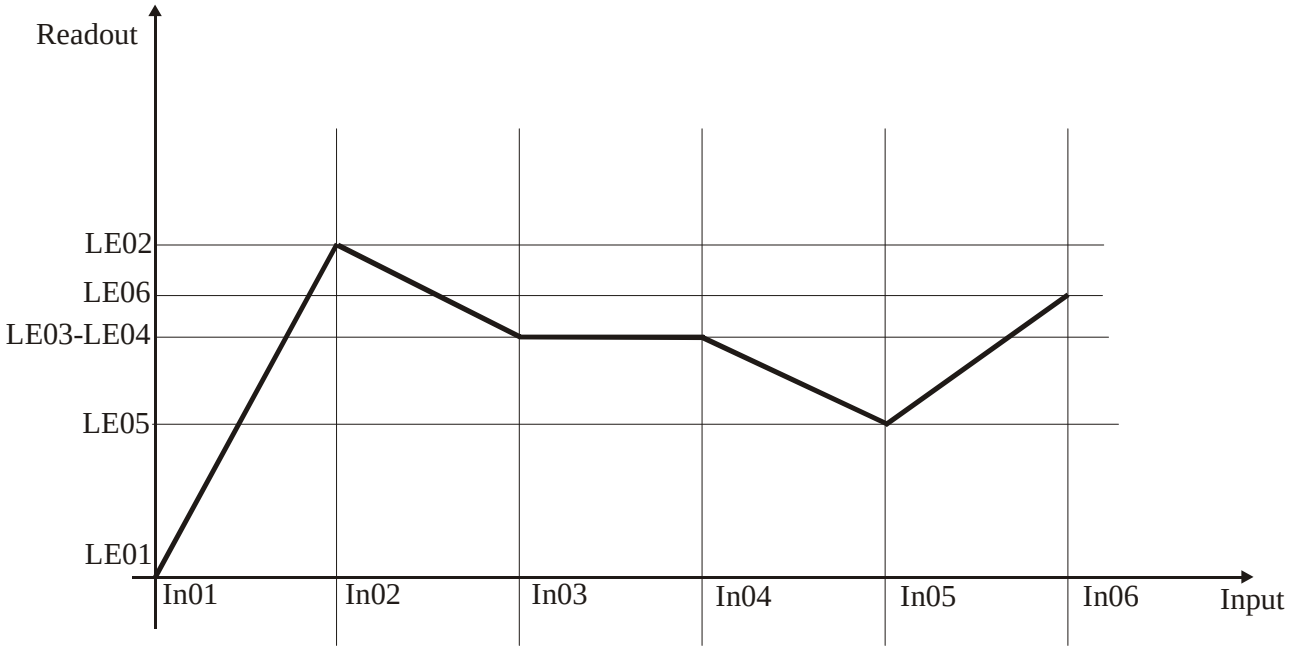
The instrument will signal erroneous setups with the “Err9” display. In order to retrieve the situation as quickly as possible it is advisable to put the “dEF” function into use, which resets all the functions to factory default standards by eliminating all error situations.

WARNING: Setting up this function eliminates all the current instrument programming.

2.7 40 STEP READOUT

The instrument can be programmed to show the readout in up to 40 linear steps with 0÷10V, 0÷20mA e 4÷20mA input. In the figure is shown, as example, a graph that shows a display with 6 steps with the following setup:

POINTS	INPUT	READOUT
Point 1	0mA(In01)	0(LE01)
Point 2	4mA(In02)	15000(LE02)
Point 3	8mA(In03)	11000(LE03)
Point 4	12mA(In04)	11000(LE04)
Point 5	16mA(In05)	7000(LE05)
Point 6	20mA(In06)	13000(LE06)



To obtain a STEP readout it is necessary to choose the “tYPE = SPE” item in the menu, program the desired number of points in the “nPUn” item in the menu (in this case 6) and program the input and readout values as desired.

IMPORTANT NOTICE

Input values (In01….In40) must be ascending in their values hence X value must be greater than X-: for example In03 is greater than In02 and so forth. The following table explains how to program the instrument. After setting the item “tyPE”= ”SPE” program the coordinates for the desired step lines following the instructions provided in the table below.

Table 3

N seq.	Key to press	Display value	NOTES
1	Enter	PASS	Touch “Enter” key for some seconds
2	Enter	0 000	Digit the personal password ** (confirm with “Enter”)
3	▲	CPAS	CHANGE PASSWORD (if required see paragraph)
4	▲	AbSP	SET POINT IN USE
5	▲	Abrt	ENABLE RECOVERY TARA
6	▲	SCAL	SELECTION INPUT
7	Enter	0 10	0 10 = input 0÷10V 0 20 = input 0÷20mA 4 20 = input 4÷20mA To change use "▲" key and confirm with “Enter”
8		SCAL	

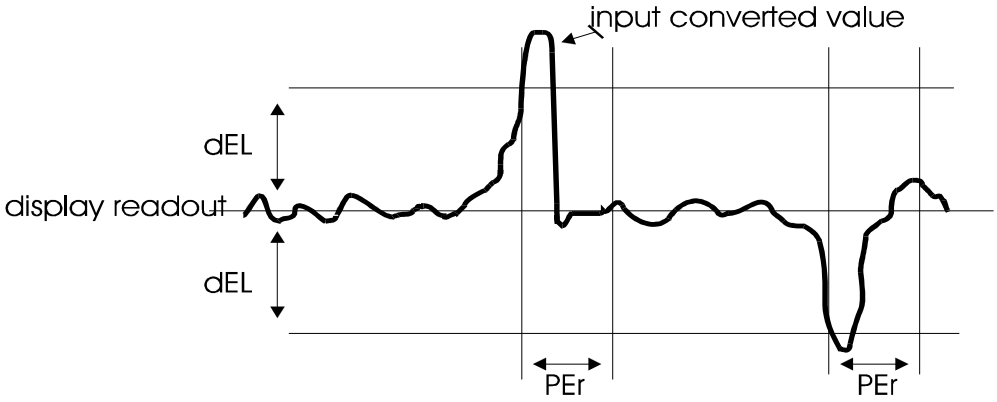
N seq.	Key to press	Display value	NOTES
9	▲	PdEC	DECIMAL POINT SETUP
10	▲	tyPE	DISPLAY SELECTION
11	Enter	SPE	LIn = linear display with 4 setup parameters SPE = 40 step display To change use " ▲ " key and confirm with “Enter”
12		tyPE	
13	▲	nPUn	NUMBER OF POINTS
14	Enter	40	Setup the desired number of points (at least 2). Confirm with “Enter”
15		nPUn	
16	▲	In01	FIRST INPUT POINT
17	Enter	04.000	Write the first point for the input (the the value must be in the scope for the chosen instrument configuration . **(confirm with “Enter”)
18		In01	
19	▲	LE01	FIRST DISPLAY POINT
20	Enter	00000	Write the desired display value with the input In01. **(confirm with “Enter”)
21		LE01	
22	▲	In02	Complete the others point in the same way .

** To modify the preset number follow the procedure shown under the “SETUP” paragraph.

3.0 “FILTER” FUNCTION

The MP20 M1 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 set 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.



4.0 ANALOGUE OUTPUT (OPTION)

The MP20 M1 instrument can be ordered with a voltmeter and ammeter analogue output (“OAP” options).

The flexibility of use and the comprehensive keyboard programming make this output an important interface between analogue computer input, recorders or repeaters with analogue input.

In particular the programming functions enable one to choose differing output (0÷10V, 0÷20mA, 4÷20mA) and the appropriate reading calibration. The maximum voltage that the instrument can use is 10V positive and is automatically limited in the programming phase. In addition the maximum current output generated is at most 20mA while in both cases their are no limits for furnishing intermediate values.

In order to set up the analogue output the user must install the two reading values (IS and FS) and the corresponding output values (ISO and FSO). It is necessary that for larger or smaller reading values to those programmed the analogue output values cannot exceed the values setup under the ISO and FSO programme values (output values).

For further clarification we would ask you to follow the examples shown in the paragraph 'Analogue output setup' . The analogue output instantly follows the display visualisation and is therefore blocked the moment in which the terminal board hold comes in and it takes account of the numbers zeroed using the “Recovery Tara” function .

4.1 TECHNICAL CHARACTERISTICS

Table 4

Analogue output	0÷10V - 0÷ 20mA - 4÷20mA
Maximum current output imp.	400 Ω
Minimum voltage output imp.	1KΩ
Maximum voltage supplied	10 V
Maximum current supplied	20mA
Resolution	12 bit

4.2 INSTALLATION OF ANALOGUE OUTPUT

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

1- Set up the connections as shown in Figure C for the ammeter output otherwise the connections shown in Figure D for the voltmeter output.

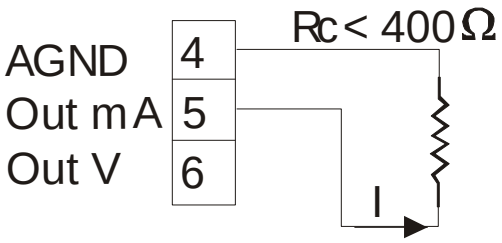


Figure C

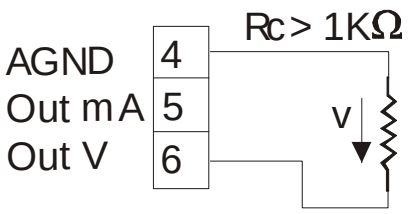


Figure D

2- Program the menu items related to the analogue output (see table 2) and follow, eventually, the examples explained in the paragraph 'Notes on analogue output setup'. To undertake this programming it is necessary to take account of the following:

ISO (beginning of output scale) is the value of the analogue output which coincides with the number programmed under the menu item 'IS'. Make sure to load under the 'IS' heading the display value which coincides with the initial value of the analogue output (ISO). The ISO programming item should be programmed on the basis of the output selected. As a consequence we can obtain:

- ISO = 00.00 V for voltmeter output
- ISO = 00.00 mA for the ammeter output (for 4-20mA output this item need not be programmed)

FSO (end scale output) is the value of analogue output which coincides with the number displayed under the menu item FS. Digit under the FS item the display value which should correspond with the final value of the analogue output (FSO). The menu item FSO should be programmed on the basis of the type of output required. As a consequence we are able to obtain:

- FSO = 10.00 V if voltmeter output
- FSO = 19.99 mA if ammeter output (for 4-20mA output the voice is not programmable).

4.3 NOTES ON ANALOGUE OUTPUT SET UPS

- Programme the instrument to function with the following calibrations:

DISPLAY: -500 AMMETER OUTPUT: 5mA
DISPLAY: 500 AMMETER OUTPUT: +15mA
The instrument parameters must be set out as follows.

SEL.A = 0 20
IS = -500
FS = 500
ISO = 5.00*
FSO =15.00*
*with the instrument readings below -500, the analogue output remains fixed at 5mA, while with the reading above 500 the analogue output remains fixed at 15mA.

- Programme the instrument to function with the following calibrations:

DISPLAY: -500 AMMETER OUTPUT: 4mA
DISPLAY: 500 AMMETER OUTPUT: 20mA
The instrument parameters must be set out as follows.
SEL.A = 4 20
IS = -500
FS = 500
ISO = not programmable*
FSO = not programmable*
*with the instrument readings below -500, the analogue output remains fixed at 4mA, while with the reading above 500 the analogue output remains fixed at 20mA.

- Programme the instrument to function with the following calibrations:

DISPLAY: -1000 VOLTMETER OUTPUT: 2V
DISPLAY: +1000 VOLTMETER OUTPUT: 6V
The instrument parameters must be set out as follows.
SEL.A = 0 10
IS = -500
FS = 500
ISO = 2.00*
FSO = 6.00*
* with the instrument readings below -500, the analogue output remains fixed at 2V, while with the reading above 500 the analogue output remains fixed at 6V.

5.0 SERIAL OUTPUT (OPTION)

MP20 M1 models can communicate with an host computer along a RS232, RS422 and RS485 serial. Program the menu items: BAUD-RATE to setup transfer speed, the address and the answer delay to avoid line conflicts (only for RS485 half duplex). To setup the instrument see the table:

Table 5

N seq.	Touch key	Display value	NOTES
1	Enter	PASS	Touch "Enter" keys for some seconds
2	Enter	0 000	Digit the personal Password ** (confirm with "Enter")
3	▲	CPAS	CHANGE PASSWORD (if required see paragraph)
	▲		Press "▲"until the next entry is available
4	▲	Addr	INSTRUMENT ADDRESS
5	Enter	0001	Input the instrument address with a number between 001 and 099. **(confirm with "Enter")
6		Addr	
7	▲	bAUd	BAUD RATE
8	Enter	9600	Press the "▲" key until appears the desired baud-rate (1200, 2400, 4800, 9600)** (confirm with "Enter").
9		bAUd	
10	▲	dLSE	SERIAL ANSWER DELAY SELECTION (SE HALF DUPLEX)
11	Enter	5	Press "▲" key until the desired delay time appears (0, 5, 10, 15, 20). Confirm with "Enter".
12		dLSE	
13	▲	"measure"	

Bi-directional serial output

By the serial output it is possible to read out and write all parameters of the instrument. It is possible to connect up to 31 instruments (with RS485). All messages are sent and received by the serial output by an ASCII protocol.

Table 6

SERIAL CHARACTERISTICS	
Baud rate	9600 4800 2400 1200 (programmable by the keyboard)
Start bit	1 bit
Length	8 bit
Stop	1 bit
Parity	No

The wiring diagram for the MP20 M1 model with RS232 is shown in fig. E while for model with RS422 or RS485 is shown in fig. F.
Programming instruments with the address code, the BAUD RATE and implement a program of interviews using the mnemonics described in the following pages.

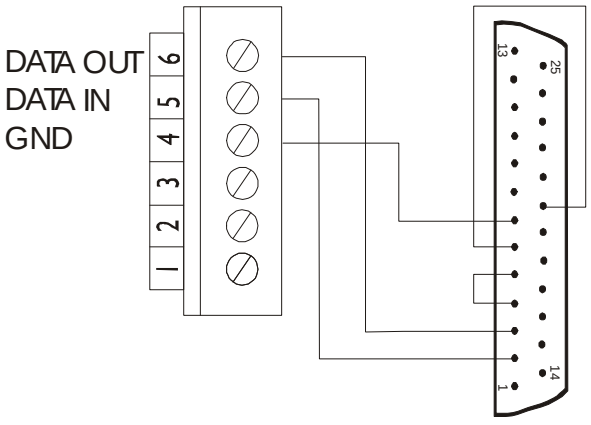


Figura E (RS232)

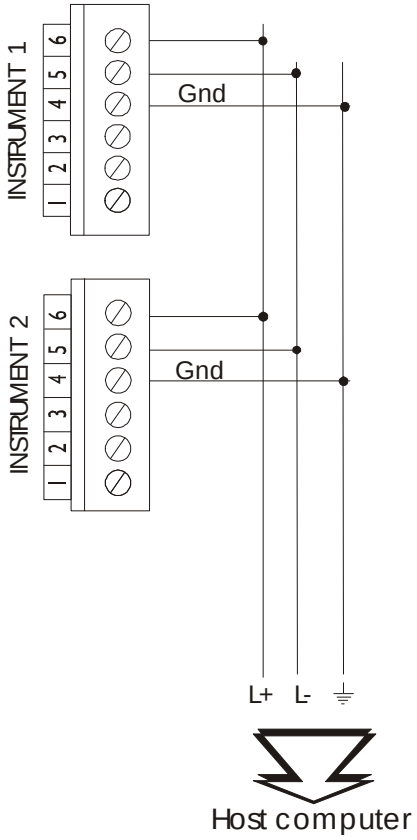


Figura F (RS485)

5.1 DATA READING FROM HOST TO INSTRUMENT MP20 M1

Transmission string set-up.

EOT GID GID UID UID C1 C2 ENQ

EOT = EOT from host indicates the start of transmission string
GID = decimal instrument address to transmit twice consecutively in ASCII code.
UID = units instrument address to transmit twice consecutively in ASCII code.
C1 C2 = mnemonic ASCII code for command to execute. (see paragraph "COMMAND CODES")

EXAMPLE: data transmission string from host to MP20 M1 with address "01" for request of "Reading scale end" (FL)

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

The instrument, from the moment in which it receives the first string code transmitted by the host, leaves 400 mSec. during which it waits for the end of the transmission operation. When the 400 mSec. operation finishes, or when the data reception is completed, the instrument, depending on the information received, can behave in the following four 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 completed, in this case the instrument transmits the data requested in ASCII format (see paragraph "DATA TRANSMISSION FROM MP20 M1 TO HOST").
4) When the complete message is not received before "timeout" (400 mSec), the instrument rejects the information received and it is ready to receive a new message.

5.2 DATA TRANSMISSION FROM MP20 M1 TO HOST

Transmission string configuration

STX C1 C2 D1 . . . . D6 ETX BCC

STX = start of text

C1 C2 = mnemonic code ASCII relative to command to execute (see paragraph "COMMAND CODES")
D1 ÷D6 = Numbers displayed, including negative sign, ">", decimal points (if it is present) and blank or zero for not significant digits (the transmitted digits must always be 6)

ATTENTION: the data must always be "supported" on the right 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	-	5	.	6
	20	20	2D	35	2E	36
2)	-	0	0	5	.	6
	2D	30	30	35	2E	36

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

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

EXAMPLE: data string from MP20 M1 to host in response to example above.

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

The MP20 M1 after having transmitted the string with the data requested from the host-computer waits the reply confirming the result of the transmission executed.

1) The host-computer replies in ASCII: NACK (not understood). The MP20 M1 transmits again the data string.
2) The host-computer does not reply. In this case the instrument waits the next EOT on the network to set up the next communication.
3) The host-computer replies in ASCII: ACK (understood). The instrument waits new commands

5.3 DATA WRITING FROM HOST TO MP20 M1

Set up of transmission string
EOT GID GID UID UID STX C1 C2 D1 . . . D6 ETX BCC

EOT = EOT from host indicates the start of transmission string
GID = decimal instrument address to transmit twice consecutively in ASCII code.

UID = units instrument address to transmit twice consecutively in ASCII code.
C1 C2 = mnemonic ASCII code for command to execute (see paragraph "COMMAND CODES")
D1 ÷ D6 = Digits displayed. The same rules are valid as those described in the paragraph " data transmission from MP20 M1 to host"
BCC = Checksum, obtained using EXCLUSIVE OR of the transmitted string excluding the code "STX" comprising "ETX" in the order indicated

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

EXAMPLE: string for writing data from host to MP20 M1 with "01". address.

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

The instrument, from the moment in which it receives the first code of the data string transmitted by the host, makes to start 400 mSec during which it waits for the transmission operation to be completed. When the 400 mSec. operation finishes, or when the data reception is completed, the instrument, depending on the information received, can be have 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 completed, in this case the instrument writes the information memorized and transmits the code ASCII=ACK (understood)
4) When the complete message is not received before "timeout" (400 mSec.), the instrument rejects the information received and is ready to receive a new message.

5.4 COMMAND CODES

The codes of the variables used for the MP20 M1 instrument programming, are listed into the following table. Not all the parameters allow the writing from host, in this case the instrument does not work and replies "NACK".

Table 7

COMMAND CODES	COMMAND DESCRIPTION	ALLOWED SET-UP	TYPE OF CODE
SC	SCAL (input selection)	read/write	hexadecimal 0 = Fe-Co 1 = Cr-Al 2 = PtPr 3 = PtE 4 = Ptr 5 = 0-10V 6 = 0-20mA 7 = 4-20mA 8 = POT
II	ISI	read/write	ASCII -1999÷9999
IL	ISL	read/write	ASCII -1999÷9999
FI	FSI	read/write	ASCII -1999÷9999
FL	FSL	read/write	ASCII -1999÷9999
OF	OFFS (display)	read/write	ASCII -1999÷9999
PT	P.dEC (decimal point)	read/write	hexadecimal 0 = no point 1 = 199.9 2 = 19.99 3 = 1.999
AT	SEL.A (analogue output scale)	read/write	hexadecimal 0 = E0.10 1 = C0.20 2 = C4.20
IU	IS (an.out)	read/write	ASCII -1999÷9999
FU	FS (an.out)	read/write	ASCII -1999÷9999
IO	ISO (an.out)	read/write	ASCII 19.99
FO	FSO (an.out)	read/write	ASCII 19.99
DS	DLSE	read/write	ASCII 0÷255
RT	Recovery tara	Only write	hexadecimal 0 = clear rec. tara 1 = set rec. tara
RO	read out (display)	Only read	

COMMAND CODES	COMMAND DESCRIPTION	ALLOWED SET-UP	TYPE OF CODE
SA	dEL (filter)	read/write	ASCII 9999
NM	NM (filter)	read/write	ASCII 7 0 = no filter 1 = 2 2 = 4 3 = 8 4 = 16 5 = 32 6 = 64 7 = 128
SW	Status word	read/write	See paragraph “Generic status word”
A1..A2*	SP1 (AL1÷AL2)	read/write	ASCII -1999÷9999
H1..H2*	HY (AL1÷AL2)	read/write	ASCII 0÷199
D1..D2*	delay(AL1÷AL2)	read/write	ASCII 0÷19.9
W1..W2*	alarm status word	read/write	hexadecimal 0÷F
AS **	step to be programmed or read	read/write	ASCII 1÷40
IX **	step input to be programmed or read	read/write	ASCII -1999÷9999
LY **	step readout to be programmed or read	read/write	ASCII -1999÷9999
NS **	maximum step number	read/write	ASCII 1÷40

* Code is formed by the letter and the number for the alarm to be programmed.

** See paragraph “programming step function through serial”.

5.5 TRASMISSION OF HEXADECIMAL VALUES

Some values must be transmitted in a 4 digit hexadecimal format. In this case the protocol string must be preceded by the ASCII character ">".

EXAMPLE: for decimal point = 199.9 the data will be: blank >0001

EXAMPLE OF READING DECIMAL POINT

HOST:

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

MP20 M1 INSTRUMENT:

STX	P	T	blank	>	0	0	0	1	ETX	BCC
02	50	54	20	3E	30	30	30	31	03	18

EXAMPLE OF WRITING DECIMAL POINT

HOST:

EOT	0	0	1	1	STX	P	T	blank	>	0	0	0	1	ETX	BCC
04	30	30	31	31	02	50	54	20	3E	30	30	30	31	03	18

MP20 M1 instrument:

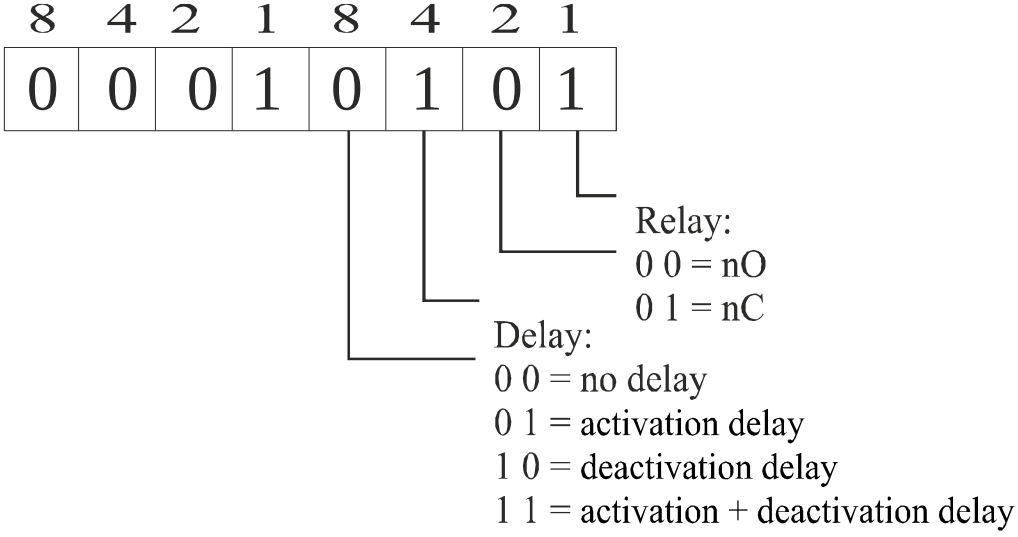
ACK
06

5.6 ALARM SETTING

MP20 M1 series instruments can have up to 2 alarms with delay time and hysteresis. The relevant codes are:

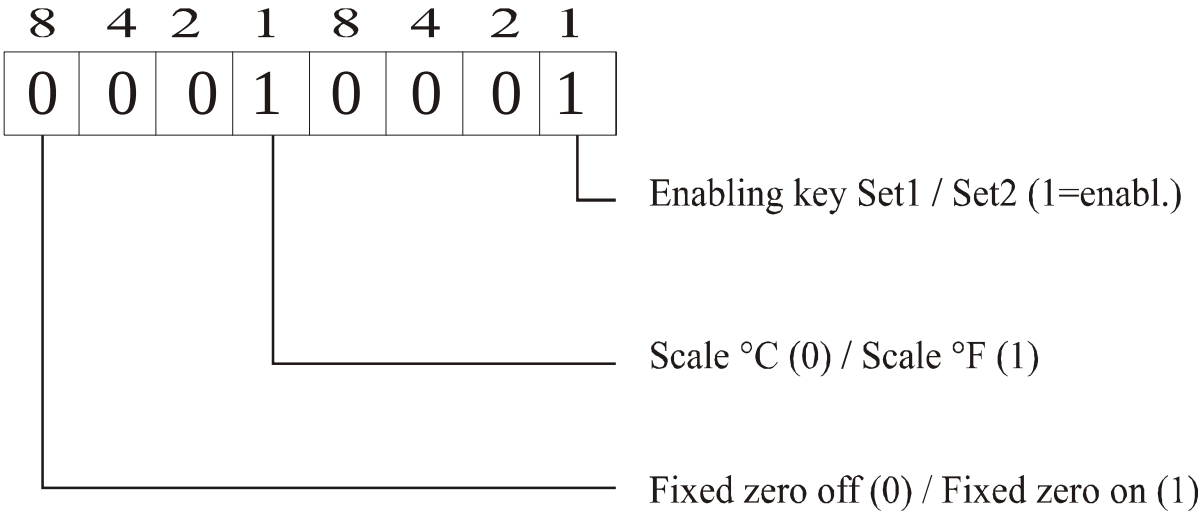
A reading/writing of SP1
H reading/writing of hysteresis
D reading/writing of delay time
W reading/writing of the status word of the alarm

The code is followed by a number between 1 and 3 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 (normaly open or close) 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.



5.7 GENERIC STATUS WORD (SW)

The status word “SW” allows to enable the front keys by serial, to enable the fixed zero and selection temperature read out (°C or °F). To make the hexadecimal data to transmit, follow the next scheme.



5.8 PROGRAMMING STEP FUNCTION THROUGH SERIAL

Write in the “AS” code (step to be programmed or read) the number of the step to be programmed or read and in the “IX” code (step input to be programmed or read) the input value for the required step (for example 1.00). Write in code “LY” (step readout to be programmed or read) the readout value for the required step (for example 500). Use the same procedure for all steps to be programmed or read. Write in “NS” (maximum step number) the maximum step number to be programmed.

5.9 AN EXAMPLE IN BASIC LANGUAGE

Here you can see an example of a program in Basic to read the readout of the instrument with a serial line. Program the instrument with address = 01, baud rate = 9600.

```
on error goto 20
cls
open “com1: 9600, n, 8, 1” for random as #1
print #1, chr$(4) + “0” + “0” + “1” + “1” + “R” + “O” + chr$(5)
print “waiting for answer …”
cls
a$ = input$(11, #1)
b$ = mid $(a$, 4, 7)
print
print “readout: “;b$
end
20 print “nothing received”
resume
```

6.0 PASSWORD FUNCTION

The user should save the programmed information from misuse by using the password function.
The instrument comes supplied with a password code =0, but any number between 0 and 9999 can be set up as an access code in order to modify the instrument functioning (for programming personal password number check with the following table).
The use of the password code is requested each time the user wishes to gain access to the programming functions. The instrument, after having obtained the password number then behaves in two different ways.
1) **correct N.Pass** The user can use the programming menu in order to modify a function or number.
2) **incorrect Pass** The user can gain access to the programming menu only in order to check the numbers and functions already programmed, but never to modify them.

WARNING. The number programmed under the c.PAS menu item by the user must be reinserted under the PASS heading each time that the programming menu is used for insertion of the variables. If the user does not remember the exact secret code, then it is necessary to call our service centre.

Table 8

N seq.	**Touch key**	**Display value**	**NOTE**
1	Enter	PASS	Touch Enet
2	Enter	0 000	Touch “Enter”key
3	▲	C.PAS	** (confirm with “Enter”)
4	Enter	0 000	PERSONAL PASSWORD NUMBER
5		C.PAS	Enter Password Number between 0 and 9999 . ** (confirm with “Enter”)
6	▲	“measure”	

** To modify the preset number follow the procedure shown under the “SETUP” paragraph.

7.0 SET UP

The following paragraph shows the steps necessary for programming the various menu items. The example that follows is related to programming under the “CPAS” menu item, but the procedure is valid for all the menu items that need a numerical setup.

Table 9

N seq.	Touch Key	Display value	NOTE
1		CPAS	Example of password change
2	Enter	0 000	The display appears as a flashing number
3	▸	0 0 00	Pressure on the ▸ key moves the flashing number right
4	▲	0 1 00	Pressure on the ▲ key increases the flashing number
5	Enter	CPAS	The number is memorized and the display returns to selected menu item

8.0 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..
The instruments must be powered by safety isolating transformer or by selv type power supply.

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.