AEP transducers

200

MP2 *Plus*

PROFESSIONAL INDICATOR
1 or 2 channels for measurements of

✓ *Force*	✓ *Weight*	✓ *Pressure*
✓ *Torque*	✓ *Displacement*	✓ *Temperature*

Smart

Alta Affidabilità
High Reliability

CALIBRAZIONI DIGITALI
DIGITAL CALIBRATIONS

ACCURATEZZA
≤ ± 0.01%
ACCURACY

Stabilità a lungo termine
Long term high stability

USER GUIDE

MO.MP2Plus.549.R2.ENG

INDEX

AEP transducers *holds the right to make any change when necessary, without notice.*

The data contained in this manual are just indicative and the manufacturer declines any responsibility for errors or discrepancies with respect to this manual.

1. DECLARATION OF CONFORMITY

Manufacter: **AEP transducers s.r.l**
Address: **Via Bottego 33/A 41126 Cognento MODENA (Italia)**

DECLARES THAT THE FOLLOWING PRODUCT

Product Name: **MP2** *Plus*
Type: **PROFESSIONAL INDICATOR**
Year of Construction: **2014**

Options: this declaration covers all the options specified in the manual.

CONFORMS TO THE FOLLOWING DIRECTIVES:
2014/30/CE - 2006/95/CE - 2011/96/UE - 2002/96/CE (RAEE)

CONFORMS TO THE FOLLOWING NORMS:
EN 61010-1(2013)   EN 61326-1 (2013)

CONFORMS TO THE REGULATION
n° 1907/2006 (REACH)

The product has been tested in the typical installation configuration, as described in the instruction manual. Above described product meets the requirements of mentioned Norms, basing on both test results and considerations listed in the technical file.

I declare that the product defined above meets the requirements of the Directives, of the Norms and Regulation above mentioned.

41126 Cognento Modena (Italy)   Date: 20/09/2014

Lioi Giovanni

2. IDENTIFICATION
On the rear panel of the instrument are marked in indelible mode all the informations for the identification, the main configuration data, the symbols of conformity and waste disposal, the production date and the serial number.

3. UNAUTHORIZED USES

Environments with explosive atmosphere.
Environments with inflammable or corrosive gas.

4. DISPOSAL

The instrument is a professional apparatus compliant to the Directives 2002/95/CE (RoHS) and 2002/96/CE (WEEE), then it must be disposed separately as electric and electronic waste.
In different countries of European Community, it must be disposed as waste electric and electronic in accord to the laws of the country where the device is commercialized.
Before to remove the instrument, you disconnect first the power supply and after the cables.

5. INTRODUCTION

MP2Plus is an instrument with 1 or 2 (option) analog inputs (defined in this manual as channels), individually programmable; each input is able to receive signals from strain gauge (standard version) full-bridge (4 or 6 wires) or transducers with amplified output voltage (+/- 10V or +/- 5V), current (4- 20mA or 0-20mA) or PT100.

It is suitable for the measurement of forces, weight and pressure, displacement and temperature (PT100). It is realized to be used in systems of static and dynamic measurement in an industrial environment where it is necessary to acquire more independent transducers simultaneously and in a synchronized manner.

The instrument, in its basic version has, for each channel, an accuracy of 0.010% due to an 24bit internal resolution. The K version (optional) instead reaches an accuracy of 0.005%.

In the case of strain gauge inputs each channel has a standard resolution of $\pm$100.000 divisions ($\pm$300.000 divisions for the optional K version). **MP2Plus** can use load cells or dynamometers of 350 / 700Ω with 4-wire or 6 wires connection.

Load cells power supply is realized using a switching voltage at a frequency equal to the sampling rate. This ensures a better suppression of interference due to offset drift and to the connecting cables.

In the case of voltage input $\pm$10V or $\pm$5V **MP2Plus** has a resolution of 0.1mV respectively and 0.05 mV ($\pm$100000divisions) while in the case of current input 0-20mA or 4-20mA has a resolution of 0.1 uA (respectively 200000divisions and 160000divisions).

To measure the temperature one input can be dedicated to sensors PT100 in a range from -50 ° C to 250 ° C with a resolution of 0.1 ° C and accuracy +/- 1 ° C.

Each channel has a dedicated converter Sigma-Delta type 24bit and all conversions take place at the same time (channel synchronization).

The sampling frequency (common to all channels) can be set from 2.5 samples per second up to 4800 samples per second therefore the instrument meets the needs of applications that require a considerable speed of response.

The instrument is equipped with 4 digital inputs and 4 relay 24Vdc (5th relay as option) with contact DPDT to realize simple automations.

The instrument can be equipped of one or two analog outputs (optional). Each input channel may be associated with one or more analog voltage ouput (± 10V, 0 / 5V, 0 / 10V, ± 5V) or current (4-20mA, 0-20mA, 0-24mA).

MP2Plus allows you to enable/disable the display of each individual channels. In this way suits the needs of use in different situation of use.

MP2Plus can be optionally equipped with a powerful datalogger that can be either internal (in an internal nonvolatile memory, which allows to exploit the maximum speed of acquisition), that external using a conventional USB stick. The files created can be directly exported to Microsoft Excel being in csv format.

Data communication can take place simultaneously and concurrently through USB ports, RS232 and RS485.

In this last case the communication protocol used is the MODBUS RTU.

MP2Plus main features are:
- Large size and high resolution graphic display.
- 1 or 2 external connections to transducers: 2mV/V, +/-10V, +/-5V, 4-20mA, 0-20mA, PT100
- Selection of a large number of measurement units for each of the connected channels.
- **Data Logger** with internal non-volatile memory that can store up to 130,000 measurement points when configured with a single channel (Option)
- **External Data Logger** that uses a usual USB stick for easy portability of data on a PC (Option)
- **ZERO** Function
- **HOLD** Function
- **PEAK** Function
- **UNLOAD** Function to measure the quantity of material unloaded from a tank
- **TOTAL** Function**:** to performs the cumulative sum of channels
- **AUTOZERO** Function**:** to clear a channel output if is below for a certain time under a programmed threhold
- **Key Block :** in order to avoid changes to the settings by unauthorized persons
- **Clock Calendar** Function with date and time (Option)
- 24 colums printer **(Option)** connected to the RS232 serial port through which it is possible to print the measurement points and the data of the company which carried out the survey.
- **USB communication port** through which you can transfer measurements in real time to a PC.
- **RS232** Serial communication port (Option)
- **RS485** communication port with MODBUS protocol (Option)
- **4 24Vdc digital inputs** with programmable function

- **5 programmable SetPoint** (each with an associated LED on the front panel)
- **4 relay outputs** (5th relay as option) with programmable functions with DPDT contacts
- **Up to 2 analogue outputs** (option): 0-20mA - 4-20mA - 0-24mA, +/- 10Vdc, 0-10Vdc, 0-5Vdc, +/- 5VDC. The refresh rate of the analog signals is equal to the frequency of acquisition of the respective channels in input.
- **Wireless Transmission (Options)**
- **REPEATER** Function: The instrument can be configured to display (in the form passive as Slave) measures from the RS232 serial port (for example from another **MP2Plus** - Master) to a remote view of the measures. In this case all the features enabled on the **MP2Plus** Slave will be active (Setpoint, USB, printer, logger etc). The **REPEATER** function is active for one channel.

MP2Plus can be accompanied by the PC program **MP Supervisor** (Option) which allows immediate interface via the USB port with the instrument and allows you to display graphs, export to Microsoft Excel.
The program also allows you to download the data logger performed using the internal memory and those on performed on USB stick and view their acquisition curves.

6. AVAILABLE FITTINGS

μKAL   KAL   CLF   C8S   CLB   TCETM
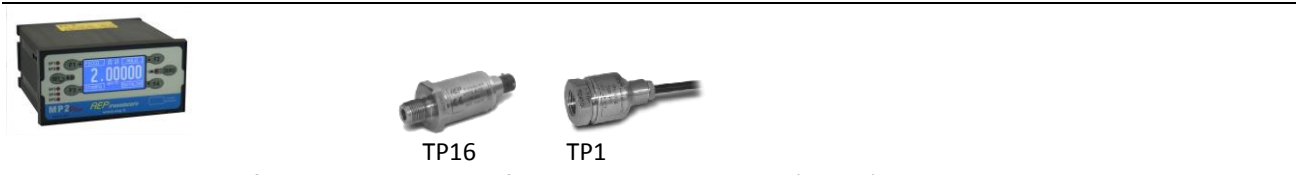
System for the measurement of **FORCE (**compression and tension) combined with force transducers with ranges from 10N to 5000kN.

CLT   CLS   C2S   F1

System for the measurement of **WEIGHT** in compression and tension matched to the load cells with ranges from 1kg to 500t.

TP16   TP1

System for the measurement of **PRESSURE** and **VACUUM** (Empty) combined with pressure transducers. Normalized ranges from 5 bar to 2000bar (29000psi) for use in gas and liquid.

TRX   TRS   μTOR   RT2

System for the measurement of **TORQUE** clockwise and counterclockwise combined with torque transducers static or dynamic. Normalized ranges from 0.5 Nm to 5000 Nm, ability to record high-speed continuous **PEAKS** up to 4.8kHz.

LDT

System for the measurement of **DISPLACEMENT** transducers coupled with transducers with normalized ranges from 5 to 100 mm.

7. COMPONENTS SUPPLIED

Mounting Brackets   DB9 Male Connector   CD with
                            for transducer   Manual and USB Driver

8. OPTIONAL COMPONENTS (purchased separately)

USB Cable   RS232 cable   Destkop Printer (24 column)

Male Connector for Transducers   Calibration Report   ACCREDIA Report
DB 9 poli   in mV/V   System (MP2Plus + Transducers)

9. SOFTWARE APPLICATION (purchased separately)

To complete the system of measurement **AEP transducers** has developed several software applications that interface directly to the instrument **MP2***Plus* and support the user in the various functions of calibration, testing, analysis, data storage, transfer of measures on Microsoft Excel etc. ...

MP Supervisor is a software dedicated to **MP2***Plus* . Through this software you can download the data logger and operate directly on **MP2***Plus* to change parameters and create graphics test.
Quick Analyzer is a general purpose acquisition software where **MP2***Plus* can be associated to other **AEP instruments** .

For more information download the manuals of the software on the site:

www.aeptransducers.com
www.aep.it

QuickAnalyzer

Dedicated to recording and graphical analysis of up to 16 different **AEP transducers** instruments to measure: force, weight, pressure, torque and displacement.
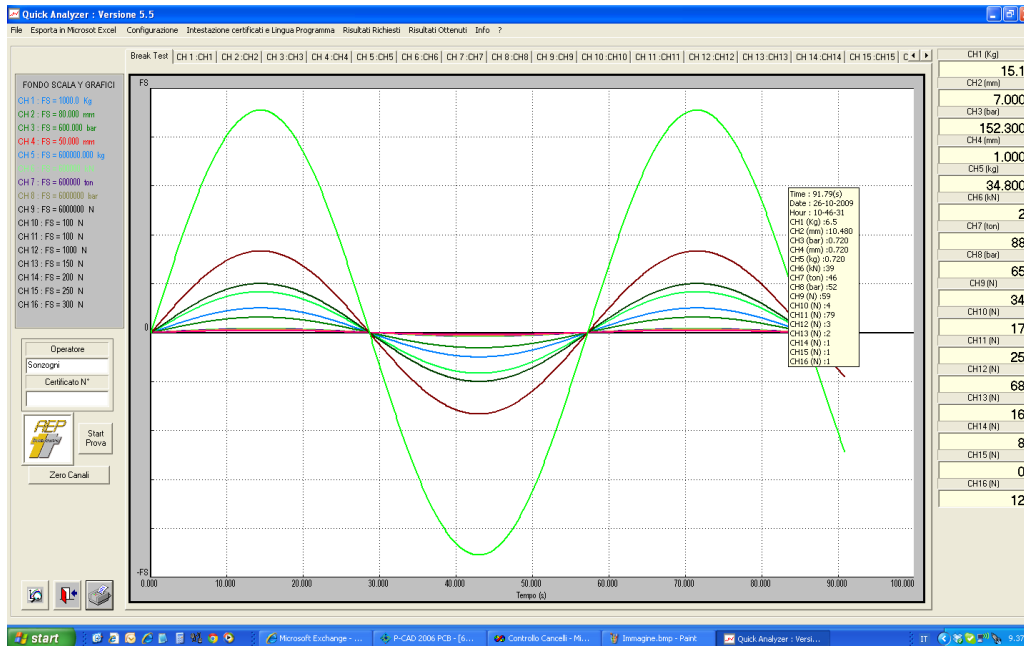
MPSupervisor

A dedicated program that allows an immediate interfacing through the USB port with the **MP2Plus** and allows you to view graphs, export data to Microsoft Excel directly from the PC and set all configuration parameters.
The program also allows you to download a Data Logger carried out using the internal memory or the USB Flash Memory and display the respective curves of acquisition.
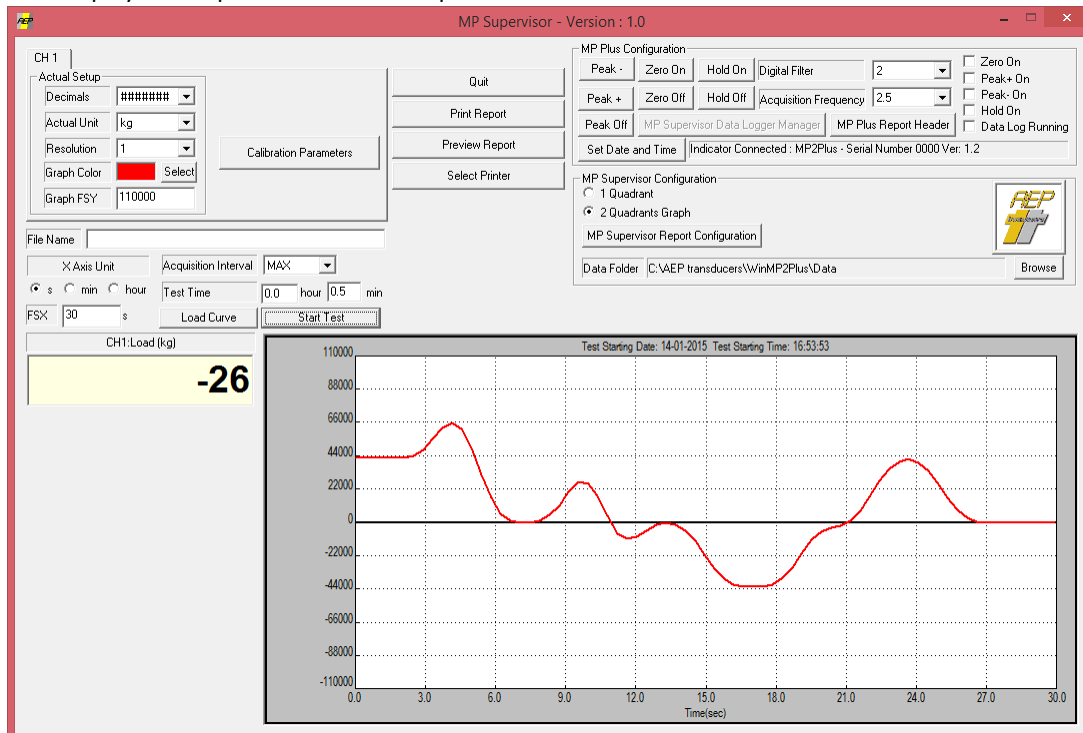
10. TECHNICAL DATA

ACCURACY	≤± 0.010%
NON LINEARITY ERROR	≤± 0.010%
K VERSION	
ACCURACY	≤± 0.005%
NON LINEARITY ERROR	≤± 0.005%
STANDARD RANGE FOR STRAIN GAUGES TRANSDUCERS	±2mV/V
STRAIN GAUGES RESOLUTION AT ±2mV/V	±100.000 div (±300.000 K version)
RESOLUTION FOR +/-10V AND +/-5V TRANSDUCERS	0.1mV e 0.05mV (±100000 div)
RESOLUTION FOR 4-20mA AND 0-20mA transducers	0.1 µA (resp. 160000 div and 200000div)
TEMPERATURE RESOLUTION : PT100 2 WIRES (range -50°C – 250°C)	±0.1°C accuracy: ±1°C
INTERNAL RESOLUTION (ALL CHANNELS)	24bit
MAX NUMBER OF STRAIN GAUGE TRANSDUCERS CONNECTABLE	Each channel: 2 @350Ω or 4 @700Ω
AMPLIFIED TRANSDUCERS (+/-10V or 4-20mA) CONNECTABLE	1 o 2
STRAIN GAUGE POWER SUPPLY	5V switching (±3%)
AMPLIFIED TRANSDUCERS POWER SUPPLY	20Vdc
ACQUISTION FREQUENCY (Programmable) (samples per second) (for all channels)	2.5–5–10–20–50-100-200-400–600-1200–2400-4800
INTERNAL DATALOG	
• MAX STORING POINTS	2 channels +Total: 43000 2 Channels: 65000 1 Channel:130000
• MAX STORING SPEED Note: The maximum storage speed is however limited by the acquisition frequency set	3 Channels: 2400 point per second 1 o 2 Channels: 4800 point per second
• MAX TIME	100 days
EXTERNAL USB Flash Memory (Option)	
• MAX STORING POINTS	• See chapter 26
• MAX STORING SPEED	• See Chapter 26
• MAX TIME	100 days
ZERO FUNCTION	100% (all measurement range)
PEAK FUNCTION	POSITIVE AND NEGATIVE PEAK
UNLOAD FUNCTION	YES
KEY BLOCK FUNCTION	YES
TOTAL FUNCTION	YES
AUTOZERO FUNCTION	YES
PROGRAMMABLE RESOLUTION	1 – 2 - 5 – 10 – 20 – 50 - 100
PROGRAMMABLE DIGITAL FILTER	0 … 5
POINT POSITION	Programmable from 0 to 5
SETPOINT	5
24V DIGITAL INPUT	4
RELAYS OUTPUT (DPDT form)	4 (5° Relays as option)
• Max voltage	220Vdc – 250Vac
• Max current	2A
• Max power	60W – 62.5VA
RS232 INTERFACE (OPTION)	MAX Cable Length 13m
RS485 INTERFACE (OPTION)	MAX Cable Length 1000m
USB port type B for data communication	MAX Cable Length 3.5m
USB port type A for external flash memory (on front panel)	
NOMINAL WORKING TEMPERATURE	0... +50°C
MAX WORKING TEMPERATURE	0... +50°C
STORAGE TEMPERATURE	-20... +70°C
TEMPERATURE EFFECTS on the measurements 10°C	
a) on zero	≤±0.005%
b) on full scale	≤±0.005%

POWER SUPPLY	230 Vac +/-10%
	115 Vac (Option)
	24Vdc (Option)
FREQUENCY	50/60 Hz
EXTERNAL PROTECTION FUSE	250mA / 250 V
MAX. POWER REQUIRED	10VA
PROTECTION CLASS (EN 60529)	IP40 (only frontal panel)
DEGREE OF ENVIRONMENTAL CONT.	1
DIMENSIONS (HxLxD) mm	72x144x153mm
WEIGHT	circa 0.8 kg

CONTAINER	TYPE
CASE	NORYL UL94 V-O
REAR AND FRONT PANEL	UL94 V-2

OPTIONS

1 or 2 Input Channels	2mV/V +/-10V, +/-5V , 4-20mA, 0-20mA, PT100
K Version	Resolution ±300000 divisions at 2mV/V
Analog Output • Current Output: • Voltage Output: max 20mA – RL min: 1kΩ Note : The refresh rate of the analog signals is equal to the frequency of acquisition of the respective channels in input.	Da 1 a 2 0-20mA 4-20mA 0-24mA 0-5V 0-10V +/-10V +/-5V
Serial Communication	RS485 with protocol MODBUS and RS232
Wireless Transmission of the measures	Frequency : 433MHz
MP Supervisor communication Software	
Internal Datalogger with clock Calendar	On Internal non volatile memory
Internal Datalogger with clock Calendar USB type A connector for Flash memories	
24 columns serial printer	

11. PURCHASE CODES

	Version	Inputs	Power	Analog Outputs	Serial Outputs	Relays Output	Data logger
MP2P	**X**	**X**	**XXX**	**XX**	**X**	**XX**	**X**
	K Version ±300.000	**2** 2 channels	**230** 230 Vac	**A1** 1° Output	**S** RS232, RS458 Modbus, Printer	**R5** 5 Relay	**D** Datalogger Clock Calendar
			115 115Vac	**A2** 2° Output	**W** Wireless Transmission		**F** Datalogger Clock Calendar USB Flash Memory
			24 24Vdc				

Example: MP2P230 (MP2Plus – power supply230Vac – base version)
Example: MP2P224A2S (MP2Plus 2 Channels – power supply 24Vdc + 2 analog outputs + Serial output)
Example: MP2P2115SF (MP2Plus 2 Channels – power supply 115Vac + Serial output + DATALOGGER+ USB Flash Memory)
ALWAYS SPECIFY in the puchase order how to configure the input channels:
Example: CH1 = 4-20mA   CH2 = 2mV/V   CH1 = 10V   CH2 = PT100

12. DIMENSIONS AND MOUNTING INSTRUCTIONS
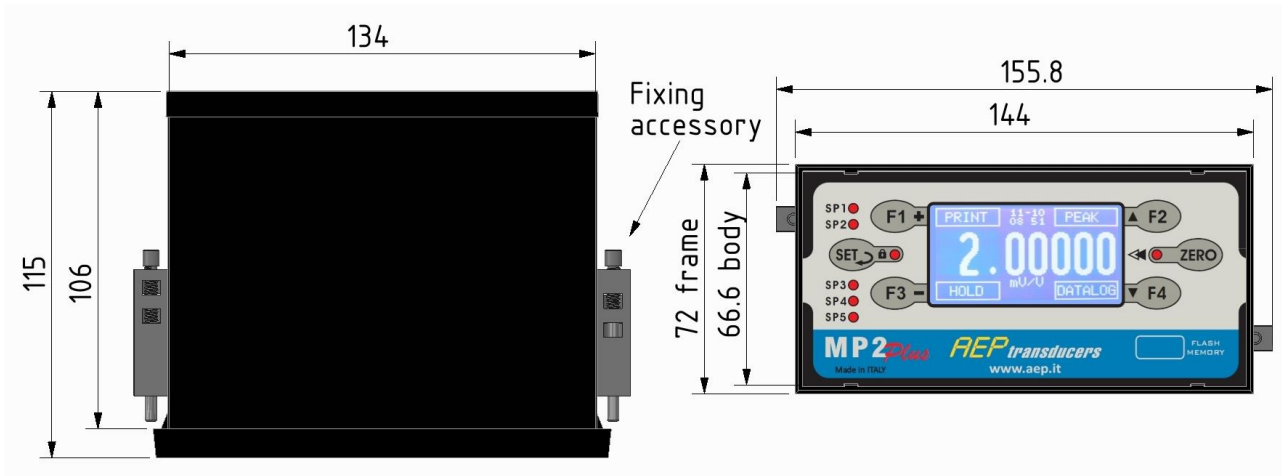
HOLES for Panel Mounting
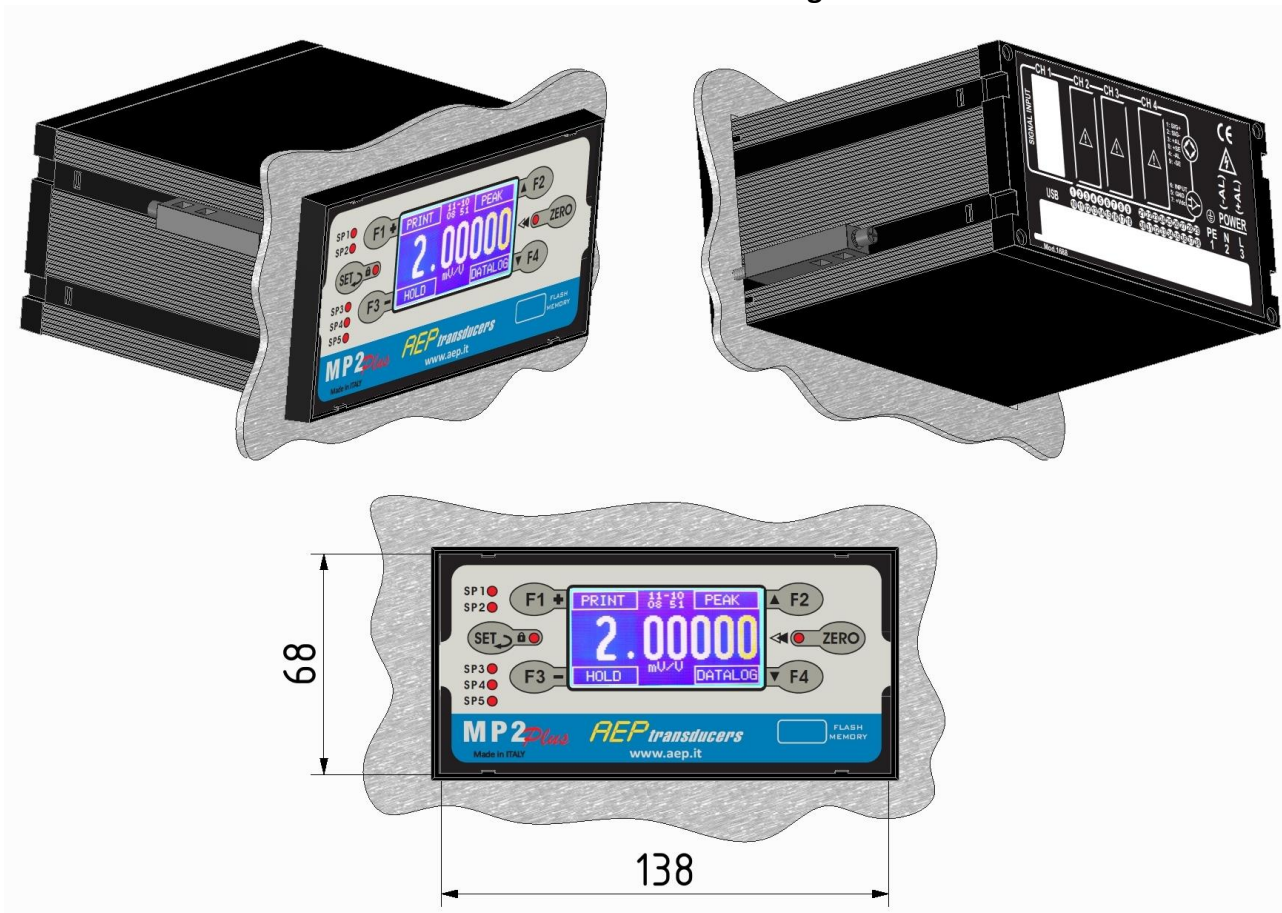
MOUNTING INSTRUCTIONS

Drill a hole in the panel (Panel cutout 68x138mm).

Insert the tool into the hole, apply the supplied accessories for mounting, screw until the instrument is stable.

13. TRANSPORTATION

⚠️ The instrument is made by electronic parts.
In the case of transportation please pack the instrument with care.
Beware of strong shocks and moisture

14. POSITIONING

The instrument is designed for built-in purposes. It shall be housed in a well ligthed position and protected by atmospherics agents.

15. INSTALLATION

This indicator has been produced in accordance with the standards for electromagnetic compatibility according to **Directive 2014/30 / EC**.
To ensure that they are respected you must perform the electrical connections as described by the safety standards and as indicated in this manual. For a correct and rapid installation to proceed in the following way:

1. Connect the transducers to the instrument
2. Verify the correct supply voltage stated on the rear panel between 230Vac, 115Vac, 24Vdc.
   Supply the instrument with a wrong voltage can lead to its rupture.
3. Switch on the instrument.

The installation should be performed by trained personnel only.

16. MAINTENANCE

The instrument does not require periodic maintenance; in case of malfunctions contact the supplier.
Occasionally clean the front panel with a nonabrasive cloth of non-corrosive substances.
When the date and time indicated there is no longer correct, replace the internal battery (see cap.34).

17. POWER ON and OFF

Connect the instrument as described in the **Power Connection Chapter**.

⚠️ **WARNING**: For this operation, observe the safety rules

Give power to the instrument.
At power on the instrument displays the **AEP transducers** logo, the model of the instrument, the software version installed and a set of information specifying the installed options.

Cx : x=Number of channels Installed (x = 1 - 2)

Dx : x=1 : The DataLogger Function is installed
     x=0 : The DataLogger Function is not installed

Tx : x=1: The Wireless Transmission option is installed
      x=0 : The Wireless Transmission option is not installed

Sx : x =1 : The Serial Communication Option is installed
      x=0 : The serial Communication Option is not installed

Ax : x = Number of analog output (x = 0 - 1 - 2)

Ox : x=number of relays output (4 or 5)

Ix   : x=1: the function digital input is installed
       x=0: the function digital input is not installed

This page is shown for 6 seconds, then **MP2**_Plus_ is ready to shown the measures in the main page.
If you press any button this page remains blocked so you can take note of this setting.
To continue press any button again or wait about 30s.

⚠️ **WARNING**: Power on must be done by trained personnel.

18. POWER OFF
Remove the power supply

19. DISPLAY and FUNCTION KEYS

The display of data and messages, is made through back-lit graphic LCD display (resolution 128x64 dots) on the front panel of the instrument.
MP2_Plus_ has six function keys: 2 of these, **SET** e **ZERO**, have a dedicated function while the other 4, **F1-F2-F3-F4**, have a programmable function.

SET:
  ➢   In the main page provides access to the **MENU** parameters
  ➢   Inside a **MENU** page its functions is **CONFIRM** and **QUIT**. So it returns to the **MENU**

ZERO:
  ➢   In the main page allows to set to 0 the shown values (**ZERO Function**)
  ➢   Inside some **MENU** Pages (if some value must be modified) it allows to set the moltiplicative factor to speed up the data setting

F1-F2-F3-F4
In the main page the **F1**, **F2**, **F3**, **F4** function is shown in the dedicated row.

Inside the MENU pages they assume the following meaning

F1: assume the **+** function: it increments the value of the parameter in editing

F2: assume the function ⬆ . It moves to the previous parameter

F3: assume the **-** function: it decrements the value of the parameter in editing

F4: assume the function ⬇ . It moves to the next parameter

When a key is pressed the instruments beeps.

Press **SET** to enter in the programming **MENU** and set the various parameters.
The various menu items can be scrolled with the cursor keys ⬆ and ⬇.
You confirms a selection with the **SET** button.
It is possible return to the main page by selecting **MENU-> QUIT** or using the short-cut key **F1+ or F3 -**

How to Modify Numeric Values

To modify a numeric value please use the Keys **+/-.**

F1 +   F3 –

The **+** key increments its value while the – key decrements its value.

If you keep the keys + /- pressed the value increments/decrements fast.

The increment/decrement step is choosen by using the **FATT** value.

The **FATT** value is modified using the **ZERO key** and its actual value is always shown in the last row.
(see picture below)**.**

◀◀ ● ZERO

The value of **FATT** is initialized to the minimum value of the parameter in edit (according to the decimal point position with which it is set).
When you press the button **ZERO** the multiplication factor increases by a factor of 10 until it reaches its maximum value. Then it resets again to the minimum value.

```
SETUP                    23/03/14
                         11:56:47
P1:   200.00  kN     0.400000 mV/V
P2:   400.00  kN     0.800000 mV/V
P3:   600.00  kN     1.200000 mV/V
P4:   800.00  kN     1.600000 mV/V
P5:  1000.00  kN     2.000000 mV/V

   ZERO KEY: FATT =         0.01
```

20. MAIN PAGE

The main page is the operative page of the instrument **MP2***Plus*.
It can assume different onfiguration according to the number of connected channels and to the channels enabled.

⚠️   **Note** : The Date and Time are present only if the DATALOG option is installed

DATALOG	15-04 08:17	PEAK
12.3467		
kg		
HOLD	CH2	UNLOAD

In case of just 1 channel enable (or when the ZOOM mode is active) the main page appears as the picture aside.
The measure is shown enlarged for a better visibility.

DATALOG	15-04 08:17	UNLOAD
CH1 :	152.60	kg
CH2 :	153.72	kg
TOT :	305.32	kg

In the case of 2 channels are enabled and the funtion TOTAL is enable enabled the page looks like in the figure.

If you do not assign any function to a function key it is not displayed and the button is disabled. In this case the function keys F3 and F4 have been disabled.

DATALOG	15-04 08:17	PEAK
CH1 :	152.60	kg
CH2 :	153.72	kg
HOLD		UNLOAD

The picture aside shows how the main page appears with 2 channels enabled.

It can be seen as the character with which measurements are showing adapts automatically to make more evident the measures.

With the **ZERO** key it is possible to set or reset **ZERO function**.
When the **ZERO** function is active the dedcated LED near the button is on.
To remove the **ZERO** keep the key pressed for 4-5 seconds.
The **ZERO** led will be turned off when the ZERO is removed.
Using the **F1 – F2 - F3 e F4** keys it is possible to perform different functions. The active function for each key is selected inside the page : **Main Menu ➡ Configuration.**

When the funtion is active its description will be shown in REVERSE
Each key each can assume one of the following function
         PRINT – PEAK – DATALOG – HOLD – TX DATA – UNLOAD – ZOOM - OFF.
When you select the function as **OFF,** the key is disabled. It has no function and nothing is displayed.

From the **MAIN PAGE** it is possible to go to the MAIN MENU using the key **SET**.
It is not possible enter in the MAIN MENU when:

- A **DATALOG** cycle is active .
- An **USB** ⚡ - **RS232 – RS485 (MODBUS)** communication is active.

21. ERROR MESSAGES

The instrument handles different types of error reported in the following way:

DATALOG	15-04 08:17	PEAK
CH1 :	-ERROR-	kg
CH2 :	153.72	kg
TOT :	OVERLOAD	kg
PRINT		UNLOAD

The indication **-ERROR-** indicates that the instrument can not display the measure. Possible causes:
- A problem of connection of the load cell.
- The channel calibration is not correct.
- It is selected a 6-wire connection instead uses 4 wires.
- The measure in the current unit of measurement has an excessive number of significant digits excessive and can not represent

In the event that the measure is higher than the range of the transducer the value is displayed in **REVERSE** to make clear that you are creating an anomalous situation. When the measure becomes greater than **135%** compared to the full scale of the transducer is given the indication of **OVERLOAD** to signal the situation of danger.

⚠ **ATTENTION**: we are in the presence of a risk to the safety of people, things and the transducer that could break irreparably. Bring to zero (UNLOAD) immediately transducer.

⚠ **CAUTION:** If the transducer has suffered an overload could be altered its metrological characteristics. It is therefore advisable Metrological Confirmation" or a new setting to make sure that the transducer still complies with its original metrological characteristics.

IT IS RECOMMENDED that the operator records the natural zero of the transducer (in mV/V switching off the ZERO function) in order to check possible high changes after an overload.
If the variation is important the transducer is permanently deformed.
In this case it is necessary to substitute the transducer

22. ZERO FUNCTION

The **ZERO** function is activated with the dedicated key **ZERO** (or remotely through a digital input) and is used to set to zero the display of a channel.
The function acts on the entire field of measurement (100%).
The status of the function is stored permanently.

When the function is activated, the corresponding LED is illuminated. Each press of the button performs a new **ZERO**.
To remove the **ZERO**, hold the key for 4-5 seconds. The **ZERO** LED turns off when accepted the command.

Each channel can be enabled / disabled to perform the function of **ZERO** (in the page **MENU-> Channels ENABLE**).
The disabling to perform the **ZERO** can be linked to the nature of the transducer connected (eg. Temperature transducer or absolute pressure) or to application needs.

In **PEAK** mode pressing **ZERO** resets the maximum registers and prepare the instrument for a new measure of **PEAK**.

When the **ZOOM** function is active the **ZERO** is performed only on the displayed channel.

23.PEAK FUNCTION

The **PEAK** function is used to display the maximum (PEAK +) or minimum (PEAK-) of a dynamic measurement.

For example, in applications where it needs to register the torque generated by a torque wrench after shooting, or the maximum force generated by a body in free fall, or to record the pressure peaks generated by a hydraulic intensifier or a hydraulic pump unit, to measure the maximum displacement and minimum of a body subjected to vibrations etc ...

MP2Plus allows to select the function PEAK+ o PEAK-.

See the picture to verify how the PEAK+ (POSITIVE) and PEAK+- (NEGATIVE) works.

The **PEAK** function is enabled when at least one of the Function keys **F1 – F2 - F3** or **F4** is associated to the function PEAK (see **MAIN MENU->CONFIGURATION**) or remotely through a digital input.
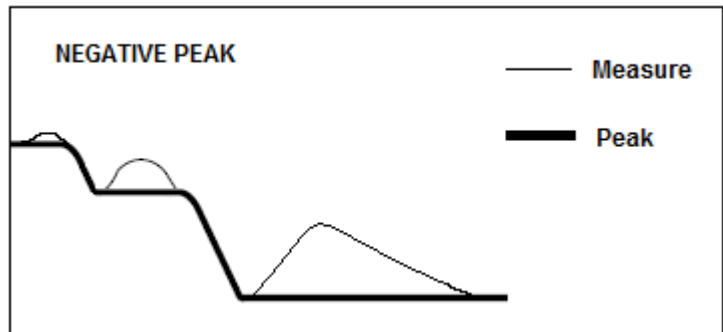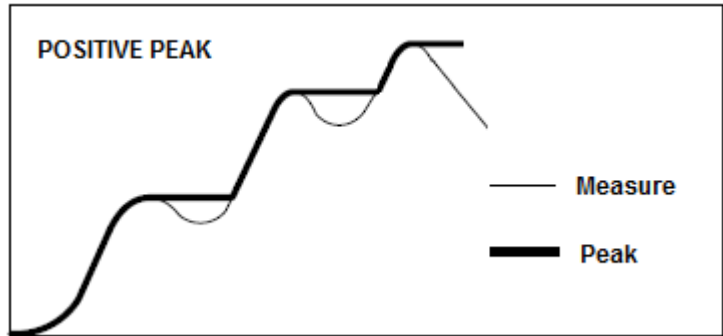
The function is not permanently stored. If you enter in the **MAIN MENU** or when you turn off the intsrument the function is disabled.

The way in which the function **PEAK** is displayed depends on the number of enabled channels.

If only one channel is enabled, when the function is activated, the display shown the **MIN** and **MAX** and the value of the **ACTUAL** value measured by the transducer in real time.

In the case of two channels enabled, the peak function displays the **ACTUAL** value, the **MAX** value in the case of **PEAK +** or the value of **MIN** if **PEAK-**.

In all other cases, you receive:
- The ACTUAL value in the case of PEAK OFF
- The MAX value in the case of PEAK +
- The MIN value in the case of PEAK -

When the **PEAK** function is active the message PEAK will be displayed in **REVERSE**

PEAK values can be reset using the **ZERO key.**

DATALOG	15-04 08:17	PEAK+
	CH1 : 152.60 kg CH2 : 153.72 kg	
HOLD		UNLOAD

24. HOLD FUNCTION

The **HOLD** function freezes the display of the instrument at the time the button is pressed.
The **HOLD** function is enabled by associating this function to one of the function keys **F1 - F2 - F3 or F4** (see **MAIN MENU ➡ Configuration**).
Entering the main menu or by switching the instrument off the instrument the function is automatically disabled.
In **PEAK** mode the **HOLD** function only locks the display of the current value. The values of **MIN** and **MAX** are always updated.
The activation of the function is displayed on the LCD display of the instrument with the message **HOLD** in reverse.
It is possible to activate the **HOLD** also by a external Digital Input (see dedicated chapter) when properly programmed.

DATALOG	15-04 08:17	PEAK
CH1 :	152.60	kg
CH2 :	153.72	kg
CH3 :	153.00	kg
CH4 :	154.36	kg
TOT :	613.68	kg
HOLD		UNLOAD

⚠ **CAUTION:** When the function is activated the indication is locked, so if the measurement changes may present danger to the safety of persons, property or breaking transducer associated to a channel overload.

25. UNLOAD FUNCTION

The function **UNLOAD** allows to determine the amount of material that is downloaded for example from a tank.
The **UNLOAD** function is enabled by associating this function to one of the function keys **F1 - F2 - F3 or F4** (see **MAIN MENU ➡ Configuration**).

It is possible to activate the **UNLOAD** also by a external Digital Input (see dedicated chapter) when properly programmed.
The activation of the function is displayed on the LCD display of the instrument with the message **UNLOAD** in reverse.
When activated, the display it resets the measurements and shows the loads unloaded.
When this function is selected, you can activate one or more relay outputs to achieve a small automation.
When completed the operation **UNLOAD** press the function key for its deactivation.

DATALOG	15-04 08:17	PEAK
CH1 :	152.60	kg
CH2 :	153.72	kg
CH3 :	153.00	kg
CH4 :	154.36	kg
TOT :	613.68	kg
HOLD		UNLOAD

26. DATA LOGGER Function (Option)

To set **DATA LOGGER** parameters refere to the chapter **MAIN MENU** ➡ **DATALOGGER MENU** ➡ **Data Logger Parameters**.

The **DATALOG** function is enabled by associating this function to one of the function keys **F1 - F2 - F3 or F4** (see **MAIN MENU** ➡ **Configuration**).

The activation of the function is displayed on the LCD display of the instrument with the message **DATALOG** in reverse.

DATALOG	15-04 08:17	PEAK
CH1 : 152.60 kg CH2 : 153.72 kg		
HOLD		UNLOAD

If you have set the data storage on **FLASH MEMORY** (OPTION) it is necessary that this has already been inserted or the command is not accepted.

Additionally it is necessary that any USB cable for communication with a PC has been removed

If you have set a threshold (threshold parameter <> 0), no storage will be made until this condition has been satisfied.

Each time a new point has been stored the icon 凹 will be shown on the display .

In case of DATALOG on **FLASH MEMORY** (OPTION) and with the parameter interval different from **MANUAL,** two different files format can be created :
- **.csv** files : this file can be read directly by **Microsoft Excel**.
  The field separator can be selected inside the page **MAIN MENU** ➡ **DATALOGGER MENU** ➡ **Files Flash memory**
- **.bin files:** the file format of this file is descrpted below and allows smaller file size and a faster storage.
  To read these file it is possible to use the software **MP Supervisor**

The selection between these two files is made in the page **MAIN MENU** ➡ **DATALOGGER MENU** ➡ **Files Flash memory**

In both case the name of the file created is : **MP Plus DataLogger DD:MM:YYYY – HHMMSS**
where:

         DD:MM:YYYY is the starting date (Day-Month-Year) of the datalog cycle
         HHMMSS is the starting time (Hour-Minutes-Seconds) of the datalog cycle

This convention makes the file name unique and recognizable and can not be duplicated even later when you will go to analyze it in your PC.
The format of the file created is described below.

⚠️ **WARNING:** It is responsibility of the operator to check that within the Pen USB there is enough free space consistent with the cycle set.

In the case of interval set to **MANUAL** a file of type text will be created with the same naming convention but with a .txt extension

An example of a file created in the manual mode is shown below where they are easily recognizable fields associated with each record. The field separator is selectable in the page **MAIN MENU ➡ DATALOGGER MENU ➡ Files Flash memory**.

This file, as a text file, can be read on a PC from any text editor (such as Notepad).

In case of Internal DATALOG (that use the internal memory instead of the flash memory) it is possible to store just a cycle at time.

So each time a new cycle is started the previuos cycle is lost.

To perform a download of a internal datalog it is possible to use the AEP transducers software **MP Supervisor** or you can copy it on a flash memory directly from **MP2**_Plus_**.**

In case of **Manual storing** and you are in **PEAK** mode , it is possible to store the PEAK (Negative or Positive) instead of the actual value. Which value to store will be request to the operator at the start of each **DATALOG** cycle.

DATALOG FILE EXAMPLE with MANUAL storing (txt file)

```
1 ;CH1; -47.07kg   CH2; -0.009kg  TOT; -47.08kg   ; Date 14-05-2014 Time 10:53:05;
2 ;CH1; -47.07kg   CH2; -0.010kg  TOT; -47.08kg   ; Date 14-05-2014 Time 10:53:11;
3 ;CH1; -47.07kg   CH2; -0.010kg  TOT; -47.08kg   ; Date 14-05-2014 Time 10:53:13;
4 ;CH1; -47.07kg   CH2; -0.009kg  TOT; -47.08kg   ; Date 14-05-2014 Time 10:53:15;
5 ;CH1; -47.07kg   CH2; -0.009kg  TOT; -47.08kg   ; Date 14-05-2014 Time 10:53:17;
```

Note:

The field separator can be '**;**' or '**,**'

The decimal point character is always '**.**'

DATALOG FILE FORMAT (csv file)

1.0	⇨ Fie version.
3	⇨ Number of channels
1;2;3;0;	⇨Channels index
(kg) ; (kg) ; (kg) ; (s);	⇨ Measurement unit
0.5; 15.1; 91734.5 ;0.000 ;	⇨ Measures + acquisition time
7.0; 15.2; 91333.5 ;1.000 ;	
…………………….	
……………………	
12.1; 17.1; 91734.5 ;25.000 ;	
0.0; 15.1; 89000.5 ;26.000 ;	

Note:
The channel index row gives you the information of such channels have been stored

> 0 = CH1
> 1= CH2
> 2= CH3
> 3= CH4
> 4= TOTAL

The field separator can be '**;**' or '**,**'

The decimal point character is always '**.**'

The starting date and time is inside the filename: **MP Plus DataLogger DD:MM:YYYY – HHMMSS . csv**
where: **DD:MM:YYYY** are the starting Day-Month and Year , **HHMMSS** are the starting Hour-Minutes-Seconds.

DATALOG FILE FORMAT (bin file)

File header

File Version	: 4 byte (floating point IEEE754)
Number of channels stored	: 1 byte
Reserved	: 1 byte
Channel Index	: 1 byte for each channel (see description above)
Reserved	: 1 byte
Measurement Unit	: 1 byte for each channel (see table 1 for the codes)

The starting date and time is inside the filename: **MP Plus DataLogger DD:MM:YYYY – HHMMSS . csv**
where: **DD:MM:YYYY** are the starting Day-Month and Year , **HHMMSS** are the starting Hour-Minutes-Seconds.

Measures:
For each measurement point is stored a record of (4*Number of channels) + 4 bytes.
The value of each channel is stored in floating point (according to IEEE754).
Last 4 bytes are the elapsed time in floating point (according to IEEE754).

The cycle of **DATALOG** ends automatically after the set time (when using the internal memory to the achievement of the highest possible recordings).
To end a **DATALOG** cycle press the **DATALOG** key.
The acceptance of the command is signaled by displaying the message **DATALOG** no longer in reverse.

With a **DATALOG** cycle running is not possible to enter in the **Programming Menu.**

The time of storage is defined by parameter **INTERVAL**.

With the parameter **INTERVAL** set to **MANUAL** a point is stored pressing the **SET** button or alternatively via an external digital input if suitably configured.

In all other cases, the storage interval is defined by parameter **INTERVAL** with recordings that go from a point every 500ms to every 24h.

CAUTION: Max duration of a DATALOG Cycle : **100 days**

27. PRINT FUNCTION (OPTION)

The **PRINT** function allows to print a report on a external 24 column printer.
When the option is enabled to use this function it is necessary to perform the followings setting:
In the **MAIN MENU ➡ RS232 COMMUNICATION** select the mode **PRINTER.**

The default communication protocol is **:** 9600, 8, N, 2 . If your printer use a different baud rate or parameter change the other parameter as necessary

Enable a function key **F1 – F2 - F3**, **F4** with the **PRINT** function in the **MAIN MENU ➡ Configuration** page.

PRINT	15-04 08:17	PEAK
CH1 :	152.60	kg
CH2 :	153.72	kg
CH3 :	153.00	kg
CH4 :	154.36	kg
TOT :	613.68	kg
HOLD		UNLOAD

When the function is activated **PRINT** will appear in reverse and will be printed a REPORT HEADER as set in the **MAIN MENU ➡ REPORT HEADER** page. If, at the moment of the activation of the **PRINT** function, the **PEAK** function is active as well, the operator will be asked to choose whether to print among the actual, the max or the min value.

Each time the **PRINT** button is pressed a measurement line will be printed as shown on the model of the example report below. The Data and Time information is present only if the Option DataLogger is installed.

To end a report measures press the **PRINT** button for 3 seconds, the printer will finish the report by advancing the paper and make arrangements for another report.

Obviously you can use this mode as well as with a physical printer with any program RS232 communication.

REPORT example:

```
      AEP    transducers
      Via Bottego 33/A
      Cognento (Modena)

   1 CH 1    0.0000kN
     CH 2    0.0000kN
   23-03-14   11:47:16

   2 CH 1    2.1250kN
     CH 2    3.4400kN
   23-03-14   11:48:17

   3 CH 1    8.5470kN
     CH 2    7.4000kN
   23-03-14   11:49:19
```

⚠️ **CAUTION**: Before you use the printer to must verify the printer settings, it is possible that you have to change some printer configuration like the communication parameters, font , printer speed and other parameters.

CHECK the configuration with the instructions on the printer's manual
For the retrieval of paper rolls contact local providers of office supplies.
AEP transducers does not handle this type of material consumption.

28. MAIN MENU

From the Main Page you g to the MAIN MENU by pressing the **SET** key
In the Main Menu you can change parameters for the followings choise

- **Measurement Unit**
- **Resolution**
- **Decimal Point**
- **Digital Flter and Acquisition Frequency**
- **Configuration of F1-F2-F3-F4 function keys and Instrument language**
- **Date and Time (Option)**
- **Channel Setup**
- **Linearization**
- **Report header (Option)**
- **DataLogger Menu (Option)**
- **Digital Input**
- **Digital Output (Relays)**
- **Analog Output (Option)**
- **SetPoint**
- **RS232 Communication and Printer (Option)**
- **MODBUS Communication (Option)**
- **Key Lock**
- **Channel Enable and Total Function (Only if the number of channel is > 1)**
- **Auto Zero Function**
- **RF Parameters (Option)**
- **Channel Save**
- **Channel Restore**
- **Service**
- **Quit**

It is possible to scroll the Menu uing the ⬆ and ⬇ keys, the active choise is shown in REVERSE.

Press **SET** to confirm you want to select the active page .

To return to the **MAIN PAGE** select **QUIT** and confirm with S**ET** or by using the fast keys **+ / -**

⚠ **CAUTION**:
The option not enabled will be not present in the MENU

29. MEASUREMENT UNITS

To convert the measurement displayed in other unit enter the **Main Menu ➜ Unit**.

In the case of multiple channels connected, select the desired channel using the keys ⬆ and ⬇.
Select with +/- the desired choice (which appears in reverse) and press **SET** to exit.
Depending on the type of transducer set to the channel (Force, Pressure, Torque and Displacement) the relevant Units will appear (see table 1).

FORCE Transducer		PRESSURE Transducer		TORQUE Transducer		DISPLACEMENT Transducer		Temperature PT100	
[1] Code	Unit	[1] Code	Unit	[1] Code	Unit	[1] Code	Unit	[1] Codice	Unità
00	kg	00	bar	00	Nm	00	mm	00	°C
01	N	01	mbar	01	Nmm	01	m	01	°F
02	daN	02	psi	02	Kgm	02	foot		
03	lb	03	MPa	03	kNm	03	inch		
04	kN	04	kPa	04	ft.lbf	04	cm		
05	MN	05	Pa	05	in.lbf	05	dm		
06	klb	06	mH_2O	06	gcm	06	µm		
07	t	07	inH_2O	07	kgmm	07	mV/V-Volt-mA [2]		
08	mV/V-Volt-mA[2]	08	kg/cm^2	08	mV/V-Volt-mA [2]				
		09	mmHg						
		10	cmHg						
		11	inHg						
		12	atm						
		13	mV/V-Volt-mA [2]						

TABLE 1

[1] In the USB-RS232-RS485 communication the unit code is trasmitted.
[2] The unit mV/V or V or mA is selected on the basis of the type of input signal configured for the channel and is useful for a control of the outputs of the transducers

30. RESOLUTION

To modify the resolution of each channel select **MAIN MENU ➡ RESOLUTION**.
The **resolution** allows to set the increment of the last digit of a constant (1, 2, 5 ...) and is used to increase the stability of the measurement in dynamic applications at the expense of the reading divisions.

Resolution: 1 – 2 – 5 - 10 - 20 - 50 -100

In the case of multiple channels connected, select the desired channel using the keys ⬆ and ⬇.
Select with +/- desired choice (which appears in reverse) and press **SET** to exit.

RESOLUTION	15-04-14
	08:17:07
CH 1 : 1	
CH 2 : 5	

31. POINT POSITION

To modify the point position for each connected channel : **MAIN MENU ➡ Decimal Point**.

Format: ######## #######.# ######.## #####.### ####.#### ###.#####

In the case of multiple channels connected, select the desired channel using the keys ⬆ and ⬇.
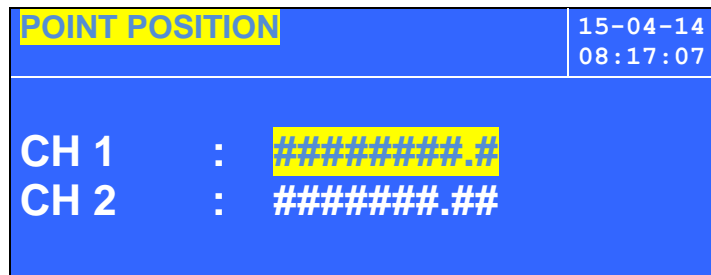Select with +/- desired choice (which appears in reverse) and press **SET** to exit.

POINT POSITION	15-04-14
	08:17:07
CH 1 : ########.#	
CH 2 : #######.##	

32 *Filter and Frequency of Conversion*

The parameters **Filter** and **Frequency of Conversion** determine both the stability of the measurement and the speed in which the measurement itself follows the transducer signal.
The signal coming from the strain gauge transducer is sampled with a frequency from 2.5 to 4800 samples per second.
MP2*Plus* apply a moving average digital filter with a number of samples determined by the parameter **Filter**.
The relationship between the filter and the number of samples that are taken into account in the calculation   is described in the table below

Filter 0: no filter
Filter 1: 2 samples
Filter 2: 4 samples
Filter 3: 8 samples
Filter 4: 16 samples
Filter 5: 32 samples

To calculate the cutoff frequency ft at -3dB of the digital filter must be taken into account both the number of samples that the sampling frequency.
A formula that in good approximation calculates the cutoff frequency of the digital filter based on these 2 parameters is:

$$ft = \frac{0.35}{Time\ response\ to\ a\ step}$$

The response times to a step function in filters and frequency conversion are reported in the table below

Stabilitation time to a Step signal in function of the Filter and Acquisition frequency parameters

Acquisition Frequency	Filter 0	Filter 1	Filter 2	Filter 3	Filter 4	Filter 5
2.5	0.4s	2s	4s	8s	16s	32s
5	0.6s	1s	2s	4s	8s	16s
10	0.1s	0.5s	1s	2s	4s	8s
20	50ms	0.25s	0.5s	1s	2s	4s
50	20ms	0.1s	0.2s	0.4s	0.8s	1.6s
100	10ms	50ms	0.1s	0.2	0.4s	0.8s
200	5ms	25ms	50ms	0.1s	0.2s	0.4s
400	2.5ms	12.5ms	25ms	50ms	0.1s	0.2s
600	1.6ms	8.2ms	16.5ms	33ms	66ms	133ms
1200	800 µs	4.1ms	8.2ms	16.5ms	33ms	66ms
2400	400µs	2ms	4.1ms	8.2ms	16.5ms	33ms
4800	200µs	1ms	2ms	4.1ms	8.2ms	16.5ms

In the figure 1 below it is possible to see how different acquisition frequencies influence the measurement. The load curve is reconstructed better when you use a higher acquisition frequency (so it is indicated for fast transient) but there will be a a higher noise.

In figure 2 below it is possible to see the effect on the filter on the measurement (at the same acquisition frequency). The time to reach the real load variation is higher when you use a higher filter but the measure is more stable than using a lower filter (a little noise remains on the measurement)

So the decision on which filter and acquisition frequency it is better to use depends on the application. If you have low changing loads and want a greater accuracy use high filter and low acquisition frequency. On the other hand for applications where the load changes fast it is better to use high acquisition frequency and low filter

Fig 1 : Effect on the measure due to different Acquisition Frequency
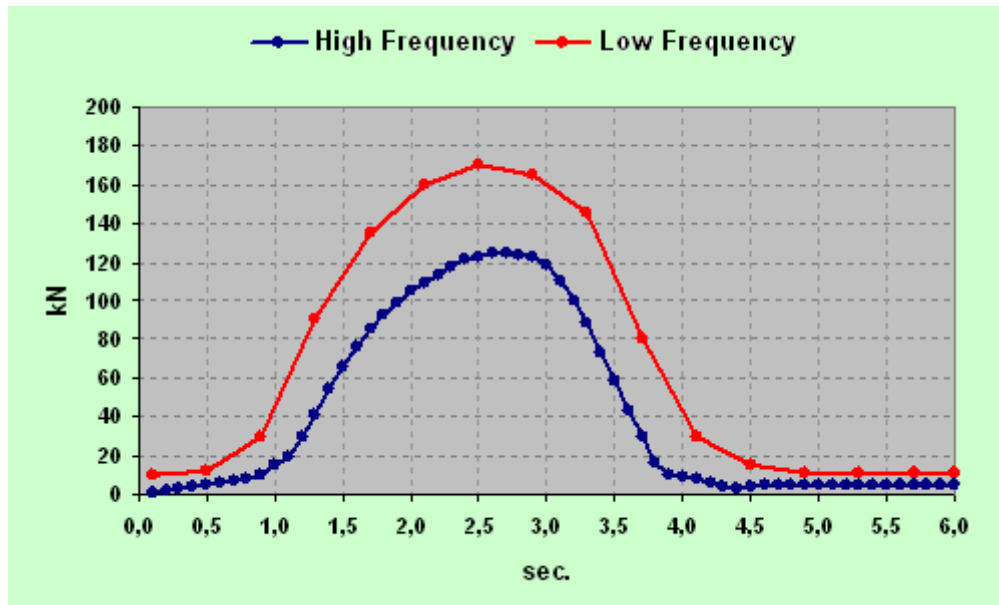
Figura 2 : Effect on the measure due to different filter
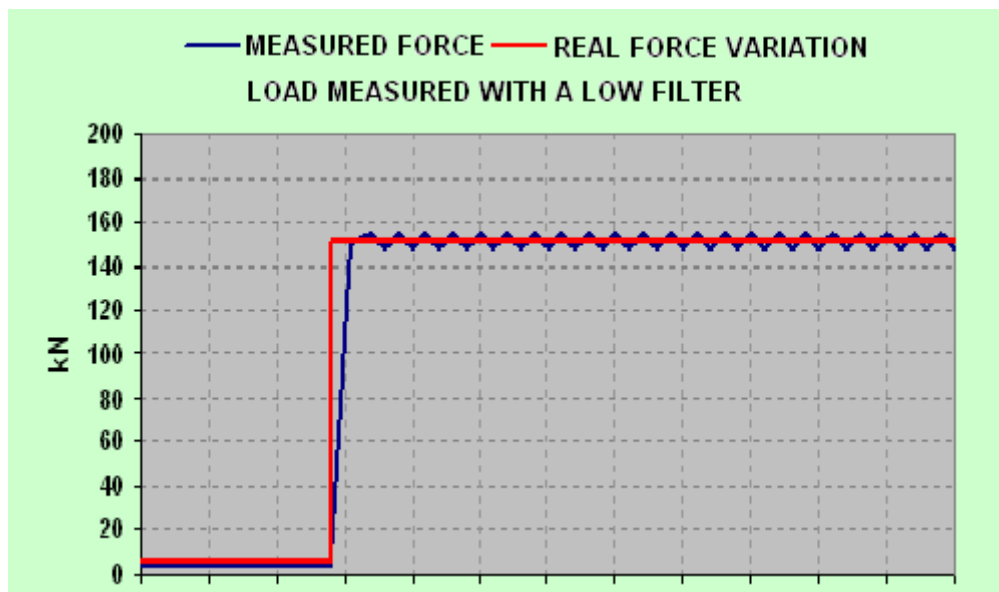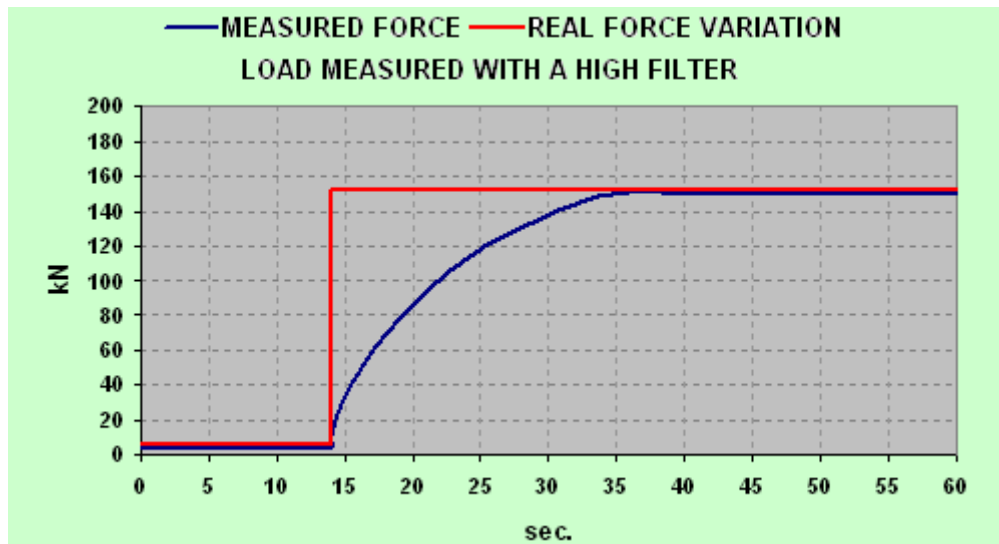
33. CONFIGURATION

On this page you can define the function of the function keys **F1 - F2 - F3 and F4** and the operating language of the instrument.

- **F1 KEY**: PEAK – HOLD - PRINT – TX DATA – DATALOG – UNLOAD – OFF - ZOOM
- **F2 KEY** : PEAK – HOLD - PRINT – TX DATA – DATALOG – UNLOAD – OFF - ZOOM
- **F3 KEY** : PEAK – HOLD - PRINT – TX DATA – DATALOG – UNLOAD – OFF - ZOOM
- **F4 KEY** : PEAK – HOLD - PRINT – TX DATA – DATALOG – UNLOAD – OFF - ZOOM
- **Language**: Italian – English: select the operating language of the instrument

For functions of **PEAK, HOLD, RELEASE, UNLOAD and DATALOG** and see chapters dedicated.
Selecting **OFF** the function key is disabled.

The **ZOOM** function allows, in the main page, to see only one channel enlarged.
In the condition of **ZOOM** not active on the main page you have the display of all enabled channels; activating the function, each time the **ZOOM** button is pressed will change the channel display, chosen in the list of enabled channels (see **MAIN MENU ➡ Enable Channels**). After selecting all enabled channels it will return to the normal display mode.

This mode is useful when you want to amplify the display of the measurement of a particular channel or when you want to perform the **ZERO** function only on one channel.

The function of **TXDATA** allows transmission of RS232 serial line (if properly configured in the **MAIN MENU ➡ RS232 COMMUNICATION**) a measured value each time the function key to which is associated function.

Select with ⬆ and ⬇ the parameter.
Change using **+/-** its value **.**

CONFIGURATION		15-04-14 08:17:07
F1 KEY	:	PEAK
F2 KEY	:	HOLD
F3 KEY	:	PRINT
F4 KEY	:	DATALOG
LANGUAGE	:	ENGLISH

34. DATE AND TIME (OPTION)

MP2*Plus* manages an internal clock calendar mainly used during a DATALOGGER cycle to associate to each measurement point the acquisition time.

When you enter in this page the cursori is positioned on the date field. Change using **+/-** its value.
Select with ⬆ and ⬇ the desired parameter : day month year hour minutes and seconds

To return to the **MAIN MENU** press **SET** any time.

The date and time are retained even when the instrument is turned off, thanks to a **CR2032** button battery long lasting and easy to find.

To replace the battery follows the procedure below:
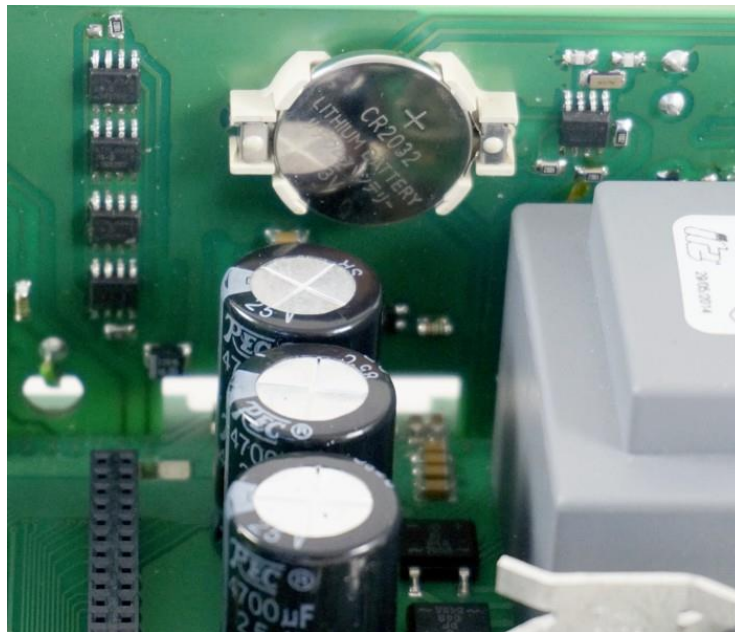
1. Remove the power supply from the instrument
2. Open the top cover
3. Change the CR2032 battery placed on the back of the front panel
4. Close the top cover
5. Turn on the instrument.
6. Set the correct Date and Time a descripted in this page.

35. CHANNEL SETUP

On this page you can change the parameters that affect the calibration of all channels. The programming of a channel consists of 2 or 3 pages depending on the type of calibration with which it is configured. The first page is the same for all configurations (except for channels PT100) while the page 2 and possibly 3 are dedicated to the type of calibration choice.

To protect the calibration pages you need to enter a password. The PASSWORD to access is: **7**

```
CHANNEL SETUP                    15-04-14
                                 08:17:07

            Insert Password

                        0

        Press ↓ to continue


        TASTO ZERO : FATT =      1
```

To confirm and continue press ⬇. To exit, press **SET**.
On the next page you are asked to specify the channel from to be modified

```
CHANNEL SETUP                    15-04-14
                                 08:17:07


        Select CH   :           1

        Press ↓ to continue
```
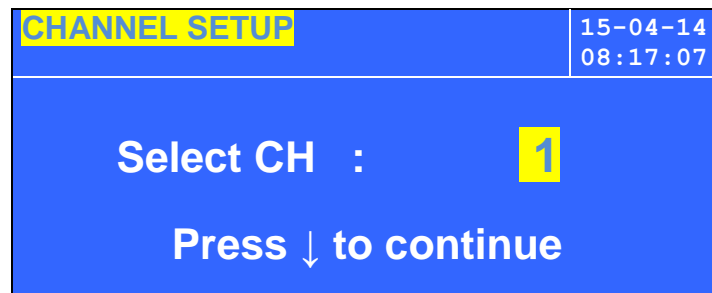
Select the desired channel. To confirm and continue press ⬇. To exit, press **SET.**.
In the case of force transducers, pressure, displacement and torque will display the following pages.

In the case of a channel in Temperature the calibration temperature page will be displayed (see relevant chapter).

36. Force – Pressure – Torque – Displacement Channels Calibration

SETUP CHANNEL 2	15-04-14 08:17:07
Type : **Force**	
Format : ########.#	
FS : 10000.0 kg	
Calibr. : FULL SCALE	

- **Type** : Force – Pressure – Torque - Displacement
- **Format** : point position for the FS parameter
    - ######### : no decimal point
    - #######.# : 1 decimal digit
    - ######.## : 2 decimal digits
    - #####.### : 3 decimal digits
    - ####.#### : 4 decimal digits
    - ###.##### : 5 decimal digits
- **FS** : Full Scale of the Transducer
- **Unit** : Measurement unit of the full scale
- **Calibr.** : FULL SCALE **– KNOWN WEIGHT – POINT INTERPOLATIOM**

Type : The definition of the **Type** of transducer is essential to select the measurement units group.

Format : Set the point position for the capacity field inside these pages

⚠️ The decimal point position used during the measurement must be done inside the page **Main Menu ➡ Point Position.**

FS : In the field **Full Scale** set the capacity of the transducer unit and its **Unit.**
Example: If the transducer is 200kN set
- 3 decimal point
- 200.000 as capacity
- Unit : kN.

Example : if the transducer is 50mm set
- 3 decimal point
- 50.000 as capacity
- Unit : mm.

Calibr. : The **Calibration Type** parameter allows you to set one the 3 possible calibration methods .
In the next pages the four calibration methods will be descripted in details.

Where you have the parameter **Calibr.** active press the key ⬇ to procede to the next pages.
To return to the previous page press the key ⬆ when you have the parameter **Type** active.
To quit press **SET.**

37. FULL SCALE CALIBRATION

Calibration with full scale is simply to select the range (full scale) of the transducer connected by referring to the fact that this may correspond to the following values:

- strain gauge transducer: Full Scale = 2 mV/V
- transducer with voltage input +/- 10V: Full Scale = 10V
- transducer with 4-20mA current input: Full scale = 20mA

These settings, even in the most accurate situation, are only theoretical.
In reality you can have some little deviation from these theoretical values due both to tolerances in the factory calibrations both dropouts in connection cables that may be more or less long.

This page is thus possible to introduce correction factors (**Gain**) that allow you to correct these deviations distinguished both for the positive scale (**GAIN +**) for the negative (**GAIN -**).

Also on this page you can always define experimentally the **SYSTEM TARA** or the load, pressure or torque that the transducer sees because of the equipment installed.

Finally you can change the **SIGN TRASDUCER** especially useful for strain gage transducers (+/- 2 mV/V).
Normally a positive load is defined for signal outputs of positive (compression) and vice versa for a negative load signal outputs negative (tensile). To reverse this convention change the parameter **SIGN** of the transducer from **STANDARD** to **INVERTED**.

In this page you have a dedicated menu. Use the keys ⬆ and ⬇ to select the desired function. This will be shown in **REVERSE**. To confirm press **SET.**

To quit from this page select the choise **QUIT** and confirm with **SET**

```
SETUP CHANNEL 2                15-04-14
                               08:17:07

SYSTEM TARA          :
GAIN +               :        1.00000
GAIN -               :        1.00000
TRANSDUCER SIGN      :     STANDARD
QUIT
```

SYSTEM TARA:
Used to reset the load, pressure, or the torque that the transducer sees due to the installed equipment and must be performed experimentally with transducer connected within the system and without load.
Entering the function the load value is displayed in real time.
Press **ZERO** to confirm.
At this point it should be displayed a load of 0.0. Repeat if necessary with the **ZERO** key if not satisfied with the measure.
Press **SET** to exit from the function and return to the menu.

GAIN + /-

As mentioned these parameters allow a correction of the output of the transducer to adapt to real situations. The parameter to be entered may be defined both by experimental and theoretical

Example 1.
The full scale output of a strain gauge transducer is 1.9990 mV/V instead of 2.0000mV/V on the basis of its certificate of calibration or because measured.
Compute the gain on the basis of the formula :

$$\text{Gain} = \frac{\text{Theoretical value}}{\text{Real Value}} = \frac{2.00000}{1.9990} = 1.0005$$

Example 2
The full scale output of a amplified transducer +/-10V is 8 V instead of 10V on the basis of its certificate of calibration or because measured.
Compute the gain on the basis of the formula :

$$\text{Gain} = \frac{\text{Theoretical value}}{\text{Real Value}} = \frac{10}{8} = 1.25$$

Example 3
The full scale output of a amplified transducer 4-20mA is 20.6 mA instead of 20mA on the basis of its certificate of calibration or because measured.
Compute the gain on the basis of the formula :

$$\text{Gain} = \frac{\text{Theoretical value}}{\text{Real Value}} = \frac{20.0-4}{20.6-4} = 0.975$$

Example 4
Experimentally it is noted that the value measured by the transducer at full scale (or to another load any) is 102.00kg instead of 100.00kg
Compute the gain on the basis of the formula :

$$\text{Gain} = \frac{\text{Theoretical value}}{\text{Real Value}} = \frac{100.00}{102.00} = 0.98$$

For better accuracy, and where possible to perform the calculation for both the positive and negative range.
In the absence of information copy the calculated value in a range in the opposite

TRANSDUCER SIGN   : STANDARD – INVERTED

As mentioned it is mainly useful in the case of strain gauge transducers to adapt the sign of the output to your needs.
Normally a positive load is defined for signal outputs of positive (compression) and vice versa for a negative load signal outputs negative (tensile).
To reverse this convention change the parameter **TRANSDUCER SIGN** from **STANDARD** to I**NVERTED**.

38. KNOWN WEIGHT CALIBRATION

This function allows the calibration of a channel by the application of a known load / pressure / torque directly on the transducer connected to the instrument.

Also on this page you can always define experimentally the **TARA SYSTEM** or the load, pressure or torque that the transducer sees because of the equipment installed.

Finally you can change the **SIGN TRASDUCER** especially useful for strain gage transducers (+/- 2 mV/V).

Normally a positive load is defined for signal outputs of positive (compression) and vice versa for a negative load signal outputs negative (tensile). To reverse this convention change the parameter **SIGN** of the transducer from **STANDARD** to **INVERTED**.

In this page you have a dedicated menu. Use the keys ⬆ and ⬇ to select the desired function. This will be shown in **REVERSE**. To confirm press **SET.**

To quit from this page select the choise **QUIT** and confirm with **SET**

```
┌────────────────────────────────────────┐
│ SETUP CHANNEL 2              15-04-14   │
│                             08:17:07    │
│ SYSTEM TARA        :                    │
│ REFERENCE WEIGHT   :      10000         │
│ CALIBRATION        :                    │
│ TRANSDUCER SIGN    :   STANDARD         │
│ QUIT                                    │
└────────────────────────────────────────┘
```

SYSTEM TARA:

Used to reset the load, pressure, or the torque that the transducer sees due to the installed equipment and must be performed experimentally with transducer connected within the system and without load.

Entering the function the load value is displayed in real time.

Press **ZERO** to confirm.

At this point it should be displayed a load of 0.0. Repeat if necessary with the **ZERO** key if not satisfied with the measure.

Press **SET** to exit from the function and return to the menu.

REFERENCE WEIGHT:

Enter the value of sample weight to be used.

The sample weight must necessarily be in the units of measure defined for the full scale.

CALIBRATION:

This calibration procedure must be performed in the field by creating a load on the transducer or a pressure or a torque equal to the reference weight.

It will be displayed in real time the value of the current load. When the system is stable, press **ZERO** to confirm.

At this point it should be displayed a load corresponding to the reference.

Repeat if necessary with the **ZERO** key if not satisfied with the measure.

Press **SET** to exit.

TRANSDUCER SIGN   : STANDARD – INVERTED

As mentioned it is mainly useful in the case of strain gauge transducers to adapt the sign of the output to your needs.

Normally a positive load is defined for signal outputs of positive (compression) and vice versa for a negative load signal outputs negative (tensile).

To reverse this convention change the parameter **TRANSDUCER SIGN** from **STANDARD** to I**NVERTED**.

39. CALIBRATION USING THE POINT INTERPOLATION .

The calibration using the **POINT INTERPOLATION** allows to calibrate a transducer by applying a correction to its linearity in order to improve the metrological characteristics and accuracy of the system.

MP2Plus is designed to set up to 5 measurement points in mV/V obtained by setting 5 reference values for both the positive and negative ranges.

The programming allows the insertion of signals in mV/V for both the positive range (for example: compression) that for the negative range (for example: tension) because transducers normally do not have a perfectly symmetrical signal in both directions.

Example : For a FORCE transducer is necessary to know the mV/V corresponding to 5 known forces obtained with weights or other systems.

Example: For a TORQUE transducer is necessary to know the mV/V corresponding to 5 known torques obtained through reference torquemeter banks.

Example: For a transducer PRESSURE is necessary to know the mV/V corresponding to 5 pressures obtained through a comparison with other systems such as reference pressure deadweight testers .

Example: For a DISPLACEMENT transducer you must know the mV/V corresponding to 5 displacement obtained through 5 gauge blocks known.

⚠️ **WARNING**: both the reference values that the corresponding signals in mV/V to be set must be purified from the zero (without tare).

The programming page for the POSITIVE field (for example COMPRESSION for a FORCE transducer).

Setup Channel 1 POSITIVE INTERP.	23/03/14 11:56:47
P1: 200.00 kN	0.400000 mV/V
P2: 400.00 kN	0.800000 mV/V
P3: 600.00 kN	1.200000 mV/V
P4: 800.00 kN	1.600000 mV/V
P5: 1000.00 kN	2.000000 mV/V
KEY SET : QUIT	
ZERO KEY : FATT =	0.01

The programming page for the NEGATIVE field (for example COMPRESSION for a FORCE transducer).

Setup Channel 1 NEGATIVE INTERP.	23/03/14 11:56:47
P1: -200.00 kN	-0.400000 mV/V
P2: -400.00 kN	0.800000 mV/V
P3: -600.00 kN	-1.200000 mV/V
P4: -800.00 kN	-1.600000 mV/V
P5: -1000.00 kN	-2.000000 mV/V
KEY SET : QUIT	
ZERO KEY : FATT =	0.01

⚠️ **WARNING:** after calibrating the channel **ALWAYS** perform a test with a known reference. For example a known weight or mass , a known pressure etc. ...

This type of calibration approximates the characteristic curve of the transducer with five straight lines, and of course, as we highlight graphically, the advantage of this method is that it allows a good correction of the non-linearity of the transducer.

WARNING: If you use this type of calibration it is necessary to insert values for both positive and negative values even if the transducer is used only in one direction.
 The easy way to do in case only values in one direction are available is to copy all values in the other direction and change the sign for both load and mV/V.

40. CALIBRATION of Temperature Channels (Only CH2)

The calibration of a PT100 temperature probe is always in ° C and is done by setting 2 calibrations: one at room temperature and the other at high temperature.

```
CHANNEL 2 CALIBRATION          15-04-14
                               08:17:07
ROOM  TEMPERATURE        :   25.0
CALIBR. ROOM TEMP.       :
HIGH TEMPERATURE         :   80.0
CALIBR. HIGH TEMP        :
QUIT
```

The page has a menu with the following options:
- Ambient temperature: allows you to change the value to be assigned to room temperature
- Calibration at room temperature: select this to perform a calibration at room temperature. The probe must be stabilized at the desired temperature and perfectly. Press **ZERO** to do the calibration. Press **SET** to return to the menu.
- High Temperature : allows you to change the value to be assigned to the second calibration point
- Calibration at High Temperature: select this to perform a calibration temperature at the second temperature point. The probe must be at the temperature defined and perfectly stabilized. Press **ZERO** to do the calibration. Press **SET** to return to the menu.
- Exit: Returns to the previous page.

Use the keys   ⬆ and ⬇ to select the desired function. This will be shown in **REVERSE**. To confirm press **SET.**

To quit from this page select the choise **QUIT** and confirm with **SET**

41. LINEARIZATION

If you take the calibrations of the channels for FULL SCALE or KNOWN WEIGHT can be useful to improve the measurement accuracy through a process of linearization on field measurements.

Both the calibration FULL SCALE and WEIGHT KNOWN adjust in a precise manner in correspondence with the outputs of a single measuring point (respectively that of the full scale, and that of the reference weight).
The nonlinearity of some transducers makes that in the other areas the measures may be less accurate and deviate from that for which the application is deemed acceptable.
MP2Plus provides up to five linearization points (P1 to P5), respectively, in both the positive and the negative range.

It is not necessary to use all 5 linearization points. The only constraint is that the points are in ascending order (eg P2> P1) and that the linearization is performed in units of calibration.
It is necessary to have a reference transducer and impose the known values of force, pressure, torque or displacement that you want to check for linearization.

These pages are protected by a password. The PASSWORD is : **7**

```
CHANNEL LINEARIZATION          15-04-14
                               08:17:07

            Insert Password

                          0

         Press ↓ to continue


         TASTO ZERO : FATT =      1
```
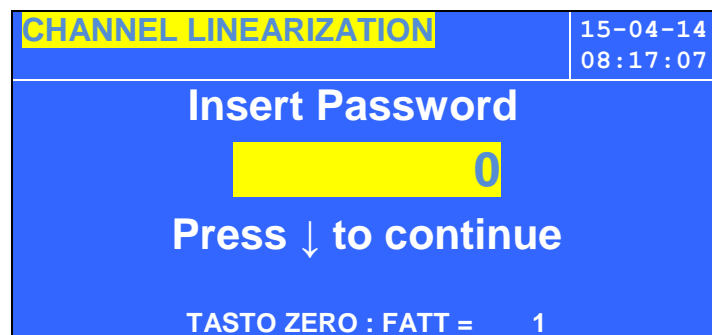
To confirm press ⬇. To quit press **SET.**
If the instrument has more than one channel it will require the channel to use

```
CHANNEL LINEARIZATION          15-04-14
                               08:17:07


     Select CH   :        1

       Press ↓ to continue

```
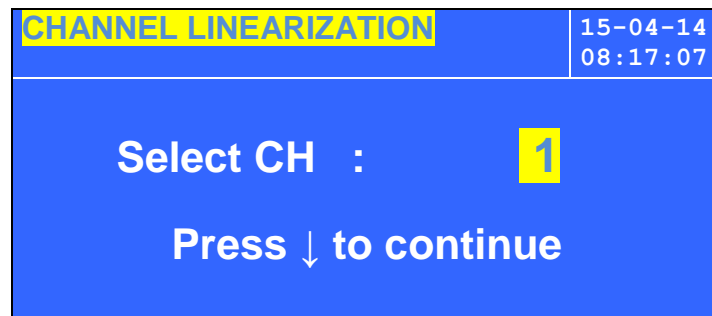
Select the channel . To confirm press ⬇. To quit press **SET.**
In the next page you will find a menu where you have to choise if perform a positive or negative calibration.
Morever if you are not happy of a previous calibration you can reset it
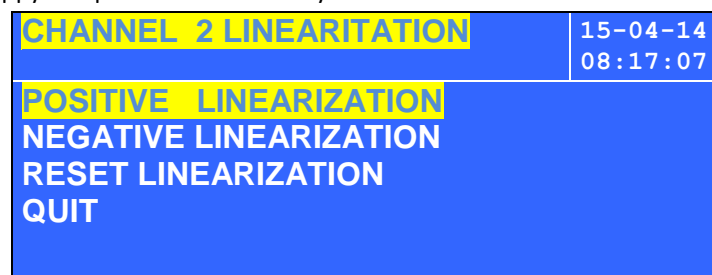
```
CHANNEL  2 LINEARITATION       15-04-14
                               08:17:07

POSITIVE   LINEARIZATION
NEGATIVE LINEARIZATION
RESET LINEARIZATION
QUIT
```

Use the keys ⬆ and ⬇ to select the desired function. This will be shown in **REVERSE**. To confirm press **SET.**

POSITIVE LINEARIZATION: allows you to access the linearization in the positive range
NEGATIVE LINEARIZATION: allows you to access the linearization in the positive range
RESET LINEARIZATION: useful is you want to clear the previous linearization in case of errors
QUIT: to return to the previous page

RESET LINEARIZATION
When you select RESET LINEARIZATION you are prompted for a confirmation of your choise to avoid unwanted selection.
To avoid resetting a linearization to unwanted selecting RESET LINEARISATION a confirmation is required. Select **YES or NO** on the confirmation prompt and press **SET** to exit.

POSITIVE AND NEGATIVE LINEARIZATION
The following descriptions apply to both the linearization in the positive in the negative.
On the first page you are asked whether you want to enable / disable the linearization of the channel.

CHANNEL 2 LINEARITATION	15-04-14
	08:17:07
ENABLE LINEARIZATION	
NO YES	
Press ↓ to continue	

Select **YES or NO** on the confirmation prompt.

Selecting **NO** the linearization is not applied on the channel. This makes it possible to evaluate the effects of the measures with and without active linearization. With the **NO** option active you can only press **SET** to exit and return to the previous page.
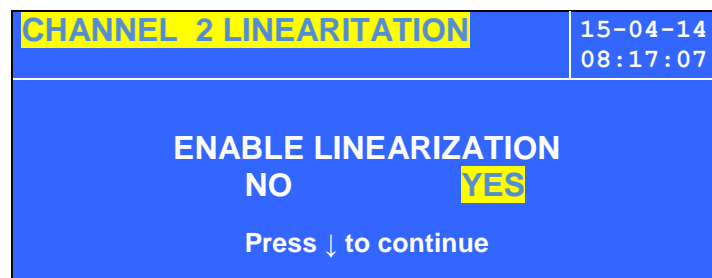By selecting **YES** you can press ⬇ to continue and go to the linearization page or to exit and return to the previous page press **SET.**

The linearization page is presented as a menu whose items are the points **P1 - P2 - P3 - P4 - P5** and voice **QUIT**.
Select points P1..P5 with the keys ⬆ and ⬇. The active choice will appear in **REVERSE**.
To confirm the choice press **SET**.
Before confirming the point linearization load the transducer with a force / pressure / torque reference equal to Px point that you intend to be linearized.

CHANNEL 2 LINEARITATION	15-04-14
	08:17:07
P1:	
P2:	
P3:	
P4:	
P5:	
QUIT	
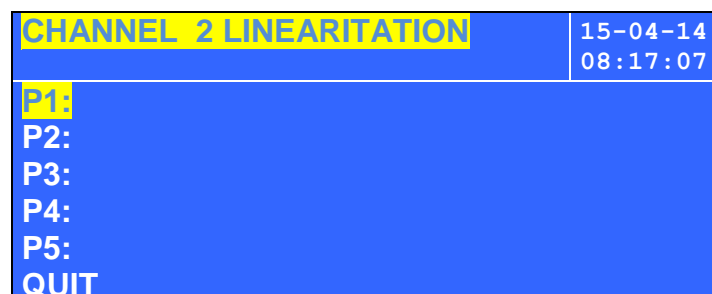
You will see the current measure. By using the keys **+/-** you can modify the value until it is equal to the applied reference load. When satisfied, press **SET** to confirm.
Repeat for all points **P1..P5**.
To exit this page and return to the previous page, select **QUIT** and confirm with **SET.**.

42. REPORT HEADER (Option)

MP2*Plus* can print measurements on a external serial printer (see the **PRINT Function** chapter for details).

The printout can be personalized with a dedicated report header.

The instruments manage a report header of 3 rows each of 24 columns .

To change row use the key **ZERO**.
To position on a character use the keys ⬆⬇.
To change the character use the keys **+/ -.**
To exit and confirm press **SET**

Characters for fields of type text

During the insertion of a text field using the keys **+/ -** a characters sequence will be proposed according to the below table

	!	"	#	$	%	&	'	(	)	*	+	,	—	.	/
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	Δ

43. DATA LOGGER MENU (Option)

When you select this choise inside the **MAIN MENU** leads to a further menu for functions that relate to specific functions of the DATALOGGER of **MP2***Plus*.
Selezionando questa voce all'interno del Menu Principale si accede ad un ulteriore menù per le funzioni che riguardano le funzioni specifiche di **DATALOGGER**

- **DATALOGGER PARAMETERS:** allows to modify the parameters related to a DATALOG cycle
- **VIEW DATALOG**   **:** allows to views points by points of acquisitions of the last DATALOG
- **COPY DATALOG**   **:** copy on a Flash Memory last DATALOG cycle
- **FILES FLASH MEMORY**   **:** allows to define the format of the files createdon a flash memory
- **QUIT**   **:** return to the MAIN MENU

Select using the keys ⬆ and ⬇ the desired function and press **SET** to confirm.

44. DATA LOGGER PARAMETERS

On this page you can change the programming parameters of a cycle storage on data logger.

The Data Logger can store measurements at regular intervals or manually by pressing **SET** or through an INPUT DIGITAL if properly configured.
Recordings can be performed in the internal memory or directly to USB FLASH MEMORY for quick use or processing on PC.

On the **INTERNAL MEMORY** you can record up to
- 130,000 measurements when only one channel is enabled
- 65,000 measurements when are enabled two channels
- 43,000 measurements when are enabled 3 channels
- 32,000 measurements when are enabled 4 channels
- 26,000 measurements when are enabled 4 channels + the total

Inside the **DATALOG** only measures of enabled channels are stored.

The internal memory is non-volatile which enables data retention even after turning off the power.

USB FLASH MEMORY may register a greater number of measures depends on the capacity of the memory with a speed that depends on the type of pen used and the fill level of the pen. It is possible that, during the physical write to the USB stick, there are time intervals without acquisitions.

⚠️   **WARNING**: In applications that demand very fast acquisition times, it is recommended to use the **INTERNAL MEMORY** because the time of registration are much more continuous and rapid than using a **FLASH MEMORY (USB stick)**. On completion of the DATALOG cycle you can any way to copy the recordings on a FLASH MEMORY (USB stick) for processing on a PC.

- **Type:** INTERNAL – FLASH MEMORY.
- **Intervall**:   MANUAL, MAX
        1, 2, 3, 5, 10, 15, 20, 30, 45, 60 seconds
        2 , 3, 5, 10, 15, 20, 30, 45, 60 minutes
        2, 3, 5, 10, 12, 18, 24 hours
- **Total Time**: the time duration of the recordings after starting the Data Logger.
- **Threshold:** allows to define a trigger value to start a DATA LOG cycle

The **TYPE** parameter allows the selection between **USB Flash Memory** and **Internal Memory.**

The **INTERVAL** parameter defines the time interval between two acquisitions.

Selecting **MAX** values are acquired at the maximum speed defined by the acquisition frequency of the selected channel (see Parameters Working Channel) ranging from 4800 acquisitions per second to 2.5 acquisitions per second when using the internal memory.

Selecting **MANUAL** acquisitions take place manually after pressing the **SET** key.

Other selections define the time between to acquisition point at regular time ranging from **0.5sec** to **24Hour**

The duration of the storage cycle is defined by **TOTAL TIME** that allows to define in days hours minutes and seconds in the overall duration of the cycle.

The maximum total time is 100 days

The **THRESHOLD** parameter allows you to define a trigger value for the storage cycle.

For instance, setting   THRESHOLD> = 124.0 the actual recordings will start when a measurement >= 124 is recorded

or by setting THRESHOLD <= 124.0 the actual recordings will start when a measurement <= 124 is recorded

The set threshold value must be inserted in the current unit of measure. Changing units of measure its value is not converted.

It is operator responsability to check the consistency of this value with the new unit.

In the case of multiple channels enabled, you must specify which channel the threshold refers.

With the threshold value equal to 0.0 the trigger will be disables and the Datalog cycle will start as soon as the function is selected.

This parameter is irrelevant in the case of recordings **Manual**
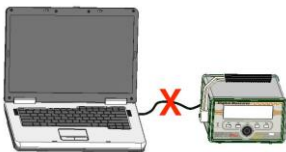
WARNING: With the selection of the type of storage in FLASH MEMORY (USB) is automatically disabled the USB communication with PC.

WARNING: When using the internal memory the datalog will stop automatically when recordings are achieved the maximum possible (130,000) while in the case of **USB Flash memory** is your responsibility to ensure that inside the devices there is the necessary memory.

To select the type of the file created on a external Flash Memory see the page : **Main Menu ➡ DATALOG MENU➡ FLASH MEMORY FILES.**

Select with ⬆ and ⬇ the parameter.

Change using **+/-** its value **.**

To return to the **MAIN MENU** press **SET** any time.

45. VIEW DATA LOGGER

A internal cycle of Datalog can be
- downloaded directly to a PC using the software **MP Supervisor** and the USB port
- copied on a flash memory.
- Displayed point by point scrolling through the various recordings stored entering this page

Through **MP Supervisor** you can create test charts, export data to Microsoft Excel, print reports, etc..

In any case, you can view the recordings made point to point by entering this page.

- **START LOG** displays Date and Time of the Log
- **POINT N.** identifies the current point sequentially.
- **TIME** line indicates the time elapsed since the beginning of the cycle in hours, minutes, seconds, and milliseconds.
- For each of the channels, active during the **DATALOG,** appears the acquired value

To scroll through the acquisition points of the log use ⬆ e ⬇.

To scroll through the points faster you can use the **ZERO** key to change the increment factor.
The active increment factor is displayed on the bottom line of the display.

To return to the **MAIN MENU** press **SET** any time.

46. COPY DATA LOGGER

Once you have created an internal DATALOG it is possible to copy it onto a Flash memory and then read it using the program **MP Supervisor**. The format of the file created is identical to what you would have with a direct storage of DATALOG on USB flash memory (see function DATALOG).

It is necessary to remove any USB communication cable to PC

WARNING: With the selection of the DATALOG type to USB FLASH MEMORY the USB communication with PC is automatically disabled.

To select the type of the file created on a external Flash Memory see the page : **Main Menu** ➡ **DATA LOGGER MENU** ➡ **FLASH MEMORY FILES.**

47. FILES FLASH MEMORY (PEN DRIVE) (OPTION)

This page allows you to define the type of file created on a USB flash memory during a cycle of datalog.
It is possible to create binary files with the extension. bin file or text files compatible with Microsoft Excel (cvs file).
For more details, please read the section dedicated to the cycles of DATALOG.

You can also define the field separator between the character ';' and the character ','

- **Created File Type:** .BIN – .CSV
- **Field Separator**: " **;** " – " **,** "

Created file type : This parameter selects the type of file created, you can set a binary format (. BIN) or select a text format (CSV) file compatible with Microsoft Excel.

Field Separator: This parameter allows you to select the character that is used to indicate the separation between fields in the text file created. You can select a semicolon (;) or comma (,).

Select with ⬆ and ⬇ the parameter.
Change using **+/-** its value **.**
To return to the **MAIN MENU** press **SET** any time.

48. DIGITAL INPUT

MP2*Plus* has 4 external digital input (0-24Vdc) through which you can activate some feature internal to the instrument.

On this page you can configure the function associated with each of the four digital inputs.

The function is active when you apply 24Vdc input.

- **INPUT 1**: DISABLE SP1 – DISABLE SP2 – DISABLE SP3 – DISABLE SP4 - DISABLE – DISABLE ALL SETPOINT ZERO – F1 KEY – F2 KEY – F3 KEY – F4 KEY – MANUAL STORING
- **INPUT 2**: DISABLE SP1 – DISABLE SP2 – DISABLE SP3 – DISABLE SP4 - DISABLE – DISABLE ALL SETPOINT ZERO – F1 KEY – F2 KEY – F3 KEY – F4 KEY – MANUAL STORING
- **INPUT 3**: DISABLE SP1 – DISABLE SP2 – DISABLE SP3 – DISABLE SP4 - DISABLE – DISABLE ALL SETPOINT ZERO – F1 KEY – F2 KEY – F3 KEY – F4 KEY – MANUAL STORING
- **INPUT 4**: DISABLE SP1 – DISABLE SP2 – DISABLE SP3 – DISABLE SP4 - DISABLE – DISABLE ALL SETPOINT ZERO – F1 KEY – F2 KEY – F3 KEY – F4 KEY – MANUAL STORING

DISABLE SPx : you can disable the selected SetPoint (x: 1..5). In this way the function associated with SetPoint is disabled

DISABLE ALL SETPOINT : In this mode, disable all SetPoint. In this way the functions associated with SetPoint are disabled

ZERO : when set this way you can perform the function of ZERO by remote control. The command must be impulsive. The function performed is always to activate **ZERO** and therefore not allowed to turn off the **ZERO** through this way

Fx Key : in this mode the input replicates the function associated with the keys F1 - F2 - F3 - F4 and then one of the functions PEAK - HOLD - PRINT - TX DATE - DATALOG - UNLOAD - ZOOM according to what has been selected in the **MAIN MENU-> Configuration**The command must be impulsive.

MANUAL STORING : If there is an cycle DataLogger running with manual storage is possible to control the storage of a point through a digital input (replica of the **SET** key). The command must be impulsive.
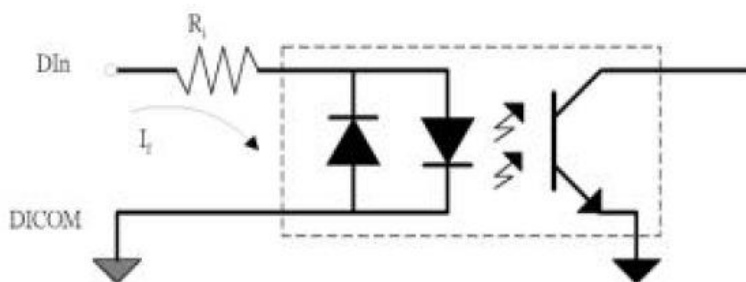
Select with ⬆ and ⬇ the parameter.
Change using **+/-** its value **.**
To return to the **MAIN MENU** press **SET** any time.

NOTE
The input circuit of the digital inputs is shown schematically in the figure below.
The input DICOM is common to all 4 inputs and is isolated to 0V system.
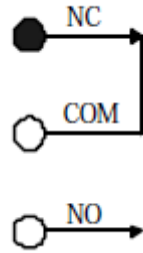

For the wiring of the digital inputs, see the section dedicated

49. RELAYS DIGITAL OUTPUT

MP2_Plus_ has 4 Relays (5° Relay as option) . Each of them with DPDT form.

The characteristics of the contacts are:
MAXIMUM VOLTAGE TO CONTACT: 220Vdc - 250Vac
MAXIMUM CURRENT: 2A
MAXIMUM POWER: 60W - 62.5VA

The functionality of the relay outputs is connected to the SetPoint and function
UNLOAD.

For the definition of the function UNLOAD see the dedicated chapter.

When you associate a relay to function UNLOAD means that it is ON when the function UNLOAD is ongoing.

For the definition of SetPoint see the dedicated chapter.

It is possible to associate a relay output to a SetPoint. The relay switches when SetPoint is ACTIVE.

It is can also create a definition where the relay outputs combined through the **CUSTOM** mode.

In this way, as a function of the threshold values defined by SetPoint, it is possible to determine the logical state of more relays inside the windows defined load by SetPoint same.

⚠ **CAUTION** :
In this mode the SetPoint is used only as a value and is not considered the sign> or <
The SetPoint 1 to 5 must be stored in a growing (as in the example below).

It has for example that outputs Relay 1 - Relay 2 - Relay 3 are associated with the **CUSTOM** function
The SetPoints have been defined as follows

SetPoint 1 : -1000kg
SetPoint 2 :   1000kg
SetPoint 3 : 5000kg
SetPoint 4 : 10000kg
SetPoint 5 : 20000kg

Load	SetPoint1 -1000kg	SetPoint 2 1000kg	SetPoint 3 5000kg	SetPoint 4 10000kg	SetPoint5 20000kg
Relay 1	0	1	1	0	1	0
Relay 2	0	0	1	0	0	0
Relay 3	0	1	1	0	0	0
Relay 4	X	X	X	X	X	X
Relay 5	X	X	X	X	X	X

Marking with 0 the state of a relay defines its status within the window **NOT ACTIVE**
Marking 1 with the state of a relay defines its status within the window **ACTIVE**

The relay 4 and relay 5 have not been defined as CUSTOM so their outputs are irrelevant in the definition and are marked as X

1° Window : Load < -1000kg :

Relè 1 = NOT ACTIVE
Relè 2 = NOT ACTIVE
Relè 3 = NOT ACTIVE

2° Window :   -1000kg < Load <1000kg

Relè 1 = ATTIVE
Relè 2 = NOT ACTIVE
Relè 3 = ATTIVE

3° Window : 1000kg < Load < 5000kg

Relè 1 = ATTIVE
Relè 2 = ATTIVE
Relè 3 = ATTIVE

4° Window : 5000kg < Load < 10000kg

Relè 1 = NOT ACTIVE
Relè 2 = NOT ACTIVE
Relè 3 = NOT ACTIVE

5° Window : 10000kg < Load < 20000kg

Relè 1 = ATTIVE
Relè 2 = NOT ACTIVE
Relè 3 = NOT ACTIVE

6° Window : Load > 20000kg

Relè 1 = NOT ACTIVE
Relè 2 = NOT ACTIVE
Relè 3 = NOT ACTIVE

Programming

Select by using ⬆ e ⬇ the relay desired (OUTPUTx) .
Change using **+/-** its value **.**

To return to the **MAIN MENU** press **SET** any time.

- **OUTPUT1** : CUSTOM – SETPOINT 1 – SETPOINT 2 – SETPOINT 3 – SETPOINT 4 – SETPOINT 5 –UNLOAD
- **OUTPUT2** : CUSTOM – SETPOINT 1 – SETPOINT 2 – SETPOINT 3 – SETPOINT 4 – SETPOINT 5 –UNLOAD
- **OUTPUT3** : CUSTOM – SETPOINT 1 – SETPOINT 2 – SETPOINT 3 – SETPOINT 4 – SETPOINT 5 –UNLOAD
- **OUTPUT4** : CUSTOM – SETPOINT 1 – SETPOINT 2 – SETPOINT 3 – SETPOINT 4 – SETPOINT 5 –UNLOAD
- **OUTPUT5** : CUSTOM – SETPOINT 1 – SETPOINT 2 – SETPOINT 3 – SETPOINT 4 – SETPOINT 5 –UNLOAD

If you have selected at least one OUTPUT as **CUSTOM** you will see: **ZERO KEY: change page**

With the **ZERO** key you go to the page definition of the states of the relays in the different windows as descripted abow

Select with the keys ⬆ and ⬇ the state of a relay (**Ox**) desired within a window.

Change the value by using +/- buttons the desired choice (which appears in reverse).

To return to the **MAIN MENU** press **SET** any time.

To return to the previous page press **ZERO**

50. ANALOG OUTPUT (OPTION)

The analog outputs (max 2) allow you to associate a channel (or the value TOTAL - sum of channels) an analog output current or voltage.

For each of the analog outputs can be defined:

- **The channel associated** :
  - from CH1 to CH2 (it depends on the number of channels configured)
  - TOTAL (present only if there are more than 1 channels)
  - OFF : the analog output is disable
- **Direction**: define the range of the analog output
  - **B**: The analog channel work in BIPOLAR mode.
    The middle value is 0kg.
  - **P**: the analog channel work only in the POSITIVE range of the channel
  - **N**: he analog channel work only n the NEGATIVE range of the channel
  - **I**: The analog channel work in BIPOLAR mode but an inverted scale.
    The middle value is 0kg.
  - **Type**:
  - +/-10V
  - 4..20mA
  - 0..20mA
  - 0..24mA
  - 0-5V
  - 0-10V
  - +/-5V
- **Full Scale (FS)** : in the current unit of the associated channel

Programming Examples:

Es. 1:   Associated Channel: CH1: Type +/-10V: Direction Bipolar: Full Scale: 10000kg
                CH1 = -10000kg   : Output = -10V
                CH1 = -5000kg   : Output =-5V
                CH1 = 0kg   : Output =0V
                CH1 = 5000kg   : Output =5V
                CH1 = 10000kg   : Output = 10V

Es. 2:   Associated Channel: CH1: Type +/-10V: Direction Positive: Full Scale: 10000kg
                CH1 = -10000kg   : Output = -10V
                CH1 = -5000kg   : Output = -10V
                CH1 = 0kg   : Output = -10V
                CH1 = 5000kg   : Output = 0V
                CH1 = 10000kg   : Output = 10V

Es. 3:   Associated Channel: CH1: Type +/-10V: Direction Negative: Full Scale: 10000kg
                CH1 = 10000kg   : Output = -10V
                CH1 = 5000kg   : Output = -10V
                CH1 = 0kg   : Output = -10V
                CH1 = -5000kg   : Output = 0V
                CH1 = -10000kg   : Output = 10V

Es. 4:   Associated Channel: CH1: Type 4-20mA: Direction Positive: Full Scale: 10000kg
                CH1 = -10000kg   : Output = 4mA
                CH1 = -5000kg   : Output = 4mA
                CH1 = 0kg   : Output = 4mA
                CH1 = 5000kg   : Output = 12mA
                CH1 = 10000kg   : Output = 20mA

Es. 5:   Associated Channel: CH1: Type 4-20mA: Direction Bipolar: Full Scale: 10000kg
                CH1 = -10000kg   : Output = 4mA
                CH1 = -5000kg   : Output = 8mA
                CH1 = 0kg   : Output = 12mA
                CH1 = 5000kg   : Output = 16mA
                CH1 = 10000kg   : Output = 20mA

Es. 6:   Associated Channel: CH1: Type 0-5V: Direction Bipolar: Full Scale: 10000kg
                CH1 = -10000kg   : Output = 0V
                CH1 = -5000kg   : Output = 1.25V
                CH1 = 0kg   : Output = 2.5V
                CH1 = 5000kg   : Output = 3.75V
                CH1 = 10000kg   : Output = 5V

Es. 7:   Associated Channel: CH1: Type 0-10V: Direction Positive: Full Scale: 10000kg

         CH1 = -10000kg   : Output = 0V

         CH1 = -5000kg   : Output = 0V

         CH1 = 0kg   : Output = 0V

         CH1 = 5000kg   : Output = 5V

         CH1 = 10000kg   : Output = 10V

The active parameter is shown in **REVERSE.**

To move inside the parameters press the keys ⬆ and ⬇.

To return to the **MAIN MENU** select by using ⬆ and ⬇ **QUIT** and confirm with **SET.**

⚠   The Full Scale is intended in the current unit of measurement. No automatically conversion is performed if you change the measurement unit for the channel

It is possible to calibrate the scale values and zero (meaning the intermediate value of the analog output) by accessing the calibration page (with the **SET** button).

The channel that will be calibrated is the one in editing when you have pressed the **SET** button.

⚠   This page is password protected and should be used only by trained personell.
     The password to access is : **7**

CALIBR. DAC 3	15-04-14
	08:17:07
Insert Password	
0	
Press ↓ to continue	
ZERO KEY : FATT = 1	
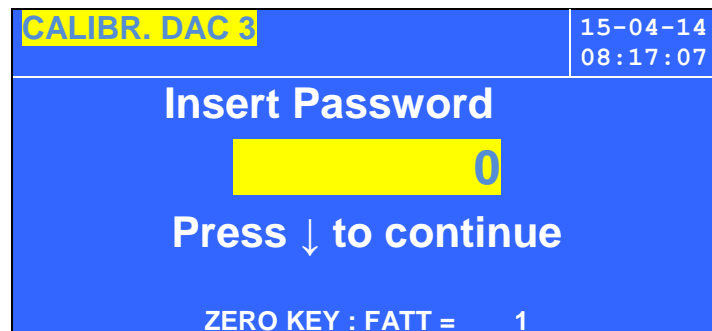
The calibration page of the analog channels is composed by the following menu :

- **OVERRANGE**   : YES – NOT   : only for voltage analog channel
- **CAL. ZERO**   : 0.0   : middle value Calibration
- **CAL. FS**   :   : Full Scale Calibration
- **USCITA**   : return to the previous page

Select the function by using ⬆ and ⬇ and confirm with **SET**.

OVERRANGE

Allows for the channels in Volts to have a margin of 10% more on the analog output (eg instead of 10V full scale as you will have 11V). This function is useful when there is a significant voltage drop on the cable of the analog output and you still want to respect the specification of full scale.

Selecting **YES** the function will be active.

CAL. ZERO

MP2_Plus_ simulates a load of 0.0.

The operator should measure with a multimeter the analog output of **MP2**_Plus._ and the desired value in V o mA.

Using the buttons ⬆ and ⬇ it is possible to change the analog output in order to obtain the desired value.

To confirm press **SET.**

CAL. FS

The **Full Scale (FS)** value will be caibrated

MP2_Plus_ simulates the same load as the Full Scale set.

The operator should measure with a multimeter the analog output of **MP2**_Plus._ and the desired value in V o mA.

Using the buttons ⬆ and ⬇ it is possible to change the analog output in order to obtain the desired value.

With the **ZERO** key it is possible to change the speed of variation of the analog output when you press ⬆ and ⬇

To confirm press **SET.**

51. SETPOINT

MP2 Plus allows to defines up to 5 **SETPOINT** values**.**

A **SETPOINT** is a threshold value that allows you to trigger an event such as the activation of an alarm via a relay contact (see chapter dedicated).

To prevent conditions of indecision, you can define a hysteresis value as shown in the figure.
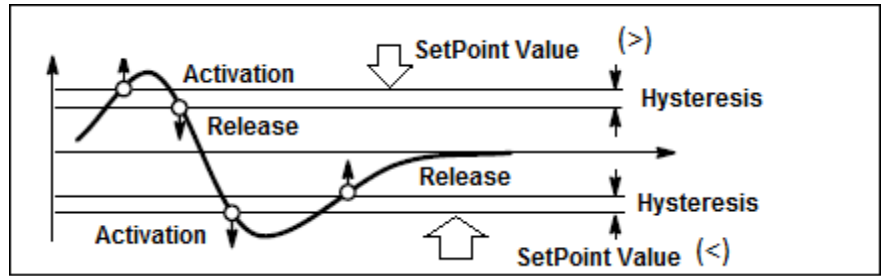
It is possible to define the ACTIVE STATUS of a SETPOINT for

- ➢ Load greater than the set value **(>)**. The SetPoint is activated for load greater than the set value and is release for a load less than the set value minus the hysteresis**.**
- ➢ Load less than the set value **(<)**. The SetPoint is activated for load less than the set value and is release for a load greater than the set value plus the hysteresis..
- ➢ Absolute loads greater than the set value (**A>).** The SetPoint is activated when the load is (as abosulte value) greater than the set value. The Setpoint is released when the load is less (as abosulte value) than the set value minus the hysteresis.
- ➢ Absolute loads less than the set value (**A<).** The SetPoint is activated when the load is (as abosulte value) less than the set value. The Setpoint is released when the load is greater (as abosulte value) than the set value plus the hysteresis.

Each of the 5 SETPOINT has an associated LED on the front panel which displays its state of activation.
When **MP2**Plus is configured with a number of channels greater than 1 can be associated with the reference channel. The channel can also be the function **TOTAL**.

⚠️ The function **TOTAL** perform the cumulative sum of the enabled channel
Check that all channel enabled to the TOTAL have the same measurement unit

⚠️ The SETPOINT and Hysteresys values intended in the current unit of measurement. No automatically conversion is performed if you change the measurement unit for the channel

Programming

CH	:	Reference Channel : Valid values : **1 – 2 – 3 – 4 - T** **T** = **TOTALE**
TYPE	:	> : the SETPOINT is activated for loads greater than the set Value
		< : the SETPOINT is activated for load less that the set value
		A> : the SETPOINT is activated for loads greater (in absolute value) than the set Value
		A< : the SETPOINT is activated for loads less (in absolute value) than the set Value
VALUE	:	SetPoint Value. It can be positive or negative
		The point position is according to the reference channel
HYSTER:	:	Hysteresis value. This value is always positive
		The point position is according to the reference channel

Select by using ⬆ and ⬇ the desired parameter (in REVERSE).
Change by using +/- the value**.**
To return to the **MAIN MENU** press **SET** any time.

⚠️ Use the **ZERO key** to change the FATT. value when you need to modify a value

52. RS232 COMMUNICATION AND PRINTER (OPTION)

This page allows you to change the setting of the RS232 serial port to make it compatible between communicating with a 24 column printer or enable the communication protocol with PC or PLC.

- **Mode :** ON DEMAND – CONTINUE – MANUAL TX – PRINTER - REPEATER
- **Baud Rate**: 9600 – 19200 – 38400 – 115200
- **Parity**: ODD – EVEN - NONE
- **STOP bit**: 1 – 2

Mode:
With this parameter you can set the operating mode of the RS232 port:
- **PRINTER**: the RS232 port is dedicated to the PRINTER (see dedicated chapter)
- **ON DEMAND**: the RS232 port is dedicated to the RS232 communication.
  To read data the HOST must requested values according to the communication protocol
- **CONTINUE** the RS232 port is dedicated to the RS232 communication.
  The transmission of the actal values is performed continuosly (without host request) at 10Hz
- **MANUAL TX:** In this mode **MP2***Plus* is programmed to transmit a value each time a function key **F1 – F2 – F3 – F4** is pressed. The function key must be set to this function : **TX DATA**.
  Alternatively, the transmission command can be given by a Digital Input
- **REPEATER:** In this mode **MP2***Plus* is programmed as REPEATER. The internal channels are no longer handled but displays the value received on the serial line such as another indicator **MP2***Plus* s. This mode can handled only one channel.
  All the features of the instruments are active except the **ZERO** function being passive viewing.
  When the repeater does not receive any data shows "--------".
  It is necessary that both the transmitter and receiver are programmed with identical parameters: Baud Rate parity and stop bits. The reception takes place always on 8 bits.

Baud Rate: It is possible to define the speed of data transmission between those indicated.

Parity: you can define the type of parity used to check transmission errors.

STOP bit: it is possible to define how many bits STOP used.

The number of bit for character is fixed : 8.

Select with ⬆ and ⬇ the parameter.
Change using **+/-** its value **.**
To return to the **MAIN MENU** press **SET** any time.

53. MODBUS COMMUNICATION (OPTION)

This page allows you to change the setting of the RS485 port with MODBUS-RTU (see chapter dedicated to the description of the protocol).
The RS-485 interface allows a bidirectional communication on a multipoint line and can be used to implement a local network of communication between a MASTER module and a series modules SLAVE.

The RS485 interface has the following advantages
- greater transmission speed
- length of the line - up to 1km
- 32 devices connected in multidrop on the same line
- differential transmission that reduces the influence of noise
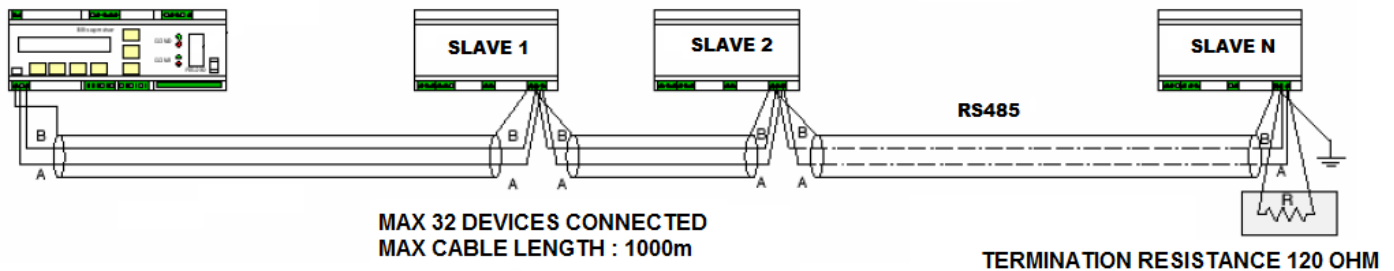
MODBUS-RTU is ne of the most popular protocol used in industrial communication. A lot of commercially instruments adopt this standard and major PLC allow you to create a network of slave.
Thats allow you to to connect on a single cable instrumentation of different nature.

MP2*Plus* parameters for the MODBUS communication are:

- **Address :** 1..127
- **Baud Rate**: 9600 – 19200 – 38400 – 115200
- **Parity**: ODD – EVEN - NONE
- **STOP bit**: 1 - 2

Address: define the address of **MP2***Plus*   inside the MODBUS network

Baud Rate: Select the Baud rate used inside your network.

Parity: you can define the type of parity used to check transmission errors.

STOP bit: it is possible to define how many bits STOP used.

The number of bit for character is fixed : 8.

Select with ⬆ and ⬇ the parameter.
Change using **+/-** its value **.**
To return to the **MAIN MENU** press **SET** any time.

54. KEY BLOCK

The KEY LOCK feature allows you to protect the current settings of **MP2***Plus* from unwanted changes.

When this feature is activated, you can enter the various programming menus to control the setting but can not change any parameter.

The condition of **KEY LOCK** is displayed via a dedicated LED on the front panel.
Select **KEY LOCK** in the Main Menu and confirm.
A password is required: **3101**

```
┌─────────────────────────────────────────┐
│ KEY LOCK                    15-04-14      │
│                             08:17:07      │
│        Insert Password                    │
│                          0                │
│        Press ↓ to continue                │
│                                           │
│        ZERO KEY : FATT =      1           │
└─────────────────────────────────────────┘
```
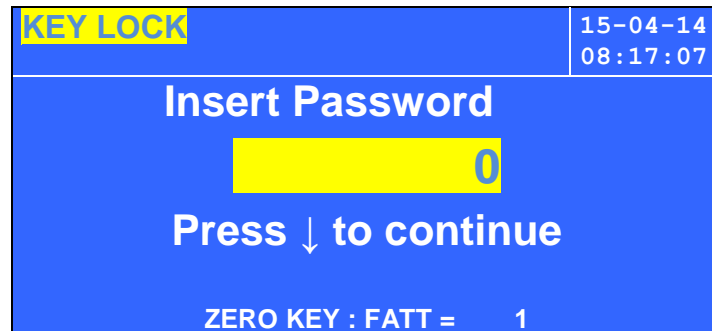
Press ⬇ to confirm.

⚠️ **The password confirmation need the ⬇ key.**
With the key **SET** return to the **MAIN MENU**

In the **KEY BLOCK** page you are asked for : **YES - NO**

Select **YES** to activate the function and press **SET** to exit.
Select **NO** to deactivate the function and press **SET** to exit.

55. CHANNEL ENABLE and Function TOTAL

This page (enabled only if the number of channels with which the instrument is configured is greater than 1) allows

- enable / disable the single channel display
- enable / disable for each channel the **ZERO** function
- define which channels contribute to the channel **TOTAL** (sum of channels)
- enable / disable the display of **TOTAL**

Sometime may be necessary to work with only a few channels and therefore do not need to appear in the **MAIN PAGE** all channels or is only interesting to have the **TOTAL** value and is not required to display the individual values.

The enabling / disabling the **ZERO** function allows to not execute the function of **ZERO** on those channels that have an absolute display (for example, pressure transducers or temperature).

⚠️ It should be highlighted that, although it is not enabled, a channel remains active and is continuously monitored, for example, for the management of SETPOINT and for any analogic associated outputs. Disabling is only applied to the display level.

For each connected channels you have to select:

ENABLE	: Enable status to visualization of the channel	: **YES / NO**
ZERO	**:** Enable status to **ZERO** funtion	: **YES / NO**
TOT	: Enable status to the **TOTAL** function	: **YES / NO**

For the **TOTAL**

TOT	: Enable status to visualizatin of the **TOTAL**	: **YES / NO**

```
CHANNEL ENABLE              15-04-14
                           08:17:07

              ENABLE   ZERO  TOT
CH 1 :        YES      YES   YES
CH 2 :        NO       YES   YES
TOT  :        YES
```

⚠️ The TOTAL is calculated as the sum of the selected channels.
The TOTAL adopts the position of the decimal point and the unit of measurement of the first channel enabled to the sum.

It is the operator's responsibility to ensure that the selected channels in the sum have a type and unit of measure between them consistently.

56. AUTO ZERO

The function of **AUTO ZERO** allows to automatically reset the output of a channel when its value is below a certain threshold within a defined period of time.

It is possible to enable / disable the function for each channel individually.

Within the defined time is to be checked that the measurement is below the threshold set. If this is the case the measurement is automatically reset.

The threshold should be considered in the current unit of measurement.
No conversion is performed by changing measurement unit.

AUTO ZERO			15-04-14
			08:17:07
	ENABLE	THRESHOLD	TIME
CH1 :	YES	0.3kg	5s
CH2 :	NO	0.3kg	10s

57. WIRELESS RF TRANSMSSION (Option)

MP2Plus can be optionally equipped with a transmitter of RF data that allows the transmission of the current value wireless.

The frequency of transmission of the current data can be set from 100ms to 5s (see menu: RF communication).
The carrier frequency, 433 MHz, makes secure and reliable communication even in the presence of other transmission systems such as mobile phones, walkie talkies, radio microphones, remote controls etc who normally work on other frequencies.
The transmission range is **~100m** in open space.

AEP transducers offers a complete package of reception consists of a receiver module with USB interface and a program **WinWIMOD** able to decode the data coming from **MP2Plus** but also by other modules **AEP transducers** wireless such as the load cells **WIMOD** to form a network of up to 32 wireless modules connected.

⚠️ Note: The transmission rate must be limited according to ETSI EN 300-200-1 standard that limits to 6 minutes per hour (10% duty cycle) the occupation of 433MHz band. Each data packet last about 3ms (3% duty cycle for 10Hz transmission rate).
To evaluate how much the RF band is occupied you must keep in count also of the number of modules in your network.

On this page you can change some of the parameters that affect the RF communication.

```
RF PARAMETERS                    15-04-14
                                 08:17:07

TX RATE    :    1s
RF POWER :     +10dBm
S/N        :    1234
```

RF Power :
Set the transmission power of **MP2Plus**. There are 4 possible levels:

                -10dBm,-2dBm,+6dBm,+10dBm.

Setting a power of +10dbm allow to transmit to a great distance

TxRate :
Select the transmission rate of **MP2Plus**.
It can be set among **100ms e 5.0s**

S/N:
Enter the last four digits of the serial number of the instrument as indicated by the data plate.
Serves to set the **MP2Plus** address inside the wireless communication network.

Select with ⬆ and ⬇ the parameter.
Change using **+/-** its value **.**

To return to the **MAIN MENU** press **SET** any time.

58. SERVICE
The **SERVICE** page allow to acces to protected for the maintenance of the instrument.
This page is reserved to **AEP transducers** personell only

59. CHANNELS SAVE

This feature allows you to save the settings of the channels creating a back-up copy.

It is advisable to do this only when the current configuration is validated.

It will be possible, in case of tampering involuntary settings go back to the last valid CONFIGURATION through the restore function.

This page is protected by a password . The password is **128.**

To return to the **MAIN MENU** press **SET** any time. To continue press ⬇

```
CHANNEL SAVE              15-04-14
                         08:17:07

     Insert Password

              0

  Press ↓ to continue
   ZERO KEY : FATT =      1
```

On the next page is requested a further confirmation to the execution of the operation.

On pressing the **SET** and having selected **YES** the copy backup will be created.

```
CHANNEL SAVE              15-04-14
                         08:17:07

       SAVE CHANNELS
   DO YOU WANT TO CONTINUE ?
      NO           YES
```

60. CHANNELS RESTORE

If they had made changes to the settings of the channels you do not want, you can revert to a previous valid copy.

This page is protected by a password . The password is **138.**

To return to the **MAIN MENU** press **SET** any time. To continue press ⬇

```
CHANNEL RESTORE           15-04-14
                         08:17:07

     Insert Password

              0

  Press ↓ to continue
   ZERO KEY : FATT =      1
```

On the next page is requested a further confirmation to the execution of the operation.

On pressing the **SET** and having selected **YES** the backup will be copied in the settings of all channels.

```
CHANNEL RESTORE           15-04-14
                         08:17:07

      RESTORE CHANNELS
   DO YOU WANT TO CONTINUE ?
      NO           YES
```

61. MODBUS COMMUNICATION PROTOCOL

For the communication parameters (address- baud rate and so on) see **MAIN MENU ➡MODBUS Communication**

MODBUS Functions applicable:
3 = Read Holding Register.
6 = Write Single Register.
16 = Write Multiple Registers.

Exception codes used:
- ILLEGAL FUNCTION   : code 1
- ILLEGAL DATA ADDRESS   : code 2
- ILLEGAL DATA VALUE   : code 3

REGISTERS

ADDRESS	MEANING	R/W	TYPE	NOTE
0	Channel 1 Value	R	4 byte floating point	(according to IEEE754)
2	Channel 2 Value	R	4 byte floating point	(according to IEEE754)
4	Channel 3 Value	R	4 byte floating point	(according to IEEE754)
6	Channel 4 Value	R	4 byte floating point	(according to IEEE754)
8	Total Value	R	4 byte floating point	(according to IEEE754)
10	Channel 1 Decimal point position	R/W	2 byte integer	See Table 1
11	Channel 2 Decimal point position	R/W	2 byte integer	See Table 1
12	Channel 3 Decimal point position	R/W	2 byte integer	See Table 1
13	Channel 4 Decimal point position	R/W	2 byte integer	See Table 1
14	Channel 1 Resolution	R/W	2 byte integer	See Table 2
15	Channel 2 Resolution	R/W	2 byte integer	See Table 2
16	Channel 2 Resolution	R/W	2 byte integer	See Table 2
17	Channel 3 Resolution	R/W	2 byte integer	See Table 2
18	Channel 1 Measurement Unit	R/W	2 byte integer	See Table 3
19	Channel 2 Measurement Unit	R/W	2 byte integer	See Table 3
20	Channel 3 Measurement Unit	R/W	2 byte integer	See Table 3
21	Channel 4 Measurement Unit	R/W	2 byte integer	See Table 3
22	Digital Filter	R/W	2 byte integer	0 .. 5
23	Acquisition Frequency	R/W	2 byte integer	See Table 4
24	Channel 1 Value	R	4 byte (32 bit value)	See Note 1
26	Channel 2 Value	R	4 byte (32bit value)	See Note 1
28	Channel 3 Value	R	4 byte (32 bit value)	See Note 1
30	Channel 4 Value	R	4 byte (32 bit value)	See Note 1
32	Total Value	R	4 byte (32 bit value)	See Note 1
34	ZERO Function	R/W	2 byte integer	0= ZERO Function Not Active 1= ZERO Function Active
35	PEAK Function	R/W	2 byte integer	0= NO PEAK Mode 1= PEAK + Active 2= PEAK - Active
36	Channel 1 Peak + Value	R	4 byte floating point	(according to IEEE754)
38	Channel 2 Peak + Value	R	4 byte floating point	(according to IEEE754)
40	Channel 3 Peak + Value	R	4 byte floating point	(according to IEEE754)
42	Channel 4 Peak + Value	R	4 byte floating point	(according to IEEE754)
44	Totale Peak + Value	R	4 byte floating point	(according to IEEE754)
46	Channel 1 Peak - Value	R	4 byte floating point	(according to IEEE754)
48	Channel 2 Peak - Value	R	4 byte floating point	(according to IEEE754)
50	Channel 3 Peak - Value	R	4 byte floating point	(according to IEEE754)
52	Channel 4 Peak - Value	R	4 byte floating point	(according to IEEE754)
54	Total Peak - Value	R	4 byte floating point	(according to IEEE754)

Notes

The measurement unit for each channel can be read using registers 18-21

The current value can be read in two different ways.
- In floating point IEEE754 (registers 0-8)
- As of 32-bit integer (long). (registers 24-32)

In this second case the values must be interpreted in the following way:

Suppose the actual value of a channel is : 123.456kg

The registers 24 to 30 contains this value as long integer : 123456
The registers 10 to 13 contains the point position. This value must be interpreted as a division factor

      0 means factor 1
      1 means factor 10
      2 means factor 100 and so on

Table 2 : Point Position

Code	Poin Position
0	########
1	######.#
2	#####.##
3	####.###
4	###.####
5	##.#####
6	#.######

Table 3 : Resolution

Code	Resolution
0	1
1	2
2	5
3	10
4	20
5	50
6	100

Tabella 4: Acquisition Frequency

Code	Acquisition Frequency
0	2.5
1	5
2	10
3	20
4	50
5	100
6	200
7	400
8	600
9	1200
10	2400
11	4800

62 RS232 COMMUNICATION PROTOCOL

For the communication parameters (baud rate and so on) see **MAIN MENU ➡RS232 Communication**

The character length is fixed to 8 bit.

<cr> = ASCII CHAR $(13) – Command Terminator
ACK = ASCII CHAR $(6) – Valid Command
'$' = ASCII CHAR $(36) – Start of command

NOTE:
When it is recognized a valid Write command the instrument answer with the message: **$00ACK<cr>.**
If the command is not valid no answer it is transmitted.
For read commands the number of characters X_i is equal to the number of channels connected to the instruments.

X_i is a single ASCII character

'0' : code 0	'1' : code 1	'2' : code 2	'3' : code 3
'4' : code 4	'5' : code 5	'6' : code 6	'7' : code 7
'8' : code 8	'9' : code 9	':' : code 10	';' : code 11
'<' : code 12	'=' : code 13	'>' : code 14	'?' : code 15

WRITE COMMANDS	MESSAGE	ANSWER	VALUE
ZERO ENABLE	$ZE00<cr>	$00ACK<cr>	
ZERO DISABLE	$ZD00<cr>	$00ACK<cr>	
PEAK DISABLE	$PE00<cr>	$00ACK<cr>	
PEAK+ ENABLE	$PE01<cr>	$00ACK<cr>	
PEAK - ENABLE	$PE02<cr>	$00ACK<cr>	
SET CHANNELS ENABLE STATUS NOTE: To enable the TOTAL at least 2 channels must be in the enable in the sum	AAX_1X_2X_3X_4$T<cr>	$00ACK<cr>	X_1: ='0' channel 1 disabled X_1: ='1' channel 1 enable X_2: ='0' channel 2 disabled X_2: ='1' channel 2 enable X_3: ='0' channel 3 disable X_3: ='1' channel 3 enable X_4: ='0' channel 4 disable X_4: ='1' channel 4 enable T: ='0' TOTAL disable T: = '1' TOTAL enabled
SET DIGITAL FILTER	$FD00NN<cr>	$00ACK<cr>	'NN' = '00' .. '05'
SET ACQUISTION FREQUENCY	$FF00NN<cr>	$00ACK<cr>	'NN' see table 4
SET RESOLUTION	RDX_1X_2X_3X_4$<cr>	$00ACK<cr>	'X_i' see table 3
SET MEAUREMENT UNIT	UIX_1X_2X_3X_4$<cr>	$00ACK<cr>	'X_i' see table 1
SET POINT POSITION	DPX_1X_2X_3X_4$<cr>	$00ACK<cr>	'X_i' see table 2
SET REPORT HEADER -ROW 1	$I100NNNNNNNNNNNNNNNNNNNN<cr>	$00ACK<cr>	'N' = 24 ASCII characters
SET REPORT HEADER -ROW 2	$I200NNNNNNNNNNNNNNNNNNNN<cr>	$00ACK<cr>	'N' = 24 ASCII characters
SET REPORT HEADER -ROW 3	$I300NNNNNNNNNNNNNNNNNNNN<cr>	$00ACK<cr>	'N' = 24 ASCII characters
MODE REPEATER 21 characters	$XXXXNNNNNNNNUUUUUU;<cr> 'NNNNNNNN' : 8 characters : the value to display 'XXXX' : 4 characters = 'CH1:' 'UUUUUU' : 6 characters : measurement unit '$' : 1 character = Start of string ';' : 1 character ';' <cr> : 1 character = carriage return		

READ COMMAND	MESSAGE	ANSWER
READ CHANNEL CONFIGURATION NOTE When the number of connected channels is 1 this command is not valid In all other cases the answer length is fixed to 8 characters	\$AS00?\<cr>	\$N $X_1X_2X_3X_4$T\<cr> : 'N' : ' 1'..'4' : number of channels configured X_1: ='0' channel 1 disabled X_1: ='1' channel 1 enable X_2: ='0' channel 2 disabled X_2: ='1' channel 2 enable X_3: ='0' channel 3 disable X_3: ='1' channel 3 enable X_4: ='0' channel 4 disable X_4: ='1' channel 4 enable T: ='0' TOTAL disable T: = '1' TOTAL enabled
DIGITAL FILTER	\$FD00?\<cr>	\$00NN\<cr> : 'NN' :' 00'..'05'
ACQUISTION FREQUENCY	\$FF00?\<cr>	\$00NN\<cr> : 'NN' see table 4
RESOLUTION Note TOTAL adopts the resolution of the first channel enabled in the sum	\$RD00?\<cr>	\$ $X_1X_2X_3X_4$\<cr> 'X_i' vedi tabella 3 The number of characters 'X_i' is equal to the number of the connected modules
MASUREMENT UNIT Note TOTAL adopts the unit of the first channel enabled in the sum	\$UI00?\<cr>	\$$X_1X_2X_3X_4$\<cr> '$X_i$' see table 1 The number of characters 'X_i' is equal to the number of the connected modules
ACTUAL VALUES NOTE The number of string 'Y_i' is equal to the number of the connected modules+ plus the TOTAL if enabled	\$DA00?\<cr>	\$ $Y_1Y_2Y_3Y_4$T\<cr> Each Yi is a 19 characters string 'CHX:' (note 1) : 4 characters ASCII X '1' a '4' 'NNNNNNNN' : 8ASCII char :measured value 'UUUUUU' : 6 ASCII char : measure unit ';' : 1 field separator
PEAK + NOTE The number of string 'Y_i' is equal to the number of the connected modules+ plus the TOTAL if enabled	\$PP00?\<cr>	\$ $Y_1Y_2Y_3Y_4$T\<cr> Each Yi is a 19 characters string 'CHX:' (note 1) : 4 characters ASCII X '1' a '4' 'NNNNNNNN' : 8ASCII char :measured value 'UUUUUU' : 6 ASCII char : measure unit ';' : 1 field separator
PEAK- NOTE The number of string 'Y_i' is equal to the number of the connected modules+ plus the TOTAL if enabled	\$PN00?\<cr>	\$ $Y_1Y_2Y_3Y_4$T\<cr> Each Yi is a 19 characters string 'CHX:' (note 1) : 4 characters ASCII X '1' a '4' 'NNNNNNNN' : 8ASCII char :measured value 'UUUUUU' : 6 ASCII char : measure unit ';' : 1 field separator
POINT POSITION Note TOTAL adopts the unit of the first channel enabled in the sum	\$DP00?\<cr>	\$ $X_1X_2X_3X_4$\<cr> 'N' see table 2 The number of characters 'X_i' is equal to the number of the connected modules
REPORT HEADER -ROW 1	\$I100?\<cr>	\$NNNNNNNNNNNNNNNNN\<cr> NNN : 24 ASCII char
REPORT HEADER -ROW 2	\$I200?\<cr>	\$NNNNNNNNNNNNNNNNN\<cr> NNN : 24 ASCII char
REPORT HEADER -ROW 3	\$I300?\<cr>	\$NNNNNNNNNNNNNNNNN\<cr> NNN : 24 ASCII Char

Note 1
For the TOTAL the string CHx is substituted by TOT:

63. USB COMMUNICATION PROTOCOL

The USB Communication is enabled only if the selection TYPE in the DATALOG PARAMETERS PAGE is set to : INTERNAL

The **MP2***Plus* USB communication is seen from the PC side just as a standard RS232 com port with the following setting.

Baud Rate : any valid value
Parity   : NO
Data Bit   : 8
Stop bit   : 1

The USB driver (in the CD MANUAL) must be installed before to establish a valid communication.

The communication commands are composed by 15 ASCII characters with the following formats :

<STX>ZYXXXXXXXXXXX<cr>

<STX> : 1carattere ASCII = '**$**' : start of command

Z: 1 carattere ASCII : define the command type

Y: 1 carattere ASCII : define the function inside the command type

XXXXXXXXXXX : **11 ASCII characters** : this contains the associated parameter

<cr> : carriage return: string terminator = 13 = 0xD

MP2*Plus* when recognized a valid command answer with a message. The message length depends on the command.
The **MP2***Plus* answer is in binary form and its length depends on the command itsself.
The first byte of the answer has the B7 (bit 7) set to 1.
The following bytes of the answer has the B7 (Bit 7) set to 0 .

Moreover i bit B7..B4 of the first byte define the SYNC code that define the number of byte of the answer.

Answer Format of **MP2Plus** to a valid command (N = number of bytes defined to the SYNC code)

BYTE N.	B7	B6	B5	B4	B3	B2	B1	B0	Comment
1		SYNC			X	X	X	X	B7.. B4 define the SYNC code . B7 always set to 1
2	0	X	X	X	X	X	X	X	
..	0	X	X	X	X	X	X	X	B7 set to 0
N	0	X	X	X	X	X	X	X	

SYNC = 8

Commands with SYNC=8 have a number of byte in the answer that can be computed as follow:

5* Number of channel enabled on the display +1

The commands with SYNC= 8 are used to transmit the values on the display in floating point (according to IEEE754)
Some bits are used to identify if some active or not.

BYTE N.	BIT 7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0	Comment
1	1	0	0	0	B7 Byte 3	B7 Byte 2	B7 Byte 1	B7 Byte 0	SYNC = 8 (1° channel)
2	0	BIT 6..BIT0 of Byte 0 float value						First 7 bits of Byte 0 float value	
3	0	BIT 6..BIT0 of Byte 1 float value						First 7 bits of Byte 1 float value	
4	0	BIT 6..BIT0 of Byte 2 float value						First 7 bits of Byte 2 float value	
5	0	BIT 6..BIT0 of Byte 3 float value						First 7 bits of Byte 3 float value	
..	0	0	0	0	B7 Byte 3	B7 Byte 2	B7 Byte 1	B7 Byte 0	
..	0	BIT 6..BIT0 of Byte 0 float value						First 7 bits of Byte 0 float value	
..	0	BIT 6..BIT0 of Byte 1 float value						First 7 bits of Byte 1 float value	
..	0	BIT 6..BIT0 of Byte 2 float value						First 7 bits of Byte 2 float value	
..	0	BIT 6..BIT0 of Byte 3 float value						First 7 bits of Byte 3 float value	
..	0	0	0	0	B7 Byte 3	B7 Byte 2	B7 Byte 1	B7 Byte 0	(channel n)
..	0	BIT 6..BIT0 of Byte 0 float value						First 7 bits of Byte 0 float value	
..	0	BIT 6..BIT0 of Byte 1 float value						First 7 bits of Byte 1 float value	
..	0	BIT 6..BIT0 of Byte 2 float value						First 7 bits of Byte 2 float value	
..	0	BIT 6..BIT0 of Byte 3 float value						First 7 bits of Byte 3 float value	
5*n+1	0	0	0	D	P+	P	H	Z	Z=1 : Zero Active H=1: Hold Active P=1: PEAK Active P+= 1 = PEAK+ Active P+= 0 = PEAK- Active D=1: Datalogging running

Each floating point value can be built as described in the table below.

Float	B7	B6	B5	B4	B3	B2	B1	B0
0	Bit 0 –Byte 1	BIT 6 .. BIT 0 - byte 2						
1	Bit 1 –Byte 1	BIT 6 .. BIT 0 - byte 3						
2	Bit 2 –Byte 1	BIT 6 .. BIT 0 - byte 4						
3	Bit 3 –Byte 1	BIT 6 .. BIT 0 - byte 5						

64. SOFTWARE EXAMPLES

In the followings examples in C and Visual Basic it is explained how to built the floating point values .
In this example just 1 channel is considered

Example in C
RxBuffer is serial buffer. Indice is the index inside RxBuffer that contains the SYNC code.

```
float GetFloat(int Indice)
{
union{
unsigned char Byte[4];
float F;
} L;
        L.Byte[0]=RxBuffer[Indice+1] & 0x7f;
        L.Byte[1]=RxBuffer[Indice+2] & 0x7f;
        L.Byte[2]=RxBuffer[Indice+3] & 0x7f;
        L.Byte[3]=RxBuffer[Indice+4] & 0x7f;
        if (RxBuffer[Indice+0] & 0x01) L.Byte[0] |=0x80;
        if (RxBuffer[Indice+0] & 0x02) L.Byte[1] |=0x80;
        if (RxBuffer[Indice+0] & 0x04) L.Byte[2] |=0x80;
        if (RxBuffer[Indice+0] & 0x08) L.Byte[3] |=0x80;
        return L.F;
}
```

Example In Visual Basic
```
Imports System.Runtime.InteropServices
<StructLayout(LayoutKind.Explicit)> Public Structure FloatStruct
  <FieldOffset(0)> Public MyFloat As Single
  <FieldOffset(0)> Public MyByte1 As Byte
  <FieldOffset(1)> Public MyByte2 As Byte
  <FieldOffset(2)> Public MyByte3 As Byte
  <FieldOffset(3)> Public MyByte4 As Byte
End Structure
Dim MioRect As FloatStruct
Public MyBuffInt(10000) As Byte

If MsComm1.BytesToRead >= 6 Then
  MsComm1.Read(MyBuffInt, 0, MsComm1.BytesToRead)
  For Indice=0 to MsComm1.BytesToRead
      If  (MyBuffInt(Indice) and &HF0) = &H80  then
              MioRect.MyByte1 = MyBuffInt(Indice+1) and &h7f
              MioRect.MyByte2 = MyBuffInt(Indice+2) and &h7f
              MioRect.MyByte3 = MyBuffInt(Indice+3) and &h7f
              MioRect.MyByte4 = MyBuffInt(Indice+4) and &h7f
              if (MyBuffInt(Indice+0) and &h01) then
                      MioRect.MyByte1 = MioRect.MyByte1 or &h80
              End if
              if (MyBuffInt(Indice+0) and &h02) then
                      MioRect.MyByte2 = MioRect.MyByte2 or &h80
              End if
              if (MyBuffInt(Indice+0) and &h04) then
                      MioRect.MyByte3 = MioRect.MyByte3 or &h80
              End if
              if (MyBuffInt(Indice+0) and &h08) then
                      MioRect.MyByte4 = MioRect.MyByte4 or &h80
              End if
…………………
MioRect.MyFloat contain the required value
```

SYNC = 9

The commands with SYNC=9 have a answer of 15 bytes.

Byte 2 of the answer is the same of the field Z of the command

Byte 3 of the answer is the same of the field Y of the command

BYTE N.	BIT 7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0	Comment
1	1	0	0	1	0	0	0	0	SYNC = 9
2	Command								field Z of the command
3	Function								field Y of the command
4	………………..								The meaning inside this byte depends on the command
….	………………..								See their description
…..	………………..								
15	………………..								

SYNC = 11

The commands with SYNC=9 have a answer of 34 bytes.

Byte 2 of the answer is the same of the field Z of the command

Byte 3 of the answer is the same of the field Y of the command

Byte from 4 to 34 contains 31 ASCII characters with the string required

BYTE N.	BIT 7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0	Comment
1	1	0	1	1	0	0	0	0	SYNC = 11
2	Command								field Z of the command
3	Function								field Y of the command
4	Character 1								
……	………………..								31 ASCII characters with the string required
……	………………..								
34	Character 31								

SYNC = 12

The commands with SYNC=9 have a answer of 10 bytes.

It is us ed to transmit an integer value 64 bits (long long type).

To decode this value it is necessary to follows the same procedure used for floatin point values

BYTE N.	BIT 7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0	Comments
1	1	1	0	0	BIT7 Byte 3	BIT7 Byte 2	BIT7 Byte 1	BIT7 Byte 0	SYNC = 12
2	0	BIT 6..BIT0 of Byte 0 long long value							First 7 bits of Byte 0 long long value
3	0	BIT 6..BIT0 of Byte 1 long long value							First 7 bits of Byte 1 long long value
4	0	BIT 6..BIT0 of Byte 2 long long value							First 7 bits of Byte 2 long long value
5	0	BIT 6..BIT0 of Byte 3 long long value							First 7 bits of Byte 3 long long value
6	0	BIT 6..BIT0 of Byte 4 long long value							First 7 bits of Byte 4 long long value
7	0	BIT 6..BIT0 of Byte 5 long long value							First 7 bits of Byte 5 long long value
8	0	BIT 6..BIT0 of Byte 6 long long value							First 7 bits of Byte 6 long long value
9	0	BIT 6..BIT0 of Byte 7 long long value							First 7 bits of Byte 7 long long value
10	0	0	0	0	BIT7 Byte 7	BIT7 Byte 6	BIT7 Byte 5	BIT7 Byte 4	

SYNC = 13

SYNC 13 commands have a variable length. The are used only to transmit datapacket during a download of a datalog cycle

The number of byte depens on the number of channel used during the datalog cycle and on if the Datalog has benn performed in manual mode or not (acquisition at regular interval).

It is possible to know if the Datalog has been performed in MANUAL mode or not using the commands : **Read Last DataLog DATA (1 of 3)**

Regular Interval Acquisitions

Number of bytes transmitted: 5*(Number of channels+1)

The value related to each channel is transmitted in floating point on 5 bytes as already descripted for commands with SYNC 8

It is added a further package of 5 byte that contains the index of the point of Datalog that is transmitted: format long integer (32 bit).

In the example below it is assumed a Datalog cycle with 4 channels
Number of bytes transmitted : 5*(4+1) = 25 bytes

BYTE N.	BIT 7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0	Comment
1	1	1	0	1	B7 Byte 3	B7 Byte 2	B7 Byte 1	B7 Byte 0	SYNC = 13 Byte 1-5 1st data record
2	0	BIT 6..BIT0 of Byte 0 float of the first record							First 7 bits of Byte 0 float value
3	0	BIT 6..BIT0 of Byte 1 float of the first record							First 7 bits of Byte 1 float value
4	0	BIT 6..BIT0 of Byte 2 float of the first record							First 7 bits of Byte 2 float value
5	0	BIT 6..BIT0 of Byte 3 float of the first record							First 7 bits of Byte 3 float value
6	0	0	0	0	B7 Byte 3	B7 Byte 2	B7 Byte 1	B7 Byte 0	Byte 6-10 2nd Data record
7	0	BIT 6..BIT0 of Byte 0 float of the second record							First 7 bits of Byte 0 float value
8	0	BIT 6..BIT0 of Byte 1 float of the second record							First 7 bits of Byte 1 float value
9	0	BIT 6..BIT0 of Byte 2 float of the second record							First 7 bits of Byte 2 float value
10	0	BIT 6..BIT0 of Byte 3 float of the second record							First 7 bits of Byte 3 float value
11-15	3rd record : the format is the same of the second record								Byte 11-15 3rd Data Record
16-20	4th record : the format is the same of the second record								Byte 16-20 4th Data Record
21	0	0	0	0	B7 Byte 3	B7 Byte 2	B7 Byte 1	B7 Byte 0	Byte 41-45 Data Packet Index
22	0	BIT 6..BIT0 of Byte 0 long of data packet index							First 7 bits of Byte 0 long value
23	0	BIT 6..BIT0 of Byte 1 long of data packet index							First 7 bits of Byte 1 long value
24	0	BIT 6..BIT0 of Byte 2 long of data packet index							First 7 bits of Byte 2 long value
25	0	BIT 6..BIT0 of Byte 3 long of data packet index							First 7 bits of Byte 3 long value

Manual Acquisition

Number of bytes transmitted: 5*(Number of channels +2)

In a Datalog with Manual acquisition the time in which any point is occured is variable. This information is added to packed

The value related to each channel is transmitted in floating point on 5 bytes as already descripted for commands with SYNC 8

The time information is transmitted in floating point on 5 bytes and contains the elapsed time respect the start of the DataLog. The risolution is 10ms.

It is added a further package of 5 byte that contains the index of the point of Datalog that is transmitted: format long integer (32 bit).

In the example below it is assumed a Datalog cycle with 4 channels
Number of bytes transmitted : 5*(4+2) = 30 bytes

BYTE N.	BIT 7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0	Comment
1	1	1	0	1	B7 Byte 3	B7 Byte 2	B7 Byte 1	B7 Byte 0	SYNC = 13 Byte 1-5 1st data record
2	0	BIT 6..BIT0 of Byte 0 float of the first record							First 7 bits of Byte 0 float value
3	0	BIT 6..BIT0 of Byte 1 float of the first record							First 7 bits of Byte 1 float value
4	0	BIT 6..BIT0 of Byte 2 float of the first record							First 7 bits of Byte 2 float value
5	0	BIT 6..BIT0 of Byte 3 float of the first record							First 7 bits of Byte 3 float value
6	0	0	0	0	B7 Byte 3	B7 Byte 2	B7 Byte 1	B7 Byte 0	Byte 6-10 2nd Data record
7	0	BIT 6..BIT0 of Byte 0 float of the second record							First 7 bits of Byte 0 float value
8	0	BIT 6..BIT0 of Byte 1 float of the second record							First 7 bits of Byte 1 float value
9	0	BIT 6..BIT0 of Byte 2 float of the second record							First 7 bits of Byte 2 float value
10	0	BIT 6..BIT0 of Byte 3 float of the second record							First 7 bits of Byte 3 float value
11-15	3rd record : the format is the same of the second record								Byte 11-15 3rd Data Record
16-20	4th record : the format is the same of the second record								Byte 16-20 4th Data Record
21	0	0	0	0	B7 Byte 3	B7 Byte 2	B7 Byte 1	B7 Byte 0	Byte 21-25 : Acquisition Time (s)
22	0	BIT 6..BIT0 of Byte 0 float of the second record							First 7 bits of Byte 0 float value
23	0	BIT 6..BIT0 of Byte 1 float of the second record							First 7 bits of Byte 1 float value
24	0	BIT 6..BIT0 of Byte 2 float of the second record							First 7 bits of Byte 2 float value
25	0	BIT 6..BIT0 of Byte 3 float of the second record							First 7 bits of Byte 3 float value
26	0	0	0	0	B7 Byte 3	B7 Byte 2	B7 Byte 1	B7 Byte 0	Byte 41-45 Data Packet Index
27	0	BIT 6..BIT0 of Byte 0 long of data packet index							First 7 bits of Byte 0 long value
28	0	BIT 6..BIT0 of Byte 1 long of data packet index							First 7 bits of Byte 1 long value
29	0	BIT 6..BIT0 of Byte 2 long of data packet index							First 7 bits of Byte 2 long value
30	0	BIT 6..BIT0 of Byte 3 long of data packet index							First 7 bits of Byte 3 long value

65. READ COMMANDS

READ COMMAND: Actual Values

Command : **$C000000000000<cr>**

MP2*Plus* Answer: 5*Number of channels enabled+1 bytes   :   SYNC = 8

Actual Values are transmitted.

The measurement Units associated with the values can be read using th command Read Current Settings

Along with the current value is transmitted status information such as

- Zero On
- Peak On
- Hold On
- Datalogging Running

Compare the paragraph describing the commands with SYNC = 8

READ COMMAND: PEAK + Values.

Command : **$CD00000000000<cr>**

MP2*Plus* Answer: 5* Number of channels enabled +1 bytes :   SYNC = 8

Positive Peak values are transmitted.

The measurement Units associated with the values can be read using th command Read Current Settings

This command is meaningfull only if **MP2***Plus* is in Peak Mode

READ COMMAND: PEAK - Values.

Command : **$CE00000000000<cr>**

MP2*Plus* Answer: 5* Number of channels enabled +1 bytes :   SYNC = 8

Negative Peak values are transmitted.

The measurement Units associated with the values can be read using th command Read Current Settings

This command is meaningfull only if **MP2***Plus* is in Peak Mode

READ COMMAND: Read Current setting of Channel K.

Command : **$C1K0000000000<cr>**   **K : '1' ..'4'**

MP2*Plus* Answer: 15 bytes :   SYNC = 9

Byte 0 : 0x90

Byte 1 : 'C'

Byte 2 : '1'

Byte 3 : K

Byte 4 : Point position   : binary value 0..5

Byte 5 : type of input : binary value : 0=mV/V : 1=+/-10V : 2 = 4-20mA : 3 = 0-20mA 4=+/-5V

Byte 6 : 1 : the channel is enabled for the TOTAL - 0 : the channel is not enabled for the TOTAL

Byte 7 : Measurement Unit : binary value : see table 1

Byte 8: Resolution : binary value : see table 2

Byte 9 : reserved

Byte 10: Calibration Type : binary value 0..2 : 0 = FULL SCALE – 1 = KNOWN WEIGHT – 2 = POINT INTERPOLATION

Byte 11: Sign : 0-1 : 0 = STANDARD - 1 = INVERTED

Byte 12: Channel type : binary value : 0 = FORCE : 1=PRESSURE : 2=TORQUE : 3=DISPLACEMENT : 4= TEMPERATURE

Byte13: FULL SCALE Unit : binary value : see table 1

Byte 14: reserved

READ COMMAND: Read Instrument Serial Number.

Command: **$C400000000000<cr>**

Answer: 15 bytes :   SYNC = 9

Transmit some info on the **MP2***Plus*.

Byte 0 : 0x90

Byte 1 : 'C'

Byte 2 : '4'

Byte 3 : Number of channel connected **MP2***Plus*: ASCII value: 1..4

Byte 4 : Enabled status of channel 1 : ASCII value: '1' enabled : '0' : disabled

Byte 5 : Enabled status of channel 2 : ASCII value: '1' enabled : '0' : disabled
Byte 6 : Enabled status of channel 3 : ASCII value: '1' enabled : '0' : disabled
Byte 7 : Enabled status of channel 4 : ASCII value: '1' enabled : '0' : disabled
Byte 8 : reserved
Byte 9 -10 : 'M2' : 2 ASCII characters : 'M2' is the identification code of the instrument
Byte 11..14 : 4 ASCII characters with the serial number.

READ COMMAND: READ Firmware Version.

Command: **$CF00000000000<cr>**

Answer : 15 bytes :   SYNC = 9
Byte 0 : 0x90
Byte 1 : 'C'
Byte 2 : 'F'
Byte 3 : reserved
Byte 4 : reserved
Byte 5 : 1 byte binary : Acquisition Frequency : see table 4
Byte 6 : 1 byte binary : Digital Filter code : 0-5
Byte 7 .. 14 : 8 ASCII characters : firmware version of **MP2*Plus*.** Example: 'Ver: 1.0'

READ COMMAND: Read the FULL SCALE of the channel k

Command : **$C5K0000000000<cr>**   K : '1' ..'4'

 MP2*Plus* Answer: 6 bytes :   SYNC = 8
The full scale of the channel k will be transmitted

READ COMMAND: Report Header.

Commands :
$CA00000000000<cr> : 1° Row
$CB00000000000<cr> : 2° Row
$CC00000000000<cr> : 3° Row
Answer: 34 bytes :   SYNC = 11
Byte 0 : 0xB0
Byte 1 : 'C'
Byte 2 : 'A' for 1°row - 'B' for 2° row - 'C' for 3° row
Byte 3 .. 26: 24 ASCII characters with the row required
Byte 27..33: always 0 binary

READ COMMAND: Read SetPoint Value

Command: **$CGY0000000000<cr>**
'Y' : 1 character : number of the SetPoint : 1..5
Answer: 6 bytes :   SYNC = 8
The SetPoint value asked will be transmitted

READ COMMAND: Read Hysteresis Value

Command: **$CHY0000000000<cr>**
'Y' : 1 character : number of the Hysteresis : 1..5
Answer: 6 bytes :   SYNC = 8
The Hysteresis value asked will be transmitted

66. WRITE COMMANDS.

Write commands allow you to change the parameters of the active channel and the instrument configuration.
They typically have an answer according to SYNC 10 with the indication of whether the command was successfully accepted.
SYNC = 10
The commands with SYNC=10 have a answer of 4 bytes.
Byte 2 of the answer is the same of the field Z of the command
Byte 3 of the answer is the same of the field Y of the command
It is used to have just a confirmation that the command has been received and executed

BYTE N.	BIT 7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0	Comment
1	1	0	1	0	0	0	0	0	SYNC = 10
2				Command					Field Z of the command
3				Function					Field Y of the command
4	0	0	0	0	0	0	0	R	R=1

WRITE COMMAND: Set Point Position for channel K.
Command: **\$L0K000000000X<cr>**   **K : 1..4**
Answer: 4 bytes : SYNC = 10
'X' = 1 ASCII character : Point Position '0'..'5' : see table 2

WRITE COMMAND: Set Acquisition Frquency.
Command: **\$L1000000000XX<cr>**
Answer: 4 bytes : SYNC = 10
'XX' : 2 ASCII Characters   : see table 4 for the XX codes

WRITE COMMAND: Set Digital Filter.
Command: **\$L20000000000X<cr>**
Answer: 4 bytes : SYNC = 10
'X' = 1 ASCII Character: Digital Filter '0'..'5'

WRITE COMMAND: Set Measurement Unit for channel K.
Command: **\$L3K00000000XX<cr>**
Answer: 4 bytes : SYNC = 10

'XX' = 2 ASCII characters: see tables 1 for the codes.

WRITE COMMAND: Set Resolution for channel K.
Command: **\$L4K000000000X<cr>**
Answer: 4 bytes : SYNC = 10
'X' = 1 ASCII character: see table 3 for the X code

WRITE COMMAND: Set Channels Enable Status
This command is valid only if the instrument is configured with a number of channels greater than 1
Command: **\$LE$X_1X_2X_3X_4$T$S_1S_2S_3S_4$00<cr>**
Answer: 4 bytes : SYNC = 10

'X_i' = 1 ASCII character: **enable status for channel i**   **: '1' enable**   **'0': disable**
'T' = 1 ASCII character: **enable status for Total**   **: '1' enable**   **'0': disable**
'S_i' = 1 ASCII character: **enable status for the channel i to the Total**   **: '1' enable**   **'0': disable**

WRITE COMMAND: Set Report Header.

Each of the 3 report row is composed by 24 characters
To set each row it is necessary to send 3 different commands.

Commands :
$LFCCCCCCCCCC0<cr>:Set characters 1..20 row 1
$LGCCCCCCCCCC0<cr>:Set characters 11..20 row 1
$LH000000CCCC0<cr>:Set characters 21..24 row 1

$LICCCCCCCCCC0<cr>: Set characters 1..20 row 2
$LJCCCCCCCCCC0<cr>:Set characters 11..20 row 2
$LK000000CCCC0<cr>:Set characters 21..24 row 2

$LLCCCCCCCCCC0<cr>:Set characters 1..20 row 3
$LMCCCCCCCCCC0<cr>:Set characters 11..20 row 3
$LN000000CCCC0<cr>:Set characters 21..24 row 3

Answer: 4 bytes :   SYNC = 10

WRITE COMMAND: Set ZERO and ZERO OFF .

Command: **$A0000000000X<cr>**
Answer: 4 bytes :   SYNC = 10

'X' : 1 ASCII character
X = '1' : Perform a new ZERO
X= '0' : Remove the ZERO (ZERO OFF) .

WRITE COMMAND: Set PEAK mode.

Command: **$A1000000000X<cr>**
Answer: 4 bytes :   SYNC = 10

'X' : 1 ASCII character
X= '0' : Remove PEAK mode (PEAKOFF).
X = '1' : Set the Mode PEAK+
X = '1' : Set The Mode PEAK-

WRITE COMMAND: Set HOLD e HOLD OFF .

Command: **$A2000000000X<cr>**
Answer: 4 bytes :   SYNC = 10
'X' : 1 ASCII character
X = '1' : Set the mode HOLD ON
X= '0' : Remove the mode HOLD (HOLD OFF).

WRITE COMMAND: Set SetPoint Value .

Command: **$LSYXXXXXXXXXX<cr>**
Answer: 4 bytes: SYNC = 10
'Y': 1 ASCII character: number of the SetPoint to be changed : '1'-'5'
'XXXXXXXXXX' = 10 ASCII characters with the SetPoint Value

WRITE COMMAND: Set Hysteresis Value .

Command: **$LTYXXXXXXXXXX<cr>**
Answer: 4 bytes: SYNC = 10
'Y': 1 ASCII character: number of the Hysteresis to be changed : '1'-'5'
'XXXXXXXXX' = 10 ASCII characters with the Hysteresis Value

67. CONTINUOS TRANSMITTING MODE

MP2 *Plus* can be set to transmit values in continuos mode without the need for the host to require data. This allows to send data at the maximum speed.

This mode is useful when you want to record a program for managing all the values acquired by the instrument in dynamic applications, for example when you want to record the progress of peak torque wrench generated by a snap or a body in free fall.

This mode is enabled when is sent the command: **'$A30000000000X'<cr>**

Where 'X' is a ASCII character with the following meaning

                'X' = '0' : Start continuous mode
                'X' = '1' : Polling
                'X' = '2' : Stop continuous mode

Risposta: 4 bytes :   SYNC = 10

Note : With 'X'='1' **MP2** *Plus* does not transmit any aswer

With 'X' = '0 'starts the continuous transmission mode.
MP2 *Plus* confirms the command with the response with SYNC = 10 and starts transmitting the values according to the protocol SYNC 8 (identical to the one received with the command $C00000000000<cr>).

To keep alive this mode the host must send, at least every 1-2 seconds, the polling command to confirm it wants to continue this mode.

MP2 *Plus* returns to normal communication mode or by sending the command Stop Continuous Mode or when **MP2** *Plus* does not receive data for at least 5 seconds.

68. COMMAND for DATA LOGGER MANAGEMENT

READ COMMAND : Read DATA LOGGER setting.

Command: **$D000000000000<cr>**
Answer: 15 bytes :   SYNC = 9

Byte 0 : 0x90
Byte 1 : 'D'
Byte 2 : '0'
Byte 3 : binary value : 0=> Internal Data Logger : 10=> Data Logger On Flash Memory
Byte 4: binary value: Storage interval

0=> Manual	1=>0.5s	2=>1sec	3=>2sec	4=>3sec	5=>5sec
6=>10sec	7=>15sec	8=>20sec	9=>30sec	10=>45sec	11=>1min
12=>2min	13=>3min	14=>5min	15=>10min	16=>15min	17=>20min
18=>45min	19=>60min	20=>1ora	21=>2ore	22=>3ore	23=>5ore
24=>10ore	25=>12ore	26=>18ore	27=>24ore		

Byte 5: binary value: Threshold type: 0 => '>="   1 => '<='
Byte6: binary value: TOTAL TIME : day (0..99)
Byte7: binary value: TOTAL TIME : ore (0..24)
Byte 8: binary value: TOTAL TIME : minuti (0..60)
Byte 9: binary value: TOTAL TIME : secondi (0..60)
Byte 10-11-12-13: binary value 32 bit in floating point :   Threshold (IEEE754)
Byte 14: binary value: Reference channel for the Threshold

READ COMMAND: Read Last DataLog Cycle Parameters (1 di 3).

Command: **$D100000000000<cr>**
Answer: 15 bytes :   SYNC = 9

Byte 0 : 0x90
Byte 1 : 'D'
Byte 2 : '1'
Byte 3-4-5-6 : binary value integer long 32 bit : number of points stored
Byte 7: Year of cycle start   : 00=> 2000
Byte 8: Month of cycle start   : 1..12
Byte 9: day of cycle start   : 1..31
Byte 10: hour of cycle start   : 0..23
Byte 11: minutes of cycle start : 0..59
Byte 12: seconds of cycle start : 0..59
Byte 13: binary value : Stoeing interval

0=> Manual	1=>0.5s	2=>1sec	3=>2sec	4=>3sec	5=>5sec
6=>10sec	7=>15sec	8=>20sec	9=>30sec	10=>45sec	11=>1min
12=>2min	13=>3min	14=>5min	15=>10min	16=>15min	17=>20min
18=>45min	19=>60min	20=>1ora	21=>2ore	22=>3ore	23=>5ore
24=>10ore	25=>12ore	26=>18ore	27=>24ore		

Byte 14: binary value : 1..5 : number of channels stored during Datalog

Note :
If there is no Datalog cycle stored the number of points stored is 0
In this case the other parameters have no meaning

READ COMMAND: Read Last DataLog Cycle Parameters (2 di 3).

Command: **$D200000000000<cr>**
Answer: 15 bytes :   SYNC = 9

Byte 0 : 0x90
Byte 1 : 'D'
Byte 2 : '2'
Byte 3 : binary value : CH1: Channel Type: see below for codes
Byte 4 : binary value: CH1: Measurement Unit : see table 1
Byte 5 : binary value: CH1: Point Position : see table 2
Byte 6 : binary value: CH2: Channel Type: see below for codes
Byte 7 : binary value: CH2: Measurement Unit : see table 1
Byte 8 : binary value: CH2: Point Position : see table 2
Byte 9 : binary value: CH3: Channel Type: see below for codes
Byte 10 : binary value: CH3: Measurement Unit : see table 1
Byte 11: binary value: CH3: Point Position : see table 2
Byte 12 : binary value: CH4: Channel Type: see below for codes
Byte 13 : binary value: CH4: Measurement Unit : see table 1
Byte 14: binary value: CH4: Point Position : see table 2

Channel Type
CH1 : 0 = WIMOD-FORCE : 1=WIMOD-PRESSURE : 2=WIMOD-TORQUE : 3=WIMOD:DISPLACEMENT 4:JET-FORCE :
5:JET-PRESSURE

READ COMMAND: Read Last DataLog Cycle Parameters (3 di 3).

Comando: **$D300000000000<cr>**
Risposta: 15 bytes :   SYNC = 9

Nota 1: Questi dati hanno significato solo se esiste già un ciclo di DataLog Memorizzato
Byte 0 : 0x90
Byte 1 : 'D'
Byte 2 : '3'
Byte 3 : binary value: TOT: Channel Type: see below for codes
Byte 4 : binary value: TOT: Measurement Unit : see table 1
Byte 5 : binary value: TOT: Point Position : see table 2
Byte 6 : binary value: channel index of first channel : 1..5
Byte 7 : binary value: channel index of second channel : 1..5
Byte 8 : binary value: channel index of third channel : 1..5
Byte 9 : binary value: channel index of fourth channel: 1..5
Byte 10 : binary value: channel index of fifth channel : 1..5
Byte 11: 0
Byte 12: 0
Byte 13: 0
Byte 14: 0

SET COMMAND: Set Data Logger Parameters.

Command: **$D400000000000<cr>**
Answer: 4 bytes :   SYNC = 10

Byte 0 = '$'
Byte 1 = 'D'

Byte 2 = '4'
Byte 3 : binary value : 0..4: reference channel for the threshold parameter
Byte 4 : binary value : Storing Interval

0=> Manual	1=>0.5s	2=>1sec	3=>2sec	4=>3sec	5=>5sec
6=>10sec	7=>15sec	8=>20sec	9=>30sec	10=>45sec	11=>1min
12=>2min	13=>3min	14=>5min	15=>10min	16=>15min	17=>20min
18=>45min	19=>60min	20=>1hour	21=>2hours	22=>3hours	23=>5hours
24=>10hours	25=>12hours	26=>18hours	27=>24hours		

Byte 5: binary value   : Threshold Type: 0 => '>="   1 => '<='
Byte 6: binary value   : Total Time: days   : 0..99
Byte 7: binary value   : Total Time: hours   : 0..24
Byte 8 binary value   : Total Time: minutes : 0..60
Byte 9: binary value   : Total Time: seconds : 0..60
Byte 10-11-12-13: floating point value (IEEE754)   Threshold Value

Command : Start DataLog Cycle.

Command: **$D300000000001<cr>**
Answer: 4 bytes :   SYNC = 10

Command : Stop DataLog Cycle.

Command: **$D400000000000<cr>**
Answer: 4 bytes :   SYNC = 10

Command: Read DataLog Total Time.

Command: **$D900000000000<cr>**
Answer: 10 bytes :   SYNC = 12

It is transmitted as long long integer value 64bit (8 bytes) the time, in steps of 10 ms, of the duration of the log
This command can also be used during a datalog cycle to determine the progress of the cycle.

How to DownLoad a DataLog cycle

In this section we analyze how to download a cycle of Datalog.

You can not run a download with a datalog cycle in progress.
This condition can be monitored with the command **Read Actual Value**
A download cycle begins with a command of **StartDownload** and ends with a command **AbortDownload** or when
MP2*Plus* has no more data to send .
Each data packet received corresponds to one points of storage and it is transmitted with SYNC = 13 .
The data Packet is composed by (6*Number of Channels) bytes
First (5*Number of Channels) bytes contain the measurements points for each channel used in the Datalog.
Th data of each channel is transmitted in floating point (IEEE754) on 5 bytes according to the encoding described for
the data received with SYNC = 8.
The last 5 bytes of storage corresponds to the index has been sent.
The index storage is a integer binary value on 32bit and is incremented by 1 for each received packet.

For every packet received from the program checks the consistency of the data received (for example, the index
storage must match the sequence number of the received packets) .

In the case of valid control will be sent to the command **SendNextItem**.
This enables **MP2*Plus*** to transmit a new data record .
Otherwise, the host will send the **RepeatLastItem** command that instructs **MP2*Plus*** to repeat the transmission of the
record.

The determination of the time in which it was made the storing is done taking into account that the storage itself is
made by **MP2*Plus*** at regular intervals.

With the command **Read DataLog Total Time** it is read the time in steps of 10ms of the duration of Log .

With the command **Read DataLog Total Time** is read the number of recordings performed in the Datalog .

So if
- i = the index of storing a given packet
- Number of Storage = number recordings performed
- Total Time = total length of the log in steps of 10ms

the time T (i) in seconds at which it occurred are :

$$T (i) = Number\ of\ Storage\ /\ (TotalTime/100\ )\ *\ i$$

DATALOG with Manual Storing

In the case of manual storage the time for each acquisition point is transmitted directly by **MP2***Plus* .

The data Packet is composed by (7*Number of Channels) bytes

First (5*Number of Channels) bytes contain the measurements points for each channel used in the Datalog.
The data of each channel is transmitted in floating point (IEEE754) on 5 bytes according to the encoding described for the data received with SYNC = 8.
Then Data Packet contain the Time information in floating point (IEEE754) in 10ms steps
The last 5 bytes of storage corresponds to the index has been sent.

Start Download Command.

Command: **$D700000000000<cr>**
Answer: 45 bytes :   SYNC = 13

MP2*Plus* **answer with the first data packet with** SYNC13.

Comando di SendNext Item.

Command: **$D900000000000<cr>**
Answer: 45 bytes :   SYNC = 13

MP2*Plus* **answer with the next data packet with SYNC 13**

Repeat Item Command.

Comando: **$DA00000000000<cr>**
Risposta: 45 bytes :   SYNC = 13

MP2*Plus* **answer with the last data packet with SYNC 13**

Abort Download Command.

Command: **$D800000000000<cr>**
Answer 4 bytes :   SYNC = 10

Stop the Download DataLog Command

69. REAR PANEL CONNECTORS

On the rear panel are two connectors 18 pins each.
The size of the connecting wires is for sections up to 1mm^2

To wire a wire, hold with a suitable tool within the rectangular window and insert the wire into the corresponding hole.
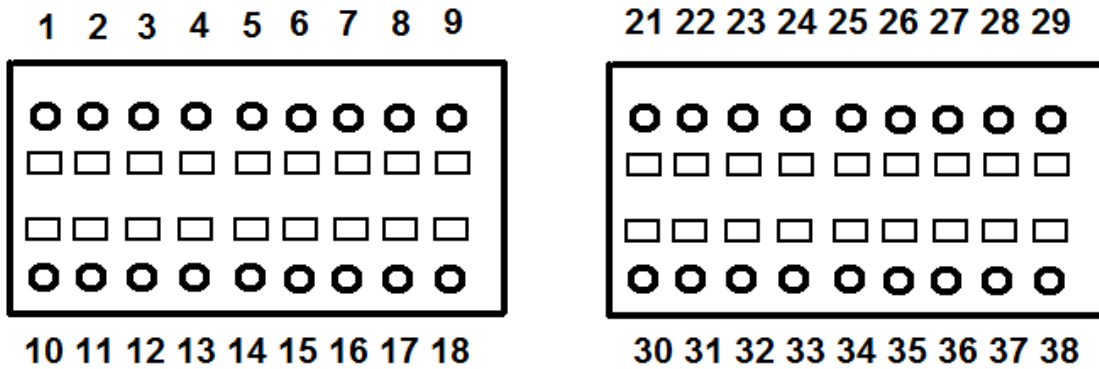
Connectors PINOUT

1	INPUT1-DI1	IN		21	RELE2-NO	OUT
2	INPUT3-DI3	IN		22	RELE3-COM	OUT
3	INPUT2-DI2	IN		23	RELE2-NC	OUT
4	INPUT4-DI4	IN		24	RELE3-NC	OUT
5	RS232-TX	OUT		25	RELE3-NO	OUT
6	RS232-RX	IN		26	RELE4-COM	OUT
7	DI-COM			27	RELE4-NC	OUT
8	RS485-D+	IN/OUT		28	RELE4-NO	OUT
9	RS485-D-	IN/OUT		29	RELE5-COM	OUT
10	VOut2	OUT		30	RELE2-COM	OUT
11	VOut1	OUT		31	RELE1-NO	OUT
12	IOut1	OUT		32	RELE1-NC	OUT
13	IOut2	OUT		33	IOut3	OUT
14	GND			34	IOut4	OUT
15	GND			35	RELE1-COM	OUT
16	VOut4	OUT		36	GND	OUT
17	VOut3	OUT		37	RELE5-NO	OUT
18	20Vdc	OUT		38	RELE5-NC	OUT

⚠ Before making any wiring you must turn off the instrument.

70. RS232C INTERFACE and PRINTER CONNECTION (OPTION)

Maximum recommended distance : 13m.
For the connections to the printer side please refer to the documentation provided with the printer itsself

Printer Suggested:
Desktop CUSTOM type NESO with RS232 interface
Desktop CUSTOM type KUBE with RS232 interface
Desktop Brother type QL1050 with RS232 interface

⚠ **CAUTION**: Before you use the printer to must verify the printer settings, it is possible that you have to change some printer configuration like the communication parameters, font , printer speed and other parameters. **CHECK** the configuration with the instructions on the printer's manual

For the retrieval of paper rolls contact local providers of office supplies.
AEP transducers does not handle this type of material consumption.

GND	15
TX	5
RX	6
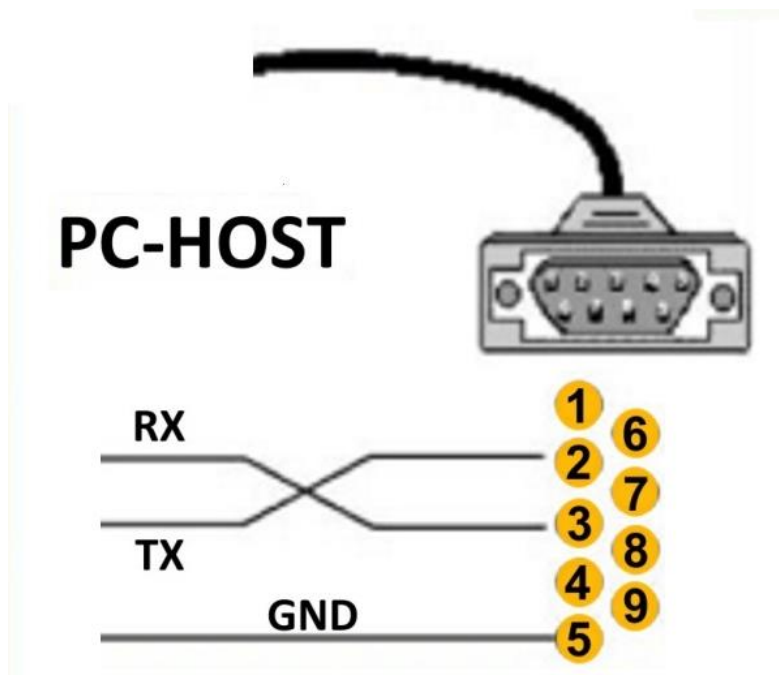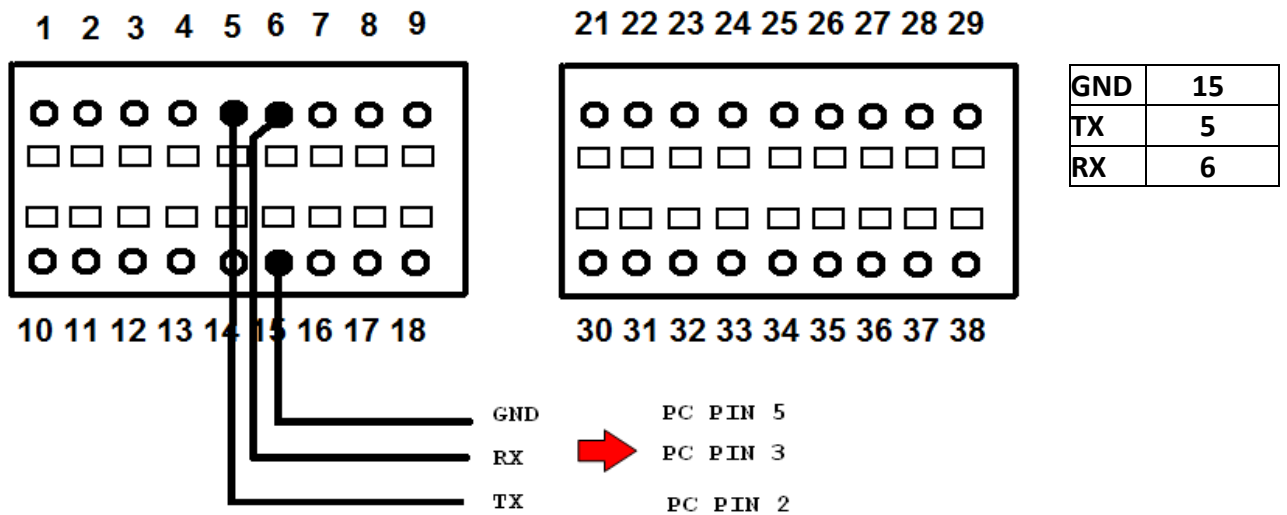
71. RS485 INTERFACE CONNECTION (MODBUS) (OPTION)

Maximum recommended distance   : 1000m
Max Number of module connected   : 32

The pin 15 of connector is GND and can be used as a further connection to have a reference GND.

GND	15
D-	9
D+	8
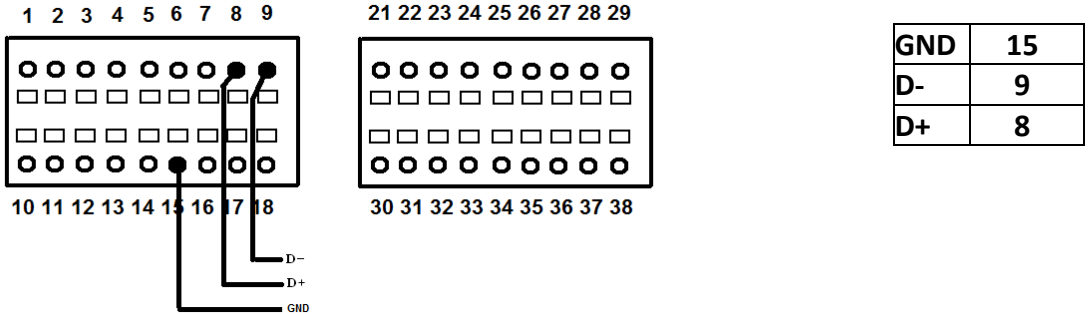
In the case of multi-drop connections you need to insert two terminating resistors of 120Ohm each (see figure below). These two resistors are placed at the ends of the physical line.

For connection is recommended to use shielded cables with pair data D + and D- twisted.
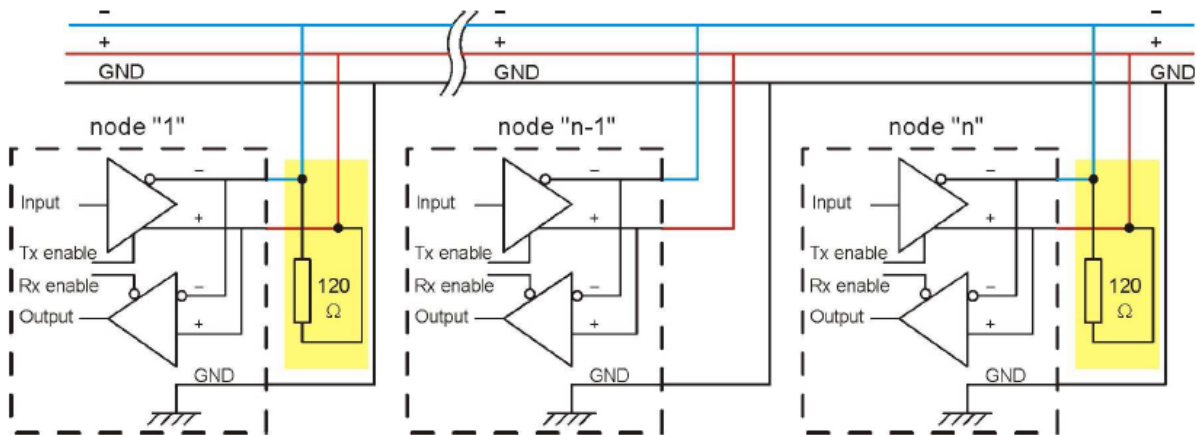
To avoid that there may be random fluctuations of voltage in the RS485 line induced by external disturbances be useful to include termination resistors Rb as in the figure.

These are particularly useful when all drivers are disconnected from the bus. In this case, the logic level is indeterminate and this can cause false signals on the receivers. Values of Rb can be around 600 ohms whereas a supply voltage of 5Vdc
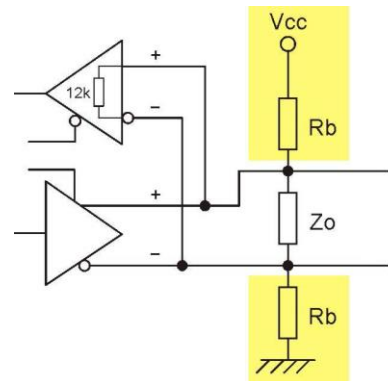
72. 24V DIGITAL INPUT CONNECTION

MP2 Plus has 4 optically isolated digital inputs 24Vdc.

The connection of the digital input is shown below
DICOM is the GND reference for the inputs.

Connect the input as below if the power supply for the digital
input is external.
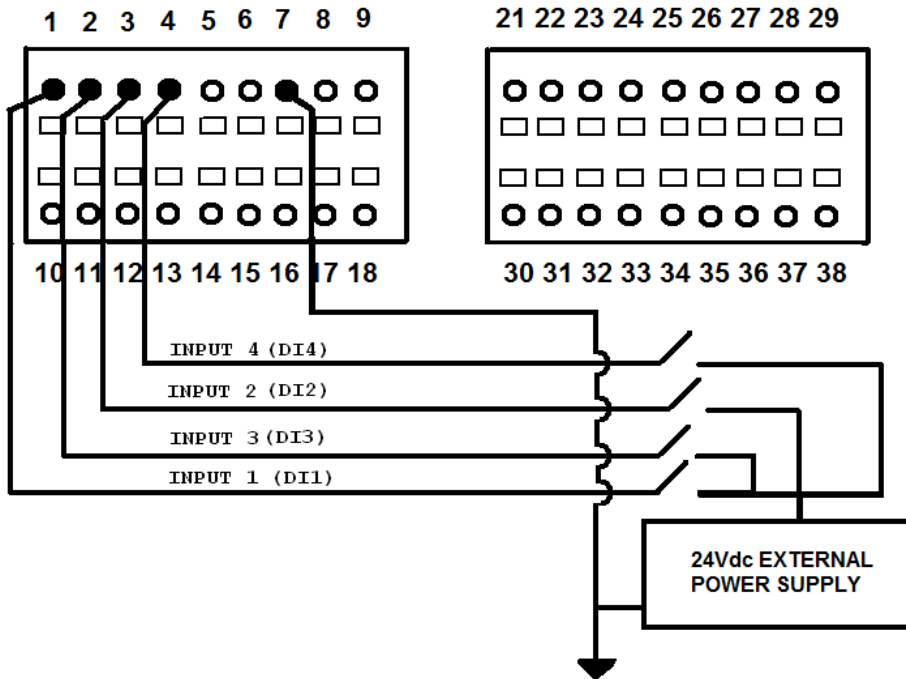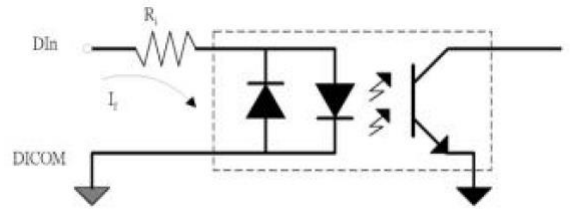
If, however, it is sufficient to use the inputs as simple switches (see figure below) a simpler connection can be used
(see the figure below) .
Pin 18 is a 20Vdc that can be used to power the digital inputs.
In this case you must also connect DICOM to GND (pin 15).
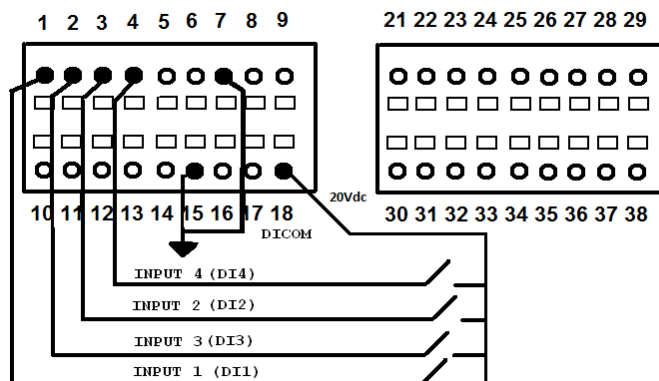
73. RELAY CONNECTION (5° RELE' Options)

MP2_Plus_   have 4 (5 in option) relays output in DPDT form
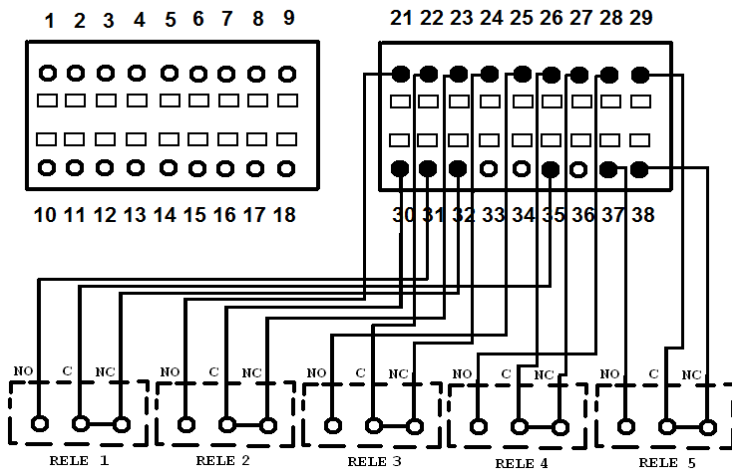
RELE1 COM	**35**
RELE1 NO	**31**
RELE1 NC	**32**
RELE2 COM	**30**
RELE2 NO	**21**
RELE2 NC	**23**
RELE3 COM	**22**
RELE3 NO	**25**
RELE3 NC	**24**
RELE4 COM	**26**
RELE4 NO	**28**
RELE4 NC	**27**
RELE5 COM	**29**
RELE5 NO	**37**
RELE5 NC	**38**

74. ANALOG OUTPUT CONNECTION (OPTION)

MP2_Plus_ can have in option up to 2 analog output. The analog signal can be in current or voltage .

Voltage Output: 0-5V   0-10V   +/-10V   +/-5V   : max load 20 mA @1kΩ
Current Output: 0-20mA   4-20mA   0-24mA
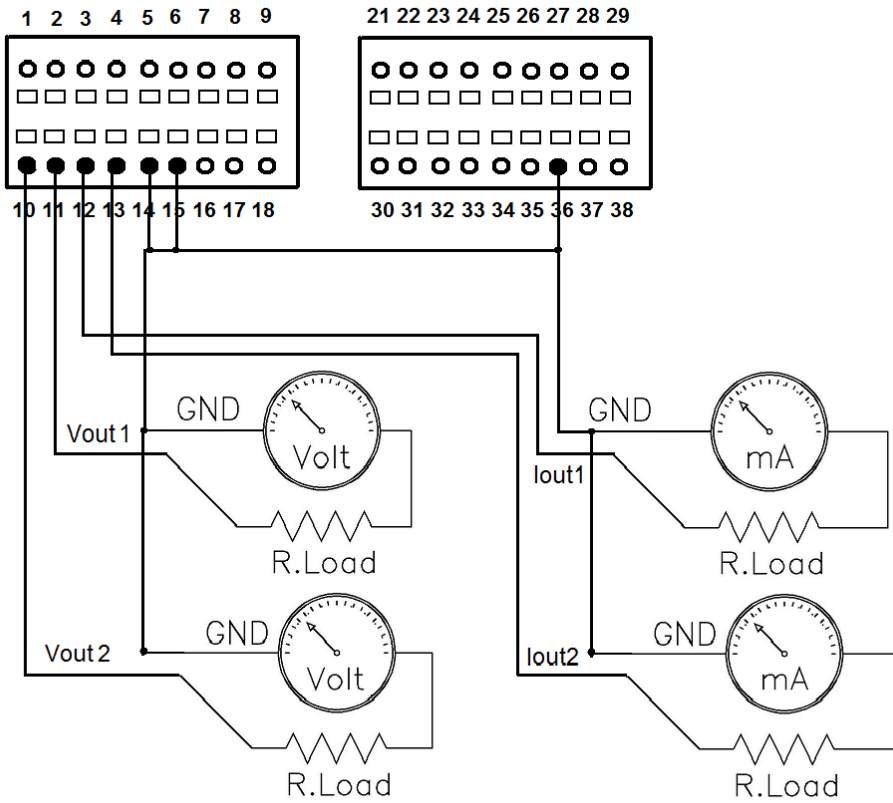
GND	14
GND	15
GND	36
IOut1	12
IOut2	13
VOut1	11
VOut2	10

75. Transducers and Load Cells Connections

For each of the channels on the back there is a female DB9 connector dedicated to the connection of the transducers both type strain gauge that amplified.
The pinout of each connector is as follows

PIN	Strain Gauge	Amplified trasd. (V o mA)	Potenziometers	PT100
1	Signal +			
2	Signal -			
3	Exictation +		Power Supply+ (5Vdc)	
4	Excitation -			
5		GND	GND	In-
6		Signal	Signal	In+
7		Power Supply+ (20Vdc)		
8	Sense +			
9	Sense -			

Carefully follow the instructions provided in this manual in the following pages according to the transducer to be connected.
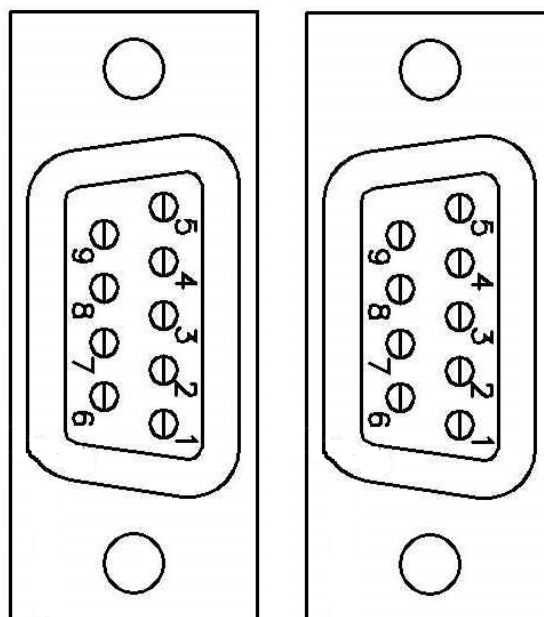
76. Load Cells Connections

The load cells can be connected in configuration to 4 or 6 wires.
To manage signals coming from the load cells **MP2**Plus has a board. Within this board you can find a DIP switch SW1 for configuring the connection type for the respective channels CH1-CH2.
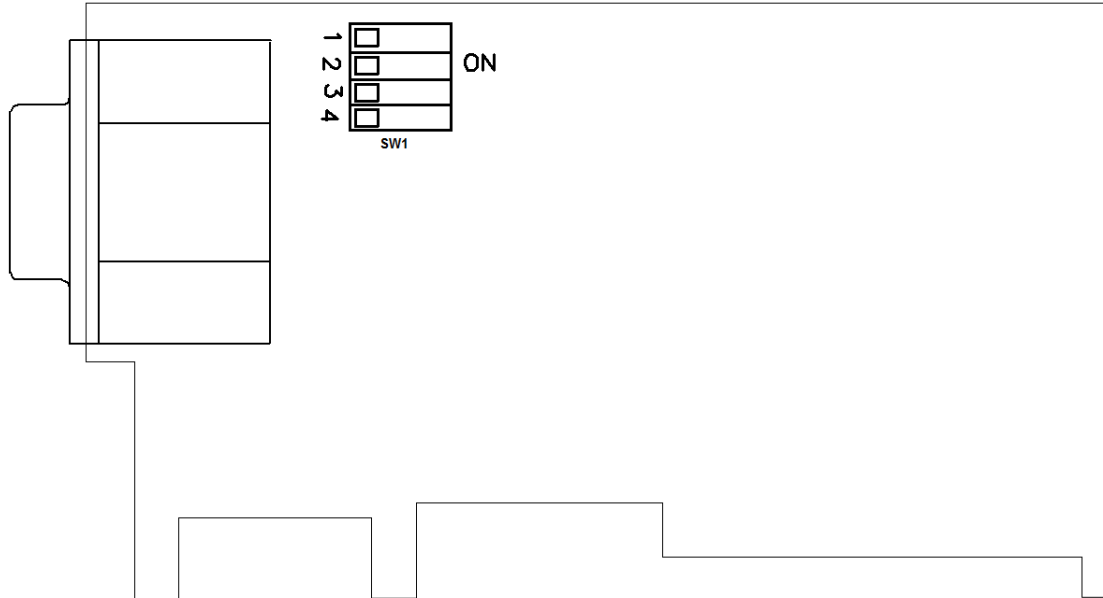
Each channel can be configured to 6 or 4 wires independently from the other channels.

The instrument is supplied by default in the configuration in the 4-wire connection for all channels with DIP-SWITCH on the ON position.

BOARD CH1-CH2
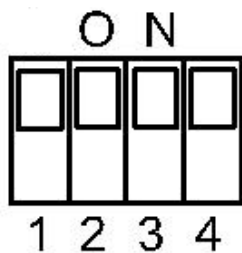
Default Configuration

In the case of 6-wire connection **MP2**Plus needs to be configured as follows:
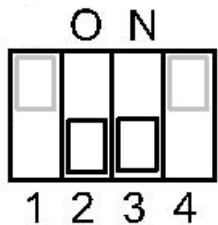
To select the connection of the CH1 load cell to 6-wire bring DIP-SW 2 and 3 of the board in the OFF position.
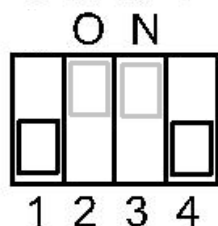
To select the connection of the CH2 load cell to 6-wire bring DIP-SW 1 and 4 of the board in the OFF position.

Connect the cable **SHIELD** to the metallic body of the connector **(DB9 male) as shown below**

SCHERMO protetto con guaina
SHIELD protected with jacket

Schermo saldato al corpo del connettore
Shield welded to the body of the connector
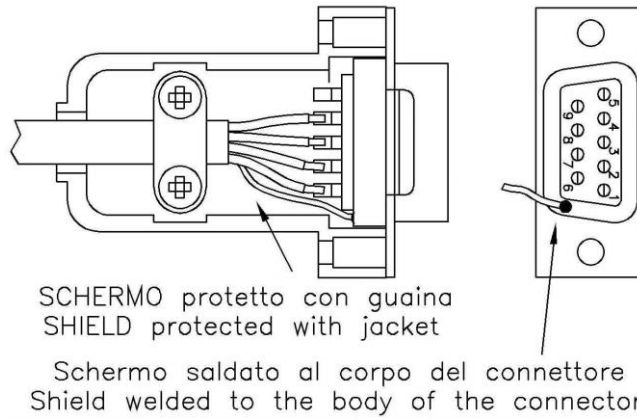
4 wires connection

1 = SIGNAL+	: White wire
2 = SIGNAL-	: Yellow wire
3 = EXCITATION+	: Red Wire
4 = EXICITATION-	: Black Wire

6 wires onnection

1 = SIGNAL+	: white wire
2 = SIGNAL-	: Yellow wire
3 = EXCITATION+	: Red wire
4 = EXCITATION-	: Black wire
8= SENSE+	: Orange wire
9= SENSE-	: Blue wire
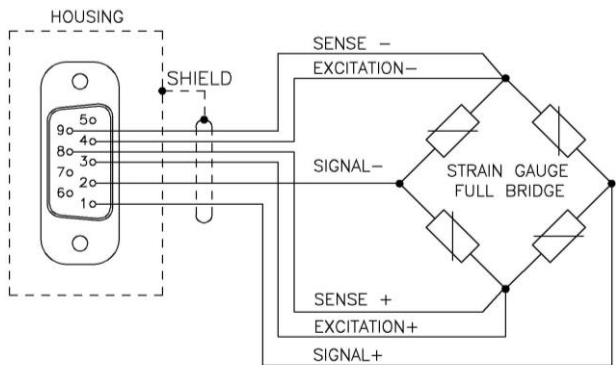
Note : Colors are referred to a **AEP transducers** standard.

77. Amplified Transducers (Voltage or Current)

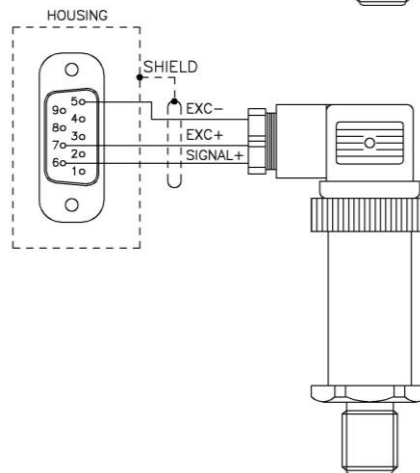**2 wires 4÷20mA e 0÷20mA Transmitters**
Pin 6 = SIGNAL+
Pin 7 = EXC+

Note : EXC+ Power Supply : 20Vdc
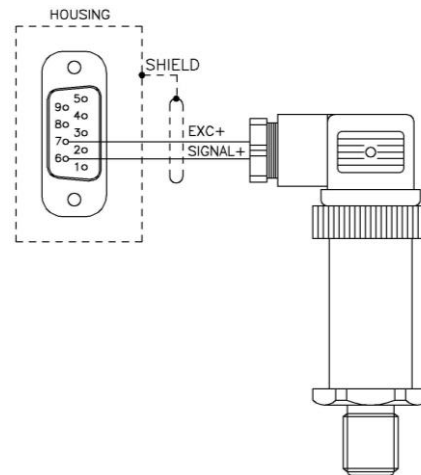
3 wires 4÷20mA, ±5Volt, ±10Volt, 0-20mA Transmitters
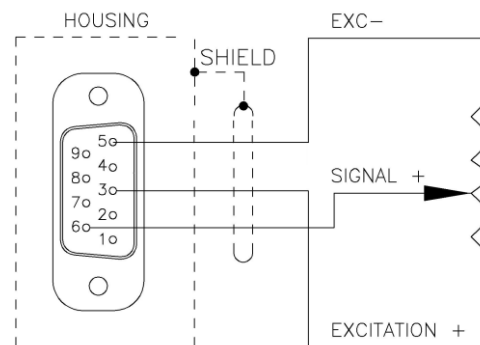Pin 5 = EXC- (**GND**)
Pin 6 = SIGNAL+
Pin 7 = EXC+

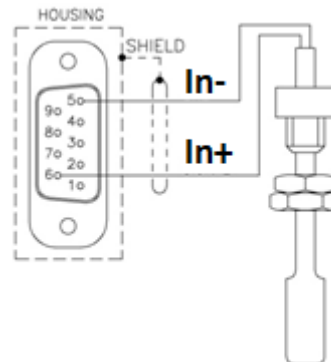## Note : EXC+ Power Supply: 20Vdc

Potenziometer Input

Pin 3 = EXC+
Pin 5 = EXC- (**GND**)
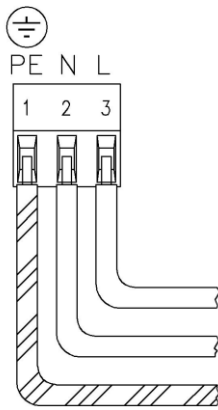Pin 6 = SIGNAL+

Note : Power Supply EXC+ : 5Vdc

78. Temperature PT100 Connection

Pin 5 = In-
Pin 6 = In+

79. Power Supply Connections

Power Supply 115/230Vac
1 = Earth (PE)
2 = Phase N
3 = Phase L

Power Supply 24Vdc
1 = Hearth (PE)
2 = 0 Volt (-AL)
3 = 24Volt (+AL)

⚠ *To ensure safety rules, an external fuse for each net feeding phase (N and L) **must be** installed .*

⚡	**EXTERNAL FUSES:** **2 x 100mA 250V Fast**