

DAT 400

Digital Transmitter

TECHNICAL MANUAL

For Analog/Profibus/Devicenet versions



Software version PW13081

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PRECAUTIONS

READ this manual BEFORE operating or servicing the instrument.

FOLLOW these instructions carefully.

SAVE this manual for future use.



CAUTION

The installation and maintenance of this instrument must be allowed to qualified personnel only.

Be careful when you perform inspections, testing and adjustment with the instrument on.

Perform the electrical connections in the absence of the power supply

Failure to observe these precautions may be dangerous.

DO NOT allow untrained personnel to work, clean, inspect, repair or tamper with this instrument.

INTRODUCTION

The DAT 400 is a transmitter of weight to be combined with the load cells to detect the weight in every situation.

The module is easy to install and can be mounted on 35 mm DIN rail.

The display allows easy reading of the weight, the status of the instrument, the setting parameters and errors.

The 4 keys located below the display allow the operator to perform the functions of ZERO, TARE, GROSS/NET switching, setting of the setpoints weight, setting and tare both theoretical than real.

The DAT 400 uses the serial port RS232 with ASCII and Modbus RTU protocols for connecting to a PC, PLC and remote units. In parallel with the RS232, a USB port available.

They are always available 2 programmable weight setpoints and the control of the maximum weight value reached (peak).

The RS422/RS485 serial output allows you to connect up to 32 addressable devices.

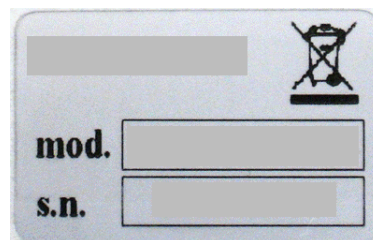
The availability of the most common fieldbuses, as an alternative to the RS422/RS485 port, also allows the transmitter to interface with any supervision device currently offered by the market.

Available versions:

DAT 400: weight transmitter with serial output RS232 (USB), RS485 and Peak function. Supported protocols are Modbus RTU, continuous, slave and the ones upon request. Two programmable setpoints, 2 inputs and Peak function.

- **DAT 400/A:** version with the analog output.
- **DAT 400/PROFIBUS:** weight transmitter with serial output RS232 and PROFIBUS DP.
- **DAT 400/DEVICENET:** weight transmitter with serial output RS232 and DEVICENET.

IDENTIFICATION PLATE OF THE INSTRUMENT



It's important to communicate this data in the event of a request for information or information concerning the instrument together with the program number and version that are shown on the cover of the manual and are displayed when the instrument is switched on.



WARNINGS

The following procedures must be performed by qualified personnel.

All connections must be performed when the instrument is switched off.

TECHNICAL FEATURES

| | |
|------------------------------------|--|
| Power supply | 24 Vdc \pm 15 % |
| Max. absorption | 5W |
| Insulation | Class II |
| Installation category | Cat. II |
| Operating temperature | -10°C ÷ +40°C (max. humidity 85% non-condensing) |
| Storage temperature | -20°C ÷ +50°C |
| Weight display | Numerical 6 red led digits and 7 segments (h 14 mm) |
| Led | 4 LEDs of 3 mm |
| Keyboard | 4 mechanical keys |
| Overall dimensions | 106 mm x 58 mm x 90 mm (l x h x w) |
| Installation | Brackets for DIN profile section or OMEGA bar |
| Case material | self-extinguishing Noryl (UL 94 V1) |
| Connections | Screw terminal boards, pitch 5.08 mm |
| Load cells power supply | 5 Vdc/120mA (max 8 cells of 350W in parallel), short-circuit protected |
| Input sensitivity | 0.02 mV min. |
| Linearity | 0.01% of the full scale |
| Temperature drift | 0.001% of the full scale / °C |
| Internal resolution | 24 bits |
| Resolution of the weight displayed | Up to 60,000 divisions on the net capacity |
| Measurement range | -0.5 mV/V to +3.5 mV/V |
| Frequency of weight capture | 5 Hz - 50 Hz |
| Digital filter | To be selected from 0.2 Hz to 25 Hz |
| Number of weight decimals | 0 ÷ 3 decimal places |
| Zero calibration and full scale | Automatic (theoretical) or executable from the keyboard. |
| Logic outputs | 2 opto-isolated (dry contact), max 24Vdc / 60 mA each |
| Logic inputs | 2 opto-isolated at 24 Vdc PNP (external power supply) |
| Serial port (# 2) | RS232C, RS422/RS485 and USB (in parallel) |
| Maximum cable length | 15m (RS232) and 1000m (RS422 and RS485) |
| Serial protocols | ASCII, Modbus RTU |
| Baud rate | 2400, 9600, 19200, 38400, 115200 to be selected |
| Program code memory | 64 Kbytes FLASH on-board reprogrammable from RS232 |
| Data memory | 2 Kbytes |
| Analog output (optional) | Voltage or current |
| Resolution | 16 bits |
| Calibration | Digital from the keyboard |
| Impedance | Voltage: min. 10K Ω ; Current: max 300 Ω |
| Linearity | 0.03 % of the full scale |
| Temperature drift | 0.001% of the full scale / °C |
| Fieldbus (optional) | PROFIBUS DP, DEVICENET |
| Buffer dimension | 128 byte IN - 128 byte OUT |

INSTALLATION

GENERAL DATA

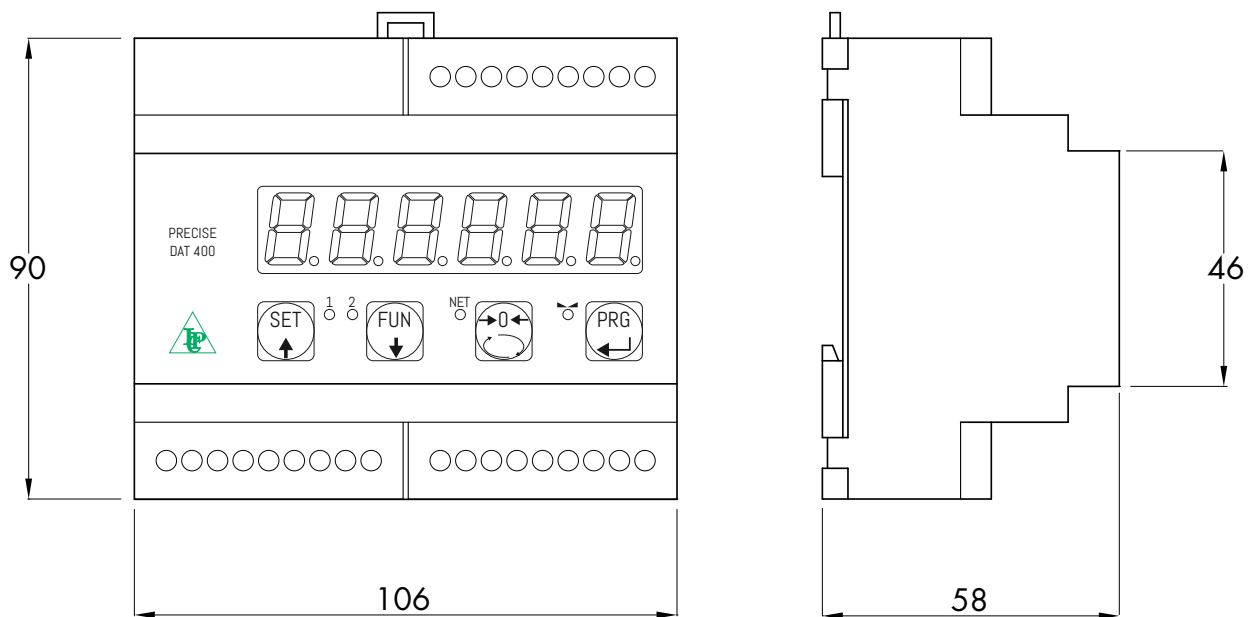
The DAT 400 is composed of a motherboard, on which you can add the options available; the motherboard is housed in a plastic enclosure by a 35mm DIN rail.



The DAT 400 should not be immersed in water, subjected to jets of water and cleaned or washed with solvents.

Do not expose to heat or direct sunlight.

OVERALL DIMENSIONS



ELECTRIC INSTALLATION



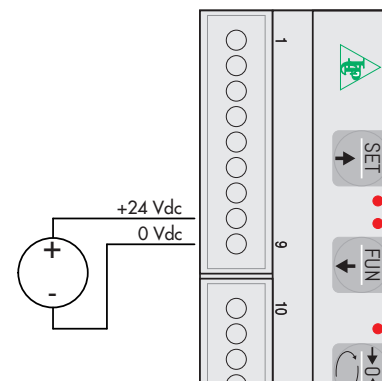
The transmitter DAT 400 uses screw terminal boards, pitch 5.08 mm, for the electrical connection. The load cell cable must be shielded and channeled away from tension cables to prevent electromagnetic interference.

INSTRUMENT POWER SUPPLY

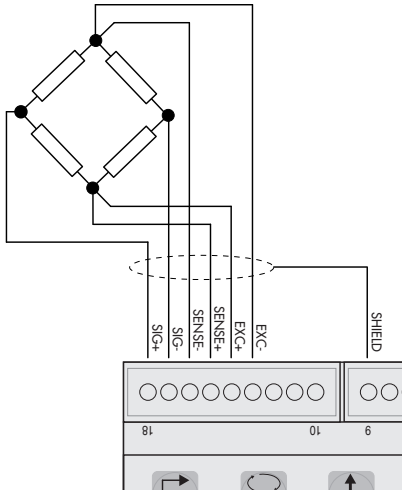
The instrument is powered through the terminals 8 and 9. The power cord must be channeled separately from other cables.

The supply voltage is electrically isolated.

Power supply voltage: 24 Vdc/ $\pm 15\%$ max. 5W



CONNECTIONS OF THE LOAD CELL/S



The cell/s cable must not be channeled with other cables, but must follow its own path.

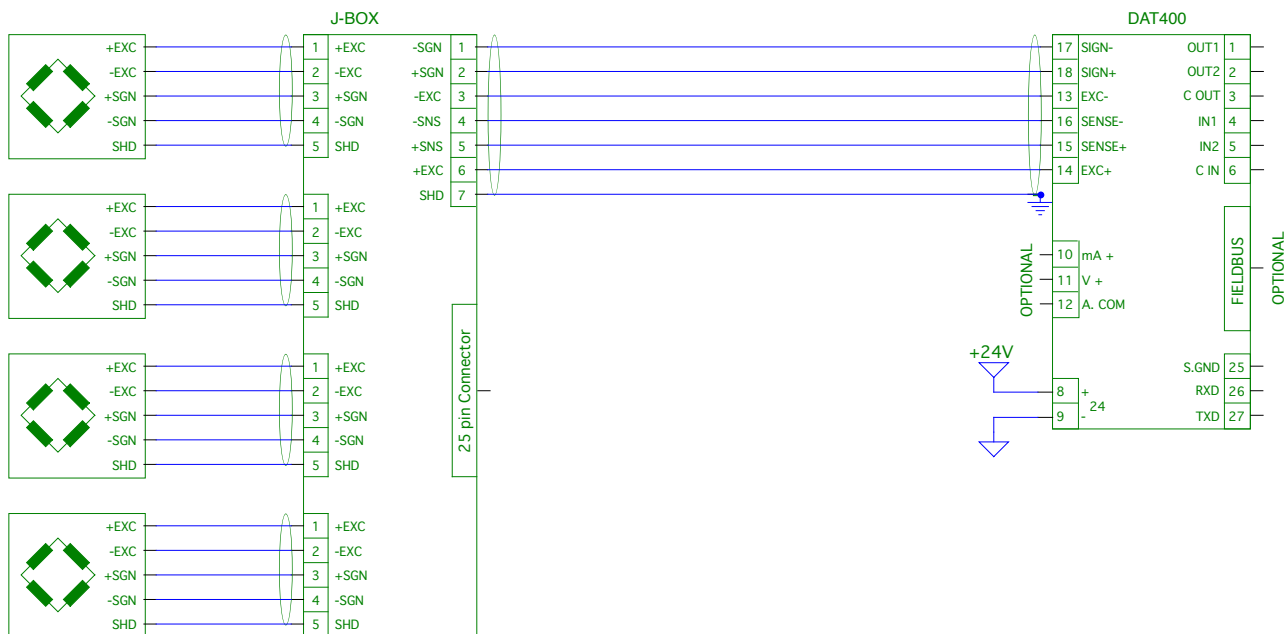
The instrument can be connected up to a maximum of 8 load cells of 350 ohm in parallel. The supply voltage of the cells is 5 Vdc and is protected by temporary short circuit.

The measuring range of the instrument involves the use of load cells with a sensitivity of up to 3.5 mV / V.

The cable of the load cells must be connected to terminals 13-18. In the case of 4-wire load cell cable, jumper the terminals 13 to 16 and 14 to 15.

Connect the cell cable shield to the terminal 9.

In the case of the usage of two or more load cells, use special junction boxes (CEM4/C or CSG4/C). Below please find their connection.



LOGIC INPUTS

The two logic inputs are opto-isolated.

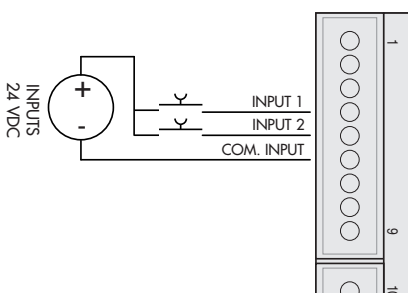
The cable connecting the logic input should not be channeled with the power cables.

The function of the two inputs is as follows:

INPUT1 Resetting the displayed value (gross, net or peak)

INPUT2 PRINT

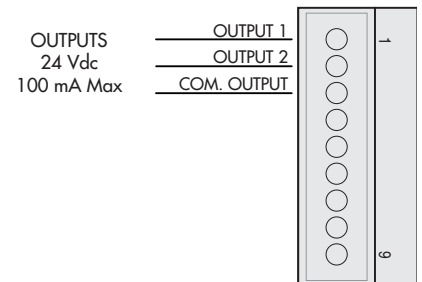
The activation of the two functions is accomplished by bringing the external power supply 24 Vdc to the corresponding terminals as shown in the figure.



LOGIC OUTPUTS

The two opto-isolated relay outputs are the normally open contact. The capacity of each contact is 24 Vdc, 100 mA max.

The cable connecting the outputs should not be channeled with the power cables. The connection should be as short as possible.



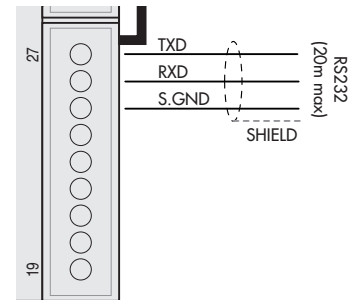
SERIAL COMMUNICATION

RS232:

The RS232 serial port is always present and handles various protocols.

To achieve the serial connection, use a shielded cable, making sure to connect the shield to one of the two ends: to pin 25 if connected on the side of the instrument, to the ground if it is connected on the other side.

The cable must not be channeled with power cables; the maximum length is 15 meters (EIA RS-232-C), beyond which you should take the optional RS485 interface.

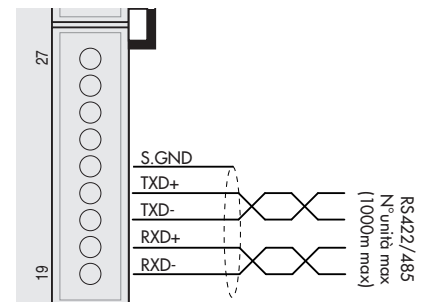


RS485:

The serial port RS485 (2-wire) is present in the model DAT 400/RS485.

To achieve the serial connection, use a suitable shielded cable, making sure to connect the shield to one of the two ends: to pin 23 if connected on the side of the instrument, to the ground if it is connected on the opposite side.

The cable should not be channeled with the power cables.



ANALOG OUTPUT (OPTIONAL)

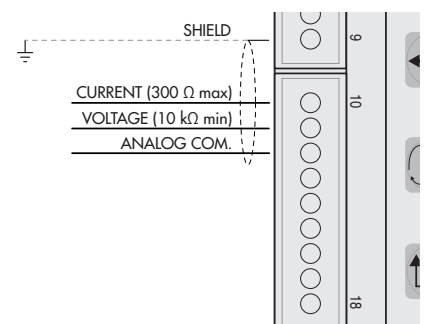
The transmitter provides an analog output in current and voltage.

Analog voltage output: range from -10 to 10 V or -5 to 5 V, 10 K Ω minimum load.

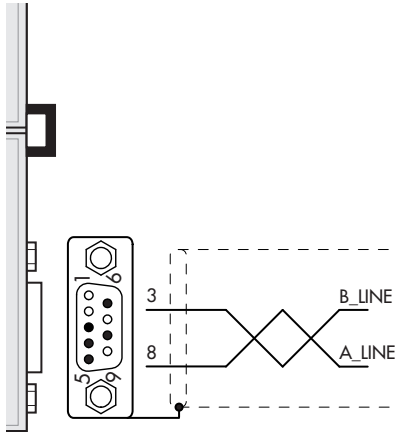
Analog current output: range from 0 to 20 mA or 4 to 20 mA. The maximum load is 300 Ω .

To achieve the serial connection, use a suitable shielded cable, making sure to connect the shield to one of the two ends: to pin 9 if connected on the side of the instrument, to the ground if it is connected on the opposite side.

Attention: do not connect the analog output to devices that are switched on.



PROFIBUS DP CONNECTION (OPTIONAL)



| Pin | Signal | Description |
|---------|-----------------|--|
| 1 | - | - |
| 2 | - | - |
| 3 | B line | +RxD/+TxD, level RS485 |
| 4 | RTS | Request to send |
| 5 | GND | Ground (isolated) |
| 6 | + 5V Bus Output | +5V termination (isolated) |
| 7 | - | - |
| 8 | A line | -RxD/-TxD, level RS485 |
| 9 | - | - |
| Housing | Cable shield | Internally connected to protective earth according to Profibus specification |

For connection to the Profibus Master, use a standard Profibus cable.

The typical impedance of the cable should be between 100 and 130 Ohms ($f > 100$ kHz). The cable capacity (measured between conductor and conductor) should be less than 60 pF / m and the minimum cable cross section should not be less than 0.22 mm²

In a Profibus-DP network, you can use either cable type A to type B cable, depending on the required performance. The following table summarizes the features of the cable to be used:

| Specification | Type A Cable | Type B Cable |
|-------------------------|---|--------------------------------------|
| Impedance | from 135 to 165 ohm ($f = 3 - 20$ MHz) | from 100 to 300 ohm ($f > 100$ kHz) |
| Capacity | < 30 pF/m | < 60 pF/m |
| Resistance | < 110 ohm/km | - |
| Conductor cross section | > 0,34 mm ² | > 0,22 mm ² |

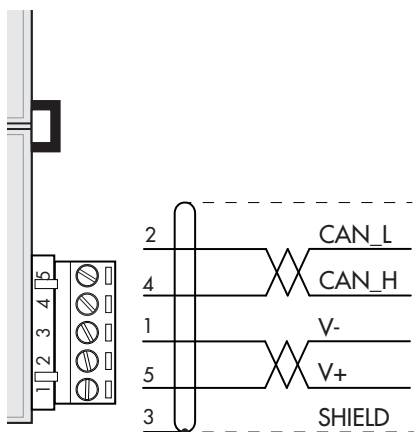
The following table shows the maximum length of the wires line with cable type A and type B, function of the different communication speed required:

| Baud rate (kbit/s) | 9.6 | 19.2 | 187.5 | 500 | 1500 | 3000 | 6000 | 12000 |
|--------------------|------|------|-------|-----|------|------|------|-------|
| Cable A lenght (m) | 1200 | 1200 | 1000 | 400 | 200 | 100 | 100 | 100 |
| Cable B lenght (m) | 1200 | 1200 | 600 | 200 | - | - | - | - |

For a reliable operation of the Fieldbus, should be used a line termination at both ends.

In the case of multiple DAT 400 instruments, use the line termination at only one instrument.

For configuring the instrument, the GSD file is available (hms_1810.GSD) that must be installed in the master.



DEVICENET CONNECTION (OPTIONAL)

| Pin | Signal | Description |
|-----|--------|--------------------|
| 1 | V- | Negative power bus |
| 2 | CAN_L | CAN low bus line |
| 3 | SHIELD | Shield |
| 4 | CAN_H | CAN high bus line |
| 5 | V+ | Positive power bus |

To connect to the DeviceNet master, use a standard DeviceNet cable or shielded twisted-pair cable as shown on the diagram.

The cable must not be channeled with power cables. For reliable operation of the Fieldbus, should be used as a line termination of 121 Ω value between the terminal CAN_L and CAN_H.

For the configuration of the card is available ESD file that must be installed in the master.

FRONT PANEL OF THE INSTRUMENT

The DAT 400 has a bright 6-digit display, 4 status LEDs and four keys.

In this operating mode the display shows the weight and the LEDs indicate the status of weight and the setpoints.

The set-up parameters are easily accessed and modified through the use of the three front buttons used to select, edit, confirm and save the new settings.



DISPLAY

On the 6-digit display, it's usually shown the scale weight. According to the various programming procedures, the display is used for programming of the parameters to be stored in the memory, or the messages that indicate the type of operation being carried out and help therefore the Operator in the management and programming of the instrument.

LED INDICATORS

Below the display there are 4 LED indicators:

1 State of the logic output 1 (ON = closed contact OFF = open contact)









2 State of the logic output 2 (ON = closed contact OFF = open contact)





NET The displayed value is the net weight





0 IT indicates the condition of stable weight.




USING THE KEYBOARD

The instrument is programmed and controlled through the keyboard which has 4 keys, with double functions. The selection of one of the key functions is established automatically by the instrument according to the operation in progress. In general, the management of the programming menus is done by using the SET and FUN keys to scroll through the items; the PRG key is used to enter its sub-menu or programmable parameter, while the 0 button allows you exiting the menu or returning to the top level.



| KEY | FUNCTIONS DURING THE WEIGHT DISPLAY |
|---|--|
|  | Access to the menu for the programming of the setpoints |
|  | Select the display view (gross weight, net weight). (Long press) Selection of the weight/peak display |
|  | Resetting the displayed value (gross weight, net weight or peak). (Press and hold for 5 sec.) Calibration of zero, to be executed only if its function is enabled in the PARAM menu (see item "0 ALL"). |
|  | Sending the weight string on the serial line. (Long press) Access to the quick set-up menu. |
|  +  | (Press for 3 sec) Access to the setup menu. |
|  +  | (Press for 3 sec) It accesses the keypad lock/unlock menu and auto-off function of the display. |


| KEY | FUNCTION DURING THE MAIN MENU DISPLAY |
|---|---|
|  | It selects the next parameter. |
|  | It selects the previous parameter. |
|  | It exits the programming menu or returns to the upper level. |
|  | It accesses the corresponding sub-menu or programming or confirms the selected parameter. |


| KEY | FUNCTION WHEN SETTING THE NUMERICAL VALUES |
|---|---|
|  | It increases the value of the flashing digit. |
|  | It decreases the value of the flashing digit. |
|  | It goes to the next digit. |
|  | It confirms the displayed value. |

| KEY | FUNCTION WHEN SETTING THE NUMERICAL VALUES |
|---|--|
|  | It selects the next value. |
|  | It selects the previous value. |
|  | It confirms and store the displayed value. |

EXIT FROM THE SETTING MENU

Press the  key to return to the main menu. Press the  key again. It's displayed "SETUP".

Press the  key to return to the main menu.

To exit without saving any changes, switch off the instrument instead of pressing the  key.

INFO DISPLAY

When the instrument is switched ON, you can test the display, then in sequence you can display the identification code of the software and its version. Communication codes in the event of a request for assistance.

ERRORS NOTIFICATION

In the operation mode, the display can report the following error codes.


- the weight applied to the load cell exceeds by more than 9 divisions the maximum capacity of the weighing system.
- O-L* Signal of the load cells absent or outside of the measurement range mV/V.
- No Lon* Fieldbus network disconnected
- E-Prof* PROFIBUS interface absent or not operating.
- E-dnEt* DEVICENET interface absent or not operating.
- Dash that runs along the perimeter of the display: BLIND function enabled.
- ErrorE0* Memory error. Press the PRG key to reset the memory and return the parameters to their default values. NOTE: it is also deleted the calibration performed.

VIEWING, ZEROING THE WEIGHT AND SELF-CALIBRATION

After being calibrated, at the subsequent switches on, the display shows the current weight.

VIEWING THE NET WEIGHT/GROSS WEIGHT



Press the  key to toggle between the net weight and the gross weight and vice versa. The value displayed is signaled by the LED NET (lit: net weight). If you have not entered the tare, the net weight is equal to the gross weight.

In case of negative weight, it is displayed the minus sign before the most significant digit.

ZEROING, WEIGHT AND SELF-CALIBRATION

These two functions are performed by pressing 0.

When the instrument is in the operation mode "Net" ("NET" LED on), the 0 key performs the self-calibration.

When the instrument is in operation mode "Gross" ("NET" LED off), the 0 key clears the gross weight.

SELF-CALIBRATION

The execution of self-calibration is possible under the following conditions:

- Instrument under conditions of "Net" (NET LED on).
- Positive gross weight.
- Gross weight not greater than the maximum capacity.
- Stable weight.
- Unstable weight. In this condition, we must distinguish two cases:
 1. The weight stability control is enabled (the parameter "MOTION" (*) must be other than zero): the command executed while the weight is unstable only has an effect if the weight stabilizes within 3 seconds from the moment the command was given.
 2. The weight stability control is disabled (the parameter "MOTION" (*) is equal to zero): the executed command takes effect immediately, even with unstable weight.

(*) *The operating modes of the parameter "MOTION" are described on page 28.*

The self-calibration is retained in memory even after the power is switched off.

ZEROING

The reset command of the gross weight is used to correct for small zero shifts of the weighing system during normal operation.

Normally these zero shifts are due to thermal drifts or to residues of material that accumulate on the weighing system over the time.

To run the command, it is necessary that the instrument is under conditions of "Gross" ("NET" LED off) and that the deviation of the weight with respect to the zero of the scale (the one performed with the calibration of zero) does not exceed (in positive or negative) the number of divisions set in parameter "0 BAND" (inside the PARAM menu).

The reset command of the gross weight does not run if there is even one of the following conditions:

- Unstable weight (with control of the stability of the weight enabled). In this case, the reset command takes effect only if the weight stabilizes within 3 seconds or if the control of the weight stability is disabled (parameter "MOTION " equal to zero).
- Gross Weight greater (in positive or negative) than the number of divisions set in parameter "O BAND" , when the setpoint of auto-calibration is not programmed.

The zero obtained with the resetting of the gross weight is retained in memory even after the power is switched off.

The reset operation of the gross weight can be repeated several times, but the number of reset divisions zero is added from time to time, so when the total exceeds the limit value set in parameter "O BAND", the zero cannot be executed. In this case, it is necessary to calibrate the Zero.

Any auto-zero parameter setting when switching on (AUTO 0) reduces (or cancels, in the case of "AUTO 0"> "O BAND") the range of action of the reset command.

PEAK FUNCTION

The instrument continuously memorizes the peak value of the gross weight. The peak value is detected at the same frequency of acquisition of the weight (see table on filters). In addition to visualization, the peak value can be used in the following functions:

| FUNCTION | DESCRIPTION |
|---------------|---|
| LOGIC OUTPUT | The setpoints can be set to have the peak value as a reference. (See the procedure for setting the logic outputs operations). |
| SERIAL PORT | Acquisition of the peak value (peak hold) through the CONTIN, AUTO, DEMAND, SLAVE and MODBUS protocols. |
| ANALOG OUTPUT | The analog output value can assume the value of the peak (peak old). (See the procedure for setting the analog output). |

Press the "FUN" key and hold it for 3 seconds until the left of the display shows the letter "P".

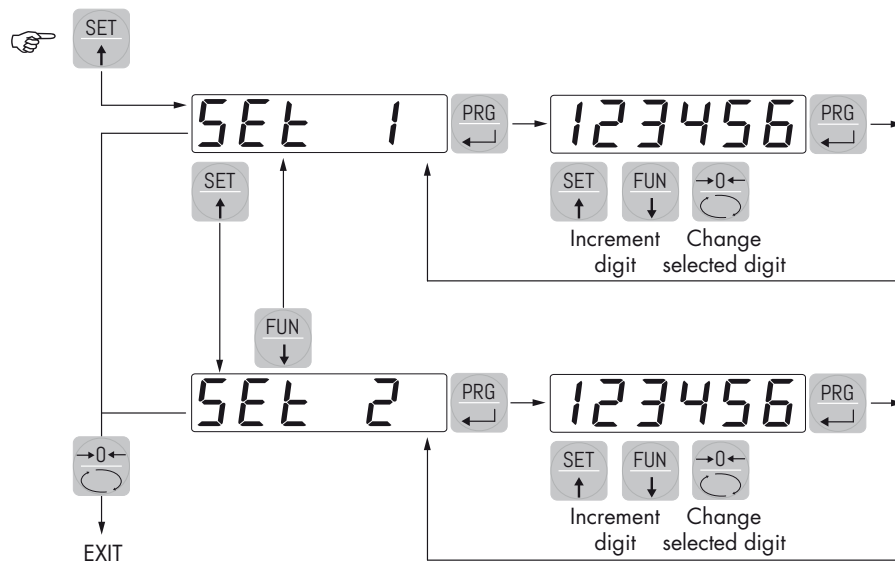
INPUT / OUTPUT FUNCTIONS

| INPUT | |
|--------|--|
| 1 | Resetting the displayed value (gross weight, net weight or peak). Closed for 5 sec. -> Calibration of zero, to be executed only if its function is enabled in the PARAM menu (see item "O ALL"). |
| 2 | Sending the weight string on the serial line or print. |
| OUTPUT | |
| 1 | Setpoint 1 |
| 2 | Setpoint 2 |

PROGRAMMING THE WEIGHT SETPOINTS

The set setpoint values are compared with the weight to drive its logic output. The comparison criterion is established in the process of set-up of the logic I / O (see relevant paragraph).

To access the Setpoint setting, press the SET key and follow the instructions on the table below.

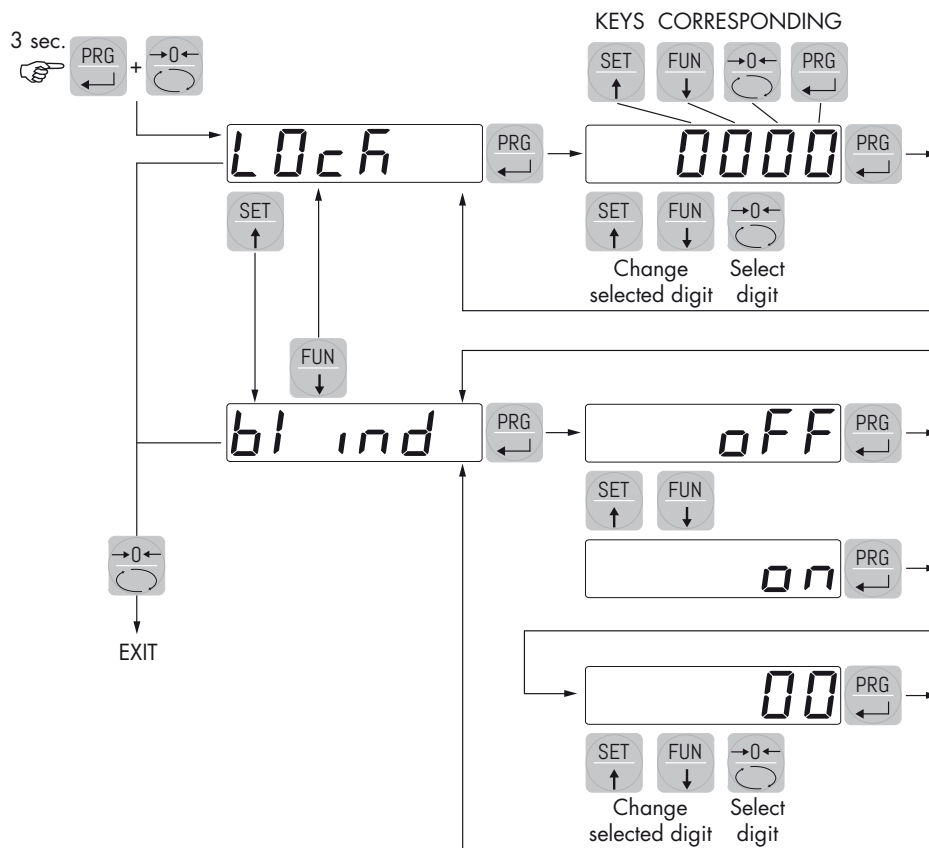


During the step of setting the setpoints, both outputs are disabled. If the setpoint value in memory is 0, the corresponding output is never enabled, regardless of the set-up of the selected setpoints. When the weight is not detectable or out of range, all outputs are disabled (contact open or closed depending on the MODE; see the relevant chapter).

KEYBOARD LOCK/UNLOCK FUNCTION

KEYBOARD LOCK/UNLOCK A function that allows you to enable or disable the keys individually. When the keys are locked, the only way to access these settings is to press and hold pressed the PRG + 0 keys for 3 seconds. For more information on the function, refer to the block diagram above.

SWITCHING THE DISPLAY OFF This function allows turning off the display after a programmable time.



You can select ON / OFF of the parameter BLIND and the setting of a time; the time count starts from the moment when, after exiting the setup menu, the display shows the weight value. After the set time, the display turns off and only a dash appears. This dash cycles through the perimeter of the display counterclockwise. When the display is off, also the 4 keys are disabled, regardless of how you set the keypad lock (LOCK). The only way to access the settings will be PRG + 0.

SETTING

GENERAL DATA

All functions of the DAT 400 are activated and modified by accessing a simple setup menu, shown on page 21. All settings selected or activated remain stored even after switching off the transmitter.

The DAT 400 is preconfigured with a default setting. The following pages show the values of "Default" for each parameter.

With the first on-site installation, it's necessary to change some parameters in order to obtain a correct indication of the displayed weight (Theoretical adjustment).

The settings of the setup menu can be changed using the front keys or via the utility "INOVATION 2" software supplied.

CHANGING AND ENTERING THE PARAMETERS:





The setup parameters are grouped into a number of main menus.





To access the setup menu press the PRG key and then the SET key and hold down simultaneously for 3 seconds.




The display shows the message *CONF IG* that is the first of the main menus.

Use the arrow keys to select the menu you want to change.


Press the PRG key to access the selected menu.

| KEY | FUNCTION DURING THE MAIN MENU PROGRAMMING |
|---|---|
|  | It selects the next menu. |
|  | It selects the previous menu. |
|  | It exits the programming menu or returns to the upper level. |
|  | It accesses the corresponding sub-menu or programming or confirms the selected parameter. |

| KEY | FUNCTION WHEN SETTING THE NUMERICAL VALUES |
|---|---|
|  | It increases the value of the flashing digit. |
|  | It decreases the value of the flashing digit. |
|  | It goes to the next digit. |
|  | It confirms and store the displayed value. |

| KEY | FUNCTION WHEN SETTING THE PROSED VALUES |
|---|--|
|  | It selects the next value. |
|  | It selects the previous value. |
|  | It confirms and store the displayed value. |

The menu parameters can assume values that can be set or selected.

NOTE To exit and save the modified data, press multiple times the  key until the display shown


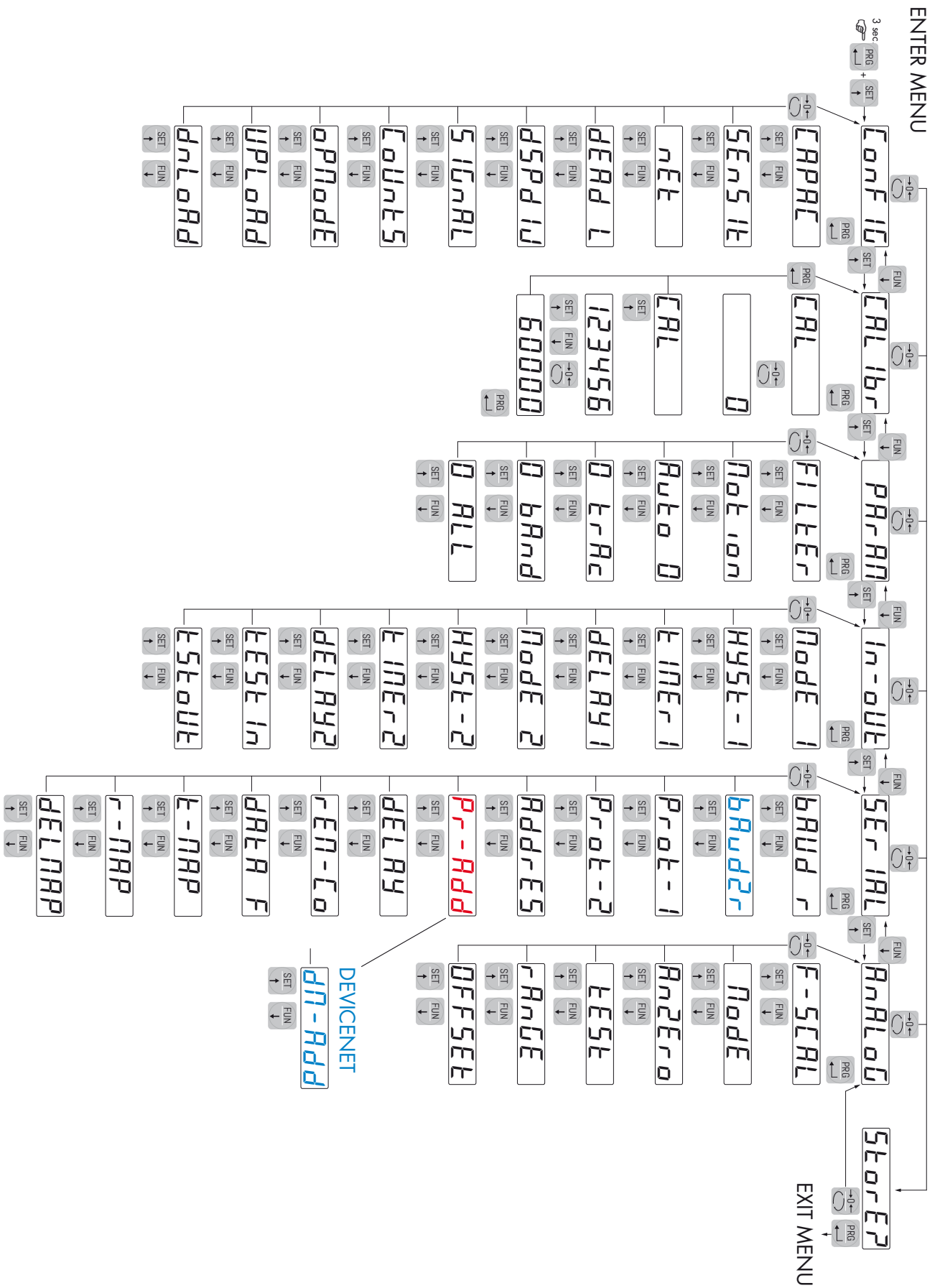
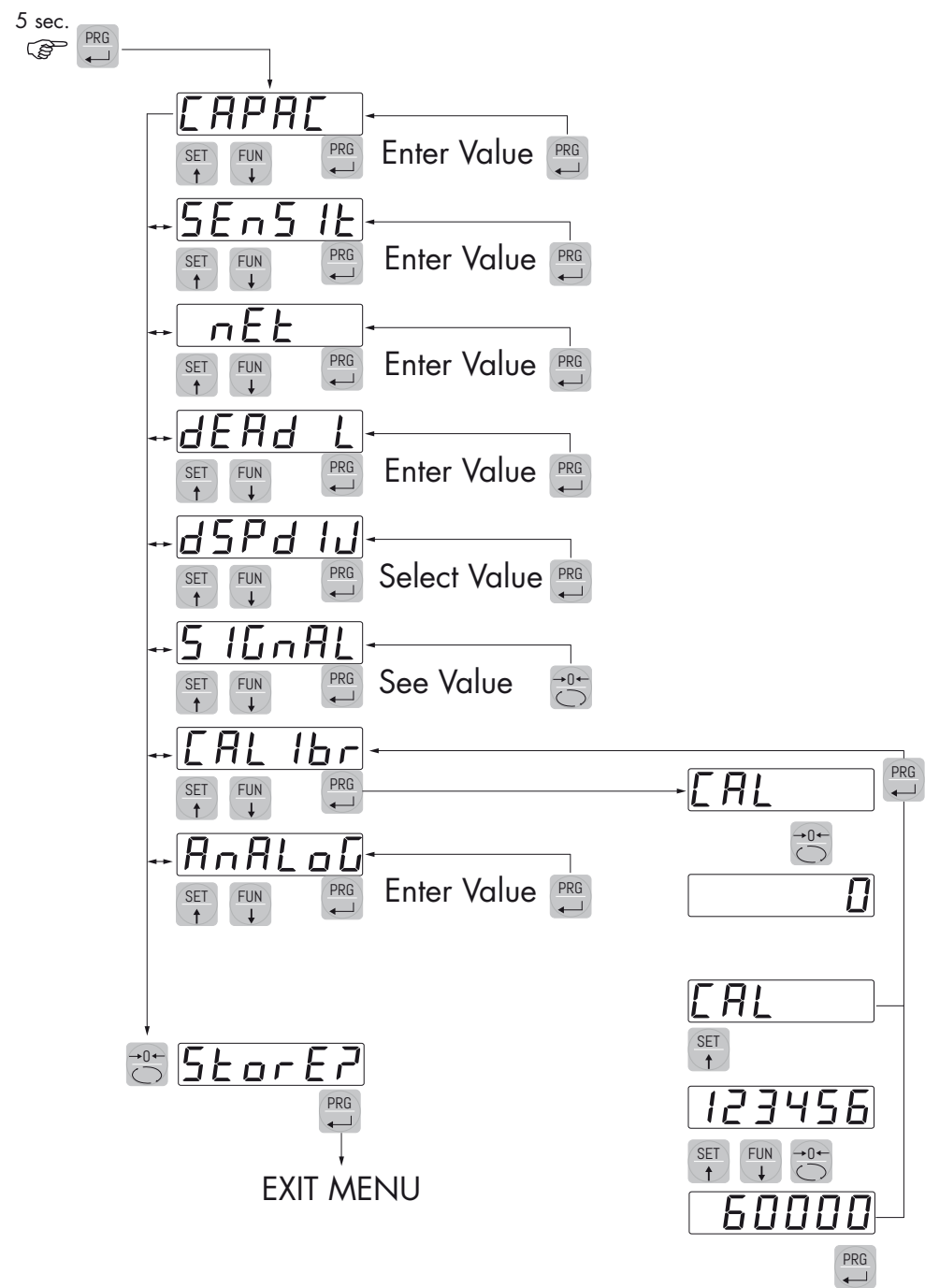
StorE, then press  key to go back to the operating mode.

DIAGRAM OF THE MENU



QUICK SETUP MENU

ENTER MENU



CONFIGURATION PARAMETERS

Through the setting of the parameters listed below, the theoretical Full Scale DAT 400 calibration is performed. These steps with the zero calibration described on the next page must be completed. The procedure ensures a good accuracy of the system (maximum error <1% FS) if there are no mechanical problems.

Program the known values of total capacity and sensitivity of the load cells and the approximate values of net capacity and calibration. If the parameter SENSIT is not programmed, it is taken the 2.0000 mV/V value.

If the parameter CAPAC is programmed other than 0, according to the data CAPAC, SENSIT, NET and DEAD L, the instrument automatically runs the following functions:

Resetting the linearization points.

Selection of the value of the division, however, to be modified, to the best of 10,000 divisions.

Calibration of the theoretical approximate calibration of the weight (zero and full scale).

Automatic programming of the overload setpoint (= NET).

These functions are performed each time you change one of the 4 parameters shown.

When you change the DSPDIV selection., it is automatically recalculated to full-scale calibration. The selections are incompatible with the calibration parameters or calibration in memory are not accepted.

The selection programmed in Opmode is read from the instrument when it is switched on and it makes that the instrument operates in that way.

CAPAC CAPACITY OF THE WEIGHING SYSTEM

It defines the value corresponding to the sum of the rated capacity of the load cells. In the case of systems with only one load cell and "N" fixed supports, enter the capacity value of the cell for the total number of supports. This figure represents the full scale value of the weighing system.

Following the change of the parameter value, the theoretical tare of the weight is recalculated.

Values: from 1 to 500000

Unit: the same of that displayed

Default: 10000

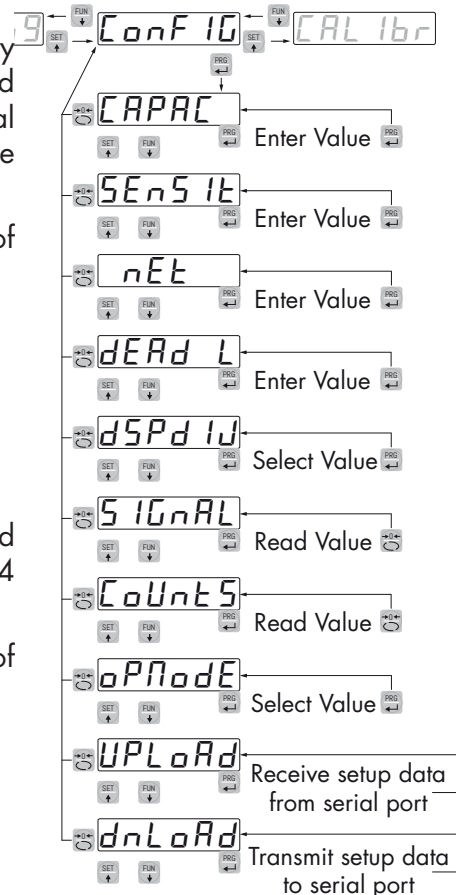
SENSIT LOAD CELLS SENSITIVITY

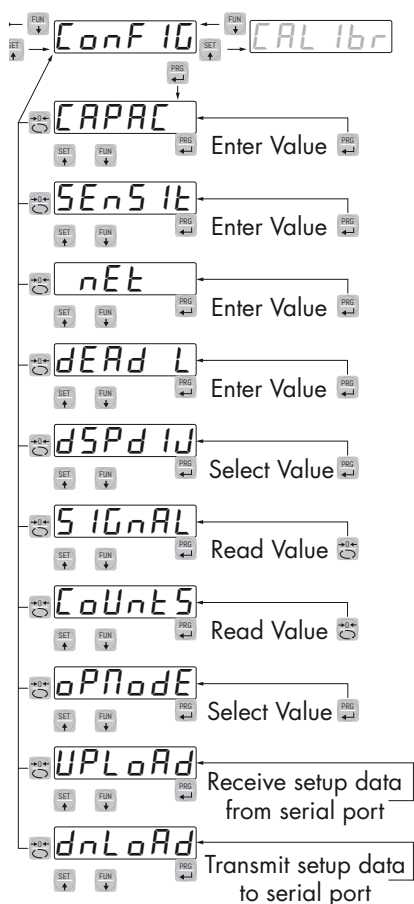
Set the value corresponding to the average sensitivity of the load cells, in mV / V. The instrument accepts values between 0.5 and 4 mV / V. If no value is programmed, it's assumed it is 2mV/V.

Following the change of the sensitivity value, the theoretical tare of the weight is recalculated.

Values: from 0.5000 to 4.0000 mV/V

Default: 2.0000





net **CAPACITY OF THE WEIGHING SYSTEM**

Programming the net capacity of the weighing system. Values lower than 1/10 of CAPAC are not accepted.

Values: from 1 to 500000

Unit: the same of that displayed

Default: 10000

dERd L **FIXED CALIBRATION OF THE WEIGHING SYSTEM**

Programming the fixed calibration value of the weighing system.

Values: from 1 to 500000

Unit: the same of that displayed

Default: 00000

dSPd IJ **DIVISION VALUE**

The ratio between the capacity of the system and the division value represents the resolution of the system (number of divisions).

Following the change of the capacity of the system, it is automatically selected the division value to the best of 10000 divisions.

Following the change of the division value, if the maximum capacity does not change, the calibration of the weight is automatically corrected.

Value to be selected:

0.0001 - 0.0002 - 0.0005

0,001 - 0,002 - 0,005

0.01 - 0.02 - 0.05

0.1 - 0.2 - 0.5

1 - 2 - 5

10 - 20 - 50

Default: 1

S IGrAL **TESTING THE LOAD CELLS SIGNAL**

It's displayed the signal acquired from the load cells expressed in mV/V.

CoUntS **A/D CONVERTER INTERIOR POINTS TEST**

View of the interior points of the instrument (1,000,000 at the maximum input signal).

oPNode **SELECTION OF THE OPERATING MODE**

Selection of the operating mode of the device (display) when it is switched on:

Value to be selected:

GROSS, NET, PEAK

Default: GROSS

UPLoAd RECEIVING DATA FUNCTION

Receiving function from a serial of a file containing the setup data that will be automatically set in the instrument.

dnLoAd SENDING DATA FUNCTION

Sending function from a serial of a file with the content of the setup memory of the instrument.

EXAMPLE OF SETTING/CALIBRATION

To weigh a tank, with empty weight of 750 kg and with a capacity of 1000 liters, containing a product with a specific gravity of 1.33 to read the weight with a display resolution of 0.2 Kg.

Before proceeding with the configuration, make sure that the load cells are connected properly to the unit and the tank is empty and set the parameters.

They are used:

Nr 3 load cells with capacity of 1000 kg

Sensitivity of respectively 2.0015, 2.0008 and 1.9998 mV/V (average value = 2.0007 mV/V)

Set the following values in the configuration parameters:

CAPAC = 3000

SEnS It 2.0007

nEt 1500

dERd L 0

dSPd lJ 0.2

Make sure that the value read in the **SI GNL** parameter corresponds with the calibration weight of the system according to the following proportion:

$$3000:2.0007=750:X$$

Where X is the value of the signal expressed in mV/V corresponding to the theoretical value of the weight of the empty tank. The value should be about 0.5 mV/V.

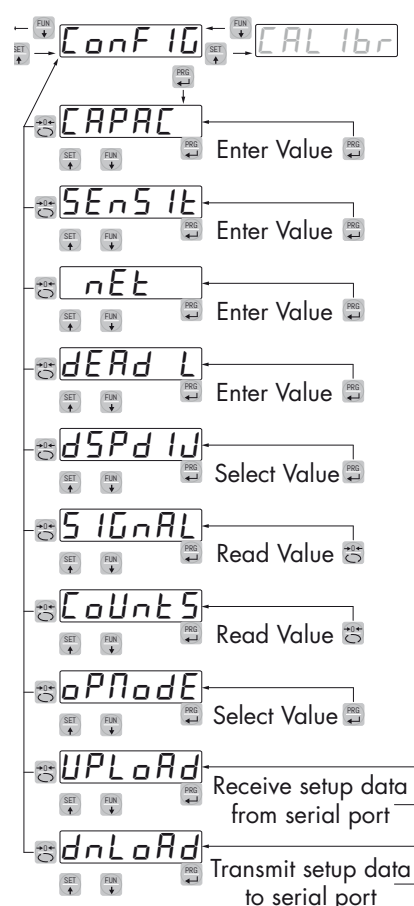
Proceed to the calibration described in the following paragraph, or you can exit the configuration menu by saving the data entered.

The instrument should indicate the value corresponding to the weight of the empty tank (for example 756.8).

Re-access the configuration menu and enter the weight value read in the **dERd L** parameter and enter the value 756.8.

Quit the configuration menu by saving the data.

For greater accuracy, prepare some sample weights or the pre-weighed material on a certified system and calibrate as described in the next paragraph.



CALIBRATION

The calibration described herein should be performed with the use of sample weights and/or product pre-weighed on a weighing system.

Before proceeding with the calibration of the full scale, always perform the zero calibration.

During the calibration phase, the display shows the weight intermittently with the inscription **CAL**.

ATTENTION: At switching off the instrument without exiting the set-up menu, the programming executed is not stored.

NOTE In the event that after calibration, the system shows linearity errors, you should verify that the weighed structure is completely free of mechanical constraints.

ZERO CALIBRATION

Perform the operation when the scale has no items (including the fixed tare), and when the weight is stable. The zero of the system is done by pressing the key 0.

The weight displayed resets and the display shows **CAL** alternated by 0. You can repeat this operation more times.

CALIBRATION OF FULL SCALE

Prior calibration load the sample weight on the system and wait for the stabilization; the display shows a weight value.

Press the SET key to adjust the weight. The display shows the theoretical weight value with the first digit to the left flashing. With the arrow keys, enter the actual weight loaded on the system starting from the first flashing digit. Switch to the next digit by pressing 0. The confirmation of the last digit (far right) with the PRG key corrects the weight. The display shows **CAL**, by altering the actual weight value entered.

If the set value is higher than the resolution offered by the instrument, the weight is not accepted and the display shows an error message for a few seconds.

This procedure can be repeated.

Press the PRG key again to return to the **CAL 1b** menu.

EXIT FROM CALIBRATION MENU

The exit from the menu **CAL 1b** is performed by pressing the key until the appearance of the message **StorEP?**

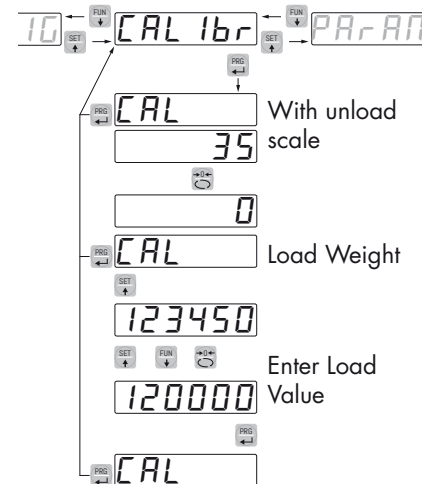


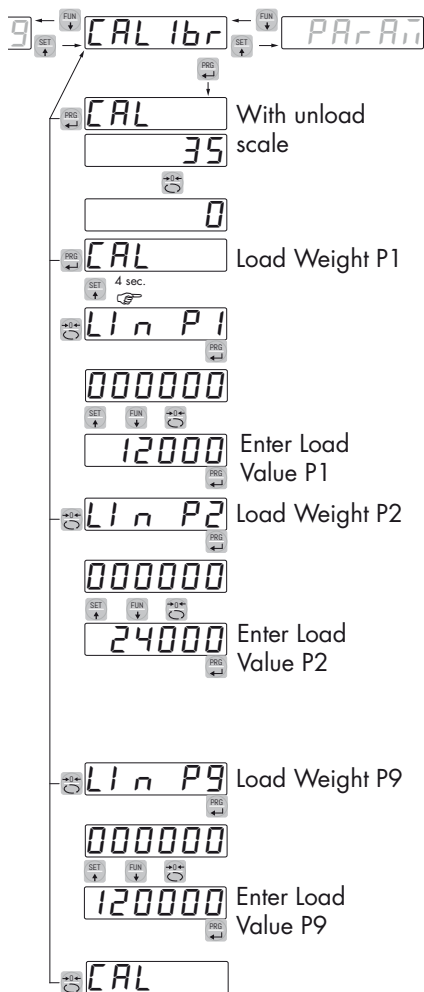
To store the new calibration and exit the setup menu, press the PRG key.

To cancel the calibration of zero and full scale:

FUN + 0 it cancels the zero calibration.

FUN + SET it cancels the calibration of the full scale.





LINEARIZATION PROCESS

When planning the sample weight, values greater than the full scale, or lower than the previous point, or when the weight is not stable, are not accepted. If the entered value is accepted, it is proposed the next step, otherwise still the same.

The linearization points are automatically reset by any change of the data of the theoretical calibration or it is performed a full-scale calibration.

WEIGHING PARAMETERS

The parameters in this menu allow the adjustment of the acquisition and updating timing of the display and the manual or automatic zeroing performed by transmitter

F I L T E R **WEIGHT FILTER**

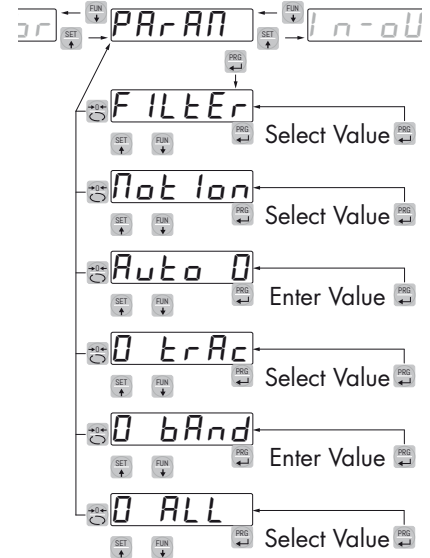
This parameter adjusts the refresh speed of the display and the serial and analog output.

Low values of the filter speed up the display refresh.

High values of the filter slow down the display refresh.

| Value | Update | Response |
|-------|--------|----------|
| 0 | 50 Hz | 25 Hz |
| 1 | 50 Hz | 16 Hz |
| 2 | 25 Hz | 8 Hz |
| 3 | 25 Hz | 5 Hz |
| 4 | 25 Hz | 2.5 Hz |
| 5 | 10 Hz | 1.5 Hz |
| 6 | 10 Hz | 1 Hz |
| 7 | 10 Hz | 0.7 Hz |
| 8 | 5 Hz | 0.4 Hz |
| 9 | 5 Hz | 0.2 Hz |

Default: 5



Not Ion **WEIGHT STABILITY**

This parameter defines the divisions number needed to deem the weight stable.

A large number of divisions allows the transmitter to detect quickly the weight stability, which is needed when executing tare and print commands.

| Value | Change |
|-------|--|
| 0 | Always stable weight |
| 1 | Stability determined quickly |
| 2 | Stability determined with medium parameters |
| 3 | Stability determined accurately |
| 4 | Stability determined with the highest accuracy |

Default: 2

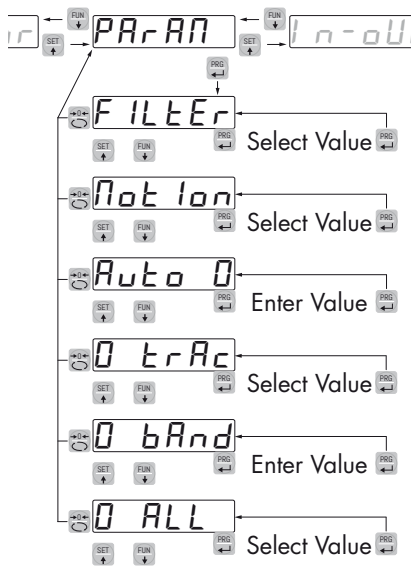
Auto 0 **AUTOZERO UPON SWITCHING ON**

This parameter defines the value of the maximum resettable weight when the instrument is switched on.

This operation corresponds to a zero calibration of the system and is executed only if the weight is stable and below the set value.

Value from 0 to the value of the CAPAC parameter.

Default: 0



0 TrAc **TRACKING THE ZERO**

This function allows you to perform a momentary zero calibration compensating for the temperature drift of the weight.

At switching off, it automatically returns to the previous zero calibration.

The maximum weight resettable by this parameter is 2% of the range of the system.

To disable this feature, use the value 0.

| Value | Change |
|-------|-------------|
| 0 | Control OFF |
| 1 | 0.5 div/sec |
| 2 | 1 div/sec |
| 3 | 2 div/sec |
| 4 | 3 div/sec |

Default: 0

0 bAnd **ZERO BAND**

This parameter defines the number of divisions resettable by the pressure of the front button of zero or by Input 1.

Values: from 0 to 200

Default: 100

0 ALL **ZERO CAL**

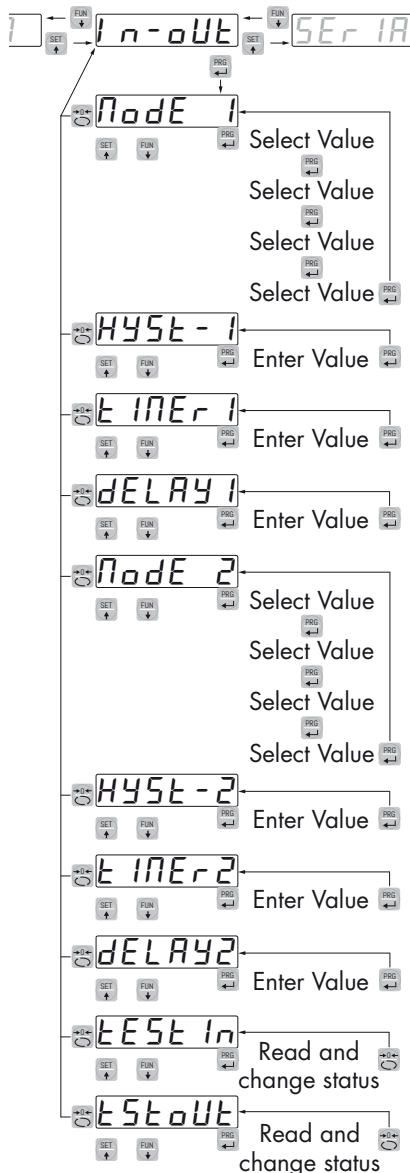
Enables the function that allows to perform zero calibration by pressing and holding the 0 key or input 1 for 5 sec.

Value:

| | |
|-----|-------------------|
| Off | Function disabled |
| On | Function Enabled |

Default: Off

INPUT/OUTPUT PARAMETERS



Node 1 SETPOINT 1 OPERATION MODE

Select 4 operation criteria of the setpoint 1 in sequence:

- NET** The relay output is active in Net Weight mode
- GROSS** The relay output is active in Gross Weight mode
- PEAK** The relay output is active in Peak mode
- Default: GROSS**

Comparison with the net weight, gross weight or the peak. In this last case, the comparison is made with the last peak value acquired, even when the peak function is not active.

- N.O.** The relay 1 is normally open
- N.C.** The relay 1 is normally closed
- Default N.O.**

- POS.** The output is operating with positive weight
- NEG.** The output is operating with negative weight
- Default: POS**

- NORML** Output 1 is active with unstable weight
- STABL** The output is active with stable weight
- Default: Norml**

HYSt-1 HYSTERESIS OF THE SETPOINT 1

Hysteresis value than the setpoint value set.

Value: from 0 to 999

Default: 2

tINEr-1 SETPOINT 1 TEMPORIZATION

Value of time, in tenths of a second, during which, when the weight value set is overcome, the output relative to setpoint 1 remains enabled.

After this time, even if the weight value is still above the setpoint, the output is automatically disabled.

The function is not activated if the programmed time is equal to zero.

Value: from 0 to 999

Default: 0

dELAY1 SETPOINT 1 DELAY

Value of time, in tenths of a second, after which, when the weight value set is overcome, the output relative to setpoint 1 remains enabled.

The function is not activated if the programmed time is equal to zero.

Value: from 0 to 999

Default: 0

Node 2 SETPOINT 2 OPERATION MODE

Select 4 operation criteria of the setpoint 2 in sequence:

NET *The relay output is active in Net Weight mode*
GROSS *The relay output is active in Gross Weight mode*
PEAK *The relay output is active in Peak mode*
Default: GROSS

Comparison with the net weight, gross weight or the peak. In this last case, the comparison is made with the last peak value acquired, even when the peak function is not active.

N.O. *The relay 2 is normally open*
N.C. *The relay 2 is normally closed*
Default N.O.

POS. *The output is operating with positive weight*
NEG. *The output is operating with negative weight*
Default: POS

NORML *Output 2 is active with unstable weight*
STABL *Output 2 is active with stable weight*
Default: Norml

HYST-2 HYSTERESIS OF THE SETPOINT 2

Hysteresis value than the setpoint value set

Value: from 0 to 999

Default: 2

TIME-2 SETPOINT 2 TEMPORIZATION

Value of time, in tenths of a second, during which, when the weight value set is overcome, the output relative to setpoint 2 remains enabled.

After this time, even if the weight value is still above the setpoint, the output is automatically disabled.

The function is not activated if the programmed time is equal to zero.

Value: from 0 to 999

Default: 0

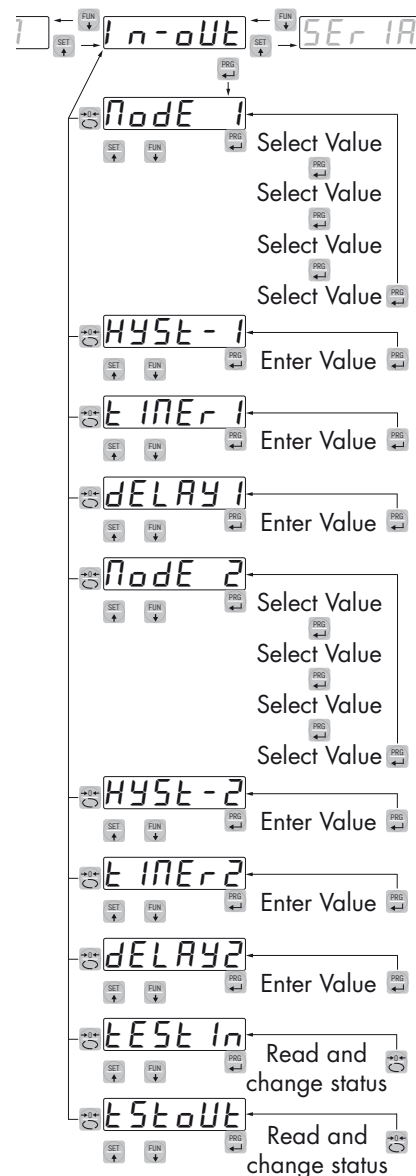
DELAY2 SETPOINT 2 DELAY

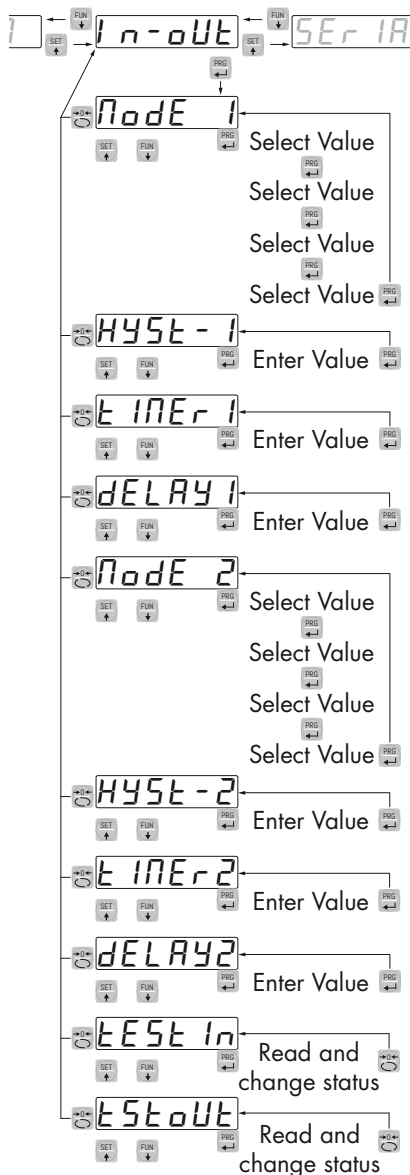
Value of time, in tenths of a second, after which, when the weight value set is overcome, the output relative to setpoint 2 remains enabled.

The function is not activated if the programmed time is equal to zero.

Value: from 0 to 999

Default: 0





tEstIn **LOGIC INPUTS TEST PROCEDURE**

The display shows the inputs status.

0 = input disabled

1 = input activated.

The input 1 corresponds to the 1st value on the left.

Enable and disable the inputs to check the corresponding state on the display. During this procedure, the normal function of the inputs is not active. Use this procedure only to check the hardware.

tEstOut **LOGIC OUTPUTS TEST PROCEDURE.**

The display shows the outputs status.

0 = output disabled, 1 = output activated.

The input 1 corresponds to the 1st value on the left.

During this procedure, the LEDs reflect the state of the outputs. To set the digits, use the keys as for the numeric settings.

During this procedure, the normal function of the outputs is not active. Use this procedure only to check the hardware.

SERIAL OUTPUT PARAMETERS

This menu allows you to set the serial ports COM1 and COM2 and the communication parameters. The instrument has two independent serial ports:

COM1 with RS232 or RS422/RS485 interface

COM2 with optional FIELDBUS interface.

bAUD r **BAUD RATE COM1**

It defines the baudrate of the RS232 serial port.

The value must be set to the same value of the PC / PLC or remote display.

Value to be selected:

2400

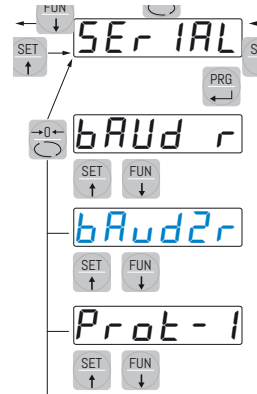
9600

19200

38400

115200

Default: 9600



bAUD2r **BAUD RATE COM2 (DEVICENET VERSION)**

It defines the baudrate of the DEVICENET interface.

The value must be set to the same value of the PC/PLC.

Value to be selected:

125 250 500 DeviceNet

Default:

125 DeviceNet

Prot - 1 **COM1 PROTOCOL**

It defines how to use the RS232 serial port

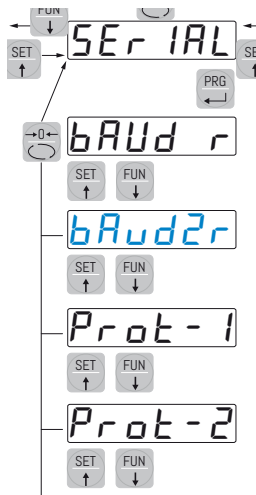
None: Serial communication OFF

Contin: Continuous transmission of the weight string. It can be used, for example, to drive a weight repeater. See details in the relevant paragraph.

Demand: When the Operator presses the front button or through Input 2, a string of weight is transmitted. The command is accepted if the weight is stable. Between two consecutive transmissions the weight must have a variation of at least 20 divisions.

Autom-: It's automatically transferred to a string of weight when the weight stabilizes at a value higher than the minimum weight (20 divisions). Between two consecutive transmissions, the weight must have a variation of at least 20 divisions.

Slave: ASCII protocol. See details in the relevant paragraph.



Modbus: MODBUS RTU (slave) protocol. used only if PROT-2 is configured equal NONE. See details in the relevant paragraph. Selectable communication parameters:

n-8-1

n-8-2

E-8-1

o-8-1

Default: n-8-1

Print: Data transfer to the printer.

Value to be selected:

None

Contin

Demand

Autom-

Slave

Modbus

Print

Default: None

Prot-2 COM2 PROTOCOL:

It defines the Fieldbus use mode

None: Serial communication OFF

PROFIB: PROFIBUS fieldbus (if there is an optional board)

DEVNET: DEVICENET fieldbus (if there is an optional board)

Value to be selected:

None

Profib

Devnet

Default:

None

Address **COM1 SERIAL COMMUNICATION ADDRESS**

Configuration of the address used in the transmission protocols and in the MODBUS protocol.

Value from 000 to 99.

Default:01

Pr-Add PROGRAMMING OF THE PROFIBUS ADDRESS

Configuration of the address used in the PROFIBUS protocol.

Values: from 0 to 126

Default: 01

***dC-Add* PROGRAMMING OF THE DEVICENET ADDRESS**

Programming of the address used in DEVICENET protocol.

Value: from 0 to 63

Default:01

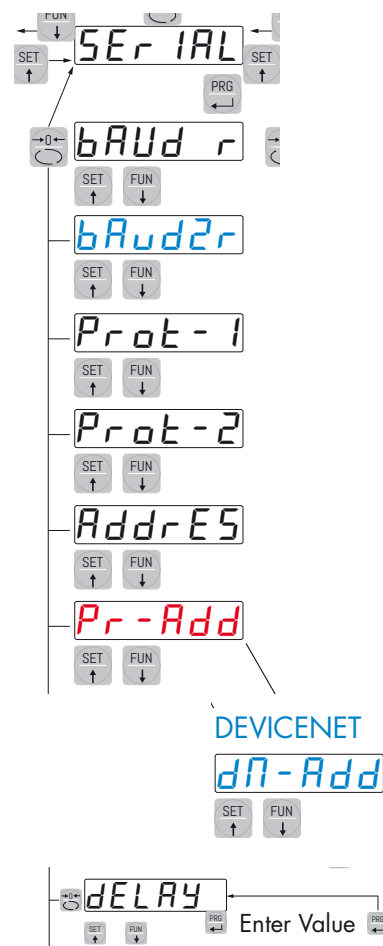
***DELAY* DELAYED RESPONSE OF THE SLAVE AND MODBUS RTU COM1 PROTOCOLS**

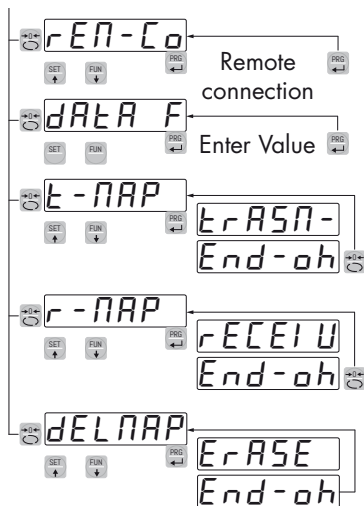
Indicative delay of the response string used in the SLAVE protocol.
(expressed in 1/100 sec., max 1 sec).

This value is expressed in milliseconds and represents the delay with which the instrument sends the response to the request received from the master.

Value: from 0 to 999 msec

Default: 000





rEN-Co REMOTE COMMUNICATION

It enables communication with a PC for the setting via the PC program

dAtA F REMOTE COMMUNICATION

Parameters of the serial COM1 protocols (parity, bits n., stop bits) except MODBUS.

t-NAP SENDING DATA TO THE PC

This function allows to transfer the mapping of the registers from the DAT 400 instrument to the PC program. Before starting the transmission of the mapping, you should enable the reception of the map (Receive button) on the PC program. During transmission, the display of the instrument displays TRASM, at the end of the transmission it shows END-OK.

To end the mapping transferring process, press the key 0.

r-NAP RECEIVING DATA FROM THE PC

This function allows to receive the registers mapping from the PC program.

Before starting the mapping transmission in the PC (Send key), the receiving function must be enabled on the DAT 400 by pressing the PRG key. When receiving, the display shows RECEIV, at the end of the receiving it shows END-OK. To end the process of mapping transferring, press the 0 key.

dELNAP DATA RESET

This function allows you to restore the default mapping of the instrument, while restoring the default mapping of the instrument, ERASE is displayed.

ANALOG - ANALOG OUTPUT PARAMETERS (DAT 400/A ONLY)

F-SCAL FULL SCALE

It's the weight corresponding to the full scale of the analog output that can be different from the capacity of the weighting system.

Value to be set from 000 to 99999.

Default: the same value of the CAPACITY parameter

MODE ANALOG OUTPUT OPERATION MODE

Selection of the value to be associated to the analog output, corresponding to the net weight, gross weight or the peak value.

Value to be selected:

NET

GROSS

PEAK

Default: GROSS


ANZERO ZERO VALUE OF THE ANALOG OUTPUT

Analog value related to the full scale of the analog output to be subtracted.

TEST ANALOG OUTPUT TEST PROCEDURE

With this procedure it is possible to check the operation of the analog output, causing the output value through the use of the keyboard.

The display shows the percentage of the output value than the full scale set.

Use the SET and  keys to increase/decrease the output value.

RANGE ANALOG OUTPUT RANGE

Select the analog output range.

Value to be selected:

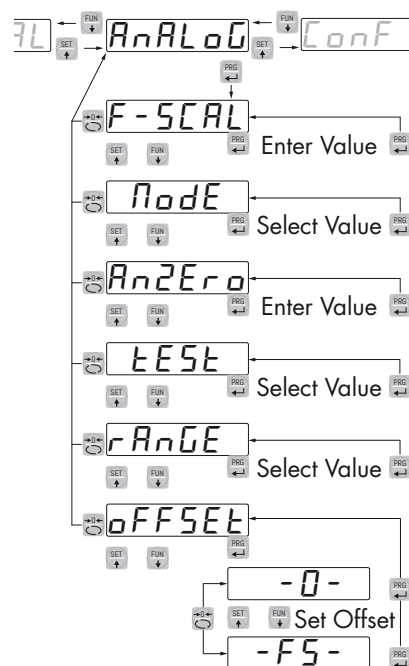
0÷20mA

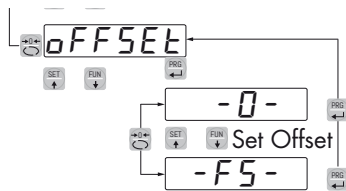
4÷20mA

0÷10Vdc

0÷5Vdc



Default: 4÷20mA







oFFSEt **ADJUSTING THE OFFSET (CALIBRATION)**

Measure the analog output value with a multimeter to perform the calibration of zero (0) and full scale (FS).

Use the  and  keys to adjust the analog output. Press and hold down the key for a rapid change.

Press the  key to toggle between offset of zero and that of full scale.

Press the  key to return to the OFFSET sub-menu. Press the  key to return to the ANALOG menu.

SERIAL COMMUNICATION PROTOCOLS

CONTINUOUS, AUTOMATIC AND MANUAL TRANSMISSION PROTOCOL

These protocols have been programmed into their programming menu.

The string is transmitted as follows:

| | | | | | | | |
|-----|----------|--------------|----------------|--------|-----|----------|-----|
| STX | <status> | <net weight> | <gross weight> | <peak> | ETX | <chksum> | EOT |
|-----|----------|--------------|----------------|--------|-----|----------|-----|

Where

STX (start of text) = 0x02h

ETX (end of text) = 0x03h

EOT (end of transmission) = 0x04.

<status> = an ASCII character that can take the following values:

"S" = stable weight.

"M" = weight that is not stable (moving).

"O" = weight greater than the maximum capacity.

"E" = weight that cannot be detected.

<net weight> = field consisting of 6 ASCII characters of net weight.

<gross weight> = field consisting of 6 ASCII characters of gross weight.

<peak> = field consisting of 6 ASCII characters of peak.

<chksum> = 2 ASCII control characters calculated considering the characters between STX and ETX excluded. The control value is obtained by executing the operation of XOR (or exclusive) of the 8-bit ASCII codes of the characters considered. The result is a character that is expressed in hexadecimal with 2 digits that can take values from "0" to "9" and "A" to "F".

<chksum> is the ASCII encoding of the two hexadecimal digits.

In the case of continuous communication protocol, the given string is transmitted at a frequency of 10 Hz, regardless of the weight filter selected.

In the case of automatic and manual communication protocols, between 2 weight transmissions, the weight must have a variation corresponding at least 20 divisions.

SLAVE TRANSMISSION PROTOCOL

LIST OF THE CONTROLS AVAILABLE:

- Request for the net and gross weight and current peak.
- Change in gross weight.
- Change in net weight.
- Command of reset or automatic calibration or peak reset.
- Programming the two setpoints of weight
- Requesting the programmed setpoints.
- Control of setpoints storage in permanent memory.

The unit connected to the instrument (typically a personal computer) acts as a MASTER and is the only unit that can start a process of communication.

The process of communication must be made by the transmission of a string by the MASTER, followed by a reply from the SLAVE concerned.

CONTROLS FORMAT DESCRIPTION:

The double quotes enclose constant characters (observe upper and lower case); the <and> symbols contain variable numeric fields.

REQUEST FOR THE NET AND GROSS WEIGHT AND CURRENT PEAK

Master: <Addr> "N" EOT

DAT 400: "N" <Addr> <status> <net> <gross> <peak> ETX <chksum> EOT

CHANGE IN GROSS WEIGHT

Master: <Addr> "C" "L" EOT

DAT 400: <Addr> "C" "L" ACK EOT

CHANGE IN NET WEIGHT

Master: <Addr> "C" "N" EOT

DAT 400: <Addr> "C" "N" ACK EOT

COMMAND OF RESET OR AUTOMATIC CALIBRATION OR PEAK RESET

Master: <Addr> "A" "A" EOT

DAT 400: <Addr> "A" "A" ACK EOT

PROGRAMMING TWO WEIGHT SETPOINTS

Master: <Addr> "S" <s1> <s2> ETX <csum> EOT

DAT 400: <Addr> "S" ACK EOT

REQUESTING FOR THE PROGRAMMED SETPOINT

Master: <Addr> "R" EOT

DAT 400: <Addr> "R" <s1> <s2> ETX <csum> EOT

STORING THE WEIGHT Setpoint IN A PERMANENT MANNER

Master: <Addr> "M" EOT

DAT 400: <Addr> "M" ACK EOT

In the case of communication error or otherwise unrecognized command from DAT 400, it will respond with the following string:

DAT 400: <Addr> NAK EOT

FIELDS DESCRIPTION

The double quotes enclose constant characters (observe upper and lower case); the <and> symbols contain variable numeric fields.

<addr> = Serial communication address of the instrument; it is the ASCII character obtained by adding 80h to the number of address (i.e. address 1: <Addr> = 80h + 01h = 81h).

<csum> = checksum of the string data. It is calculated by performing the exclusive OR (XOR) of all characters from <Addr> to ETX excluded the latter; the result of the XOR is decomposed into 2 characters by considering separately the upper 4 bits (first character) and lower 4 bits (second character); the 2 characters obtained are then ASCII encoded (example: XOR = 5Dh; <csum> = "5Dh" namely 35h and 44h).

ETX (end of text) = 0x03h,

EOT (end of transmission) = 0x04h,

ACK (acknowledgment) = 0x06h,

NAK (No acknowledgment) = 0x15h.

<status> = an ASCII character that can take the following values:

"S" = stable weight

"M" = weight that is not stable (moving)

"O" = weight greater than the maximum capacity

"E" = weight that cannot be detected.

<s1>...<s2> = 6 ASCII characters of setpoint.

<net weight> = 6 ASCII characters of net weight.

<gross weight> = 6 ASCII characters of gross weight.

<peak> = 6 ASCII characters of peak.

If the request is made cyclically, the weight is acquired with a maximum frequency of:

| Frequency | Baud Rate |
|-----------|-----------|
| 200Hz | 115200 |
| 50Hz | 38400 |
| 35Hz | 19200 |
| 25Hz | 9600 |
| 8Hz | 2400 |

MODBUS RTU PROTOCOL

The addresses listed in the tables below follow the standard address specified in the guidelines of the Modicon PI-MBUS-300. Below please find an excerpt that helps the user to communicate with the instrument.

"All data addresses in Modbus messages are referenced to zero. The first occurrence of a data item is addressed as item number zero. For example:

The coil known as 'coil 1' in a programmable controller is addressed as coil 0000 in the data address field of a Modbus message.

Coil 127 decimal is addressed as coil 007E hex (126 decimal).

Holding register 40001 is addressed as register 0000 in the data address field of the message. The function code field already specifies a 'holding register' operation. Therefore the '4XXXX' reference is implicit."

To confirm a new value in E2prom, run the function of MAKE – BACKUP. If this function is not performed by switching off, the DAT will return to the value before the change.

If not specified otherwise, the numerical values (such as addresses, codes and data) are expressed as decimal values.

For any hardware configuration of the instrument (FIELDBUS or Analog), the MODBUS RTU protocol is always available on COM1 RS232; in the event of Fieldbus absence, the MODBUS RTU protocol is also available on COM2 RS485.

INSTRUMENT RESPONSE TIMES

In order to respond to most requests, the instrument takes a maximum time of 20 msec.

Exceptions are:

- the e2prom Backup command (max time = 350mSec.)
- writing of the registers of the cells capacity, cells sensitivity, net weight, system calibration, filter (max time = 550mSec).

COMMUNICATION ERRORS HANDLING

The communication strings are controlled by the CRC (Cyclic Redundancy Check). In the case of a communication error, the slave does not respond with a string. The master must consider a timeout for the receipt of the response. In case of no answer, a communication error has occurred.

RECEIVED DATA ERROR HANDLING

In the case of string received correctly, but that cannot be executed, the slave responds with an EXCEPTION RESPONSE according to the following table.

| Code | Description |
|------|---|
| 1 | ILLEGAL FUNCTION (The function is not valid or not supported) |
| 2 | ILLEGAL DATA ADDRESS (The address of the specified data is not available) |
| 3 | ILLEGAL DATA VALUE (The received data have invalid value) |

SUPPORTED FUNCTIONS

| Function | Description |
|-------------|---|
| 01 | READ COIL STATUS (Reading the state of the logic outputs) |
| 02 | READ INPUT STATUS (Reading the state of the logic inputs) |
| 03 | READ HOLDING REGISTERS (Reading the programmable registers) |
| 04 | READ INPUT REGISTERS (Reading the "read only" registers) |
| 05 | FORCE SINGLE COIL (Writing the status of each output) |
| 06 | PRESET SINGLE REGISTER (Writing a programmable register) |
| 15 | FORCE MULTIPLE COILS (Multiple writing of outputs) |
| 16 | PRESET MULTIPLE REGISTERS (Multiple writing of registers) |
| Funct + 80h | EXCEPTION RESPONSE |

LIST OF THE MODBUS PROTOCOL HOLDING REGISTERS

| Address | Holding Register | R/W | Format | Note |
|---------|-------------------------------|-----|--------|--|
| 40001 | Status Register | R | INT | See table A |
| 40002 | Gross weight (MSB) | R | DINT | |
| 40003 | Gross weight (LSB) | R | | |
| 40004 | Net weight (MSB) | R | DINT | |
| 40005 | Net weight (LSB) | R | | |
| 40006 | Peak value (MSB) | R | DINT | |
| 40007 | Peak value (LSB) | R | | |
| 40008 | Load cell signal in mV/V | R | INT | |
| 40009 | Logic inputs | R | INT | LSB = Input 1 |
| 40010 | Output | R/W | INT | LSB = Output 1 (it writes only if the setpoint = 0) |
| 40011 | Keys status | R | INT | See table B, even if the key lock is enabled |
| 40012 | Firmware code and version | R | INT | See table C |
| 40201 | Setpoint 1 (MSB) | R/W | DINT | |
| 40202 | Setpoint 1 (LSB) | R/W | | |
| 40203 | Setpoint 2 (MSB) | R/W | DINT | |
| 40204 | Setpoint 2 (LSB) | R/W | | |
| 40501 | Data Register (MSB) | W | DINT | Data related to the Command Register |
| 40502 | Data Register (LSB) | W | | |
| 40503 | Command Register | W | INT | See table D |
| 41001 | Cells capacity (MSB) | R/W | DINT | |
| 41002 | Cells capacity (LSB) | R/W | | |
| 41003 | Cells sensitivity | R/W | INT | |
| 41004 | Weight division value | R/W | INT | See table E |
| 41005 | Tare of the system (MSB) | R/W | DINT | |
| 41006 | Tare of the system (LSB) | R/W | | |
| 41007 | System capacity (MSB) | R/W | DINT | |
| 41008 | System capacity (LSB) | R/W | | |
| 41101 | Weight filter | R/W | INT | 0-9 |
| 41102 | Weight stability | R/W | INT | 0-4 |
| 41103 | Auto-zero setpoint in % (MSB) | R/W | DINT | 0-100%. |
| 41104 | Auto-zero setpoint in % (LSB) | R/W | | |
| 41105 | Zero tracking | R/W | INT | 0-4 |
| 41106 | Zero band in divisions | R/W | INT | |
| 41201 | Operation mode Set 1 | R/W | INT | See table F |
| 41202 | Hysteresis Set 1 (MSB) | R/W | DINT | |
| 41203 | Hysteresis Set 1 (LSB) | R/W | | |
| 41204 | Timer Set 1 | R/W | INT | |
| 41205 | Delay Set 1 | R/W | INT | |
| 41206 | Operation mode Set 2 | R/W | INT | See table F |
| 41207 | Hysteresis Set 2 (MSB) | R/W | DINT | |
| 41208 | Hysteresis Set 2 (LSB) | R/W | | |
| 41209 | Timer Set 2 | R/W | INT | |
| 41210 | Delay Set 2 | R/W | INT | |
| 41401 | Analog full scale (MSB) | R/W | DINT | |
| 41402 | Analog full scale (LSB) | R/W | | |
| 41403 | Analog mode | R/W | INT | See table G |
| 41404 | Analog range | R/W | INT | See table H |
| 41405 | Analog output value | R/W | INT | Points of analog output (da 0 a 65535). Analog output uses this value only if FS (41402) = 0 |
| 42000 | Monitor Register | W | INT | The programmed value is automatically copied to Monitor Register R (42100) |
| 42100 | Monitor Register | R | INT | Copy of the value entered in Monitor Register W (42000) |

TABLE A - REGISTER STATUS CODING

| BIT | 13 | 12 | 11 | 10 | 9 | 8 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------|----------|---------|---------|-------------|---------------|-----------|-----------|------------|--------------|-----------|---------------|-------------|
| Description | Output 2 | Output 1 | Input 2 | Input 1 | Memory Flag | Lock keyboard | Off Range | Over-load | Under-load | Tare entered | Zero band | Stable weight | Zero center |

WARNING: Bits 15, 14 and 7 are not managed and are always equal to 0.

OPERATION Flag memory (bit 9): When modifying a register that requires saving in the E²prom (see table "Data stored in memory with the command 0x020" on the next page), this bit is set to 1 to remind the user to run the command 0x0020 (saving data in the permanent memory). After performing this operation, the bit is automatically reset to zero.

OPERATION Bit related to a weight error (bit 6 of the STATUS REGISTER) When the cell is disconnected or the measured values are out of range, this bit is set to 1.

OPERATION Bit related to the Band of zero (bit 2 of the STATUS REGISTER) When the gross weight is less than or equal to the parameter "Band of zero in divisions", bit 2 of the status register is set to 1.

TABLE B - KEYS CODING (40011)

| bit | Keys Status |
|-----|-------------|
| 0 | SET key |
| 1 | FUN key |
| 2 | 0 key |
| 3 | PRG key |

WARNING: Bits 4 to 15 are not managed and are always equal to 0.

TABLE C - FIRMWARE CODING

| bit | Firmware Code |
|--------|---------------|
| 0...7 | Version code |
| 8...15 | Firmware code |

TABLE D- COMMAND REGISTER CODING TABLE FOR MODBUS PROTOCOL

| Register value | Command Register Function |
|----------------|---|
| 0x0000 | No command |
| 0x0001 | Semiautomatic zero |
| 0x0002 | Autotare |
| 0x0003 | Peak reset |
| 0x0010 | Calibration of the weight zero |
| 0x0011 | Calibration of the full weight scale |
| 0x0020 | Saving the data in the permanent memory |
| 0x7FFF | Direct access to memory |

TABLE E- CODING DIVISION VALUE

| Register value | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|----------------|-------|-------|-------|------|------|------|-----|-----|-----|
| Division value | 0.001 | 0.002 | 0.005 | 0.00 | 0.02 | 0.05 | 0.1 | 0.2 | 0.5 |

| Register value | 9 | 10 | 11 | 12 | 13 | 14 |
|----------------|---|----|----|----|----|----|
| Division value | 1 | 2 | 5 | 10 | 20 | 50 |

| Addr. of Modbus register | Data stored in memory with the 0x0020 command |
|--------------------------|---|
| 41001-41002 | Cells capacity |
| 41003 | Cells sensitivity |
| 41004 | Weight division value |
| 41005-41006 | Tare of the system |
| 41007-41008 | System capacity |
| 41101 | Weight filter |
| 41102 | Weight stability |
| 41103-41104 | Auto-zero setpoint |
| 41105 | Zero tracking |
| 41106 | Zero band in divisions |
| 41201 | Operation mode Set 1 |
| 41202-41203 | Hysteresis Set 1 |
| 41204 | Timer Set 1 |
| 41205 | Delay Set 1 |
| 41206 | Operation mode Set 2 |
| 41207-41208 | Hysteresis Set 2 |
| 41209 | Timer Set 2 |
| 41210 | Delay Set 2 |
| 41401-41402 | Analog full scale |
| 41403 | Analog mode |
| 41404 | Analog range |

TABLE F - WEIGHT SETPOINT OPERATION CODING

| bit | Setpoint operation mode |
|-------|---|
| 0...1 | 0 = Net weight, 1 = Gross weight, 2 = Peak |
| 2 | 0 = N.O. 1 = N:C. |
| 3 | 0 = Positive values 1 = Negative values |
| 4 | 0 = Always controlled 1 = Only with stable weight |

EXAMPLE: CALIBRATION FUNCTION VIA MODBUS

To perform the calibration of full scale (that require the weight value in the sample set in the data register), the value in the data register must be present when the command register is programmed. For example:

Calibrate the full scale using a sample weight of 2000 kg.

Write 2000 in the data register.

Write 0x0011 in the command register.

Use the multiple registers write function and write the registers of data register and command register in a single command.


PRINT PROTOCOL

This protocol enables the communication with a printer. The data on the printed report are the following: NET, GROSS and TARE (+ PEAK, if enabled).

The print command takes place by pressing the  key or by activating the remote input #2. (*)

The printed report is issued only if the following conditions are met:


- Gross weight positive
- Net weight positive
- Stable weight (**)
- BLIND function disabled (***)

(*) In case the  key is locked (see page 18) the print command can take place through the remote input #2 only.

(**) The weight stability condition is controlled only if the "MOTION" parameter (see page 28) is set to a value different than 0.

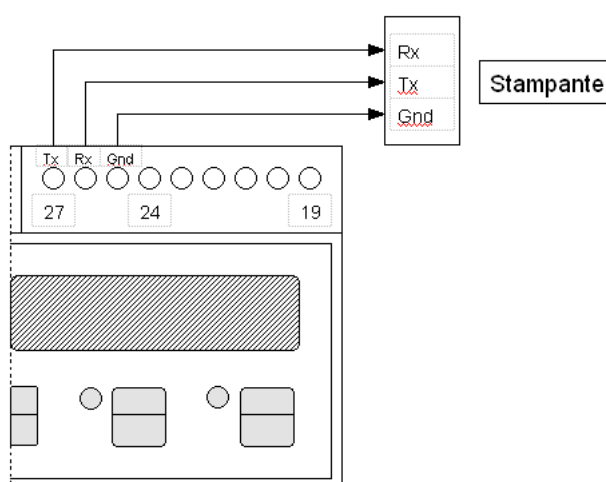
If MOTION = 0 the printed report is issued even if the weight is unstable.

(***) In case the BLIND function is enabled (see page 18) the print command can take place through

the remote input #2 only, not via the  key.

Between one printout and the next one the weight must change for at least 20 counts.

CONNECTION TO THE PRINTER



PRINTED REPORT FORMATS

| Standard | | Peack enabled | |
|----------|-----------|---------------|-----------|
| Net | 9.488 kg | Net | 9.488 kg |
| Gross | 19.874 kg | Gross | 19.874 kg |
| Tare | 10.386 kg | Tare | 10.386 kg |
| | | Peak | 35.294 kg |

THE USB CONNECTION BETWEEN THE DAT-400 AND THE PC

The hardware module installed inside the DAT-400 and allowing the instrument to be interfaced with a PC through the USB port, is named CP210x, manufactured by Silicon Laboratories.

The CP210x module needs the drivers to be installed in the PC:

By installing on PCs the INNOVATION 2 utility software drivers will be loaded automatically. For installation refer to the manual.

FIELD BUS PROTOCOL

FIELD BUS data exchange takes place on two separate memory areas, which are described in the tables below.

WARNING:

The “Input Data Area” and the “Output Data Area” are of 128 bytes

To transfer the parameters of the Output Data Area to the instrument you need to enable direct access to the memory, writing the hexadecimal value 0x7FFF in the Command Register (1 word in writing) in order to avoid that the instrument resets all its variables in the case of uninitialized Output Data Area

This command must be sent before the connection to inform the instrument that the parameters have been initialized by the master. Now, the instrument continually tests the changes made to the parameters and stores them only in case of real change.

INPUT DATA AREA

| ADDRES | | Description | Format | Note |
|--------|-----|------------------------|--------|---------------------|
| Byte | Bit | | | |
| 0 | 0 | Keyboard_Look | BOOL | See table A Page 45 |
| 0 | 1 | Memory_Flag | BOOL | See table A Page 45 |
| 0 | 2 | Input_1 | BOOL | See table A Page 45 |
| 0 | 3 | Input_2 | BOOL | See table A Page 45 |
| 0 | 4 | Output_1 | BOOL | See table A Page 45 |
| 0 | 5 | Output_2 | BOOL | See table A Page 45 |
| 0 | 6 | Spare | BOOL | See table A Page 45 |
| 0 | 7 | Spare_1 | BOOL | See table A Page 45 |
| 1 | 0 | Center_of_Zero | BOOL | See table A Page 45 |
| 1 | 1 | Stable_Weight | BOOL | See table A Page 45 |
| 1 | 2 | Zero_Band | BOOL | See table A Page 45 |
| 1 | 3 | Tare_entered | BOOL | See table A Page 45 |
| 1 | 4 | Under_Load | BOOL | See table A Page 45 |
| 1 | 5 | Over_Load | BOOL | See table A Page 45 |
| 1 | 6 | Off_Range | BOOL | See table A Page 45 |
| 2 | 0 | Gross_Weight | DINT | |
| 6 | 0 | Net_Weight | DINT | |
| 10 | 0 | Peak_Weight | DINT | |
| 14 | 0 | Load_Cells_Signal_mV_V | INT | |
| 16 | 0 | Input_Status | INT | |
| 18 | 0 | Output_Status | INT | |
| 20 | 0 | Not used | BYTE | |
| 21 | 0 | SET_Key | BOOL | See table B Page 45 |
| 21 | 1 | FUN_Key | BOOL | See table B Page 45 |
| 21 | 2 | O_Key | BOOL | See table B Page 45 |
| 21 | 3 | PRG_Key | BOOL | See table B Page 45 |

| | | | | |
|----|---|------------------------|------|---------------------|
| 22 | 0 | Cod_Firmware | BYTE | See table C Page 45 |
| 23 | 0 | Cod_Versione | BYTE | See table C Page 45 |
| 24 | 0 | SP_1 | DINT | |
| 28 | 0 | SP_2 | DINT | |
| 32 | 0 | Load_Cell_Capacity | DINT | |
| 36 | 0 | Load_Cell_Sensitivity | INT | |
| 38 | 0 | Weight_Division_Value | INT | |
| 40 | 0 | Tare_of_the_System | DINT | |
| 44 | 0 | Capacity_of_the_System | DINT | |
| 48 | 0 | Filter_Value | INT | |
| 50 | 0 | Weight_Stability_value | INT | |
| 52 | 0 | Autozero_Set | DINT | |
| 56 | 0 | Tracking_Factor | INT | |
| 58 | 0 | Zero_Band | INT | |
| 60 | 0 | Not used | BYTE | |
| 61 | 0 | Set_1_Net_Weight | BOOL | See table F Page 46 |
| 61 | 1 | Set_1_Gross_Weight | BOOL | See table F Page 46 |
| 61 | 2 | Set_1_NO_NC | BOOL | See table F Page 46 |
| 61 | 3 | Set_1_Pos_Neg_Values | BOOL | See table F Page 46 |
| 61 | 4 | Set_1_Control | BOOL | See table F Page 46 |
| 62 | 0 | Set_1_Hysteresys | DINT | |
| 66 | 0 | Set_1_Timer | INT | |
| 68 | 0 | Set_1_Delay | INT | |
| 70 | 0 | Not used | BYTE | |
| 71 | 0 | Set_2_Net_Weight | BOOL | See table F Page 46 |
| 71 | 1 | Set_2_Gross_Weight | BOOL | See table F Page 46 |
| 71 | 2 | Set_2_NO_NC | BOOL | See table F Page 46 |
| 71 | 3 | Set_2_Pos_Neg_Values | BOOL | See table F Page 46 |
| 71 | 4 | Set_2_Control | BOOL | See table F Page 46 |
| 72 | 0 | Set_2_Hysteresys | DINT | |
| 76 | 0 | Set_2_Timer | INT | |
| 78 | 0 | Set_2_Delay | INT | |
| 80 | 0 | Monitor_Register | INT | |

READING EXAMPLE

To read the gross weight on the DAT 400 it is needed to read the addresses from 2 to 5 of the Input Area.

To read the net weight it is needed to read the addresses from 6 to 9 of the Input Area.

When the display shows the gross weight value of 12351 in the corresponding bytes there will be:

| | Byte 2 | Byte 3 | Byte 4 | Byte 5 |
|-----|--------|--------|--------|--------|
| Hex | 00 | 00 | 30 | 3F |

OUTPUT DATA AREA

| Dirección | | Descripción | Formato | Note |
|-----------|-----|------------------------|---------|---------------------|
| Byte | Bit | | | |
| 128 | 0 | Command_Register | INT | See table D Page 45 |
| 130 | 0 | Logic_Output | INT | |
| 132 | 0 | SP_1 | DINT | |
| 136 | 0 | SP_2 | DINT | |
| 140 | 0 | Data_Register | DINT | |
| 144 | 0 | Load_Cell_Capacity | DINT | |
| 148 | 0 | Load_Cell_Sensitivity | INT | |
| 150 | 0 | Weight_Division_Value | INT | See table E Page 45 |
| 152 | 0 | Tare_of_the_System | DINT | |
| 156 | 0 | Capacity_of_the_System | DINT | |
| 160 | 0 | Filter_Value | INT | |
| 162 | 0 | Weight_Stability_value | INT | |
| 164 | 0 | Autozero_Set | DINT | |
| 168 | 0 | Tracking_Factor | INT | |
| 170 | 0 | Zero_Band | INT | |
| 172 | 0 | Not used | BYTE | |
| 173 | 0 | Set_1_Net_Weight | BOOL | See table F Page 46 |
| 173 | 1 | Set_1_Gross_Weight | BOOL | See table F Page 46 |
| 173 | 2 | Set_1_NO_NC | BOOL | See table F Page 46 |
| 173 | 3 | Set_1_Pos_Neg_Values | BOOL | See table F Page 46 |
| 173 | 4 | Set_1_Control | BOOL | See table F Page 46 |
| 174 | 0 | Set_1_Hysteresys | DINT | |
| 178 | 0 | Set_1_Timer | INT | |
| 180 | 0 | Set_1_Delay | INT | |
| 182 | 0 | Not used | BYTE | |
| 183 | 0 | Set_2_Net_Weight | BOOL | See table F Page 46 |
| 183 | 1 | Set_2_Gross_Weight | BOOL | See table F Page 46 |
| 183 | 2 | Set_2_NO_NC | BOOL | See table F Page 46 |
| 183 | 3 | Set_2_Pos_Neg_Values | BOOL | See table F Page 46 |
| 183 | 4 | Set_2_Control | BOOL | See table F Page 46 |
| 184 | 0 | Set_2_Hysteresys | DINT | |
| 188 | 0 | Set_2_Timer | INT | |
| 190 | 0 | Set_2_Delay | INT | |
| 192 | 0 | Monitor_Register | INT | |

WRITING EXAMPLES

To write the set-up parameters following the example:

In the byte 128 (Command Register) write value Hex 7FFF. This value opens the writing area of the DAT 400.

Example: to change the default values of the DAT 400 like the Capacity of the load cells, the Sensitivity and Division value to 15000, 2.9965 and 2:

| Capacity | Byte 144 | Byte 145 | Byte 146 | Byte 147 |
|----------|----------|----------|----------|----------|
| Hex | 00 | 00 | 3A | 98 |
| Dec | 15000 | | | |

| Sensitivity | Byte 148 | Byte 149 |
|-------------|----------|----------|
| Hex | 75 | 0D |
| Dec | 29965 | |

| Division | Byte 150 | Byte 151 |
|----------|----------|----------|
| Hex | 00 | 0D |
| Dec | 13 | |

Save the data by writing the value Hex 20 in Command Register.

N.B. The DAT 400 does not accept writing of the same values already written.

To perform Zero and FS Calibration it is not needed to abilitate the internal Writing Area of the DAT 400.

Zero Calibration:

Whit empty system put Hex 10 in Command Register (byte 128). The new Zero value is stored.

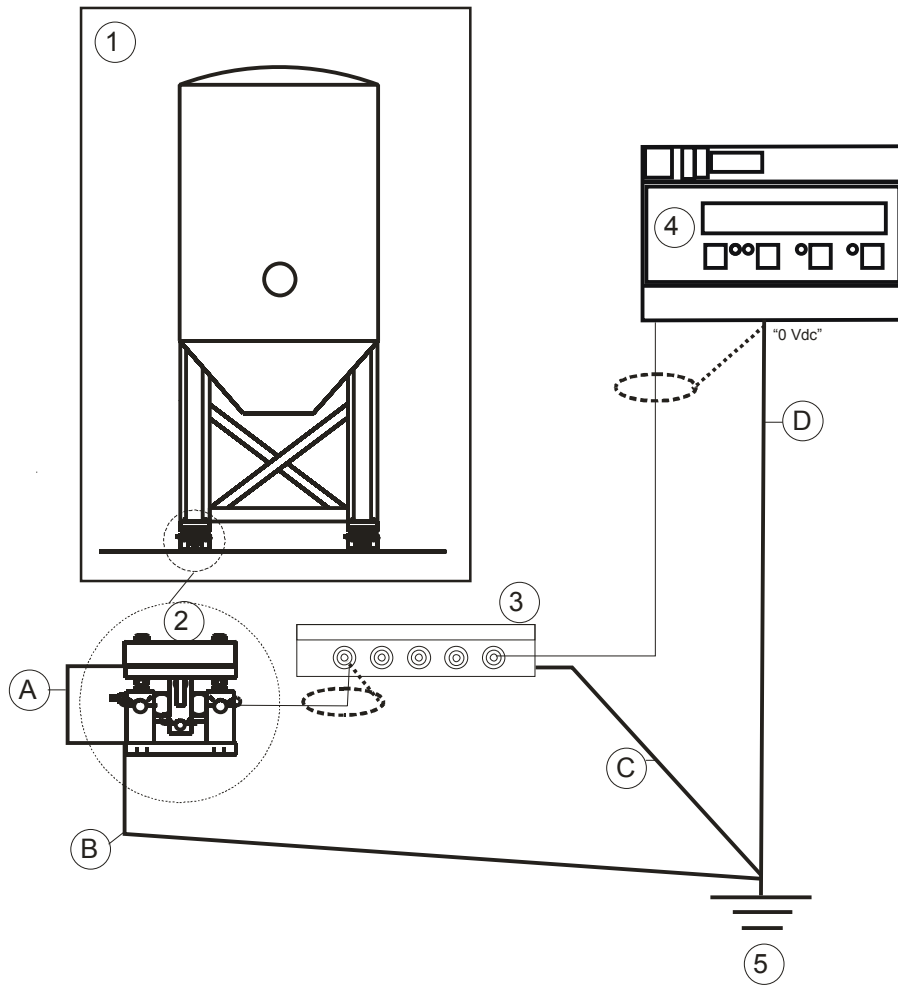
Full Scale Calibration:

Put a know weight on the system and write its value in the Data Register (from byte 140 to 143). Put value Hex 11 in Command Register. The weight value will be displayed.

TROUBLESHOOTING

| PROBLEM | POSSIBLE CAUSE | SOLUTION |
|--|---|--|
| The display shows the O-L message | The weight is not detectable because the cell is absent or incorrectly connected | Check the connections of the cells. |
| The display shows the hyphen in the upper display | The weight cannot be shown because it exceeds the available five digits or is greater than the capacity of the cells. | |
| The display shows the underscore on the lower display. | The weight cannot be shown because negative, more than -9999. | |
| The number of decimal places is wrong. | Incorrect division value selected. | Select the correct division value in the main menu. |
| The serial communication does not work properly. | Installation wrong. The selection of the operation of the serial interface is incorrect. | Check the connections as described in the installation manual. Select the settings as appropriate. |
| The function of semiautomatic zero doesn't work. | The gross weight exceeds the action limit of semi-automatic zero. The weight doesn't stabilize. | To re-establish the zero, calibrate the weight. Wait for the stabilization of the weight or adjust the weight filter parameter. |
| The semiautomatic tare function does not work. | The gross weight is negative or exceeds the maximum capacity. The weight doesn't stabilize. | Check the gross weight. Wait for the stabilization of the weight or adjust the weight filter parameter. |

GROUNDING CONNECTIONS DAT-400



1: Silo.

2: Load cell Accessory.

3: Junction Box.

4: DAT indicator.

A: Load receptor-base Earthing.

B: Accessory Earthing.

C: Junction Box Earthing.

D: DAT indicator Earthing.

Intrinsic Safety Barriers

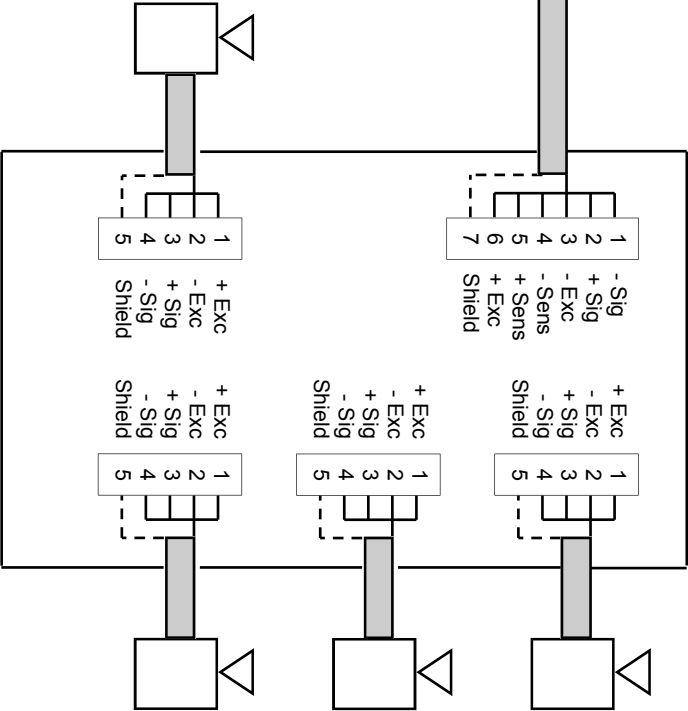
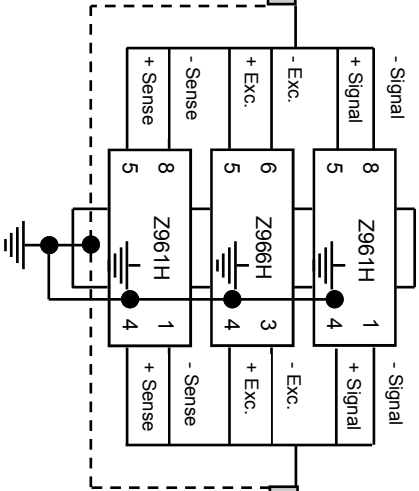
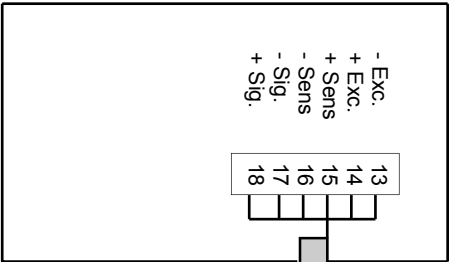
SAFE AREA

HAZARDOUS AREA

Model 400
Digital / Analog Transmitter

PEPPERL & FUCHS
Intrinsic Safety Barriers

Summing Junction Box



| FUNCTION | COLOR |
|----------|--------|
| + Exc. | Green |
| + Sense | Blue |
| - Exc. | Black |
| - Sense | Yellow |
| + Signal | Red |
| - Signal | White |
| Shield | GND |

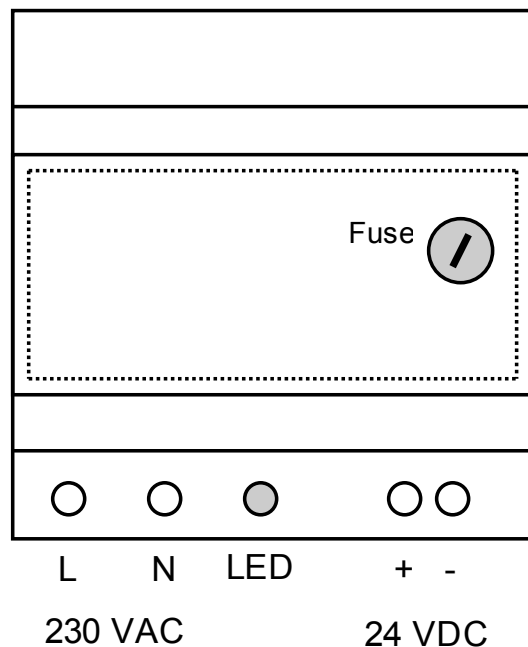
| FUNCTION | BARRIER TYPE | QTY |
|------------|--------------|-----|
| +/- Signal | Z961H | 1 |
| +/- Exc. | Z966H | 1 |
| +/- Sense | Z961H | 1 |

OPTION 24 VOLT POWER SUPPLY

INSTALLATION

- Make sure the installation complies with local regulations and electrical codes.
- Connect AC voltage to the terminals marked "L" and "N".
- A red LED is illuminated when the power supply is "ON".
- The DC voltage is available on the terminals marked "+" and "-". The second set of Terminals are used when powering two transmitters from a single power supply (See notes).

Notes: The power supply should be used to power two transmitters only when a single load cell is connected to each transmitter. For multiple load cell applications it is recommended that an individual power supply be used for each transmitter. This enables the power supply to compensate for any fluctuations in the incoming line voltage. Recent field experiences have shown that voltage drops of greater than 10% can cause the transmitters to drift and become unstable.



FUSE REPLACEMENT

The following procedures require work inside the power supply enclosure and should be performed by qualified service personnel.

- Before opening the unit, disconnect the AC voltage.
- Remove the front cover from the power supply.
- Press down gently on the cover of the fuse holder, and turn counter-clockwise.
- Pull out the cover and fuse as an assembly, replace fuse with a new one.
- Re-install fuse and cover as an assembly, press down gently and turn clockwise.
- Replace the front cover on the power supply.
- Re-apply AC voltage to the unit.

In the event of a malfunction, please contact the nearest distributor for assistance. Any attempt to modify or repair the power supply will void the manufacturers warranty.

NOTES

[illegible]

NOTES

[illegible]

