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Installation and User Manual

version 1.02

WLIGHT

SYMBOLS

Here are the symbols used in the manual to draw the reader's attention:

Caution! Risk of electric shock.

Caution! This operation must be performed by skilled personnel.

Pay particular attention to the following instructions.

Further information.

WARRANTY

24 months from the date of the delivery note. Warranty covers only failures of defective components (due to construction defects or defects in materials) and includes replacement or repair of the components and related labor costs.
Warranty is automatically forfeited in the event of:
- tampering, deletion, removal of the identification label and/or serial number of the product
- misuse, transformation, alteration, repair of products not carried out by Laumas personnel

Laumas provides a 1-year warranty from the date of the delivery note on defects in material or manufacture of the battery.

GUIDELINES FOR PROPER DISPOSAL

This symbol on the product or packaging indicates that:
- This is electrical/electronic equipment and cannot be disposed of as municipal solid waste, but must be delivered to a recycling center
- Improper use or disposal can pollute the environment or damage human health
- Non-compliance with these guidelines will be penalized in accordance with the regulations in force in the country of destination
- It is recommended to dispose of the packing and packaging as required by local regulations

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USER WARNINGS

RECOMMENDATIONS FOR THE PROPER USE OF WEIGHING INSTRUMENT

- Keep away from heat sources and direct sunlight
- Repair the instrument from rain (except special IP versions)
- Do not wash with water jets (except special IP versions)
- Do not dip in water
- Do not spill liquid on the instrument
- Do not use solvents to clean the instrument
- Do not install in areas subject to explosion hazard (except special Atex versions)

RECOMMENDATIONS FOR CORRECT INSTALLATION OF WEIGHING INSTRUMENTS

The terminals indicated on the instrument's wiring diagram to be connected to earth must have the same potential as the weighed structure (same earthing pit or earthing system). If you are unable to ensure this condition, connect with an earthing wire the terminals of the instrument (including the terminal –SUPPLY) to the weighed structure.

The cell cable must be individually led to its panel input and not share a conduit with other cables; connect it directly to the instrument terminal strip without breaking its route with support terminal strips.

Use "RC" filters on the instrument-driven solenoid valve and remote control switch coils.

Avoid inverters in the instrument panel; if inevitable, use special filters for the inverters and separate them with sheet metal partitions.

The panel installer must provide electric protections for the instruments (fuses, door lock switch etc.).

It is advisable to leave the equipment always switched on to prevent the formation of condensation.

MAXIMUM CABLE LENGTHS

- RS232: 15 m for baud rates up to 19200

RECOMMENDATIONS FOR CORRECT INSTALLATION OF THE LOAD CELLS

SIZING OF LOAD CELLS CAPACITY

For safety reasons, in case of static weighing, it is advisable to use the load cells at a maximum of 70-80% of its nominal capacity (assuming that the load is uniformly distributed over the entire weighed structure); depending on the handling mode of the load to weigh, consider to further reduce the % of load with respect to the nominal capacity (ex.: forklifts handling, bridge cranes, etc.).

In case of weighing with dynamic loads, the installer has to estimate the thrust speed, the acceleration, the frequency, etc.

INSTALLING LOAD CELLS

The load cells must be placed on rigid, stable in-line structures; it is important to use the mounting modules for load cells to compensate for misalignment of the support surfaces.

CONNECTING SEVERAL CELLS IN PARALLEL

Connect several cells in parallel by using - if necessary - a watertight junction box with terminal box. The cell connection extension cables must be shielded, led individually into their piping or conduit and laid as far as possible from the power cables (in case of 4-wire connections, use cables with 4x1 mm^2 minimum cross-section).

PROTECTION OF THE CELL CABLE

Use water-proof sheaths and joints in order to protect the cables of the cells.

MECHANICAL RESTRAINTS (pipes, etc.)

When pipes are present, we recommend the use of hoses and flexible couplings with open mouthpieces with rubber protection; in case of hard pipes, place the pipe support or anchor bracket as far as possible from the weighed structure (at a distance at least 40 times the diameter of the pipe).

WELDING

Avoid welding with the load cells already installed. If this cannot be avoided, place the welder ground clamp close to the required welding point to prevent sending current through the load cell body.

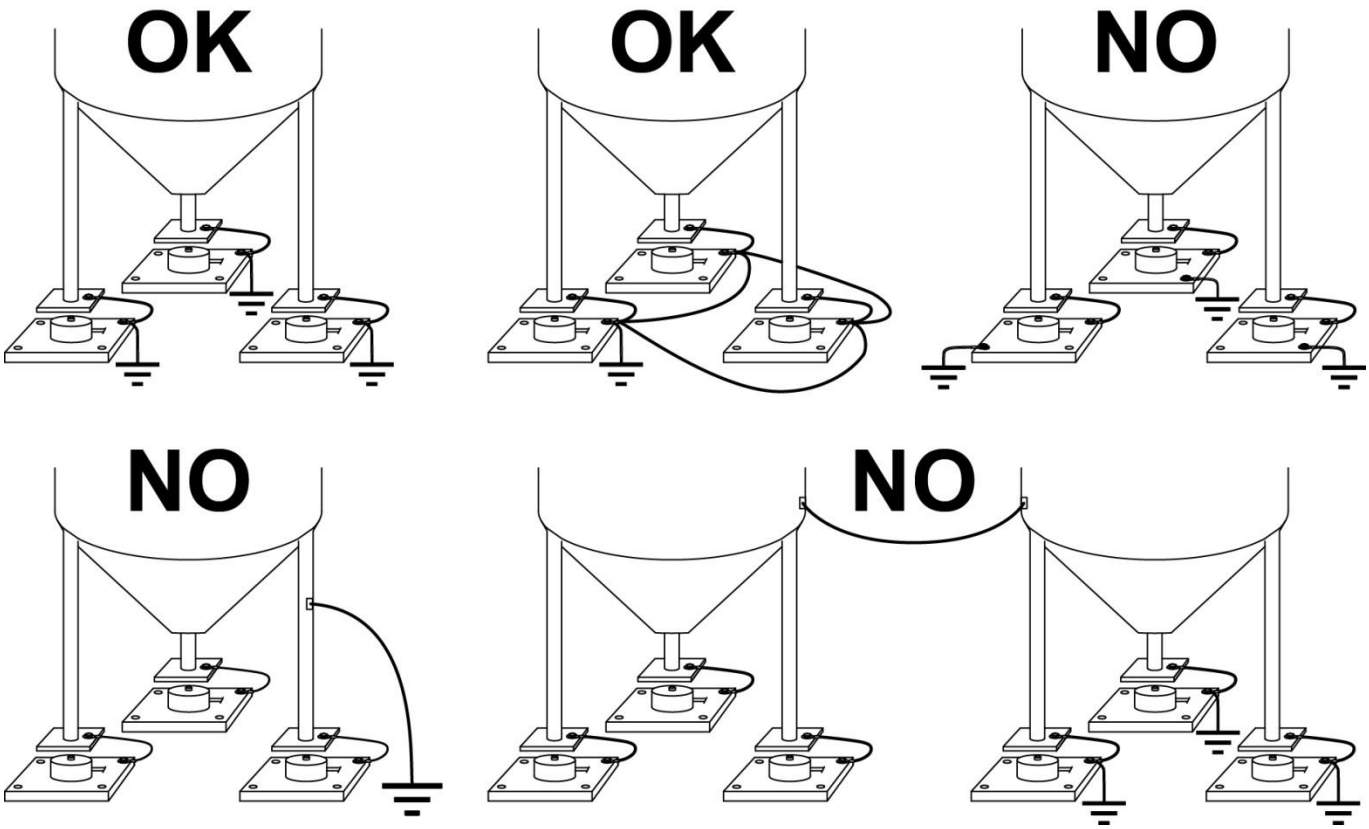
WINDY CONDITIONS - KNOCKS – VIBRATIONS

The use of weigh modules is strongly recommended for all load cells to compensate for misalignment of the support surfaces. The system designer must ensure that the plant is protected against lateral shifting and tipping relating to: shocks and vibration; windy conditions; seismic conditions in the installation setting; stability of the support structure.

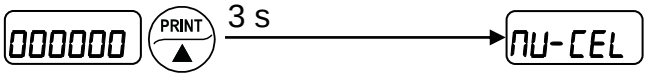
EARTHING THE WEIGHED STRUCTURE

By means of a copper wire with suitable cross-section, connect the cell upper support plate with the lower support plate, then connect all the lower plates to a single earthing system. Electrostatic charges accumulated because of the product rubbing against the pipes and the weighed container walls are discharged to the ground without going through or damaging the load cells. Failure to implement a proper earthing system might not affect the operation of the weighing system; this, however, does not rule out the possibility that the cells and connected instrument may become damaged in the future. It is forbidden to ensure earthing system continuity by using metal parts contained in the weighed structure.

FAILURE TO FOLLOW THE INSTALLATION RECOMMENDATIONS WILL BE CONSIDERED A MISUSE OF THE EQUIPMENT



LOAD CELL INPUT TEST (QUICK ACCESS)



From the weight display, press ▲ for 3 seconds; the response signal of the load cells is displayed, expressed in mV with four decimals.

LOAD CELL TESTING

Load cell resistance measurement (use a digital multimeter):

- Disconnect the load cells from the instrument and check that there is no moisture in the cell junction box caused by condensation or water infiltration. If so, drain the system or replace it if necessary.
- The value between the positive signal wire and the negative signal wire must be equal or similar to the one indicated in the load cell data sheet (output resistance).
- The value between the positive excitation wire and the negative excitation wire must be equal or similar to the one indicated in the load cell data sheet (input resistance).
- The insulation value between the shield and any other cell wire and between any other cell wire and the body of the load cell must be higher than 20 Mohm.

Load cell voltage measurement (use a digital multimeter):

- Take out the load cell to be tested from underneath the container, or alternatively, lift the container support.
- Make sure that the excitation of two wires of the load cell connected to the instrument (or amplifier) is 5 VDC ±3%.
- Measure the response signal between the positive and the negative signal wires by directly connecting them to the tester, and make sure that it is comprised between 0 and ±0.5 mV.
- Apply load to the cell and make sure that there is a signal increment.

IF ONE OF THE ABOVE CONDITIONS IS NOT MET, PLEASE CONTACT THE TECHNICAL ASSISTANCE SERVICE.

MAIN SPECIFICATIONS OF THE INSTRUMENT

Indicator with 6-wire load cell input installable on table, wall or column. Dimensions: 120x200x280 mm. 6-digit semi-alphanumeric red LED display (20 mm height), 8 signaling LED. 5-key mechanical keyboard. D-SUB connectors. IP40 protection rating.
Real-time clock/calendar with buffer battery.
A RS232 serial port for connection to: PC/PLC up to 32 instruments (max 99 with line repeaters) by ASCII Laumas or ModBus R.T.U. protocols, remote display, printer.
24 VDC/1 A stabilized power supply included.

Designed to operate with 8 NiMH rechargeable batteries, 1.2 V, AA type (not included).

BUFFER BATTERY

The instrument is equipped with an internal battery that allows to keep active the internal clock even in the event of power failure.

At the first start and after long periods of inactivity, leave the instrument on for at least 12 hours to fully charge the battery.

TECHNICAL SPECIFICATIONS

POWER SUPPLY and CONSUMPTION	12/24 VDC ±10%; 6 W (standard)
NO. OF LOAD CELLS IN PARALLEL and SUPPLY	max 8 (350 ohm); 5 VDC / 120 mA
LINEARITY	< 0.01% F.S.
THERMAL DRIFT	< 0.0005% F.S./°C
A/D CONVERTER	24 bit (16000000 points)
MAX DIVISIONS (with measurement range: ±10 mV = sens. 2 mV/V)	±999999
MEASUREMENT RANGE	±39 mV
MAX SENSITIVITY OF USABLE LOAD CELLS	±7 mV/V
MAX CONVERSIONS PER SECOND	300 conversions/second
DISPLAY RANGE	±999999
NO. OF DECIMALS / DISPLAY INCREMENTS	0÷4 / x 1 x 2 x 5 x 10 x 20 x 50 x 100
DIGITAL FILTER / READINGS PER SECOND	10 levels / 5÷300 Hz
SERIAL PORTS	RS232
BAUD RATE	2400, 4800, 9600, 19200, 38400, 115200
HUMIDITY (non condensing)	85%
STORAGE TEMPERATURE	-30°C +80°C
WORKING TEMPERATURE	-20°C +60°C

c UL us	WORKING TEMPERATURE	-20°C +58°C
	Equipment to be powered by 12-24 VDC LPS or Class 2 power source.	

ELECTRICAL CONNECTIONS

BASIC INFORMATION

- It is possible to supply up to eight 350 ohm load cells or sixteen 700 ohm load cells.
- For 4-wire load cells, make a jumper between EX- and REF- and between EX+ and REF+.

KEY CONNECTORS

Connector	Pin	Signal
Power supply		+SUPPLY (12/24 VDC)
		-SUPPLY (12/24 VDC)
D1 Female Load cell	1	-LOAD CELL EXCITATION (-Exc)
	2	-LOAD CELL REF/SENSE
	3	
	4	
	5	LOAD CELL SHIELD
	6	+LOAD CELL EXCITATION (+Exc)
	7	+LOAD CELL REF/SENSE
	8	-LOAD CELL SIGNAL (-Sig)
	9	+LOAD CELL SIGNAL (+Sig)
D4 Male RS232 serial port	1	
	2	RS232: RXD
	3	RS232: TXD
	4	
	5	RS232: SHIELD, GND
	6	
	7	
	8	
	9	

KEYS AND LED FUNCTIONS

KEYS

KEY	Short press	Long press (3 s)	Into menus
→0← ESC	Semi-automatic zero	Tare resetting	Cancel or return to previous menu
TARE ◀	Gross → Net	Net → Gross	Select figure to be modified or go to previous menu item.
START STOP	If PEAHOn = YES: activate peak If PEAHOn = nO: select operating mode (base, piece counter, totalizer) PIECE COUNTER: show in sequence total weight on scale, average unit weight calculated, number of pieces TOTALIZER: show in sequence number of weighing, totalized partial weight, total weight	If PEAHOn = YES: deactivate peak If PEAHOn = nO: when in piece counter or totalizer mode, select another operating mode.	
PRINT ▲	Print actual weight	mV load cell test	Modify selected figure or go to next menu item.
MENU ENTER			Confirm or enter in submenu
MENU ENTER + →0← ESC	Setting general parameters (press MENU ENTER immediately followed by →0← ESC)		
MENU ENTER + TARE ◀	Setting preset tare (press MENU ENTER immediately followed by TARE ◀)		

LED

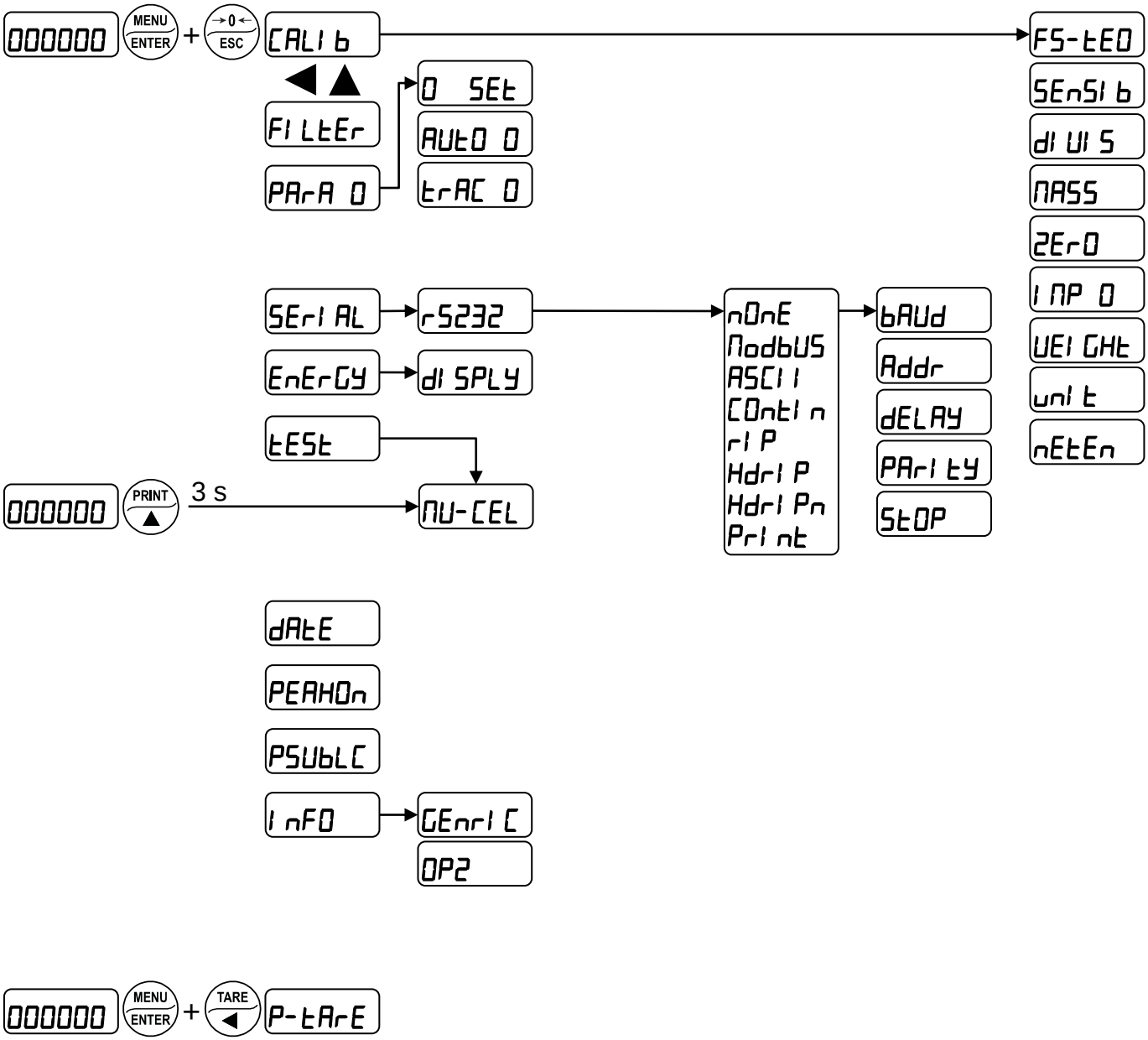
LED	Function
NET	net weight (semi-automatic tare or preset tare)
→0←	zero (deviation from zero not more than ±0.25 divisions)
▬◢◣	stability
kg	unit of measure: kg
g	unit of measure: g
W1	not used
W2	
W3	

Into menus LEDs light up in sequence to indicate that it is not displaying a weight.

MENU MAP

Into menus changes are applied right after pressing the ENTER key (no further confirmation is required).

SYSTEM PARAMETERS



INSTRUMENT COMMISSIONING

Use the POWER button to turn the device on or off.

Upon switch-on, the display shows in sequence:
- 111111 → 999999 (ONLY in case of approved program);
- instrument model (e.g.: ULGt);
- SU followed by the software code (e.g.: SU 120);
- program type: bASE (base);
- r followed by the software version (e.g.: r 1.00.00);
- HU followed by the hardware code (e.g.: HU 720);
- serial number (e.g.: 10005 15);

Check that the display shows the weight and that when loading the load cells there is an increase in weight. If there is not check and verify the connections and correct positioning of the load cells.

- **If the instrument has already been theoretical CALIBRATED** (plant system identification tag present on the instrument and on the cover: load cell's rated data already entered):
  - Reset to zero (see section **TARE WEIGHT ZERO SETTING**)
  - Check the calibration with sample weights and correct the indicated weight if necessary (see section **REAL CALIBRATION (WITH SAMPLE WEIGHTS)**).

- **If the instrument HAS NOT BEEN CALIBRATED** (missing plant system identification tag) proceed with calibration:
  - If load cells data are unknown, follow the procedure in section **REAL CALIBRATION (WITH SAMPLE WEIGHTS)**
  - Enter the rated data of load cells following the procedure given in section **THEORETICAL CALIBRATION**
  - Reset to zero (see section **TARE WEIGHT ZERO SETTING**)
  - Check the calibration with sample weights and correct the indicated weight if necessary (see section **REAL CALIBRATION (WITH SAMPLE WEIGHTS)**).

- If you use serial communication, set the related parameters (see section **SERIAL COMMUNICATION SETTING**).

PROGRAMMING OF SYSTEM PARAMETERS

From the weight display, press simultaneously keys MENU and ESC to access the parameter setting.

MENU/ENTER: to enter a menu/confirm the data entry.
▲: to modify the displayed figure or menu item.
◀: to select a new figure or modify the displayed menu item.
ESC: to cancel and return to the previous menu.

THEORETICAL CALIBRATION

000000 (MENU/ENTER) + (→0← ESC) CALIb (MENU/ENTER) FS-tEO (MENU/ENTER) SEnSIb (MENU/ENTER) dIVIS

This function allows the load cell rated values to be set.

To perform the theoretical calibration set the following parameters in sequence:

- FS-tEO (default: dENo)**:** the **system full scale** is given by one cell capacity multiplied by the number of cells used. Example: 4 cells of 1000 kg → FULL SCALE = 1000 x 4 = 4000. The instrument is supplied with a theoretical full scale value dENO corresponding to 10000. To restore factory values, set 0 as full scale.
- SEnSIb (default: 2.00000 mV/V): **sensitivity** is a load cell rated parameter expressed in mV/V. Set the average sensitivity value indicated on the load cells. It's possible to set a value between 0.50000 and 7.00000 mV/V. Example of 4-cell system with sensitivity: 2.00100, 2.00150, 2.00200, 2.00250; enter 2.00175, calculated as (2.00100 + 2.00150 + 2.00200 + 2.00250) / 4.
- dIVIS**:** the **division** (resolution) is the minimum weight increment value which can be displayed. It is automatically calculated by the system according to the performed calibration, so that it is equal to 1/10000 of full scale. It can be changed and be variable between 0.0001 and 100 with x1 x2 x5 x10 increments.

- By modifying the full scale or the sensitivity, the real calibration is cancelled and the theoretical calibration only is considered valid.
- If the theoretical full scale and the recalculated full scale in real calibration (see section **REAL CALIBRATION (WITH SAMPLE WEIGHTS)**) are equal, this means that the calibration currently in use is theoretical; if they are different, the calibration in use is the real calibration based on sample weights.
- By modifying the theoretical full scale, the system's parameters containing a weight value will be set to default values.

MAXIMUM CAPACITY

000000 (MENU/ENTER) + (→0←/ESC) CALIb (MENU/ENTER) FS-tEO ◀ ▲ MASS

MASS: maximum displayable weight (from 0 to max full scale; default: 0). When the weight exceeds this value by 9 divisions, the display shows ------. To disable this function, set 0.

TARE WEIGHT ZERO SETTING

000000 (MENU/ENTER) + (→0←/ESC) CALIb (MENU/ENTER) FS-tEO ◀ ▲ 2Er0

This menu may also be accessed directly from the weight display, holding down the →0← key for 3 seconds.

Perform this procedure after having set the THEORETICAL CALIBRATION data.

Use this function to set to zero the weight of the empty system after commissioning and then later on to compensate zero variations due to the presence of product residues.
Procedure:

- Confirm the message 2Er0 by pressing ENTER.
- The weight value to be set to zero is displayed. In this phase all of the LEDs are flashing.
- Confirming once again, the weight is set to zero (the value is stored to the permanent memory).
- Press ▲ to display the value of the total weight reset by the instrument, given by the sum of all of the previous zero settings.

ZERO VALUE MANUAL ENTRY

000000 (MENU/ENTER) + (→0←/ESC) CALIb (MENU/ENTER) FS-tEO ◀ ▲ INP 0

WARNING: perform this procedure only if it's not possible to reset the weighed structure tare, for example because it contains product that can not be unloaded.

Set in this parameter the estimated zero value (from 0 to max 999999; default: 0).

REAL CALIBRATION (WITH SAMPLE WEIGHTS)

000000 MENU/ENTER + →0← ESC CALIb MENU/ENTER FS-tEO ◀ ▲ UEIGHt

After having performed the THEORETICAL CALIBRATION and TARE WEIGHT ZERO SETTING, this function allows correct calibration to be done using sample weights of known value and, if necessary, any deviations of the indicated value from the correct value to be corrected.

Load onto the weighing system a sample weight, which must be **at least 50%** of the maximum quantity to be weighed.
By confirming the message UEIGHt the flashing value of the weight currently on the system is displayed. In this phase all of the LEDs are off. Adjust the value on display by using the arrow keys if necessary. After confirming, the new set weight will appear with all the LEDs flashing.
After an additional confirmation, the message UEIGHt will be restored and by repeatedly pressing the key ESC the weight will once again be displayed.

Example: for a system of maximum capacity 1000 kg and 1 kg division, two sample weights are available, one of 500 kg and the other one of 300 kg. Load both weights onto the system and correct the indicated weight to 800. Now remove the 300 kg weight, the system must show 500; remove the 500 kg weight too; the system must read zero. If this does not happen, it means that there is a mechanical problem affecting the system linearity.

WARNING: identify and correct any mechanical problems before repeating the procedure.

- If theoretical full scale and recalculated full scale in real calibration are equal, it means that the theoretical calibration is currently in use; otherwise, the real calibration based on sample weights is in use.
- If the correction made changes the previous full scale for more than 20%, all the parameters with settable weight values are reset to default values.

LINEARISATION OPTION ON MAX 8 POINTS:
It is possible to perform a linearisation of the weight repeating the above-described procedure up to a maximum of eight points, using eight different sample weights. The procedure ends by pressing the ESC button or after entering the eighth value; at this point it will no longer be possible to change the calibration value, but only to perform a new real calibration. To perform a new calibration, should return to the weight display and then re-entering into the calibration menu.

By pressing ▲ after having confirmed the sample weight that has been set, the full scale appears, recalculated according to the value of the maximum sample weight entered and making reference to the cell sensitivity set in the theoretical calibration (SEnSIb).

FILTER ON THE WEIGHT

000000 (MENU/ENTER) + (→0←/ESC) CALIb ◀ ▲ FILtEr

Setting this parameter allows a stable weight display to be obtained.
To increase the effect (weight more stable) increase the value (from 0 to 9, default 4).
As seen in the diagram:

- By confirming the FILtEr message, the currently programmed filter value is displayed.
- By changing and confirming the value, the weight is displayed and it will be possible to experimentally verify its stability.
- If stability is not satisfactory, confirming brings back the message FILtEr and the filter may be modified again until an optimum result is achieved.

The filter enables to stabilise a weight as long as its variations are smaller than the corresponding "response time". It is necessary to set this filter according to the type of application and to the full scale value set.

FILTER VALUE	Response times [ms]	Display and serial port refresh frequency [Hz]
0	12	300
1	150	100
2	260	50
3	425	25
4 (default)	850	12.5
5	1700	12.5
6	2500	12.5
7	4000	10
8	6000	10
9	7000	5

ANTI PEAK

When the weight is stable, the anti peak filter removes any sudden disturbances with a maximum duration of 1 second. Confirm the filter on the weight with ENTER and select one of the following options:

- AntPOn: anti peak filter enabled (default);
- AntPOF: anti peak filter disabled.

000000 (MENU/ENTER) + (→0←/ESC) CALIb ◀ ▲ PArA 0

RESETTABLE WEIGHT SETTING FOR SMALL WEIGHT CHANGES

0 SEt (from 0 to max full scale; default: 300; considered decimals: 300 – 30.0 – 3.00 – 0.300): this parameter indicates the maximum weight value resettable by external contact, keypad or serial protocol.

AUTOMATIC ZERO SETTING AT POWER-ON

AUt0 0 (from 0 to max 10% of full scale; default: 0): If at switch-on the weight value is lower than the value set in this parameter and does not exceed the 0 SEt value, the weight is reset. To disable this function, set 0.

ZERO TRACKING

trAC 0 (from 1 to 5, default: nOnE): When the weight value is stable and, after a second, it deviates from zero by a figure in divisions smaller or equal to the figure in divisions set in this parameter, the weight is set to zero. To disable this function, set nOnE.
Example: if the parameter di UI 5 is set to 5 and trAC 0 is set to 2, the weight will be automatically set to zero for variations smaller than or equal to 10 (di UI 5 x trAC 0).

SETTING UNITS OF MEASURE

000000 (MENU/ENTER) + (→0←/ESC) CALIb (MENU/ENTER) FS-tEO ◀ ▲ unit

These are the available units of measure:

HI LOG: kilograms
G: grams
t: tons
Lb: pounds*
nEUton: newtons*
LI trE: litres*
bAr: bars*
AtM: atmospheres*
PI ECE: pieces*
nEU-M: newton metres*
HI LO-M: kilogram metres*
OtHEr: other generic units of measure not included in the list.

If the print function is enabled, the symbol corresponding to the selected unit of measure will be printed after the measured value.

NET FUNCTIONS

000000 (MENU/ENTER) + (→0←/ESC) CALIb (MENU/ENTER) FS-tEO ◀ ▲ nEtEn

Enables or disables the semiautomatic tare and preset tare functions:

EnAbLE: net functions enabled (default).
dI SAbL: net functions disabled.

SEMI-AUTOMATIC TARE (NET/GROSS)

THE SEMI-AUTOMATIC TARE OPERATION IS LOST UPON INSTRUMENT POWER-OFF.

To perform a net operation (SEMI-AUTOMATIC TARE), press the TARE key for less than 3 seconds. The instrument displays the net weight (just set to zero) and the NET LED lights up. To display the gross weight again, press TARE for 3 seconds.
This operation can be repeated many times by the operator to allow the loading of several products.

Example:
Put the box on the scale, the display shows the box weight; press TARE, the display shows the net weight to zero; introduce the product in the box, the display shows the product weight. This operation can be repeated several times.

While the net weight is displayed, keep ▲ pressed to display gross weight. When the key is released the net weight will be displayed again.

The semi-automatic tare operation is not allowed if the gross weight is zero.

Function not available if net functions are disabled (see section **NET FUNCTIONS**).

PRESET TARE (SUBTRACTIVE TARE DEVICE)

While the net weight is displayed, keep ▲ pressed to display the gross weight. When the key is released the net weight will be displayed again.

- **IF A SEMI-AUTOMATIC TARE (NET) IS ENTERED, IT IS NOT POSSIBLE TO ACCESS THE ENTER PRESET TARE FUNCTION.**
- **IF A PRESET TARE IS ENTERED, IT'S STILL POSSIBLE TO ACCESS THE SEMI-AUTOMATIC TARE (NET) FUNCTION. THE TWO DIFFERENT TYPES OF TARE ARE ADDED.**

ALL THE SEMI-AUTOMATIC TARE (NET) AND PRESET TARE FUNCTIONS WILL BE LOST WHEN THE INSTRUMENT IS TURNED OFF.

000000 (MENU ENTER) + (TARE ◀) P-tArE

It is possible to manually set a preset tare value to be subtracted from the display value provided that the P-tArE ≤ max capacity condition is verified.

By default the instrument shows the last programmed preset tare value: to apply it press ENTER.
After setting the tare value, going back to the weight display, the display shows the net weight (subtracting the preset tare value) and the NET LED lights up to show that a tare has been entered. To delete a preset tare and return to gross weight display, hold down TARE for about 3 seconds. The preset tare value is set to zero. The NET LED is turned off when the gross weight is displayed once again.

Function not available if net functions are disabled (see section **NET FUNCTIONS**).

SEMI-AUTOMATIC ZERO (WEIGHT ZERO-SETTING FOR SMALL VARIATIONS)

By pressing the [→0←] key for less than 3 seconds, the StorEP message is displayed for 3 seconds, by pressing ENTER the weight is set to zero.
This function is only allowed if the weight is lower than the 0 SEt value (see section **RESETTABLE WEIGHT SETTING FOR SMALL WEIGHT CHANGES**), otherwise the alarm E ----- appears and the weight is not set to zero.

PEAK

000000 (MENU/ENTER) + (→0←/ESC) CALI b ◀ ▲ PEAHOn

nO: the peak function is disabled;
YES: the peak function is run via the START/STOP key.

By pressing the START/STOP key, the maximum weight value reached remains displayed. By keeping the START/STOP key pressed for 3 seconds, the current weight is displayed.

If you wish to use this input to view a sudden variation peak, set the FILTER ON THE WEIGHT to 0.

SERIAL COMMUNICATION SETTING

000000 (MENU/ENTER) + (→0←/ESC) CALI b ◀ ▲ SEri AL

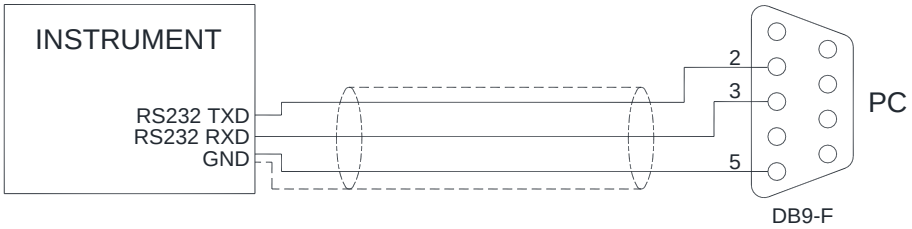
- rS232: communication port.

  - nOnE: it disables any type of communication (default).
  - ModbUS: MODBUS-RTU protocol; possible addresses: from 1 to 99 (see section **MODBUS-RTU PROTOCOL**).
  - ASCII : ASCII bidirectional protocol; possible addresses: from 1 to 99 (see section **ASCII BIDIRECTIONAL PROTOCOL**).
    - nOdU60
    - nOd td
  - CONtI n: continuous fast weight transmission protocol (see section **CONTINUOUS FAST WEIGHT TRANSMISSION PROTOCOL**), at the frequency set in HErt2 item (from 10 to 300).
    - nOd t (set: PAri tY = nOnE, StOP = 1).
    - nOd td (set: PAri tY = nOnE, StOP = 1).
  - ri P: continuous weight transmission protocol to RIP5/20/60, RIP50SHA, RIPLED series remote displays; the remote display shows the net weight or gross weight according to its settings (set: bAUd = 9600, PAri tY = nOnE, StOP = 1).

- *HdrIP*: continuous weight transmission protocol to RIP6100, RIP675, RIP6125C series remote displays; the remote display shows the net weight or gross weight according to its settings (set: *bAUd* = *9600*, *PArIty* = *nonE*, *StOP* = *1*).
- *HdrIPn*: continuous weight transmission protocol to RIP6100, RIP675, RIP6125C series remote displays (set: *bAUd* = *9600*, *PArIty* = *nonE*, *StOP* = *1*).
  When the remote display is set to gross weight:
  - if the instrument displays the gross weight, the remote display shows the gross weight.
  - if the instrument shows the net weight, the remote display shows the net weight alternated with the message *nEt*.
- *PrIntr*: printer.

  - *bAUd*: transmission speed (2400, 4800, 9600, 19200, 38400, 115200; default: 9600).
  - *Addr*: instrument address (from 1 to 99; default: 1).
  - *HErtZ*: maximum transmission frequency (10 – 20 – 30 – 40 – 50 – 60 – 70 – 80 – 100 – 200 – 300; default: 10); o be set when the *CONtIn* transmission protocol is selected.
    Maximum setting frequency **(***HErtZ***)**:
    - 20 Hz with minimum baud rate 2400 baud.
    - 40 Hz with minimum baud rate 4800 baud.
    - 80 Hz with minimum baud rate 9600 baud.
    - 100 Hz with minimum baud rate 19200 baud.
    - 200 Hz with minimum baud rate 38400 baud.
    - 300 Hz with minimum baud rate 38400 baud.
  - *dELAY*: delay in milliseconds which elapses before the instrument replies (from 0 to 200 ms; default: 0).
  - *PArIty*:
    - *nOnE*: no parity (default).
    - *EUEn*: even parity.
    - *Odd*: odd parity.
  - *StOP*: stop bit (1 – 2; default: 1).
  - *nCOPY*: number of copies of the weight printout.
  - *EMPtY*: number of blank lines between one printout and the next.
  - *HEAdEr*: printing of custom heading from PC (*YES* – *no*; default: *no*).
  - *PrtMOd*: connected printer type:
    - *P 190*
    - *StAUP*
    - *StAUt*
    - *tMt203*

RS232 SERIAL COMMUNICATION



DIRECT CONNECTION BETWEEN RS485 AND RS232 WITHOUT CONVERTER

Since a two-wire RS485 output may be used directly on the RS-232 input of a PC or remote display, it is possible to implement instrument connection to an RS-232 port in the following manner:

This type of connection allows A SINGLE instrument to be used in a ONE WAY mode.

RECEIVE		
WLIGHT		**RS232**
RXD	←	RS485 –
GND	←	RS485 +

TRANSMIT		
WLIGHT		**RS232**
TXD	→	RS485 –
GND	→	RS485 +

TEST

000000 (MENU ENTER) + (→0← ESC) CALIb ◀ ▲ tESt

- **Millivolt Test:**

  nU-CEL: displays the load cell response signal in mV with four decimals.

BATTERY OPERATION

The instrument is designed to operate with 8 NiMH rechargeable batteries, 1.2 V, AA type (not included).

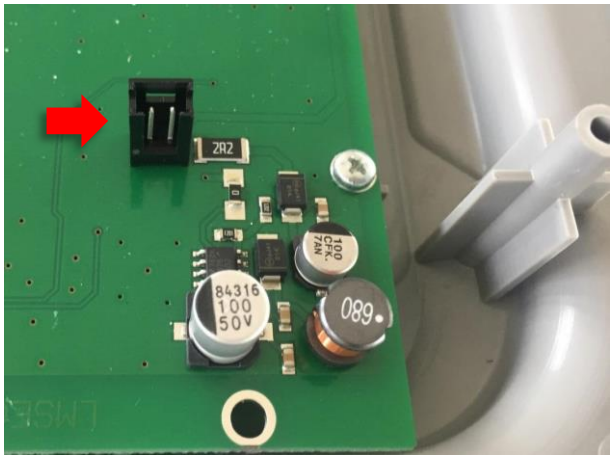
- Use the functions of the EnErGY menu to optimize battery lifetime (see section **ENERGY SAVING**).
- The batteries are recharged automatically every time the instrument is powered from an external power source. A full charge takes about 20 hours.
- The instrument may be left connected to the external power source and this will not damage the batteries.
- The batteries will not charge if the instrument is powered by 12 VDC.
- The instrument indicates that the batteries are low by displaying the LOUBAt message alternated with the weight display.

Mode	Maximum operating time (hours)*
1 load cell (350 ohm), energy saving: disabled	14
1 load cell (350 ohm), energy saving: enabled	16
4 load cells (350 ohm), energy saving: disabled	13
4 load cells (350 ohm), energy saving: enabled	15

* The operating times refer to batteries with a capacity of 2500 mAh.

To insert the batteries, unscrew and open the bottom door of the instrument.

The battery case is already connected. If during the insertion of the batteries the case should come out from the board (or if the battery operation should have problems), reconnect the case to the instrument by using the connector shown in the figure below.



ENERGY SAVING

000000 (MENU ENTER) + (→0← ESC) CALIb ◀ ▲ EnErGY (MENU ENTER) diSPLY

- On: display always on;
- CHAnGE: the display enters energy saving mode after about one minute of no activity; pressing a key or a weight change turns normal operations on again.

DATE AND TIME SETTING

000000 (MENU ENTER) + (→0← ESC) CALIb ◀ ▲ dAtE

Selecting the dAtE item in the main menu, access is obtained to the date and time display menu. Pressing ENTER several times scrolls through days - months – years and hours – minutes; pressing ◀ selects the figure to modify; pressing ▲ the figure increases; pressing ENTER you can confirm and go to the next menu item.

INFO MENU

000000 (MENU ENTER) + (→0← ESC) CALIb ◀ ▲ InFO

GEnrIC: the identification data of the instrument are displayed.

- InStrM: instrument model
- SU CId : software code
- FU UEr: software version
- SEr nu: serial number

OP2: active options are displayed.

PIECE COUNTER

Weight has to be set to zero before selecting operation type.

INCREASING OPERATION

- Load the empty container on the scale;
- press TARE to display zero (net weight);
- press START, select COUnt and confirm with ENTER, PCS appears on the display;
- insert sample pieces in the container and press ENTER;
- set the number of sample pieces just loaded and confirm with ENTER;

The instrument displays the average weight calculated for the single piece for 1 second (PMU in 1/1000 unit of measure) and then the number of pieces preceded by the letter P (e.g.: P 10), the system is now ready to start counting the pieces.

DECREASING OPERATION

- Load pieces to be counted on the scale;
- press TARE to display zero (net weight);
- remove sample pieces;
- press START, select COUnt and confirm with ENTER, PCS appears on the display;
- set the number of sample pieces just removed and confirm with ENTER;

The instrument displays the average weight calculated for the single piece for 1 second (PMU in 1/1000 unit of measure) and then the negative number of pieces subtracted preceded by the letter P (e.g.: P - 10), the system is now ready to start counting the pieces.

Pressing START you can move from one display to another:
- total weight on scale: preceded by the letter t (e.g.: t 1234);
- average unit weight calculated: preceded by the letter u (e.g.: u 1.9876);
- number of pieces: preceded by the letter P (e.g.: P 10);

Press PRINT to print the number of pieces on the scale (see section **PRINTING EXAMPLES**).

In piece counter mode you can:
- set weight to zero for small variations (press →0← and confirm with ENTER);
- set semi-automatic tare (press TARE);
- do a new sampling: press START for 3 seconds, PCS appears, press ENTER, set number of pieces on scale and confirm with ENTER;

To exit piece counter mode and return to standard operations, press START for 3 seconds, PCS appears; press ESC, select the bASE operating mode and confirm with ENTER.

TOTALIZER

SELECT TOTALIZER OPERATING MODE

000000 (START/STOP) bASE ◀ ▲ tOtAL

- bASE: basic operations;
- COUnt: piece counter;
- tOtAL: totalizer;

Select tOtAL and press ENTER to confirm.
Select type of totalization:

- SPEEd: fast manual totalization, the display shows tOt for 1 second;
- nOrM: normal manual totalization, the display shows the number of the weighing for 1 second and then the total weight for 1 second;
- AUtO: automatic totalization;

MI n (default: 0): gross weight value under which the system has to go back to totalize again. Setting 0 disables this function.

HOLd(default: nO): setting YES the weight is blocked after a totalization. To release the weight press PRINT.

StAbLE (default: nO), only for SPEEd and nOrM type of totalization: setting YES the weight is only totalized if stable.

CHAnGE (default: nO): the weight is always totalized. Setting YES the weight is only totalized if it has changed compared to the last totalization.

MAXtOt (default: 0), only if AUtO is selected: number of automatic totalizations to be done before totalized partial weight is printed and zero-set.
Setting 0 disables automatic totalization.

Once settings have ended, the system is ready to totalize weights; press PRINT to totalize.

Based on selection set the total weight on scale is displayed:
- Fast manual totalization: preceded by the letter E (e.g.: E 1234);
- Normal manual totalization: preceded by the letter b (e.g.: b 1234);
- Automatic totalization: preceded by the letter A (e.g.: A 1234);

Press PRINT to store and print weight values and number of weighing (nUM), see section **PRINTING EXAMPLES**.

TOTALIZATION NOTES: the weight is only totalized and printed if not 0;
AUTOMATIC TOTALIZATION: totalization takes place when the weight is stable after a variation; if a MIn value has been set, the weight must drop under that value first, then go up again and become stable; after a number of totalizations equal to what was set in MAXtOt the number of weighings and the totalized partial weight will be cleared with the first weighing of a new automatic totalization.

If the HOLd function is enabled the weight remains blocked and is preceded by the letter H; press PRINT to continue.

Press START to access the following displays:
- nUM: number of weighing;
- tOtP: totalized partial weight and date of last deletion;
- tOtG: total weight and date of last deletion;

Print of number of weighing, totalized partial weight and total weight: press PRINT while displaying total weight or number of weighing.

Deletion of number of weighing and totalized partial weight: press START while displaying number of weighing and confirm message SUrE? pressing ENTER.

Deletion of number of weighing and totalized partial weight, total weight: press START while displaying total weight and confirm message SUrE? pressing ENTER.

In totalizer mode you can:
- set weight to zero for small variations (press →0← and confirm with ENTER);
- set semi-automatic tare (press TARE);

To exit totalizer mode and return to standard operations, press START for 3 seconds, the selected type of totalization appears (SPEEd, nOrM, AUtO); press ESC, select the bASE operating mode and confirm with ENTER.

ALARMS

ErCEL: the load cell is not connected or is incorrectly connected; the load cell signal exceeds 39 mV; the conversion electronics (AD converter) is malfunctioning; the load cell is a 4-wire and there are no jumpers between EX- and REF- and between EX+ and REF+.

Er OL: the weight display exceeds 110% of the full scale.

Er Ad: internal instrument converter failure; check load cell connections, if necessary contact technical assistance.

------: the weight exceeds the maximum capacity by 9 divisions.

Er OF: maximum displayable value exceeded (value higher than 999999 or lower than -999999).

t-----: weight too high: zero setting not possible.

MAX-PU: this message appears in the sample weight setting, in real calibration, after the fifth sample weight value has been entered.

Error: the value set for the parameter is beyond the permitted values; press ESC to quit the setting mode leaving the previous value unchanged. Examples: a number of decimals is selected for full scale which exceeds the instrument's display potential; value above the maximum setting value; the weight value set in sample weight verification does not match the detected mV increase.

bLOC: lock active on menu item, keypad or display.

nOdI SP: It's not possible to display properly the number because is greater than 999999 or less than -999999.

bAtrtC: buffer battery low, loss of date and time of Real-Time Clock. Confirm with ENTER to continue; leave the instrument on for at least 12 hours to charge the battery, if the alarm persists contact technical assistance.

dAtE?: an incorrect date has been detected: go into the related menu to check and correct it.

I n2Er0: gross weight equal to zero: the semi-automatic tare operation cannot be performed.

unStbL: unstable weight: not possible to print or save or zero-setting or net weight.

nOMI n: the weight has not dropped below the minimum weight: not possible to print or save.

nCHAnG: the weight has not changed: not possible to print or save.

M in: the weight is below the minimum set: not possible to print or save.

Serial protocol alarms:

	ErCEL	Er OL	Er Ad	------	Er OF	t-----
MODE						
Bit LSB	76543210	76543210	76543210	76543210	76543210	The response to the zero command is a 'value not valid' error (error code 3)
Status Register MODBUS RTU	**xxxxxxx1**	**xxxx1xxx**	**xxxxxx1x**	**xxxxx1xx**	On gross: **xxx1xxxx** On net: **xx1xxxxx**	
ASCII	__O-F_	__O-L_	__O-F_	__O-L_	__O-F_	&aa#CR
RIP *	__O-F_	__O-L_	__O-F_	__O-L_	__O-F_	__O-F_
HDRIP-N	_ERCEL	_ER_OL	_ER_AD	######	_ER_OF	O__SET
CONTIN	_ERCEL	_ER_OL	_ER_AD	^^^^^^	_ER_OF	O__SET

*** For RIP remote displays, if the message exceeds 5 digits the display reads ------.**

PRINTING EXAMPLES

If the printer has been set (see section **SERIAL COMMUNICATION SETTING**), from the weight display press the PRINT key:

BASIC PRINTOUT:

```
::::::::::::::::::::::
WLGT            Addr:01
DATE: 23/03/18 14:48:12

GROSS           1204 kg
NET              831 kg
TARE             373 kg
```

PIECE COUNTER PRINTOUT:

```
::::::::::::::::::::::
WLGT            Addr:01
DATE: 23/03/18 14:48:12

GROSS            155 kg
NET              155 kg
TARE               0 kg
PMU          3154.77
PCS                49
```

TOTALIZER PRINTOUT:

```
::::::::::::::::::::::
WLGT            Addr:01
DATE: 23/03/18 14:48:12

GROSS            155 kg
NET              155 kg
TARE               0 kg
TOTAL           3500 kg
TOTP            2350 kg
NUM                55
```

STORED TOTALIZED PRINTOUT:

```
::::::::::::::::::::::
WLGT            Addr:01
DATE: 23/03/18 08:22:06
FROM: 22/03/18 11:55:32
TOTAL              444 kg
FROM: 22/03/18 11:55:32
TOTP               444 kg
NUM                  6
```

CONTINUOUS FAST WEIGHT TRANSMISSION PROTOCOL

This protocol allows the continuous transmission of the weight at high update frequencies. Up to 300 strings per second are transmitted with a minimum transmission rate of 38400 baud.
Following communication modes availables (see section **SERIAL COMMUNICATION SETTING**):

- *MOd t*: communication compatible with TX RS485 instruments
- *MOd td*: communication compatible with TD RS485 instruments

If *MOd t* is set, the following string is transmitted to PC/PLC:
xxxxxxCRLF

where: **xxxxxx** ..... 6 characters of gross weight (48 ÷ 57 ASCII)
CR..... 1 character return to the start (13 ASCII)
LF..... 1 character on new line (10 ASCII)

In case of negative weight, the first character from the left of the weight characters takes on the value "-" (minus sign - ASCII 45).
In case of error or alarm, the 6 characters of the weight are substituted by the messages found in the table of the ALARMS section.

If *MOd td* is set, the following string is transmitted to PC/PLC:
&TzzzzzzPzzzzzz\ckckCR

where: **&** ..... 1 initial string character (38 ASCII)
T ..... 1 character of gross weight identification
P ..... 1 character of gross weight identification
zzzzzz ..... 6 characters of gross weight (48 ÷ 57 ASCII)
**** ..... 1 character of separation (92 ASCII)
ckck ..... 2 ASCII control characters or calculated considering the characters included between "&" and "\" excluded. The control value is obtained executing the XOR operation (exclusive OR) for the 8 bit ASCII codes of the characters considered. Therefore, a character expressed in hexadecimal is obtained with 2 numbers that may assume values from "0" to "9" and from "A" to "F". "**ckck**" is the ASCII code of the two hexadecimal digits
CR..... 1 character of end string (13 ASCII)

In case of negative weight, the first character from the left of the weight characters takes on the value "-" (minus sign - ASCII 45).
In case of error or alarm, the 6 characters of the gross weight are substituted by the messages found in the table of the ALARMS section.

CONTINUOUS WEIGHT TRANSMISSION TO REMOTE DISPLAYS PROTOCOL

This protocol allows the continuous weight transmission to remote displays. The communication string is transmitted 10 times per second.
Following communication modes availables (see section **SERIAL COMMUNICATION SETTING**):

- *rI P*: communication with RIP5/20/60, RIP50SHA, RIPLED series remote displays; the remote display shows the net weight or gross weight according to its settings
- *HdrI P*: communication with RIP6100, RIP675, RIP6125C series remote displays; the remote display shows the net weight or gross weight according to its settings
- *HdrI Pn*: communication with RIP6100, RIP675, RIP6125C series remote displays

The instrument sends the following string to the remote display:
&NxxxxxxLyyyyyy\ckckCR

where: **&** ..... 1 initial string character (38 ASCII)
N ..... 1 character of net weight identification (78 ASCII)
xxxxxx ..... 6 characters of net weight (48 ÷ 57 ASCII)
L ..... 1 character of gross weight identification (76 ASCII)
yyyyyy ..... 6 characters of gross weight (48 ÷ 57 ASCII)
\ ..... 1 character of separation (92 ASCII)
ckck ..... 2 ASCII checksum characters calculated considering the characters between "**&**" and "****" excluded. The checksum value is obtained from the calculation of XOR (exclusive OR) of the 8-bit ASCII codes of the characters considered. This obtains a character expressed in hexadecimals with two digits that can have the values from "0" to "9" and from "A" to "F". "**ckck**" is the ASCII code of the two hexadecimal digits
CR..... 1 character of end string (13 ASCII)

In case of negative weight, the first character from the left of the weight characters takes on the value "-" (minus sign - ASCII 45).
If *HdrI P* has been set, the decimal point at the position shown on the instrument's display can also be transmitted. In this case, if the value exceeds 5 digits, only the 5 most significant digits are transmitted, while if the value is negative, no more than the 4 most significant digits are transmitted. In both cases, however, the decimal point shifts consistently with the value to display.
If *HdrI Pn* has been set, in addition to what stated in *HdrI P* protocol, the instrument transmits the prompt *nEt* every 4 seconds in the gross weight field, if on the instrument, it has been carried out a net operation (see section **SEMI-AUTOMATIC TARE (NET/GROSS)**).
In case of weight value is under -99999, the minus sign "-" is sent alternated with the most significant figure.
In case of error or alarm, the 6 characters of the gross weight and net weight are substituted by the messages found in the table of the ALARMS section.

ASCII BIDIRECTIONAL PROTOCOL

The instrument replies to the requests sent from a PC/PLC.
It is possible to set a waiting time for the instrument before it transmits a response (see dELAY parameter in the **SERIAL COMMUNICATION SETTING** section).
Following communication modes availables (see section **SERIAL COMMUNICATION SETTING**):

- MOdU60: communication compatible with instruments series W60000, WL60 Base, WT60 Base, TLA600 Base
- MOd td: communication compatible with TD RS485 instruments

Captions:

$ ..... Beginning of a request string (36 ASCII)
& or **&&**..... Beginning of a response string (38 ASCII)
aa..... 2 characters of instrument address (48 ÷ 57 ASCII)
! ..... 1 character to indicate the correct reception (33 ASCII)
? ..... 1 character to indicate a reception error (63 ASCII)
..... 1 character to indicate an error in the command execution (23 ASCII)
ckck: ..... 2 ASCII characters of Check-Sum (for further information, see section **CHECK-SUM CALCULATION**)
CR..... 1 character for string end (13 ASCII)
**** ..... 1 character of separation (92 ASCII)

1. READING WEIGHT OR PEAK (IF PRESENT) FROM PC

The PC transmits the ASCII string: **$aajckckCR**

where: **j** = t ..... to read gross weight
j = n ..... to read net weight
j = p ..... to read the gross weight peak if the ASCII parameter is set as MOdU60; if, instead, the ASCII parameter is set on MOd td the gross weight will be read.
To read the points, set the FS_tEO parameter equal to 50000

Possible instrument responses:

- correct reception: **&aaxxxxxxj\ckckCR**
- incorrect reception: **&&aa?\ckckCR**
- In case of peak not configured: **&aa#CR**

where: **xxxxxx** ..... 6 characters of the required weight value

Notes: in case of negative weight, the first character from the left of the weight characters takes on the value "-" (minus sign - ASCII 45). In case of weight value is under -99999, the minus sign "-" is sent alternated with the most significant figure.

Error messages:
in case of an instrument alarm for exceeding 110% of the full scale or 9 divisions above the value of the parameter MASS, the instrument sends the string:
&aassO-Lst\ckck

in case of faulty connection of the load cells or of another alarm, the instrument sends:
&aassO-Fst\ckck

where: **s** ..... 1 separator character (32 ASCII – space)

Generally refer to the **ALARMS** section.

2. SEMI-AUTOMATIC ZERO (WEIGHT ZERO-SETTING FOR SMALL VARIATIONS)

The PC transmits the ASCII string: **$aaZEROckckCR**

Possible instrument responses:
- correct reception: **&&aa!\ckckCR**
- incorrect reception: **&&aa?\ckckCR**
- the current weight is over the maximum resettable value: **&aa#CR**

3. SWITCHING FROM GROSS TO NET WEIGHT

The PC transmits the ASCII string: **$aaNETckckCR**

Possible instrument responses:
- correct reception: **&&aa!\ckckCR**
- incorrect reception: **&&aa?\ckckCR**

4. SWITCHING FROM NET TO GROSS WEIGHT

The PC transmits the ASCII string: **$aaGROSSckckCR**

Possible instrument responses:
- correct reception: **&&aa!\ckckCR**
- incorrect reception: **&&aa?\ckckCR**

5. SWITCHING FROM NET TO GROSS WEIGHT

The PC transmits the ASCII string: **$aaDckckCR**

Possible instrument responses:

- correct reception: **&aaxy\ckckCR**
- incorrect reception: **&&aa?\ckckCR**

where: **x** ..... number of decimals
y = 3 ..... for division value = 1
y = 4 ..... for division value = 2
y = 5 ..... for division value = 5
y = 6 ..... for division value = 10
y = 7 ..... for division value = 20
y = 8 ..... for division value = 50
y = 9 ..... for division value = 100

6. TARE ZERO SETTING

The PC transmits the ASCII string: **$aazckckCR**

where: **z** ..... command of weight zero-setting (122 ASCII)

Possible instrument responses:

- correct reception: **&aaxxxxxxt\ckckCR**
- incorrect reception: **&&aa?\ckckCR**
- the gross weight is not displayed on the instrument: **&aa#CR**

where: **xxxxxx** ..... 6 characters to indicate the required weight value
t ..... character to indicate the weight (116 ASCII)

Example: zeroing the weight of the instrument with address 2
For the calibration you have to make sure that the system is unloaded or that the instrument measures a signal equal to the mV in the same condition:
query: **$02z78(Cr**
response: **&02000000t\76(Cr)**

If the zeroing works correctly the instrument sends the zeroed weight value ("000000").

The calibration values are stored permanently in the EEPROM memory and the number of allowed writings is limited (about 100000).

7. REAL CALIBRATION (WITH SAMPLE WEIGHT)

After the tare zero-setting, this function allow the operator to check the calibration obtained by using sample weights and correct automatically any change between the displayed value and the actual one.
Load onto the weighing system a sample weight, which must be at least 50% of the full scale, or make so that that the instrument measures a corresponding mV signal.

The PC transmits the ASCII string: **$aasxxxxxxckckCR**

where **: s** ..... calibration command (115 ASCII)
xxxxxx ..... 6 characters to indicate the value of sample weight

Possible instrument responses:
- correct reception: **&aaxxxxxxt\ckckCR**
- incorrect reception or full scale equal to zero: **&&aa?\ckckCR**

where: **t** ..... character of gross weight identification (116 ASCII)
xxxxxx ..... 6 characters to indicate the value of current weight

In case of correct reception, the read value has to be equal to the sample weight.

Example: calibration of the instrument no. 1 with a sample weight of 20000 kg:
query: **$01s02000070(Cr)**
response: **&01020000t\77(Cr)**

In case of correct calibration, the read value has to be “020000”.

8. CHECK-SUM CALCULATION

The two ASCII characters (**ckck**) are the representation of a hexadecimal digit in ASCII characters. The check digit is calculated by executing the operation of XOR (exclusive OR) of 8-bit ASCII codes of only the string underlined.

The procedure to perform the calculation of check-sum is the following:
- Consider only the string characters highlighted with underlining
- Calculate the exclusive OR (XOR) of 8-bit ASCII codes of the characters

Example:

character	decimal ASCII code	hexadecimal ASCII code	binary ASCII code
0	48	30	00110000
1	49	31	00110001
t	116	74	01110100
XOR =	117	75	01110101

- The result of the XOR operation expressed in hexadecimal notation is made up of 2 hexadecimal digit (that is, numbers from 0 to 9 and/or letters from A to F). In this case the hexadecimal code is 0x75.
- The checksum is made up of the 2 characters that represent the result of the XOR operation in hexadecimal notation (in our example the character "7" and the character "5").

MODBUS-RTU PROTOCOL

The MODBUS-RTU protocol allows the management of the reading and writing of the following registries according to the specifications found on the reference document for this **Modicon PI-MBUS-300** standard**.**

To select the MODBUS-RTU communication see **SERIAL COMMUNICATION SETTING** section.

Check if the *master* MODBUS-RTU in use (or the development tool) requires the disclosure of registers based on 40001 or 0. In the first case the registers numbering corresponds to the one in the table; in the second case the register must be determined as the value in the table minus 40001. E.g.: the register 40028 shall be reported as 27 (= 40028-40001).

Certain data, when specifically indicated, will be written directly in the EEPROM type memory. This memory has a limited number of writing operations (100000), therefore it is necessary to pay particular attention to not execute useless operations on said locations. The instrument in any case makes sure that no writing occurs if the value to be memorised is equal to the value in memory.

The numerical data found below are expressed in decimal notation; if the prefix 0x is entered the notation will be hexadecimal.

MODBUS-RTU DATA FORMAT

The data received and transmitted by way of the MODBUS-RTU protocol have the following characteristics:
- 1 start bit
- 8 bit of data, *least significant bit* sent first
- Settable parity bit
- Settable stop bit

FUNCTIONS SUPPORTED IN MODBUS

Among the commands available in the MODBUS-RTU protocol, only the following are utilised for management of communication with the instruments; other commands could be incorrectly interpreted and generate errors or blocks of the system:

FUNCTIONS	DESCRIPTION
03 (0x03)	READ HOLDING REGISTER (READ PROGRAMMABLE REGISTERS)
16 (0x10)	PRESET MULTIPLE REGISTERS (WRITE MULTIPLE REGISTERS)

Interrogation frequency is linked to the communication speed set (the instrument stands by for at least 3 bytes before starting calculations an eventual response to the interrogation query). The dELAY parameter present in the **SERIAL COMMUNICATION SETTING** section, allows the instrument to respond with a further delay and this directly influences the number of interrogations possible in the unit of time.
For additional information on this protocol refer to the general technical specifications PI_MBUS_300.

In general queries and answers toward and from one slave instrument are composed as follows:

FUNCTION 3: Read holding registers (READ PROGRAMMABLE REGISTERS)

QUERY

Address	Function	1st register address	No. registers	2 byte
A	0x03	0x0000	0x0002	CRC

Tot. byte = 8

RESPONSE

Address	Function	No. bytes	1st register	2nd register	2 byte
A	0x03	0x04	0x0064	0x00C8	CRC

Tot. byte = 3+2*No. registers+2

where: No. registers.. number of Modbus registers to write beginning from the address no. 1
No. byte..... number of bytes of the following data

FUNCTION 16: Preset multiple registers (WRITE MULTIPLE REGISTERS)

QUERY

Address	Function	1st reg. add.	No. reg.	No. bytes	Val.reg.1	Val.reg.2	2 byte
A	0x10	0x0000	0x0002	0x04	0x0000	0x0000	CRC

Tot. byte = 7+2*No. registers+2

RESPONSE

Address	Function	1st reg. address	No. reg.	2 byte
A	0x10	0x0000	0x0002	CRC

Tot. byte = 8

where: No. registers.. number of Modbus registers to read beginning from the address no. 1
No. byte..... number of bytes of the following data
Val.reg.1..... contents of the register beginning from the first

The response contains the number of registers modified beginning from the address no. 1.

COMMUNICATION ERROR MANAGEMENT

The communication strings are controlled by way of the CRC (Cyclical Redundancy Check).
In case of communication error the slave will not respond with any string. The master must consider a time-out for reception of the answer. If it does not receive an answer it deduces that there has been a communication error.

In the case of the string received correctly but not executable, the slave responds with an EXCEPTIONAL RESPONSE. The "Function" field is transmitted with the msb at 1.

EXCEPTIONAL RESPONSE

Address	Function	Code	2 byte
A	Funct + 0x80		CRC

CODE	DESCRIPTION
1	ILLEGAL FUNCTION (the function is not valid or is not supported)
2	ILLEGAL DATA ADDRESS (the specified data address is not available)
3	ILLEGAL DATA VALUE (the data received has an invalid value)

LIST OF AVAILABLE REGISTERS

The MODBUS-RTU protocol implemented on this instrument can manage a maximum of 32 registers read and written in a single query or response.

R ..... the register may only be read
W..... the register may only be written
R/W..... the register may be both read and written
H ..... high half of the DOUBLE WORD containing the number
L..... low half of the DOUBLE WORD containing the number

Register	Description	Saving in EEPROM	Access
40001	Firmware version	-	R
40002	Instrument type	-	R
40003	Year of manufacture	-	R
40004	Serial number	-	R
40005	Program type	-	R
40006	COMMAND REGISTER	NO	R/W
40007	STATUS REGISTER	-	R
40008	GROSS WEIGHT H	-	R
40009	GROSS WEIGHT L	-	R
40010	NET WEIGHT H	-	R
40011	NET WEIGHT L	-	R
40012	PEAK WEIGHT H	-	R
40013	PEAK WEIGHT L	-	R

40014	Divisions and Units of measure	-	R
40065	Sample weight for instrument calibration H	Use with command 101 of the Command Register	R/W
40066	Sample weight for instrument calibration L		R/W

STATUS REGISTER (40007)

Bit 0	Load cell error
Bit 1	AD convertor malfunction
Bit 2	Maximum weight exceeded by 9 divisions
Bit 3	Gross weight higher than 110% of full scale
Bit 4	Gross weight beyond 999999 or less than -999999
Bit 5	Net weight beyond 999999 or less than -999999
Bit 6	
Bit 7	Gross weight negative sign
Bit 8	Net weight negative sign
Bit 9	Peak weight negative sign
Bit 10	Net display mode
Bit 11	Weight stability
Bit 12	Weight within ±¼ of a division around ZERO
Bit 13	
Bit 14	
Bit 15	

DIVISIONS AND UNITS OF MEASURE REGISTER (40014)

This register contains the current setting of the divisions (parameter dIUI5) and of the units of measure (parameter Unit).

H Byte	L Byte
Unit of measure	Division

Least significant byte (L Byte)

Division value	Divisor	Decimals
0	100	0
1	50	0
2	20	0
3	10	0
4	5	0
5	2	0
6	1	0
7	0.5	1

Most significant byte (H Byte)

Unit of measure value	Unit of measure description	Coefficient effect on the read gross weight
0	Kilograms	No effect
1	Grams	No effect
2	Tons	No effect
3	Pounds	No effect
4	Newton	Multiplies
5	Litres	Divides
6	Bar	Multiplies
7	Atmospheres	Multiplies

8	0.2	1
9	0.1	1
10	0.05	2
11	0.02	2
12	0.01	2
13	0.005	3
14	0.002	3
15	0.001	3
16	0.0005	4
17	0.0002	4
18	0.0001	4

8	Pieces	Divides
9	Newton Metres	Multiplies
10	Kilogram Metres	Multiplies
11	Other	Multiplies

POSSIBLE COMMANDS TO BE SENT TO THE COMMAND REGISTER (40006)

0	No command	**1**	
6		**7**	SEMI-AUTOMATIC TARE enabling (net weight displaying)
8	SEMI-AUTOMATIC ZERO	**9**	SEMI-AUTOMATIC TARE disabling (gross weight displaying)
10	Reserved	**11**	Reserved
12	Reserved	**13**	Reserved
14	Reserved	**15**	Reserved
16	Reserved	**17**	Reserved
18	Reserved		
20		**21**	Keypad lock
22	Keypad and display unlock	**23**	Keypad and display lock
98		**99**	Save data in EEPROM
100	TARE WEIGHT ZERO SETTING for calibration	**101**	Sample weight storage for calibration

REAL CALIBRATION COMMANDS (WITH SAMPLE WEIGHTS)

- Unload the system and reset to zero the displayed weight value with the command 100 “TARE WEIGHT ZERO SETTING for calibration” of the Command Register.
- Load a sample weight on the system and send its value to the registers 40065-40066.
- To save the first sample weight value and remove the previously saved values, send the command 101 “Save first sample weight for calibration” to the Command Register;
- To store a sample weight value and keep the previously saved values, send the command 106 “Add sample weight for calibration” to the Command Register;
- Up to 8 different sample weights can be saved to perform a linearization on multiple points.
  - The same sample weight can only be saved once for each calibration.
  - Zero sample weight values cannot be saved.

If the operation is successfully completed, the two sample weight registers are set to zero.

To cancel the real calibration and return to the theoretical calibration, send the command 104 to the Command Register. The tare reset is not cancelled.

In order to correctly set the sample weight, consider the value of the Division register (40014). Example: to set the sample weight to 100 kg and the division is 0.001, then the value to enter is 100000 (100 / 0.001 = 100000).

In order to correctly set a sample weight of negative value, it is necessary to consider the registers "Sample weight for instrument calibration" (40065–40066) as a 32-bit signed number. If the development system does not handle signed numbers, enter the values in two's complement.
Example: to set the sample weight to -56 kg, enter the values indicated in the table in the registers "Sample weight for instrument calibration".

REGISTER	***DESCRIPTION***	***VALUE***	
		HEX	***DECIMAL***
40065	Sample weight for instrument calibration H	0xFFFF	-1
40066	Sample weight for instrument calibration L	0xFFC8	-56

COMMUNICATION EXAMPLES

The numerical data below are expressed in hexadecimal notation with prefix h.

EXAMPLE 1
Command for multiple writing of registers (command 16, h10 hexadecimal):
Assuming that we wish to write the value 0 to the register 40037 and the value 2000 to the register 40038, the string to generate must be:

h01 h10 h00 h24 h00 h02 h04 h00 h00 h07 hD0 hF3 hE8

The instrument will respond with the string:

h01 h10 h00 h24 h00 h02 h01 hC3

Query field name	**hex**	**Response field name**	**hex**
Instrument address	**h01**	Instrument address	**h01**
Function	**h10**	Function	**h10**
Address of the first register H	**h00**	Address of the first register H	**h00**
Address of the first register L	**h24**	Address of the first register L	**h24**
Number of registers H	**h00**	Number of registers H	**h00**
Number of registers L	**h02**	Number of registers L	**h02**
Byte count	**h04**	CRC16 H	**h01**
Datum 1 H	**h00**	CRC16 L	**hC3**
Datum 1 L	**h00**		
Datum 2 H	**h07**		
Datum 2 L	**hD0**		
CRC16 H	**hF3**		
CRC16 L	**hE8**		

EXAMPLE 2
Multiple commands reading for registers (command 3, h03 hexadecimal):
Assuming that we wish to read the gross weight value (in the example 4000) and net weight value (in the example 3000), reading from address 40008 to address 40011 must be performed by sending the following string:

h01 h03 h00 h07 h00 h04 hF5 hC8

The instrument will respond with the string:

h01 h03 h08 h00 h00 h0F hA0 h00 h00 h0B hB8 h12 h73

Query field name	hex	Response field name	hex
Instrument address	**h01**	Instrument address	**h01**
Function	**h03**	Function	**h03**
Address of the first register H	**h00**	Byte count	**h08**
Address of the first register L	**h07**	Datum 1 H	**h00**
Number of registers H	**h00**	Datum 1 L	**h00**
Number of registers L	**h04**	Datum 2 H	**h0F**
CRC16 H	**hF5**	Datum 2 L	**hA0**
CRC16 L	**hC8**	Datum 3 H	**h00**
		Datum 3 L	**h00**
		Datum 4 H	**h0B**
		Datum 4 L	**hB8**
		CRC16 H	**h12**
		CRC16 L	**h73**

For additional examples regarding the generation of correct control characters (CRC16) refer to the manual **Modicon PI-MBUS-300.**

RESERVED FOR THE INSTALLER

MENU LOCKING

Through this procedure, it's possible to block the access to any menu on the instrument.
Select the menu that you wish to lock:

000000 (MENU ENTER) CALIb press ESC and ◀ simultaneously for 3 seconds, the display shows C.ALIb (the left point on the text indicates that this menu item is now locked). If the operator tries to enter this menu, the access is denied and the display shows bLOC.

MENU UNLOCKING

000000 (MENU ENTER) C.ALIb press ENTER and ▲ simultaneously for 3 seconds, the unlock password is requested (if enabled) and the display shows CALIb (the left point on the text is off to indicate that this menu item is unlocked).

TEMPORARY MENU UNLOCKING

000000 (MENU ENTER) C.ALIb press ▲ and ◀ simultaneously for 3 seconds, the unlock password is requested (if enabled): it is now possible to enter and modify all menus including those which are locked. By returning to weight display, the menu lock is restored.

SETTING UNLOCK PASSWORD

000000 (MENU ENTER) + (→0← ESC) CALIb ◀ ▲ PSUbLC

The password must contain 6 characters; in order to change a customized password, the current password is required.
By setting 000000 (default) the unlock password is disabled.

DATA DELETION AND PROGRAM SELECTION

WARNING: operations must only be performed after contacting technical assistance.
After each operation the display shows dOnE, press ENTER to continue.
By pressing ESC the procedure is cancelled and no changes are made.

Upon instrument power-on hold down the ESC key until the display shows PrOG, then proceed as follows:

CONSTANTS RESTORE (does not erase the calibration): confirm PrOG, use arrow keys to select PASSU, set code 6935 and confirm.

PROGRAM SELECTION: confirm PrOG and use the arrow keys to select the desired program:
bASE: basic program.
r iP: weight remote display program.

- Set the approval status (only if r iP have not been set)

  - nOtLEG: not approved program;
  - LEGAL: approved program, single interval*;
  - LEGMI : approved program, multi-interval*;
  - LEGMr: approved program, multiple range*;

  * *Contact technical assistance to request the proper manual and the correct procedures for approval, indicating mandatory hardware code and serial number (see section **INSTRUMENT COMMISSIONING**).*

- Set the active regulation on the instrument (only if nOtLEG have not been set):

  - OI ML: approved program according to EN45501:2015 and OIML R76:2006 for UE;
  - ntEP: approved program according to NIST Handbook 44; NCWM PUB 14 for North America (NTEP).

By confirming, the instrument is restored to default and data is erased.

KEYPAD OR DISPLAY LOCKING

Press ESC immediately followed by ▲ hold them down for about 5 seconds (this operation is also possible via the MODBUS and ASCII protocols):

- FrEE: no lock.
- HEY: keypad lock: if active, when a key is pressed the message bLOC is displayed for 3 seconds.
- dI SP: keypad and display lock: if active, the kaypad is locked and the display shows the instrument model (weight is not displayed); by pressing a key the display shows bLOC for 3 seconds.

DECLARATION OF CONFORMITY - EU

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SISTEMA QUALITÀ CERTIFICATO UNI EN ISO 9001 - SISTEMA GESTIONE AMBIENTALE ISO 14001 - MODULO D: GARANZIA DELLA QUALITÀ DEL PROCESSO DI PRODUZIONE

I	Dichiarazione di conformità	Dichiariamo che il prodotto al quale la presente dichiarazione si riferisce è conforme alle norme di seguito citate.
GB	Declaration of conformity	We hereby declare that the product to which this declaration refers conforms with the following standards.
E	Declaración de conformidad	Manifestamos en la presente que el producto al que se refiere esta declaración está de acuerdo con las siguientes normas
D	Konformitäts-erklärung	Wir erklären hiermit, dass das Produkt, auf das sich diese Erklärung bezieht, mit den nachstehenden Normen übereinstimmt.
F	Déclaration de conformité	Nous déclarons avec cela responsabilité que le produit, auquel se rapporte la présente déclaration, est conforme aux normes citées ci-après.
CZ	Prohlášení o shode	Tímto prohlašujeme, že výrobek, kterého se toto prohlášení týká, je v souladu s níže uvedenými normami.
NL	Conformiteit-verklaring	Wij verklaren hiermede dat het product, waarop deze verklaring betrekking heeft, met de hierna vermelde normen overeenstemt.
P	Declaração de conformidade	Declaramos por meio da presente que o produto no qual se refere esta declaração, corresponde às normas seguintes.
PL	Deklaracja zgodności	Niniejszym oświadczamy, że produkt, którego niniejsze oświadczenie dotyczy, jest zgodny z poniższymi normami.
RUS	Заявление о соответствии	Мы заявляем, что продукт, к которому относится данная декларация, соответствует перечисленным ниже нормам.

Models: WLIGHT

Mark Applied	EU Directive	Standards
CE	**2014/35/EU** Low Voltage Directive	*Not Applicable (N/A)* for VDC type EN 61010-1:2010+A1:2019 for 230/115 VAC type
CE	**2014/30/EU** EMC Directive	EN 55011:2016+A1+A11:2020 EN 61000-6-2:2019 EN 61000-6-4:2019 EN 61000-4-2:2009 EN 61000-4-3:2006+A2:2010 EN 61000-4-4:2012 EN 61000-4-5:2014+A1:2017 EN 61000-4-6:2014
CE M (only if "M" mark is applied)	**2014/31/EU** NAWI Directive	EN 45501:2015 OIML R76-1:2006

Montechiarugolo (PR), 23/11/2022

LAUMAS Elettronica s.r.l.
M. Consonni
(*Legal Representative*)

DECLARATION OF CONFORMITY - UKCA

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RUS	Заявление о соответствии	Мы заявляем, что продукт, к которому относится данная декларация, соответствует перечисленным ниже нормам.

Models: WLIGHT

Mark Applied	UK legislation	Standards
UKCA	**Electrical Equipment (Safety) Regulations 2016**	*Not Applicable (N/A)* for VDC type BS EN 61010-1:2010+A1:2019 for 230/115 VAC type
UKCA	**Electromagnetic Compatibility Regulations 2016**	BS EN 55011:2016+A1+A11:2020 BS EN 61000-6-2:2019 BS EN 61000-6-4:2019 BS EN 61000-4-2:2009 BS EN 61000-4-3:2006+A2:2010 BS EN 61000-4-4:2012 BS EN 61000-4-5:2014+A1:2017 BS EN 61000-4-6:2014
UKCA M (only if "M" mark is applied)	**Non-automatic Weighing Instruments Regulations 2016**	BS EN 45501:2015

Montechiarugolo (PR), 23/11/2022

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