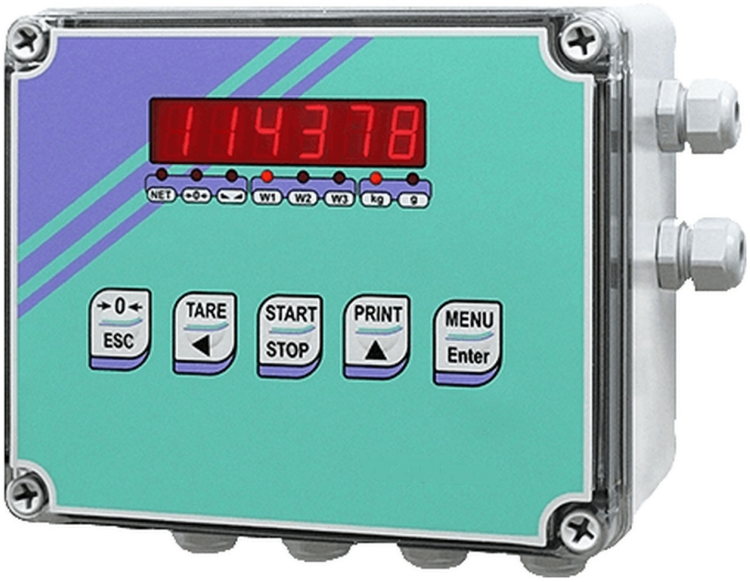
OCTOGON

MANUAL

EILC

WEIGHT INDICATOR IN A FIELD HOUSING

Installation and user manual – BASE program



Document	Version	Date	Applies to
Installation and user manual	V00x	10/2026	EILC, BASE program

This manual describes installation, connection and operation of the EILC weight indicator with the BASE program: weighing with setpoints and hysteresis, peak, analog output and the serial protocols.

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1 About this manual

Display texts are set in a fixed-width typeface, as they appear on the display, for example **`CALIb`**. Keys are written in square brackets (section 8.1). A menu path is a sequence of keys and display texts, for example:

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[ENTER]** › **FS-tEO** › **[TARE] [PRINT]** › **MASS**

000000 stands for the weight display. "[ENTER]+[ESC]" means: press [ENTER] immediately followed by [ESC]. "[TARE] [PRINT]" means: scroll to the next menu item with the arrow keys. In the menus changes are applied right after pressing [ENTER]; no further confirmation is required.

1.1 Symbols

Notice	Meaning
Caution	Risk of electric shock, or: this operation must be performed by skilled personnel.
Important	Pay particular attention to the following instructions.
Note	Further information.

1.2 Scope

The EILC is supplied with one of several programs; the instrument shows the program at switch-on (chapter 9). This manual applies to the BASE program (display **bASE**): weighing with setpoints and hysteresis, peak and use as remote display with setpoints. The other programs have program manuals of their own; the approved (legal for trade) version and the Multiprogram version are not described in this manual.

Of the options, this manual describes the analog output (chapter 14) and the E/EC option (setpoint classes, section 7.5). Connection and setup of the other options of the data sheet – fieldbuses, additional RS485, USB port with pen drive, external relay modules, weight input 0 ... 10 V or 4 ... 20 mA – are provided by octogon on request.

2 Safety, warranty and disposal

2.1 Recommendations for proper use

- Keep away from heat sources and direct sunlight.
- Protect 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).

2.2 Recommendations for correct installation of the instrument

- 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 this cannot be ensured, connect the terminals of the instrument (including the terminal –SUPPLY) to the weighed structure with an earthing wire.
- Lead the cell cable individually to its panel input, do not share a conduit with other cables, and 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.

2.3 Maximum cable lengths

Connection	Length
RS485	1000 m with AWG24, shielded and twisted cables
RS232	15 m for baud rates up to 19200
Analog current output	up to 500 m with 0.5 mm^2 cable
Analog voltage output	up to 300 m with 0.5 mm^2 cable

2.4 Warranty

24 months from the date of the delivery note. The 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 labour costs.

The 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 the manufacturer.

A 1-year warranty from the date of the delivery note applies to defects in material or manufacture of the battery.

2.5 Guidelines for proper disposal

- This is electrical/electronic equipment and cannot be disposed of as municipal solid waste, but must be delivered to a recycling centre.
- Improper use or disposal can pollute the environment or damage human health.
- Non-compliance with these guidelines will be penalised in accordance with the regulations in force in the country of destination.
- Dispose of the packing and packaging as required by local regulations.

3 Installation of the load cells

3.1 Sizing of load cell capacity

For safety reasons, in case of static weighing, it is advisable to use the load cells at a maximum of 70–80 % of their nominal capacity (assuming that the load is uniformly distributed over the entire weighed structure); depending on the handling mode of the load (e.g. forklifts, bridge cranes), consider reducing the share of the nominal capacity further. With dynamic loads the installer has to estimate thrust speed, acceleration, frequency, etc.

3.2 Installing load cells

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

3.3 Connecting several cells in parallel

Connect several cells in parallel by using – if necessary – a watertight junction box with terminal box. The cell extension cables must be shielded, led individually into their piping or conduit and laid as far as possible from the power cables (with 4-wire connections use cables of at least 4 × 1 mm^2).

3.4 Protection of the cell cable

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

3.5 Mechanical restraints (pipes, etc.)

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

3.6 Welding

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

3.7 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.

3.8 Earthing the weighed structure

By means of a copper wire with suitable cross-section, connect the upper support plate of each cell with its lower support plate, then connect all the lower plates to a single earthing system. Electrostatic charges accumulated by the product rubbing against the pipes and the container walls are discharged to the ground without going through or damaging the load cells. Without a proper earthing system the weighing system may still work, but future damage to the cells and the connected instrument cannot be ruled out. Earthing continuity must not be ensured by using metal parts of the weighed structure.

Important Failure to follow the installation recommendations will be considered a misuse of the equipment.

4 Load cell testing

4.1 Load cell input test (quick access)

Menu **000000** › **[PRINT] 3 s** › **MU-CEL**

From the weight display, press [PRINT] for 3 seconds: the response signal of the load cells is displayed, expressed in mV with four decimals.

4.2 Load cell resistance measurement (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 and the negative signal wire must be equal or similar to the output resistance indicated in the load cell data sheet.
– The value between the positive and the negative excitation wire must be equal or similar to the input resistance indicated in the load cell data sheet.
– 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 MΩ.

4.3 Load cell voltage measurement (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 the two wires of the load cell connected to the instrument is 5 VDC ± 3 %.
– Measure the response signal between the positive and the negative signal wire by directly connecting them to the tester, and make sure that it is between 0 and ± 0.5 mV.
– Apply load to the cell and make sure that there is a signal increment.

Note If one of the above conditions is not met, please contact octogon.

5 Product description

5.1 Main specifications

Manufacturer type: W200BOX

– Weight indicator with 6-wire load cell input
– 6-digit semi-alphanumeric red LED display (14 mm height)
– 8 signalling LEDs
– 5-key keyboard
– Real-time clock/calendar with buffer battery
– Two serial ports (RS485 and RS232) for connection to: PC/PLC up to 32 instruments (max. 99 with line repeaters) by ASCII or Modbus RTU protocol, remote display, printer
– Optional: integrated Profibus DP, DeviceNet, CANopen, Profinet IO, Ethernet/IP, Ethernet TCP/IP, Modbus TCP output

The instrument can be connected to an intelligent junction box (e.g. octogon ETLB) or to a weight transmitter.

Caution The box version is not compatible with the optional 115/230 VAC power supply.

5.2 Version and dimensions

Item	Value
Housing	polycarbonate box, IP67
Dimensions	170 × 140 × 95 mm
Fixing	four fixing holes Ø 4 mm, centre distance 152 × 122 mm
Cable entries	4 + 2 caps for M16 × 1.5 cable glands (octogon data sheet)

5.3 Buffer battery

The instrument is equipped with an internal battery that keeps the internal clock running even in the event of power failure.

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

6 Technical specifications

Item	Value
Power supply and consumption (VDC)	12/24 VDC ± 10 %; 5 W
No. of load cells in parallel and supply	max. 8 (350 Ω); 5 VDC / 120 mA
Linearity / analog output linearity	< 0.01 % F.S.; < 0.01 % F.S.
Thermal drift / analog output thermal drift	< 0.0005 % F.S./°C; < 0.003 % F.S./°C
A/D converter	24 bit (16000000 points)
Max. divisions (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
Display range	± 999999
No. of decimals / display increments	0 ... 4 / x1 x2 x5 x10 x20 x50 x100
Digital filter / readings per second	10 levels / 5 ... 300 Hz
Relay outputs	5 – max. 115 VAC; 150 mA (4 with analog output)
Digital inputs	3 – optoisolated 5 ... 24 VDC PNP (2 with analog output)
Serial ports	RS485, RS232
Baud rate	1200, 2400, 4800, 9600, 19200, 38400, 115200
Humidity (non condensing)	85 %
Storage temperature	–30 ... +80 °C
Working temperature	–20 ... +60 °C
Optoisolated analog output (optional), 16 bit – 65535 divisions	0 ... 20 mA; 4 ... 20 mA (max. 300 Ω); 0 ... 10 V; 0 ... 5 V; ± 10 V; ± 5 V (min. 10 kΩ)

6.1 UL version

For the UL version the source states instead: relay outputs 5 – max. 30 VAC, 60 VDC; 150 mA (4 with analog output); working temperature –20 ... +50 °C. Equipment to be powered by 12–24 VDC LPS or Class 2 power source.

7 Electrical connections

7.1 Basic information

- It is recommended that the power supply negative pole be grounded.
- It is possible to supply up to eight 350 Ω load cells or sixteen 700 Ω load cells.
- For 4-wire load cells, make a jumper between EX– and REF– and between EX+ and REF+ (section 7.4).
- Connect terminal –SUPPLY to the RS485 common of the connected instruments in the event that these receive alternating current input or that they have an optically isolated RS485.
- In an RS485 network with several devices, provide a 120 Ω termination resistance on the two devices located at the ends of the network (section 15.3).
- Option E/EC: selects 12 groups of 5 setpoints (section 7.5).

7.2 Outputs, inputs and power supply

- 5 outputs: controlled by setpoint values or by a remote device via protocol.
- 3 inputs, settable as NET/GROSS WEIGHT, SEMI-AUTOMATIC ZERO, PEAK, PRINT, LIMIT or REMOTE CONTROL (chapter 12).
- With the analog output (option) input 3, output 5 and the E/EC option are no longer available.

Caution Connect the power supply specified on the plate of the instrument.

7.3 Terminals

Terminal	Signal
1	+SUPPLY (12/24 VDC)
2	–SUPPLY (12/24 VDC) · RS232, RS485: SHIELD, GND · E/EC OPTION: GND
3	RS232: TXD
4	RS232: RXD
5	OUTPUT No. 1
6	OUTPUT No. 2
7	OUTPUT No. 3
8	OUTPUT No. 4
9	OUTPUT COMMON
10	INPUT No. 1 (+VDC min. 5 V, max. 24 V)
11	INPUT No. 2 (+VDC min. 5 V, max. 24 V)
12	INPUT COMMON (–VDC 0 V)
13	–
14	INPUT No. 3 (+VDC min. 5 V, max. 24 V) · otherwise: +ANALOG OUTPUT (0 ... 20 or 4 ... 20 mA)
15	OUTPUT No. 5 · otherwise: +ANALOG OUTPUT (0 ... 10 V)
16	E/EC OPTION · otherwise: –ANALOG OUTPUT COMMON
17	RS485: –
18	RS485: +
19	–LOAD CELL EXCITATION (–Exc) · LOAD CELL SHIELD
20	+LOAD CELL EXCITATION (+Exc)
21	+LOAD CELL REF/SENSE
22	–LOAD CELL REF/SENSE
23	–LOAD CELL SIGNAL (–Sig)
24	+LOAD CELL SIGNAL (+Sig)

Terminal 13 has no signal in the source legend.

7.4 4-wire load cell

With a 4-wire load cell, jumper EX– with REF– (terminals 19 and 22) and EX+ with REF+ (terminals 20 and 21). Without these jumpers the instrument reports **ErCEL** (chapter 18).

7.5 E/EC option

With the E option (buttons, not included in the supply) or the EC option (selector switch) one of 12 groups (classes) of 5 setpoints is selected (chapter 17). Both are connected to terminal 16 (E/EC OPTION) and terminal 2 (GND) of the instrument. With the analog output the option is not available.

8 Keys, display and menu map

8.1 Keys

Key	Short press	Long press (3 s)	Into menus
[ESC] (>0<)	semi-automatic zero	tare resetting	cancel or return to previous menu
[TARE] (left arrow)	gross › net	net › gross	select figure to be modified or go to previous menu item
[START] (START/STOP)	activate peak (if enabled)	deactivate peak (if enabled)	–
[PRINT] (up arrow)	print actual weight	mV load cell test	modify selected figure or go to next menu item
[ENTER] (MENU/ENTER)	setting setpoint and hysteresis	–	confirm or enter in submenu

Key	Short press	Long press (3 s)	Into menus
[ENTER]+[ESC]	setting general parameters (press [ENTER] immediately followed by [ESC])	–	–
[ENTER]+[TARE]	setting preset tare (press [ENTER] immediately followed by [TARE])	–	–

8.2 Signalling LEDs

LED	Main function	Secondary function*
NET	net weight (semi-automatic tare or preset tare)	LED lit: input 1 closed
>0<	zero (deviation from zero not more than ± 0.25 divisions)	LED lit: input 2 closed
stability symbol	stability	LED lit: input 3 closed
kg	unit of measure: kg	LED lit: output 4 closed
g	unit of measure: g	LED lit: output 5 closed
W1	–	LED lit: output 1 closed
W2	–	LED lit: output 2 closed
W3	–	LED lit: output 3 closed

*) To activate the secondary LED function, during weight display press [ENTER] immediately followed by [PRINT] and hold both down. Into menus the LEDs light up in sequence to indicate that no weight is displayed.

8.3 Setpoint menu

Menu **000000** › **[ENTER]** › **CLASS** › **[ENTER]** › **C 01 … C 12** › **[ENTER]** › **SEt 01 … SEt 05**

Next to **CLASS** are **HYStE1** … **HYStE5**. Description: chapter 17.

8.4 System parameters menu

[ENTER]+[ESC] opens **CALIb**; [TARE] [PRINT] scroll to the other main items, [ENTER] opens the submenu.

Main item	Sub-items	Chapter
CALIb	**FS-tEO SEnSIb dIUIS MASS 2ErO IMP 0 UEIGHt unIt COEFF nEtEn**	10
FILtEr	value 0 … 9, then **AntPOn** / **AntPOF**	11
PArA 0	**0 SEt AUtO 0 trAC 0**	11
AnALOG (option)	**tYPE MOdE AnA 0 AnA FS COr 0 COr FS**	14
SErIAL	**rS485** / **rS232** › **nOnE ModbUS ASCII COntIn rIP HdrIP HdrIPn YHL PrIntr UEIMOd UEIrIP** › **bAUd Addr dELAY PArItY StOP**	15
Out-In	**Out 1** … **Out 5 In 1** … **In 3**	12
LIMIt	only if an input is set to LIMIT	12
tESt	**In Out AnALOG** (option) **EC** (option) **MU-CEL**	12
dAtE	date and time	16
PEAHOn	**nO** / **YES**	13
PSUbLC	unlock password	20
InFO	**GEnrIC OP2**	16

Direct access from the weight display: [ESC] 3 s › **2ErO** (tare weight zero setting); [PRINT] 3 s › **MU-CEL** (mV test); [ENTER]+[TARE] › **P-tArE** (preset tare).

9 Instrument commissioning

Upon switch-on, the display shows in sequence:

- **111111** › **999999** (only in case of approved program);
- instrument model (e.g. **U200**);
- **SU** followed by the software code (e.g. **SU 5**);
- program type: **bASE** (base);
- **r** followed by the software version (e.g. **r 1.12.00**);
- **HU** followed by the hardware code (e.g. **HU 104**);

- serial number (e.g. **100515**).

Check that the display shows the weight and that the weight increases when the load cells are loaded. If not, check the connections and the correct positioning of the load cells.

- Instrument already theoretically calibrated (plant identification tag on the instrument and on the cover, load cell rated data entered): reset to zero (section 10.4), then check the calibration with sample weights and correct the indicated weight if necessary (section 10.6).
- Instrument not calibrated (no plant identification tag): load cell data unknown – real calibration (section 10.6); known – theoretical calibration (section 10.2); then reset to zero (section 10.4) and check with sample weights (section 10.6).
- Analog output: set type and full scale (chapter 14).
- Serial communication: set the parameters (chapter 15).
- Setpoints: set the weight values and parameters (chapters 17 and 12).
- Set the clock to the current date and time (section 16.1).

10 Calibration and weight parameters

10.1 Programming of system parameters

From the weight display, press [ENTER] immediately followed by [ESC]. [ENTER]: enter a menu or confirm the data entry; [PRINT]: modify the displayed figure or menu item; [TARE]: select a new figure or modify the displayed menu item; [ESC]: cancel and return to the previous menu.

10.2 Theoretical calibration

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[ENTER]** › **FS-tEO** › **[ENTER]** › **SEnSIb** › **[ENTER]** › **dIUIS**

This function allows the load cell rated values to be set, in sequence:

- **FS-tEO** (default **dEMO**): system full scale = capacity of one cell × number of cells. Example: 4 cells of 1000 kg › full scale 1000 × 4 = 4000. The instrument is supplied with a theoretical full scale **dEMO**, corresponding to 10000. To restore factory values, set 0 as full scale.
- **SEnSIb** (default 2.00000 mV/V): load cell rated sensitivity; enter the average value of the cells, settable 0.50000 … 7.00000 mV/V. Example 4 cells with 2.00100, 2.00150, 2.00200, 2.00250 › 2.00175 = (2.00100 + 2.00150 + 2.00200 + 2.00250) / 4.
- **dIUIS**: division (resolution), the minimum weight increment which can be displayed. It is calculated automatically after the calibration to 1/10000 of full scale; it can be changed between 0.0001 and 100 with x1 x2 x5 x10 increments.

Important By modifying full scale or sensitivity, the real calibration is cancelled and only the theoretical calibration is valid. If theoretical full scale and the full scale recalculated in real calibration are equal, the theoretical calibration is in use, otherwise the real one. By modifying the theoretical full scale, all parameters containing a weight value (setpoint, hysteresis, etc.) are set to default.

10.3 Maximum capacity

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[ENTER]** › **FS-tEO** › **[TARE] [PRINT]** › **MASS**

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

10.4 Tare weight zero setting

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[ENTER]** › **FS-tEO** › **[TARE] [PRINT]** › **2Er0**

This menu may also be accessed directly from the weight display by holding [ESC] for 3 seconds. Perform it after the theoretical calibration. Use it to set to zero the weight of the empty system after commissioning and later to compensate zero variations due to product residues.

- Confirm **2Er0** with [ENTER]; the weight value to be set to zero is displayed, all LEDs are flashing.
- Confirm again: the weight is set to zero and stored to the permanent memory.
- Press [PRINT] to display the total weight reset by the instrument, the sum of all previous zero settings.

10.5 Zero value manual entry

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[ENTER]** › **FS-tEO** › **[TARE] [PRINT]** › **IMP 0**

Caution Perform this procedure only if it is not possible to reset the weighed structure tare, for example because it contains product that cannot be unloaded.

Set the estimated zero value (–999999 ... 999999; default 0).

10.6 Real calibration (with sample weights)

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[ENTER]** › **FS-tEO** › **[TARE] [PRINT]** › **UEIGHt**

After the theoretical calibration and the tare weight zero setting, calibrate with weights of known value and correct the display if necessary. Load a sample weight of at least 50 % of the maximum quantity to be weighed. Confirming **UEIGHt**, the current weight is displayed flashing, all LEDs are off; adjust the value with the arrow keys if necessary and confirm – the new weight appears with all LEDs flashing. After a further confirmation **UEIGHt** is shown again; pressing [ESC] repeatedly returns to the weight display.

Example: system of maximum capacity 1000 kg and 1 kg division, sample weights of 500 kg and 300 kg. Load both and correct the indicated weight to 800. Remove the 300 kg weight – the system must show 500; remove the 500 kg weight too – the system must read zero. If not, a mechanical problem affects the linearity; correct it before repeating the procedure.

Important If the correction changes the previous full scale by more than 20 %, all parameters with settable weight values are reset to default.

Linearisation on max. 8 points: repeat the procedure with up to eight different sample weights. It ends with [ESC] or after the eighth value; then only a new real calibration is possible (return to the weight display and re-enter the calibration menu). [PRINT] after confirming the sample weight shows the full scale recalculated from the maximum sample weight entered and the sensitivity **SEnSIb**.

10.7 Units of measure

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[ENTER]** › **FS-tEO** › **[TARE] [PRINT]** › **unIt**

Display	Unit
HILOG	kilograms
G	grams
t	tons
Lb	pounds*
nEUton	newtons*
LItrE	litres*
bAr	bars*
AtM	atmospheres*
PIECE	pieces*
nEU-M	newton metres*
HILO-M	kilogram metres*
OtHEr	other unit not included in the list*

If the print function is enabled, the symbol of the selected unit is printed after the measured value. For the units marked with * the display coefficient **COEFF** can also be set; it applies when an input set to **COEFF** is closed (chapter 12).

10.8 Display coefficient

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[ENTER]** › **FS-tEO** › **[TARE] [PRINT]** › **COEFF**

COEFF (max. 99.9999; default 1.0000) changes the display while the input set to **COEFF** is closed; when the input is open the weight is displayed again. Meaning according to **unIt**: with **LItrE** the specific weight in kg/l (system calibrated in kg); with **PIECE** the weight of one piece; with **Lb**, **nEUton**, **bAr**, **AtM**, **nEU-M**, **HILO-M** and **OtHEr** the value is multiplied by the weight currently displayed.

Caution All other settings (setpoint, hysteresis, calibration ...) remain weight values. To convert them to the new unit, change the system calibration as follows; **COEFF** must then remain 1.0000.

– Theoretical calibration: set in **FS-tEO** the full scale divided by the conversion coefficient from kg to the new unit. Example: 4 cells of 1000 kg under a scale for olive oil of 0.916 kg/l › full scale (4 × 1000) / 0.916 = 4367; the system works in litres. With **unIt** = **LItrE** it displays and prints "l" instead of "kg".

– Real calibration: load a known quantity of product in litres (at least 50 % of the maximum amount to weigh) and enter the value in litres in **UEIGHt**; with **unIt** = **LItrE** the system displays and prints "l".

10.9 Net functions

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[ENTER]** › **FS-tEO** › **[TARE] [PRINT]** › **nEtEn**

Enables or disables the semi-automatic tare and preset tare functions: **EnAbLE** net functions enabled (default), **dISAbL** net functions disabled.

11 Filter on the weight and zero parameters

11.1 Filter on the weight

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[TARE] [PRINT]** › **FILtEr**

The filter stabilises the weight display; a higher value increases the effect (0 … 9, default 4). Confirming **FILtEr** shows the current value; after changing and confirming, the weight is displayed to check its stability. If it is not satisfactory, confirming brings back **FILtEr**. The filter stabilises a weight as long as its variations are shorter than the response time; set it according to the application and the full scale.

Filter value	Response time [ms]	Display and serial port refresh [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 sudden disturbances with a maximum duration of 1 second. After the filter value select with [ENTER]: **AntPOn** enabled (default), **AntPOF** disabled.

11.2 Zero parameters

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[TARE] [PRINT]** › **PArA 0**

– **0 SEt** (0 to full scale; default 300; with decimals 300 – 30.0 – 3.00 – 0.300): maximum weight resettable by external contact, keypad or serial protocol.

– **AUtO 0** (0 to 10 % of full scale; default 0): if at switch-on the weight is lower than this value, it is reset; set 0 to disable.

– **trAC 0** (1 … 5, default **nOnE**): when the weight is stable and after a second deviates from zero by a number of divisions smaller or equal to this value, it is set to zero; **nOnE** disables. Example: **dIUIS** = 5, **trAC 0** = 2 › zero tracking for variations up to 10 (**dIUIS** × **trAC 0**).

12 Outputs, inputs and test

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[TARE] [PRINT]** › **Out-In** › **[ENTER]** › **Out 1 … Out 5 / In 1 … In 3**

12.1 Outputs

The outputs are set by default as follows: **OPEn** / **SEt** / **GrOSS** / **POSnEG** / **OFF**. Operation modes:

- **OPEn** (normally open): the relay is de-energised and the contact open while the weight is lower than the setpoint; it closes when the weight is higher than or equal to the setpoint.
- **CLOSE** (normally closed): the relay is energised and the contact closed while the weight is lower than the setpoint; it opens when the weight is higher than or equal to the setpoint.
- **SEt**: the contact switches on the basis of weight, according to the setpoint (chapter 17).
- **PLC**: the contact does not switch on the basis of weight but is controlled by protocol commands.
- **StAbLE**: relay switching occurs when the weight is stable.

With **SEt** also: **GrOSS** switches on gross weight, **nEt** on net weight (without active net function on gross; with net functions disabled **GrOSS** applies); **POSnEG** switches for positive and negative, **POS** for positive only, **nEG** for negative weight values only. After [ENTER] the behaviour at setpoint 0 is selected:

- **OFF**: relay switching will not occur if the setpoint value is 0.
- **On** with **POSnEG**: relay switching occurs when the weight is 0; the relay switches again when the weight differs from zero, taking hysteresis into account (both positive and negative weights).
- **On** with **POS**: relay switching occurs for a weight higher than or equal to 0; it switches again for values below 0, taking hysteresis into account.
- **On** with **nEG**: relay switching occurs for a weight lower than or equal to 0; it switches again for values above 0, taking hysteresis into account.

12.2 Inputs

Default: input 1 = **2ErO**, input 2 = **nE-LO**, input 3 = **PEAH**. Operation modes:

- **nE-LO** (NET/GROSS): closing the input for no more than one second › semi-automatic tare, net display; holding it closed for 3 seconds › back to gross.
- **2ErO**: closing the input for no more than one second › semi-automatic zero (section 13.3).
- **PEAH**: while the input is closed the maximum weight reached remains on display; with the input open the current weight is displayed.
- **PLC**: no operation; the input status can be read via the protocol.
- **COntIn**: closing the input for max. one second › the weight is transmitted once with the fast continuous protocol (only if **COntIn** is set under **SErIAL**).
- **COEFF**: with the input closed the display uses the coefficient (section 10.8), otherwise the weight.
- **PrIntr**: with the input closed the data are printed if **PrIntr** is set on one of the serial ports.
- **LIMIt**: with the input open **--__--** is displayed; the weight cannot be saved (section 12.3).

12.3 Limit mode

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[TARE] [PRINT]** › **LIMIt**

The menu is displayed only when one of the inputs is set as LIMIT.

- **OPEn** (1 ... 65535 ms; default 10): time before the instrument recognises the closure of the input. Example 100: the input is recognised as closed 0.1 s after the actual closure; if it opens and closes again in this time, the counting starts all over.
- **CLOSE** (1 ... 65535 ms; default 1000): time before the instrument recognises the opening of the input. Example 3000: the input is recognised as open 3 s after the actual opening.

12.4 Test

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[TARE] [PRINT]** › **tESt**

Test	Meaning
In	inputs: open input **0**, closed input **1**
Out	outputs: **0** › the output must open; **1** › the output must close
EC	E/EC option: number of the selected setpoint class; without or with inactive option **EC-Er**
AnALOG	analog output option: the signal ranges from minimum to maximum; **MA** current, **uOLt** voltage
MU-CEL	millivolt: load cell response signal in mV with four decimals

13 Tare, zero and peak

13.1 Semi-automatic tare (net/gross)

Close the NET/GROSS input or press [TARE] for less than 3 seconds: the instrument displays the net weight (just set to zero), NET lights up. Back to gross: keep the NET/GROSS input closed or press [TARE] for 3 seconds. The operation can be repeated many times, e.g. to load several products. Example: put the box on the scale, [TARE] – display zero net; introduce the product – display product weight.

- While the net weight is displayed, keep [PRINT] pressed to display the gross weight.
- Not allowed if the gross weight is zero (**In2Er0**) or if the net functions are disabled (section 10.9).
- The semi-automatic tare is lost upon instrument power-off.

13.2 Preset tare (subtractive tare device)

Menu **000000** › **[ENTER]+[TARE]** › **P-tArE**

A tare value is set manually and subtracted from the display, provided that **P-tArE** ≤ max. capacity. The last programmed value is shown; to apply it press [PRINT] and then [ENTER]. Back in the weight display the net weight is shown and NET lights up. To delete and return to gross: hold [TARE] for about 3 seconds or keep the NET/GROSS input closed for 3 seconds; the preset tare is set to zero, NET goes off.

- If a semi-automatic tare is entered, the preset tare function cannot be accessed.
- If a preset tare is entered, the semi-automatic tare is still possible; the two tares are added.
- Both types of tare are lost when the instrument is turned off; not available with net functions disabled.

13.3 Semi-automatic zero

Close the SEMI-AUTOMATIC ZERO input: the weight is set to zero. Or press [ESC] for less than 3 seconds: **StOrE?** is displayed for 3 seconds, [ENTER] sets the weight to zero. Only allowed if the weight is lower than **0 SEt** (section 11.2); otherwise **t‾‾‾‾** (upper dashes) appears and the weight is not set to zero.

13.4 Peak

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[TARE] [PRINT]** › **PEAHOn**

- **nO**: the peak function is run only via input (default).
- **YES**: the peak function is also run via [START].

While the PEAK input is closed or after [START] (if enabled) the maximum weight reached remains displayed. Opening the input or holding [START] for 3 seconds › current weight. To view a sudden variation peak, set the filter on the weight to 0.

14 Analog output (option)

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[TARE] [PRINT]** › **AnALOG**

- **tYPE**: analog output type: 4 ... 20 mA, 0 ... 20 mA, 0 ... 10 V, 0 ... 5 V, ± 10 V, ± 5 V (default 4 ... 20 mA).
- **MOdE**: **GrOSS** follows the gross weight, **nEt** the net weight, **PLC** remote control via protocol (section 23.6).

– **AnA 0**: weight for the minimum analog output value. Only set a value other than zero to limit the range – e.g. full scale 10000 kg, 4 mA at 5000 kg and 20 mA at 10000 kg › 5000.

– **AnA FS**: weight for the maximum value; it must correspond to the value in the PLC program (default: calibration full scale). Example 4 ... 20 mA with 20 mA = 8000 kg › 8000.

– **COr 0**: zero correction so that the PLC indicates 0; "–" can be set on the last digit on the left. Example: with 4 ... 20 mA the PLC reads 4.1 mA at minimum › set 3.9 to obtain 4.0.

– **COr FS**: full scale correction so that the PLC indicates the value of **AnA FS**. Example: at full scale 19.9 mA › set 20.1 to obtain 20.0.

Caution For the ± 10 V and ± 5 V outputs the soldered jumper SW1 must be closed: open the instrument, releasing with a screwdriver the locking tabs that hold together the two sides of the case, locate the soldered jumper SW1 on the printed circuit board and short the pads with a drop of tin. The position of SW1 is shown in the manufacturer's documentation only on a photo; octogon provides it on request.

Analog output type	Minimum	Maximum
0 ... 10 V	–0.150	10.200
0 ... 5 V	–0.150	5.500
± 10 V	–10.300	10.200
± 5 V	–5.500	5.500
0 ... 20 mA	–0.200	22.000
4 ... 20 mA	–0.200	22.000

The output can also be used in the opposite manner: **AnA 0** may be greater than **AnA FS**; the output then increases as the weight decreases. Example 0 ... 10 V with **AnA 0** = 10000 and **AnA FS** = 0: 0 kg › 10 V, 5000 kg › 5 V, 10000 kg › 0 V.

Important All analog outputs are ACTIVE and SINGLE ENDED and can only be connected to PASSIVE receiver devices. Voltage output: minimum load 10 kΩ; current output: maximum load 300 Ω.

15 Serial communication

15.1 Setting

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[TARE] [PRINT]** › **SErIAL** › **[ENTER]** › **rS485 / rS232**

First select the port (**rS485** or **rS232**), then the protocol:

Protocol	Meaning
nOnE	no communication (default)
ModbUS	Modbus RTU, addresses 1 ... 99 (chapter 23)
ASCII	ASCII bidirectional protocol, addresses 1 ... 99; sub-modes **MOdU60** and **MOd td** (chapter 22)
COntIn	fast continuous weight transmission at the frequency **HErt2** (10 ... 300); sub-modes **MOd t** and **MOd td**, each with **PArItY** = **nOnE**, **StOP** = **1** (section 21.1)
rIP	continuous transmission to remote displays; the remote display shows net or gross weight according to its settings (**bAUd** = **9600**, **PArItY** = **nOnE**, **StOP** = **1**; section 21.2)
HdrIP	as **rIP**, for remote displays with decimal point (section 21.2)
HdrIPn	as **HdrIP**; if the remote display is set to gross and the instrument shows net, the remote display shows net alternated with **nEt**
YHL	continuous weight transmission (section 21.3)
PrIntr	printer
UEIMOd / **UEIrIP**	weight reception (section 15.5)

15.2 Parameters

Parameter	Meaning
bAUd	transmission speed 1200, 2400, 4800, 9600, 19200, 38400, 115200 (default 9600)
Addr	instrument address 1 ... 99 (default 1)
HErt2	maximum transmission frequency with **COntIn**: 10, 20, 30, 40, 50, 60, 70, 80, 100, 200, 300 Hz (default 10); max. 20 Hz from 2400 baud, 40 Hz from 4800, 80 Hz from 9600, 100 Hz from 19200, 200 and 300 Hz from 38400 baud

Parameter	Meaning
dELAY	delay of the reply 0 ... 200 ms (default 0)
PArItY	**nOnE** no parity (default), **EUEn** even, **Odd** odd parity
StOP	stop bits 1 or 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 a custom heading from PC: **YES** / **nO** (default **nO**)
LbLPAr	configuration parameters of the **LbLPrt** label printer (manual of its own)
PrtMOd	connected printer type: **P190**, **StAUP**, **StAUt**, **tMt203**, **LbLPrt**

15.3 RS232 and RS485

Connection	Instrument	Counterpart
RS232 to PC (DB9 female)	RS232 TXD · RS232 RXD · GND	pin 2 · pin 3 · pin 5
RS485, several instruments	RS485 + · RS485 – · GND	RS485 + · RS485 – · GND of each instrument
RS485 directly to RS232 (no converter)	RS485 – · RS485 +	RXD · GND

– Terminals: RS485 – 17, RS485 + 18, GND 2; RS232 TXD 3, RXD 4, GND 2 (section 7.3).

– If the RS485 network exceeds 100 m or baud rates over 9600 are used, connect two 120 Ω terminating resistors between "+" and "–" on the terminal strip of the furthest instruments. With other instruments or converters refer to their manuals.

– A two-wire RS485 output may be used directly on the RS232 input of a PC or remote display; this allows A SINGLE instrument to be used in a ONE WAY mode.

– For an RS485 converter at the PC, follow its wiring diagram.

15.4 Weight reading via serial port

The transmitting instrument is the one connected to the load cell, the receiving instrument the one which receives the weight via RS485 or RS232. Outputs, serial ports and analog output of the receiving instrument work as described, using the weight received.

Caution For this the weight reading mode must be set as **SErIAL** (section 20.5).

15.5 WEIMOD and WEIRIP modes

UEIMOd: the instrument works as if it were directly connected to the load cell; calibration and zero setting are possible. Protocol Modbus, the receiving instrument is master, the transmitting one slave. Transmitting instrument: select the port, **ModbUS**, set the communication parameters and the filter value. Receiving instrument: select the port, **UEIMOd**, the same parameters as on the transmitting one: **bAUd**, **SLAUE** (address of the transmitting instrument, 1 ... 99, default 1), **dELAY**, **PArItY**, **StOP**. The transmitting instrument display is locked and shows the instrument model; to unlock it, disconnect the receiving instrument and release the keypad/display lock (section 20.6).

UEIrIP: the instrument receives the gross weight; calibration and zero setting on the transmitting instrument. Transmitting instrument: select the port, **rIP**, set the parameters. Receiving instrument: select the port, **UEIrIP**, **bAUd**, **dELAY**, **PArItY**, **StOP** as on the transmitting one, plus unit **UnIt** and decimals **dECIM** of the received weight; these two items appear in the main menu after setting **UEIrIP**.

UEIMOd and **UEIrIP** can only be enabled on one port; in case of conflict the port set last remains active. Connection transmitting › receiving instrument: RS485 +, RS485 – and –SUPPLY, or RS232 TX › RX, RX › TX and –SUPPLY (terminals section 15.3).

16 Date and info

16.1 Date and time setting

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[TARE] [PRINT]** › **dAtE**

Pressing [ENTER] several times scrolls through day, month, year, hours, minutes; [TARE] selects the figure to modify, [PRINT] increases it, [ENTER] confirms and goes to the next item.

16.2 Info menu

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[TARE] [PRINT]** › **InFO**

GEnrIC: identification data of the instrument – **InStrM** model, **SU COd** software code, **PrOGrM** program type, **FU UEr** software version, **SEr nu** serial number. **OP2**: active options.

17 Setpoint programming

Menu **000000** › **[ENTER]** › **CLASS** › **[ENTER]** › **C 01 … C 12** › **[ENTER]** › **SEt 01 … SEt 05**

From the weight display, press [ENTER]. [ENTER]: enter a menu or confirm; [PRINT]: modify the figure or menu item; [TARE]: select a new figure or modify the menu item; [ESC]: cancel and return.

– **CLASS**: with the E/EC option 12 groups (classes) of setpoint values can be set, otherwise only the first class. The E/EC position selects the values valid for relay switching.

– **SEt 01** ... **SEt 05** (0 to full scale; default 0): setpoint – relay switching occurs when the weight exceeds this value; the type of switching is settable (section 12.1).

– **HYStE1** ... **HYStE5** (0 to full scale; default 0): hysteresis – value subtracted from the setpoint to obtain switching for decreasing weight. Example: setpoint 100, hysteresis 10 › for decreasing weight switching occurs at 90.

Note These values are set to zero if the calibration is changed significantly (sections 10.2 and 10.6).

18 Alarms

Display	Meaning
ErCEL	load cell not connected or incorrectly connected; load cell signal exceeds 39 mV; conversion electronics (AD converter) malfunctioning; 4-wire cell without jumpers EX–/REF– and EX+/REF+
nO COM	communication problems between transmitter and receiver; check electrical connections and instrument configuration
Er OL	the weight display exceeds 110 % of full scale
EErOL	weight display on the transmitting instrument exceeds 110 % of full scale
Er Ad	internal converter failure; check load cell connections, if necessary contact octogon
‾‾‾‾‾ (upper dashes)	the weight exceeds the maximum capacity **MASS** by 9 divisions
Er OF	maximum displayable value exceeded (higher than 999999 or lower than –999999)
EErOF	maximum displayable value exceeded on the transmitting instrument
t ‾‾‾‾‾ (upper dashes)	weight too high: zero setting not possible
MAH-PU	in real calibration, after the eighth sample weight has been entered
Error	value beyond the permitted values; [ESC] quits the setting leaving the previous value (e.g. too many decimals for the full scale, value above the maximum, sample weight not matching the detected mV increase, analog output correction beyond the limits)
bLOC	lock active on menu item, keypad or display
nOdISP	number greater than 999999 or less than –999999, cannot be displayed
bAtrtC	buffer battery low, date and time lost; confirm with [ENTER], leave the instrument on for at least 12 hours; if the alarm persists contact octogon
dAtE?	incorrect date detected; check and correct it in the **dAtE** menu
In2ErO	gross weight equal to zero: semi-automatic tare not possible
--__--	the input set in LIMIT mode is open

18.1 Serial protocol alarms

Alarm	Modbus RTU, status register	ASCII	RIP*	HDRIP-N	CONTIN
ErCEL	bit 0	**__O-F_**	**__O-F_**	**_ERCEL**	**_ERCEL**
Er OL	bit 3	**__O-L_**	**__O-L_**	**_ER_OL**	**_ER_OL**
Er Ad	bit 1	**__O-F_**	**__O-F_**	**_ER_AD**	**_ER_AD**
‾‾‾‾‾ (upper dashes)	bit 2	**__O-L_**	**__O-L_**	######	^^^^^^
Er OF	gross bit 4 · net bit 5	**__O-F_**	**__O-F_**	**_ER_OF**	**_ER_OF**
t‾‾‾‾‾ (upper dashes)	response to the zero command: 'value not valid' error (code 3)	**&aa#CR**	**__O-F_**	**O__SET**	**O__SET**

"_" stands for a space. *) With remote displays on the **rIP** protocol, the display reads ‾‾‾‾‾ (upper dashes) if the message exceeds 5 digits.

With an alarm the relays open and the analog outputs go to the lowest possible value:

Range	0 ... 20 mA	4 ... 20 mA	0 ... 5 V	0 ... 10 V	± 10 V	± 5 V
Output value	–0.2 mA	3.5 mA	–0.5 V	–0.5 V	0 V	0 V

19 Printing examples

If the printer has been set (chapter 15), press [PRINT] from the weight display. "‹Model›" stands for the model identification printed by the instrument.

Basic printout

```
‹Model›  BASE     Addr:01
DATE: 12/09/11 14:48:12
GROSS             878 kg
NET               589 kg
TARE              289 kg
```

Basic printout (peak enabled)

```
‹Model›  BASE     Addr:01
DATE: 12/09/11 14:48:12
GROSS            1204 kg
NET               831 kg
TARE              373 kg
PEAK             2103 kg
```

Printout with coefficient enabled

```
‹Model›  BASE     Addr:01
DATE: 12/09/11 15:07:41
UNIT     kg |       bar
G      1195 |      1792
N      1195 |      1792
T         0 |         0
```

20 Reserved for the installer

20.1 Menu locking

Any menu can be locked. Select the menu (e.g. **CALIb**) and press [ESC] and [TARE] simultaneously for 3 seconds: the display shows **C.ALIb** (the left point indicates the lock). When the operator tries to enter this menu, **bLOC** is displayed.

20.2 Menu unlocking

With **C.ALIb** displayed press [ENTER] and [PRINT] simultaneously for 3 seconds; the unlock password is requested (if enabled) and the display shows **CALIb** without point.

20.3 Temporary menu unlocking

With **C.ALIb** displayed press [PRINT] and [TARE] simultaneously for 3 seconds; after the password (if enabled) all menus, including the locked ones, can be entered and modified. Returning to the weight display restores the lock.

20.4 Setting unlock password

Menu **000000** › **[ENTER]+[ESC]** › **CALIb** › **[TARE] [PRINT]** › **PSUbLC**

The password must contain 6 characters; to change a customized password the current one is required. **000000** (default) disables the unlock password.

20.5 Data deletion and program selection

Caution Perform these operations only after contacting octogon. After each operation **dOnE** is displayed, press [ENTER] to continue; [ESC] cancels without changes.

Upon power-on hold [ESC] until **PrOG** is displayed, then:

– Constants restore (the calibration is not erased): confirm **PrOG**, select **PASSU** with the arrow keys, set code 6935 and confirm.

– Program selection: confirm **PrOG** and select with the arrow keys – **bASE** basic program (setpoint management only), **rIP** remote display program with setpoint.

– Weight reading mode (not with **rIP**): **CELL** – from load cells, intelligent junction box or weight transmitter connected to the instrument; **SErIAL** – via serial port (WEIMOD or WEIRIP, section 15.5).

– Approval status (not with **rIP**): **nOtLEG** not approved; **LEGAL** approved, single interval*; **LEGMI** approved, multi-interval*; **LEGMr** approved, multiple range*.

– Active regulation (not with **nOtLEG**): **OIML**, **ntEP**, **InMEtr** (**bASE** program only).

– Connection of an intelligent junction box or weight transmitter (not with **SErIAL** or **rIP**): **EStYES** connected, **EStnO** not connected.

*) For the approved version request the proper manual and procedure from octogon, stating hardware code and serial number (chapter 9). When the indicator is used with an intelligent junction box or weight transmitter, the approval status set on both devices must be the same. By confirming, the instrument is restored to default and data is erased.

20.6 Keypad or display locking

Press [ESC] immediately followed by [PRINT] and hold them down for about 5 seconds (also possible via the Modbus and ASCII protocols):

– **FrEE**: no lock;

– **HEY**: keypad lock – when a key is pressed **bLOC** is displayed for 3 seconds;

– **dISP**: keypad and display lock – the display shows the instrument model instead of the weight; when a key is pressed **bLOC** is displayed for 3 seconds.

21 Continuous transmission protocols

Common to all strings: with negative weight the first character from the left is "–" (ASCII 45); in case of error or alarm the weight is replaced by the messages of section 18.1. The checksum ckck is the XOR of the 8-bit ASCII codes of the characters between "&" and "\" (both excluded), as two hexadecimal digits 0 … 9, A … F in ASCII.

21.1 Continuous fast weight transmission

Transmits the weight with up to 300 strings per second, from 38400 baud. Setting **COntIn** (section 15.1) with the sub-mode **MOd t** or **MOd td** (each compatible with older instruments). An input set to **COntIn** can also send the weight just once (chapter 12).

MOD t

```
xxxxxxCRLF
```

Character	Meaning
xxxxxx	6 characters of gross weight (ASCII 48 ... 57)
CR	carriage return (ASCII 13)
LF	new line (ASCII 10)

MOD td

```
&TzzzzzzPzzzzzz\ckckCR
```

Character	Meaning
&	start (ASCII 38)
T, P	1 character of gross weight identification each
zzzzzz	6 characters of gross weight (ASCII 48 ... 57)
\	separation (ASCII 92)
ckck	2 checksum characters
CR	end (ASCII 13)

21.2 Continuous transmission to remote displays

The string is transmitted 10 times per second; **`bAUd`** = **`9600`**, **`PArItY`** = **`nOnE`**, **`StOP`** = **`1`**. **`rIP`**: remote displays e.g. octogon EDLD; **`HdrIP`** and **`HdrIPn`**: remote displays e.g. octogon EDLF, EDLG.

```
&NxxxxxxLyyyyyy\ckckCR
```

Character	Meaning
&	start (ASCII 38)
N	net weight identification (ASCII 78)
xxxxxx	6 characters of net weight or PEAK if present (ASCII 48 ... 57)
L	gross weight identification (ASCII 76)
yyyyyy	6 characters of gross weight (ASCII 48 ... 57)
\	separation (ASCII 92)
ckck	2 checksum characters
CR	end (ASCII 13)

– **`HdrIP`**: the decimal point at the position shown on the instrument display can also be transmitted; if the value exceeds 5 digits, only the 5 most significant digits are transmitted, if negative no more than the 4 most significant; the decimal point shifts accordingly.

– **`HdrIPn`**: in addition the instrument transmits **`nEt`** every 4 seconds in the gross weight field if a net operation has been carried out.

– Below –99999 "–" is sent alternated with the most significant figure.

21.3 Continuous transmission YHL

The string is transmitted 5 times per second; after a net operation the net weight, otherwise the gross weight.

```
=xxxxxxxxx
```

Character	Meaning
=	start (ASCII 62)
xxxxxxxxx	9 characters of net or gross weight (ASCII 48 ... 57), LITTLE ENDIAN sorting

With negative weight the first character from the right is "–"; the decimal point is transmitted at the position given by the calibration. Example gross weight –20.7 kg: **`=7.02000-`**. In case of error or alarm "999999999" is sent.

22 ASCII bidirectional protocol

The instrument replies to the requests sent from a PC/PLC; a waiting time before the reply can be set (**dELAY**, section 15.2). Sub-modes: **MOdU60** and **MOd td** – two variants compatible with older weighing instruments.

Character	Meaning
$	beginning of a request string (ASCII 36)
& or &&	beginning of a response string (ASCII 38)
aa	2 characters of instrument address (ASCII 48 ... 57)
!	correct reception (ASCII 33)
?	reception error (ASCII 63)
#	error in the command execution (ASCII 35)
ckck	2 ASCII characters of checksum (section 22.14)
CR	end of string (ASCII 13)
\	separation character (ASCII 92)

Setpoint programming: without E/EC option set the values (22.3) and store them in the EEPROM (22.4); with E/EC option first select the class to be programmed (22.1).

22.1 Selecting the setpoint class to be programmed (E/EC option only)

Direction	String
PC transmits	**$aaFffckckCR**
correct reception	**&&aa!\ckckCR**
incorrect reception	**&&aa?\ckckCR**
ff exceeds the maximum allowable	**&aa#\ckckCR**

F = command; ff = class number 01 ... 12. Example class 11, instrument 01: **$01F1147(Cr)**.

22.2 Reading the class to be programmed (E/EC option only)

Direction	String
PC transmits	**$aafckckCR**
correct reception	**&aaff\ckckCR**
incorrect reception	**&&aa?\ckckCR**

ff = class 01 ... 12.

22.3 Setting setpoint values currently in use

Direction	String
PC transmits	**$aaxxxxxxyckckCR**
correct reception	**&&aa!\ckckCR**
incorrect reception	**&&aa?\ckckCR**
value exceeds the maximum allowable	**&aa#\ckckCR**

xxxxxx = 6 characters of setpoint value (ASCII 48 ... 57); y = A ... E for setpoint 1 ... 5. Without E/EC option the new values are active immediately, with E/EC option only if the programmed class is the one in use. Example 500 in setpoint 4: **$01000500D40(Cr)**.

22.4 Setpoint storage in EEPROM memory

Direction	String
PC transmits	**$aaMEMckckCR**
correct reception	**&&aa!\ckckCR**
incorrect reception	**&&aa?\ckckCR**

Setpoints are stored in RAM and lost at power-off; this command saves them permanently. The number of writings allowed in the EEPROM is limited (about 100000).

22.5 Reading the setpoint class currently in use (E/EC option only)

Direction	String
PC transmits	**$aagckckCR**
correct reception	**&aaff\ckckCR**
incorrect reception	**&&aa?\ckckCR**

ff = class 01 ... 12.

22.6 Reading weight, setpoint and peak

Direction	String
PC transmits	**$aajckckCR**
correct reception	**&aaxxxxxxj\ckckCR**
incorrect reception	**&&aa?\ckckCR**
peak not configured	**&aa#CR**

j = a ... e: setpoint 1 ... 5; t: gross weight; n: net weight; p: gross weight peak with **ASCII** = **MOdU60**, with **MOd td** the gross weight (to read the points, set **FS-tE0** = 50000). xxxxxx = 6 characters of value; negative weight with "–" on the left, below –99999 alternated with the most significant figure. Alarm for exceeding 110 % of full scale or 9 divisions above **MASS**: **&aass0-Lst\ckck**; faulty load cell connection or other alarm: **&aass0-Fst\ckck** (s = space, ASCII 32).

22.7 Semi-automatic zero

Direction	String
PC transmits	**$aaZER0ckckCR**
correct reception	**&&aa!\ckckCR**
incorrect reception	**&&aa?\ckckCR**
weight over the maximum resettable value	**&aa#CR**

22.8 Switching from gross to net weight

Direction	String
PC transmits	**$aaNETckckCR**
correct reception	**&&aa!\ckckCR**
incorrect reception	**&&aa?\ckckCR**

22.9 Switching from net to gross weight

Direction	String
PC transmits	**$aaGR0SSckckCR**
correct reception	**&&aa!\ckckCR**
incorrect reception	**&&aa?\ckckCR**

22.10 Reading of decimals and division

Direction	String
PC transmits	**$aaDckckCR**
correct reception	**&aaxy\ckckCR**
incorrect reception	**&&aa?\ckckCR**

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

22.11 Tare zero setting

Direction	String
PC transmits	**$aazckckCR**
correct reception	**&aaxxxxxxt\ckckCR**
incorrect reception	**&&aa?\ckckCR**
gross weight not displayed	**&aa#CR**

z = command (ASCII 122); xxxxxx = weight value; t = weight identification (ASCII 116). The system must be unloaded or the instrument must measure the corresponding mV signal. Example address 2: query **$02z78(Cr)**, response **&02000000t\76(Cr)** – with correct zeroing "000000". The values are stored in the EEPROM (about 100000 writings).

22.12 Real calibration (with sample weight)

Direction	String
PC transmits	**$aasxxxxxxckckCR**
correct reception	**&aaxxxxxxt\ckckCR**
incorrect reception or full scale zero	**&&aa?\ckckCR**

After the tare zero setting load a sample weight of at least 50 % of full scale (or apply the corresponding mV signal). s = calibration command (ASCII 115); xxxxxx = sample weight (negative values are not allowed); response: xxxxxx = current weight, t = gross weight identification (ASCII 116) – with correct calibration equal to the sample weight. Example instrument 1, 20000 kg: query **$01s02000070(Cr)**, response **&01020000t\77(Cr)**.

22.13 Keypad lock, unlock, display and keypad lock

Direction	String
PC transmits	**$aaKEYckckCR · $aaFREckckCR · $aaKDISckckCR**
correct reception	**&&aa!\ckckCR**
incorrect reception	**&&aa?\ckckCR**

KEY: keypad lock; FRE: keypad unlock; KDIS: display and keypad lock.

22.14 Checksum calculation

The two characters ckck represent a hexadecimal number in ASCII characters: the XOR (exclusive OR) of the 8-bit ASCII codes of the characters between "$" and ckck (request) or between "&" and "\" (response). The examples in this chapter can be recalculated this way. Example with the characters 0, 1, t:

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

The result 0x75 gives the checksum made up of the characters "7" and "5".

23 Modbus RTU protocol

The Modbus RTU protocol allows the reading and writing of the registers listed below according to the Modicon PI-MBUS-300 specification. Selection: section 15.1. Check whether the Modbus master (or the development tool) numbers the registers from 40001 or from 0; in the second case the register is the table value minus 40001 (e.g. 40028 › 27).

Some data are written directly to the EEPROM, whose writing operations are limited (100000); avoid useless writings. The instrument does not write if the value equals the stored one. Numbers without prefix are decimal, with 0x hexadecimal.

23.1 Data format and functions

1 start bit; 8 data bits, least significant bit sent first; settable parity bit and stop bit. Use only the following functions – others could be incorrectly interpreted and generate errors or blocks of the system:

Function	Description
03 (0x03)	READ HOLDING REGISTER (read programmable registers)
16 (0x10)	PRESET MULTIPLE REGISTERS (write multiple registers)

The interrogation frequency depends on the baud rate (the instrument stands by for at least 3 bytes before calculating a response); **dELAY** (section 15.2) adds a further delay.

	Address	Function	Content	CRC	Bytes
Function 3 query	A	0x03	1st register 0x0000 · no. registers 0x0002	2 byte	8
Function 3 response	A	0x03	no. bytes 0x04 · 1st register 0x0064 · 2nd register 0x00C8	2 byte	3 + 2 × no. registers + 2
Function 16 query	A	0x10	1st register 0x0000 · no. registers 0x0002 · no. bytes 0x04 · value 1 0x0000 · value 2 0x0000	2 byte	7 + 2 × no. registers + 2
Function 16 response	A	0x10	1st register 0x0000 · no. registers 0x0002	2 byte	8

23.2 Broadcast requests and communication errors

– Broadcast (address 0): read requests are not executed and not answered; write requests are executed but not answered.

– The strings are checked by CRC. In case of communication error the slave does not respond; the master must consider a time-out.

– If a correctly received string is not executable, the slave responds with an exceptional response: address, function + 0x80, code, CRC – code 1 ILLEGAL FUNCTION (function not valid or not supported), 2 ILLEGAL DATA ADDRESS (data address not available), 3 ILLEGAL DATA VALUE (invalid value).

23.3 List of available registers

A maximum of 32 registers per query or response. R = read only, R/W = read and write; H/L = high/low half of the DOUBLE WORD.

Register	Description	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 (section 23.5)	no	R/W
40007	status register (section 23.4)	–	R
40008 / 40009	gross weight H / L	–	R
40010 / 40011	net weight H / L	–	R
40012 / 40013	peak weight H / L	–	R
40014	divisions and units of measure (section 23.4)	–	R
40015 / 40016	coefficient H / L	–	R
40017	inputs	–	R
40018	outputs	no	R/W
40019 ... 40028	setpoint 1 ... 5, H / L each	only after command 99	R/W
40037	setpoint class selected by the E/EC option	–	R
40038	setpoint class to be set and read (E/EC option)	no	R/W
40039 ... 40048	hysteresis 1 ... 5, H / L each	yes	R/W
40050	instrument status	–	R
40051 ... 40060	register 1 ... 10 (exchange registers)	no	R/W
40065 / 40066	sample weight for instrument calibration H / L (with command 101)	–	R/W
40067 / 40068	weight value corresponding to zero of the analog output H / L	yes	R/W
40069 / 40070	weight value corresponding to full scale of the analog output H / L	yes	R/W
40073 / 40074	preset tare H / L (with command 130)	–	R/W

Caution When written, the setpoint values are saved to RAM and lost at the next power-off; command 99 of the command register stores them permanently to EEPROM.

23.4 Status, inputs, outputs, divisions

Status register 40007	Meaning
Bit 0	load cell error
Bit 1	AD converter 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 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

Instrument status 40050	Meaning (BASE program)
0	instrument in idle condition (weight displaying)
4	system parameters displaying
8	‾‾‾‾‾ (upper dashes) alarm
26	instrument waits for the printing to complete
28	setpoint class displaying
30	**usb er** alarm (only with DATAUSB option)
34 / 35	**MEMFUL** / **MEMOUr** alarm (only with DATAUSB or DATAPC option)

The other values of 40050 belong to the batching programs. Inputs 40017 (read only): bit 0 ... 2 = input 1 ... 3. Outputs 40018: bit 0 ... 4 = output 1 ... 5; readable at any time, writable only if the output is set as **PLC** (section 12.1) – otherwise the outputs switch on weight.

Register 40014: L byte = division, H byte = unit of measure. Together with the coefficient registers it gives the value displayed by the instrument.

L byte	Divisor	Decimals	H byte	Unit	Coefficient effect
0	100	0	0	kilograms	no effect
1	50	0	1	grams	no effect
2	20	0	2	tons	no effect
3	10	0	3	pounds	no effect
4	5	0	4	newton	multiplies
5	2	0	5	litres	divides
6	1	0	6	bar	multiplies
7	0.5	1	7	atmospheres	multiplies
8	0.2	1	8	pieces	divides
9	0.1	1	9	newton metres	multiplies
10	0.05	2	10	kilogram metres	multiplies
11	0.02	2	11	other	multiplies
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			

23.5 Commands to the command register 40006

Command	Description
0	no command
7	semi-automatic tare enabling (net weight displaying)
8	semi-automatic zero
9	semi-automatic tare disabling (gross weight displaying)
21	keypad lock
22	keypad and display unlock
23	keypad and display lock
99	save data in EEPROM; BASE program: setpoints into the class set in register 40038
100	tare weight zero setting for calibration
101	save first sample weight for calibration
104	real calibration cancellation
106	add sample weight for calibration
130	preset tare enabling
131	reserved
6811 / 6812	writing / reading the current value requested at the analog output
6813 / 6814	writing / reading the voltage value requested at the analog output

To execute the same command twice consecutively, send command 0 between them. The commands of the batching programs (200 ... 251, 2000 ... 2999) do not apply to the BASE program.

23.6 Analog output

– **`MOdE`** = **`GrOSS`** or **`nEt`** (chapter 14): write or read the weight for zero and full scale in registers 40067/40068 and 40069/40070.

– **`MOdE`** = **`PLC`**: the output is set directly. Multiply the value by 10000, write the H bytes into REGISTER 1 (40051) and the L bytes into REGISTER 2 (40052) and send command 6811 (current, value in mA) or 6813 (voltage, value in V). Reading: send command 6812 or 6814, read 40051/40052 and divide by 10000.

Example	REGISTER 1 (H)	REGISTER 2 (L)	Total
write current 14 mA, hexadecimal	0x0002	0x22E0	0x000222E0
decimal	2	8928	140000
read voltage, hexadecimal	0x0000	0xCF76	0x0000CF76
decimal	0	53110	53110 › 5.3110 V

23.7 Real calibration commands

– Unload the system and reset the displayed weight with command 100 (tare weight zero setting for calibration).

– Load a sample weight and write its value to registers 40065/40066.

– Command 101 saves the first sample weight and removes the previously saved values; command 106 adds a sample weight and keeps the previous ones.

– Up to 8 different sample weights for a linearisation; the same sample weight only once per calibration, no sample weights of value zero. If successful, 40065/40066 are set to zero.

– Command 104 cancels the real calibration and returns to the theoretical one; the tare reset is not cancelled.

Enter the sample weight in divisions (register 40014): 100 kg with division 0.001 › 100000. 40065/40066 are a 32-bit signed number; negative values in two's complement if necessary: –56 kg › 40065 = 0xFFFF (–1), 40066 = 0xFFC8 (–56).

23.8 Setpoints via protocol

With the E/EC option first write the class into 40038; then write or read the setpoints in 40019 ... 40028. Without E/EC option new values are active immediately, with E/EC option only if the programmed class is the one in use. Permanent storage: command 99.

23.9 Communication examples

Values in hexadecimal with prefix h; instrument address h01.

Example	Query	Response
1 – function 16: write 0 to 40019 and 2000 to 40020	h01 h10 h00 h12 h00 h02 h04 h00 h00 h07 hD0 h70 hD6	h01 h10 h00 h12 h00 h02 hE1 hCD
2 – function 16: setpoint 1 = 2000 (40019/40020), setpoint 2 = 3000 (40021/40022)	h01 h10 h00 h12 h00 h04 h08 h00 h00 h07 hD0 h00 h00 h0B hB8 h49 h65	h01 h10 h00 h12 h00 h04 h61 hCF
3 – function 3: read gross (4000) and net (3000) from 40008 ... 40011	h01 h03 h00 h07 h00 h04 hF5 hC8	h01 h03 h08 h00 h00 h0F hA0 h00 h00 h0B hB8 h12 h73

Structure: address, function, first register H/L, number of registers H/L, (byte count, data,) CRC16 L/H. For example 1 the source gives the response as a string with “h00 h10 ... h40 h0D”; the field table on the same page and the CRC calculation give the response shown above. Further CRC16 examples: Modicon PI-MBUS-300.

24 Directives and standards

According to the manufacturer's declarations of conformity (EU and United Kingdom, 03/12/2024):

Directive	Standards
2014/35/EU Low Voltage	EN 61010-1:2010+A1:2019 – not applicable for the VDC type (only for 230/115 VAC type)
2014/30/EU EMC	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
2014/31/EU NAWI (only if the M mark is applied)	EN 45501:2015 · OIML R76-1:2006
United Kingdom	Electrical Equipment (Safety) Regulations 2016, Electromagnetic Compatibility Regulations 2016, Non-automatic Weighing Instruments Regulations 2016 (only if the M mark is applied) – with the corresponding BS EN standards

The declarations of conformity are available from octogon on request.