

# MANUAL

# EILA

## WEIGHT INDICATOR, DIN PANEL

Installation and user manual



| Document                     | Version | Date    | Applies to                                             |
|------------------------------|---------|---------|--------------------------------------------------------|
| Installation and user manual | V00x    | 10/2026 | EILA, BASE program, with the options of the data sheet |

This manual describes installation, connection and operation of the EILA weight indicator, the communication protocols (continuous transmission, ASCII, Modbus RTU) and the options analog output, additional RS485 port, analog input and E/EC. The approved (legal for trade) version has manuals of its own.



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## 1 About this manual

Display texts are set in a fixed-width typeface, as they appear on the 7-segment display, for example **CALib**. Keys are written in square brackets (section 8.2). A menu path is a sequence of keys and display texts, for example:

Menu **[ENTER]+[ESC]** > **CALib** > **[ENTER]** > **FS-tEO**

**000000** stands for the weight display. “[ENTER]+[ESC]” means: press [ENTER] immediately followed by [ESC]. “[TARE] [PRINT]” means: scroll with the arrow keys to the next item of the same level.

### 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

This manual applies to the EILA in the BASE program (setpoint management) with the options listed in the data sheet. Chapters 25 to 28 describe the communication protocols, which the source documentation contains in a separate protocols manual; chapters 17.5 and 19 the options from the options manual. The approved version (legal for trade use) has manuals and procedures of its own; they are available from octogon.

## 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 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.

## 2.3 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

### 3.1 Installation of the instrument

The terminals indicated on the 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 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 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 instrument (fuses, door lock switch etc.).
- It is advisable to leave the equipment always switched on to prevent the formation of condensation.

### 3.2 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 <sup>2</sup> cable     |
| Analog voltage output | up to 300 m with 0.5 mm <sup>2</sup> cable     |

### 3.3 Installation of the load cells

| Topic                    | Recommendation                                                                                                                                                                                                                                                                                                        |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rated load               | For safety reasons, with static weighing use the load cells at a maximum of 70–80 % of their rated capacity (load uniformly distributed). Depending on the handling of the load (forklifts, bridge cranes etc.) reduce further. With dynamic loads the installer estimates thrust speed, acceleration, frequency etc. |
| Mounting                 | Place the cells on rigid, stable in-line structures; use mounting modules to compensate for misalignment of the support surfaces.                                                                                                                                                                                     |
| Cells in parallel        | Connect several cells in parallel using a watertight junction box with terminal box. Extension cables shielded, led individually into their piping or conduit, as far as possible from power cables; with 4-wire connections at least 4 × 1 mm <sup>2</sup> .                                                         |
| Cable protection         | Use water-proof sheaths and joints.                                                                                                                                                                                                                                                                                   |
| Mechanical restraints    | With pipes use hoses and flexible couplings with rubber protection; with hard pipes place the pipe support as far as possible from the weighed structure (at least 40 times the pipe diameter).                                                                                                                       |
| Welding                  | Avoid welding with the cells installed. If unavoidable, place the welder ground clamp close to the welding point so that no current passes through the cell body.                                                                                                                                                     |
| Wind, knocks, vibrations | Use weigh modules for all cells. The system designer protects the plant against lateral shifting and tipping caused by shocks and vibration, wind, seismic conditions and the stability of the support structure.                                                                                                     |

### 3.4 Earthing the weighed structure

Connect the upper support plate of each cell to the lower plate with a copper wire of suitable cross-section, then connect all lower plates to a single earthing system. Electrostatic charges (product rubbing against pipes and container walls) are then discharged to ground without passing through the cells. Without proper earthing the weighing system may work, but future damage to the cells and the instrument is not ruled out. Earthing continuity must not be ensured by metal parts of the weighed structure.

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

## 4 Testing the load cells

### 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 in mV with four decimals.

### 4.2 Resistance measurement (digital multimeter)

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

### 4.3 Voltage measurement (digital multimeter)

- Take out the cell to be tested from underneath the container, or lift the container support.
- Make sure that the excitation of the cell connected to the instrument (or amplifier) is 5 V DC  $\pm$  3 %.
- Measure the response signal between positive and negative signal wire directly at the tester: it must be between 0 and  $\pm$  0.5 mV.
- Apply load to the cell and make sure that the signal increases.

**Important** If one of these conditions is not met, contact octogon.

## 5 Product description

### 5.1 Main specifications

- Weight indicator with 6-wire load cell input in a DIN box (96 × 48 × 130 mm; drilling template 92 × 45 mm) for front panel mounting.
- IP54 front panel protection (IP65 with front gasket on request).
- 6-digit semi-alphanumeric red LED display, 14 mm digit height; 8 signalling LEDs; 4-key keyboard.
- Real-time clock/calendar with buffer battery.
- Two serial ports (RS485 and RS232) for connection to PC/PLC (up to 32 instruments, up to 99 with line repeaters) via ASCII or Modbus RTU, to a remote display or a printer.
- Can be connected to an intelligent junction box (e.g. octagon ETLB) or to a weight transmitter.

Manufacturer designation: W100.

### 5.2 Buffer battery

An internal battery keeps the 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.

### 5.3 Options and accessories

| Option            | Description                                                                                         |
|-------------------|-----------------------------------------------------------------------------------------------------|
| Analog output     | optoisolated, 16 bit – chapter 16                                                                   |
| Additional RS485  | second RS485 port – section 17.5                                                                    |
| Weight reading    | from a 0 ... 10 V or 0/4 ... 20 mA input – chapter 19                                               |
| E / EC            | selection of 12 groups of 5 setpoints via external contacts (E) or a step switch (EC) – section 7.5 |
| Relay module      | external 5-relay module, raises the capacity of the SPDT contacts to 115 V AC / 2 A                 |
| Alibi memory      | software option                                                                                     |
| IP65 front gasket | raises the front protection from IP54 to IP65                                                       |
| Label holder      | for the initial verification, 124 × 77 × 1.5 mm                                                     |

**Important** Analog output and additional RS485 exclude each other, as do E and EC. Analog output and additional RS485 use terminals 14 to 16: input 3, output 5 and the E/EC option are then not available. Relay module, alibi memory, front gasket and label holder are not described in this manual; data according to the data sheet.

## 6 Technical specifications

| Item                                                          | Value                                                     |
|---------------------------------------------------------------|-----------------------------------------------------------|
| Power supply and consumption                                  | 12/24 V DC $\pm$ 10 %; 5 W                                |
| Load cells in parallel and supply                             | max. 8 (350 $\Omega$ ); 5 V DC / 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 (16 000 000 points)                                |
| Max. divisions (measurement range $\pm$ 10 mV = sens. 2 mV/V) | $\pm$ 999999                                              |
| Measurement range                                             | $\pm$ 39 mV                                               |
| Max. sensitivity of usable load cells                         | $\pm$ 7 mV/V                                              |
| Max. conversions per second                                   | 300                                                       |
| Display range                                                 | $\pm$ 999999                                              |
| 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 V AC; 150 mA (4 with analog output)          |
| Digital inputs                                                | 3 – optoisolated 5 ... 24 V DC PNP (2 with analog output) |
| Serial ports                                                  | RS485, RS232                                              |
| Baud rate                                                     | 1200, 2400, 4800, 9600, 19200, 38400, 115200              |
| Humidity (non condensing)                                     | 85 %                                                      |

| Item                                                          | Value                                                                                    |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Storage temperature                                           | −30 ... +80 °C                                                                           |
| Working temperature                                           | −20 ... +60 °C                                                                           |
| Optoisolated analog output (option), 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) |

**Important** When the UL recognition is relied upon, narrower limits apply: relay outputs 5 (4 with analog output) – max. 30 V AC, 60 V DC; 150 mA; working temperature −20 ... +50 °C; equipment to be powered by a 12–24 V DC LPS or Class 2 power source.

## 7 Electrical connections

### 7.1 Terminals

| Terminal | Assignment                                                                              |
|----------|-----------------------------------------------------------------------------------------|
| 1        | +SUPPLY (12/24 V DC)                                                                    |
| 2        | –SUPPLY (12/24 V DC) · RS232, RS485: shield, GND · E/EC option: GND                     |
| 3        | RS232: TXD                                                                              |
| 4        | RS232: RXD                                                                              |
| 5        | output 1                                                                                |
| 6        | output 2                                                                                |
| 7        | output 3                                                                                |
| 8        | output 4                                                                                |
| 9        | output common                                                                           |
| 10       | input 1 (+V DC min. 5 V, max. 24 V)                                                     |
| 11       | input 2 (+V DC min. 5 V, max. 24 V)                                                     |
| 12       | input common (–V DC, 0 V)                                                               |
| 13       | not used                                                                                |
| 14       | input 3 (+V DC min. 5 V, max. 24 V) – otherwise: +analog output 0 ... 20 or 4 ... 20 mA |
| 15       | output 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)                                                                |

The terminals are removable screw terminal blocks (24 poles). Outputs: max. 115 V AC, 150 mA. Inputs: supply 5 ... 24 V DC, referred to the input common (terminal 12).

### 7.2 Basic information

- Ground the negative pole of the power supply.
- Up to eight 350  $\Omega$  load cells or sixteen 700  $\Omega$  load cells can be supplied.
- For 4-wire load cells, jumper EX– with REF– and EX+ with REF+ (terminals 19–22 and 20–21).
- Connect terminal –SUPPLY to the RS485 common of the connected instruments if these receive alternating current input or have an optically isolated RS485.
- In an RS485 network with several devices, fit the 120  $\Omega$  termination on the two devices at the ends of the network (section 17.3).
- E/EC option: selects 12 groups of 5 setpoints (section 7.5).

### 7.3 Outputs and inputs

- 5 outputs: controlled by setpoint values or by a remote device via protocol.
- 3 inputs: settable as NET/GROSS, SEMI-AUTOMATIC ZERO, PEAK, PRINT, LIMIT or REMOTE CONTROL (section 14.4).

### 7.4 Analog output option

| Terminal | Signal                   |
|----------|--------------------------|
| 14       | + 0 ... 20 / 4 ... 20 mA |
| 15       | + 0 ... 10 V DC          |
| 16       | – common                 |

Current output: max. load 300  $\Omega$ ; voltage output: min. load 10 k $\Omega$ . If the analog output is present, input 3, output 5 and the E/EC options are no longer available. Setting: chapter 16.

## 7.5 E and EC options

With the E/EC option an external contact (E) or a 12-position selector switch (EC) selects one of 12 groups of 5 setpoints (chapter 21). Both are connected between terminal 2 (GND) and terminal 16. With E these are 12 push-buttons on a 16-pole terminal strip; the buttons are not included in the supply.

# 8 Display, LEDs and keys

## 8.1 LED

| LED       | Main function                                       | Secondary function * |
|-----------|-----------------------------------------------------|----------------------|
| NET       | net weight (semi-automatic tare or preset tare)     | input 1 closed       |
| >0<       | zero (deviation not more than $\pm 0.25$ divisions) | input 2 closed       |
| stability | stability                                           | input 3 closed       |
| kg        | unit of measure kg                                  | output 4 closed      |
| g         | unit of measure g                                   | output 5 closed      |
| W1        | —                                                   | output 1 closed      |
| W2        | —                                                   | output 2 closed      |
| W3        | —                                                   | output 3 closed      |

\* Secondary 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.

## 8.2 Keys

| Key                        | Short press                                                        | Long press (3 s)  | Into menus                                               |
|----------------------------|--------------------------------------------------------------------|-------------------|----------------------------------------------------------|
| [ESC] (>0< / ESC)          | semi-automatic zero                                                | tare resetting    | cancel or return to previous menu                        |
| [TARE] (TARE / left arrow) | gross > net                                                        | net > gross       | select figure to be modified or go to previous menu item |
| [PRINT] (PRINT / up arrow) | prints 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                              |
| [ENTER]+[ESC]              | setting general parameters ([ENTER] immediately followed by [ESC]) | —                 | —                                                        |
| [ENTER]+[TARE]             | setting preset tare ([ENTER] immediately followed by [TARE])       | —                 | —                                                        |

## 8.3 Data entry in the menus

| Key     | Function                                              |
|---------|-------------------------------------------------------|
| [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                |

Into menus changes are applied right after pressing [ENTER]; no further confirmation is required.

## 9 Menu map

### 9.1 Setpoints

Menu **000000** > **[ENTER]** > **CLASS** > **[ENTER]** > **C 01 ... C 12** > **[ENTER]** > **Set 01 ... Set 05**

Next to **CLASS**, on the same level, are **HYStE1 ... HYStE5** (hysteresis of the five setpoints). Details: chapter 21.

### 9.2 System parameters

Access: from the weight display **[ENTER]**+**[ESC]**. The main menus are on one level and are selected with **[TARE]** **[PRINT]**:

| Main menu              | Submenu                                                                                                                            | Section      |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>CALiB</b>           | <b>FS-tE0 SenSIb dIUIS MASS 2Er0 INP 0 UEIGHT unIt COEFF nEtEn</b>                                                                 | 11, 13, 14.1 |
| <b>FILtEr</b>          | filter on the weight, anti peak                                                                                                    | 12.1         |
| <b>PARA 0</b>          | <b>0 SEt AUtO 0 trAC 0</b>                                                                                                         | 12.3         |
| <b>AnALOG</b> (option) | <b>tYPE M0dE AnA 0 AnA FS Cor 0 Cor FS</b>                                                                                         | 16           |
| <b>SERIAL</b>          | <b>rS485 rS232 – each n0nE M0dbUS ASCII ContIn rIP HdrIP HdrIPn YHL<br/>PrIntr UEIM0d UEIrIP, plus bAUd Addr dELAY PARItY StOP</b> | 17           |
| <b>Out-In</b>          | <b>Out 1 ... Out 5, In 1 ... In 3</b>                                                                                              | 14           |
| <b>LIMIt</b>           | only when an input is set as LIMIT                                                                                                 | 14.5         |
| <b>tESt</b>            | <b>In Out, AnALOG and EC</b> (options)                                                                                             | 20.1         |
| <b>dAtE</b>            | date and time                                                                                                                      | 20.2         |
| <b>PSubLC</b>          | unlock password                                                                                                                    | 24.4         |
| <b>InFO</b>            | <b>GErIC OP2</b>                                                                                                                   | 20.3         |

Direct access from the weight display: **[ESC]** 3 s > **2Er0** (tare weight zero setting); **[PRINT]** 3 s > **MU-CEL** (mV test); **[ENTER]**+**[TARE]** > **P-tArE** (preset tare).

## 10 Instrument commissioning

Upon switch-on, the display shows in sequence:

- **111111** > **999999** (ONLY in case of approved program);
- the instrument model;
- **SU** followed by the software code (e.g. **SU 5**);
- the 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**);
- the 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.

### 10.1 Instrument already theoretically calibrated

Plant system identification tag present on the instrument and on the cover, the rated data of the load cells are already entered:

- Reset to zero (section 11.3).
- Check the calibration with sample weights and correct the indicated weight if necessary (section 11.5).

### 10.2 Instrument not calibrated

- If the load cell data are unknown: follow the procedure in section 11.5.
- Enter the rated data of the load cells according to section 11.1.
- Reset to zero (section 11.3).
- Check the calibration with sample weights and correct it if necessary (section 11.5).

### 10.3 Further settings

- Analog output (option): set the output type and the full scale value (chapter 16).
- Serial communication: set the related parameters (chapter 17).
- Setpoints: set the weight values and the relevant parameters (chapters 21 and 14).
- Set the clock to the current date and time (section 20.2).

# 11 Calibration

## 11.1 Theoretical calibration

Menu **[ENTER]+[ESC]** > **CALib** > **[ENTER]** > **FS-tEO** > **[ENTER]** > **SEnSib** > **[ENTER]** > **dIUIS**

This function allows the load cell rated values to be set. Set the following parameters in sequence:

| Parameter                            | Meaning                                                                                                                                                                                                                 |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FS-tEO</b> (default <b>dEMO</b> ) | system full scale = capacity of one cell × number of cells. Example: 4 cells of 1000 kg > 1000 × 4 = 4000. The instrument is supplied with <b>dEMO</b> , corresponding to 10000. Setting 0 restores the factory values. |
| <b>SEnSib</b> (default 2.00000 mV/V) | load cell sensitivity in mV/V, 0.50000 ... 7.00000. Enter the average of the cells; example 2.00100, 2.00150, 2.00200, 2.00250 > (sum) / 4 = 2.00175.                                                                   |
| <b>dIUIS</b>                         | division (resolution) = minimum weight increment that can be displayed. Calculated automatically as 1/10000 of full scale; can be changed between 0.0001 and 100 with x1 x2 x5 x10 increments.                          |

**Important** Modifying the full scale or the sensitivity cancels the real calibration; only the theoretical calibration is then valid. If the theoretical full scale and the full scale recalculated in real calibration are equal, the theoretical calibration is in use, otherwise the real one. Modifying the theoretical full scale sets all parameters containing a weight value (setpoint, hysteresis etc.) to their default values.

## 11.2 Maximum capacity

Menu **[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 ----- (six dashes in the upper segment row; likewise with **t-----**). Setting 0 disables the function.

## 11.3 Tare weight zero setting

Menu **[ENTER]+[ESC]** > **CALib** > **[ENTER]** > **FS-tEO** > **[TARE]** **[PRINT]** > **2Er0**

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

- Confirm **2Er0** with **[ENTER]**.
- The weight value to be set to zero is displayed; in this phase all of the LEDs are flashing.
- Confirm once again: the weight is set to zero (the value is stored in the permanent memory).
- **[PRINT]** shows the total weight reset by the instrument, the sum of all previous zero settings.

## 11.4 Zero value manual entry

Menu **[ENTER]+[ESC]** > **CALib** > **[ENTER]** > **FS-tEO** > **[TARE]** **[PRINT]** > **INP 0**

Use 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).

## 11.5 Real calibration (with sample weights)

Menu **[ENTER]+[ESC]** > **CALib** > **[ENTER]** > **FS-tEO** > **[TARE]** **[PRINT]** > **UEIGHT**

After theoretical calibration and tare weight zero setting, sample weights of known value are used to calibrate and to correct the indicated value. Load a sample weight of at least 50 % of the maximum quantity to be weighed.

- Confirm **UEIGHT**: the weight currently on the system flashes, all LEDs are off.
- Adjust the value with the arrow keys to the sample weight and confirm: the new weight appears with all LEDs flashing.
- Confirm again: **UEIGHT** is restored; press **[ESC]** repeatedly to return to the weight display.

Example: system 1000 kg, division 1 kg, sample weights 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 – 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 values.

### Linearisation on up to 8 points

The procedure can be repeated with up to eight different sample weights. It ends with [ESC] or after the eighth value (**MAH-PU**); after that the calibration can no longer be changed, only performed again – return to the weight display and re-enter the calibration menu. [PRINT] after confirming a sample weight shows the full scale recalculated from the maximum sample weight and the sensitivity **SEnSIb**.

## 12 Filter and zero parameters

### 12.1 Filter on the weight

Menu **[ENTER]+[ESC]** > **CALib** > **[TARE] [PRINT]** > **FILtEr**

The filter gives a stable weight display. Higher value = stronger effect (0 ... 9, default 4). Confirming **FILtEr** shows the programmed value; after changing and confirming, the weight is displayed to verify its stability. If stability is not satisfactory, confirming brings back **FILtEr** until an optimum result is achieved. The filter stabilises variations shorter than its response time; set it according to the application and the full scale.

| Filter value | Response time [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                                              |

### 12.2 Anti-Peak

When the weight is stable, the anti peak filter removes sudden disturbances with a maximum duration of 1 second. Confirm the filter on the weight with **[ENTER]** and select: **AntPOn** – anti peak enabled (default); **AntPOF** – anti peak disabled.

### 12.3 Zero parameters

Menu **[ENTER]+[ESC]** > **CALib** > **[TARE] [PRINT]** > **PARA 0**

| Parameter     | Meaning                                                                                                                                                                                                                                                                    |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>0 SET</b>  | Maximum weight value resettable by external contact, keypad or serial protocol (0 to full scale; default 300; with decimals 300 – 30.0 – 3.00 – 0.300).                                                                                                                    |
| <b>AUTO 0</b> | Automatic zero setting at power-on: if at switch-on the weight is lower than this value, it is reset (0 to 10 % of full scale; default 0 = disabled).                                                                                                                      |
| <b>trAC 0</b> | Zero tracking: when the weight is stable and after a second deviates from zero by no more than this number of divisions, it is set to zero (1 ... 5; default <b>nOnE</b> = disabled). Example: <b>dIUIS</b> = 5, <b>trAC 0</b> = 2 > zero setting for variations up to 10. |

## 13 Units of measure and display coefficient

### 13.1 Unit of measure

Menu **[ENTER]+[ESC]** > **CALib** > **[ENTER]** > **FS-tEO** > **[TARE] [PRINT]** > **unIt**

| Display       | Unit                                 | Effect of COEFF                                   |
|---------------|--------------------------------------|---------------------------------------------------|
| <b>HILOG</b>  | kilograms                            | —                                                 |
| <b>G</b>      | grams                                | —                                                 |
| <b>t</b>      | tons                                 | —                                                 |
| <b>Lb</b>     | pounds *                             | × displayed weight                                |
| <b>nEUton</b> | newtons *                            | × displayed weight                                |
| <b>LitrE</b>  | litres *                             | specific weight in kg/l (system calibrated in kg) |
| <b>bAr</b>    | bars *                               | × displayed weight                                |
| <b>AtM</b>    | atmospheres *                        | × displayed weight                                |
| <b>PIECE</b>  | pieces *                             | weight of one piece                               |
| <b>nEU-M</b>  | newton metres *                      | × displayed weight                                |
| <b>HILO-M</b> | kilogram metres *                    | × displayed weight                                |
| <b>Other</b>  | other generic unit not in the list * | × displayed weight                                |

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 acts only while an input set to **COEFF** mode is closed (section 14.4).

### 13.2 Display coefficient

Menu **[ENTER]+[ESC]** > **CALib** > **[ENTER]** > **FS-tEO** > **[TARE] [PRINT]** > **COEFF**

**COEFF** (max. 99.9999; default 1.0000) changes the display according to the selected unit (table above). With the **COEFF** input closed the converted value is displayed, with the input open the standard weight display is restored.

**Important** All other settings (setpoint, hysteresis, calibration ...) are expressed in weight values. To convert them to the new unit, change the calibration according to 13.3; **COEFF** must then remain set to 1.0000.

### 13.3 Calibration for other units of measure

- Theoretical: 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, specific gravity 0.916 kg/l >  $(4 \times 1000) / 0.916 = 4367$ ; the system works in litres of olive oil.
- Real: load a known quantity of product in litres (at least 50 % of the maximum quantity to be weighed) and enter the value in litres in **UEIGHT**.
- In both cases, with **unIt** = **LitrE** the system displays and prints "l" instead of "kg".

## 14 Outputs and inputs

### 14.1 Net functions

Menu **[ENTER]+[ESC]** > **CALib** > **[ENTER]** > **FS-tEO** > **[TARE] [PRINT]** > **nEtEn**

Enables or disables the semi-automatic tare and preset tare functions: **EnABLE** – enabled (default); **dISABl** – disabled.

### 14.2 Outputs

Menu **[ENTER]+[ESC]** > **CALib** > **[TARE] [PRINT]** > **Out-In** > **[ENTER]** > **Out 1 ... Out 5**

Default for all outputs: **OPEn** / **SEt** / **GrOSS** / **POSnEG** / **OFF**. Settings in sequence:

| Setting                                 | Meaning                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>OPEn</b>                             | normally open: relay de-energised, contact open while the weight is lower than the setpoint; it closes when the weight is $\geq$ the setpoint.                                                                                                                                                                  |
| <b>CLOSE</b>                            | normally closed: relay energised, contact closed while the weight is lower than the setpoint; it opens when the weight is $\geq$ the setpoint.                                                                                                                                                                  |
| <b>SEt</b>                              | the contact switches on the basis of weight, according to setpoint (chapter 21)                                                                                                                                                                                                                                 |
| <b>PLC</b>                              | the contact does not switch on the basis of weight but is controlled by protocol commands                                                                                                                                                                                                                       |
| <b>StAbLE</b>                           | relay switching occurs when the weight is stable                                                                                                                                                                                                                                                                |
| <b>GrOSS</b> / <b>nEt</b>               | only with <b>SEt</b> : switching on the basis of gross or net weight (if the net function is not active, on gross; with net functions disabled <b>GrOSS</b> applies)                                                                                                                                            |
| <b>POSnEG</b> / <b>POS</b> / <b>nEG</b> | switching for positive and negative / positive only / negative only weight values                                                                                                                                                                                                                               |
| <b>OFF</b>                              | no relay switching if the setpoint value is 0                                                                                                                                                                                                                                                                   |
| <b>On</b>                               | setpoint 0 is evaluated: with <b>POSnEG</b> the relay switches at weight 0 and again at weight $\neq 0$ (taking hysteresis into account, positive and negative); with <b>POS</b> at weight $\geq 0$ and back below 0; with <b>nEG</b> at weight $\leq 0$ and back above 0 (each taking hysteresis into account) |

### 14.3 Examples

| No. | Out 1                                                                | SEt 1  | HYSIE 1 |
|-----|----------------------------------------------------------------------|--------|---------|
| 1   | <b>OPEn</b> / <b>SEt</b> / <b>GrOSS</b> / <b>POS</b> / <b>OFF</b>    | 500 kg | 0 kg    |
| 2   | <b>CLOSE</b> / <b>SEt</b> / <b>GrOSS</b> / <b>POS</b> / <b>OFF</b>   | 500 kg | 0 kg    |
| 3   | <b>OPEn</b> / <b>SEt</b> / <b>GrOSS</b> / <b>POS</b> / <b>OFF</b>    | 500 kg | 100 kg  |
| 4   | <b>OPEn</b> / <b>SEt</b> / <b>GrOSS</b> / <b>nEG</b> / <b>OFF</b>    | 500 kg | 0 kg    |
| 5   | <b>OPEn</b> / <b>SEt</b> / <b>GrOSS</b> / <b>POSnEG</b> / <b>OFF</b> | 500 kg | 0 kg    |
| 6   | <b>OPEn</b> / <b>SEt</b> / <b>GrOSS</b> / <b>POS</b> / <b>On</b>     | 0 kg   | 0 kg    |
| 7   | <b>OPEn</b> / <b>SEt</b> / <b>GrOSS</b> / <b>POSnEG</b> / <b>On</b>  | 0 kg   | 0 kg    |

The switching behaviour follows from the rules in 14.2; the source shows it as a diagram over the gross weight.

### 14.4 Inputs

Menu **[ENTER]+[ESC]** > **CALib** > **[TARE] [PRINT]** > **Out-In** > **[ENTER]** > **In 1 ... In 3**

Default: input 1 = **2Er0**, input 2 = **nE-L0**, input 3 = **PEAH**.

| Mode          | Function                                                                                                                                                         |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>nE-L0</b>  | NET/GROSS: closing for no more than 1 s = semi-automatic tare, net display; holding closed for 3 s = back to the gross weight display                            |
| <b>2Er0</b>   | closing for no more than 1 s = semi-automatic zero (section 15.3)                                                                                                |
| <b>PEAH</b>   | closed: the maximum weight reached remains on display; open: current weight                                                                                      |
| <b>PLC</b>    | no operation; the input status can be read by the communication protocol                                                                                         |
| <b>ContIn</b> | closing for max. 1 s = the weight is transmitted once according to the fast continuous transmission protocol (only if <b>ContIn</b> is set under <b>SERIAL</b> ) |
| <b>COEFF</b>  | closed: display with the coefficient (chapter 13), otherwise the weight                                                                                          |
| <b>PrIntr</b> | closed: data are sent for printing if <b>PrIntr</b> is set in the protocol of either serial port                                                                 |
| <b>LIMIt</b>  | open: alarm -- __ --, the weight cannot be saved (section 14.5)                                                                                                  |

## 14.5 Limit mode

Menu **[ENTER]+[ESC]** > **CALib** > **[TARE] [PRINT]** > **LIMIt**

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

| Parameter    | Meaning                                                                                                                                                                                                            |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>OPEN</b>  | time in ms before the closure of the input is recognised (1 ... 65535; default 10). Example 100: recognised after 0.1 s; if the input opens and closes again during this time, the time counting starts all over.  |
| <b>CLOSE</b> | time in ms before the opening of the input is recognised (1 ... 65535; default 1000). Example 3000: recognised after 3 s; if the input closes and opens again during this time, the time counting starts all over. |

## 15 Tare, zero setting and peak

### 15.1 Semi-automatic tare (net/gross)

**Important** The semi-automatic tare operation is lost upon instrument power-off.

Net operation: close the NET/GROSS input or press [TARE] for less than 3 seconds. The instrument displays the net weight (just set to zero) and the NET LED lights up. Back to the gross weight: keep the NET/GROSS input closed or press [TARE] for 3 seconds. The operation can be repeated to load several products. Example: put the box on the scale (display: box weight), press [TARE] (net display 0), fill in the product (display: product weight).

- While the net weight is displayed, keep [PRINT] pressed to display the gross weight; when the key is released the net weight is displayed again.
- The semi-automatic tare is not allowed if the gross weight is zero (**InZER0**).
- Not available if net functions are disabled (section 14.1).

### 15.2 Preset tare (subtractive tare device)

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

A tare value can be set manually and subtracted from the display value, provided that **P-tArE** ≤ max capacity. By default the last programmed value is shown; apply it with [PRINT] and then [ENTER]. Back in the weight display the net weight is shown and the NET LED lights up. To delete: hold down [TARE] for about 3 seconds or keep the NET/GROSS input closed for the same time; the value is set to zero and the NET LED is turned off.

- While the net weight is displayed, keep [PRINT] pressed to display the gross weight.
- 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 are added.
- All tare values are lost when the instrument is turned off.
- Not available if net functions are disabled (section 14.1).

### 15.3 Semi-automatic zero

Close the SEMI-AUTOMATIC ZERO input, or press [ESC] for less than 3 seconds: **St0rE?** is displayed for 3 seconds, [ENTER] sets the weight to zero. Only allowed if the weight is lower than **0 Set** (section 12.3); otherwise **t-----** appears and the weight is not set to zero.

### 15.4 Peak

By keeping the PEAK input closed the maximum weight value reached remains displayed; opening the input shows the current weight. To capture a sudden variation peak, set the filter on the weight to 0.

## 16 Analog output (option)

Menu **[ENTER]+[ESC]** > **CALib** > **[TARE] [PRINT]** > **AnALOG**

| Parameter     | Meaning                                                                                                                                                                        |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>tYPE</b>   | output type: 4 ... 20 mA, 0 ... 20 mA, 0 ... 10 V, 0 ... 5 V, $\pm 10$ V, $\pm 5$ V (default 4 ... 20 mA)                                                                      |
| <b>M0dE</b>   | <b>GROSS</b> – follows the gross weight; <b>nEt</b> – follows the net weight; <b>PLC</b> – remote control via protocol (section 27.9)                                          |
| <b>AnA 0</b>  | weight value for the minimum output value. Only $\neq 0$ to limit the range; example: full scale 10000 kg, 4 mA at 5000 kg and 20 mA at 10000 kg > set 5000.                   |
| <b>AnA FS</b> | weight value for the maximum output value; must correspond to the value in the PLC program (default: calibration full scale). Example: 4 ... 20 mA and 20 mA = 8000 kg > 8000. |
| <b>Cor 0</b>  | correction at zero so that the PLC indicates 0; “-” can be set on the last digit on the left. Example: 4 ... 20 mA, read 4.1 mA > set 3.9 to obtain 4.0.                       |
| <b>Cor FS</b> | correction at full scale so that the PLC indicates the value of <b>AnA FS</b> . Example: read 19.9 mA > set 20.1 to obtain 20.0.                                               |

**Caution** For  $\pm 10$  V and  $\pm 5$  V the solder jumper SW1 on the printed circuit board must be closed: open the instrument (release with a screwdriver the locking tabs that hold together the two sides of the case), locate SW1 and short the two pads with a drop of tin. The source shows the position of SW1 in a photo; ask octogon if needed. Skilled personnel only.

| Output type | Correction min. | Correction max. |
|-------------|-----------------|-----------------|
| 0 ... 10 V  | -0.150          | 10.200          |
| 0 ... 5 V   | -0.150          | 5.500           |
| $\pm 10$ V  | -10.300         | 10.200          |
| $\pm 5$ V   | -5.500          | 5.500           |
| 0 ... 20 mA | -0.200          | 22.000          |
| 4 ... 20 mA | -0.200          | 22.000          |

The output may also be used the opposite way: **AnA 0** may be greater than **AnA FS**; the output then increases as the weight decreases. Example 0 ... 10 V, **AnA 0** = 10000, **AnA FS** = 0: weight 0 kg > 10 V; 5000 kg > 5 V; 10000 kg > 0 V.

**Important** All analog outputs are ACTIVE and SINGLE ENDED; connect only PASSIVE receiver devices. Voltage output: min. load 10 k $\Omega$ ; current output: max. load 300  $\Omega$ . With an alarm the outputs go to the lowest value (section 22.3).

## 17 Serial communication

### 17.1 Setting

Menu **[ENTER]+[ESC]** > **CALib** > **[TARE] [PRINT]** > **SERIAL** > **[ENTER]** > **rS485 / rS232**

For each port (**rS485**, **rS232**) the protocol is selected:

| Protocol               | Meaning                                                                                                                                                                                                   |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>nOnE</b>            | no communication (default)                                                                                                                                                                                |
| <b>ModBUS</b>          | Modbus RTU, addresses 1 ... 99 (chapter 27)                                                                                                                                                               |
| <b>ASCII</b>           | ASCII bidirectional protocol, addresses 1 ... 99 (chapter 26); variants <b>ModU60</b> and <b>Mod td</b>                                                                                                   |
| <b>ContIn</b>          | continuous transmission at the frequency <b>HErt2</b> (10 ... 300); variants <b>Mod t</b> and <b>Mod td</b> , each with <b>PARitY</b> = <b>nOnE</b> , <b>StOP</b> = 1 (section 25.1)                      |
| <b>rIP</b>             | continuous transmission to remote displays; the remote display shows the net or gross weight according to its settings ( <b>bAUd</b> = 9600, <b>PARitY</b> = <b>nOnE</b> , <b>StOP</b> = 1; section 25.2) |
| <b>HdrIP</b>           | as <b>rIP</b> , for remote displays with decimal point (section 25.2)                                                                                                                                     |
| <b>HdrIPn</b>          | as <b>HdrIP</b> ; if the remote display is set to gross and the instrument shows the net weight, the remote display shows the net weight alternated with <b>nEt</b>                                       |
| <b>YHL</b>             | continuous weight transmission (section 25.3)                                                                                                                                                             |
| <b>PrIntr</b>          | printer                                                                                                                                                                                                   |
| <b>UEIMod / UEIrIP</b> | weight reception via the serial port (chapter 18)                                                                                                                                                         |

Then the port parameters:

| Parameter     | Meaning                                                                                                                                                                                                                                                 |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>bAUd</b>   | baud rate 1200, 2400, 4800, 9600, 19200, 38400, 115200 (default 9600)                                                                                                                                                                                   |
| <b>Addr</b>   | instrument address 1 ... 99 (default 1)                                                                                                                                                                                                                 |
| <b>HErt2</b>  | maximum transmission frequency with <b>ContIn</b> : 10 – 20 – 30 – 40 – 50 – 60 – 70 – 80 – 100 – 200 – 300 Hz (default 10). Maximum: 20 Hz with min. 2400 baud, 40 Hz with 4800, 80 Hz with 9600, 100 Hz with 19200, 200 Hz and 300 Hz with 38400 baud |
| <b>dELAY</b>  | delay of the reply in ms, 0 ... 200 (default 0)                                                                                                                                                                                                         |
| <b>PARitY</b> | <b>nOnE</b> no parity (default), <b>EUEn</b> even, <b>Odd</b> odd                                                                                                                                                                                       |
| <b>StOP</b>   | stop bits 1 – 2 (default 1)                                                                                                                                                                                                                             |
| <b>nCOPY</b>  | number of copies of the weight printout                                                                                                                                                                                                                 |
| <b>EMPtY</b>  | number of blank lines between one printout and the next                                                                                                                                                                                                 |
| <b>HEAdEr</b> | printing of a custom heading set from PC, <b>YES</b> – <b>n0</b> (default <b>n0</b> )                                                                                                                                                                   |
| <b>LbLPAr</b> | parameters of the <b>LbLPrt</b> label printer – not described in this manual                                                                                                                                                                            |
| <b>PrtMOD</b> | connected printer type: <b>P 190</b> , <b>StAUP</b> , <b>StAut</b> , <b>tMt203</b> , <b>LbLPrt</b>                                                                                                                                                      |

### 17.2 RS232 connection to a PC

| Instrument             | PC, DB9 female |
|------------------------|----------------|
| RS232 TXD (terminal 3) | pin 2          |
| RS232 RXD (terminal 4) | pin 3          |
| GND (terminal 2)       | pin 5          |

### 17.3 RS485 network

The instruments are connected in parallel to the line: RS485 + (terminal 18), RS485 – (terminal 17) and GND (terminal 2), using shielded cable. A PC with RS232 is connected via an RS485/RS232 converter (converter supplied with 24 V DC; TX+ and RX+ to RS485 +, TX– and RX– to RS485 –).

**Important** If the RS485 network exceeds 100 m or baud rates over 9600 are used, two 120  $\Omega$  terminating resistors are needed between “+” and “–” on the terminal strips of the two furthest instruments. With other instruments or converters, refer to their manuals to determine whether the resistors are needed.

## 17.4 Direct connection RS485 – RS232 without converter

A two-wire RS485 output can be used directly on the RS232 input of a PC or remote display: RS485 – > RXD, RS485 + > GND.

**Caution** This type of connection allows only ONE instrument to be used in ONE WAY mode.

## 17.5 Additional RS485 port (option)

An additional communication port which supports all protocols of the instrument. Setting:

Menu **[ENTER]+[ESC]** > **CALib** > **[TARE] [PRINT]** > **SErIAL** > **[ENTER]** > **rS485b**

Select **rS485b**, confirm with **[ENTER]** and set as in 17.1. Connection: terminal 15 = RS485 –, terminal 16 = RS485 +, terminal 2 = shield, GND.

**Important** This option is not compatible with the analog output and with the E/EC options; input 3 and output 5 are not available.

# 18 Weight reading via serial port

The instrument reads the weight via RS485 or RS232 from another instrument (the transmitting instrument, connected to the load cell) instead of from a load cell. Outputs, serial ports and analog output (if present) work as described, using the received weight. Two modes: **UEIMod** and **UEIrIP**.

**Important** First set the weight reading mode to **SErIAL** (section 24.5). The function can be enabled on one serial port only; in case of conflict the port set last remains active.

## 18.1 WEIMOD mode

The instrument works as if it were directly connected to the load cell; calibrations and zero settings can be done. The protocol is Modbus (the receiving instrument works as master, the transmitting one as slave).

- Transmitting instrument (according to its manual): select the port, set protocol **ModBUS**, the serial parameters and the desired filter on the weight.
- Receiving instrument: select the port, set **UEIMod**, then set as on the transmitting instrument **bAud**, **SLAUE** (address of the transmitting instrument 1 ... 99, default 1), **dELAY**, **PARItY**, **StOP** (values as in 17.1).

The transmitting instrument display is locked and shows the instrument model. To unlock it, disconnect the receiving instrument and release the keypad/display lock on the transmitting instrument (according to its manual).

## 18.2 WEIRIP mode

The instrument receives the gross weight; calibrations and zero settings must be performed on the transmitting instrument.

- Transmitting instrument: select the port, set protocol **rIP** and the serial parameters.
- Receiving instrument: select the port, set **UEIrIP**, then **bAud**, **dELAY**, **PARItY**, **StOP** as on the transmitting instrument.
- Set unit of measure (**unIt**) and number of decimals (**dECIM**) of the received gross weight; both items appear in the main menu after **UEIrIP** has been set.

## 18.3 Connection

RS485: + to +, – to –; RS232: TX of one instrument to RX of the other. In both cases connect the –SUPPLY terminals of the two instruments. For the terminating resistors see 17.3.

| Connection | Terminal | Signal             |
|------------|----------|--------------------|
| RS485      | 17       | RS485: –           |
| RS485      | 18       | RS485: +           |
| RS485      | 2        | RS485: shield, GND |
| RS232      | 3        | RS232: TXD         |
| RS232      | 4        | RS232: RXD         |
| RS232      | 2        | RS232: shield, GND |

## 19 Weight reading via analog input (option)

With this option, load cells or, more generally, transducers with analog output can be connected instead of a strain gauge load cell. Signal – to terminal 23, signal + to terminal 24; the drawing of the source also shows a jumper between terminals 20 and 21 and the shield on terminal 19. All other functions remain unchanged.

### 19.1 Analog input voltage 0 ... 10 V

- Input impedance 15 k $\Omega$ .
- In the theoretical calibration (11.1) no sensitivity (**SEnSib**) is required: 0 V corresponds to weight 0, 10 V to the system full scale **FS-tE0**.
- Instead of the load cell mV (test **MU-CEL**) the input voltage in V is read (**U-CELL**).

### 19.2 Analog input current 0 ... 20 mA and 4 ... 20 mA

- Input impedance 120  $\Omega$ .
- In the theoretical calibration **SEnSib** is not required; the new parameter **C-tYPE** asks for the input type **0-20MA** or **4-20MA**. With **0-20MA** 0 mA corresponds to weight 0, with **4-20MA** 4 mA; in both cases 20 mA corresponds to the system full scale **FS-tE0**.
- Instead of mV the input current in mA is read (**MA-CELL**).

## 20 Test, date and info

### 20.1 Test

Menu **[ENTER]+[ESC]** > **CALib** > **[TARE] [PRINT]** > **tEst**

| Test          | Meaning                                                                                                                                 |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>In</b>     | inputs: open input = <b>0</b> , closed input = <b>1</b>                                                                                 |
| <b>Out</b>    | outputs: <b>0</b> opens the output, <b>1</b> closes it                                                                                  |
| <b>EC</b>     | E/EC option: shows the selected setpoint group; if the option is not present or not active, <b>EC-Er</b> is displayed                   |
| <b>AnALOG</b> | analog output option: the signal ranges from the minimum to the maximum value; <b>MA</b> = current output, <b>uOLt</b> = voltage output |
| <b>MU-CEL</b> | load cell response signal in mV with four decimals                                                                                      |

### 20.2 Date and time

Menu **[ENTER]+[ESC]** > **CALib** > **[TARE] [PRINT]** > **dAtE**

[ENTER] scrolls through days – months – years and hours – minutes; [TARE] selects the figure to modify, [PRINT] increases it, [ENTER] confirms and goes to the next item.

### 20.3 Info menu

Menu **[ENTER]+[ESC]** > **CALib** > **[TARE] [PRINT]** > **InFO**

**GENrIC**: identification data – **InStrM** instrument model, **SU C0d** software code, **ProGrM** program type, **FU UEr** software version, **SER nu** serial number. **OP2**: active options.

## 21 Setpoint programming

From the weight display press [ENTER] (menu path 9.1); operation as in 8.3.

Menu **000000** > **[ENTER]** > **CLASS** > **[ENTER]** > **C 01 ... C 12** > **[ENTER]** > **Set 01 ... Set 05**

| Parameter                | Meaning                                                                                                                                                                                |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CLASS</b>             | With the E/EC option connected, 12 groups (classes) of different setpoint values can be set, otherwise only the first. The E/EC position selects the values valid for relay switching. |
| <b>Set 01 ... Set 05</b> | setpoint (0 to full scale; default 0): relay switching occurs when the weight exceeds this value; the type of switching is settable (section 14.2).                                    |
| <b>HYSTe1 ... HYSTe5</b> | hysteresis (0 to full scale; default 0): subtracted from the setpoint to obtain the switching point for decreasing weight. Example: setpoint 100, hysteresis 10 > switching at 90.     |

**Important** These values are set to zero if the calibration is changed significantly (sections 11.1 and 11.5).

## 22 Alarms

### 22.1 Display messages

| Display       | Meaning                                                                                                                                                                                                                                                                     |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ErCEL</b>  | load cell not connected or incorrectly connected; load cell signal exceeds 39 mV; A/D converter malfunctioning; 4-wire cell without jumpers EX-/REF- and EX+/REF+.                                                                                                          |
| <b>n0 C0n</b> | communication problems between transmitter and receiver; check electrical connections and instrument configuration.                                                                                                                                                         |
| <b>Er OL</b>  | the weight display exceeds 110 % of the full scale.                                                                                                                                                                                                                         |
| <b>EerOL</b>  | the weight display on the transmitting instrument exceeds 110 % of full scale.                                                                                                                                                                                              |
| <b>Er Ad</b>  | internal converter failure; check load cell connections, if necessary contact octogon.                                                                                                                                                                                      |
| <b>-----</b>  | the weight exceeds the maximum capacity by 9 divisions.                                                                                                                                                                                                                     |
| <b>Er OF</b>  | maximum displayable value exceeded (higher than 999999 or lower than -999999).                                                                                                                                                                                              |
| <b>EerOF</b>  | maximum displayable value exceeded on the transmitting instrument.                                                                                                                                                                                                          |
| <b>t-----</b> | weight too high: zero setting not possible.                                                                                                                                                                                                                                 |
| <b>MAH-PU</b> | in real calibration, after the eighth sample weight has been entered.                                                                                                                                                                                                       |
| <b>Error</b>  | the value set is beyond the permitted values; [ESC] quits leaving the previous value unchanged. Examples: too many decimals for the full scale; value above the maximum; sample weight does not match the detected mV increase; analog output correction beyond the limits. |
| <b>bLOC</b>   | lock active on menu item, keypad or display.                                                                                                                                                                                                                                |
| <b>n0dISP</b> | the number cannot be displayed (greater than 999999 or less than -999999).                                                                                                                                                                                                  |
| <b>bAtrtC</b> | 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.                                                                                                                         |
| <b>dAtE?</b>  | incorrect date detected: check and correct it in the menu.                                                                                                                                                                                                                  |
| <b>InZErO</b> | gross weight equal to zero: semi-automatic tare not possible.                                                                                                                                                                                                               |
| <b>--__--</b> | the input set to <b>LIMIT</b> mode is open.                                                                                                                                                                                                                                 |

### 22.2 Serial protocol alarms

| Protocol                              | ErCEL    | Er OL    | Er Ad    | ---      | Er OF                             | t---                                                           |
|---------------------------------------|----------|----------|----------|----------|-----------------------------------|----------------------------------------------------------------|
| Modbus RTU, status register (bit LSB) | xxxxxxx1 | xxxx1xxx | xxxxxx1x | xxxxx1xx | gross: xxx1xxxx;<br>net: xx1xxxxx | response to the zero command: 'value not valid' error (code 3) |
| 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                                                          |

\* With **rIP** remote displays, ----- is shown if the message exceeds 5 digits. In the source “\_” stands for a space.

### 22.3 Outputs with an alarm

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   |

## 23 Printing examples

If the printer has been set (chapter 17), [PRINT] prints from the weight display. <Model> stands for the model designation of 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
```

## 24 Reserved for the installer

### 24.1 Menu locking

This blocks the access to any menu. Select the menu (e.g. **000000** > [ENTER] > **CALib**) and press [ESC] and [TARE] simultaneously for 3 seconds: the display shows **C.ALib** (the left point indicates the lock). If the operator tries to enter this menu, **bLOC** is displayed.

### 24.2 Menu unlocking

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

### 24.3 Temporary menu unlocking

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

### 24.4 Unlock password

Menu [ENTER]+[ESC] > **CALib** > [TARE] [PRINT] > **PSuBLc**

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

### 24.5 Data deletion and program selection

**Caution** Perform only after contacting octagon. After each operation the display shows **dOnE**; press [ENTER] to continue. [ESC] cancels without changes.

Upon power-on hold down [ESC] until the display shows **PrOG**, then:

| Step                                                                  | Selection                                                                                                                                                                        |
|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Constants restore (calibration is kept)                               | confirm <b>PrOG</b> , select <b>PASSU</b> with the arrow keys, set code 6935 and confirm                                                                                         |
| Program selection                                                     | confirm <b>PrOG</b> and select: <b>bASE</b> – basic program, setpoint management only; <b>r IP</b> – weight remote display program with setpoint                                 |
| Weight reading mode (only without <b>r IP</b> )                       | <b>CELL</b> – weight from load cells, intelligent junction box or transmitter connected to the instrument; <b>SERIAL</b> – weight via serial port (WEIMOD or WEIRIP, chapter 18) |
| Approval status (only without <b>r IP</b> )                           | <b>notLEG</b> – not approved; <b>LEGAL</b> – approved, single interval *; <b>LEGMI</b> – approved, multi-interval *; <b>LEGMr</b> – approved, multiple range *                   |
| Regulation (only without <b>notLEG</b> )                              | <b>OIML</b> , <b>ntEP</b> or <b>InMEtr</b> (INMETRO only with the <b>bASE</b> program)                                                                                           |
| Junction box/transmitter (only without <b>SERIAL</b> or <b>r IP</b> ) | <b>EStYES</b> – intelligent junction box (e.g. octagon ETLB) or transmitter connected; <b>EStnO</b> – not connected                                                              |

By confirming, the instrument is restored to default and data are erased. \* For the approval, request the proper documents and procedures from octagon, stating hardware code and serial number (chapter 10). When a weight indicator is used in combination with an intelligent junction box or a weight transmitter, the approval status set on both devices must be the same. For a newly set program without its own manual, ask octagon.

### 24.6 Keypad or display locking

Press [ESC] immediately followed by [PRINT] and hold them down for about 5 seconds (also possible via Modbus and ASCII): **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, pressing a key shows **bLOC** for 3 seconds.

## 25 Continuous transmission protocols

### 25.1 Continuous fast weight transmission (BASE program only)

The instrument transmits the weight continuously at high update frequencies: up to 300 strings per second with a minimum transmission rate of 38400 baud. Communication modes (section 17.1): **M0d t** and **M0d td** – two variants compatible with older RS485 weighing instruments.

**M0d t**: the following string is transmitted to PC/PLC:

```
xxxxxxCRLF
```

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

**M0d td**: the following string is transmitted to PC/PLC:

```
&TzzzzzzPzzzzzz\ckckCR
```

| Character | Meaning                                                                                                                                               |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| &         | initial string character (ASCII 38)                                                                                                                   |
| T, P      | 1 character of gross weight identification each                                                                                                       |
| zzzzzz    | 6 characters of gross weight (ASCII 48 ... 57)                                                                                                        |
| \         | separation character (ASCII 92)                                                                                                                       |
| ckck      | 2 ASCII control characters: XOR of the 8-bit ASCII codes of the characters between "&" and "\" (excluded), as two hexadecimal digits 0 ... 9, A ... F |
| CR        | end of string (ASCII 13)                                                                                                                              |

- With negative weight the first character from the left is "-" (ASCII 45).
- In case of error or alarm, the 6 weight characters are replaced by the messages of section 22.2.
- Fast transmission via external contact: the weight can also be transmitted just once by closing an input for no more than one second (sections 14.4 and 17.1).

### 25.2 Continuous transmission to remote displays

The string is transmitted 10 times per second. Communication modes (section 17.1, each **bAuD** = 9600, **PArItY** = **nOnE**, **StOP** = 1): **rIP** – e.g. octagon EDLD; the remote display shows the net or gross weight according to its settings; **HdrIP** and **HdrIPn** – e.g. octagon EDLF, EDLG.

```
&NxxxxxxLyyyyyy\ckckCR
```

| Character | Meaning                                                         |
|-----------|-----------------------------------------------------------------|
| &         | initial string character (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 character (ASCII 92)                                 |
| ckck      | checksum as in section 25.1                                     |
| CR        | end of string (ASCII 13)                                        |

- With negative weight the first character from the left is "-" (ASCII 45).
- With **HdrIP** the decimal point at the position shown on the display can also be transmitted. If the value exceeds 5 digits, only the 5 most significant digits are transmitted, with a negative value no more than the 4 most significant; the decimal point shifts consistently.
- With **HdrIPn**, in addition, the instrument transmits **nEt** every 4 seconds in the gross weight field if a net operation has been carried out (section 15.1).
- Below -99999 the minus sign "-" is sent alternated with the most significant figure.
- In case of error or alarm, the 6 characters of gross and net weight are replaced by the messages of section 22.2.

## 25.3 Continuous weight transmission (YHL)

The string is transmitted 5 times per second. **YHL**: if a net operation has been performed (section 15.1) the net weight is transmitted, otherwise the gross weight.

=XXXXXXXX

| Character | Meaning                                                                      |
|-----------|------------------------------------------------------------------------------|
| =         | initial string character (ASCII 62)                                          |
| xxxxxxxx  | 9 characters of net or gross weight (ASCII 48 ... 57), LITTLE ENDIAN sorting |

With negative weight the first character from the right is "-" (ASCII 45); the decimal point can also be transmitted at the position determined by the calibration. Example: gross weight -20.7 kg > =7.02000-. In case of error or alarm, the 9 characters are replaced by "999999999".

## 26 ASCII bidirectional protocol (BASE program only)

The instrument replies to the requests sent from a PC/PLC; a waiting time before the reply can be set (**DELAY**, section 17.1). Communication 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 26.16)       |
| CR        | end of string (ASCII 13)                             |
| \         | separation character (ASCII 92)                      |

Setpoint programming: without E/EC option set the values (26.3) and store them in the EEPROM (26.4); with E/EC option first select the class to be programmed (26.1).

### 26.1 Selecting the setpoint class to be programmed (E/EC only)

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

F = command, ff = class 01 ... 12. Example: class 11 for instrument 01 > \$01F1147(Cr).

### 26.2 Reading the selected class to be programmed (E/EC only)

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

f = reading command, ff = class 01 ... 12.

### 26.3 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, B, C, D, E for setpoint 1 ... 5. Without E/EC the new values are active immediately, with E/EC only if the class programmed is the class currently in use. Example: 500 in setpoint 4 › **\$01000500D40(Cr)**.

## 26.4 Setpoint storage in EEPROM memory

| Direction           | String                      |
|---------------------|-----------------------------|
| PC transmits        | <b>\$aaMEMckckCR</b>        |
| correct reception   | <b>&amp;&amp;aa!\ckckCR</b> |
| incorrect reception | <b>&amp;&amp;aa?\ckckCR</b> |

The 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).

## 26.5 Reading the class currently in use (E/EC only)

| Direction           | String                      |
|---------------------|-----------------------------|
| PC transmits        | <b>\$aagckckCR</b>          |
| correct reception   | <b>&amp;aaff\ckckCR</b>     |
| incorrect reception | <b>&amp;&amp;aa?\ckckCR</b> |

g = reading command, ff = class 01 ... 12.

## 26.6 Reading weight, setpoint and peak

| Direction           | String                       |
|---------------------|------------------------------|
| PC transmits        | <b>\$aajckckCR</b>           |
| correct reception   | <b>&amp;aaxxxxxxj\ckckCR</b> |
| incorrect reception | <b>&amp;&amp;aa?\ckckCR</b>  |
| peak not configured | <b>&amp;aa#CR</b>            |

j = a ... e: setpoint 1 ... 5; t: gross weight; n: net weight; p: gross weight peak with **ASCII = M0dU60** (with **M0d** the gross weight is read). To read the points set **FS-tE0 = 50000**. xxxxxx = 6 characters of the value. With negative weight the first character from the left is "-" (ASCII 45); below -99999 "-" is sent alternated with the most significant figure. In case of an alarm for exceeding 110 % of full scale or 9 divisions above **MASS** the instrument sends **&aass0-Lst\ckck**, in case of faulty load cell connection or another alarm **&aass0-Fst\ckck** (s = space, ASCII 32); see chapter 22.

## 26.7 Semi-automatic zero

| Direction                                | String                      |
|------------------------------------------|-----------------------------|
| PC transmits                             | <b>\$aaZER0ckckCR</b>       |
| correct reception                        | <b>&amp;&amp;aa!\ckckCR</b> |
| incorrect reception                      | <b>&amp;&amp;aa?\ckckCR</b> |
| weight over the maximum resettable value | <b>&amp;aa#CR</b>           |

## 26.8 Switching from gross to net weight

| Direction           | String                      |
|---------------------|-----------------------------|
| PC transmits        | <b>\$aaNETckckCR</b>        |
| correct reception   | <b>&amp;&amp;aa!\ckckCR</b> |
| incorrect reception | <b>&amp;&amp;aa?\ckckCR</b> |

## 26.9 Switching from net to gross weight

| Direction           | String          |
|---------------------|-----------------|
| PC transmits        | \$aaGROSSckckCR |
| correct reception   | &&aa!\ckckCR    |
| incorrect reception | &&aa?\ckckCR    |

## 26.10 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.

## 26.11 Tare zero setting

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

z = zero setting 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).

## 26.12 Real calibration (with sample weight)

| Direction                              | String            |
|----------------------------------------|-------------------|
| PC transmits                           | \$aasxxxxxckckCR  |
| 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); in the response xxxxxx = current weight, t = gross weight identification (ASCII 116) – with correct calibration equal to the sample weight. Example address 1, 20000 kg: query **\$01s02000070(Cr)**, response **&01020000t\77(Cr)**.

## 26.13 Keypad lock

| Direction           | String        |
|---------------------|---------------|
| PC transmits        | \$aaKEYckckCR |
| correct reception   | &&aa!\ckckCR  |
| incorrect reception | &&aa?\ckckCR  |

## 26.14 Keypad unlock

| Direction           | String        |
|---------------------|---------------|
| PC transmits        | \$aaFREckckCR |
| correct reception   | &&aa!\ckckCR  |
| incorrect reception | &&aa?\ckckCR  |

## 26.15 Display and keypad lock

| Direction           | String         |
|---------------------|----------------|
| PC transmits        | \$aaKDISckckCR |
| correct reception   | &&aa!\ckckCR   |
| incorrect reception | &&aa?\ckckCR   |

## 26.16 Checksum calculation

The two check 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 (query) or between "&" and "\" (response). Example with the characters 0, 1, t – the result 0x75 gives the checksum made of the characters "7" and "5":

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

## 27 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 17.1. 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.

### 27.1 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 17.1) adds a further delay.

#### Function 3 – read holding registers

|          | Address | Function | Content                                                    | CRC    | Bytes                     |
|----------|---------|----------|------------------------------------------------------------|--------|---------------------------|
| Query    | A       | 0x03     | 1st register 0x0000 · no. registers 0x0002                 | 2 byte | 8                         |
| Response | A       | 0x03     | no. bytes 0x04 · 1st register 0x0064 · 2nd register 0x00C8 | 2 byte | 3 + 2 × no. registers + 2 |

#### Function 16 – preset multiple registers

|          | Address | Function | Content                                                                                       | CRC    | Bytes                     |
|----------|---------|----------|-----------------------------------------------------------------------------------------------|--------|---------------------------|
| 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 |
| Response | A       | 0x10     | 1st register 0x0000 · no. registers 0x0002                                                    | 2 byte | 8                         |

The response contains the number of registers modified beginning from the first address.

### 27.2 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 and deduce a communication error.
- If a correctly received string is not executable, the slave responds with an exceptional response: address, function + 0x80, code, 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)        |

### 27.3 List of available registers

A maximum of 32 registers can be read or written in a single query or response. R = read only, W = write only, R/W = read and write; H/L = high/low half of the DOUBLE WORD.

| 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      |

| Register        | Description                                                             | Saving in EEPROM      | Access |
|-----------------|-------------------------------------------------------------------------|-----------------------|--------|
| 40006           | COMMAND REGISTER                                                        | no                    | R/W    |
| 40007           | STATUS REGISTER                                                         | –                     | 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                                          | –                     | R      |
| 40015 / 40016   | coefficient H / L                                                       | –                     | R      |
| 40017           | inputs                                                                  | –                     | R      |
| 40018           | outputs                                                                 | no                    | R/W    |
| 40019 ... 40028 | setpoint 1 ... 5, H and L each                                          | only after command 99 | R/W    |
| 40037           | setpoint class selected by E/EC (with E/EC only)                        | –                     | R      |
| 40038           | setpoint class to be set and read (with E/EC only)                      | no                    | R/W    |
| 40039 ... 40048 | hysteresis 1 ... 5, H and 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 the full scale of the analog output H / L | yes                   | R/W    |
| 40073 / 40074   | preset tare H / L (with command 130)                                    | –                     | R/W    |

**Warning** At the time of writing the setpoint values are saved to RAM (lost at the next power-off); to store them permanently in the EEPROM, command 99 must be sent to the command register.

## 27.4 Status register (40007)

| Bit       | Meaning                                                   |
|-----------|-----------------------------------------------------------|
| 0         | load cell error                                           |
| 1         | AD converter malfunction                                  |
| 2         | maximum weight exceeded by 9 divisions                    |
| 3         | gross weight higher than 110 % of full scale              |
| 4         | gross weight beyond 999999 or less than –999999           |
| 5         | net weight beyond 999999 or less than –999999             |
| 6         | –                                                         |
| 7         | gross weight negative sign                                |
| 8         | net weight negative sign                                  |
| 9         | peak weight negative sign                                 |
| 10        | net display mode                                          |
| 11        | weight stability                                          |
| 12        | weight within $\pm \frac{1}{4}$ of a division around ZERO |
| 13 ... 15 | –                                                         |

## 27.5 Instrument status register (40050)

| Value | Meaning                                          |
|-------|--------------------------------------------------|
| 0     | instrument in idle condition (weight displaying) |
| 4     | system parameters displaying                     |
| 8     | ----- alarm                                      |
| 26    | instrument waits for the printing to complete    |
| 28    | setpoint class displaying                        |

The other values of the source belong to batching programs and options of other devices.

## 27.6 Inputs (40017) and outputs (40018)

40017 (read only): bit 0 ... 2 = status of input 1 ... 3. 40018 (BASE program: read and write): bit 0 ... 4 = status of output 1 ... 5. The output status can be read at any time but written only if the output is set as PLC (section 14.2); otherwise the outputs are managed according to weight and setpoint.

## 27.7 Divisions and units of measure (40014)

L byte: division (**dIVIS**); H byte: unit of measure (**unIt**). Use this register together with the coefficient registers to calculate the value displayed.

| L value | Divisor | Decimals | H value | 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        |         |                 |                    |

## 27.8 Commands to the command register (40006)

| Command     | Meaning                                                                                      |
|-------------|----------------------------------------------------------------------------------------------|
| 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: saving the 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                                                                         |
| 6811 / 6812 | writing / reading the current value requested at the analog output                           |
| 6813 / 6814 | writing / reading the voltage value requested at the analog output                           |

If the same command has to be executed twice consecutively, send command 0 in between. The other commands of the source belong to batching programs and other devices.

## 27.9 Analog output setting (option)

- **MODE = GRoss** or **nEt** (chapter 16): write or read the weight value for ZERO in 40067/40068 and for the full scale in 40069/40070.
- **MODE = PLC**: set the output directly. Current: multiply the value in mA by 10000, write the two H bytes into register 1 (40051) and the two L bytes into register 2 (40052), send command 6811. Voltage: multiply the value in V by 10000, write likewise, send command 6813. Reading: send command 6812 (current) or 6814 (voltage), read 40051 (H) and 40052 (L) and divide by 10000.

| Example                   | 40051 (H) | 40052 (L) | Total      |
|---------------------------|-----------|-----------|------------|
| writing 14 mA, hex        | 0x0002    | 0x22E0    | 0x00022E0  |
| writing 14 mA, decimal    | 2         | 8928      | 140000     |
| reading 5.3110 V, hex     | 0x0000    | 0xCF76    | 0x0000CF76 |
| reading 5.3110 V, decimal | 0         | 53110     | 53110      |

## 27.10 Real calibration commands

- Unload the system and reset the displayed weight with command 100.
- Load a sample weight and write its value to 40065/40066.
- Command 101 saves the first sample weight and removes previous values; command 106 adds a sample weight and keeps the previous ones.
- Up to 8 sample weights (linearisation); each sample weight only once per calibration, no zero values. If successful, both registers are set to zero.
- Command 104 cancels the real calibration (back to the theoretical one); the tare reset is not cancelled.

Consider the division register (40014): sample weight 100 kg with division 0.001 › write 100000. Negative sample weights as signed 32-bit number (two's complement), example -56 kg: 40065 = 0xFFFF (-1), 40066 = 0xFFC8 (-56).

## 27.11 Setpoints (BASE program)

Programming: (with E/EC only) write the class in 40038, then write the setpoint values in 40019 ... 40028. Without E/EC the new values are active immediately, with E/EC only if the class programmed is the class currently in use. Reading: (with E/EC only) write the class in 40038, then read 40019 ... 40028.

## 27.12 Communication examples

Values in hexadecimal notation with prefix h.

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

Query structure: address, function, first register H/L, number of registers H/L, (with function 16) byte count and data H/L, CRC16 L/H. The register address counts from 0 (40019 › h0012, 40008 › h0007). Further CRC16 examples: Modicon PI-MBUS-300.

# 28 Use and calibration of converter points

The weight can be read directly from the protocol or calculated by the PC or PLC. In the latter case: if the instrument sends e.g. 6500 points with the tank empty and 49833 points with a sample weight of 10000 kg, the constant is  $(49833 - 6500) / 10000 = 4.333$ . If the PC or PLC receives 40000 points, the weight is  $(40000 - 6500) / 4.333 = 7731$  kg.

## 29 Dimensions, directives and standards

### 29.1 Dimensions

| Item          | Value                                              |
|---------------|----------------------------------------------------|
| Housing       | DIN box for front panel mounting, 96 × 48 × 130 mm |
| Panel cut-out | 92 × 45 mm                                         |
| Protection    | IP54 at the front (IP65 with front gasket)         |

### 29.2 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.