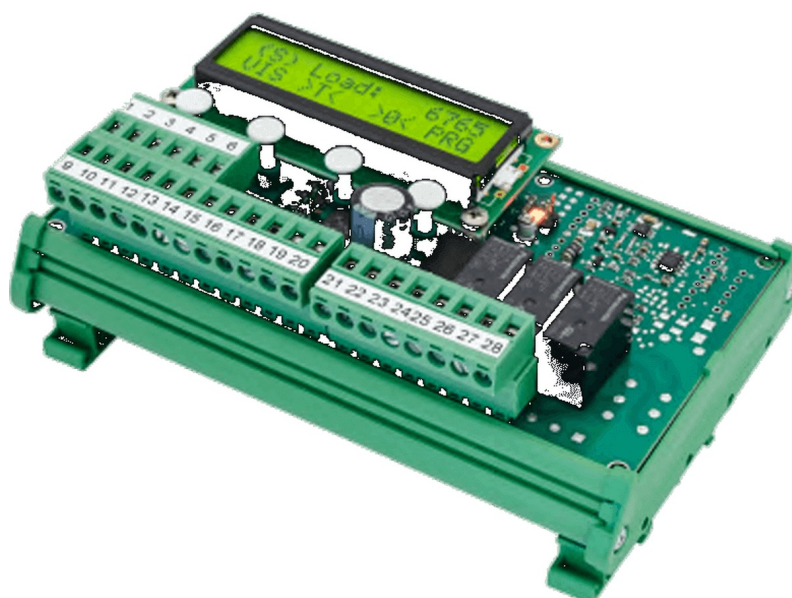


MANUAL

ETLD

DIGITAL LOAD LIMITER FOR LIFTING SYSTEMS

Installation and user manual



Document	Version	Date	Applies to
Installation and user manual	V00x	10/2026	ETLD single-channel and safety version

This manual describes installation, connection, commissioning, calibration and programming of the ETLD digital load limiter in its single-channel version and in its safety version, including the serial communication protocols.



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1 About this manual

The ETLD is available in two versions, and this manual is valid for both. Where the versions differ, the tables have one column per version or the section title names the version: “single-channel” for the version with one load cell input and three relay outputs, “safety version” for the version with two load cell inputs and an additional safety lock relay.

Display texts and menu items are set in a fixed-width typeface, as they appear on the display, for example **NO CALIBRATION** or **WEIGHT CALIBR..** Menu paths are written as menu > item, followed by the parameter number in square brackets, for example **FUNCTIONAL PARS. > GENERAL PASSWORD [1002]**.

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 Versions covered

	Single-channel	Safety version
Load cell input	one input, single-bridge load cells	two independent inputs, dual-bridge load cells
Relay outputs	3	3 + 1 safety lock relay with guided contacts
Hardware revisions	Rev 1 and Rev 2	Rev 2 with firmware version 0.2
Type marking on the device	LCD3	LCD3PL

Important Safety version: this manual applies only to instruments with hardware revision 2 and firmware version 0.2 (the firmware version is shown at power-on, section 5.3). Hardware revision 1 is obsolete. For earlier hardware revisions or firmware versions please contact octagon.

2 Safety, warranty and disposal

2.1 Recommendations for correct installation of weighing instruments

- The cell cable must be individually led to its panel input (from one side or the other of the panel) and not share a conduit with other cables; connect it directly to the instrument terminal block without breaking its route with support terminal blocks.
- Safety version: the instrument's other signal cables must be routed separately from power supplies and cables connected to contactors.
- Use RC filters on the instrument-driven solenoid valve and remote control switch coils.
- Avoid installing the instrument in a panel containing inverters; if inevitable, use special filters for the inverters and separate them with sheet metal partitions.
- The panel installer must provide electric protections for the instruments (fuses, door lock switch etc.).
- It is advisable to leave the equipment always switched on to prevent the formation of condensation.

2.2 Safety version: conditions for the safety function

- The instrument must be installed in an enclosure with a minimum protection rating of IP54, in accordance with EN 60529.
- If Performance Level PL d is required, the load cells must be dual-bridge load cells.
- Alarms marked (*) in section 5.5 remain active even if the condition that generated the alarm is no longer present. To restore operation, first switch off the power supply to the instrument.

2.3 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 octogon personnel.

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

2.4 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 Product description

3.1 Main specifications

- Digital load limiter/indicator for lifting systems.
- Backlit LCD display with 2 lines of 16 characters, character height 5 mm.
- 4 × 3 mm indicator LEDs: one instrument status LED and one LED per relay output (section 5.1).
- Keypad with 4 mechanical keys.
- Overall dimensions 140 × 93 × 65 mm, terminal blocks included.
- Fixing with 4 screws or on a support for DIN rail or Omega rail.

Safety version

The safety version is a dual-channel input load limiter compliant with EN ISO 13849-1. In accordance with category 2 (PL d), load limitation is achieved through a lock relay (safety relay with guided contacts to EN 50205) that is monitored in real time. The relays switch when the load reaches the set thresholds. In the event of a fault, disconnection from the load cell, imbalance of the two acquisition channels or self-diagnosis, the lock relay and the other limiting relays are de-energised and the alarm relay is energised.

Configuration and calibration, with the possibility of load linearisation, are done with the four keys and the display, which also offers diagnostic functions and shows the load cell signal and any active alarms. The two logic inputs, which can also be controlled remotely, perform selectable functions such as limited load zero-setting, data transmission (e.g. receipt printing) and “motor” input with monitoring of the remaining life of the lifting system, calculated from the lifted load and the operating time.

Single-channel version

Up to four single-channel instruments can be joined into one system over RS485 or over the optional on-board RF module, so that both the single load and the total load are limited (chapter 11). The RF module (868 MHz, 7 channels, average range 50 m) is an option on request for the single-channel version only.

3.2 Version identification

To define the revision of the instrument, check the number of contacts on the terminal block:

Version	Revision	Contacts	Pitch
Single-channel	Rev 1	28	5.08 mm
Single-channel	Rev 2	29	5.00 mm
Safety version	Rev 1 (obsolete)	31	5.08 mm
Safety version	Rev 2	32	5.00 mm

3.3 Technical specifications

Item	Single-channel	Safety version
Power supply and consumption	24 ... 48 V DC/AC; 6 VA	24 ... 48 V DC/AC; 6 VA
Insulation	class III	class III
Cell input type	single-bridge cells: signal input up to 3.9 mV/V	dual-bridge load cells: two signal inputs
Load cell supply	4 V DC (max. 8 cells of 350 Ω in parallel), protected against short circuit	4 V DC (max. 8 cells of 350 Ω in parallel), protected against short circuit
Linearity	< 0.01 % of full scale	< 0.01 % of full scale
Thermal drift	< 0.002 % of full scale/°C	< 0.002 % of full scale/°C
A/D converter	24 bit	24 bit
Measurement range	± 3.9 mV/V	± 3.9 mV/V
Digital filter	0.25 ... 3 Hz	0.25 ... 3 Hz
Conversions per second	3	3
Decimals / display increments	0 ... 4 / $\times 1 \times 2 \times 5 \times 10 \times 20 \times 50$	0 ... 4 / $\times 1 \times 2 \times 5 \times 10 \times 20 \times 50$
Relay outputs	Rev 1: 1 relay (NO contact) and 2 relays (changeover contact), 18 ... 50 V DC/AC; 2 A · Rev 2: 3 relays (changeover contact), 30 V DC / 250 V AC; 2 A	3 relays (changeover contact), 30 V DC / 250 V AC; 2 A · 1 safety relay with guided contacts (EN 50205), one changeover contact, 30 V DC / 250 V AC; 2 A
Digital inputs	2 optoisolated (12/24 V DC), clean contact	2 optoisolated (12/24 V DC), clean contact
Maximum cable length	5 m (RS232) and 500 m (RS485)	5 m (RS232) and 500 m (RS485)
Serial protocols	ASCII (SLAVE and WEIGHT) and protocol for remote displays	ASCII (SLAVE and WEIGHT) and protocol for remote displays
Serial ports	RS232, RS485	RS232, RS485
Baud rate	1200, 2400, 9600, 19200, 38400, 57600, 115200	1200, 2400, 9600, 19200, 38400, 57600, 115200
Humidity (non-condensing)	85 %	85 %
Storage temperature	-20 ... +60 °C	-20 ... +60 °C
Working temperature	-10 ... +50 °C	-10 ... +50 °C
Functional safety	–	category 2 to EN 13849-1, PL d (comparable to SIL 2, EN 62061); enclosure min. IP54 (EN 60529)

4 Electrical connections

4.1 Load cell connection

- The cell cable must not be routed with other cables (e.g. outputs connected to remote control switches or power supply cables), but must follow its own path.
- Any cable extension connections must be carefully shielded, observing the colour code and using the cable of the type supplied by the manufacturer. Extension connections must be made by welding, either through back-up terminal blocks or via the junction box supplied separately.
- The cell cable must have no more conductors than those used. In the case of an unused multi-conductor cable, connect the remaining wires to the negative pole of the cell power supply (terminal 1).
- The cell cable shield must be connected to terminal 1 (– cell power supply) or to ground.
- Single-channel version: for connections with 4-wire cells, jumper terminal 1 with 4 and 2 with 3.

The cell power supply voltage is 4 V DC and is protected against temporary short circuits. Single-channel version: the load cell cable is connected to terminals 1 ... 6. Safety version: the load cell cable is connected to terminals 1 ... 8; the second signal is connected to terminals 7 and 8.

4.2 Terminals

Terminal	Single-channel Rev 1	Single-channel Rev 2	Safety version Rev 2
1	Load cell supply – (neg.)	Load cell supply – (neg.)	Load cell supply – (neg.)
2	Load cell supply + (pos.)	Load cell supply + (pos.)	Load cell supply + (pos.)
3	Reference + (pos.)	Reference + (pos.)	Reference + (pos.)
4	Reference – (neg.)	Reference – (neg.)	Reference – (neg.)
5	Signal C.1 – (neg.)	Signal C.1 – (neg.)	Signal C.1 – (neg.)
6	Signal C.1 + (pos.)	Signal C.1 + (pos.)	Signal C.1 + (pos.)
7	–	–	Signal C.2 + (pos.)
8	–	–	Signal C.2 – (neg.)
9	COM1 – TX (RS232)	COM1 – TX (RS232)	COM1 – TX (RS232)
10	COM1 – RX (RS232)	COM1 – RX (RS232)	COM1 – RX (RS232)
11	COM1 – GND	COM1 – GND	COM1 – GND
12	COM2 – A + (RS485)	COM2 – A + (RS485)	COM2 – A + (RS485)
13	COM2 – B – (RS485)	COM2 – B – (RS485)	COM2 – B – (RS485)
14	not used	not used	not used
15	not used	not used	not used
16	Input 1	Input 1	Input 1
17	Input 2	Input 2	Input 2
18	Input common	Input common	Input common
19	Power supply + / ~	Power supply + / ~	Power supply + / ~
20	Power supply – / ~	Power supply – / ~	Power supply – / ~
21	Relay 1 common (alarm)	Relay 1 common (alarm)	Relay 1 common (alarm)
22	Relay 1 NO (alarm)	Relay 1 NC (alarm)	Relay 1 NC (alarm)
23	Relay 2 common	Relay 1 NO (alarm)	Relay 1 NO (alarm)
24	Relay 2 NC	Relay 2 common	Relay 2 common
25	Relay 2 NO	Relay 2 NC	Relay 2 NC
26	Relay 3 common	Relay 2 NO	Relay 2 NO
27	Relay 3 NC	Relay 3 common	Relay 3 common
28	Relay 3 NO	Relay 3 NC	Relay 3 NC
29	–	Relay 3 NO	Relay 3 NO
30	–	–	Lock relay 4 common
31	–	–	Lock relay 4 NC
32	–	–	Lock relay 4 NO

The supply range of terminals 19 and 20 is given in the technical specifications (section 3.3). Terminal blocks: load cells 1 ... 6 (single-channel) or 1 ... 8 (safety version); serial ports, inputs and power supply 9 ... 20; relay contacts from 21.

4.3 Relay outputs

Important The relays are normally energised.

When the programmed setpoint value is exceeded, the setpoint relay switches off; the corresponding status LED switches off as well. When an alarm occurs, the alarm relay (1) is energised and all other relays are de-energised at the same time.

Version	Relay outputs
Single-channel Rev 1	relay 1 (alarm, NO contact) and relays 2 and 3 (changeover contact), 18 ... 50 V DC/AC; 2 A – terminals 21 ... 28
Single-channel Rev 2	relays 1 (alarm), 2 and 3 (changeover contact), 30 V DC / 250 V AC; 2 A – terminals 21 ... 29
Safety version Rev 2	relays 1 (alarm), 2 and 3 (changeover contact), 30 V DC / 250 V AC; 2 A – terminals 21 ... 29; safety lock relay 4 with guided contacts to EN 50205, monitored in real time, 30 V DC / 250 V AC; 2 A – terminals 30 ... 32

4.4 Digital inputs

The instrument has two optoisolated inputs: input 1 on terminal 16, input 2 on terminal 17, common on terminal 18. To activate an input, close the contact between the input and the common terminal. Use the shortest possible connection cable. The input functions are set in chapter 8.

4.5 Serial ports

Port	Interface	Use
COM1	RS232, terminals 9 (TX), 10 (RX), 11 (GND)	data transmission
COM2	RS485, terminals 12 (A +), 13 (B -)	single-channel: summing connection with other units, repeater and data transmission - safety version: connection to repeater and data transmission
COM3	RS485/RF via the optional on-board RF module	as COM2, over the RF module; the menu items are only shown if the module is installed

Connection example RS232 – PC

Instrument terminal	Signal	PC connector pin
9 (COM1 – TX)	data transmission	2
10 (COM1 – RX)	data receiving	3
11 (COM1 – GND)	signal ground	5

Use a shielded cable; the shield is earthed.

5 Display, LEDs and keys

5.1 LEDs

LED	Function	Version
L1	instrument status LED	both
L2	output 1 relay active/energised	both
L3	output 2 relay active/energised	both
L4	output 3 relay active/energised	both
L5	output 4 relay active/energised	safety version

5.2 Keys

In normal operating conditions, the function of the 4 keys is shown on the bottom line of the display every 3 seconds, for example **(S) Load:12345.6 / VIS >T< >0< PRG**.

Key	Function
Awaiting commands	
VIS	switches the data shown on the bottom line (section 5.4)
>T<	semi-automatic tare command (section 7.8)
>0<	zero-setting of the gross weight within the threshold programmed in parameter [1306] (section 7.7)
PRG	pressed and held for 2 seconds: opens the set-up menu (chapter 6)
Parameters menu	line 1 shows the parameter number on the left and the current value on the right, e.g. [1102] 5000
<-	previous parameter
->	next parameter
ESC	exits the menu and returns to the upper level, or exits the procedure
SEL	enters parameter editing/programming
Numeric parameter programming	the digit being edited flashes
(+)	increments the flashing digit
(-)	decrements the flashing digit
->	moves to the next digit on the right; held for 2 seconds: sets the value to zero
ENT	confirms and saves the displayed value
Programming with default values	the current value flashes
<-	selects the previous value
->	selects the next value
ENT	confirms and saves the displayed value

5.3 Safety version: display at power-on

On power-on the display temporarily shows two screens: first the firmware code with the firmware version and checksum, then the instrument serial number (parameter [1006], section 7.2).

5.4 Display in normal operation

When no programming procedure is in progress, the top line shows the current gross weight with the stability indication (**S**), refreshed ten times per second. The information on the bottom line is switched with the **VIS** key:

No.	Single-channel	Safety version
1	bargraph of the current load referred to SET1	bargraph of the current load referred to the setpoint of lock relay 4
2	load cell signal, e.g. Sign. 1.234 mV/V	load cell signal on channel 1, e.g. Sig.1:0.066 mV/V
3	net weight (if a tare is entered), Net Load:12345.6	load cell signal on channel 2, e.g. Sig.2:0.065 mV/V
4	status of the digital inputs, INPUTS:I1=0 I2=0	net weight (if a tare is entered), Net Load:12345.6
5	with an active summing protocol: total load Total Ld:12345.6 or the difference between the minimum and the maximum load of the system Diff. Ld:12345.6 (chapter 11); the other information can still be switched manually	status of the digital inputs, INPUTS:I1=0 I2=0

Note In alarm conditions, pressing **VIS** shows the values on the bottom line for 5 seconds.

5.5 Alarm messages

When an alarm occurs, the message describing the cause is shown on the bottom line of the display, the alarm relay 1 is activated (safety version: unless stated otherwise below) and the other relays are deactivated at the same time. If several alarms occur, the message with the highest priority is displayed; the list can be scrolled by pressing **VIS** repeatedly. The alarms are listed in order of priority, highest first.

Single-channel version

No.	Display	Cause
1	HARDWARE FAILURE	hardware failure of the board, the cell signal cannot be acquired; the top line shows Load: with dashes
2	OFF SCALE CELLS	load cell nominal capacity exceeded
3	CELL1 :ERR.CONN.	load cell (channel 1) not connected or connected incorrectly; the top line shows Load: with dashes
4	NO CALIBRATION	the load has not been calibrated (theoretical or with sample weights)
5	OVERLOAD SETP.1	relay 1 threshold exceeded for the programmed time
6	SUM: COMM. ERROR	communication alarm with the summing protocol
7	SAFETY MEM. ERR.	counter saving alarm with SAFETY/OVERLOAD operation
8	Total Ld:^^^^^^	with an active summing function: an instrument connected to this one has exceeded its capacity or has a load cell not connected

Safety version

No.	Display	Cause
1	HARDWARE FAILURE	hardware failure of the board, the cell signal cannot be acquired (*)
2	OFF SCALE CELLS	load cell nominal capacity exceeded
3	RELAY 4 FAILURE	faulty contacts of the lock relay R4 (*); the contact status is monitored continuously in real time, and at power-on the lock relay is checked in 3 phases: watchdog signal operation, contacts closed, contacts open
4	CELL1 :ERR.CONN.	load cell (channel 1) not connected or connected incorrectly
5	CELL2 :ERR.CONN.	no or incorrect connection of the second channel of the load cell
6	NO CALIBRATION	the load has not been calibrated (theoretical or with sample weights)
7	OVERLOAD SETP.4	relay 4 threshold exceeded for the programmed time, or relay 2 or 3 threshold exceeded with the BLOCK option active; these conditions do not activate the alarm relay
8	IMBALANCE C1/C2	signal imbalance of the two load cell channels: with the weight stationary, the two signals differ from the set value (parameter [1109]) for at least 0.5 seconds (*)
9	SUM: COMM. ERROR	communication alarm with the summing protocol
10	SAFETY MEM. ERR.	counter saving alarm with SAFETY operation

Important Safety version: to meet the safety requirements, the alarms marked (*) remain active even if the condition that generated them is no longer present. To restore operation, first switch off the power supply to the instrument.

6 Set-up menu

Press **PRG** for two seconds to open the set-up menu. Access can be protected by a programmable password (default: not set). To set or disable it, open the set-up menu, enter the current password if prompted and go to **FUNCTIONAL PARS. > GENERAL PASSWORD** [1002]; permissible values 0 ... 9999, 0 disables the password.

Menu item	Description	Version
Functional pars.		
CALIBR. PASSWORD [1001]	calibration parameter access password	both
GENERAL PASSWORD [1002]	password to access the set-up menu	both
SAFETY FUNCTIONS [1003]	single-channel: selection of the SAFETY or OVERLOAD function · safety version: SAFETY function enabled/disabled	both
STAND-BY [1004]	stand-by activation time	both
SERIAL NUMBER [1006]	instrument identification code	both
Weighing const.		
L.CELLS CAPACITY [1102]	total load cell rated capacity	both
L.C.SENS. [mV/V] [1103]	load cell average rated output	both
PRE-LOADED TARE [1105]	theoretical zero	both
DIVISION VALUE [1106]	weight division value	both
SIG.DIFF. [mV/V] [1109]	signal imbalance limit of the two load cell channels	safety version
Weight calibrat.		
ACQUIRE ZERO	zero calibration	both
WEIGHT CALIBR.	calibration of full scale with sample weight	both
LINEARIZATION	weight linearisation procedure	both
THEORETICAL CAL	theoretical calibration calculation	both
SIGNAL 2 CALIBR.	calibration procedure for signal 2 (section 7.5)	safety version
Parameters		
FILTER FACTOR [1301]	filter to attenuate weight fluctuations	both
STABILITY FACTOR [1302]	weight stabilisation factor	both
INITIAL AUTOZERO [1304]	initial automatic zero-setting limit at power-on	both
ZERO-TRACKING [1305]	zero tracking function, in divisions per second	both
ZERO BAND [1306]	semi-automatic zero command acceptance band	both
Input/output · Input/alarm	input functions, setpoints and outputs – menu “Input/output” (single-channel) or “Input/alarm” (safety version), parameters in chapter 8	both

Menu item	Description	Version
Serial ports		
COM1 BAUD RATE [1501] · COM2 BAUD RATE [1505] · COM3 BAUD RATE [1510]	baud rate, default 115200	both
COM1 FRAME FORM. [1502] · COM2 FRAME FORM. [1506] · COM3 FRAME FORM. [1511]	frame format, default n-8-1	both
COM1 PROTOCOL [1503] · COM2 PROTOCOL [1507] · COM3 PROTOCOL [1512]	protocol type	both
COM1 ADDRESS [1504] · COM2 ADDRESS [1508] · COM3 ADDRESS [1513]	instrument address	both
SUM UNITS NUMBER [1509]	number of units connected in the sum function	single-channel
RF CHANNEL SEL [1514]	RF channel number	both
Safety counters (if SAFETY on)		
OPERAT. COUNTER [1702]	lifting operations counter	both
OPERATIONAL TIME [1706]	system operating time	both
SYSTEM CAPACITY [1708]	rated lifting system capacity	both
RESET COUNTERS	counter reset procedure	both
Overload (if OVERLOAD on)		
SETPOINT 1 [1802] · SETPOINT 2 [1804] · SETPOINT 3 [1806]	overload thresholds 1 ... 3	single-channel
HYSTERESIS [%] [1807]	overload hysteresis value	single-channel
COUNTER 1 [1809] · COUNTER 2 [1811] · COUNTER 3 [1813]	overload threshold counters 1 ... 3	single-channel
COUNTER 4 [1815]	full scale threshold counter	single-channel
PEAK [1817]	maximum peak value	single-channel
RESET	counter reset procedure	single-channel

Important All changed settings are applied and saved permanently on leaving the set-up menu by pressing **ESC** repeatedly. If the instrument is switched off without leaving the set-up menu, the changes are discarded.

7 Commissioning and calibration

7.1 Instrument commissioning

Switch on the instrument and wait five minutes for all the components to reach a stable temperature. Check that the indication is positive and that it increases when a weight force is applied to the container. If the indication is negative or the instrument shows an error message, check the connection of the load cells and their correct positioning (direction of load).

7.2 Functional parameters

Parameter	Setting
FUNCTIONAL PARS. › CALIBR. PASSWORD [1001]	password for the weight calibration procedure; 0 disables it (default 2792)
FUNCTIONAL PARS. › GENERAL PASSWORD [1002]	general password for the set-up menu; 0 disables it (default 0)
FUNCTIONAL PARS. › SAFETY FUNCTIONS [1003]	single-channel: SAFETY (life control function of the system) or OVERLOAD (counting of lifting cycles with 3 programmable overload thresholds) · safety version: SAFETY enabled/disabled · see chapter 10
FUNCTIONAL PARS. › STAND-BY [1004]	time (0 ... 999 s) without keypad use after which the display backlight turns off and the keypad is disabled; hold a key for 3 seconds to exit this condition; 0 disables the function
FUNCTIONAL PARS. › SERIAL NUMBER [1006]	instrument ID code shown at power-on

7.3 Calibration check

To check the calibration, for example at first use: make sure the system is unloaded and the instrument indicates zero. Apply a significant quantity of product (at least 50 % of the maximum quantity to be weighed) and check that it is indicated correctly.

- If the difference is in the order of 1–2 %, correct it by keypad: perform **WEIGHT CALIBRAT.** > **WEIGHT CALIBR.** (section 7.5) with a sample weight of at least 50 % of the maximum quantity to be weighed.
- If the difference is greater than 1–2 %, make sure that it is not due to mechanical issues, check the electrical connections and the direction of load of the load cells again, and check that the theoretical calibration meets the application (section 7.4).
- If necessary, perform a real calibration with sample weights (section 7.5).

7.4 Theoretical calibration

Note The calibration procedures may require access to the **WEIGHT CALIBRAT.** menu, which can be protected by **CALIBR. PASSWORD** [1001].

The submenu **WEIGHING CONST.** contains the items for a theoretical calibration without sample weight; checking the calibration with a known quantity of product is always recommended.

Parameter	Setting
WEIGHING CONST. > L.CELLS CAPACITY [1102]	load cell full scale in kg, integer values only. Example: 3 load cells of 300 kg rated capacity > 900
WEIGHING CONST. > L.C.SENS. [mV/V] [1103]	load cell rated output in mV/V, 4 decimal places (default 2.0000). Example: cells of 2 mV/V > 2.0000; three cells of 1.9800, 1.9600 and 1.9900 mV/V > average 1.9766
WEIGHING CONST. > DIVISION VALUE [1106]	instrument resolution (division), with decimal point if required
WEIGHING CONST. > PRE-LOADED TARE [1105]	theoretical zero, set before calibration
WEIGHING CONST. > SIG.DIFF. [mV/V] [1109]	safety version: signal imbalance limit of the two load cell channels, 0.100 ... 1.000

To confirm the settings and activate the theoretical calibration, go to the submenu **WEIGHT CALIBRAT.** and select **THEORETICAL CAL.** The message **DONE** confirms that the calibration has been activated.

7.5 Real calibration (with sample weights)

Important The calibration with a sample weight is not an alternative to the theoretical calibration: it requires a correct theoretical calibration. In particular, **L.CELLS CAPACITY** [1102] is the maximum weight that can be entered during the calibration with a sample weight.

- With the system idle and unloaded, calibrate zero with **WEIGHT CALIBRAT.** > **ACQUIRE ZERO** (zero signal acquisition) and confirm.
- Apply a sample weight of at least 50 % of the maximum quantity to be weighed and select **WEIGHT CALIBRAT.** > **WEIGHT CALIBR.** (calibration of full scale with sample weight). The display asks to confirm the load with **ENT** and to enter the value of the sample.
- For greater accuracy, a linearisation over up to 5 points with different sample weights can be performed with **WEIGHT CALIBRAT.** > **LINEARIZATION**. The display asks to confirm the weight and to enter the sample value up to 5 times; fewer points are entered by ending the procedure with **ESC**.

Safety version: calibration of signal 2

To eliminate signal differences between channel 1 and channel 2, the calibration can also be performed for the second channel with **WEIGHT CALIBRAT.** > **SIGNAL 2 CALIBR.:**

- zero calibration: unload the load cell and press the **CAL** key;
- calibration with load: apply a load and press the **CAL** key;
- display of values: the signals C1 and C2 are shown, press **ESC** to exit.

7.6 Weighing parameters

Parameter	Setting
PARAMETERS > FILTER FACTOR [1301]	0 ... 9 (default 4). A higher value slows down the weight response and absorbs oscillations or vibrations of the weighing system; a lower value gives a faster response. 0 = minimum, 9 = maximum digital filter intervention.
PARAMETERS > STABILITY FACTOR [1302]	0 ... 4 (default 2). Determines how accurately and how quickly the stable weight condition (S) is detected; maximum accuracy with 0.

7.7 Weight zero-setting

Small zero displacements can be corrected in the following ways:

- From the condition awaiting commands, with the **>0<** key. The command is not executed if the weight is unstable (it does not stabilise within the time set by **STABILITY FACTOR** [1302]) or if the gross weight is greater (positive or negative) than the threshold **ZERO BAND [div]** [1306] (max. 200 divisions).
- With the automatic zero-setting at power-on, **PARAMETERS > INITIAL AUTOZERO** [1304]: if the weight shown at power-on is below this value, the display is set to zero. The weight must be stable; if it does not stabilise within 3 seconds of switching on, the function is not performed. 0 disables the function.
- With the zero tracking for small variations, **PARAMETERS > ZERO-TRACKING** [1305]: NO, 0.5d, 1d or 2d (divisions per second). With the scale unloaded, the instrument corrects small and slow weight changes from zero; the corrections are cancelled when the instrument is switched off, the maximum correction is the automatic zero-setting threshold.

7.8 Semi-automatic tare (net/gross)

- From the condition awaiting commands: short press **>T<** activates the semi-automatic tare; long press **>T<** (2 seconds) cancels the tare.
- By closing an input set to tare mode: **FUNCTION INPUT 1** [1401] or **FUNCTION INPUT 2** [1402] = **Tare** (chapter 8).

After the tare is activated, the top line still shows the gross weight; to display the net weight, switch the bottom line with **VIS** until the net weight is shown (section 5.4).

8 Inputs and outputs programming

The parameters are in the menu **INPUT / OUTPUT** (single-channel) or **INPUT / ALARM** (safety version).

8.1 Input functions

Value of [1401] / [1402]	Function when the contact is closed	Version
Tare	semi-automatic tare (section 7.8)	both
Motor	motor input for the SAFETY function (chapter 10)	both
Txd	weight data transmission (section 12.6)	both
Se1.Set	setpoint group selection (see below)	safety version

Safety version: setpoint groups

If both inputs are set to **Se1.Set**, the setpoint group function is active on the outputs: each output has two setpoint values, A and B (section 8.3), selected via the inputs:

Input 1	Input 2	Function
closed	open	setpoint A
open	closed	setpoint B
open	open	inputs alarm
closed	closed	inputs alarm

8.2 Single-channel: output parameters

Three setpoints are available. If a setpoint value is 0, the setpoint output is never activated.

Parameter	Out 1	Out 2	Out 3	Setting
SETPOINT OUT n	1404	1410	1416	setpoint of output n, 0 ... <capacity>
DELAY OUTn	1405	1411	1417	intervention delay in tenths of a second, 0 ... 99.9 s
POLARITY SETn	1406	1412	1418	intervention polarity: positive/negative
HYSTERESIS SETn	1407	1413	1419	hysteresis, subtracted from the setpoint to obtain the switching threshold for decreasing weight, 0 ... 9999
OUT n LOAD SEL.	1408	1414	1420	load compared with the setpoint (section 8.4)

8.3 Safety version: output parameters

Four setpoints are available. If a setpoint value is 0, the setpoint output is never activated. The setpoint values A and B are used when the setpoint group function is active (section 8.1); otherwise the setpoint without group applies.

Parameter	Out 1	Out 2	Out 3	Out 4	Setting
SETPOINT OUT n	1404	1412	1420	1428	setpoint of output n, no group selected, 0 ... <capacity>
SETPOINT OUT n A	1404	1412	1420	1428	setpoint of output n, group A, 0 ... <capacity>
SETPOINT OUT n B	1406	1414	1422	1430	setpoint of output n, group B, 0 ... <capacity>
DELAY OUTn	1407	1415	1423	1431	intervention delay in tenths of a second, 0 ... 99.9 s
POLARITY SET n	1408	1416	1424	1432	intervention polarity of logic output n: positive/negative
HYSTERESIS SET n	1409	1417	1425	1433	hysteresis, subtracted from the setpoint for decreasing weight, 0 ... 9999
OUT n LOAD SEL.	1410	1418	1426	1434	load compared with the setpoint (section 8.4)
OUT n BLOCK	—	1435	1436	—	if enabled: when setpoint n is exceeded, output 4 is also disabled (lock)

Important In PL operation the threshold of setpoint 1 cannot be set: output 1 is dedicated exclusively to alarm signalling.

8.4 Output load selection

Value	The setpoint is compared with ...	Version
SINGLE	the gross weight of the instrument	both
TOTAL	the total load of the weighing system; the sum/difference protocol must be active (chapter 11)	single-channel · not available in the safety version
DIFFER.	the difference of the loads in the weighing system: with 2 instruments load A minus load B, with more than 2 instruments the difference between the minimum and the maximum load; the sum/difference protocol must be active	single-channel
PAIR	the partial total: A + B for instrument address A or B, C + D for address C or D; the sum/difference protocol must be active	single-channel

9 Serial ports programming

The ports are described in section 4.5. They are configured in the menu **SERIAL PORTS**:

Parameter	Setting
COM1 BAUD RATE [1501] · COM2 BAUD RATE [1505] · COM3 BAUD RATE [1510]	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
COM1 FRAME FORM. [1502] · COM2 FRAME FORM. [1506] · COM3 FRAME FORM. [1511]	n-8-1, n-8-2, E-7-2, E-8-1, o-7-2, o-8-1
COM1 PROTOCOL [1503] · COM2 PROTOCOL [1507] · COM3 PROTOCOL [1512]	see table below
COM1 ADDRESS [1504] · COM2 ADDRESS [1508] · COM3 ADDRESS [1513]	value depending on the protocol set (chapter 12)
SUM UNITS NUMBER [1509]	single-channel: 0 ... 4 (chapter 11) · not available in the safety version
RF CHANNEL SEL [1514]	0 ... 7; must be the same on all devices to be connected; only with the RF module installed

Serial protocols

Value	Protocol	Version
SLAVE	PC slave protocol with bidirectional communication (sections 12.1 and 12.2)	both
REPEATER	continuous transmission repeater protocol (section 12.3)	both
REPEAT.C. / REPEATER C.	continuous transmission repeater protocol with decimal places (section 12.3); menu value REPEAT.C. (single-channel) or REPEATER C. (safety version)	both
WEIGHT / CONTINUE	continuous weight transmission and instrument status protocol (section 12.4); menu value WEIGHT (single-channel) or CONTINUE (safety version)	both
SUM / DIF.	activation of the sum/difference protocol, COM2 and COM3 only (section 12.5)	single-channel
PULS. 1 · PULS. 2 · DIN 105	proprietary protocols	safety version
NONE	deactivation (section 12.6)	both

Note Safety version: the protocols **REPEATER** and **REPEATER C.** are available from firmware version 08 rev 0.0.

10 Life counters

The life control function is selected with **FUNCTIONAL PARS.** > **SAFETY FUNCTIONS** [1003]; the related configuration menus are shown or hidden accordingly.

- **SAFETY** (both versions) counts the number of lifts detected and records the system operating time.
- **OVERLOAD** (single-channel only) allows up to 3 progressive weight thresholds and records the threshold counts and the maximum peak reached. **SAFETY** and **OVERLOAD** are mutually exclusive.

10.1 Safety counters

Parameter	Setting
SAFETY COUNTERS › OPERAT. COUNTER [1702]	lifting operation counter (motor input active), 0 ... 999999. The value is increased with a variable frequency according to (load raised / rated capacity of the lifting system) ³ .
SAFETY COUNTERS › OPERATIONAL TIME [1706]	system operating time (motor input active), as HHHH:MM:SS up to 9999 hours, as HHHHH:MM above 9999 hours
SAFETY COUNTERS › SYSTEM CAPACITY [1708]	rated capacity of the lifting system, 0 ... <capacity>, password protected (2792)
SAFETY COUNTERS › RESET COUNTERS	counter reset procedure, password protected (1687)

10.2 Single-channel: overload counters

Parameter	Setting
OVERLOAD › SETPOINT 1 [1802] · SETPOINT 2 [1804] · SETPOINT 3 [1806]	overload thresholds 1 ... 3, 0 ... <capacity>. The values must be progressive, otherwise the setting is not accepted; 0 overrides the threshold control.
OVERLOAD › HYSTERESIS [%] [1807]	hysteresis in % of the capacity, 0 ... 100. A loading procedure starts when at least one overload threshold is exceeded and ends when the gross weight falls to SETPOINT 1 minus the hysteresis.
OVERLOAD › COUNTER 1 [1809] · COUNTER 2 [1811] · COUNTER 3 [1813]	threshold counters 1 ... 3, 0 ... 999999; only the counter of the highest threshold reached during a loading procedure is increased
OVERLOAD › COUNTER 4 [1815]	full scale threshold counter, 0 ... 999999
OVERLOAD › PEAK [1817]	maximum peak value reached during the loading procedure, 0 ... 999999
OVERLOAD › RESET	counter reset procedure, password protected (1687)

11 Single-channel: multi-instrument system

Up to 4 single-channel instruments can be interconnected over RS485 or over the optional on-board RF module: A + B (2 instruments), A + B + C (3 instruments) or A + B + C + D (4 instruments). The settings are made on each instrument (chapters 8 and 9).

11.1 RS485 serial connection

- Connect terminal 12 of each instrument to terminal 12 of the others, and terminal 13 to terminal 13.
- Set the same number of decimal places on all instruments: **WEIGHING CONST.** › **DIVISION VALUE** [1106].
- Enable the sum/difference protocol: **SERIAL PORTS** › **COM2 PROTOCOL** [1507] = **SUM / DIF.**
- Give each instrument its own address: **SERIAL PORTS** › **COM2 ADDRESS** [1508] = A, B, C or D.
- Enter the number of devices: **SERIAL PORTS** › **SUM UNITS NUMBER** [1509] = 2 (A + B), 3 (A + B + C) or 4 (A + B + C + D).
- Set baud rate **COM2 BAUD RATE** [1505] and frame format **COM2 FRAME FORM.** [1506].

11.2 RF connection (optional)

If the RF module is installed, its configuration items are shown in the menu **SERIAL PORTS**.

- Set the same RF channel on every instrument to be connected: **SERIAL PORTS** › **RF CHANNEL SEL** [1514].
- Set the same number of decimal places on all instruments: **WEIGHING CONST.** › **DIVISION VALUE** [1106].
- Enable the sum/difference protocol: **SERIAL PORTS** › **COM3 PROTOCOL** [1512] = **SUM/DIF.**
- Give each instrument its own address: **SERIAL PORTS** › **COM3 ADDRESS** [1513] = A, B, C or D.
- Enter the number of devices: **SERIAL PORTS** › **SUM UNITS NUMBER** [1509] = 2, 3 or 4.
- Set baud rate and frame format of COM3 ([1510], [1511]).

Once the communication is set, the total or difference value can be shown on the display of each instrument (section 5.4). Finally, set the behaviour of the outputs on each instrument with **OUT n LOAD SEL.** (section 8.4).

12 Serial communication protocols

In the strings below, ck ck stands for the two check-sum characters (section 12.7), CR for carriage return (ASCII 13), STX for start of text (ASCII 02), ETX for end of text (ASCII 03) and EOT for end of transmission (ASCII 04).

12.1 Single-channel: slave protocol

Communication is always initiated by the PC; the commands are transmitted as ASCII strings. Every generic command received correctly with the address of the device is acknowledged:

Case	Response
command successful	&&aa!\ckck CR
command received but with an error	&&aa?\ckck CR

&& = 2 characters string start (ASCII 38) · aa = 2 characters instrument numeric address · ! = ok (ASCII 33) · ? = ko/error (ASCII 63) · \ = separator (ASCII 92). If a command returns further information such as a weight, the response is given with the command. During a fault, every request is answered with a warning: load cell nominal capacity exceeded **&aass 0-L st\ckck**, incorrect load cell connection **&aass 0-F st\ckck** (s = space, ASCII 32; t = type of data requested).

Function	PC transmits	Instrument responds / remarks
set setpoint	\$aaxxxxxxy ckck CR	xxxxxx = 6 setpoint characters, y = A, B or C (setpoint 1, 2, 3); the setpoints are volatile until saved
save setpoints to E2PROM	\$aaMEM ckck CR	setpoints set from the PC are kept in RAM and lost at switch-off unless saved
read weight, setpoint, peak	\$aa j ckck CR	j = a, b, c (setpoint 1, 2, 3), t (gross weight), n (net weight), p (peak); response &aaxxxxxxj\ ckck CR; a negative weight starts with “-” (ASCII 45), e.g. -00082
zero-setting of the weight	\$aaZERO ckck CR	above the maximum resettable value the response is &aa# CR; the zero-setting is kept after switch-off
semi-automatic tare, gross > net	\$aaNET ckck CR	
net > gross	\$aaGROSS ckck CR	
read decimals and division	\$aad ckck CR	response &aaxy\ ckck CR: x = number of decimals, y = division value; with fixed zero y = 6 (division 10), 7 (20), 8 (50), 9 (100)

12.2 Safety version: slave protocol (weight request)

Communication is always initiated by the PC; the commands are transmitted as ASCII strings.

	String
Request	<ADDRESS> “N” EOT
Response	<ADDRESS> “N” <STATUS> <NET> <GROSS> ETX <CHECKSUM> EOT

- <ADDRESS>: instrument identifier, the ASCII character obtained by adding 80 h to the address number (address 1: 80 h + 01 h = 81 h).
- “N”: character N (4E h).
- <STATUS>: one character, coded as in the status table of section 12.4.
- <NET>, <GROSS>: 8 ASCII characters each, weight value right-justified. Above the maximum capacity the field is filled with ^; with a negative weight of more than 9 divisions it is filled with _.
- <CHECKSUM>: section 12.7.

12.3 Repeater / repeater C protocol

Baud rate 1200 ... 115200, string transmitted 10 times per second:

& N xxxxxx L yyyyyy \ ck ck CR

- & = string start (ASCII 38); N = net reference character (ASCII 78); xxxxxx = 6 ASCII characters of net or peak weight, right-justified (ASCII 48 ... 57).

- L = gross weight reference character (ASCII 76); yyyyyy = 6 ASCII characters of gross or peak weight, right-justified (ASCII 48 ... 57); \ = separator (ASCII 92).
- A negative weight starts with “-” (ASCII 45).
- With “Repeater C.” the net weight, gross weight or peak includes the decimal places, separated by a point. The characters available include any “.” or “-”. If the number of characters is exceeded, ^^^^^^ is transmitted for a positive weight and _____ for a negative weight.

12.4 Continuous weight transmission protocol

Used for continuous transmission, usually to a remote display. Baud rate 1200 ... 115200, string transmitted 10 times per second:

STX <STATUS> <WEIGHT> ETX <CK> EOT

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	1	1	tare entered	minimum weighing	stable weight	zero centre

<STATUS>: bit = 1 if the condition is true. <WEIGHT>: 8 ASCII characters, weight value right-justified; above the maximum capacity filled with ^, with a negative weight of more than 9 divisions filled with _. <CK>: 2 check-sum characters.

12.5 Single-channel: summing protocol

STX <ID> <NET> <GROSS> ETX <CK> EOT

- <ID>: instrument identifier A (ASCII 41 h), B (42 h), C (43 h) or D (44 h).
- <NET>, <GROSS>: 6 ASCII characters each, “0” ... “9” (30 h ... 39 h), without spaces or decimal point; with a negative weight the first character is “-” (2D h).
- <CK>: section 12.7.

12.6 Single transmission protocol

Transmitted when an input set to Txd is activated, on every serial port set to **NONE** or **SLAVE**:

<ADDRESS> <STATUS> <WEIGHT> ETX <CK> EOT

- <ADDRESS>: ASCII character obtained by adding 80 h to the address number (address 1: 81 h).
- <STATUS>: as in section 12.4.
- <WEIGHT>: 8 ASCII characters, weight value right-justified; overweight: filled with ^; underweight: filled with _; weight read error: **0-L**.
- <CK>: section 12.7.

12.7 Calculation of the check-sum

- Only the significant characters between the delimiters are used, the delimiters excluded (for example all characters between STX and ETX).
- The EXCLUSIVE OR (XOR) of the ASCII codes is calculated; XOR gives 1 when the number of 1s of the operands is odd, otherwise 0.
- The result in hexadecimal notation has 2 digits (0 ... 9, A ... F); the check-sum consists of these 2 characters.

Character	Decimal	Hexadecimal	Binary
0	48	30	00110000
1	49	31	00110001
t	116	74	01110100
XOR	117	75	01110101

In this example the check-sum is the character “7” followed by “5”: **\$01t75** CR (address 1, weight request, slave protocol of the single-channel version).

13 Safety version: troubleshooting

Problem	Possible cause	Solution
the instrument does not turn on	the power supply voltage is not as required	check the power supply voltage
the display shows IMBALANCE C1/C2	the load cell is not functioning or is not connected properly	check with a tester that there are 4 V between "Power supply +" and "Power supply -" and between "Reference +" and "Reference -"; check with a tester that the voltage between the + and - signal terminals changes while the load cell is loaded or unloaded
serial communication does not work properly	errors in the wiring or in the communication interface settings	check the wiring and the settings of the communication interface
the display shows CELL1 :ERR.CONN. or CELL2 :ERR.CONN.	the load cell on channel 1 or 2 is not connected properly	check the wiring of channel 1 or 2

14 Directives and standards

According to the manufacturer's declarations of conformity:

Version	Directive / regulation	Standards
Single-channel (EU, 11/08/2025)	2014/30/EU EMC	EN 61000-6-2:2005 · EN 61000-6-3:2007 + A1:2011 · EN 61326-3-1:2017
	2014/35/EU Low Voltage	EN 61010-1:2010 + A1:2019
Single-channel (United Kingdom, 11/08/2025)	Electromagnetic Compatibility Regulations 2016	BS EN 61000-6-2:2005 · BS EN 61000-6-3:2007 + A1:2011 · BS EN 61326-3-1:2017
	Electrical Equipment (Safety) Regulations 2016	BS EN 61010-1:2010 + A1:2019
Safety version (EU, 12/02/2026)	2014/30/EU EMC	EN 61000-6-2:2005 · EN 61000-6-3:2007 + A1:2011 · EN 61326-3-1:2017
	2014/35/EU Low Voltage	EN 61010-1:2010 + A1:2019
	2006/42/EC Machinery	EN 13849-1:2015 · EN 13849-2:2012; notified body TUV CYPRUS LTD (NB 2261)

The declarations of conformity are available on request.