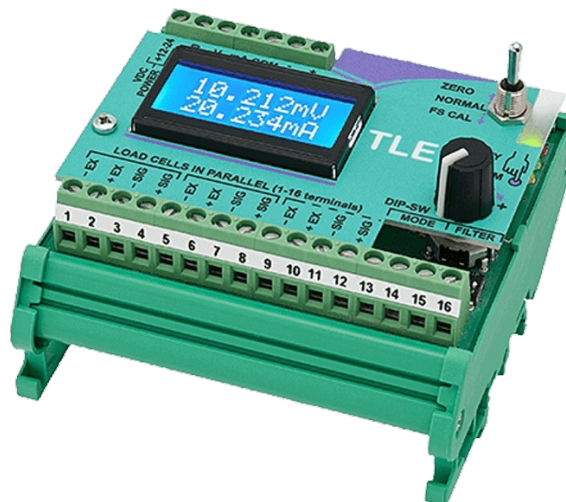


MANUAL

ETLA

ANALOGUE WEIGHT TRANSMITTER, RS485

Installation and user manual



Document	Version	Date	Applies to
Installation and user manual	V00x	10/2026	ETLA

This manual describes installation, connection, commissioning and calibration of the ETLA analogue weight transmitter and its RS485 serial port.



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1 About this manual

The instrument is operated without a keypad: with a three-position selector switch (ZERO, NORMAL, FS CAL), a knob control that is turned and pressed, and two DIP switches (MODE and FILTER). The controls are described in section 5.2.

Display texts are set in a fixed-width typeface, as they appear on the two-line display, for example **FS CAL** or **BLOCK**.

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.

2 Safety, warranty and disposal

2.1 Recommendations for proper use

- Keep away from heat sources and direct sunlight.
- Protect the instrument from rain.
- Do not wash with water jets.
- 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.

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 0 V DC) to the weighed structure with an earthing wire.

- Lead the cell cable individually to its panel input and do not share a conduit with other cables; connect it directly to the instrument terminal strip without breaking its route with support terminal strips.
- Use RC filters on the instrument-driven solenoid valve and remote control switch coils.
- Avoid inverters in the instrument panel; if inevitable, use special filters for the inverters and separate them with sheet metal partitions.
- The panel installer must provide electric protections for the instruments (fuses, door lock switch etc.).
- It is advisable to leave the equipment always switched on to prevent the formation of condensation.

Maximum cable lengths

Connection	Length
RS485	1000 m with AWG24 shielded and twisted cables
Analogue current output	up to 500 m with 0.5 mm ² cable

3.2 Installation of the load cells

Installing load cells

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

Protection of the cell cable

Use waterproof sheaths and joints in order to protect the cables of the cells.

Mechanical restraints (pipes etc.)

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

Connecting several cells in parallel

Connect several cells in parallel by using, if necessary, a watertight junction box with terminal box. The extension cables must be shielded, led individually into their piping or conduit and laid as far as possible from the power cables (with 4-wire connections use cables with 4 × 1 mm² minimum cross-section).

Welding

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

Wind, knocks, vibrations

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

Earthing the weighed structure

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

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

4 Load cell testing

Resistance measurement (with a digital multimeter)

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

Voltage measurement (with a digital multimeter)

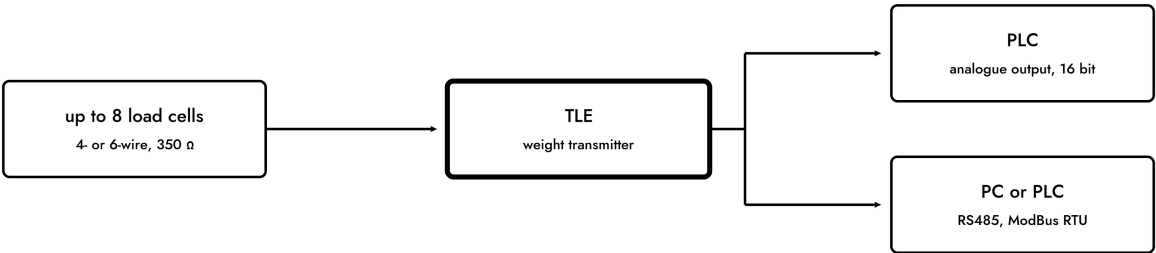
- Take out the load cell to be tested from underneath the container, or lift the container support.
- Make sure that the excitation of the load cell connected to the instrument is 5 V DC $\pm$ 3 %.
- Measure the response signal between the positive and the negative signal wire directly with the tester; 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 the technical assistance service.

5 Product description

5.1 Main specifications

- Analogue/serial weight transmitter for mounting on an Omega/DIN rail on the back panel. Dimensions 90 × 95 × 60 mm.
- 16 bit analogue output, current or voltage.
- RS485 serial output with Modbus RTU or continuous transmission protocol.
- Zero and full scale setting.
- Simultaneous display of the load cell reading in mV and of the analogue output value.
- Operating mode selection via a 3-position selector switch, DIP switches, knob control and a 2-line, 8-column alphanumeric display.



Overview: load cells, weight transmitter, analogue output and RS485.

5.2 Controls

Element	Function
Selector switch, position ZERO	tare weight zero setting (section 9.1); red LED lights up
Selector switch, position NORMAL	operation; green LED lights up
Selector switch, position FS CAL	full scale calibration (sections 9.2 and 9.3); yellow LED lights up
Knob control	turning modifies the flashing value, pressing confirms
DIP switch MODE	analogue output type (section 8.1)
DIP switch FILTER	filter on the weight (section 9.4)
Display, 2 lines × 8 columns	line 1: load cell reading in mV; line 2: analogue output value

6 Technical specifications

Item	Value
Power supply and consumption	12/24 V DC $\pm$ 10 %; 5 W
No. of load cells in parallel and supply	max. 8 (350 Ω); 5 V DC / 120 mA
Linearity / analogue output linearity	< 0.01 % F.S.; < 0.01 % F.S.
Thermal drift / analogue output thermal drift	< 0.0005 % F.S./°C; < 0.003 % F.S./°C
A/D converter	24 bit (16 000 000 points)
RS485 max. divisions	$\pm$ 200 000 ($\pm$ 10 mV with sens. 2 mV/V); $\pm$ 300 000 ($\pm$ 15 mV with sens. 3 mV/V)
Measurement range	$\pm$ 39 mV
Max. sensitivity of usable load cells	$\pm$ 7 mV/V
Max. conversions per second	300
Digital filter / readings per second	0.003 ... 4 s / 10 ... 300 Hz
Serial port	RS485
Baud rate	2400, 4800, 9600, 19200, 38400, 115200
Analogue current output, 16 bit = 65 535 divisions	0 ... 20 mA; 4 ... 20 mA (max. 400 Ω)
Analogue voltage output, 16 bit = 65 535 divisions	0 ... 10 V; 0 ... 5 V; $\pm$ 10 V; $\pm$ 5 V (min. 2 k Ω)
Humidity (non-condensing)	85 %
Storage temperature	-30 ... +80 °C
Operating temperature	-20 ... +60 °C
Dimensions	90 x 95 x 60 mm
Mounting	Omega/DIN rail, back panel

Important Equipment to be powered by a 12 ... 24 V DC LPS or Class 2 power source.

7 Electrical connections

7.1 Basic information

- It is recommended that the power supply negative pole be grounded.
- The instrument can supply up to eight 350 Ω load cells or sixteen 700 Ω load cells.
- Connect terminal 0 V DC to the RS485 common of the connected instruments if these receive alternating current input or have an opto-isolated RS485 port.

7.2 Terminals

Terminal	Marking	Function
1 · 5 · 9 · 13	–EX	load cell excitation –
2 · 6 · 10 · 14	+EX	load cell excitation +
3 · 7 · 11 · 15	–SIG	load cell signal –
4 · 8 · 12 · 16	+SIG	load cell signal +
17	+12-24	supply + (12/24 V DC)
18	0	supply – (0 V DC)
19	V	analogue voltage output +
20	mA	analogue current output +
21	COM	analogue output common –
22	RS485 –	RS485 –
23	RS485 +	RS485 +

Terminals 1 ... 16 form four groups with the same assignment; the load cells are connected to them in parallel (one cell per group in the wiring diagram of the source). The analogue output is taken between 19 (voltage) or 20 (current) and 21, depending on the type; current output max. load 400 Ω , voltage output min. load 2 k Ω .

Important 6-wire load cells: the instrument has no separate sense terminals. REF – is connected together with EXCITATION – to terminal 1 (–EX), REF + together with EXCITATION + to terminal 2 (+EX).

In the wiring diagram of the source the shields of the analogue output and RS485 cables are connected to 0 V DC (terminal 18), the shield of the load cell cable to –EX; the supply negative pole is grounded.

7.3 RS485 network

The instruments are connected in parallel to a shielded cable via RS485 +, RS485 – and 0 V DC (up to 500 m in the example of the source); the shield is earthed at one end. A PC with RS232 is connected through an RS232/RS485 interface converter.

Important If the RS485 network is longer than 100 m or baud rates higher than 9600 are used, connect two 120 Ω terminating resistors between “+” and “–” on the terminal strips of the instruments furthest away. With other instruments or converters, refer to their manuals.

8 Analogue output

8.1 Analogue output type selection

Set the DIP switch marked MODE:

DIP 1	DIP 2	DIP 3	Operation mode
OFF	OFF	OFF	0 ... 5 V
OFF	OFF	ON	0 ... 10 V
OFF	ON	OFF	± 5 V
OFF	ON	ON	± 10 V
ON	OFF	ON	4 ... 20 mA (default)
ON	ON	OFF	0 ... 20 mA

By default, the instrument is calibrated to convert the load cell 0 ... 10 mV to the selected analogue output value.

Important Modifying the type of analogue output brings the calibration back to the default values.

8.2 Active output, passive receiver

All analogue outputs of the instrument are ACTIVE and SINGLE ENDED; they can only be connected to PASSIVE receiver devices. The voltage or current output and the common (COM) go to the input of the receiver. The minimum load allowed for voltage outputs is 2 k Ω , the maximum load allowed for current outputs is 400 Ω .

9 Instrument commissioning

Power on the transmitter and wait 5 minutes until all the components have reached a stable temperature. Check that the display shows the mV value of the load cells and that this value increases when the load cells are loaded. If this does not happen, check the connections and the correct positioning of the load cells.

9.1 Tare weight zero setting

- Set the selector switch to ZERO; the red LED lights up.
- The display shows the load cell reading in mV and, flashing, the zero value of the selected analogue output (0 V, 0 mA or 4 mA). Adjust the analogue output value with the knob control.
- Hold the knob control down until the display reads **ZERO**.
- Release the knob control and set the selector switch back to NORMAL.

Note If the display reads **BLOCK**, zero setting is not enabled (section 12.2).

Zero setting can also be obtained by referring to the values read by devices connected to the instrument, such as the PC or PLC.

9.2 Real calibration (with sample weight)

Before the real calibration, select the type of analogue output (section 8.1) and perform the tare weight zero setting (section 9.1).

- Load onto the weighing system a sample weight of at least 50 % of the full scale value.
- Set the selector switch to FS CAL; the yellow LED lights up.
- The display shows the load cell reading in mV and, flashing, the corresponding value of the analogue output. Adjust the value with the knob control.
- Hold the knob control down until the display reads **FS CAL**.
- Release the knob control and set the selector switch back to NORMAL.

Note If the display reads **BLOCK**, calibration is not enabled (section 12.2).

Calibration can also be obtained by referring to the values read by devices connected to the instrument, such as the PC or PLC.

Example

The weighing system uses four 1000 kg cells, the 4 ... 20 mA analogue output has been selected and 20 mA shall correspond to 2000 kg. Check that the system is not loaded, perform the tare weight zero setting and load a sample weight of 1000 kg (50 % of the required full scale). Move the selector switch to FS CAL and set the analogue output to 12 mA with the knob control (range $20 - 4 = 16$ mA; half of the range $16 / 2 = 8$ mA; half of full scale $8 + 4 = 12$ mA). Hold down the knob control until the display reads **FS CAL**, release it and set the selector switch back to NORMAL.

9.3 Theoretical calibration

With this type of calibration the analogue output value corresponding to a given mV value read by the cell is set.

Note Theoretical calibration may be carried out with or without load cells connected. The analogue output is zero (4 mA for the 4 ... 20 mA output) when the value read by the cell is 0 mV.

- Hold down the knob control, set the selector switch to FS CAL within four seconds (the yellow LED lights up) and release the knob control.
- **5.000mV** flashes on the first line: adjust the value with the knob control and hold the knob control down for at least three seconds.
- On releasing it, line two starts flashing: adjust the analogue output value with the knob control and hold the knob control down for at least three seconds.
- On releasing it, the first line flashes again: confirm the settings by setting the selector switch to NORMAL, or change the values again by repeating the steps above.
- Ensure that the weighing system is not loaded and perform the tare weight zero setting (section 9.1).

Example

The weighing system uses four 1000 kg cells with 2 mV/V sensitivity, the 4 ... 20 mA analogue output has been selected and 20 mA shall correspond to 2000 kg. The instrument supplies the load cells with 5 V DC, so the cell full scale value is $2 \text{ mV/V} \times 5 \text{ V} = 10 \text{ mV}$. 2000 kg is 50 % of the system full scale ($4 \times 1000 \text{ kg} = 4000 \text{ kg}$); the values to enter are therefore 50 % of $10 \text{ mV} = 5 \text{ mV}$ and 20 mA.

9.4 Filter on the weight

A digital filter reduces the effects of weight oscillation. Set the DIP switch marked FILTER; for an increased effect (more stable weight) select a longer response time.

DIP 1	DIP 2	DIP 3	Response time [ms]	Display and serial port refresh [Hz]
OFF	OFF	OFF	3	300
OFF	OFF	ON	150	100
OFF	ON	OFF	260	50
OFF	ON	ON	425	25
ON	OFF	OFF	850	12.5 (default)
ON	OFF	ON	1700	12.5
ON	ON	OFF	2500	12.5
ON	ON	ON	4000	10

10 RS485 serial communication

Via the RS485 port the instrument transmits – continuously one way or on query (Modbus RTU) – the division value between 0 and 200 000 for load cell signal values between 0 and 10 mV. The protocol is selected with the address (section 12.2).

10.1 Continuous one-way transmission

The instrument transmits the number of divisions continuously as the string **xxxxxxCRLF**:

Characters	Meaning
xxxxxx	6 division characters (ASCII 48 ... 57)
CR	1 carriage return character (ASCII 13)
LF	1 new line character (ASCII 10)

10.2 Modbus RTU protocol

The Modbus RTU protocol reads the registers listed below according to the reference document Modicon PI-MBUS-300. Check whether the master in use (or the development tool) numbers the registers from 40001 or from 0: in the first case the number in the table applies, in the second the number in the table minus 40001 (e.g. register 40028 as 27). Values preceded by 0x are hexadecimal.

Data format

- 1 start bit; 8 data bits, least significant bit sent first; no parity; 1 stop bit.
- Only the READ HOLDING REGISTER command (code 0x03) may be used.
- The query frequency is linked to the set baud rate; the instrument waits for at least 3 bytes before calculating a response.

Query and response

Frame	Structure	Bytes
Query	address A · 0x03 · register 1 address 0x0000 · no. of registers 0x0002 · CRC	8
Response	address A · 0x03 · no. of bytes 0x04 · register 1 0x0064 · register 2 0x00C8 · CRC	3 + 2 × no. of registers + 2
Exception	address A · function + 0x80 · code · CRC	

No. of registers: number of registers to be read, starting from the register 1 address; no. of bytes: number of following data bytes. If a string is received correctly but cannot be executed, the instrument responds with an exceptional response; the function field is transmitted with the most significant bit at 1.

Code	Description
1	ILLEGAL FUNCTION – function not valid or not supported
2	ILLEGAL DATA ADDRESS – the specified data address is not available
3	ILLEGAL DATA VALUE – the data received have no valid value

The communication strings are checked by CRC (Cyclical Redundancy Check). In case of a communication error the instrument does not respond; the master must allow for a time-out before response reception and infers a communication error if no response is received. Examples for generating the control characters (CRC16) are given in the document Modicon PI-MBUS-300.

10.3 Registers

The registers may only be read. H and L are the high and the low half of a DOUBLE WORD value.

Register	Description
40007	status register
40008	divisions H
40009	divisions L

Status register (40007)

Bit	Meaning
0	cell error (ERCEL)
1	A/D converter malfunction (ER AD)
2	off-scale analogue output (ER OL)
7	division negative sign
10	instrument switched on
11	weight stability

11 Alarms

Display	Cause and behaviour
ERCEL	The load cell is not connected or is connected incorrectly, or its signal exceeds 39 mV; the analogue output generates the lowest possible value.
ER AD	The conversion electronics is malfunctioning; the analogue output generates the lowest possible value. Check the load cell connections, if necessary contact technical assistance.
ER OL	The calculated analogue signal is outside the range that can be generated (table below).

Analogue output value under alarm conditions

Output type	Minimum	Maximum
0 ... 10 V	-1.000	11.000
0 ... 5 V	-1.000	5.500
± 10 V	-11.000	11.000
± 5 V	-5.500	5.500
0 ... 20 mA	0.000	24.000
4 ... 20 mA	0.000	24.000

12 Reserved for the installer

12.1 Restoring factory values

- Turn off the instrument and set the selector switch to ZERO.
- While holding down the knob control, turn the instrument back on until the display shows **CANC / NO**.
- Release the knob control and set the selector switch to NORMAL.
- Rotate the knob control to display **YES** and confirm by pressing it: the instrument restarts and all parameters are restored to the factory values.

12.2 Access limitation, address and baud rate

Turn on the instrument, set the selector switch to NORMAL and hold down the knob control for five seconds until **Block / No** is displayed. Each parameter is selected with the knob control and confirmed by holding it down for at least three seconds; on release the next parameter follows, after the last one normal operation resumes.

Display	Setting
Block	No : access allowed · Yes : access denied for unauthorised staff – in the positions ZERO and FS CAL the display reads BLOCK
Address	0 : continuous division transmission at a frequency proportional to the baud rate (30 ... 300 Hz at 38400 bps) · 1 ... 99 : Modbus RTU slave on query
Baud	2400, 4800, 9600, 19200, 38400, 115200 bps (default 9600)

13 Directives and standards

According to the manufacturer's declarations of conformity (EU and United Kingdom, 21/11/2022):

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 (not applicable for the VDC type), Electromagnetic Compatibility Regulations 2016 – with the corresponding BS EN standards

The declarations of conformity are available on request.