

Tank-Spion Digital LX-2

Initial Operation and Handling:

The measuring and display system *Tank-Spion Digital LX-2* consists of the following components:

- Display unit, with probe voltage supply of 15 V
- Measurement probe (4 – 20 mA)
- Screw-in tank latch (1/1 "R / 3/2 "R)

The display unit has an analogue measuring input (left clamps 1 + 2) for connecting the measurement probe.

Depending on display setup and tank dimensions the probe signal results in an number display of four digits. Litres or m³ or inches or cm or percent can be setup to be displayed.

The display unit needs AC ~230V power (right clamps: PE, N, L).

The display unit has a serial output to connect with the input of other systems for remote monitoring (Tecson PC-Link protocol); e.g. the *GSM-Messenger* system from Tecson can be connected there directly.



Pay attention to:

- Only qualified experts are allowed to do the installation of the display unit and the measurement probe.
- The display unit is not qualified for operation in humid location.
- When the initial operation is done, it is not allowed to operate the unit with unclosed enclosure cover. The basic program setup can be done by a qualified expert with opened enclosure cover.
- The displayed values, particularly the values in litre display, are not calibrated for billing purpose. The precision required for this, is not available.

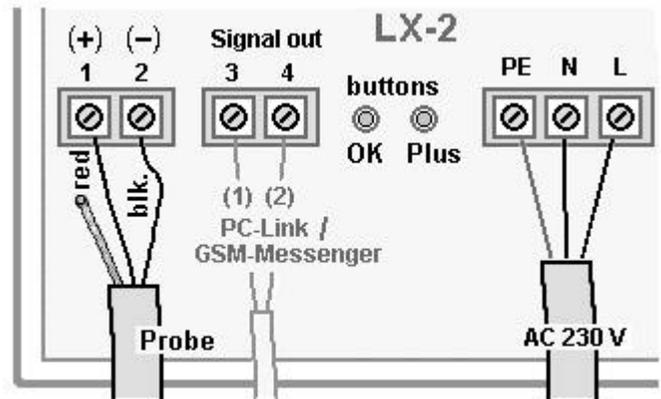
Installation and Initial Operation:

- 1) **Determine the tank height and the current fill level** and write it down.
- 2) **Preinstall the measurement probe**, according to the probes installation instruction, but **don't** lower the probe to the tank base now!
- 3) Lay the **connection line*** from the meas. probe to the display unit and **attach** it to the display unit as shown:
 - Clamp 1 <= (+) **red**
 - Clamp 2 <= (-) **black**

The probe cable* can be extended with a usual two wire control line (+ and -) up to 100 m and more. The capillary tube must be able to do air pressure ventilation.

At outdoor cable extension or in a tank ditch of underground tanks use the special clamp box (Tecson part no. 12080).

- 4) For the measurement probe **zero-point correction** (Calibration) you have to do the following once:
 - Activate the *Setup mode* of the display unit. When a new display unit is switched on for the first time the *Setup mode* is activated automatically. You can recognise this on the blinking first digit.
 - With plus button and OK button** (left) set display to '0 0 0 0', the forth display segment has to blink now.
 - Make sure that the **measurement probe is not plunged** and press the OK button again. When the display value is changed to '0 0 0 1' the zero-point value is stored, and the zero-point correction is done correctly.
- 5) When the zero-point calibration is done **lower the measurement probe** to the base of the tank. **Close** respective screw-in **the tank latch**.
- 6) Finally the tank dimensions have to be entered at the display unit, see page 2 : *Programming*.



* Prolongation of 100 m can be done with an unshielded two wire cable ($\geq 2 \times 0.4 \text{ mm}^2$). Only if it is placed near a high power cable, a shielded prolongation cable has to be chosen.

Programming:

For programming change to **Setup mode**, therefore shortly press both buttons. When setup mode is active the first digit is blinking. The decimal point represents the current setup step (step 1 to 4).



Enter the values by the 2 operating buttons **Plus** and **OK**. The active value is increased with the **Plus button (right)**. With the **OK button (left)** the current value is accepted.

Before you begin, determine the values which are needed for programming and write the values to the **Input value** column of the following table. Afterwards successively enter the values. For details refer page 3 and 4.

Step	Input function	Input values write down here first
<u>Condition:</u> 0. Zero point correction has been carried out once	For storing probe zero-point value set display to 0.000. With entering OK for the forth zero the value is stored. Display 0.001 means success. <u>Afterwards</u> lower the measurement probe to the base of the tank.	 (0)
<u>Enter tank data/dimensions</u>	Lower the probe to the base of the tank.	
1. Tank shape	Enter tank shape key number to digit 4 (See tank shape table on page 3) e.g. 0002 => cylindric tank shape	 (1)
2. Tank volume and positioning the decimal point	Enter tank volume in litres: 4 digits, add/omit 0 if needed, e.g. 5600 [litres] After that do shift the decimal dot to the right display position, e.g. for tank volume of 1000 m ³ move the point to position 3 and enter it by pressing the OK button.	 (2) . . ? .
3. Tank height	Enter tank height in millimetres or in inches/10 : e.g. 186 cm => 1860 [mm]	 (3)
4. Current fill level	Enter the current measured fill level of the tank in millimetres or in inches/10 : e.g. 0940 [mm]	 (4)
5. Step 5	Step 5 has no function, so enter "0000". By that in normally cases the setup have been finished.	 (5)
- finished -		
<u>Specific setup:</u> - only if needed -	Enter step 1 for specific rounding setup: - Therefore shortly press both buttons After changing the value use OK to move through the other steps and exit.	
1.(1) Display rounding - see page 3 -	Digit 1 : 0 => automatic rounding (recommended) e.g. : 5 => display rounding in steps of 20 (see page 3)	 (1)

<u>Example 1: Displaying LITRES</u>	<u>Example 2: Displaying m³</u> (e.g. 80 cbm cyl. tank)
<p><u>Input:</u> After probe zero-correction is performed once</p> <p>(1) Cellar tank lineary 0.0 0 1 (2) 6000 Litres, 6.0.0 0 Leave dec. dot at pos.4 . (OK) (3) 1650 mm tank height 1.6.5.0 (4) 1250 mm current level 1.2.5.0. (5) no function 0.0 0.0</p> <p>results in displaying => e.g. 4 5 5 0 [Ltr]</p>	<p><u>Input:</u> After probe zero-correction is performed once</p> <p>(1) ground tank cylindric 0.0 0 2 (2) 80 000 Litres 8.0.0 0 Shift decimal dot to position 2 : 2 x Plus then OK (3) 2480 mm inside diameter 2.4.8.0 (4) 1210 mm current fill level 1.2.1.0. (5) no function 0.0 0.0</p> <p>results in displaying => e.g. 3 9. 5 0 [m³]</p>

Subsequent correction of displaying:

While normal operating it is possible to re-adjust the display value to the current fill level at any time, e.g. after a complete fuelling.

Corrections can be done with: **left button => minus , right button => plus.**

During the corrections the display is blinking. Holding down the button will change the value quickly.

That overwrites the saved input value of step 4, this means these adjustments can be done alternatively.

Tank Geometry and Fill Level Display

Details for 1.(1) Rounding: Step 1 (digit 1) :

The display unit automatically rounds the value in a clever way.

Depending on tank height and tank volume the display value is rounded to full values of 10 or 5.

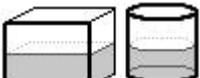
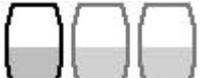
For individual cases (e.g. at tanks with huge volume) it is possible to change the rounding.

- 0 :** Standard setting - Normal automatic rounding!
- 1 :** rounding OFF - 1 step rounding = No truncation
- 2 :** rounding in steps of 2 - 2 step rounding (even values)
- 3 :** rounding in steps of 5 - Display in steps of 5
- 4 :** rounding in steps of 10 - Display in steps of 10
- 5 :** rounding in steps of 20 - Display in steps of 20
- 6 :** rounding in steps of 50 - Display in steps of 50
- 7 :** rounding in steps of 100 - Display in steps of 100
- 8 :** rounding in steps of 200 - Display in steps of 200
- 9 :** rounding in steps of 500 - Display in steps of 500

1.(4) Tank Shape Table:

Step 1 (digit 4)

- For direct litres display you have to determine the tank shape key number from the following table. Enter the key number in step 1 digit 4.
- For a linear translation from measurement data to display range **enter 1** for the key number.

Key number	Basic tank shape	
--- 1	linear tank or linear displaying cm or inches rectangular tank, standing cylinder, basement welded steel tank. (enter key no. 1 also for other linear measurement uses)	
--- 2	cylindric tank (see <u>alternatively</u> key number 9) horizontal cylinder (lying), tubular tank, (common design for steel tank / underground tank)	
--- 3	spheric tank Underground tank with spherical shape, often fiberglass underground tank.	
--- 4	oval tank oval basement tank, typical design of fiberglass tank and single casing steel plate tank	
--- 5	plastic battery tank, konvex	
--- 6	plastic battery tank, konkav	
--- 7	plastic battery tank with cavity plastic tank with one big cavity in the middle of the tank (longish battery tank without bandages)	
--- 8	reserved	
--- 9	cylindric outdoor tank or underground tank 50 - 100.000 Ltr For tank smaller than 50.000 Ltr see key number 2	 50 m³ - 100 m³

Details for 2. Tank Volume:

Step 2 (4 digits):

- Enter the total volume of the tank(s) in litres as a numeric value.
- For tanks of 10 000 litres and more the value has to be displayed in m³. In that case you have to enter the first 4 numbers of the volume and then shift the decimal point to position 2. ==> 21_50 [m³] (display example)
- For displaying percent values enter 1000 and shift the decimal point to position 3 accordingly. At a full tank you see ==> 100_0 [%] (display example)

Details for 3. Tank Height:

Step 3 (4 digits):

- Enter the tank height (internal tank dimension) in mm.
- For a tank with an external height of 1,87 m, the input value could be 1860 [mm] for the internal tank dimension.

Details for 4. Current Fill Level:

Step 4 (4 digits):

- Attention: The measurement probe has to be lowered before step 4 is reached! When this entry is done with a nearly empty tank, it is recommended to do a correction later on (see section Subsequent correction of displaying)
- Enter the current fill level in millimetres [mm]. If it is not possible to evaluate the heating oil tanks current fill level, enter estimated value. This value can be corrected later on.

Error codes:

To confirm a displayed error press the OK button.

Code	Meaning
E 0 0 1	Entered value is invalid
E 0 0 2	Probe measure value is too small. Perhaps probe not connected correctly. - <u>At</u> zero-point correction: If probe current is less than 3,5 mA then the probe is defective. - <u>At</u> programming step 4: Probe is <u>not</u> plunged. - <u>At displ. mode:</u> If probe current is 0 mA check connection. Otherwise probe could be defective. RETRY once: Switch off and on the AC power of the display unit and try once again.
E 0 0 3	Measured value is too large for zero-point correction. (The probe must <u>not</u> be plunged during calibration.) If probe signal is higher than 4,5 mA the probe could be defective.
E 0 0 4	Setup is possible only after zero-point correction (perform calibration again)
E 0 0 5	Entered height is greater than the tank height (wrong input)
E 0 0 6	Entered height is too large (Measured value is too small. Probe has to be plunged) RETRY once: Switch off and on the AC power of the display unit and try once again.
E 0 0 7	Entered volume is too huge (Measured value is too small. Probe has to be plunged)
E 0 0 8	Measured value too large. Probe current is too high. Switch unit off and on, repeat step 3 and step 4. At least repeat zero-point correction. At half full tank the probe signal should be less than 12 mA. At full tank the probe signal should be less than 20 mA. Otherwise the probe could be defective.
E 0 0 9	No probe current. The probe signal is zero. Maybe the probe is not connected correctly. Check cable prolongation and polarity.
E 0 1 0	Calibration fault. Disconnect the display unit from power supply, wait 5 sec. and connect again. Try again.
E 0 1 1	Lower probe to tank base. In case of relatively low level in the tank this is only a clue. Press OK to confirm and continue.

Note: At signal current of 2,0 - 2,5 mA disconnect or switch off the display unit, wait 5 sec. and switch on again

Technical Data	LX-2 :	Manufacturer:
Supply:	230V, 50Hz, 2VA	TECSON-DIGITAL Wulfsfelder Weg 2a D-24242 Felde
Measuring input:	4 - 20mA / U ₀ =15V / R _{Shunt} =100Ω	Fon: (+49) 4340 / 402530
Resolution:	10 Bit	Fax: (+49) 4340 / 402529
Precision:	+/- 1%	Internet: www.tecson.de
Temperature range:	0 - 45 °C	
The display unit is not suitable for operation in humid location		
CE conformity:	Under terms of EN50081-1, EN50082-1	