Setup and Operation

of 'TANK SPION LX' tank monitoring devices

LX-2 / LX-2-R	software version V5.1 or higher
LX-Q	software version V5.1 or higher
LX-NET / LX-Q-NET	software version V5.1 or higher
LX-GSM / LX-Q-GSM	software version V5.1 or higher

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Device setup and probe mounting

Concerning installation and mounting as well as regulations and operation please consult the corresponding device documentation.
The initial setup is to be carried out after completed mounting.

The monitoring devices of the LX-series are to be used for tank content measurement and if applicable for data forwarding or transmission.

For programming of the device the subsequent description is to be followed.
Ascertain holding the tanks data beforehand and enter them in the menu input steps.
To enter the menu mode from the displaying mode press the [Enter] push button.
To exit the programming confirm the 'Exit' menu item (step 0 or 7 or 8).
So you will return to the general displaying mode.

Control elements and display

The setup of the device has to be completed once during the initial setup. After the initial setup the device operates in the displaying mode with closed cover.

Display panel

The LCD-display consists of 2 rows of 16 characters.
The display has a background lighting for the best readability at all lighting conditions.
Depending on the number of linked tanks or measuring devices the following display is resulted:

One tank:

```
Tank/Liquid
Liter       Percent
```

Two tanks:

```
T1 Liter    T2 Liter
T1 Percent T2 Perc.
```

Three / four tanks:

```
T1 Liter  T2 Liter
T3 Liter  T4 Liter
```

For more than one tank the display of the single tanks can be set up additionally to the standard display above. Refert to menu item '14.Show tanks'.
For example as alternating display :

```
Tank-1 Name
Liter       Percent
```

...

```
Tank-2 Name
Liter       Percent
```

...

```
Total (L)
Single% T1,T2,T3,T4
```

Pushbuttons

The setup is to be carried out by three little blue pushbuttons: [+] [Enter] [-]
They are placed on the electronic PCB between the connecting clamps.

Language

The menu operating language is selectable via menu item 18 by pressing the buttons
[Enter] [+] [+] [+] . . . [Enter] . . .

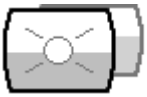
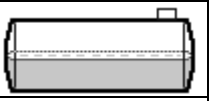
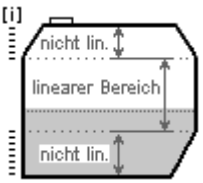
Setup / Programming

To enter the setup menu press the [Enter] pushbutton.
The setup menu consists of the basic menu items 1 to 7.
The specific menu items 9 to 24 contain extra adjustments.

To the device types LX-Q, LX-Q-NET and LX-Q-GSM more than one measuring probe can be linked for displaying. In this case the number of the tank is requested before the menu is entered. Press [Enter] one time and then elect the number of the tank by pressing [+] / [-].
The following parameter adjustments refer to that tank number.

Press [+] to navigate to a particular menu item. Enter the parameterization of a particular menu item by pressing [Enter] and confirm the selected the value.

Input function: ***Menu function***	***Description***	***For which device***
Preselection of **tank number i**	For more than one linked tank / measuring probe: select 'Tank number 1' ... up to 'Tank number 4'.	LX-Q-GSM LX-Q-NET LX-Q
0. Exit	Entering the programming mode. **Use [+] to go further.** Also leaving the programming. Leave with [OK].	all
1. Measure probe	Setup range of the level probe: range: **max.height of oil tank** Water column 100 mbar 1,25 m 1,00 m 150 mbar 1,85 m 1,50 m **200 mbar 2,50 m** 2,00 m **250 mbar 3,00 m** 2,50 m 400 mbar 4,90 m 4,00 m 500 mbar 6,00 m 5,00 m 1000 mbar 12,0 m 10,0 m 2000 mbar 20,0 m 5000 mbar 50,0 m Or 'Set mbar', for specific measuring range of the probe 'By calibration' is displayed when 'Trim height' or 'Trim vol.' has been executed in menu item 10/11 (probe not relevant).	(all) **Select the pressure range of the measure probe.** **Do not enter the liquid level here.**
2. Liquid	Selection of measuring liquid (specific weight of the liquid): Heating oil, water, diesel oil , bio diesel oil, AdBlue, motor oil, RME/FAME, rapeseed oil, palm oil*, gasoline*, ... Or enter the 'Density value' in xxx kg / m^3. Use [+] [-]. If the density value of the liquid is unknown calibrate the device via menu item '10.Trim height' 'By calibration' is displayed when 'Trim height' or 'Trim vol.' has been executed in menu item 10/11 In that case the parameter 'Liquid' (resp. density) is not relevant.	all * = with special type of probe *

3. Tank shape		Selection of the shape of the holding tank: **Alternatively** just 1 special tank geometry can be setup by a 'Bearing chart' for liter conversion.	all
	Linear	Default: Linear tank. Rectangular tank; vertical cylinder; steel cellar tank.	
	Cylindric horiz	Cylindric tank (alternative: Cyl. > 50m^3). Horizontal cylindric tank, up to 45 m³. Typical tank shape for outdoor tanks and sub-grounded steel tanks.	
	Ball-shaped	Spherical tank. Ball-shaped subgrounded tank; common subgrounded plastic tanks (GRP).	
	Oval	Oval cellar tank. Typical shape of GRP plastic tanks	
	Convex	Convex plastic tank, mostly as a battery. Slightly bellied tank shape	
	Concave	Concave plastic tank, mostly as a battery. Cave-bellied tank shape.	
	Holed plastic	Plastic tank with large cavity. Hollow in the middle of the tank's body. (No ring bandages)	
	Cyl. > 50m^3	Large cylindric outdoor tank with volume of 50.000 up to 100.000 liter or more. (alternative: 'Cylindric horiz.' - see above).	
	Bearing chart (input of 1 special chart) Value input from an existing bearing chart for the tank	Reference table: Basic value table with up to 15 pairs of values 'cm => liter' for the non-linear regions of the tank. Step 4 (Tank volume) and Step 5 (Tank height) have to be set up beforehand. Value pairs for 0% (0.0 cm => 0 L) and 100% (tank height => volume) are already set and do not have to be entered again. Index [1] xxx.x cm => xxxx L Index [2] . . . . . cm => . . . . L Index [n] . . . . . cm => . . . . L Non-linear region: Enter several value pairs. Linear region: Enter only begin and end pairs.	Unsymmetrical or other tank shape.  Individual tank shape
	Steel tanks	Steel tank or battery tanks group, mostly single-walled tanks: Linear side panels, w. hemicycles at top a. bottom.	

Input function: ***Menu main functions***	***Description***	***For which type of device***
4. Tank volume **4 b Display free space** **4 c** (Filling limit in %)	Enter the tank volume by [+] [-]. (100% value) Preadjustment is 0 L . The value must be entered. In case of tanks > 1.000.000 *units* see menu item 12 too. Attention: If a bearing chart is available, please utilize total value. For a buried tank of ~100 m^3 it may be e.g. 100600 liters. Display present free space of the tank? **Y**es / **N**o The free space is clearance in the tank to be filled up to the filling limitation. After entering **Y** you have to enter the percent value of the filling limit of the tank. (Pos. of the limit indicator; often 95 %)	all When **Y** has been selected the display shifts over from showing contend and showing the fillabel space.
5. Tank height	Enter the interior height of the tank in millimeters: e.g. 249.0 cm Attention: If a bearing chart is available it is recommended to take the max. value pair out of the chart. E.g. in case of a 100 m^3 subgrounded tank the exact value could be 288 cm.	all
6. Relay 1 or Exit	Switching function of relay 1: **Inactive** / Active / On / Off - Inactive Effect: The relay does not operate depending on the contents. No relay state is displayed or comes with the messages. - Active Effect: The relay operates depending on the contents level. - On Makes the relay operate (fix ON, closed). - Off Makes the relay release (fix OFF). Example: Switching point setup for 'Active' (with hysteresis): On 10% - Enter relay's operating point by + / - Off 15% - Enter relay's releasing point by + / - On +35°C - Enter relay's operating point by + / - Off +45°C - Enter relay's releasing point by + / - The relay is without switching function if both values are set to 0% and the temperature switching points are set to 0°C.	LX-2-R LX-GSM LX-NET
7. Relay 2 oder Exit	Inputs for relay 2 are analog to '6. Relay 1', see above.	LX-2-R
8. Exit	Press [Enter] to leave the setup mode (parameter input).	all
Menu items 9 – 24	Steps 9 – 24 contain special settings.	all

After entering and setup of step 1 to 7 the standard programming is completed. The device returns automatically to the usual displaying mode by confirming the 'Exit' step. The display shows the present tank content. Mount the device's cover after completing the inital setup!

Programming examples

Example 1 Cellar welded heating oil tank for 6000 L of heating oil, linear steel tank.
Interior height 165 cm, (current level: 125 cm) level probe 0 - **200 mbar**
Device LX-2-R: Relay 1 has to when rest stock is 500 liter (8%):

Menu item	Input
1. Measuring probe	200 mbar
2. Liquid	Heating oil
3. Tank shape	Linear
4. Tank volume	6000 Liter
5. Tank height	165.0 cm
6. Relay 1	Active => On = 8% ; Off = 10%
7. Relay 2	Deactive
8. Exit [Enter]	Displaying mode => ... 4550 L ... 76 %

Example 2 Buried tank, cylindric horizontal, for 100600 liter of diesel oil,
Interior height 2.88 m, (current level 54 cm), level probe 0 - **250 mbar**
Device LX-GSM with SIM card:

Menu item	Input
1. Measuring probe	250 mbar
2. Liquid	Diesel oil
3. Tank shape	Cyl. horizontal > 50.000 L
4. Tank volume	100600 L (exact value of bearing chart)
5. Tank height	288.0 cm (exact value of bearing chart)
6. Relay 1	Deactive
7. (Exit)	Go on to the next step by pressing [+]
. . .	...
15. Modem	PIN: xxxx - Enter the PIN code of the SIM-card.
. . .	...
19. Exit [Enter]	Displaying mode => ... 12 800 L ... 13 %

Example 3 Fountain, 7.50 m max. water level from ground (present level 4,20 m)
Probe TDS-6131 (measuring range 0-1000 mbar), **display in m of water level**.
Device LX-2-R. Relay 1 has to protect the pump against running dry (switch off):

Menu item	Input
1. Measuring probe	1000 mbar
2. Liquid	Water
3. Tank shape	Linear
4. *Tank volume*	(Volume) Alternatively max. level 7,50 m 750.0 [ ] (enter by +/-)
5. *Tank height*	(Max.level) 750.0 cm (enter by +/-)
6. Relay 1	Active => 'On' for 99 % ; 'Off' for 10 % of the level.
7. Relay 2	Deactive
8. Exit [Enter]. . .	Go forward to next step by pressing [+]
12. Unit	Set display unit to 'm'.
13. Rounding	Automatically (keep setup).
14. Exit [Enter]	Displaying mode => ... e.g. ' 4.20 m 56 %'

Tank with interior mantle

In case of tank with interior mantle (e.g. horizontal cylindric or cellar steel tank) correct the input values. Example: Mantle thickness ~ 0,5 cm to 1 cm => reduce interior height by ~ 2 cm

Volume up to 10 m³ => reduce volume by 3 %
Volume up to 20 m³ => reduce volume by 2.5 %
Volume up to 50 m³ => reduce volume by 2%
Volume up to 100 m³ => reduce volume by 1.5%

Setup special parameters

Input function: Additional functions	***Description***	***For which device***
Menu items 1 to 7	The menu items 1 to 7 are the basic setup of the devices. These steps are described before. Some special settings like language or network parameters or others have to be set up via menu items 9 to 24.	all
9.Offset probe	Sub-menu a. '**Offset calibration**' (electrical zero point) b. 'Probe bottom gap' (position over ground) c. 'Bottom dead stock' (shall not be displayed) - ESC Exit this sub-menu. - Offset calibration: Stores signal value of probe's zero poirt. Probe must not be plunged. - Probe bottom gap: Distance: x cm Standard is x = **0 cm**, max = 99 cm - Bottom dead stock: Sucking position over ground: y cm Standard is **0 cm**, means total contents. y > 0 cm means dead stock height which doesn't occur in the liter displaying - **Default values**: Resets all values back to standard 0.	all
10.Trim height	Input option for the reference height for calibration of probe and measurement device. It is useful in case of unknown specific weight of the fluid. Enter the beared liquid level: **xx.x** cm (+ / - / Enter). After confirming with 'Calibrate: Yes', then in step 1+2 'by Calibration' will be displayed instead of a value. If this is done at a low tank filling level it is recommend to repeat this later again at a higher filling level. Also refer to 11.	all
11.Trim volume	Fine trimming of current liter value. Enter the beared liquid content as **xxxx** L (+ / - / Enter). Confirm with 'Calibrate: Yes'. If this is done at a low tank filling level it is recommend to repeat this later again at a higher filling level. Also refer to 10.	all

12.Unit	Selectabel units are: **L** (Liter), %, m, kg, t (Tons), IG (Imp.gallons), UG (US gallons). (+ / - / Enter). With version 5.0 mbar and kPa are selectable. '%' or 'm' values are displayed with two decimal places.	all
13.Rounding	**Automatically** - Default setting for autom. rounding Without rounding - No rounding means highest resolution. Maybe wobbling values. A certain rounding is recommended => sedation. Or 2 / 5 / 10 / 20 / 50 / 100 [L] is selectable.	all
14.Show tanks or Exit	**- collective** - Displaying tanks without shifting-over. Liters of tank 1 to n will be displayed together, see page 2. or otherwise - single/detailed - Displaying tanks with shifting-over. All connected tanks are shown in detail by shift-over one by one. L + % (+ temperature) are displayed. - +Sum Σ: Yes/No Liter stock of all tanks is displayed beside the single tanks details; see p.2	Only at LX-Q LX-(Q)-GSM LX-(Q)-NET
15.Network or **15. Modem**	**At LX-(Q)-NET** : - DHCP . . . Sub-menu for network parameter setup like IP addresses, message destination and communication test. Please coordinate these settings with your network admin. See additional documentation 'network device connection'. **At LX-(Q)-GSM:** - Send SMS . . . A test SMS will be sent to the mobile number set by #T command. See additional documentation 'Messages, Commands a. Parameters'. - PIN . . . . Shows the PIN No. of the SIM card. PIN = 0000 deactivates the internal GSM modem completely.	Only at LX-NET LX-Q-NET Only at LX-GSM LX-Q-GSM
16.Sort tanks / Clear tank	'ESC' / 'Tank n' Deletion of a registered tank: If the LX-Q-xxx device detects a measure probe signal at the next input then this tank becomes registered at the next tank number (tank n). Here you may re-sort or delete the registered tank numbers.	Only at LX-Q LX-(Q)-GSM LX-(Q)-NET

Input function: Additional functions	***Description***		***For which type of device***
17.Input/Output	**Alarm-In :** . . .	Choose the function of the alarm contact input: - **Deactive** Defines the alarm input to not operating. - Opening If input contact opens for > 2 min. then alarm case will be entered. - Closing If input contact closes for > 2 min. then alarm case will be entered.	LX-GSM LX-NET
	Data-Out : . . .	Defines the data output at the adaptor slot. Choosable are: - Output of single tank data T1 / T2 / T3 / T4 => Applicable for analogue adaptor. - Output of all tanks T1 – T4 => Data of all tanks sequentially go to the output, - e.g. via the 'serial output adaptor' to PC-LINK or to H-Protocol- Box - or for the MBus Adaptor.	LX-Q LX-GSM LX-Q-GSM LX-NET LX-Q-NET
18.Language	**Language :** . . .	'**German**' / 'English' / 'French' / 'ESC', use + / - / Enter	all
	Names : . . .	Name and characters are overwriteable. Characters changeable by + / - / Enter - Tank 1: *abcabc* - Tank n: *xyzxyz* - Alarm name: *Alarm A*	all
19.Exit	Press [Enter] for returning to the displaying mode.		all
20. LCD display	By factory setup the contrast of the LCD display is a hexadecimal value of e.g. 24 . Contrast: XX		all
21. Device info	Shows Software version : V5.10 (e.g.) Serial no. : Tank i: SN=1234 (i = tank no.) Offset + Gain : X0=2980 B=1268 (for tank i)		all
22.Test current	Testing function for the current mA signal of the measuring probe: e.g. ADC = 28A1 = 4.01 mA In case of unplunged measuring probe the value should be near to 4 mA. Tolerance range is 3.7 ... 4.3 mA. If out of tolerance range, see menu item 9.Offset probe.		all

23.Test relay	Testing function for relay switching: Relay 1 = **Off** / On + / - / Enter Same for Relay 2 at device type LX-2-R. + / - / Enter	LX-2-R LX-GSM LX-NET
24. Reset	Resetting of the device software: - ESC : Leaves this sub-menu without execution. - Restart : New initialization of the device software but parameter setup is left unchanged. - Factory setting: Complete resetting and clearing of all parameters back to the original state of delivery.	all
25. Configuration	Internal controlling parameters. Sensitive! Don't change them. Exit with 'Cfg:0' [Enter]	all
26. Exit	Return to displaying mode…	all

Error codes / error display

Message	*Meaning*
Error **E 1**	Invalid input value.
Error **E 2**	Measuring value of the probe is too small ! If current is less than 3.5 mA => Probe error.
Error **E 3**	Measuring value is too high for zero-point calibration or offset calibration. The probe must not be plunged ! Probe's current higher than 4.5 mA indicates a defective probe.
Error **E 4**	Call step '9.Offset probe' and perform the calibration once. Then retry settings.
Error **E 5**	'Height' input is larger than tank height. (Wrong input.)
Error **E 6**	The measuring value is too small for reference. Make sure the probe is plunged. Settled height is too large (or means the measuring value is too small for setting). Execute step '9. Offset'. If it doesn't work check the probe current (mA) !
Error **E 7**	The current measuring value is too small for the corresponding tank height or the volume input value. Make sure the probe is plunged.
Error **E 8**	The current measuring value (mA) is too high. Check electrical connection and check the measuring range of the probe. Switch 230V supply off and on. Check input steps 1 to 5. Execute the zero-point calibration again (=> '9.Offset probe') and check step '22.Test current.' Otherwise replace the measuring probe.
Error **E 9**	The current value is 0 mA. The probe's connection could be broken. Check probe connection (polarity) and extension. Measure the voltage at the probe (red to black).
Error **E10**	Calbration error. Switch off and on the 230V supply voltage and retry. Otherwise the probe is working not properly.
Error **E11**	Warning – The liquid level in the tank is too low for an exact calibration. (Press [Enter] to continue anyway.)
Error **E12**	Yet no measurement data is received from the external tanks 2 ... 4.

For device type LX-NET / LX-Q-NET:

Info/Error-Messages at network communication

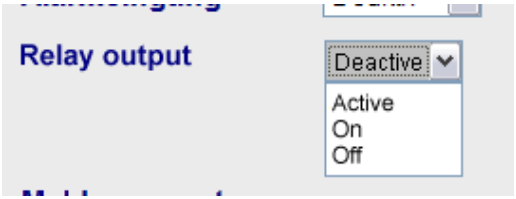
Error **N 1**	No network communication. A problem at the internal network module. The device automatically executes a 'Reset' for the internal network module and retrys initial communications. Try disconnection of network plug, wait… and remount the network plug.
Error **N 2**	Error at the network communication. Check the connections at the device and at the network router... Check parameter setup at menu item '15.Network'... Check the function '15.Network > Test > Ping: Yes' … Try to connect another network device at this network cable, e.g. a Laptop. If it does not work please contact your network admin. Error N2 only occurs in case of a domain like www.oilview.de is entered for destination. In case of entering an individual dest-IP, no Error N2 messages will be shown. Important: The destination adress must be a fixed IP address. Otherwise the device retrys sending again and again. When 'Sending...' is displayed periodically, it is caused by an unreachable destination IP address.
Sending ...	'Sending' is shown in the display in case of current sending of a data message. The message destination can be setup as an IP address at menu item '15.Network => Dest. ...' Periodically 'Sending...' will be displayed caused by an unreachable destination IP address. The destination should be a fixed IP address. IP + Port should be setup in correct manner.

XML-Data:	Call the device with command ***ip-address*** / **xml** via browser or program.

Remote controlling of the relay:

The LX-NET device supports a remote control function for the relay.

The output relay can be operated by remote commands from browser at the 'CONFIG' page of the LX-NET device.



Deactive = No switching
Active = State depends on level.
On = Makes the relay operate (fix).
Off = Makes the relay release state (fix).

For device type LX-GSM / LX-Q-GSM:

Error messages of GSM module / SIM card / Mobile network

Error **M 0**	GSM modem is inactivated. Entering PIN => 0000 deactivates the modem completely.
Error **M 1**	Internal communication error. The device automatically executes an internal RESET and retries communication with the internal modem again.
Error **M 2**	SIM card is not inserted or is not readable or is defective. Please check the SIM card in a mobile phone.
Error **M 3**	PUK code must be entered. Wrong PIN has been entered 3 times, so the SIM card is locked. Insert that SIM card in a mobile phone and enter PUK code to unlock it.
Error **M 4**	In case of a prepaid SIM card check the credit. Otherwise disturbance or network error when sending SMS.
Error **M 5**	No mobile network available for the SIM card. (An external antenna could help.)
Error **M 6**	In case of a prepaid SIM card check the credit. Otherwise disturbance or network error when sending SMS.
Error **M 7**	Mobile network logon failed or has been rejected.
Error **M 8**	Interlock is active! In case of lots of failed network logon trials the device will retry logon only once a day. This mode operates for 255 days. By pushing the [Enter] button the device does one logon trail to mobile network again. In case of successfully sending an SMS the interlock is cleared.
Error **M 9**	No destination mobile number has been set up. #T command has not been sent or OilView connection has not yet been linked.

Relay remote control:	The LX-GSM device supports a remote control function for the relay. The output relay can be operated by the #S remote commands send by SMS. See the additional documentation for GSM device parameter setup.

Maintenance:	It is recommended to check once a year if the displayed values are correct. Two practical check options are: - Lift the probe above the liquid level. Then check if ~ 0 L is displayed. - Check the cm value displayed in Step '10.Trim height' (without trimming!). In case of deviation it is recommended to recalibrate the measuring probe by menu step 9 or 10. But maybe the level probe is defective. **New measuring probe:** In case of replacement of the level probe it is recommended to call menu item '9.Probe offset' and execute the item 'Default values'!

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