SmartBox® 4 LAN / SmartBox® 4 LAN PRO

Electronic remote level gauge with network connection

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CERTIFICATE

Our management system is certified according to ISO 9001, ISO 14001 and ISO 50001, see:
www.gok.de/qualitaets-umwelt-und-energiemanagementsystem.

GENERAL PRODUCT INFORMATION

The electronic tank management system **SmartBox® 4 LAN, SmartBox® 4 LAN PRO** can be used for remote monitoring of the level in unpressurised tanks containing liquids.
In addition to recording the tank content and remote data transfer, other functions can be implemented by system enhancements, e. g. temperature measurement, reporting system faults or connection to master control systems of the building.

The **SmartBox® 4 LAN** has relay control functions, e. g. for activating external alarm devices, solenoid valves, or the dry-run protection of pumps.
Via an integrated interface, a maximum of three more level gauges indicators **SmartBox® 1, 2 or 3** can be connected and their measurements monitored remotely.

SmartBox® 4 LAN PRO allows the content of up to four tanks to be recorded and monitored remotely.
Because of its modular design, the system can be modified to suit many different applications.
The indicated measurements are not calibrated for invoicing.
SmartBox® 4 LAN has a 2-line LCD display, a measuring input for connecting the probe, a programmable relay with make and break switching output, a fault message input and an integrated network connection for remote data transmission.

SmartBox® 4 LAN PRO has a 2-line LCD display, four measuring inputs to connect the probes, a fault message input and an integrated network connection for remote data transmission.

SAFETY ADVICE

Your safety and the safety of others are very important to us. We have provided many important safety messages in this assembly and operating manual.
✓ Always read and obey all safety messages.

This is the safety alert symbol.
This symbol alerts you to potential hazards that can kill or hurt you and others.
All safety messages will follow the safety alert symbol and either the word "DANGER", "WARNING", or "CAUTION". These words mean:

⚠DANGER
describes a **personal hazard** with a **high degree of risk**.
➜ May result in **death or serious injury**.

⚠WARNING
describes a **personal hazard** with a **medium degree of risk**.
➜ May result in **death or serious injury**.

⚠CAUTION
describes a **personal hazard** with a **low degree of risk**.
➜ May result in **minor or moderate injury**.

NOTICE describes **material damage**.
➜ Has an **effect** on ongoing operation.

ⓘ describes a piece of information ✓ describes a call to action

WARRANTY

We guarantee that the product will function as intended and will not leak during the legally specified period. The scope of our warranty is based on Section 8 of our terms and conditions of delivery and payment.

ABOUT THE MANUAL

- This manual is part of the product.
- This manual must be observed and handed over to the operator to ensure that the component operates as intended and to comply with the warranty terms.
- Keep it in a safe place while you are using the product.
- In addition to this manual, please also observe national regulations, laws and installation guidelines.

NOTICE This assembly and operating manual is aimed at users and operators of this product. These persons must have read and understood the assembly and operating manual. ⚠ The physical and psychical requirements for proper and safe handling of the product must be ensured at all times!

INTENDED USE

Operating media

Operating media with consideration of the otherwise suitable probe type and accessories, see:

Please comply with the “Level gauge type FSA-W 4-20mA for SmartBox® 1 – 4” assembly and operating manual!

Comply with the “Level probe” assembly and operating manual!

You will find a **list of operating media** with descriptions, the relevant standards and the country in which they are used in the Internet at **www.gok.de/liste-der-betriebsmedien.**

⚠WARNING Escaping, liquid operating media:

- are hazardous to the aquatic environment
- are inflammable category 1, 2 or 3 liquids
- can ignite and cause burning
- can cause injury through people falling or slipping

✓ Capture operating media during maintenance work.

Installation location

- with type of protection IP30, in protected and dry rooms

⚠DANGER

May not be used in potentially explosive areas.

Can cause an explosion or serious injuries.

✓ Must be installed by a specialised company in accordance with local industrial health and safety regulations.

✓ Installation outside the defined EX protection zone.

NOTICE **Malfunctions caused by flooding!**

The product is not designed for installation in areas prone to flooding or risk areas.

✓ Following flooding, the product must be replaced!

INAPPROPRIATE USE

All uses exceeding the concept of intended use:

Display unit:

- changes to the product or parts of the product
- installation in a potentially explosive area

Probe:

- e.g. operation with different operating media
- operation with inflammable operating media of categories 1, 2 or 3 with a flash point < 55°C[1)]
- installation in pressurised tanks and containers

[1)] It is also necessary to comply with the divergent provisions/regulations of the EU member states concerning areas at risk of explosion and the flash point of the operating medium!

USER QUALIFICATION

This product may be installed only by qualified experts. These are personnel who are familiar with setting up, installing, starting up, operating and maintaining this product.
"Equipment and systems requiring supervision may be operated only by persons aged at least 18, who are physically capable and who have the necessary specialist knowledge or who have been instructed by a competent person. Instruction at regular intervals, but at least once per year, is recommended."

Activity	Qualification
storing, transporting, unpacking, OPERATION	trained personnel
ASSEMBLY, MAINTENANCE START-UP, SHUT-DOWN , REPLACEMENT, RESTART, RESTORATION, DISPOSAL,	qualified personnel, customer service
ELECTRICAL INSTALLATION	qualified electrician

ASSEMBLY

Before assembly, check that the product is complete and has not suffered any damage during transport.

ASSEMBLY must be carried out by a specialised company.

The specialised company and the operator must observe, comply with and understand all of the following instructions in this assembly and operating manual. For the system to function as intended, it must be installed professionally in compliance with the technical rules applicable to the planning, construction and operation of the entire system.
These regulations also include the accident prevention regulations of the employers' liability insurance associations, the VDE regulations, and the installation and operating instructions.

NOTICE The housing of the display unit is suitable for wall mounting and is connected to the 230 V mains supply. Under normal circumstances, the display unit must be operated with the housing cover closed.

⚠ It is installed and started up by a qualified technician while the unit is open.

⚠WARNING

Do not use this device for safety applications or emergency stop mechanisms or misuse it!

Injuries and damage to health and property through misuse.

✓ You must observe the information contained in these instructions, especially regarding installation, start-up and maintenance.

⚠DANGER

Damaged or destroyed insulation!

Can result in short circuit or electric shock.

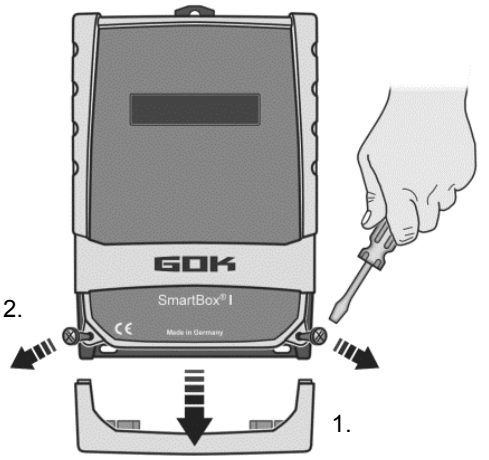
✓ Do not use the device if the insulation is damaged!

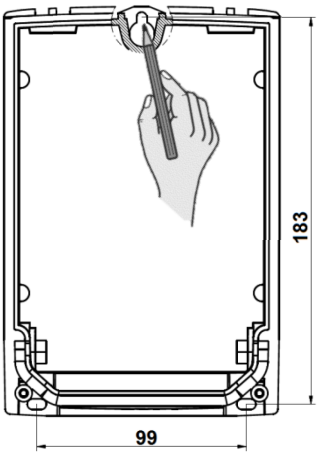
✓ Have new insulation installed by a specialised company!

Selecting the installation location

Before installing the SmartBox®, you have to check whether a free network connection is available at the intended installation location (see page configuring the network communication / device connection in the network / LAN).

Installation of the display unit





Mount the display unit to the wall in a suitable position.

1. Open the display unit by removing the bottom cover.
2. After loosening the 2 screws, open the display unit by removing the cover.
3. Mount the display unit to a smooth vertical wall by means of dowels. Mount the housing of the display unit by the four fixing holes with the enclosed screws and anchors. Take care not to damage the housing.
4. After connecting the terminals and setting the unit up, replace the covers.

Installing the level probe

See assembly and operating instruction “Level probe“.

Installing the probe

See assembly and operating instruction „FSA-W 4-20mA level gauge for SmartBox® 1 – 4“.

ELECTRICAL INSTALLATION see corresponding instruction „FSA-W 4-20mA level gauge for SmartBox® 1 – 4“.

ELECTRIC CONNECTION

Safety precautions for electrical components

CAUTION The functions and operating safety of the device are guaranteed only under the climatic conditions that are specified in TECHNICAL DATA. If the device is transported from a cold to a warm environment, condensation may cause the device to malfunction or may even destroy the device. Because of this, you must ensure that the device has acclimatised to the ambient temperature before using it.

CAUTION If you have any doubts that the device can be operated safely, do not operate it. Your safety may be adversely affected by the device, if for example:

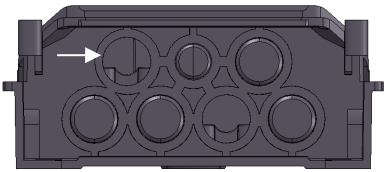
- it is obviously damaged
- it no longer works as specified
- it has been stored in unsuitable conditions for some time, if in doubt, send the device to the manufacturer for repair or maintenance

Connection line between display unit and probe

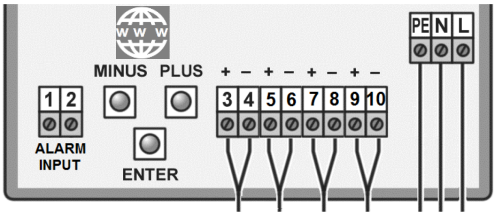
Voltage	probe supply 20V DC			
Connection	probe connection cable	**+**	**–**	
SmartBox® 4 LAN	probe - terminals	1	2	➜ Tank 1 Fig.①
SmartBox® 4 LAN PRO	probe 1 - terminals	3	4	➜ Tank 1 Fig ②
	probe 2 - terminals	5	6	➜ Tank 2
	probe 3 - terminals	7	8	➜ Tank 3
	probe 4 - terminals	9	10	➜ Tank 4

NETWORK CONNECTION

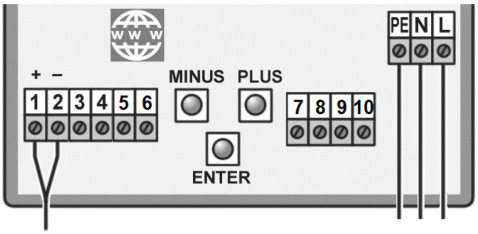
The network connection socket (RJ45) can be found in the device (see figure ① and ②). The network cable (performance class cat 5 or higher) must be guided through the left upper cable inlet into the housing. Remove the cable inlet and insert the cable through the slot in the cable inlet. Then, connect the network cable to the device and press the cable inlet down until flush.



ELECTRICAL INSTALLATION



SmartBox® 4 LAN PRO



SmartBox® 4 LAN

Connection of supply voltage: Voltage: 230 V AC 50 Hz
Connection: Terminals **PE** + **N** + **L** to the display unit (cable not included in the delivery)

Connection of relay contacts on the display unit SmartBox® 4 LAN

The display unit SmartBox® 4 LAN has two relay contact pairs for the connection of external control circuits or for activating external alarm or signal devices. In case of failure of the unit and if the fill level (and optionally temperature) is above the selected limit, the contacts of relay terminals **7 + 8** are closed, or **9 + 10** are open - see PCB in the display unit.

SmartBox® 4 LAN

Switching contact	normally closed (NC)	normally open (NO)
Relay	Terminals **7 + 8**	Terminals **9 + 10**

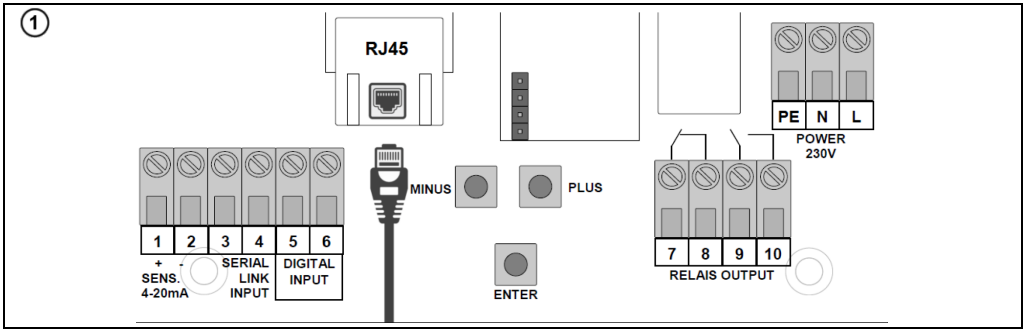
⚠CAUTION

Switching voltage: max. 250V AC
Switching current: max. 3,5A

⚠WARNING Excess voltage!

Damage to components and device defect.

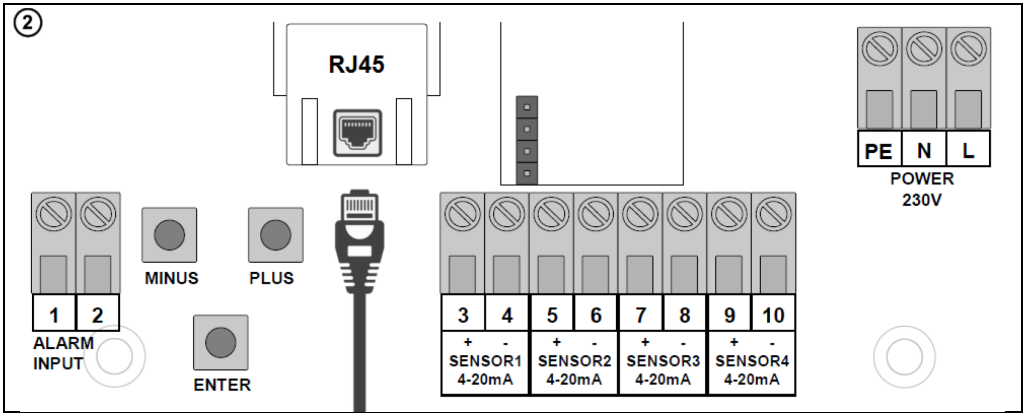
✓ No 230V AC connections may be made to terminals **3** + **4** and **5** + **6** and probe input terminals **1** + **2**!



Conncetion of the interface SmartBox® 4 LAN to SmartBox® 1, 2 or 3

Via the integrated interface “SERIAL LINK INPUT“ terminals (3 + 4), a maximum of three additional display unit SmartBox® 1, 2 or 3 can be connected and the measured values for the additional tanks (tank 2 to tank 4) can be monitored remotely.
For SmartBox® 1, SmartBox® 2 or SmartBox® 3, the two-pole output terminal “Serial Link Output“ terminals (3 + 4) is connected to terminals 3 + 4 (terminal 3 ➜ 3 and 4 ➜ 4) of the SmartBox® 4 LAN with a two-core cable (e. g. 2 x 0.4mm²).
If the tanks should be numbered in a defined sequence (tank 2 to 4), then SmartBox® 4 LAN must be activated first, followed by the other display unit in the desired sequence.

SmartBox® 4 LAN PRO



⚠WARNING Excess voltage!

Damage to components and device defect.

✓ No 230 V AC connections may be made to probe input terminals **3 + 4, 5 + 6, 7 + 8 and 9 + 10** and terminals **1** + **2**!

Connection of the fault signal input

A switch contact (make or break contact) can be connected to the fault message input; for a burner fault signal, for example. If a fault occurs, an alarm is indicated at the display (with an approx. 5-minute delay).

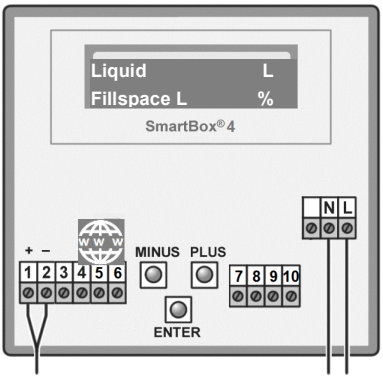
SmartBox® 4 LAN	Terminal 5 + 6 “DIGITAL INPUT“
SmartBox® 4 LAN PRO	Terminal 1 + 2 “ALARM INPUT“

START-UP

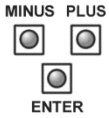
Operation elements and display

The device is adjusted once when it is put into operation. After start-up the device operates in display mode with the top closed.
The display is a two-line LCD display with 2 x 16 characters.
The display has blue background lighting for best readability in all lighting conditions.

SmartBox® 4 LAN has the following display:



The device is adjusted via the three small blue buttons:



These are located on the PCB between the terminals.

Choose the language (German, English, French or Spanish) in menu step 18. Language+Names.

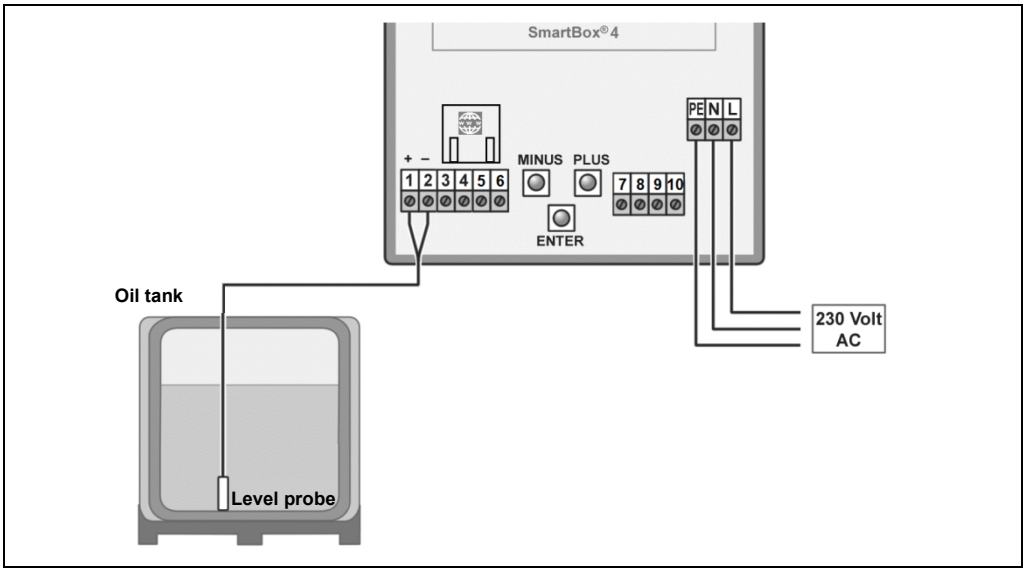
After the contents the display unit has been installed, it can be started up.

⚠WARNING Activating power supply:
Keep away from the area of the 230V terminal!

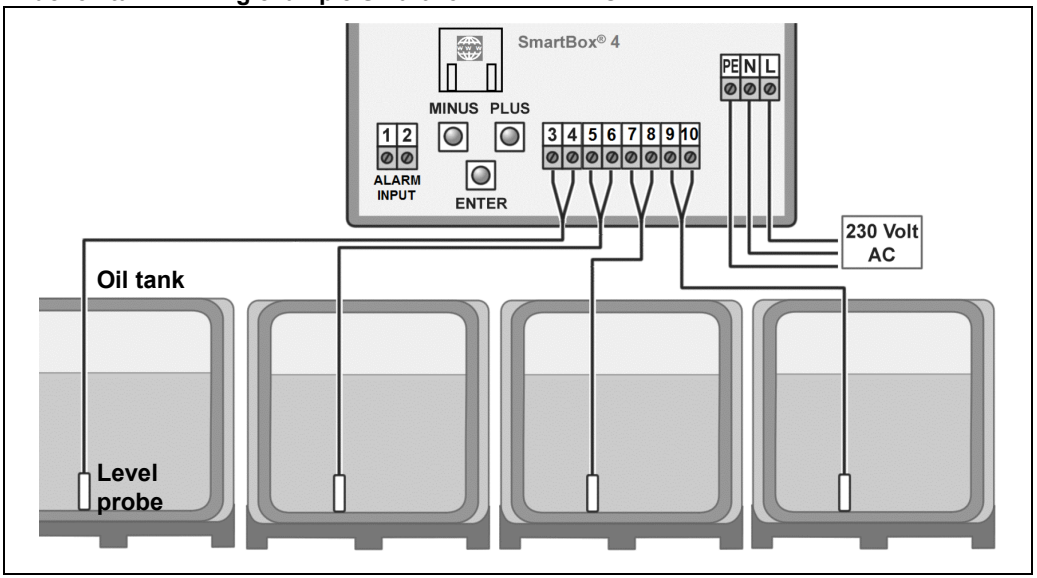
Activate power supply – the following is displayed

Heat oil	0L
-0L	100%

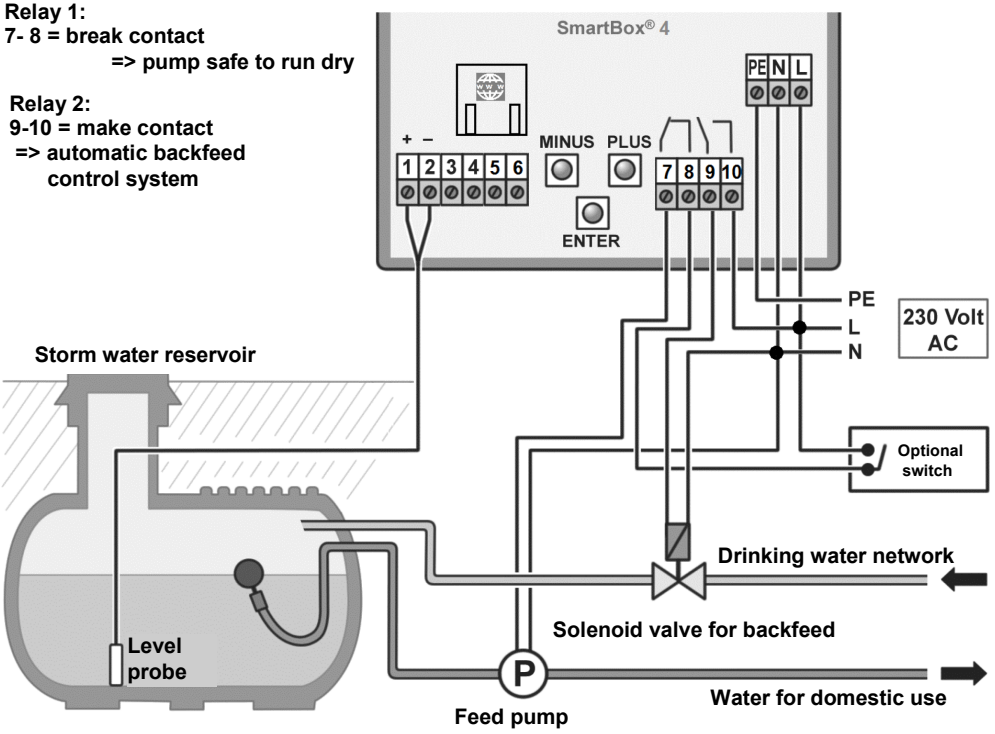
Fuel oil tank - wiring example SmartBox® 4 LAN



Fuel oil tank - wiring example SmartBox® 4 LAN PRO



Rain water tank - wiring example SmartBox® 4 LAN



TECHNICAL CHANGES

All the information contained in this assembly and operating manual is the result of product testing and corresponds to the level of knowledge at the time of testing and the relevant legislation and standards at the time of issue. We reserve the right to make technical changes without prior notice. Errors and omissions excepted. All figures are for illustration purposes only and may differ from actual designs.

PROGRAMMING

⚠WARNING Overfilling of the tank due to incorrect entry values.

Operating media may leak. These:

- are hazardous to water,
- are category 1,2 and 3 inflammable liquids,
- can ignite and cause burning,
- may cause falling injuries due to slipping.

✓ Enter these values with care!

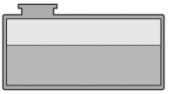
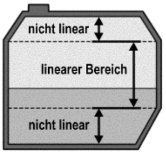
The entry values are also retained in the event of the failure of the supply voltage.

Programming the level gauge

Before programming, you need to ascertain the tank data and enter the values into the right column (Input value) of the following table. Then, enter the values for the individual entry steps.

Setting a parameter:	Press [ENTER] to open setup mode. Select the desired setting parameter via [PLUS]. Press [ENTER] to call up the value selection for the parameter. Set the value with [MINUS]/[PLUS], press [ENTER] to save.
Quitting the setup mode:	You can quit the setup mode at any time. Select “Exit“ and press [ENTER] ➜ to go back to the standard display mode.

Menu	**Input function**			**Input value**
Tank: 1 ➜ SmartBox 4 LAN PRO	Select the tank (tank: 1 to tank: 4) to enter the corresponding values. (This step is not displayed if only one probe is connected to SmartBox® 4 LAN PRO.)			**Tank:_____** **Tank:_____** **Tank:_____** **Tank:_____**
0.Exit	Press [ENTER] to return to display mode			
1.Measure probe	Select probe measuring range **see type label of the probe** - **default setting** 250 mbar			**_____mbar**
	Standard probe	**max. tank height for**		
		fuel oil	**water**	
	100mbar	1.20m	1.00m	
	150mbar	1.80m	1.50m	
	160mbar	1.90m	1.60m	
	200mbar	2.40m	2.00m	
	250mbar	2.90m	2.50m	
	400mbar	4.70m	4.00m	
	500mbar	6.00m	5.00m	
	1.000mbar	12.00m	10.00m	
	2.000mbar	24.00m	20.00m	
	3.000mbar	36.00m	30.00m	
	5.000mbar	60.00m	50.00m	
	set mbar			
2.Liquid	Select the **medium**			**_____kg/m³** If the density of the stored medium is unknown, the reference height can be entered in menu item “10.Trim height”
	Medium	**Density value kg/m³ (15 °C)**		
	Heat oil	845kg/m³ - default setting		
	Water	999kg/m³		
	Diesel	830kg/m³		
	Biodiesel	880kg/m³		
	RME, FAME	880kg/m³		
	Rape oil	915kg/m³		
	Palm oil	910kg/m³		
	Motor oil	865kg/m³		
	AdBlue	1090kg/m³		
	Regular gasoline	743kg/m³		
	Premium gasoline	750kg/m³		
	Density value	Enter a special density value		

Menu	Input function	Input value
3.Tank shape	Select Tank shape with [Enter]	
Linear	**Default setting** linear tank, rectangular tanks, vertical cylinders, basement-welded steel tanks.	
Cylinder horizontal	**cylindrical** tank with arched ends horizontal tanks, tubular tanks typical shape for steel outdoor or buried tanks.	
Ball-shaped	**spherical** tank; buried tanks with spherical basic shape; frequently plastic buried tank (GRP).	
Oval	**oval** basement tanks; typical shape of GRP tanks and single-walled sheet metal tanks	
Convex	Plastic battery tanks, **convex,** slightly convex shape, alternative to linear	
Concave	Plastic battery tanks, **concave,** slightly concave shape, alternative to linear	
Holed plastic	Plastic tank with recess Plastic tank with a large recess (hollow) in the center (without tape bindings)	
Tube w. flat ends	**Lying cylindrical** tank with flat ends, tube segment with straight end plates. Typical tank shape for smaller diesel tanks.	
Metal oil tanks	**Plate tank or plate tank battery** linear side walls, with semicircular arc top and bottom.	
Bearing chart	Enter a special tank shape from existing bearing chart. For this purpose, up to 16 value pairs (height in cm + volume in L) can be entered. Before the value pairs are entered, the values for the tank volumes **must** be entered in in steps "4.Tank volume" and "5. Internal tank height".	

Index: 0 ➜ 0cm ➜ 0L ➜ Specified value pair (do not have to be entered).

Index: 1 ➜ xxx.x cm ➜ xxxx L first value pair entered
Index: 2 ➜ . cm ➜ L
Index: 3 ➜ . cm ➜ L

max. ➜ max. inside height of tank ➜ the max. tank volume menu step “5.Internal tank height” is allocated automatically and does not have to be entered.
Index:16 ➜ max. cm ➜ max. L

Not all 15 intermediate value pairs (Index: 1 - 15) have to be entered.
A linear interpolation is made between 2 interpolation values. For a linear range of the tank geometry it is sufficient to enter a lower and an upper value pair.

Menu	Input function		Input value
4.Tank volume	Adjust the tank volume with [+] / [-] (100%). The default setting is 0 L. The value must be set. ⚠ Please see a volume table for the highest value, if available. For a 100 m³ cyl. buried tank, this may for example be the value 100600 litres.		_____L
5.Tank height	Enter inner tank height in millimetres: e. g.: 249 cm (max. value = 999,9 cm) (height without dome) ⚠ Please see a volume table for the highest value, if available. For a 100 m³ cyl. buried tank, this may for example be the value 288 cm.		_____mm
5b.Filling limit	Set the filling limit of the tank with [+]/ [-]: With fuel oil tanks, that is the shut-off point of the limit indicator. The default setting is 95%. e.g. 95%=237cm. For tanks which can be filled to the very top (e.g. water tanks), it is necessary to set the highest value of 99%.		_____%
6.View ➜ SmartBox 4 LAN	In the 1st line of the display, the tank name/medium and contents are displayed (e.g. in litres). The display in the 2nd line can be selected: View details e.g. Single/detailed: Fillspace+Percent a); Fillspace+Level b); Percent+Level c) For fuel oil tanks in Germany, a free capacity display is required according to TRwS 791-2. This is possible with selection a) and b).		_____
6.View Tanks ➜ SmartBox 4 LAN PRO	Single/Detailed	The tanks are displayed cyclically one after the other, with L, % and, if applicable, temperature. With display change.	
	Collective	The (eg. L) values of tanks 1 to 4 are displayed (depending on the number of connected probes) Without display change.	
	Percent: Yes / No	Select Yes ➜ display change values (eg. in L) Tank 1 – 4 ➜ total capacity display + percent values	

⚠WARNUNG Entering incorrect switching points and mixing up the switch-on and shut-off point can lead to the overfilling of the tank or the dry running of a pump!

7.Relay 1 ➜ SmartBox 4	Switch function relay:	
	Deactive	The relay does not switch.
	Active	The relay switches .
	On	Forces the relay to energise.
	Off	Forces the relay to de-energise.

	Example of switch point setting for Active (with hysteresis): Enter switching points as % values from 01 - 99 (and/or enter as °C value from -99 to +99 only for probe **with temperature measurement**) `deactive` ➜ activate with [+] / [-] to `active` ➜ press [Enter] to confirm ➜ `On 10%` ➜ ON: set with [+] / [-] ➜ [Enter] `Off 12%` ➜ OFF: set with [+] / [-] ➜ [Enter] `On +0°C` ➜ ON: set with [+] / [-] ➜ [Enter] `Off +0°C` ➜ OFF: set with [+] / [-] ➜ [Enter] **Deactivate** the relay via `deactive` or input of `0%` or `0°C` (for `On` and `Off`).	**ON** _____**%** **OFF** _____**%** **ON** _____**°C** **OFF** _____**°C**
`7.Exit` ➜ `SmartBox 4 PRO` Press [Enter] to return to display mode		
`8.Exit` Press [Enter] to return to display mode		

After performing entry steps 1 - 7, the programming process is completed.
After confirmation of step "8.Exit", the device automatically returns to default display mode; the current tank content is shown in the display.
Special functions are available under entry steps 9 to 24.
After the end of setup, do not forget to replace the housing cover!
After completing the ASSEMBLY and PROGRAMMING, carrying out a function check is recommended (FUNCTION CHECK section).

EXAMPLES FOR PROGRAMMING

Example 1: Basement tank for 6.000 litres fuel oil, litre display, linear steel tank
Inner height 165cm, (fill level 125cm)
SmartBox® 4 LAN with standard probe 0 - 250mbar

Step	Entries / selection
`1.Measure probe`	`250mbar`
`2.Liquid`	`Heat.oil`
`3.Tank shape`	`Linear`
`4.Tank volume`	`6.000L` (set with [+] / [-] keys)
`5.Tank height`	`165.0cm` (set with [+] / [-] keys)
`5b.Filling limit`	`95%=157cm` (set with [+] / [-] keys)
`6.View` ➜ `View details`	`Fillspace+Percnt` display 2. line - (set with [+] / [-] keys)
`7.Relay`	`Deactive`
`8.Exit` ➜ press [+] to go to	
`15.Network`	`DHCP: Yes`
`16.-18.` ➜ press [+] to go to	
`19.Exit` ➜ press [Enter] to see the indication	`Heat.oil 4.550L` `-1.150L 76%`

Example 2: Buried tank, cylindrical, horizontal, for 100.600 litres diesel oil
Inner height 288.6cm, (fill level 54cm)
SmartBox® 4 LAN with 4 standard probes 0 - 250mbar
The relay is to be used as an dry-run protection for a pump.
Relay - On at > 11% - Off at < 10%

Step	Entries / selection
1.Measure probe	250mbar
2.Liquid	Diesel (set with [+] / [-] keys)
3.Tank shape	Cyl.horizontal (set with [+] / [-] keys)
4.Tank volume	100.600L (exact value from volume table, set with [+] / [-] keys)
5.Tank height	288.6cm (exact value from volume table, set with [+] / [-] keys)
5b.Filling limit	97%=279cm (set with [+] / [-] keys)
6.View ➜ View details	Fillspace+Percnt display 2. line - (set with [+] / [-] keys)
7.Relay ➜ Active ➜ Limiting tank:1	Switch-on: 11% ➜ Switch-off: 10% (set with [+] / [-] keys)
8.Exit ➜ press [+] to go to	
15.Network	DHCP: Yes
16.-18. ➜ press [+] to go to	
19.Exit ➜ press [Enter] to see the indication	Diesel 12.800L -84.800L 13%

Example 3: 4 Basement tanks for 15.000 litres fuel oil, litre display, linear steel tank
Inner height 220cm, (fill level tank 1 = 125cm)
SmartBox® 4 LAN PRO with 4 standard probes 0 - 250mbar
connection to Smart-Inspector-database

Step	Entries / selection
Tank number:	1 (2,3,4)
1.Measure probe	250mbar
2.Liquid	Heat.oil
3.Tank shape	Linear
4.Tank volume	15.000L (set with [+] / [-] keys)
5.Tank height	220.0cm (set with [+] / [-] keys)
5b.Filling limit	95%=209cm (set with [+] / [-] keys)
6.View tanks ➜ Single/detailed	➜ Collective ➜ Percents: Yes (L ➜ Σ ➜ % are displayed alternately)
7.Exit ➜ press [+] to go to	
15.Network	DHCP: Yes ➜ Destination ➜ SmartInspector
16.-18. ➜ press [+] to go to	
19.Exit ➜ press [Enter] to see the indication	8.500L 8.520L ➜ Σ 34.120L ▙▙▙▙ 8.540L 8.560L 57% 57% 57% 57%
➜ For Tank 2-4 repeat the entry with the correct value in the same way as with tank1	

Tanks with inner shell
For tanks with an inner shell (e.g. cylindrical horizontal or tanks welded together in the basement) the data in steps "4.Tank volume" and "5.Internal tank height" must be corrected.
Examples:
- ➜ Wall thickness of inner casing 0.5cm ➜ reduce value for inner height by approx. 1cm, reduce volume for 10m³ by 1.3%, for 20m³ by 1 %, for 50m³ by 0.8% and for 100m³ by 0.7 %.
- ➜ Wall thickness of inner casing 2cm ➜ reduce value for inner height by approx. 4cm, reduce volume for 10m³ by 5%, for 20m³ by 4%, for 50m³ by 3% and for 100m³ by 2.5%.

NOTES ON PROGRAMMING

Menu	Setting	Description
9.Offset probe		Adjusting: • Probe zero point, electric • Position / Distance from base • Unusable capacity that is not to be displayed
	ESC	Exit the menu
	Offset calibr.	New measurement of probe zero point (electric). ⚠ Lift **level probe** out of the liquid beforehand.
	Probe bottom gap	Probe pos: x cm; normal reference is x = 0cm, max = 99cm
	Bottom deadstock	Sucker pos: y cm Normal reference is 0cm = complete capacity. y > 0cm means corresponding unusable capacity.
	Default values	Reset values from menu step 9 to **factory settings.**
10.Trim height	xxx.x cm	Entry option for the reference height for the 2-point measurement, for other probe measurement range or for an unknown density. Subtract 1.0cm from the actual measured level and enter this value.
	Calibrate:No Calibrate:Yes	If activated (Yes), the display in menu steps "1.Measure probe" and "2.Liquid" is then "by Calibration". **NOTICE** If this is entered with an almost empty tank, it is recommended that you make a correction the next time it is filled.
11.Exit		Press [Enter] to return to display mode
12.Unit	L default settings m³ % m kg IG UG t mbar kPa	litre: 999900L cubic meters: 2.50m³ percent: 99.50% meter: 2.50m kilogram: 999900kg imperial Gallon: 219750IG US liquid gallon: 263900UG ton: 2.50t millibar: 500mbar kilopascals: 50kPa

Menu	Setting	Description
13.Rounding	Automatically non rounded 20L 50L 100L 200L 500L 1.000L	Default settings: minimal increments Rounding increments in relation to the set volume set with [+] / [-] keys
14.Exit		Press [Enter] to return to display mode
15.Network	DHCP: YES DHCP: NO	Select whether to automatically obtain the IP address or directly specify it.
	➜ Detailed description of all the adjustable parameters look at CONFIGURING THE NETWORK COMMUNICATION.	
16.Sort tanks ➜ with SmartBox 4 LAN	ESC	Exit the menu
	Delete Tank n	Delete the registered Tank
	T2<->T3	Replace Tank 2 for Tank 3
	T2<->T4	Replace Tank 2 for Tank 4
	T3<->T4	Replace Tank 3 for Tank 4
16. Delete tank ➜ with SmartBox 4 LAN PRO	ESC	Exit the menu
	Delete Tank n	Settings for tank n are deleted and reset to default settings (tanks 2, 3, 4)
17.Input/ Output	Alarm-In:	Sets the function of the alarm contact input
	Closing	Closer alarm. Input closed ➜ Alarm
	Opening	Opener alarm. Input contact opens ➜ Alarm
	Deactiv	⚠ Sets the alarm input functionless
	Data-Out:	Defines the data output on the output adapter slot
	Tank: 1 Tank: 1-4	For data output a selection can be made between • Output single tank 1, 2, 3 or 4 ➜ for analogue adapter • Output “1-4” ➜ all tanks are output sequentially ➜ via digital slot-in adapter – e.g. for H-Box
17b. H protocol	Data output: Deactiv Data: Litres Data: Level	Data output to H Box (only with DTM-2): • Deactivated • Output in litres • Output in level
18.Language	Language:	German, English, French, Spanish [+] / [-] / [Enter]
	Names:	ESC [+] / [-] / [Enter] Name Tank 1: Suggested name Letters can be changed with [+] / [-] / [Enter]
19.Exit		Back to display mode

Menu	Setting	Description
20.LCD display	Contrast: 90	Set the contrast of the LCD display
21.Device info		Software version:V7.00 (e. g.) Serial number: Tank 1: SN=1234 (e. g.) Offset+Gain:X0=4.05mA B=1268 (Tank 1)
22.Test current		Test function for the current mA value of the **probe**: ADC: 7400=11.40 mA If **level probe** is not submerged, the value should be close to 4 mA. Tolerance range is 3.7 ... 4.3mA.
23.Test relay ➜ SmartBox 4	**⚠WARNING** Furthermore, devices connected on the relay contact will also be switched on and/or off! • Connected devices can be damaged (dry running). • Operating media may leak. ✓ Disconnect the devices connected before test relay. ✓ Only reconnect the devices again **after** test relay.	
	Relay 1 ON/OFF	Test function for the switch function of relay
24.Reset	ESC	Reset the device software: Exit this function without executing it.
	Restart	Initialization. The device software restarts and keeps all device settings.
	Factory settings	Complete reset of all parameters to the original delivery status.
	Reset password	Password resetting to default ‘tank‘.
26.Exit		Press [Enter] to return to display mode

SmartBox® 4 LAN
-Activation of other indicators (and assignation of the respective tank numbers)

Numbering the tanks (if applicable)
The level gauge SmartBox® 4 LAN always has tank number 1.
If other level gauge SmartBox® 1, 2 or 3 (display unit) are to be connected, they must be assigned defined tank numbers. The tank numbers are simply assigned in the sequence in which the display units log on for the first time.

- First, activate display unit 2 for tank number 2 (switch on mains voltage), then for display unit 3, and so on.

Example: Activate tank 2

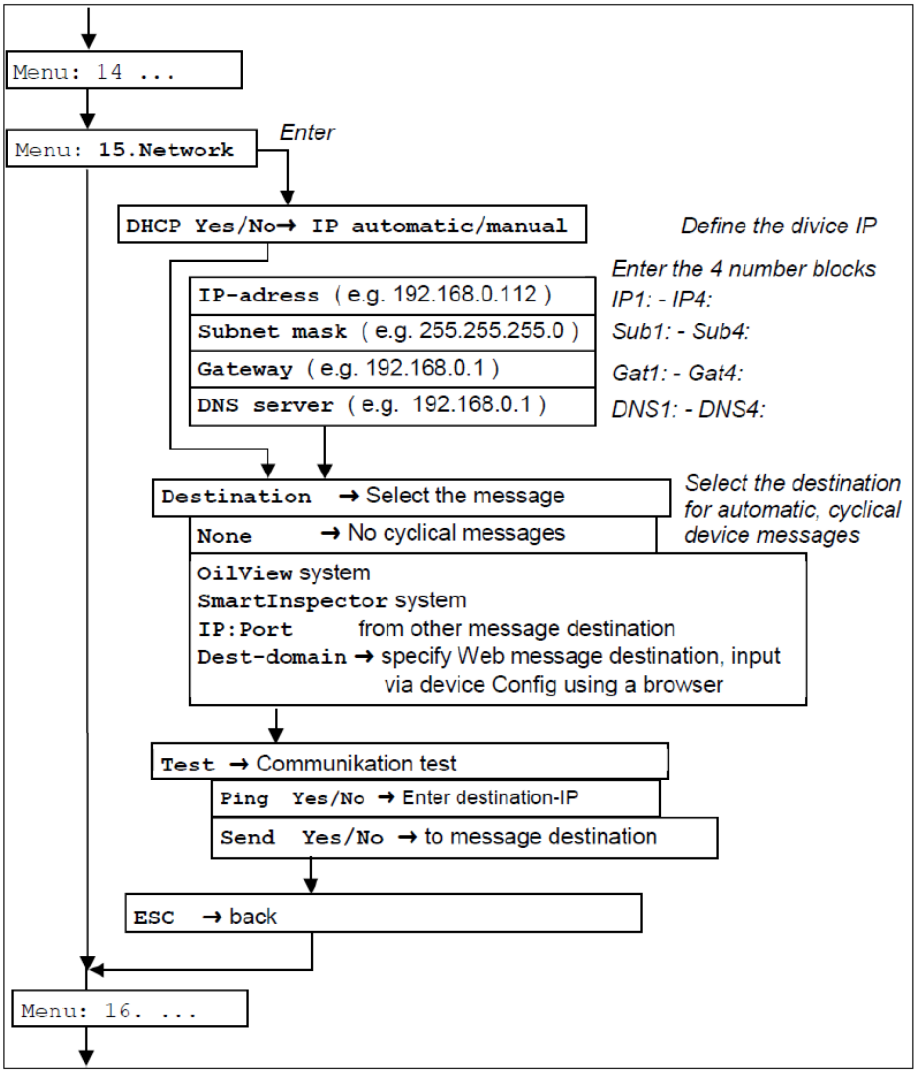
- After connection the display unit of tank 2 as described under electrical installation – Connecting the Interface to SmartBox® 1, SmartBox® 2 or SmartBox® 3, switch on the display unit of the tank in question (switch on the mains voltage).

In the display unit of SmartBox® 4 LAN, the following will be indicated alternatingly: “Tank1:” - “xx.xxxL“ – “Tank2:“ – “yy.yyyL“ (depending on the selection / adjustment in the menu step 6. Show tanks). Then, follow the same steps for the other display units.

The order of the displayed tanks can be changed subsequently under menu step 16.Sort. Tanks ➜ SmartBox 4 LAN to be changed.

CONFIGURING THE NETWORK COMMUNICATION

Network communication for the device is configured via the menu item "15.Network".
By default, DHCP is enabled with "Yes". In this case, the device is assigned its IP address, subnet mask, gateway and DNS server address automatically by the router.
Alternatively you can/should configure these address parameters manually. To do this, select "No" in DHCP. In particular, your network administrator should confirm the port no. for the device.
When the network cable has been connected, the device can be addressed in the network (LAN) with a browser. To do this, enter the IP address of the device, such as 192.168.0.112, in the browser's address line.
➞It is generally advisable to involve the network administrator for these configuration settings.

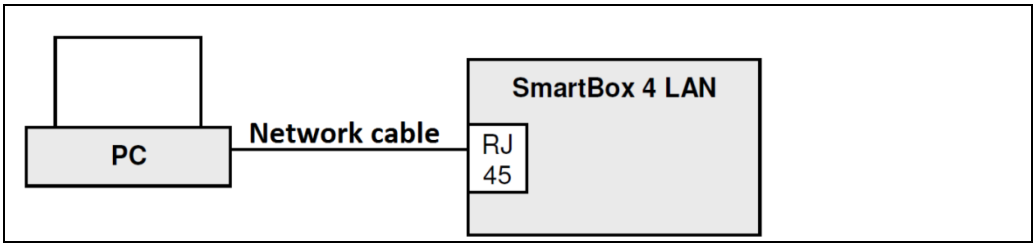


⚠WARNING Overfilling of the tank due to incorrect entry values.
Operating media may leak. These:
- are hazardous to water,
- are category 1,2 and 3 inflammable liquids,
- can ignite and cause burning,
- may cause falling injuries due to slipping.

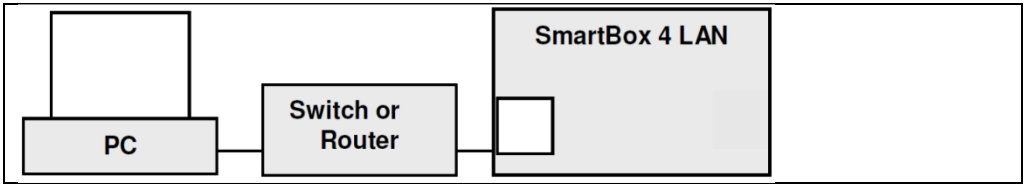
✓ Enter these values with care!

The entry values are also retained in the event of the failure of the supply voltage.

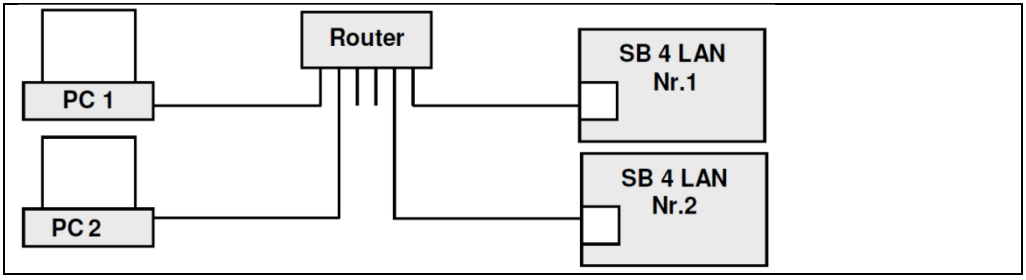
Device connection in the network
The Ethernet network connection is established as follows:
Option A: Direct connection for testing
Connect a PC/laptop directly with SmartBox® 4 LAN with a crossover cable



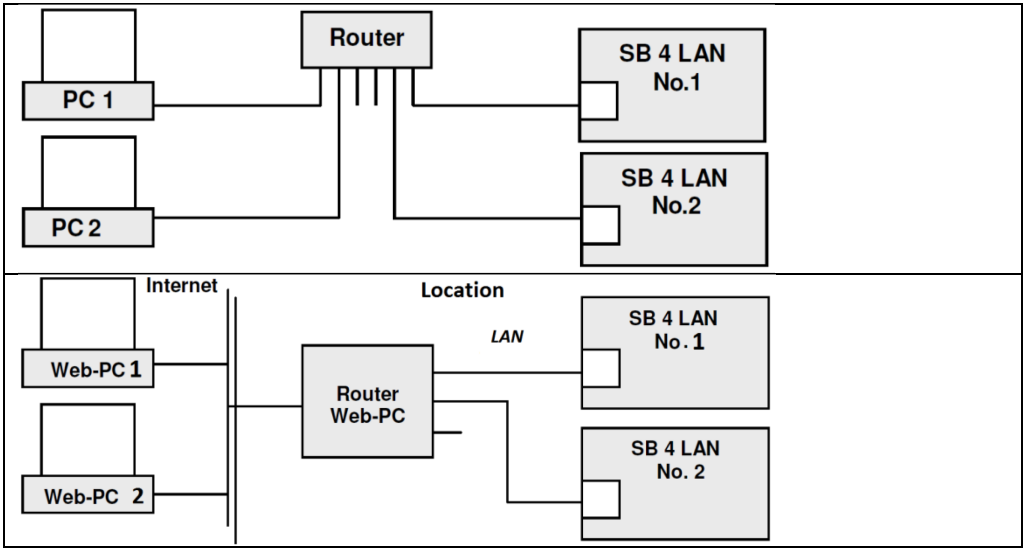
Option B: Mini network
Connect a PC/laptop with SmartBox® 4 LAN via a switch or router



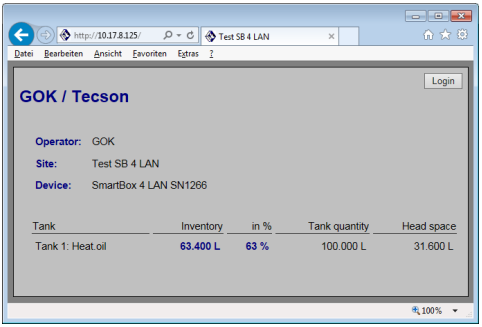
Option C: LAN/intranet
PC and SmartBox® 4 LAN are connected directly to a local network (LAN/intranet). In each case the SmartBox® 4 LAN and the PC must be in the same network segment or be able to "see" each other via corresponding routers



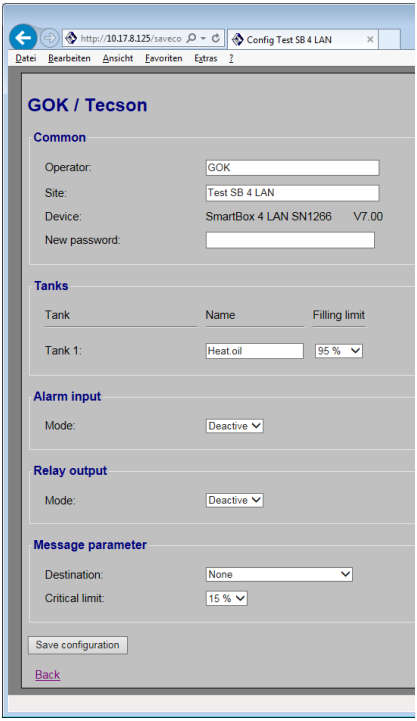
Option D: Internet access
PC and SmartBox® 4 LAN are connected to a local network. The devices are visible in the intranet / LAN. The devices can be accessed from externally via the Internet through port forwarding in the router. For setup, refer to page **Access in the intranet/LAN**.



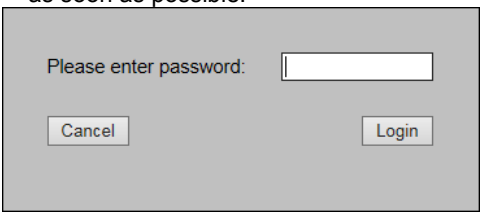
Access in the intranet/LAN
The device queries on the intranet take place via a browser (e.g. Firefox or Internet Explorer). To query using a browser, enter the device IP of the SmartBox® in the address line. If several devices are connected in the intranet, they have different IPs.
It is advisable to set up bookmarks in your browser or to set up desktop icons.



The browser shows the status page of the device with litre values and the system status. The configuration page of the device can also be called with the **[Config]** button.



You can set the device and message parameters on this configuration page if you have change authorization with a password.
The default password to access the configuration page is: **`tank`**
This password can be changed on the configuration page.
➜ We recommend that you replace this default password with your own password as soon as possible.



External access via the Internet

The network administrator must also configure the router for device queries from the Internet.
Two Internet query solutions are available:
- Internet query by browser
- Internet connection to an external system (Smart-Inspector.com)

The devices are addressed in the LAN (Intranet) via a browser (HTML / Port 80).
A device is addressed from the Internet by browser via the IP address.
If several SmartBox® devices are activated at one location, access is via the IP address + the port number for the device, which must be routed through.

For Internet queries via the Smart-Inspector inventory management system:
- SmartBox® Nr.1 ➜ P address: Port 3000.
- SmartBox® Nr.2 ➜ IP address: Port 3001.

Port numbers 3000, 3001 and 300n are firmly assigned.
Alternatively you can configure these parameters manually.
Refer also to Internet connection to an external system (Smart-Inspector.com).

Internet query by browser
As a practical solution, this requires the following
- Option A: The system location has a fixed IP.
  Call with the following browser address line: e.g. http://84.141.255.229:3000
- Option B: A DynDNS service has been set up for the system location.
  Call with the following browser address line: e.g. http://myname.dynalias.com:3000

Internet connection to an external system (Smart-Inspector.com)
Convenient inventory management and alarm support with an external system server, e.g. www.Smart-Inspector.com.
With this convenient solution the devices and the external system are continuously connected via the Internet. The devices cyclically report the current inventory data, the limit value status and the alarm status (alarm/no alarm). The Smart-Inspector system handles the graphical data presentation and the alarm routing function (can be configured).
For this solution, the device location does not need a fixed IP or DynDNS service.
All that is required is that the ports are routed to the device IPs in the router. If this is not possible for some reason (e.g. security),

- the configuration page cannot be called remotely to adjust the device settings (i.e. the device configuration page would only be available locally in the intranet). and no measurements could be requested manually via 'Refresh' (i.e. the displayed tank inventories could be a few minutes old because the devices send data in 10-minute cycles, for example).

Testing the network communication of the device
Open a browser on a PC (recommended, Firefox® or Microsoft Internet Explorer ®). Enter the IP address of the SmartBox® in the address line.

- e.g. 192.168.1.112 (in the LAN)

The SmartBox® reports with the status page that the browser then displays*
Press F5 to refresh or open the page.
Press CONFIG to open the configuration page*
For the external query test, enter the current IP of the device location plus (:) the port no. that is set up in the router.

- e.g. 95.123.63.15:3000 (from the Internet)

* (see page configuring the network communication / device connection in the network / LAN)

Ping test

Call a ping test via the device menu "15.Network" ➜ Test ➜ Ping Yes/No.
When "OK" is returned, the device's network connection communication functions.

Send test

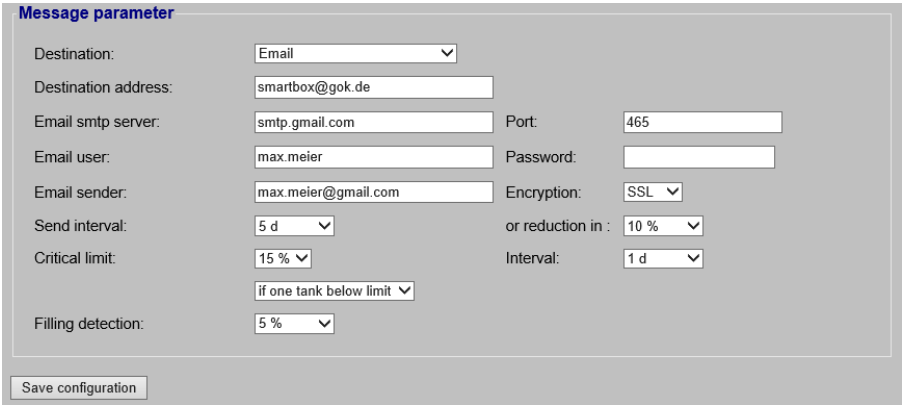
You can call a communication test with the external destination system (e.g. Smart-Inspector) via the device menu "15. Network" ➜ Test ➜ Send Yes/No.
If "OK" is returned, the network connection, router configuration and Internet connection to the external system all function.
"Send Data ..." indicates that a data telegram is being sent.
This is sent to the destination that is set as the IP address via the device menu "15.Network ➜ Destination ...".
If "Send Data" is displayed often, this indicates repeated attempts to send because the destination computer IP cannot be reached.
The destination computer must be assigned a fixed IP. Accordingly, the destination IP + port in the device must be correctly parameterised.

Relay remote control
A remote control function is available for the Relay output of SmartBox® 4 LAN.
Setting and operation take place via the browser call of the 'Config' page of the device in the area **Relay output**. For a description, refer to Menu step 7. Relay 1.

CONFIGURATION OF EMAIL FUNCTION AND MESSAGING

With the integrated e-mail function, the network device automatically and regularly reports its status (measured values and system status), as well as events (e.g. reserve) to the configured email destination mailbox.
These messages occur in intervals (for example, every 3 days = 3d) or whenever the stock changes by x% or when a reportable event occurs.
The parameters are set in the 'CONFIG' mask. This device mask is accessible via browser. (Enter the IP address of the device in the address bar.)

Configuration of email service:



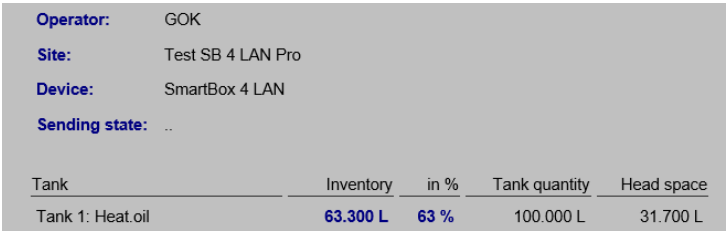
Explanation of the parameters for email sending service:

Parameter	Description	Example / Presetting
Email target (max. 40 chars)	Receiver, operator, headquarter. The device sends its current messages to this e-mail address.	recipient-name@example.de
Email SMTP server (max. 25 chars)	The SMTP server is the e-mail sending service. The message will be send to the e-mail target: mail.yourdomain.com	Connection security: For secure transmission use SSL encryption, smtp.gmail.com Port: 465
Email user (max. 25 chars)	Usually your username is the email address, without specifying the domain. In some cases the email is to be specified with domain.	e.g. max.meier or e.g.max.meier@gmail.com (if necessary ask the service provider)
Email sender (max. 25 chars)	Your e-mail address.	e.g. max.meier@gmail.com
Sending interval	Message interval in days or hours or % change: e.g. 1d means report after 1 day as well as % of inventory change (since last message)	e.g. 5d (range 1d ... 15d). Even hours are possible for example. 1h, 4h, 12h or disabled. Or at xx% of change.
Detection of fueling	% value of inventory change for refueling detection and event notification.	e.g. 5% Range is 1% ... 20% or deactivated

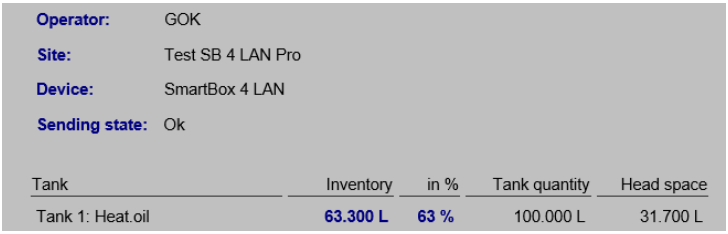
Parameter	Description	Example / Presetting
Critical limit	Reporting threshold in %. When reached a message will be send. Options: • if one tank below critical limit • if all tanks below critical limit • if one tank exceeding limit • if all tanks exceeding limit	e.g. 15% (range 0% ... 99%) Time interval for repeating: 1 ... 15d or 1h, 4h, 12h or deactivated. Select between withdrawal tank(s) and collection tank(s).

Testing the e-mail messaging

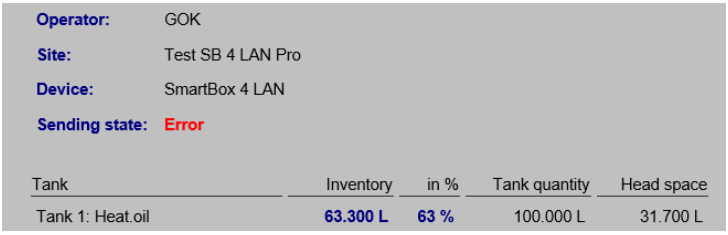
The 'Save configuration' button saves the settings in the device.
A communication test is carried out as soon as the configuration page is left. The device shows the transmission process (Sending state).
If the device reports an OK, then the e-mail function is set up properly.
If the parameters are not correct or if the device cannot establish a connection then transmit status 'Error' will be displayed.



Send status: Transmission attempt (when closing the configuration setup window).



Send status: Sending test was successful.



Send status: Sending attempt has failed.

OPERATION

The product requires no operation while it is running.

FUNCTION CHECK / MAINTENANCE

We recommend that you check the displayed litre values once per year to make sure that they are correct.
For a simple check, pull the level probe up by its cable so that it hangs above the liquid.
In this status the display device should show 0 litre (+ tolerance).
The probe signal can be checked with menu step "22. Test Current"
At 0cm fill level ➜ approx. 3.7 – 4.3mA.
In the event of a considerable deviation, we recommend a replacement.➜ New probe.

New probe/ replacement of the operating medium
If the installation of a new probe is required and/or a change in the operating medium takes place, then firstly, all of the "standard values" under menu step "9th zero point probe" must be reset to the **factory setting**!
It is also necessary to check, and if required, correct all further set values.

DISPOSAL

To protect the environment, our electrical and electronic appliances may not be disposed of along with household waste.
At the end of its lifespan, each end user is obligated to pass old appliances to a district or area collection point, separate from household waste. This ensures that old appliances are disposed of properly and negative effects on the environment are avoided. Our registration number for the electrical old appliances register (EAR) is: WEEE-Reg.-No. DE 78472800.

RESTORATION

If the actions described in TROUBLESHOOTING do not lead to a proper restart and if there is no dimensioning problem, the product must be sent to the manufacturer to be checked. Our warranty does not apply in cases of unauthorised interference.
In case of repeated errors or alarm messages (relay output) while the tank content does not reach / remains below the set fill level alarm threshold at the probe element, check the connection line of the signal and probe element for breakage or short-circuit, re-install if necessary.

TROUBLESHOOTING

Errors in the network connection/data transfer	
`Error N1`	No network communication - problem with the internal network adapter. The device automatically resets the adapter and tries to address the plug-in adapter again. To test, unplug or check the network cable.
`Error N2`	Error in network communication. Check the device cables and the connection to the network router. Check the parameters, menu item "15.Network". Execute the function "Network > Test > Ping: Yes". As a test, connect a different network device, such as a laptop. If necessary, ask your network administrator for advice. Error N2 is reported only for defined reporting destinations, such as www.smart-inspector.com. If an individual destination IP is entered, there will be no N2 problem message: Important: The destination address must be a fixed IP. Otherwise, the device will keep trying to send with the display test "Send Data..." because the IP address is not reached.

Error code	Significance
Error E1	The set value is invalid
Error E2	Measured value too small (I < 3.7mA ➜ probe defective)
Error E3	Measured value too great for zero point calibration (probe must not be immersed)
Error E4	Measured value not plausible. Check menu item “9.Offset probe”
Error E5	Set height is more than the height of the tank. (incorrect entry menu step 10)
Error E6	The current measured value is too low as a reference point. The probe must be submerged. The set height (menu step 10) is too high (the measured value is too low) Check menu item "9. Offset probe". Otherwise, probe fault.
Error E7	The current measured value is too low in relation to the set tank height or to the tank volume. The probe must be submerged.
Error E8	Measured value (probe current) is too high - check electrical connection and measuring range of the probe, switch power supply off and on again. Check menu settings steps 1 to 5. If necessary, Check menu step "9.Offset probe". Otherwise, probe fault.
Error E9	Probe current = 0 mA - no signal current. The probe cable is poled wrongly or interrupted; check cable extension, reconnect if necessary.
Error E10	Calibration error. Disconnect the display device from the power supply, wait 5 sec. and then reconnect. Otherwise, probe fault.
Error E11	**⚠CAUTION** The liquid level in the tank is actually too low for an exact measurement. You can still press [Enter] to confirm and continue.
Error E12	(Still) no measured value available from external tank 2..4 ➜ only SmartBox® 4 LAN.

Checking the probe signal: can be checked through menu item “22.Test current”:
At 0cm fill level ➜ approx. 3.7 - 4.3mA
For 1m water column➜ approx. 9 - 11m (standard probe with measuring range 250mbar)

PROBES AND ACCESSORY PARTS

Product name	Usage information	Order no.

⚠DANGER

May not be used in potentially explosive areas!
Can cause an explosion or serious injuries.
- ✓ Must be installed by a specialised company in accordance with local industrial health and safety regulations.
- ✓ Installation outside the defined EX protection zone.

Level probe 0 up to 250mbar Accuracy class 1%	for non-pressurized tanks with liquid operating medium	28 801 00
Level probe 0 up to 250mbar Accuracy class 0.5%	for non-pressurized storage tanks with liquid operating medium	28 891 00
Mechanical level gauge type FSA-W 4-20mA Measuring accuracy: ± 3%	for non-pressurized tanks with liquid operating medium, measurement range: 0 to 2.40m tank height	28 903 00

LIST OF ACCESSORIES

Product name	Usage information	Part. no.
Data transfer module analogue 0 to 5 volt DTM-1	Retrofittable module as an interface for data transfer, e.g. for building systems	28 851 00
Data transfer module analogue 4 to 20 mA DTM-3	Retrofittable module as an interface for data transfer, e.g. for building systems	28 853 00
M-Bus interface DTM-4	Retrofittable module as an interface for data transfer, e.g. for building systems	28 863 00
Junction box IP66 breathable	To extend the probe cable - e.g. in the dome	28 857 00

TECHNICAL DATA

Indicator	
Action	Typ 1.B (according to EN 60730-1)
Contamination degree	2 (according to EN 60730-1)
Rated impulse voltage	4000V
Type of protection	IP30 acc. to EN 60529
Supply voltage	230V AC 50Hz
Power input	max. 2VA
Measuring input	4 to 20mA; U_o = 20V
Relay output	optional
Switching voltage	max. 250V AC
Switching current	max. 3,5A
Network module	Ethernet 10/100 Mbit/s; connection socket RJ45; using a network cable cat 5 or higher
Dimensions W/H/D in mm	194 x 130 x 65mm
Ambient temperature	-10°C to +50°C
Housing	Polycarbonat (PC)
Analog output	0 to 5V DC; 4 to 20mA
Resolution	12 Bit
Level probe / Standard probe	
Operating voltage	20V DC
Material	V4A; POM; FPM; PUR
Accuracy	± 1 %
Standard version	250mbar
Installation position	vertically suspended, or horizontally supine
Ambiente temperature operating media	-10°C to +50°C
connection cable	6m
Length of standard probe	without cable: 97mm
	Diameter of probe: 22mm
Degree of protection	IP68 acc. to EN 60529

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