EN

KNX SO250

Tank Sensor

Item number 70151

elsner elektronik

Installation and Adjustment

KNX SO250 • from software version 0.1.0, ETS programme version 1.1 • Status: 18.04.2016. Errors excepted. Subject to technical changes.

elsner elektronik

Elsner Elektronik GmbH Control and Automation Engineering
Sohlengrund 16 | 75395 Ostelsheim | Germany
Tel.: +49 (0) 70 33 / 30 945 - 0 | Fax: +49 (0) 70 33 / 30 945 - 20
info@elsner-elektronik.de | www.elsner-elektronik.de

Product Description

The Ultrasonic Probe KNX SO250 is used for measurement of the fill level of liquids in tanks or for distance measurement. In addition to application areas like rainwater cisterns or fuel tanks, also e. g. fish ponds or wells or the parking distance of trucks can be monitored. Please follow the "Instructions for assembly and operation" on page 4.

The display directly indicates the distance/fill level. The integrated key pad is used for selection of the tank dimensions and setting of two relay switching outputs. When the relays are switched an additional acoustic alarm can be emitted.
The KNX software ETS software allows individual parameterization of all bus functions of the KNX SO250. Five switching outputs with adjustable threshold values are available.

Functions:

- **Distance measurement**
- **Fill level measurement** in spherical, rectangular and cylinder tanks. Several similar tanks as battery
- Setting of the two **relays** with the integrated display and keypad
- Setting of **bus functions** by means of the KNX software ETS. 5 switching outputs with adjustable threshold values (Threshold values can be set by parameter or via communication objects)

Configuration is made using the KNX software ETS. The programme file (VD2 format) can be downloaded from the homepage of Elsner Elektronik on www.elsner-elektronik.de in the menu area "*Service*".

Technical Data

Evaluation Unit

Housing:	Plastic material
Colour:	White
Mounting:	Snap-on fitting on mounting rails
Protection category:	IP 20
Dimensions:	approx. 123 x 89 x 61 (W x H x D, mm), 7 width units
Weight:	approx. 345 g
Ambient temperature:	Operation -5…+45 °C, Storage -25…+70°C
Ambient air humidity:	max. 95% R. H., avoid bedewing
Operating voltage:	230 V AC , 50 Hz
Power consumption:	max. 4 W
Outputs:	• KNX data • 2 x Relay, potential-free NOC, max. 250 V AC / 7 A

Data output:	KNX +/- bus terminal plug
BCU type:	Own micro controller
PEI type:	0
Group addresses:	max. 254
Allocations:	max. 255
Communication objects:	57

The product conforms with the provisions of EU directives.

Air ultrasonic probe

Housing:	Plastic material
Colour:	Black
Protection category:	IP 52
Liquid resistance:	Water, fuel
Dimensions:	Total diameter approx. 60 mm, total head height approx. 45 mm, thread 1½ inches
Connection lead:	RG 58 coax cable, length 10 m
Total weight:	approx. 400 g
Ambient temperature:	+0…+40 °C
Measurement range:	12…250 cm

Installation and commissioning

Attention! Mains voltage!
The legal national regulations must be complied with.

Installation, inspection, commissioning and troubleshooting of the power supply system must only be carried out by a competent electrician. Disconnect all lines to be assembled, and take safety precautions against accidental switch-on.

The sensor is exclusively intended for appropriate use. With each inappropriate change or non-observance of the instructions for use, any warranty or guarantee claim will be void.
After unpacking the device, check immediately for any mechanical damages. In case of transport damage, this must immediately notified to the supplier.

If damaged, the tank sensor must not be put into operation.

If an operation without risk may supposedly not be guaranteed, the device must be put out of operation and be secured against accidental operation.

The sensor must only be operated as stationary system, i.e. only in a fitted state and after completion of all installation and start-up works, and only in the environment intended for this purpose.

Elsner Elektronik does not assume any liability for changes in standards after publication of this instruction manual.

Instructions for assembly and operation

Evaluation device:

Must only be installed and operated in dry, indoor spaces.
Avoid condensation.

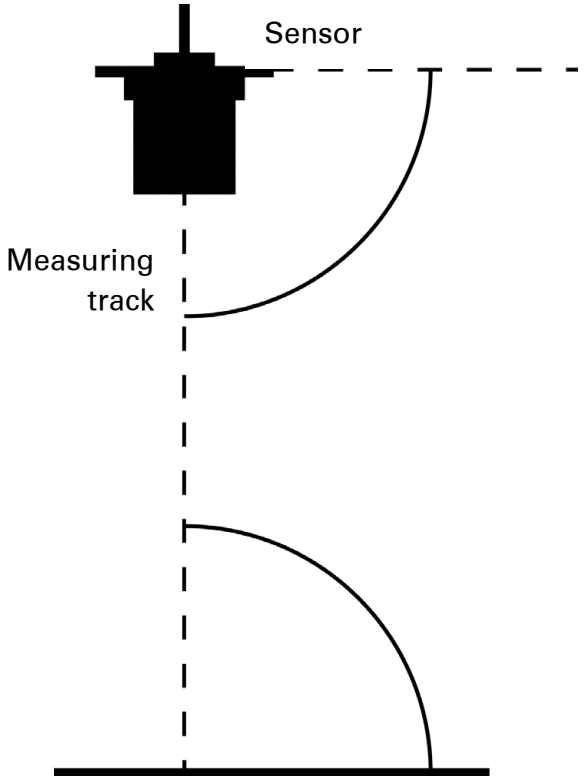
Ultrasonic probe:

Do not cause any mechanical stress on the front part (rubber)!

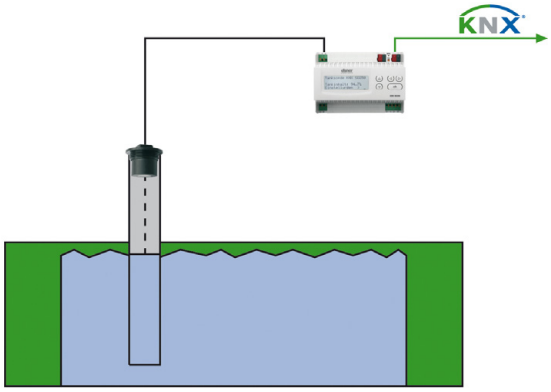
The measuring head must be dry:
It must not be washed by liquids!
No condensation, no droplet formation!

The measuring track must be free:
No steam, fog, etc. between the sensor and the measuring surface.
Steam is formed e.g. when a warm fluid is poured into a tank.

The measured surface must be still:
No waves, no vibrations!



The measuring track is aligned vertical to the sensor surface. The measuring track has to meet the measuring surface vertically, too.



To avoid wave formation in fluids, the measured area can be separated using a measuring tube (Ø at least 50 mm).

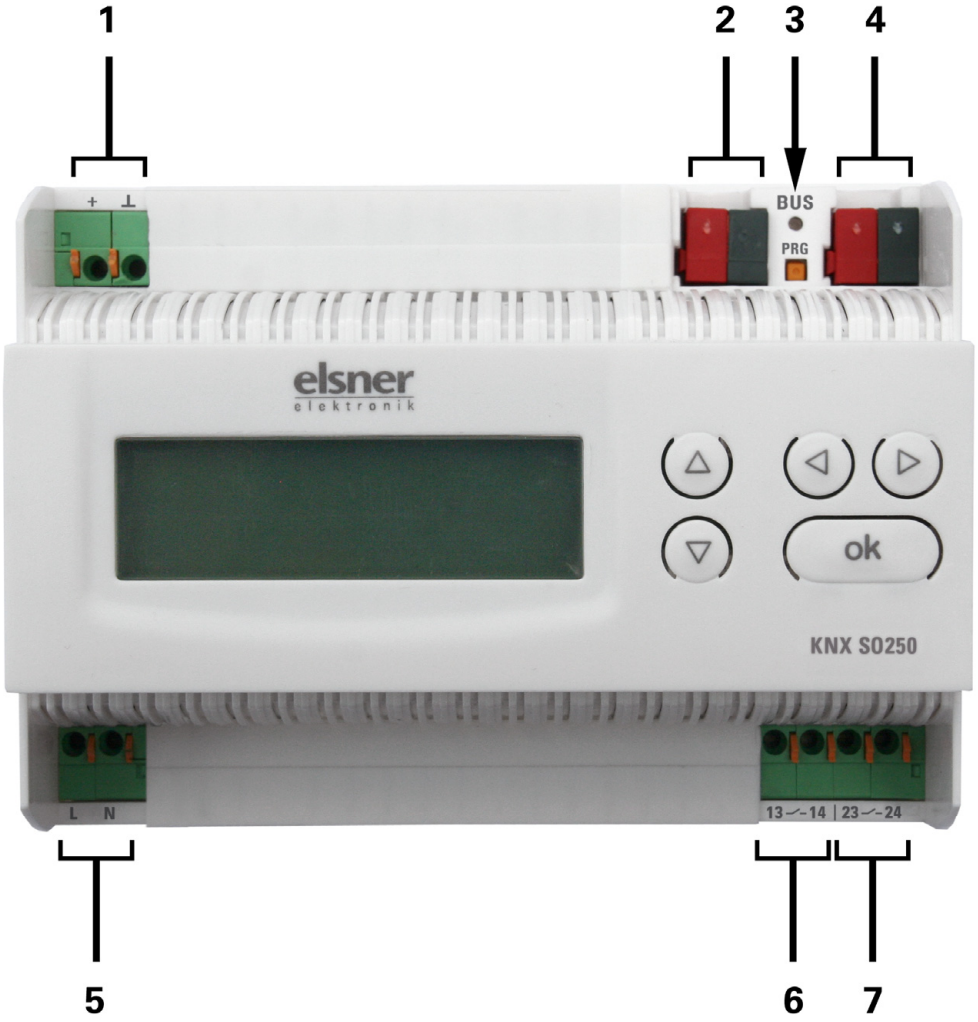
Loud surrounding noise (e.g. when filling metal tanks) may disrupt the measurement. Please contact us with any questions regarding the area of application or installation.

Connection

Ensure that all connections are made correctly. Incorrect connection can result in destruction of the tank sensor or of connected electronic devices.

After the auxiliary voltage is applied the device will enter an initialisation phase lasting 5 seconds. During this phase no information can be received via the bus.

Casing



1 Connection measurement probe, +/screen ⊥
2 Bus connection (KNX terminal +/-)
3 Programming LED and programming button
4 Bus connection (KNX terminal +/-)
5 Operating voltage input 230 V AC, L/N
6 Relay output 1 (close-circuit contact), 13/14
7 Relay output 2 (close-circuit contact), 23/24

Connections 1, 5, 6 and 7 suitable for solid conductors up to 1.5 mm² or fine-wire conductors

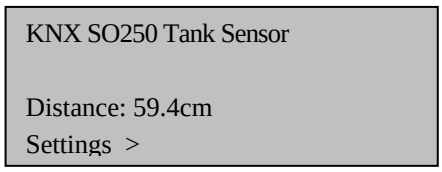
Settings on the device

The display of the KNX SO250 is only used for defining the specifications for the two output relays. Additional parameterization options can be found in the ETS programme file.

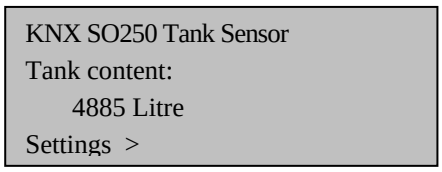
The bus allows blocking of a measurement and to request a repeated measurement. The blocking and the measured value also apply for the relays.

Standard display screen

Standard screen:



or



The display shows the currently measured distance and/or the tank content (according to the setting). If a measurement is not possible the message ”No echo received!“ will be displayed.

The following settings can be made directly at the KNX SO250 Tank Sensor:

- Distance measurement
- Fill level measurement
- Relay set-up
- Acoustic alarm

The display will be dimmed after keys have not been operated for 60 seconds.

Function of the keys in the display menu

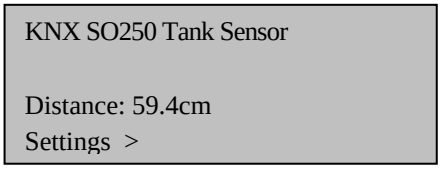
Key ▷:	Confirm the selection, continue with next step.
Key ◁:	Go to previous step.
Key ▽ and △:	Change setting (select a setting or change a value). The cursor (flashing rectangle) indicates which menu item is selected.
Key ok:	Confirm the setting and return to the standard display screen.

Distance measurement

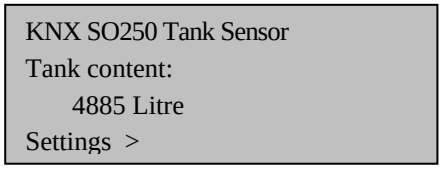
The KNX SO250 Tank Sensor can measure distances. The following settings are made in the menu “Distance measurement“:

- Unit of the distance display
- Time interval between measurements

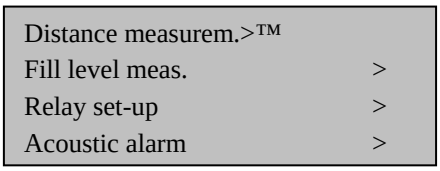
Standard screen:



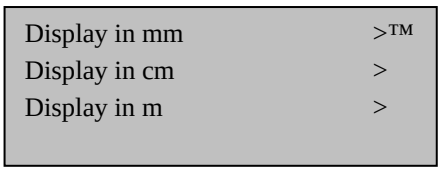
or



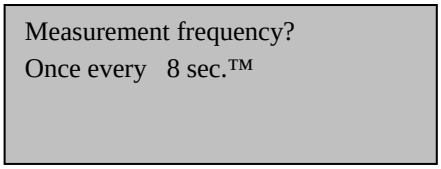
Press key ▷ once to enter the “Settings“ menu.



Move the cursor (flashing rectangle on the right) using the keys ▽ and △ to the menu item “Distance measurement“ and press key ▷.



Move the cursor using the keys ▽ or △ to the required setting. You can display the distance in millimetres (mm), centimetres (cm) or meters (m). Confirm your selection by pressing the key ▷.



Use the keys ▽ and △ to set the required time interval for the measurements.

Setting options: From 1 s to 9 s in increments of one second from 10 s to 50 s in increments of ten seconds, from 1 min to 120 min in increments of 10 minutes.

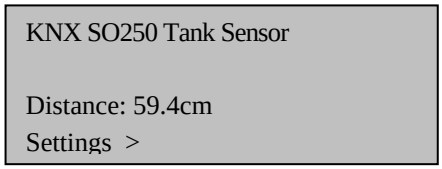
Confirm your selection by pressing the key ▷. You will automatically return to the standard screen.

Fill level measurement

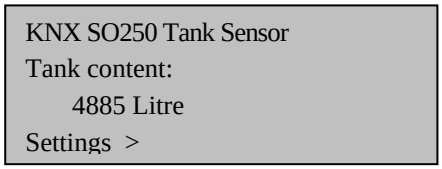
The KNX SO250 Tank Sensor can measure the fill level of liquids in tanks. Possible tank designs are rectangular tanks, spherical tanks, vertical or horizontal tanks. If more than one similar tank exist in a battery only one tank needs to be described for the KNX SO250 to calculate the content according to the specified tank number. The following settings are made in the “Fill level measurement“ menu:

- Tank design
- Tank volume/capacity/fill height
- Probe distance to liquid for full tank
- Number of tanks in a battery
- Unit of the fill level display
- Time interval for measurements

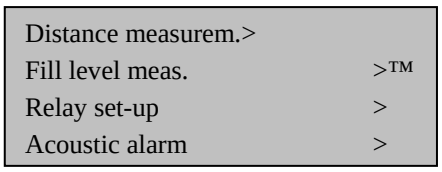
Standard screen:



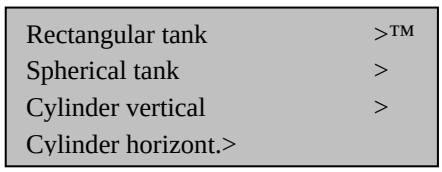
or



Press key ▷ once to enter the “Settings“ menu.



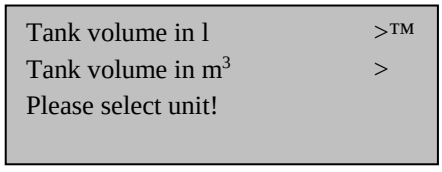
Move the cursor (flashing rectangular at the right side) using the keys ▽ and △ to the menu item “Fill level measurement“ and press key ▷.



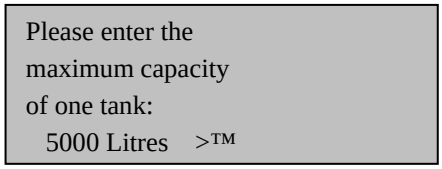
Move the cursor using the keys ▽ or △ to the required setting. The KNX SO250 can determine the fill level of rectangular tanks, spherical tanks, vertical or horizontal cylindrical tanks.

Press key ▷ to confirm your selection and continue as described for the relevant tank design.

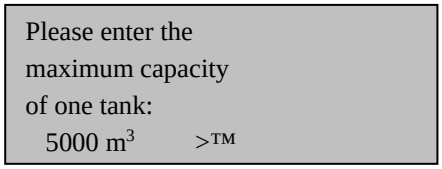
Rectangular tank



Move the cursor (flashing rectangular at the right side) using the keys ▽ and △ to the required setting. You can specify the capacity of a tank in Litres (l) or cubic metres (m³). Press key ▷ to confirm your selection.



or



Use the keys ▽ and △ to select the maximum capacity of a tank (in a later step the number of existing tanks can be specified).

Setting options: *Litres*: 1 to 99 l in increments of one Litre, 100 to 900 l in increments of hundred Litres, 1000 to 100,000 l in increments of thousand Litres. *Cubic metres*: 1 to 99 m³ in increments of one cubic metre, 100 to 900 m³ in increments of hundered cubic metres, 1000 to 100,000 m³ in increments of thousand cubic metres.

Press key ▷ to confirm your selection.

Please enter the maximum fill level of the tank: 230 cm ™ Tank volume in m^3 >

Use the keys ▽ and △ to select the maximum fill level of the tank (1 to 254 cm).

Press key ▷ to confirm your selection and continue as described in “Settings for all tank designs“.

Spherical tank

Please enter the inside diameter of the tank: 200 cm ™

Use the keys ▽ and △ to select the inside diameter of a tank (1 to 1000cm).

Press key ▷ to confirm your selection and continue as described in “Settings for all tank designs“.

Cylinder vertical

Please enter the inside diameter of the tank: 200 cm ™

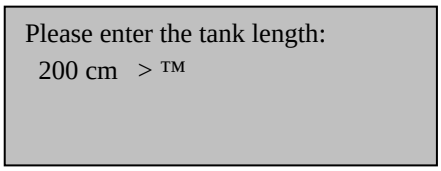
Use the keys ▽ and △ to select the inside diameter of a tank (1 to 1000 cm). Press key ▷ to confirm your selection.

Please enter the maximum fill level of the tank: 230 cm ™

Use the keys ▽ and △ to select the maximum fill level of the tank (1 to 254 cm).

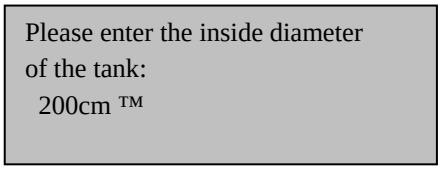
Press key ▷ to confirm your selection and continue as described in “Settings for all tank designs“.

Cylinder horizontal



Use the keys ▽ and △ to select the length of the tank.

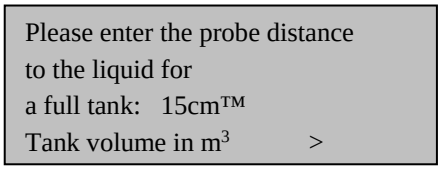
Setting options: 1 to 99 cm in increments of one centimetre, 100 to 900 cm in increments of hundred centimetres, 1000 to 100,000 cm in increments of thousand centimetres.
Press key ▷ to confirm your selection.



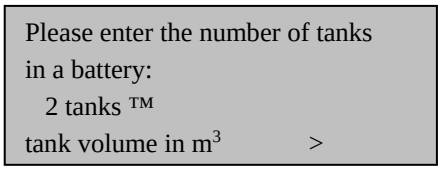
Use the keys ▽ and △ to select the inside diameter of the tank (1 to 1000 cm).

Press key ▷ to confirm your selection and continue as described in "Settings for all tank designs".

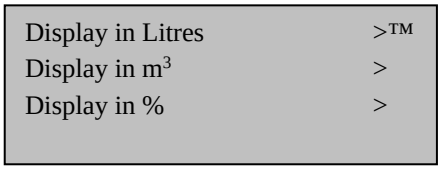
Settings for all tank designs



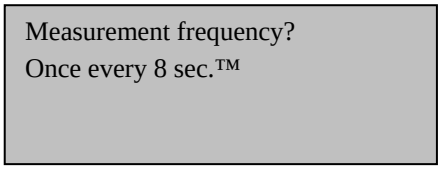
Use the keys ▽ and △ to select the distance of the probe to the liquid for full tank (12 to 200 cm). Press key ▷ to confirm your selection.



Use the keys ▽ and △ to select how many of the described tanks exist in one battery (1 to 100 tanks). Press key ▷ to confirm your selection.



Move the cursor to the required setting using the keys ▽ or △. The KNX SO250 can indicate the tank fill volume in Litres (l), cubic metres (m³) or percent (%).
Press key ▷ to confirm your selection.



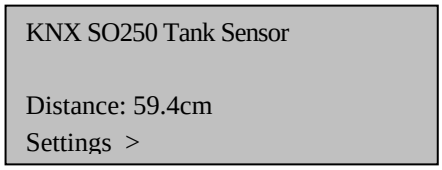
Use the keys ▽ and △ to specify the required time interval for the measurements.

Setting options: From 1 s to 9 s in increments of one second, from 10 s to 50 s in increments of ten seconds, from1 min to120 min in increments of 10 minutes.

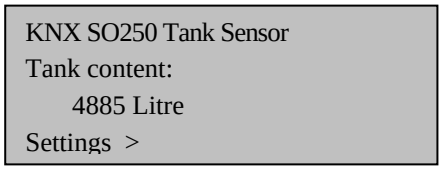
Press key ▷ to confirm your selection. You will automatically return to the standard screen.

Relay set-up

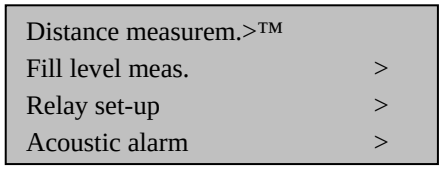
Standard screen:



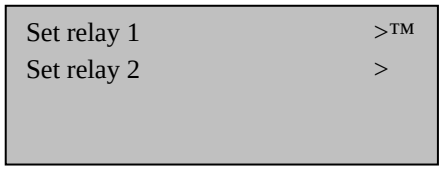
or



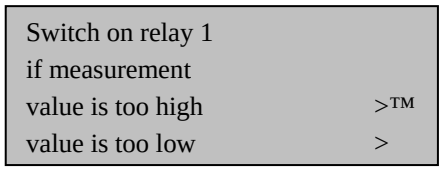
Press key ▷ once to enter the "Settings" menu.



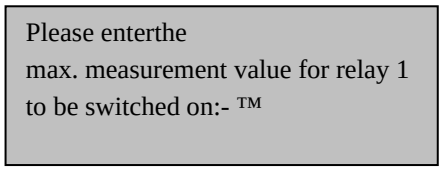
Move the cursor (flashing rectangular at the right side) to the menu item "Relay set-up" using the keys ▽ or △ and press key ▷.



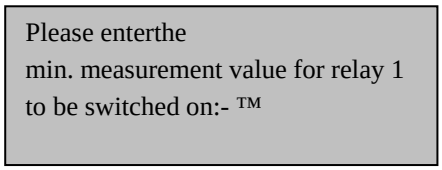
Move the cursor to the required relay using the keys ▽ or △. The set-up options are the same for both relays. Press key ▷ to confirm your selection.



Move the cursor to the required setting using the keys ▽ or △. The relay can be switched on in case of a too high or too low measured value.
Press key ▷ to confirm your selection.



or



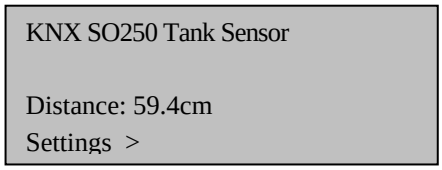
Use the keys ▽ and △ to select the required limit value for the relay (1% to 99% or not used ---).
For fill level measurements 1% refers to: tank empty, 100% refers to: tank full. For distance measurements 1% refers to: 12 cm, 100% refers to: 254 cm (i.e. 50%: distance 121 cm).

Press key ▷ to confirm your selection. You will automatically return to the standard screen.

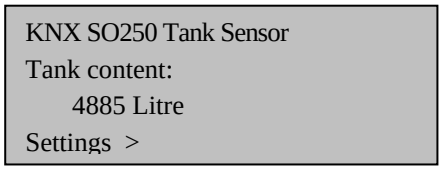
Acoustic alarm

The KNX SO250 Tank Sensor can optionally emit an acoustic alarm if the actual values are below or above the values specified for the relays.

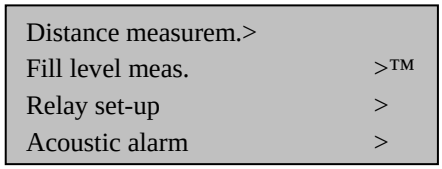
Standard screen:



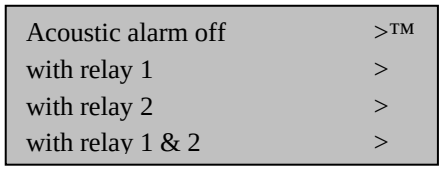
or



Press key ▷ once to enter the “Settings“ menu.



Move the cursor (flashing rectangular on the right side) to the menu item “Acoustic alarm“ using the keys ▽ or △ and press key ▷.

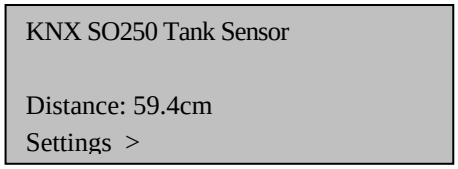


Move the cursor to the required setting using the keys ▽ or △. The KNX SO250 can emit an acoustic alarm if relay 1 is switched on, if relay 2 is switched on or if relay 1 or relay 2 is switched on.

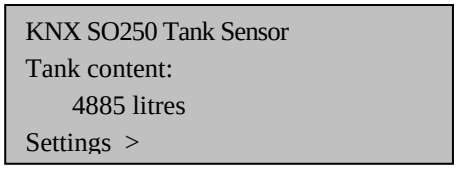
Press key ▷ to confirm your selection. You will automatically return to the standard screen.

Language

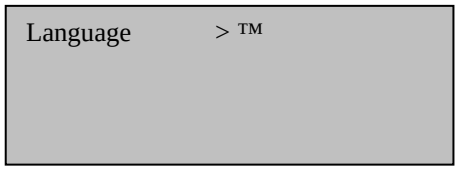
Standard screen:



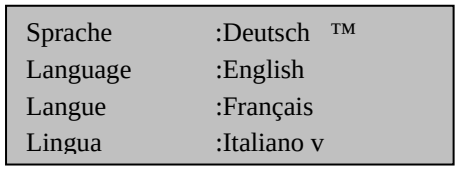
or



Press key ▷ once to enter the "Settings" menu.



Move the cursor (flashing rectangular on the right side) to the menu item “Language“ using the keys ▽ or △ and press key ▷.



Move the cursor to the desired language using the ▽ or △ keys (German, English, French, Italian or Spanish).

Press key ▷ to confirm your selection. You will automatically return to the standard screen.

Transmission protocol

Abbreviations

EIS types:

EIS 1	Switching 1/0
EIS 5	Floating decimal value
EIS 6	8 bit value
EIS 9	Float value

Flags:

C	Communication
R	Read
W	Write
T	Transmit
U	Update

Listing of all communication objects

No.	***Name***	***Function***	***EIS-type***	***Flags***
0	Measured value in Litres	Output	5	C R T
1	Measured value in m³	Output	9	C R T
2	Measured value in %	Output	6	C R T
3	Measured value in m	Output	9	C R T
4	Measured value request	Input	1	C R W
5	Lock measurement	Input	1	C R W
6	Sensor fault	Output	1	C R T
7	Min/max adjustment	Input	1	C R W
8	Request max fill level	Input	1	C R W
9	Max fill volume in Litres	Output	5	C R T
10	Max fill volume in m³	Output	5	C R T
11	Threshold value 1 in litres: 16 bit value	Input / Output	5	C R W T U
12	Threshold value 1 in m³: 16 bit value	Input / Output	9	C R W T U
13	Threshold value 1 in %: 16 bit value	Input / Output	5	C R W T U
14	Threshold value 1 in m: 16 bit value	Input / Output	9	C R W T U
15	Threshold value 1: 1 = increase | 0 = decrease	Input	1	C R W

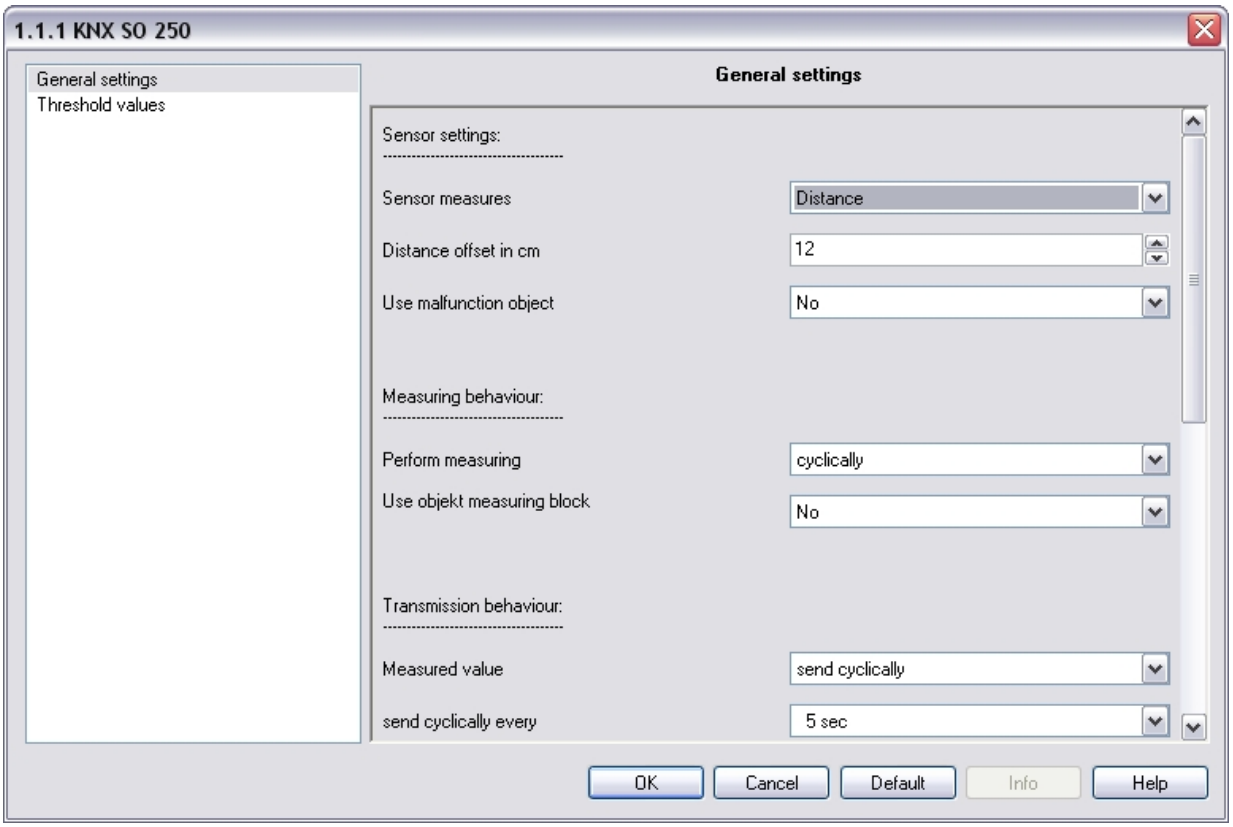
16	Threshold value 1: increase	Input	1	C R W
17	Threshold value 1: decrease	Input	1	C R W
18	Threshold value 1: switching output	Output	1	C R T
19	Threshold value 1: switching output lock	Input	1	C R W
20	Threshold value 2 in litres: 16 bit value	Input / Output	5	C R W T U
21	Threshold value 2 in m³: 16 bit value	Input / Output	9	C R W T U
22	Threshold value 2 in %: 16 bit value	Input / Output	5	C R W T U
23	Threshold value 2 in m: 16 bit value	Input / Output	9	C R W T U
24	Threshold value 2: 1 = increase | 0 = decrease	Input	1	C R W
25	Threshold value 2: increase	Input	1	C R W
26	Threshold value 2: decrease	Input	1	C R W
27	Threshold value 2: switching output	Output	1	C R T
28	Threshold value 2: switching output lock	Input	1	C R W
29	Threshold value 3 in litres: 16 bit value	Input / Output	5	C R W T U
30	Threshold value 3 in m³: 16 bit value	Input / Output	9	C R W T U
31	Threshold value 3 in %: 16 bit value	Input / Output	5	C R W T U
32	Threshold value 3 in m: 16 bit value	Input / Output	9	C R W T U
33	Threshold value 3: 1 = increase | 0 = decrease	Input	1	C R W
34	Threshold value 3: increase	Input	1	C R W
35	Threshold value 3: decrease	Input	1	C R W
36	Threshold value 3: switching output	Output	1	C R T
37	Threshold value 3: switching output lock	Input	1	C R W
38	Threshold value 4 in litres: 16 bit value	Input / Output	5	C R W T U
39	Threshold value 4 in m³: 16 bit value	Input / Output	9	C R W T U
40	Threshold value 4 in %: 16 bit value	Input / Output	5	C R W T U
41	Threshold value 4 in m: 16 bit value	Input / Output	9	C R W T U
42	Threshold value 4: 1 = increase | 0 = decrease	Input	1	C R W
43	Threshold value 4: increase	Input	1	C R W
44	Threshold value 4: decrease	Input	1	C R W
45	Threshold value 4: switching output	Output	1	C R T
46	Threshold value 4: switching output lock	Input	1	C R W

No.	*Name*	*Function*	*EIS-type*	*Flags*
49	Threshold value 5 in %: 16 bit value	Input / Output	5	C R W T U
50	Threshold value 5 in m: 16 bit value	Input / Output	9	C R W T U
51	Threshold value 5: 1 = increase | 0 = decrease	Input	1	C R W
52	Threshold value 5: increase	Input	1	C R W
53	Threshold value 5: decrease	Input	1	C R W
54	Threshold value 5: switching output	Output	1	C R T
55	Threshold value 5: switching output lock	Input	1	C R W
56	Software version	readable	16 bit	C R

Setting of KNX Parameters (in ETS)

General settings

Distance measurement



Sensor settings:

.....

Sensor measures	**Distance** Filling level
Distance offset in cm	12 … 200
Use malfunction object	Yes • No

Measuring behaviour:

.....

Perform measuring	cyclically on request and cyclically
Use object measuring block If the object is used: for value: 1 = Block measurement | 0 = release measurement Value before 1st communication: 0	Yes • No

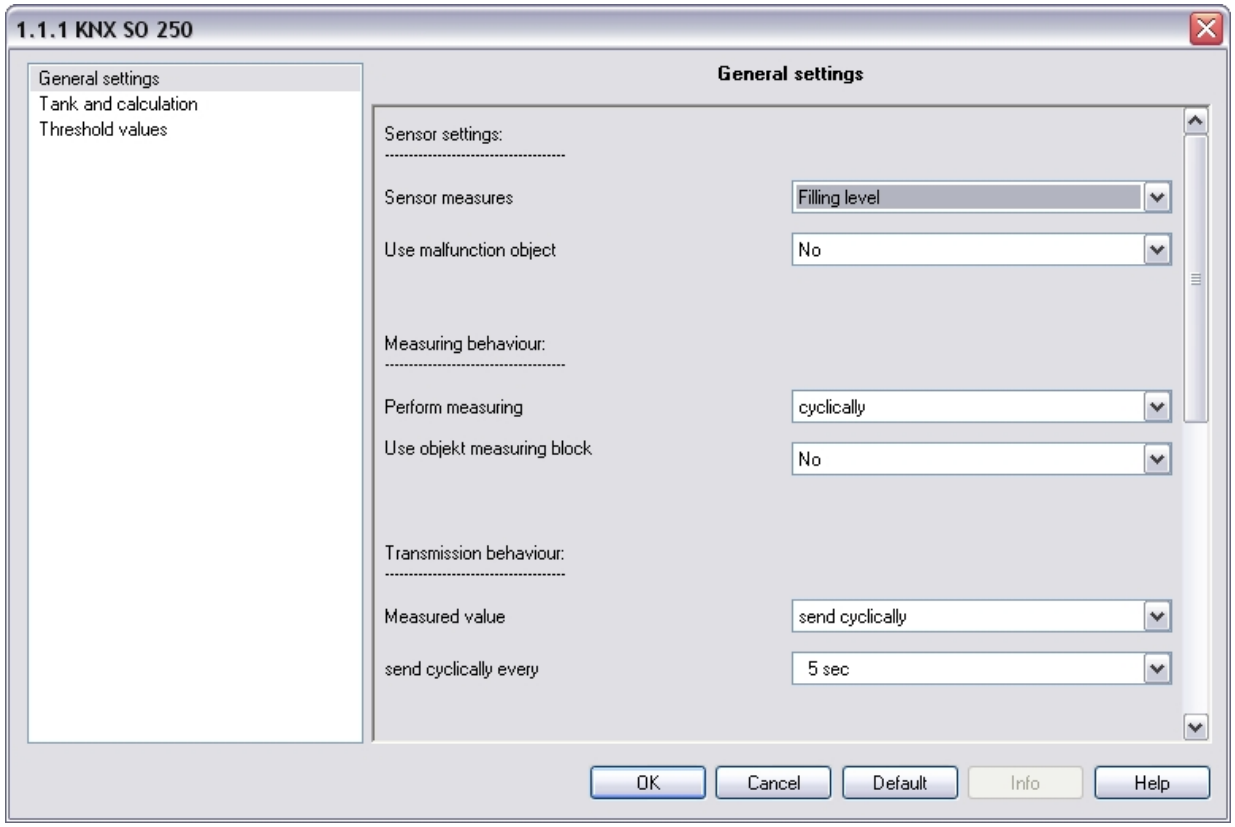
Note: If the measurement is made on request the measured value will be sent immediately.

Transmission behaviour:

.....

Measured value	send cyclically send in case of change send in case of change and cyclically
from change in % (only for sending “in case of change“)	1 … 50
send cyclically every (only for “cyclic“ sending)	5 sec … 2h
Output of the measured value in	m
General sending delay after power up and programming	5 sec 10 sec 20 sec 30 sec 1 min 2 min 5 min

Fill level measurement



Sensor settings:

.....

Sensor measures	Distance **Filling level**
Use malfunction object	Yes • No

Measuring behaviour:

.....

Perform measuring	cyclically on request and cyclically
Use object measuring block If the object is used: for value: 1 = Block measurement | 0 = release measurement Value before 1st communication: 0	Yes • No

Note: If the measurement is made on request the measured value will be sent immediately.

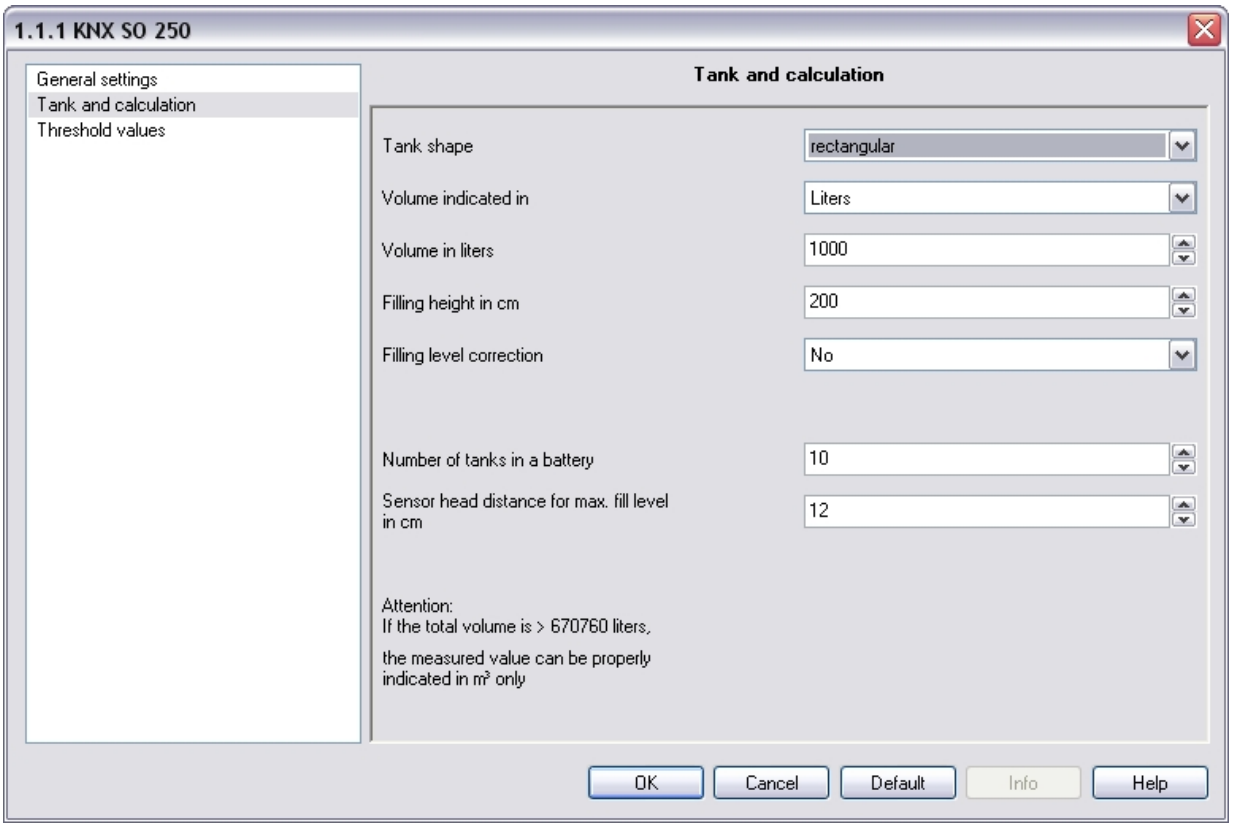
Transmission behaviour:

.....

Measured value	send cyclically send in case of change send in case of change and cyclically
from change in % (only for sending "in case of change")	1 … 50
send cyclically every (only for "cyclic" sending)	5 sec … 2h
Output of the measured value in	Litre cubic metres % m
Send max. filling amount on request	Yes • No
Send max. filling amount in (only when filling amount is sent on request and measured value is displayed in % or in m)	Litre cubic metres
General sending delay after power up and programming	5 sec 10 sec 20 sec 30 sec 1 min 2 min 5 min

Tank and calculation (only for fill level measurement)

Rectangular tank



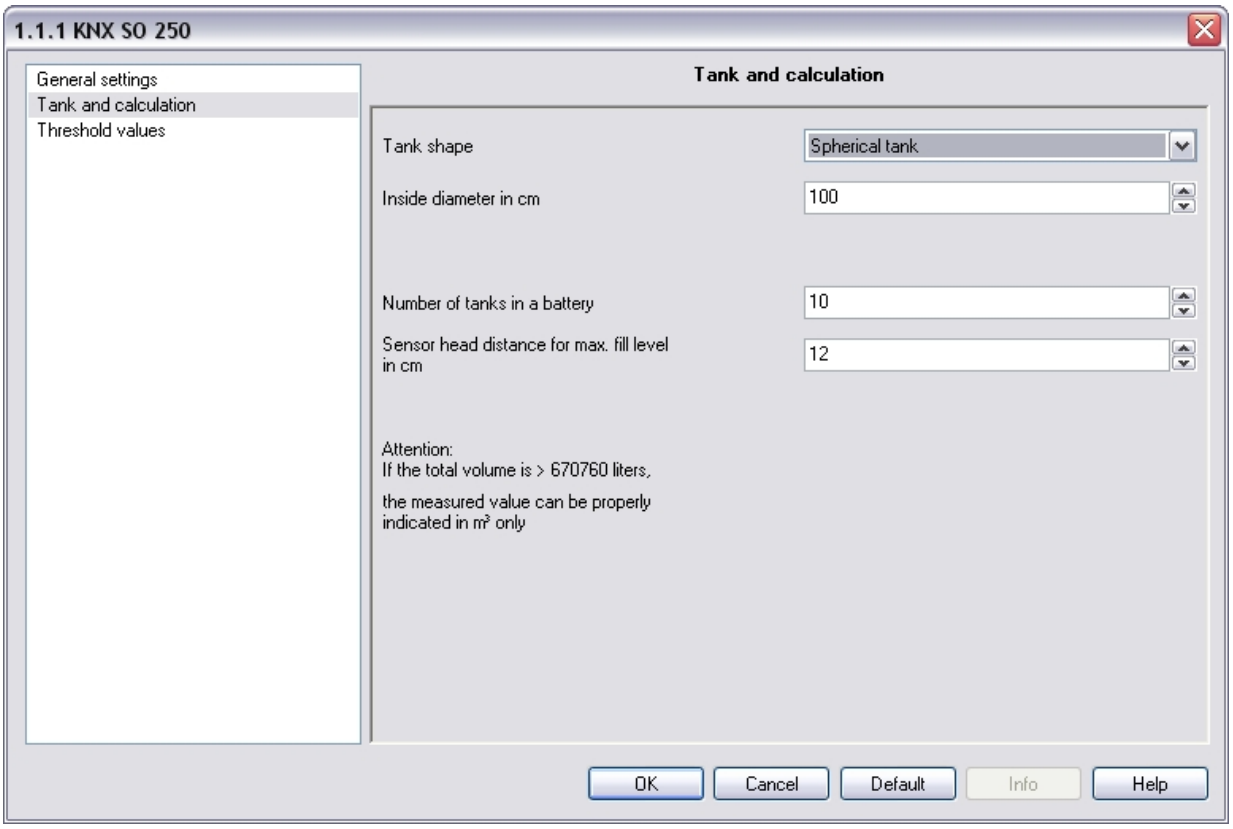
Tank design	• **Rectangular** • Spherical tank Cylinder vertical Cylinder horizontal
Volume indicated in	Litres • Cubic metres
Volume in Litres Volume in cubic metres	1 … 10.000.000
Fill height in cm	1 … 254
Fill level correction	Yes • No
Correction of (only if fill level is corrected)	Minimum Maximum Minimum and maximum
Shall correction be maintained after programming?	Yes • No

Note: When the fill level is adjusted the parameter fill height and/or sensor head distance is adjusted in the software.

Number of tanks in a battery	1 … 100
Sensor head distance for max. fill level in cm	12 … 200

Note: If the overall volume exceeds 670,760 Litres correct display of the measured value is only possible in m³.

Spherical tank

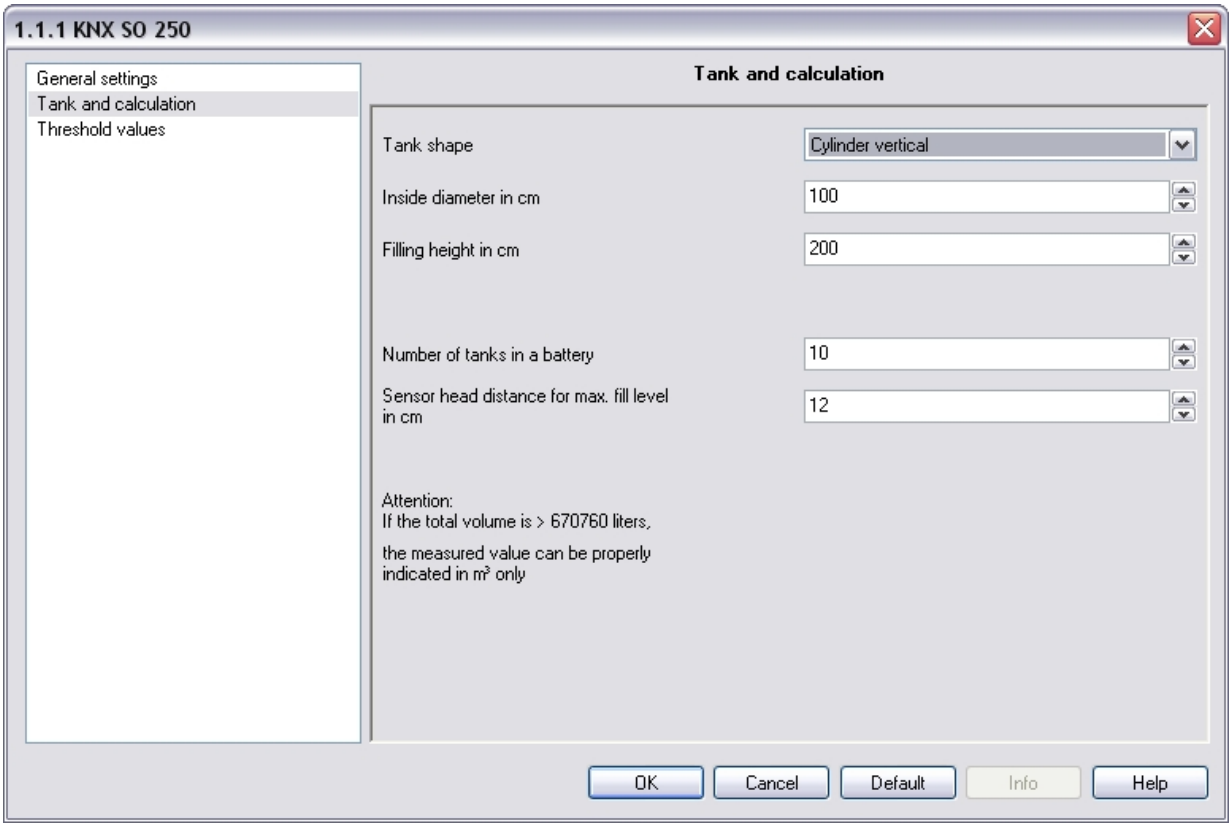


Tank design	Rectangular • **Spherical tank** • Cylinder vertical Cylinder horizontal
Inside diameter in cm	1 … 254

Number of tanks in a battery	1 … 100
Sensor head distance for max. fill level in cm	12 … 200

Note: If the overall volume exceeds 670,760 Litres correct display of the measured value is only possible in m³.

Cylinder vertical

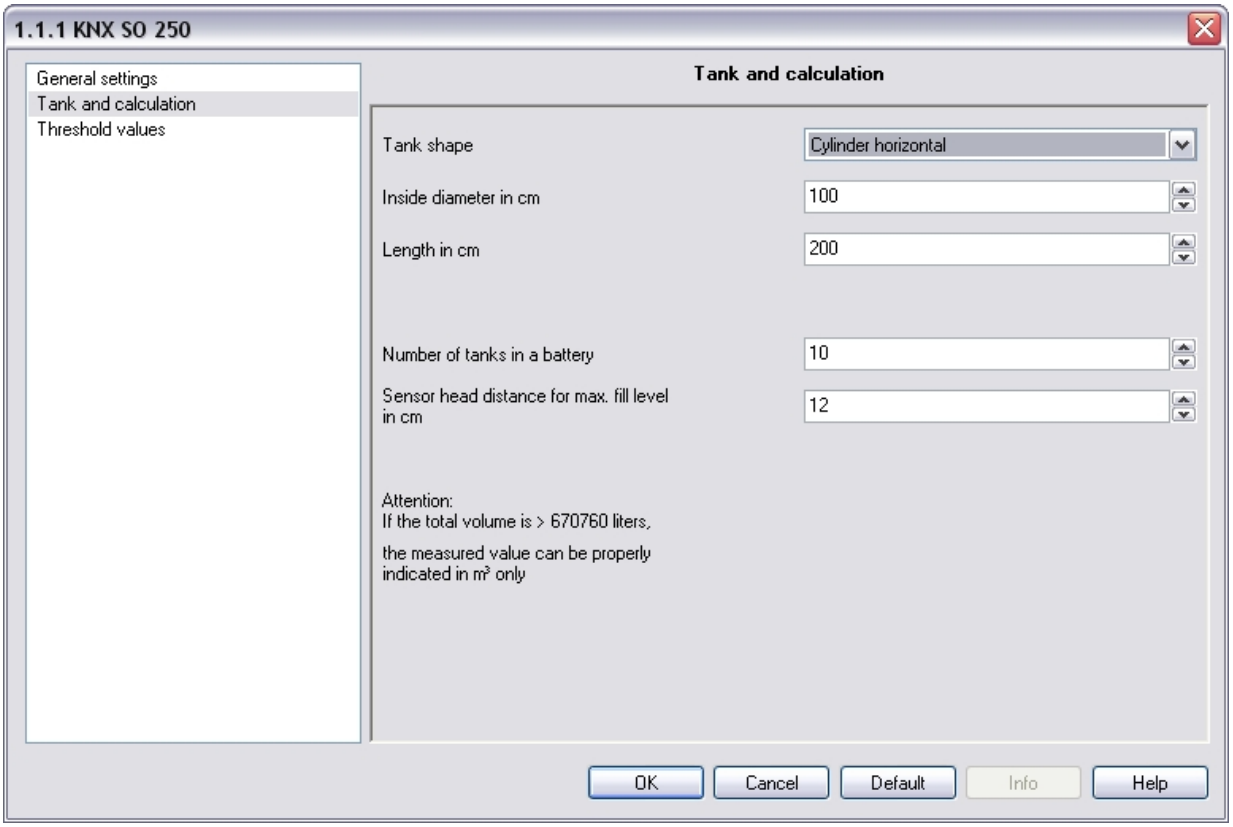


Tank design	Rectangular • Spherical tank **Cylinder vertical** • Cylinder horizontal
Inside diameter in cm	1 … 1000
Filling height in cm	1 … 254

Number of tanks in a battery	1 … 100
Sensor head distance for max. fill level in cm	12 … 200

Note: If the overall volume exceeds 670,760 Litres correct display of the measured value is only possible in m³.

Cylinder horizontal

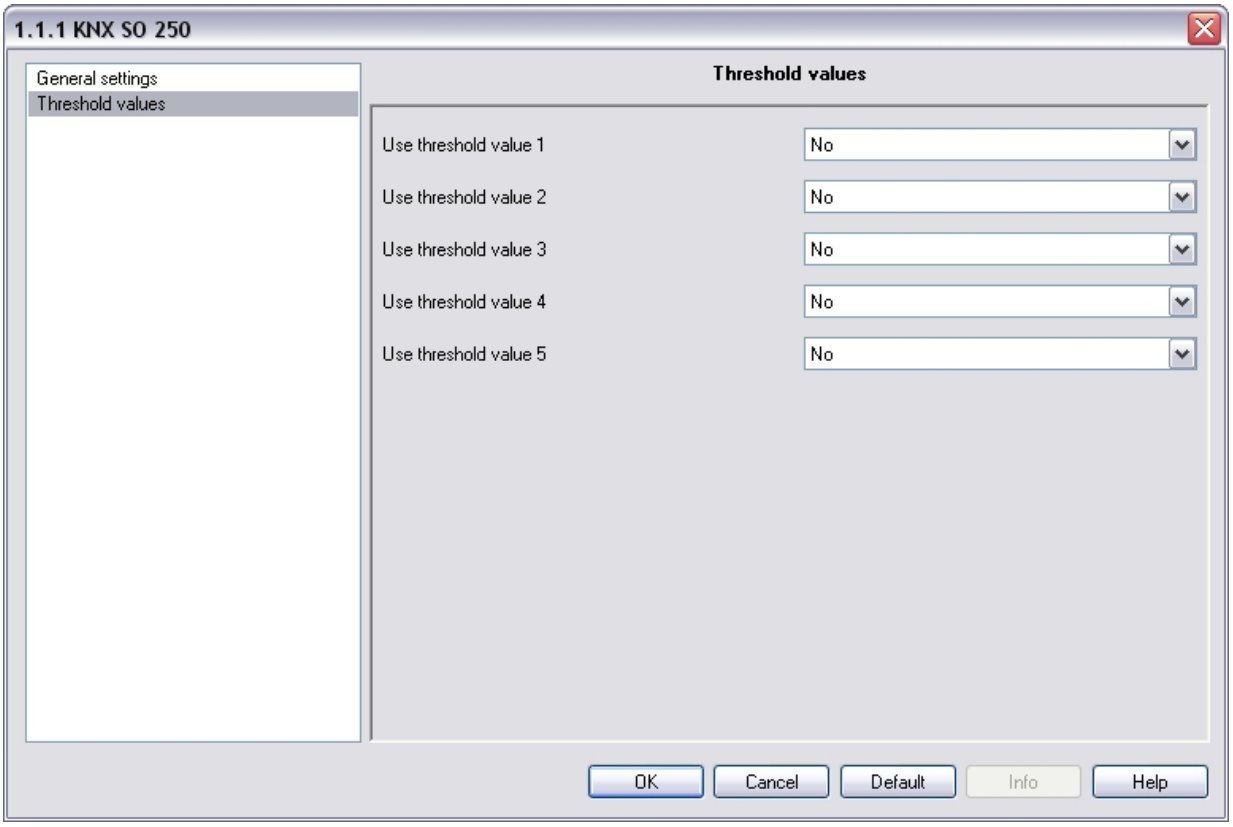


Tank design	Rectangular • Spherical tank Cylinder vertical **Cylinder horizontal**
Inside diameter in cm	1 … 254
Length in cm	1 … 100.000

Number of tanks in a battery	1 … 100
Sensor head distance for max. fill level in cm	12 … 200

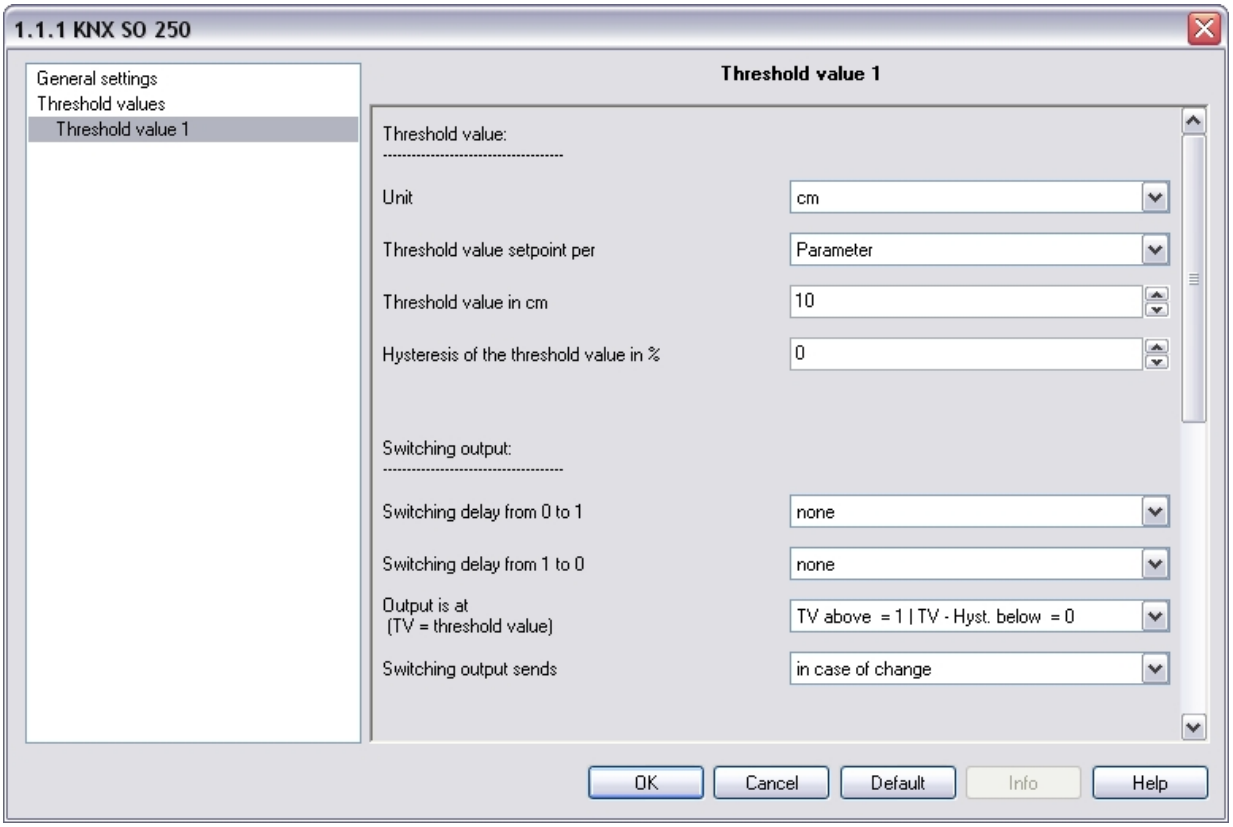
Note: If the overall volume exceeds 670,760 Litres correct display of the measured value is only possible in m³.

Threshold Values



Use threshold value 1	Yes • No
Use threshold value 2	Yes • No
Use threshold value 3	Yes • No
Use threshold value 4	Yes • No
Use threshold value 5	Yes • No

Threshold Value 1 / 2 / 3 / 4 / 5



Threshold value:

.....

Unit Note: for distance measurements only “cm“ allowed!	Litre cubic metres % cm
Threshold value setpoint per	Parameter • Communication object

For selection of “Threshold value setpoint per parameter“:

Threshold value in Litre Threshold value in m³ Threshold value in % Threshold value in cm	1 … 10,000,000 1 … 10,000,000 0 … 100 1 … 254
Hysteresis of the threshold value in %	0 … 50

For selection of “Threshold value setpoint per communication object”:

The value communicated last shall be maintained	not after restoration of voltage after restoration of voltage and programming

Start threshold value in Litre Start threshold value in m³ Start threshold value in % Start threshold value in cm valid until 1st communication (not for output after … programming)	1 … 10,000,000 1 … 10,000,000 0 … 100 1 … 254
Type of threshold change	Absolute value with a 16 bit comm. object (l) Absolute value with a 32 bit comm. object (m^3 and cm) Absolute value with a 8 bit comm. object (%) Increase/decrease with one comm. object Increase/decrease with two comm. objects
Step size (only for "increase/decrease" with one/two comm. object(s))	0,1 0,2 0,5 1 2 5 10 20 Liter 0,1 0,2 0,5 1 2 5 10 20 m^3 1 2 3 4 5 10 % 1 2 5 10 cm
Hysteresis of the threshold value value in %	0 … 50

Switching output:

.....

Switching delay from 0 to 1	none 1 sec … 2h
Switching delay from 1 to 0	none 1 sec … 2h
Output is at	TV above = 1 | TV – Hyst. below = 0 • TV above = 0 | TV – Hyst. below = 1 • TV below = 1 | TV + Hyst. above = 0 • TV below = 0 | TV + Hyst. above = 1
Switching output sends	In case of change In case of change to 1 In case of change to 0 In case of change and cyclically In case of change to 1 and cyclically In case of change to 0 and cyclically
Send switching output in a cycle of	5 sec … 2 h

Blocking:

.....

Use block of the switching output	Yes • No

If "use block of switching output: Yes" is selected:

Evaluation of the blocking object	if value 1: block | if value 0: release • if value 0: block | if value 1: release
Value of the blocking object before 1. communication	0 • 1

Behaviour of switchning output

with blocking	do not send telegram • send 0 • send 1

with release	(depending on switching output sending procedure)

The switching output procedure depends on the value of the parameter “Switching output sends …“ (see “Switching output“).

Switching output sends in case of change	do not send telegram • send status of the switching output
Switching output sends in case of change to 1	do not send telegram • if switching output = 1 ➔ send 1
Switching output sends in case of change to 0	do not send telegram • if switching output = 0 ➔ send 0
Switching output sends in case of change and cyclically	send switching output status
Switching output sends in case of change to 1 and cyclically	for switching output = 1 ➔ send 1
Switching output sends in case of change to 0 and cyclically	for switching output = 0 ➔ send 0

Elsner Elektronik GmbH Control and Automation Technology
Sohlengrund 16
75395 Ostelsheim
Germany
Phone +49 (0) 7033/30945-0
Fax +49 (0) 7033/30945-20
info@elsner-elektronik.de
www.elsner-elektronik.de

Technical support: +49 (0) 70 33 / 30 945-250