INSTRUCTION MANUAL

INDEX

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1. INTRODUCTION

Dear customer,

thank you for buying the tankmonitor TCM 4. This digital unit is state of the art in tank monitoring

On the large, illuminated display you can read:

- the actual filling level of up to four tanks

You have the possibility of:
- adjusting an alarm threshold (full or empty alarm)

The tank levels are shown as a bar and in % or litres.
The TCM 4 is easy to operate and well readable. You have a quick overview of up to four tank levels.

For level-sensoring we recommend the sensors of our TGT / TGW - series, the ultrasonic sensors UTV and the fresh water flow sensor DFS. These sensors are not part of the purchased parts package.
Sensors of other manufacturers can be connected as well; depending on the type you may need a hardware adaption at our company.
In the SETUP- menu the display will be configurated to the connected sensors. Also you have the possibility to adjust the tankmonitor to your given tank - geometry to show the real tank filling level correctly.

⚠ Please note: only when using the flow sensors DFS the shown display of litres is correct, because it measures the flowed litres. If you`re using other sensors, the TCM calculates the remaining tank capacity by the tank volume and the actual level. Depending on the accuracy of the sensors it cannot be litre-correct.

EXTENDED ADJUSTMENT POSSIBILITIES starting from software 2A - May 2010: the tank depth can be adjusted to the centimetre by using ultrasonic sensors UTV40 or UTV80. If you`re using a distance ring to balance the off zone of the sensors, you can compensate this value too! (please see page 9).

Please, read the Instruction Manual carefully and follow all instructions before putting the equipment in operation.

1.1. PURPOSE

The tankmonitors of the TCM-series can only be used with suitable tank sensors for low voltage purposes DC 10-30V. They were designed for the use on yachts or camper vans and must be used in an enclosed environment which is protected against rain, moisture, dust and condensation.
Don`t use the TCM tankmonitors in places where there could be danger of explosion by gas or dust.

1.2.CONTENT

- Tankmonitor TCM 4
- Plug-in clamp
- This Instruction Manual

1.3. ACCESSORIES (TO BE ORDERED SEPARATELY)

● Flow sensor for fresh water	DFS	Ord.-Nr.: 7 0003 0304
● Tank sensor	TGT / TGW 200-800	Ord.-Nr.: 6 6011 7xxx
● Ultrasonic tank sensor	UTV 20-80	Ord.-Nr.: 7 0219 35xx

1.4. WARRANTY

philippi elektrische systeme gmbh grants a two year limited and not transferable warranty for the first buyer of this equipment, commencing on the date of purchase and covers defects in manufacturing, parts and materials. Production or material defects will be corrected without costs if:

- the equipment will be send to us at the expense of the sender
- enclose the receipt (copy) of purchase
- the equipment was treated in the intended use
- no strange spare parts were built in or external effects happened

Not included in the warranty are damages from:

- overvoltage in the inputs or reverse polarity
- entered liquids in the device or oxydation through condensation
- lightning

Not under warranty are follow-up costs and normal wear and tear.

In case of warranty there must be a specification of the defect. A detailed description of the defect will ease and speed up the repair.
Please note that we cannot accept carriage forward deliveries.

1.5. EXCLUSION OF LIABILITY

Both the adherence to the operating instruction, and the conditions and methods during installation, using and maintenance of the TCM cannot be supervised by philippi electrical systems. Therefore we do not take any responsibility for loss, damage or costs, which develop due to incorrect installation and/or inappropriate enterprise.

1.6. QUALITY MANAGEMENT

During the process of manufacturing all devices pass several checks, controls and tests. Production, controls and tests are due to given protocols. Each TCM has its own serial number. Please do not remove this label. The assembly and testing of all TCM devices is carried out completely in our company at Remseck am Neckar.

2. SAFETY REFERENCES

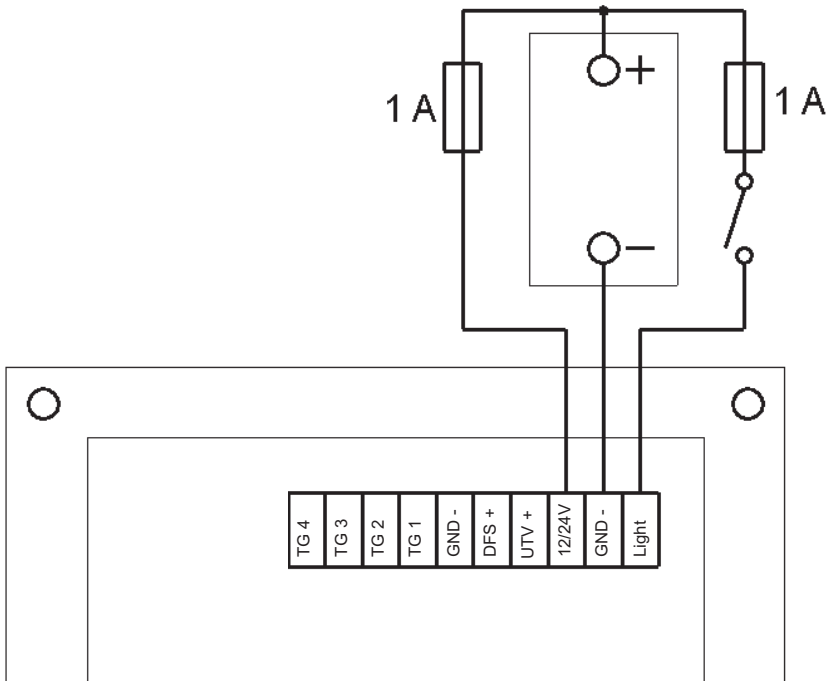
- unautorised change to the equipment will invalidate the CE sign
- the installation of the TCM may be made only by electrical specialists.
- Important! Pay attention to the correct polarity of the batteries!

The assembly and operating instruction is a component of the TCM package. It must be kept (for reference). Importantly: - for later maintenance work - and for the use of subsequent owners of the equipment.

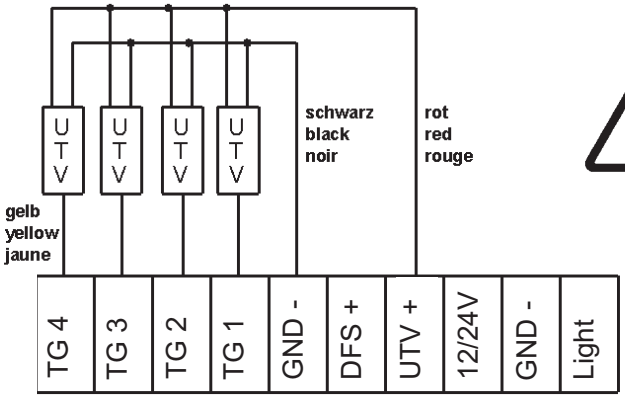
3.3. INSTALLATION AND CONNECTION

Please install the TCM in a visible place, so that it can be read off at any time. The necessary installation cutout is 88 x 88 mm, the necessary minimum depth is 40 mm.
The TCM supervises up to four tanks at the same time. If you have less sensors, start connecting the first sensor at terminal TG 1 (if you`re using two, connect them to TG 1 and TG 2 and so on)
You can use both passive (resistance) and active (ultrasonic) sensors at the same time. For the connection have a look at the connection diagramms.
The flow sensor DFS has to be connected to terminal TG 1 (if you`re using 2 flow sensors DFS, terminal TG1 and TG2)!
If you want to use tank sensors with an output of 4-20 mA or 0-10 V you need a hardware-adaption at our company. Please ask.

The power supply of the TCM is either directly from the battery or over a power distribution panel. Use a cable 1,5 mm² cross section which has to be fused (1A).
The display is lit when you press a button or you can connect the terminal “Light” to a switch and switch it on/off manually.

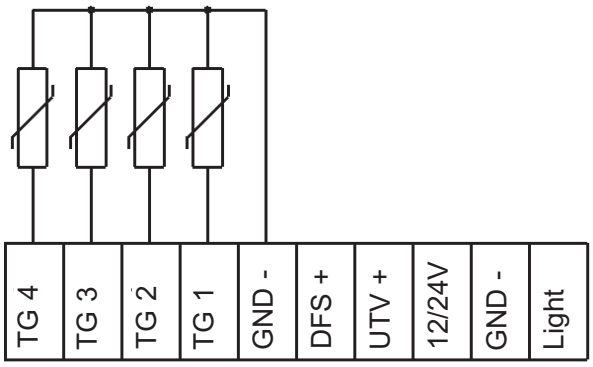


Connection of ultrasonic sensor UTV or over active sensors:

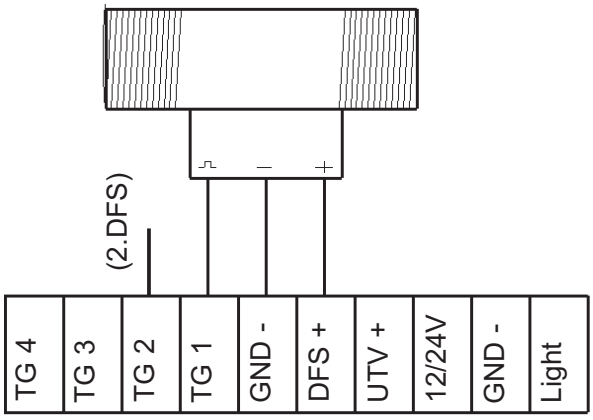


ATTENTION:
If the power supply of an ultrasonic sensor is connected directly to the on board DC system, not through the tankmonitor, this connection wire has to be fused by an 1A fuse!

Connection of passive (resistance) sensors like TGT / TGW and other:

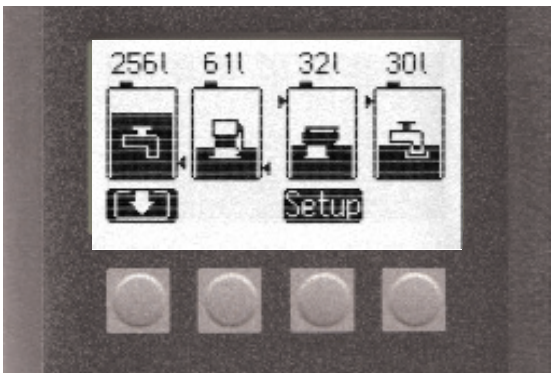


Connection of flow sensors DFS:



4. OPERATION

The display shows the tank levels automatically after switching on.
In the SETUP-menu you can adjust each tank-display individually to the medium (fuel, water...), to the type of sensor used, to the compensation value for the tank-geometry and the alarm-threshold. In case of a power supply breakdown all of these adjustments are saved and immediately available after switching on.
The tank levels are measured each 5 s. The measured levels are shown in a bar diagram and additonally either in litres, in percent or without further indication. This can be adjusted in the SETUP-menu.
If the indication over a tank is “----”, the measured value of the related tank is out of an expected value or there is no sensor connected.



If an alarm threshold for a tank is set up , this threshold is shown by a little triangle on the side of the bar.
So you have a quick overview if the tank level is inside of the correct range.
If the threshold is **over 50%,** the **full** -alarm is on, i.e. a filling level over the threshold set off the alarm.
If the threshold is **below 50%** the **empty -** alarm is on, i.e. a filling level below the threshold sets off the alarm.
In case of an alarm the related tank symbol is blinking and a buzzing signal is sounding for the preset time.
The alarm can be acknowledged by you when pressing a button

To reduce the current consumption when using ultrasonic sensors (ca. 50 mA / sensor), you can choose the **Powersave Mode**. Please note: when using the Powersave mode, the alarm is deactivated too!

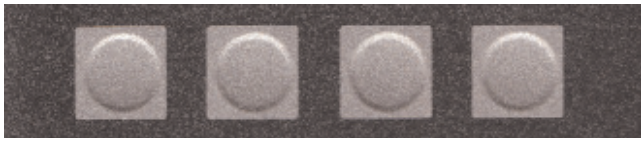
In the Powersave mode the measurement is carried out every 30 min. (11,5 - 13 V) and every 2 hours (below 11,5 V). The Powersave mode is activated automatically if the supply voltage goes below 11,5 V to save the batteries life. Under 10 V no measurement takes place.

In 24V- operation double values are applying.

5. HANDLING

When pressing the push buttons the display light is lit during 60 s. If you connect the terminal “Light” to the power supply via the power distribution panel the light can be activated manually.
The alarm can be acknowledged by pressing a button.

Following actions are activated by pressing:



Button 1 Button 2 Button 3 Button 4

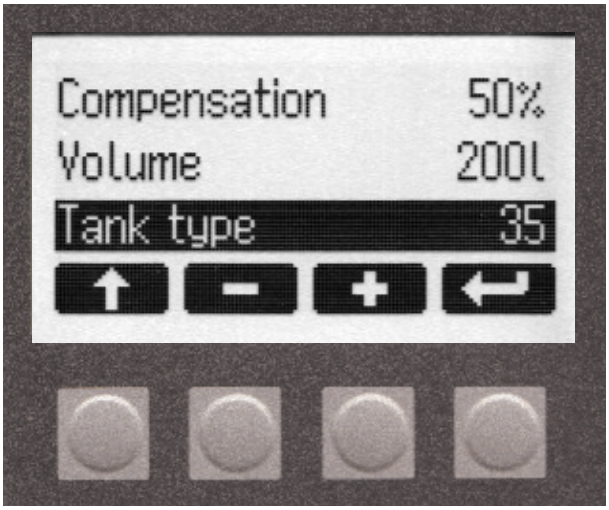
Button 1	Long pressing (3s)	Tank is being filled up in 5% steps until the maximum value (Only if tank1: Tanktype 40 - Flow sensor DFS)
Button 2	Long pressing (3s)	Tank is being filled up in 5% steps until the maximum value (Only if tank1: Tanktype 40 - Flow sensor DFS)
Button 3	Short pressing (2s)	“SETUP”- menu available; when the display is blinking, release the button
	Long pressing (5s)	Setup-menu is locked / unlocked
Button 4	no function	

5.1. SETUP

In the SETUP-menu all adjustments can be changed:

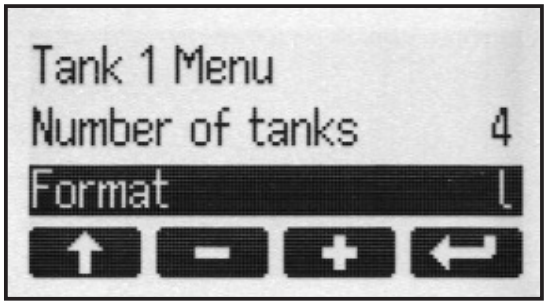
Following is the key function:

Arrow:	selection of the line to be modified
Plus:	increase the value
Minus:	decrease the value
Return:	save the values and return to the tank display



GLOBAL SETUP

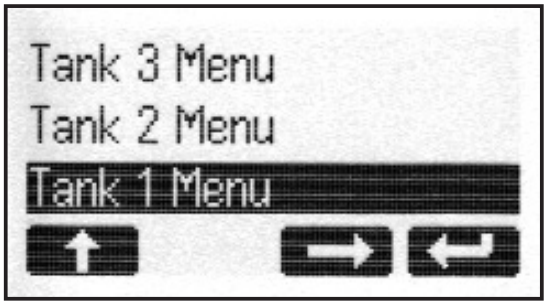
1. Display	a) Display of the remaining tank capacity in litres (l) b) Display of the remaining tank capacity in percentage (%) c) No numerical display of the remaining tank capacity
2. Amount of tanks	Amount of the displayed tanks (1 - 4 tanks)
3.Tank X Menu	individual adjustment of each tank: Capacity in litres, tanktype, Compensation-value, alarm - threshold and alarm - duration
4. Language	Language for the SETUP-menu. Available are following languages: German / English / French / Italian / Spanish
5. Contrast	Display contrast attitude + = dimmer, - = brighter
6. Powersave Mode	1 = on, 0 = off



The inverted line can be changed.

ADJUSTMENTS OF THE TANK DISPLAY:

You get into the choosen tank menu by pressing the button 3 (arrow to the right):



in the tank menu you can adjust the tank type (e.g. water, fuel, waste and the type of the sensor), the capacity, the compensation-value (adjustment of the tank-geometry), the alarm-threshold and duration.
Also you have the possibility to preset the ohm-values for 0%, 50% and 100% if your sensor has another range of resistance than 5 - 180 or 240 - 33 ohm (tank type 25 -29).

INDIVIDUAL TANK SETTINGS IN THE TANK MENU:

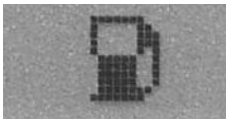
CAPACITY OF THE TANK

By pressing the +/- - button you can adjust the capacity of the tank. The capacity is displayed in litres.

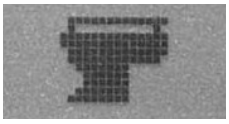
TANK TYPE (Tank 1-4)

By choosing the type of tank you`re defining both the desired display symbol and the type of a given sensor. There are 5 different tank symbols to choose of:

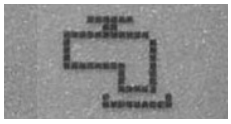
Fresh Water



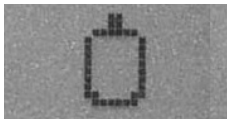
Fuel



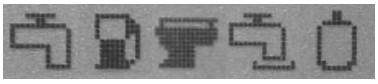
Waste Water



Grey-water



Gas

	Tank type					Sensor	Measurement range	Attention
								
	0	1	2	3	-4	philippi TRG	6 levels (6..190 Ohm)	
	5	6	7	8	9	philippi TGT / TGW	5..180 Ohm	
	10	11	12	13	14	philippi UTV	0,5..2,5V	
	15	16	17	18	19		0...10 V	Hardware adjustment!
	20	21	22	23	24		240...33 Ohm	UTR not possible!
A)	25	26	27	28	29		free adjustment of resistance range	
	30	31	32	33	34	5 Stab Büschelgeber	4 Stufen	Auxiliary hardware PB43!
B)	35	36	37	38	39	philippi UTV 40/UTV 80	0,5..2,5V	
C)	40					Flow sensor	DFS	former: tank type 35
							4...20mA possible by:	Hardware adjustment!

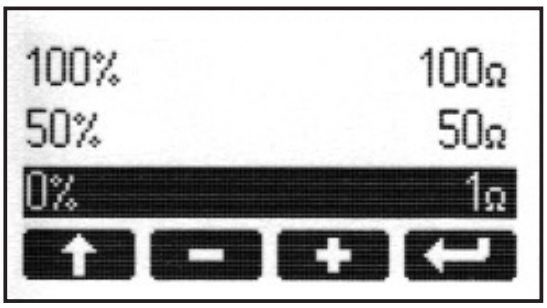
Incorrect display information can occur due to not compatible parts. Please ensure that the tank type matches the sensor. In former models the tank type of the flow sensor DFS was 35.

A) FREE ADJUSTMENT OF THE RESISTANCE RANGE OF THE SENSOR:
(TANK TYPE 25/ 26/ 27/ 28/29)

Does your sensor have a characteristic line which doesn`t exist in the SETUP? In this mode you can adjust the display to your sensor!

Sensors: this mode can only be used in connection with resistance-sensors, not in connection with active / capacitive sensors!

The resistance-values for 3 levels (0%, 50%, 100%) have to be entered. First you have to measure the resistance of your sensor when the tank level is empty, half-full and full by using an ohm-meter. You have to enter these values in the submenu of the according tank at 0%, 50% and 100%.



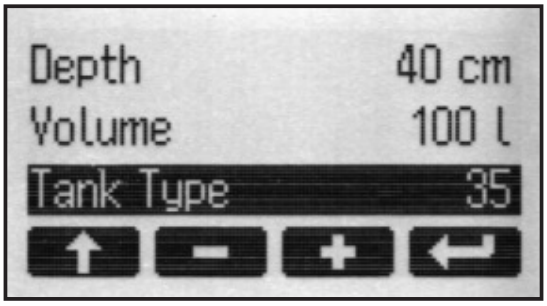
B) ADJUSTMENT OF THE TANK DEPTH + DISTANCE RING
(TANK TYPE 35 / 36 / 37 / 38 / 39)

You need the following ultrasonic sensor:

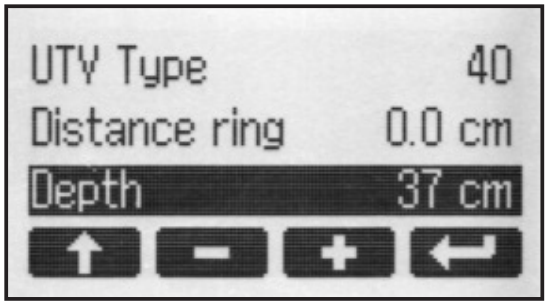
- tank depth plus distance ring equal or less than 40 cm: UTV40
- tank depth plus distance ring greater than 40 cm: UTV80 (max. depth measurable : 80 cm)

The depth of each tank can be adjusted to the centimetre in the SETUP-menu.

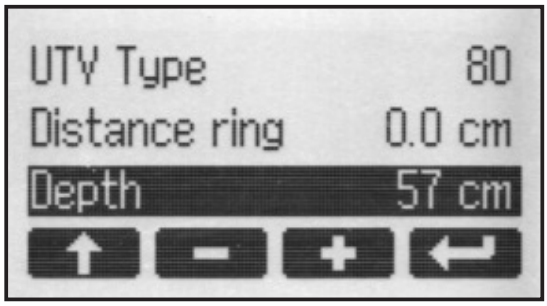
After entry of the tank type 35 - 39 the display shows the depth 40 cm:



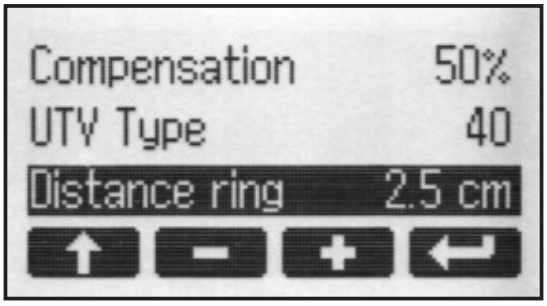
Now you can adjust the depth by pressing the - / + buttons

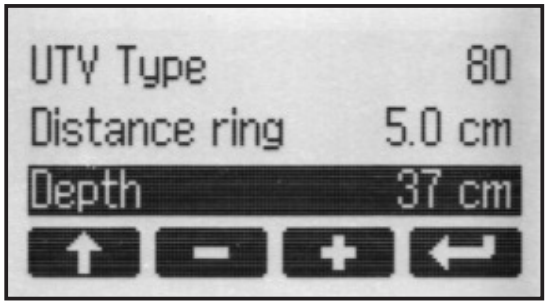


Is the depth of the tank greater than 40 cm, you have to use an UTV80. The TCM4 is showing that automatically:



To balance the off zone of the ultrasonic sensor (the range which is not measurable between sensor and liquid surface - 50 mm) you can use a distance ring UTS 25 or UTS 50.
If you`re using such a distance ring you can entry this distance too.



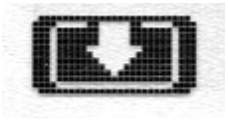


If the tank depth plus the distance ring is equal or less than 40 cm you need an UTV 40; greater than 40 cm an UTV 80. The TCM4 shows the type of UTV- sensor required automatically.

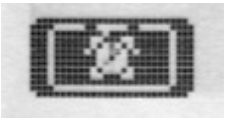
ATTENTION! If the total of tank depth and distance ring is greater than 40 cm, you have to use an UTV 80! (f.e. tank depth is 37 cm and distance ring is 5 cm = total depth is 42 cm)
You can use only ultrasonic sensors UTV40 or UTV80!

C) TANK TYPE 40 - DFS (former software: tank type 35)

If the tank type 40 (flow sensor DFS) is preset for tank 1 or 2, the following symbol is shown in the basic display:



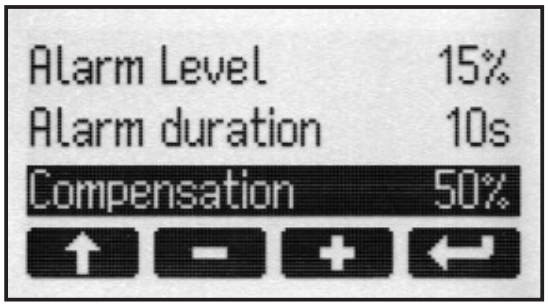
after filling-up of the tank you can fill-up the shown content according to the filling in steps of 5% by long-pressing (ca. 5s) of the button.



If there`s water flowing through the flow sensor DFS and the tank is filled, this is shown by a rotating bar. If the tank is empty, the bar doesn`t rotate.

ADJUSTING THE ALARM

You can adjust the alarm threshold for each tank separately.

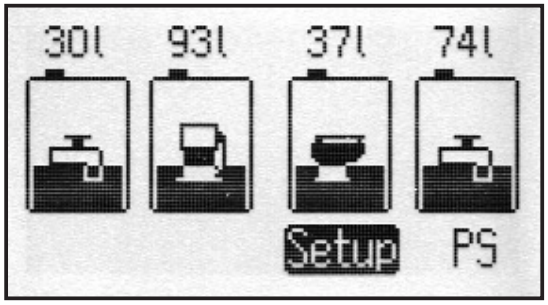


Alarm duration	0 s	Alarm off
	1... 600 s	Alarm duration 1... 600 seconds
	601 s	Alarm open end, until it will be acknowlegded by pressing a button or if the measured value has changed so that the alarm is cancelled.
Alarm level	0 %	Alarm off
	1..50 %	Empty-alarm: if the level falls below the adjusted threshold the alarm will be activated. The activation is delayed by 15s.
	51... 99 %	Full-alarm: if the level rises above the adjusted threshold the alarm will be activated. The activation is delayed by 15s.

POWERSAVE- MODE (PS)

The Powersave mode (PS) is only for the use with ultrasonic sensors UTV, or other active sensors, because these sensors have a power consumption of ca. 50 mA of each sensor.

If the Powersave mode is activated in the SETUP, there`s the sign “PS” down to the right.

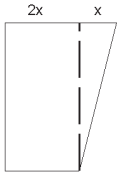


ATTENTION!
In the Powersave mode the alarm is switched off!

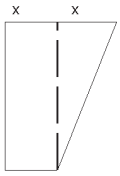
In the Powersave mode the measurement takes place in dependence of the supply voltage:
Above 13V the Powersave mode is switched off automatically. Below 11,5V automatically switched on.
If the supply-voltage is between 11,5 - 13V a measuring cycle takes place every 30 minutes;
if the supply voltage is below 11,5V a measuring cycle takes place every 2 hours.
A measuring cycle lasts 5 minutes, thereby the sensors are scanned each 5 s.
A new measuring cycle is started each time when a button is pressed. During the cycle-interval the display shows the latest measured values.
In 24V- operation double values are applying.

ADJUSTMENT TO THE GEOMETRY OF THE TANK / COMPENSATION (TANK 1-4):

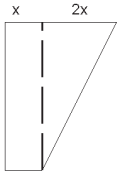
K = 50



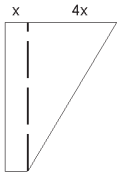
K = 45



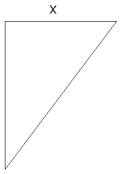
K = 40



K = 35



K = 30



K = 25

Tank1...4 : Adjustment of tank geometry

With non rectangular tanks the level height is not proportional to the content of liquid in the tank. By means of the compensation value this can be considered in the display. The compensation value changes the tank characteristic in such a way that the indicated level is approximated to geometry of the tank.
The value to be entered is value the tank display should indicate with the half level height of the tank is. The following examples shows which values the compensation value with different geometry will be:

If tank geometry is strongly deviating from the examples, then the correction value can be determined.

The correction value is computes by capacity of level iof half height divided by the capacity of entire level in the tank multiplyied by 100.

$$\text{Correction value } K = \frac{\text{Capacity of half level height}}{\text{Level of fuel in the tank entirely}} \times 100$$

Example: The tank has a total volume of 150 l with a maximum filling height (tank height) of 50 cm.

In order to determine the correction value, the tank is filled up only up to the half filling height (= 25 cm). Computationally or by filling up a value of 65 l results.

Inserted into the formula results for the correction value a value of:

K = 65 l/150 l x 100 = 43

This is deposited accordingly now in the Setup.

6. TROUBLESHOOTING

If the tankmonitor shows wrong values or (---), please check first the sensor and the correct connection of the sensor. Check also the wiring between the sensor and the tankmonitor. This is the main source of defect.
If the shown values are totally implausible, check the supply voltage of the sensors. The supply voltage has to be min. 10 V (see the data sheet of the sensor).

7. MAINTENANCE

The tank does not request special maintenance. The frontpanel can be cleaned with a damp cloth without using agressive detergents.

8. TECHNICAL DATA

Power supply	DC 10 - 30 Volt
Power consumption	ca. 8 mA when using resistance sensors, 60 mA if the display is lit (12 V) 12 mA when using a flow sensor DFS when using ultrasonic sensors UTV: 50 mA per sensor (without Powersave mode)
Dimensions:	105 x 105 x 40 mm
Installation cutout:	88 x 88 mm

9. CE-CONFORMITY

philippi elektrische systeme gmbh
Neckaraue 19
71686 Remseck am Neckar
Germany

certifies herewith, that the product: Tank monitor TCM 4

fulfills the requirements of the European Regulation 2004/108/EG.
Following harmonised standards were implemented:

Immunity:	EN 61000-6-1:2007
Emission:	EN 61000-6-3:2007

Remseck, May 2009

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