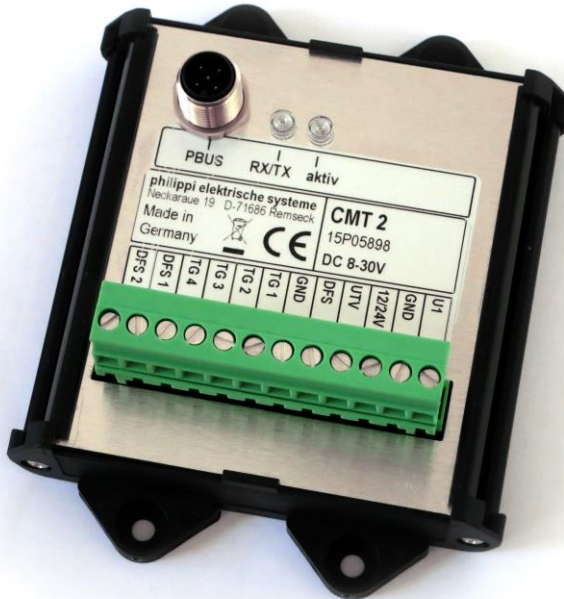philippi

OPERATING MANUAL

TANK INTERFACE CMT 2

General Information

By using the tank interface CMT 2 you can connect up to 4 tank sensors to the philippi PBUS – system. With a tank interface CMT 2 you can supervise up to 4 tanks and in addition one battery voltage.
All in all you can connect up to 4 tank interfaces CMT to one PBUS system.

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1 Safety References

• unauthorized changes to the equipment will invalidate the CE sign
• the installation of the CMT 2 may be made only by electrical specialists.
• before connection of the CMT 2 the battery terminals must be clamped.
• Important! Pay attention to the correct polarity of the batteries!
• the power supply wire of the tank interface CMT 2 has to be protected at the battery.

The assembly and operating instruction is a component of the CMT 2 package. It must be kept (for reference). Importantly: - for later maintenance work - and for the use of subsequent owners of the equipment.

1.1 Exclusion of liability

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

1.2 Warranty

philippi elektrische systeme gmbh grants a two year limited and non-transferable warranty for the first buyer of this equipment, based on our terms of sales and delivery – chapter 7. These terms are the principles of all our quotations and deliveries. They`re printed on our catalogues and part of all quotations and confirmations.

1.3 Declaration of Conformity

This device fulfills the requirements of the European regulation:

2004/108/EG ''ElectroMagnetic Compatibility''

The conformity to this regulation is certified by the CE - sign.

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2 Contents

Tank Interface CMT 2, PBUS-M12-T-cable
Plug-in clamp 10 poles
This instruction manual

3 Technical Data

Power Supply   DC 10-30 V

Power consumption   8 mA @ 12 V with resistor tank sensors
                                     By use of flow sensor DFS
                                     12mA per DFS in addition
                                     By use of ultrasonic sensors UTV:
                                     50mA per UTV in addition
                                     (without Powersave mode)

Dimensions: W111 x D 90 mm ,
                                     Height incl. plugs 42mm
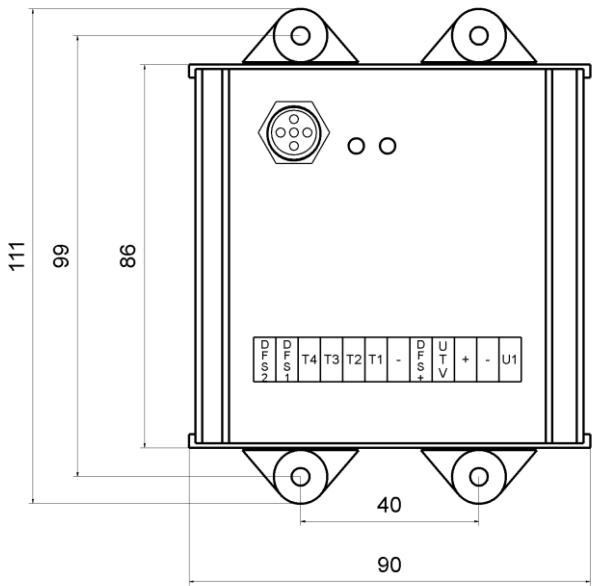
3.1 Softwarerevision

V1.8 JUL 2016
For DFS sensors, the number of pulses per liter is adjustable. Default value is 1000
pulses / liter

4 Recommended tank sensors (not part of delivery)

Fresh water:
• Flow sensor	DFS24	Order no.: 7 0003 0324
• Tank sensor	TGW 200-800	Order no.: 6 6011 7xxx
• Pressure sensor	TDW200	Order no.: 6 6025 1206
• Gobius	GOBIUS4	Order no.: 7 0097 0497

Petrol/Gasoline:
• Tank sensor	TGT 200-900	Order no.: 6 6011 7xxx

Diesel:
• Tank sensor	TGT 200-900	Order no.: 6 6011 7xxx
• Pressure sensor	TDS200	Order no.: 6 6026 1206
• Gobius	GOBIUS4	Order no.: 7 0097 0497

Grey water / Black (Waste) water:
• Pressure sensor	TDW200	Order no.: 6 6025 1206
• Gobius	GOBIUS4WASTE	Order no.: 7 0097 0442
• Ultrasonic tank sensor	UTV 20-80	Order no.: 7 0219 35xx

Recommended accessories for ultrasonic sensors:
• Focus tube	UFT 40 (40cm long)	Order no.: 7 0219 9400
• Focus tube	UFT 80 (80cm long)	Order no.: 7 0219 9800
• Distance ring	UTS 25 (25mm)	Order no.: 7 0219 9025
• Fuse holder incl.fuse1A for measuring lines ASH1A		Order no.: 6 0030 3411

5 Installation

Please install the tank interface CMT 2 at a sheltered and dry place and connect the DC- power supply via a fuse (1A) and up to four tank sensors as shown in the diagram. The tank sensors can be connected mixed (TGT / TGW and UTV etc.).
Each tank sensor has it`s own specific connection scheme.
At the terminal U1 a battery can be connected by a fused measuring line – the voltage will be shown in the battery menu.
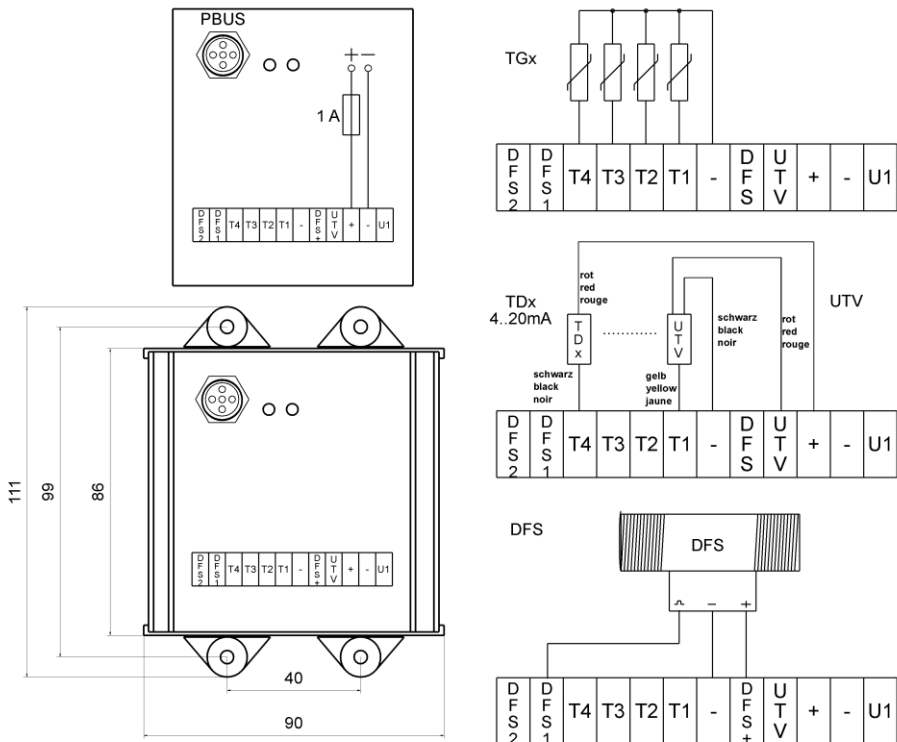
The LED "aktiv" flashes every second, as soon as the CMT 2 is active.

Attention: at the CMT 2 you can connect **max. 2 flow sensors DFS.** They have to be connected to the terminals DFS 1 and DFS 2. If flow sensors DFS are connected, you **cannot** use the input TG1 (and also TG2, if two flow sensors are connected) for other sensors.

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5.1 Embedding into the PBUS

After having connected the CMT 2 to the PBUS by using the M12-data cable you can look if the CMT 2 is recognized in the PBUS:
Therefore please choose in the Setup menu „Display" page 2 „Connect devices". After scanning the PSM lists every identified device.
If an additional device is connected it will be displayed too automatically. If there are devices de-installed or not operable these devices will be cancelled on the list.

After having identified and recognized all devices you can go to the Setup menu for tanks and set all individual adjustments for each tank.
If a battery voltage is connected to the terminal U1, a "CMV" device is recognized in the "Connect devices" – menu.
The LED RX/TX flashes, if the communication with the PSM / PBUS is active.

6 Setup of the PSM / CMT2

In the PSM Setup submenu for the tanks you can make all adjustments for each tank. These adjustments are saved in each CMT 2 locally and are available immediately for additional System Monitors PSM.
Please also have a look at the PSM manual.
For each connected tank sensor there are following adjustments available in the Setup menu: description, location, volume, sensor type, compensation, alarm threshold 1 & 2. In order to get a correct display it is absolutely necessary to adapt the parameters to the relating tank / tank sensor.

6.1 Description

This name will be shown under the tank symbol and serves for a better allocation.

6.2 Location

This location will be shown under the tank symbol and the description – it serves for the clear relationship for several similar tanks.

6.3 Volume [1-9999l]

Please give in the volume of the tank, so that the percentaged displayed value can be calculated into a liter value.

Please note, that the displayed value cannot be correct to the liter, because it is only a calculated value and it isn`t possible to get such a correct information from your tank measuring system!

6.4 Sensor type

Following tank sensors can be connected/adjusted:

Not active	No sensor connected
PB42	Prong sensor incl. electronic board PB42
Level switch TRS	On / Off for tank alarm 100%
Gobius	4 levels for Gobius 4(1-4V) from year 17
DFS W (Filling / Emptying of the tank)	2 flow sensors necessary
philippi TRG	6 levels (6..190 Ohm)
philippi TGx	TGT / TGW (10..180 Ohm)
philippi UTV/UTA	0,5..2,5V, UTA (4...20mA)
0...10 V	Hardware adjustment necessary at the CMT
240...33 Ohm	Resistance sensor (UTR not possible!)
User [Ohm]	free adjustment of the resistance range
TDS / User [V]	Pressure sensor TDx 200/ sensors with a voltage output range of 0-5V
philippi UTV40/80	UTV40 or UTV80 (0,5..2,5V)

DFS down (Emptying of the tank)   Flow sensor   counting downwards
DFS up (Filling by a water maker)   Flow sensor   counting upwards

6.4.1 Not active

If a tank input terminal isn`t connected to a sensor, please choose "not active"

6.4.2 Sensor type PB42

For this setting you need a prong sensor with 5 rods and the electronic printed board PB42. The display shows 4 steps.

6.4.3 Sensor type TRS

If you have a float level sensor like the philippi TRS (installation on top of the tank) or a philippi RSW/DSW (installation at the side of the tank) you have to choose this function. The display of the tank level rests at 0% until the level sensor is switching - then the displays goes to 100% (delay time 30s).
A pre - resistor isn`t required.

6.4.4 Sensor type DFSW

When choosing this function, you`re using two flow sensors DFS for one tank; one flow sensor empties the tank (this one has to be connected at terminal TG1) and the other flow sensor fills up the tank (water maker, flow sensor connected to terminal TG2). With this function the values of both flow sensors are added and displayed as tank 1 in the main menu. The tank 2 is only virtual and cannot be seen / displayed.
If you choose this function for tank 1, tank 2 will be automatically adjusted to DFS ↑ (arrow up).
Please see also chapters 6.4.13 and 6.4.14.

6.4.5 Sensor type GOBIUS

The voltage output of the GOBIUS control unit has to be connected to a CMT 2 input. The display of the fluid level is shown in 4 levels according to the GOBIUS LED-display. The internal adjustments of the GOBIUS system cannot be adjusted from the CMT/PSM. They have to be done by using the GOBIUS LED-display.

6.4.6 TRG (built until 2006)

This function is for sensors series TRG with a 6 level resistance output 6-190 Ohm.

6.4.7 Sensor type TGx (TGW / TGT)

For this adjustment you need a tank sensor series TGW (fresh water) or TGT (fuel) with a resistance output of 10 - 180 Ohm (10 Ohm = empty / 180 Ohm = full).

6.4.8 Sensor type UTV / UTA

For this function you need an ultrasonic sensor Philippi UTV with a voltage output of 0,5 - 2,5V (0,5 V = empty / 2,5 V = full).

⚠️ If you want to connect an ultrasonic sensor UTA with an output of 4 - 20mA you have to adjust the input setting of this terminal by switching the relating DIP switch (please see chapter 6.4.12) to 4-20mA.

6.4.9 Sensor type 0-10V

⚠️ For this function you need a sensor with a voltage output of 0 - 10V. ATTENTION: Hardware modification necessary!

6.4.10 Sensor type 240 – 33 Ohm

For this function you need a tank sensor with a resistance output of 240 - 33 Ohm (240 Ohm = empty / 33 Ohm = full).

6.4.11 Sensor type User R

For this function you need a passive resistance sensor with a resistance output range between 1 ohm and 400 ohm. You need to fill in the voltage values for the 5 tank levels 0, 25, 50, 75 and 100%. There are two possibilities to do this:

1) You know the resistance values for the respective fill levels and enter them.

2.) Press the% button on the PSM for 2s when the respective level is reached. The monitor assumes the corresponding resistance value of the sensor for the current measured value.

⚠️ This setting only works for passive resistance tank sensors, not for capacitive tank sensors or active resistance encoders (eg philippi UTR)

6.4.12 Sensor type TDS / TDW / USER (V)

This setting has to be chosen for the following tank sensors:
- Sensors with a voltage output range of 0-5V
- Pressure sensor TDS 200 / TDW 200
- Sensors with a current output of 4-20mA

Sensors with an output range of 0-5V can be connected directly.

While using a pressure sensor TDS or a sensor with current output 4-20mA you have to adjust the relating input via DIP switch.

The DIP-switches are situated underneath the black housing.
This housing is fixed with 2 screws and can be easily removed. After having opened the coverage you can see the DIP switches as shown hereby.

Choose the relating input and adjust the corresponding DIP switch either to TDS or to setting 4-20mA depending on your sensor.

Setting for TDS/TDW 200:

You have to fill in the voltage values for the 5 tank levels 0, 25, 50, 75 and 100%. You have two possibilities to do this:

Method 1 (recommended, tank has to be filled step by step):
the sensor is in the empty tank. You go in the Setup menu, to the 2nd page and press the button 0% for 2s. While pressing the measured value for 0% will be entered. In the next step you fill up the tank to 25%. Then you go in the Setup menu to the value for 25% and press the button 25% for 2s.
For the values 50%, 75% and 100% you proceed in the same manner. We recommend to take a note of these values for later maintenance work. You have to make sure, that every voltage value (for 0%, 25%, 50%, 75%, 100%) is recorded/registered.
This method has the advantage, that the shown tank level of even an abnormal tank form is displayed correctly.

Method 2 (installing the TDS/TDW200 in a full tank):
The sensor is outside of the tank. Press in the Setup menu the button for the value of 0% for 2s. While pressing the measured value for 0% will be entered. Please note this value. Then install the sensor (take care that it is at the bottom of the tank) and go again in the Setup menu and press the button for the value 100% for 2s. Please note this value too.
The values for 25%, 50% and 75% have to be calculated now. First please subtract the 0% value from the 100%. Divide this value by four. Add this value to the 0%- value and you have the 25%- value. Go in the Setup menu to the 25% value and enter it by pressing the 25% button. In the same manner you calculate the 50% and 75% values and enter them manually.

6.4.13 Sensor type UTV 40 / UTV 80

You need the following ultrasonic sensors:

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

The depth of each tank can be adjusted to the cm in the SETUP-menu.(1 inch = 2,5 cm). After having selected the tank type UTV 40/80 you have to choose the UTV type (40 or 80), a distance ring UTS (if installed) and the depth of the tank.

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. If the UTV40 is chosen, the adjustable depth incl. distance ring is always less than 40cm.

6.4.13 Sensor type DFS ↓

For this setting you need a flow sensor philippi DFS or DFS24.
By default, the CMT2 is set to the DFS24 (1000 imp. / L). When using the predecessor DFS, the impulse number must be set to 2200 Imp./l.
The DFS24 can only be connected to terminals DFS 1 and / or DFS 2. Since this sensor cannot detect whether the tank is filled, you must enter the level manually.
By pressing the assigned key, you can go directly to the tank menu and adjust the level accordingly.

6.4.14 Sensor type DFS ↑

Please see chapter 6.4.13. But in difference the relating tank will be filled. This can be useful to obtain the produced amount of fresh water if you have a Watermaker.

6.5 Compensation / Adjustment to the geometry of the tank

With non-rectangular tanks, the level height is not proportional to the content of liquid in the tank. With the CMT2/PSM you two options to display such tank volumes:
- You can use the percentage input via USER R (resistance tank sensors) or USER V (voltage input) – see chapters 6.4.11 and 6.4.12
- Or you`re using the compensation menu:

With the compensation value the proportion of the filling height to the liquid quantity can be taken in account. The compensation value changes the tank characteristic in such a way that the indicated level is approximated to the geometry of the tank.

The value to be entered is the half-height percentage by volume of a full tank. The examples on the left show what compensation value (K) would be entered as an approximation for tanks of several common geometric shapes.
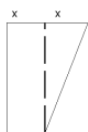

K = 50

If your tank geometry deviates greatly from those shown on the left, then the compensation value can be determined by the formula below.
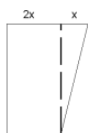
K = 45

The compensation value is found by dividing the liquid capacity at half the tank height, by the capacity of the tank when full, multiplied by 100.

K = 40

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

Example:

K = 35

The tank has a total volume of 150 L with a maximum filling height (tank height) of 50 cm.
In order to determine the compensation value, the tank is filled to the half-tank height (= 25 cm), and it is found to require 65L to fill to this level.

K = 30

Using the formula, the compensation value is found to be:

K = 65 l/150 l x 100 = 43 - The number 43 is then entered as the compensation value in Setup.

K = 25

It doesn`t make sense to use both proportion adjustment at the same time.

6.6 Alarm ON / Alarm OFF [0-100%]

For each tank you have the possibility to adjust two alarm levels, one level is the Alarm-ON threshold and the other is the Alarm-OFF threshold. This function is very useful if you want to switch for instance a tank pump automatically. To switch the pump on / off you need the switching module CMR4. You recognize the thresholds optically in the main tank menu as lines.
In the main tank menu you can see at a glance if the filling levels are in the correct range.
For Alarm-ON-thresholds over 50% the full alarm is activated. That means, that a fluid level above this threshold causes an alarm.
For Alarm-ON-thresholds under 50% the empty alarm is activated. That means, that a fluid level under this threshold causes an alarm.
When an alarm is on, the relating filling level is shown in red.

6.7 Identification

The type of hardware will be shown (CMT2), the software version (V015), the serial no. of the CMT2 and the terminal name of the sensor input (TG1).

6.8 Voltage measurement at U1

In addition to the tank supervision you have the possibility to supervise one more voltage / battery. If a battery is connected to the terminal U1, you can see the device "CMV" in the Setup mode (connected devices) and the voltage will be displayed in the battery menu of the PSM.

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7 Operation
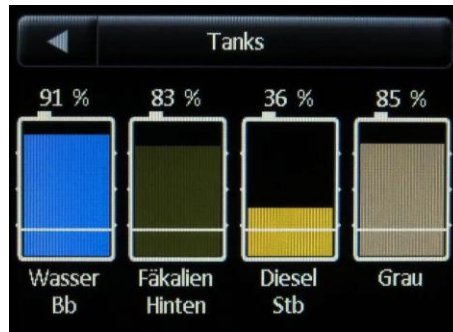
7.1 Display

By pressing on any tank the display will be switched between no value, % and liter-display.
If a tank is defined as a flow sensor tank, you can adjust the filling level of the tank by pressing on the tank description below the tank symbol (e.g. setting the filling level to 100%). If you`re using a water maker we recommend to adjust the tank volume to a value which is 100 times of the hourly performance of the water maker.

7.2 Powersave Mode of the CMT2

The Powersave Mode is especially designed for the operation together with ultrasonic sensors UTV. These UTV sensors have an own consumption of 50mA per sensor.

The Powersave Mode is active as soon as all connected System Monitors PSM are in sleeping mode (display out). Thereby the CMT2 switches automatically from a permanent measurement to a cyclic measurement, dependent on the voltage of the power supply:
 If the voltage is between 11,5 - 13V (respectively 23-26V for 24 V- systems) the measurement takes place every 30 minutes for a 5 minutes period. Drops the power supply voltage below 11,5V (23 V) the measurement takes place every 2 hours for a 5 minutes period. If the voltage is above 13V (26 V) the Powersave Mode is disabled automatically.
At any time you can start the measurement by activating the tank main menu – so you get the up to date filling levels even if the system was in standby mode.
The alarm management is always active and if a filling level under/over an alarm threshold is recognized, the PSM display will be activated and shows the alarm message.

8 Troubleshooting

If the tank monitor shows wrong values or (---): please first check the sensor and that the electrical connections are good. Check also the wiring between the sensor and the tank monitor, as this is the main source of problems.
If the reading from an ultrasonic sensor UTV is incorrect, check the power supply voltage at the sensor. This must be at least 10V (see technical data of the tank sensor).
If the shown values are implausible please check the power supply of the CMT2 – it must be at least 10V.

**Voltage at terminal U1 isn`t shown:** please check, if the device "CMV" will be shown in the Setup menu (chapter 5.1) by pressing the button "logged devices". The voltage measurement takes place via an integrated interface "CMV". If the device isn`t shown, please press "renew device addresses" and then " connect devices" – if a battery voltage is connected at U1, the device "CMV" will be displayed and the voltage will be shown in the battery menu.

9 Disposal Note

Please take care of your local directives on waste electrical and electronic equipment.
Please use collection points for waste electrical and electronic equipment.