Initial Operation and Handling:

The electronic level display control unit DWA-5006 controls the fill level in liquid tanks. The unit provides a 4-digit LED display and two output relays with programmable thresholds. The unit has an analogue measurement input for a 4 – 20 mA measurement probe and a malfunction dispatcher input.
Main application for this unit are fill level monitoring of heating oil tanks and level management of rain water cistern systems.
A plugable Link Adapter module allows the transmission of the current measurement data to an office PC (*PC-LINK* accessory set) or to the *GSM-Messenger* for observance by handy.

Attention should be paid to:

- Only qualified experts are allowed to do the installation of the display unit and the measurement probe. For the probe installation follow the installation instruction.
- The DWA-5006 has a enclosure for wall fastening and is connected to 230 V power line.
- In normal operating mode the enclosure cover has to be closed.
  The basic program setup initial operation can be done by a qualified expert with opened enclosure cover.
  Attention! Keep distance to the area with the 230V clamps.
- The displayed values are not suitable for billing purpose. The precision required for this is not available and the unit is not calibrated.
- The initial operation of the display unit and the measurement probe has to be done according to the following instructions.
- Before you start with the installation work, check the completeness of the following parts: display unit, measurement probe and probe installation supplies.

Electric Connection and Initial Operation:

1) **Prepare the measurement probe** near the tank, according to the probes installation instruction. **Don't lower** the probe to the tank now! Determine the current fill level (cm) of the tank and write it down.

2) Mount the device with 2 screws at the wall.

3) Connect all wires except the 230 V power line. See wiring diagram on page 2.

The probe cable can be extended with an usual two wire control line (2 x 0,4 mm^2) up to 100 m and more.

Important: The capillary tube must be able to do air pressure ventilation. At outdoor cable extension or in tank ditch use special clamp box (Tecson part no. 12080).

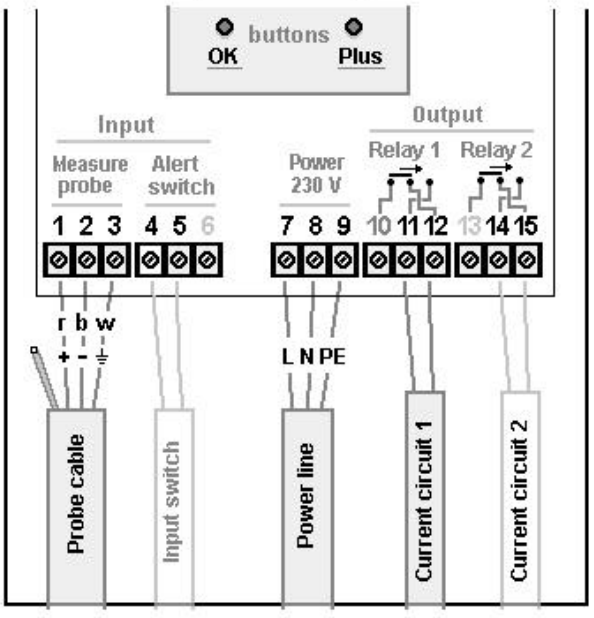
If the cable is placed near a high power cable, use a shielded cable and attach the shielding to clamp 3.

4) Connect all the other wires, before you connect the unit with L, N, PE to line power. Remove the line fuse (fuse box) and check whether cable is **not** energized.

5) After connecting the line cables set the unit in operation by switching on the line fuse .

6) Carried out **zero-point correction** (calibration) of measurement probe once:
- Shortly press both buttons (OK + Plus).
- Set all 4 digits to : 0.0 0 **0**
- Press OK button, ready => Display: 0.0 0 **1**

Plan of clamps



HINT:

Relay 1: 12 - 11 is an active shutter.
(12 - 10 is an active opener.)

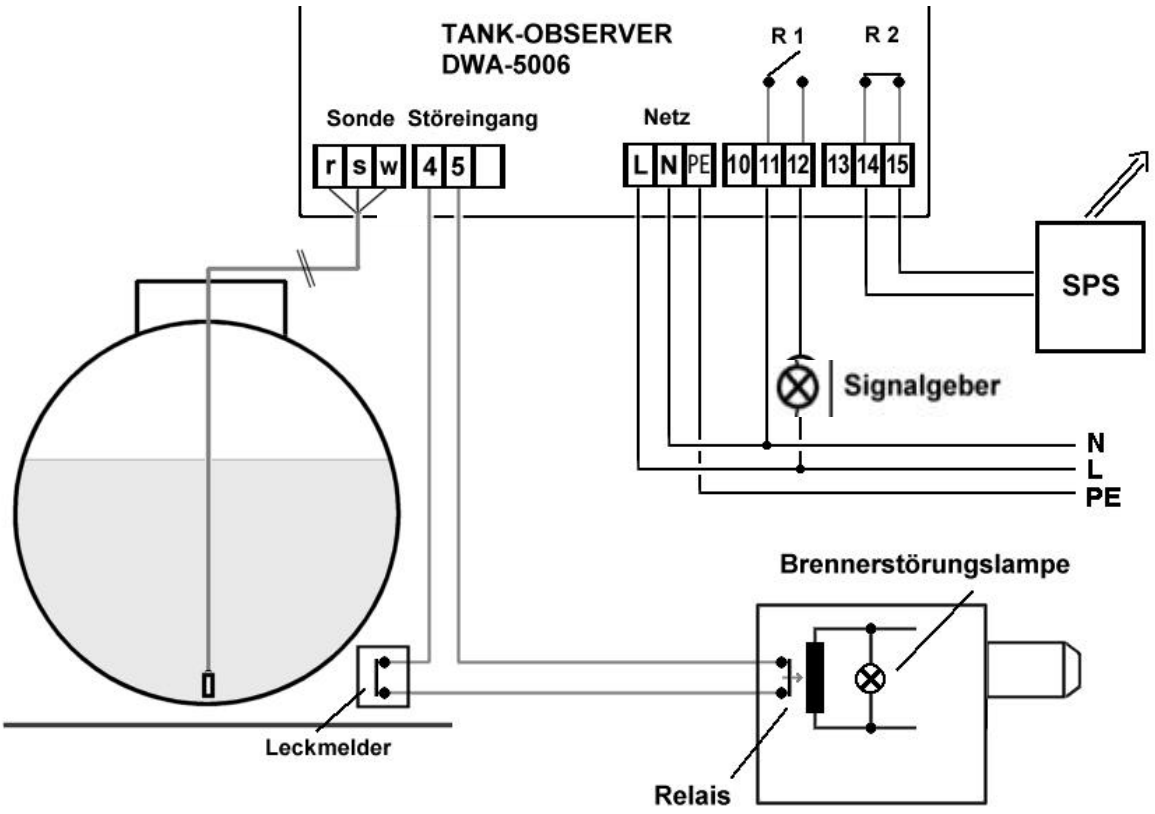
Relay 2: 15 - 14 is an active shutter.
(15 - 13 is an active opener.)

7) After zero-point calibration is done, lower the measurement probe to the bottom of the tank. Close resp. screw in the tank latch.

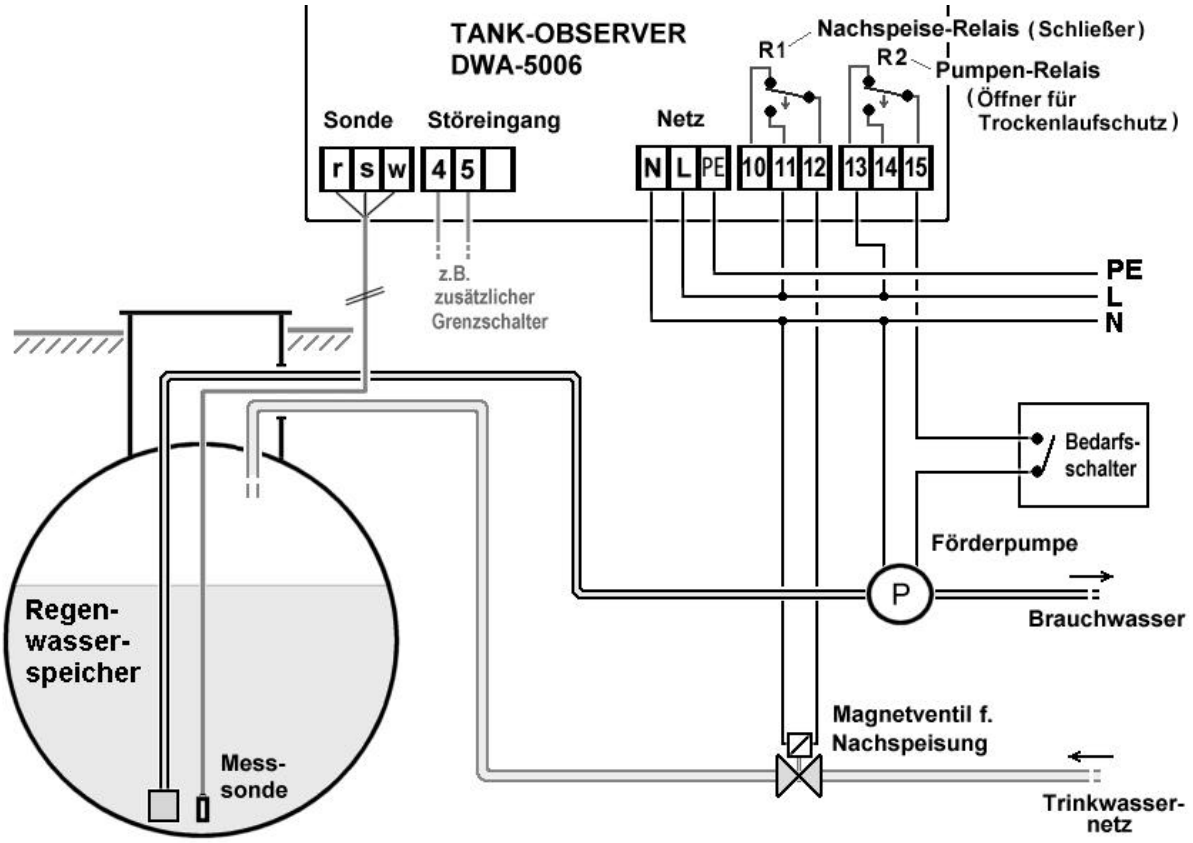
8) Continue with the programming of DWA-5006 according to description on page 3

For further details see page 4 to 8.

Heating Oil Tank – Exemplary wiring diagram

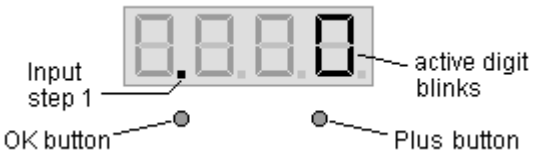


Rain Water Cistern - Exemplary wiring diagram



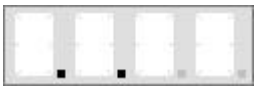
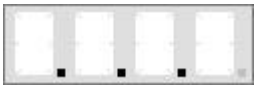
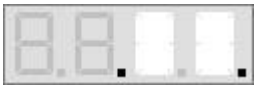
Programming:

For programming change to ***Setup mode***, therefore shortly press both buttons, so digit 1 starts blinking. The decimal dot represents the current setup step (step 1 to 6).



To make the entries use the 2 operating buttons ***Plus*** and ***OK.*** The active value is increased with the ***Plus*** **button (right),** with the **OK button (left**) the current value is accepted.

Before you begin, determine the values which are needed for programming and write the values to the **Input values** column of the following table

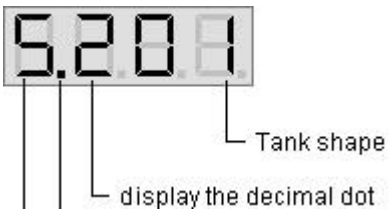
Step	Input function	Input value
Condition:		**write down here first**
Zero-point correction has to be carried out once	For storing the probe zero-point valuee set display to 0 **.** 0 0 0 . With entering OK for the forth zero the value is stored. Display 0**.** 0 0 1 means success. Afterwards lower the measurement probe to the bottom of the tank.	
Tank data:		
1.(2) Decimal dot 0 = normal displaying 2 = for m^3 3 = for %	Definition of fix position of decimal dot in the display: **0** = no dot; integer values in Display ; e..g. to 9999 litres. **1** = fix dot behind digit 1 ; e.g. for levels up to 9,999 m. **2** = fix dot behind digit 2 ; e.g. for tanks up to 99,99 m^3. **3** = fix dot behind digit 3 ; e.g. percents up to 100,0%.	
1.(4) Tank shape	Enter tank shape key number to digit 4 (See tank shape table on page 4) e.g. 0 0 0 **2** => cylindrical tank shape	
2. Tank volume	Enter tank volume in litres: 4 digits, add / omit 0 if needed, e.g. **5 6 0 0** [litres]	
3. Tank height	Enter tank height in millimetres: e.g.. 186 cm => **1 8 6 0** [mm]	
4. Current fill level	Enter the current measured fill level of the tank in millimetres: e.g. **0 9 4 0** [mm]	
Switching functions relay 1:	Step 5: see table page 6	
5.(1) + 5.(2) relay 1	- Digit 1 defines the effect of the fill level for relay **1** - Digit 2 defines the effect of the malfunction dispatcher input for relay **1** - If relay 1 is not used : Enter 0 0 0 0	
5.(3-4) relay 1	Enter threshold for relay 1 in percent: e.g. threshold at 10% => X X **1 0** [%]	
Switching functions relay 2:	Step 6: see table page 6	
6.(1) + 6.(2) relay 2	- Digit 1 defines the effect of the fill level for relay **2** - Digit 2 defines the effect of the malfunction dispatcher input for relay **2**. - If relay 2 is unused : Enter 0 0 0 0	
6. (3-4) relay 2	Enter threshold for relay 1 in per cent: e.g. threshold at 8% => X X **0 8** [%]	
	In most common cases the setup is now complete.	
Specific setup: - only if needed --	Enter specific setup in step 1 – see page 4 : - therefore shortly press both buttons -	
1.(1) Display rounding	Digit 1 : **0** => automatic rounding (recommended) e.g. : **5** => display rounding in steps of 20	
1.(2) Decimal dot	Digit 2: **2** => fixed decimal dot after digit 2. Display: e.g. 2 1**.** 5 0 [m^3]	

Tank Geometry and Fill Level Display

Details for 1.(1) Rounding:

Step 1 (digit 1):

The unit automatically rounds the display value in a clever way. Depending on the tank height and tank volume the display value is rounded to full values of 10 or 5.



For individual cases (e.g. at tanks with huge volume) it is possible to change the rounding.

0 :	**Standard setting**	**-**	**Normal automatic rounding!**
1 :	rounding OFF	-	1 step rounding = No truncation
2 :	rounding in steps of 2	-	2 step rounding (even values)
3 :	rounding in steps of 5	-	Display in steps of 5
4 :	rounding in steps of 10	-	Display in steps of 10
5 :	rounding in steps of 20	-	Display in steps of 20
6 :	rounding in steps of 50	-	Display in steps of 50
7 :	rounding in steps of 100	-	Display in steps of 100
8 :	rounding in steps of 200	-	Display in steps of 200
9 :	rounding in steps of 500	-	Display in steps of 500

Details for 1.(2) Decimal Dot:

Step 1 (digit 2)

The display of a decimal dot is only necessary for m^3, for percent or similar.
The decimal point is shown at a fixed position.

0 = **no decimal point (Standard setting)**
1 = fixed decimal point after digit 1
2 = fixed decimal point after digit 2, e.g. 21.50 [m^3]
3 = fixed decimal point after digit 3, e.g. 98.5 [%]

Hint:
With PC-LINK-Connection increase this value by 4: 0 => 4 , 1 => 5 …

1.(4) Tank Shape Table:

Step 1 (digit 4)

- For direct litres display you have to determine the tank shape key from the following table. Enter the key number in step 1 digit 4.

- For a linear translation from measurement data to display range enter 1 for the key number.

Key number	Basic tank shape	Detailed specification of tank shape
1	**linear tank**	rectangular tank, standing cylinder, basement welded steel tank. (enter key no. 1 also for other linear measurement uses)
2	**cylindric tank**	horizontal cylinder (lying), tubular tank, (common design for steel tank / earth tank)
3	**spheric tank**	earth tank with spherical shape, often fiberglass earth tank.
4	**plastic battery tank**	plastic battery tank with bandage or with several cavities
5	**oval tank**	oval basement tank, typical design of fiberglass tank and single casing steel plate tank
6	**plastic battery with cavity**	plastic tank with one big cavity in the middle of the tank (longish battery tank without bandages)
7	**half cylindric cistern**	half cylindric cistern with plane ground space

Details for 2. Tank Volume:

Step 2 (4 digits):

- Enter the total volume of the tank(s) in litres as numeric value.
  For coupled battery tanks the total volume of all tanks has to be entered .
  e.g. 3 tanks each with 1500 litres ==> input value 4500 [litres]
- For tanks with a volume of more than 10 000 litres, only enter the first 4 digits.
  In this case the display shows m^3. Corresponding to this the decimal point has to be set in step 1 (digit 2): e.g. to 2 ==> 21.50 [m^3]
- For displaying in percent enter 1000 and set the decimal dot respectively.
  Enter 3 in step 2 ==> 100.0 [%]

Details for 3. Tank Height:

Step 3 (4 digits):

- Enter the tank height (internal tank dimension) in mm.
- For a tank with an external height of 1,87 m, the input value could be 1860 [mm] for the internal tank dimension.

Details for 4. Current Fill Level:

Step 4 (4 digits):

- Attention: The measurement probe has to be lowered before step 4 is reached!
  When this entry is done with a nearly empty tank, it is recommended to do a correction later on (see section *Subsequent correction of display*)
- Enter the current fill level in millimetres [mm]
  Example: With a fill level of 94 cm the corresponding value for the input is 0940 [mm]
- Note: If it is not possible to evaluate the heating oil tanks current fill level, enter an estimated value. This value can be corrected later on.

Relay programming:

When the relay output will not be used and no switching lines are connected, disable the relays by entering 0000 in step 5 for relay 1 or step 6 for relay 2.

Cistern level management:

Automatic refilling with relay 1:

For the control of a magnetic valve for the refilling with water from the water supply this electric circuit has to be connected to **relay 1** (Clamp 11,12) :
Step 5 for relay 1:
Entry **1 0 1 2**
this means relay 1 switches at 12% (shutter contact closing) + stuck protection of magnetic valve is activated.

Protection against dry running of cistern pump with relay 2 :

When the pump is not allowed to work with an empty cistern (protection against dry running), the pumps electric circuit has to be connected to **relay 2** (Clamp 14,15) :
Step 6 for relay 2:
Entry **2 0 0 8**
this means relay 2 opens and suspends the pumps electric circuit at less then 8% of remaining content.

Details to 5.(1) und 6.(1)

Relays switching – depending on **Fill level:**

Step 5.(1) or Step 6.(1)	**Fill level falls below the threshold**	**Stuck protection (SP)** (e.g. for magnetic valves)	**Typical application**
0	causes no relay action	-	0 = typical if no electric circuit is connected
1	**causes closing of relay**	**Deactivated (SP off)**	
2	causes **opening of relay**	**Deactivated** (SP off)	**2 = typical for a pump (protection against dry running)**
3	causes closing of relay	Activated (SP on)	**3 = typical for magnetic valve for cistern autom. refilling**
4	causes opening of relay	Activated (SP on)	

1 0 x x = Relay closes when fill level falls below the threshold of xx %.

Details to 5.(2) und 6.(2)

Switching of the relays – depending on **malfunction dispatcher input:**

Step 5.(2) or Step 6.(2)	**Depending on Relay Action** depending on malfunction dispatcher	**Dispatcher Action** (Input signal)	**Typical application**
0	**No** relay reaction to dispatcher	-	0 = typical if no dispatcher is connected
1	Relay has to close **...**	… if dispatcher closes	
2	**Relay has to open ...**	**... if dispatcher closes**	dispatcher opens ==> relay suspends electric circuit
3	Relay has to close **...**	... if dispatcher opens	
4	**Relay has to open ...**	**... if dispatcher opens**	dispatcher closes ==> relay suspends electric circuit

1 **0** x x = No relay reaction to malfunction dispatcher input (Clamp 4 - 5).

Details to 5.(3-4) and 6.(3-4)

Relay threshold in percent:

- The entered limit values define the switching points (with hysteresis) of relay 1 and relay 2.

- Step **5.(3-4)** : The value of this entry (0 – 99 %) defines the threshold for relay 1.

- Step **6.(3-4)** : The value of this entry (0 – 99 %) defines the threshold for relay 2.

Subsequent correction of display:

While normal operating it is possible at any time to readjusted the display value to the current fill level. After a complete fuelling the display correction makes sense to synchronize the display to the tank volume:
e.g. set to 5600 litres or to 100.0 percent

The correction entry takes place with:

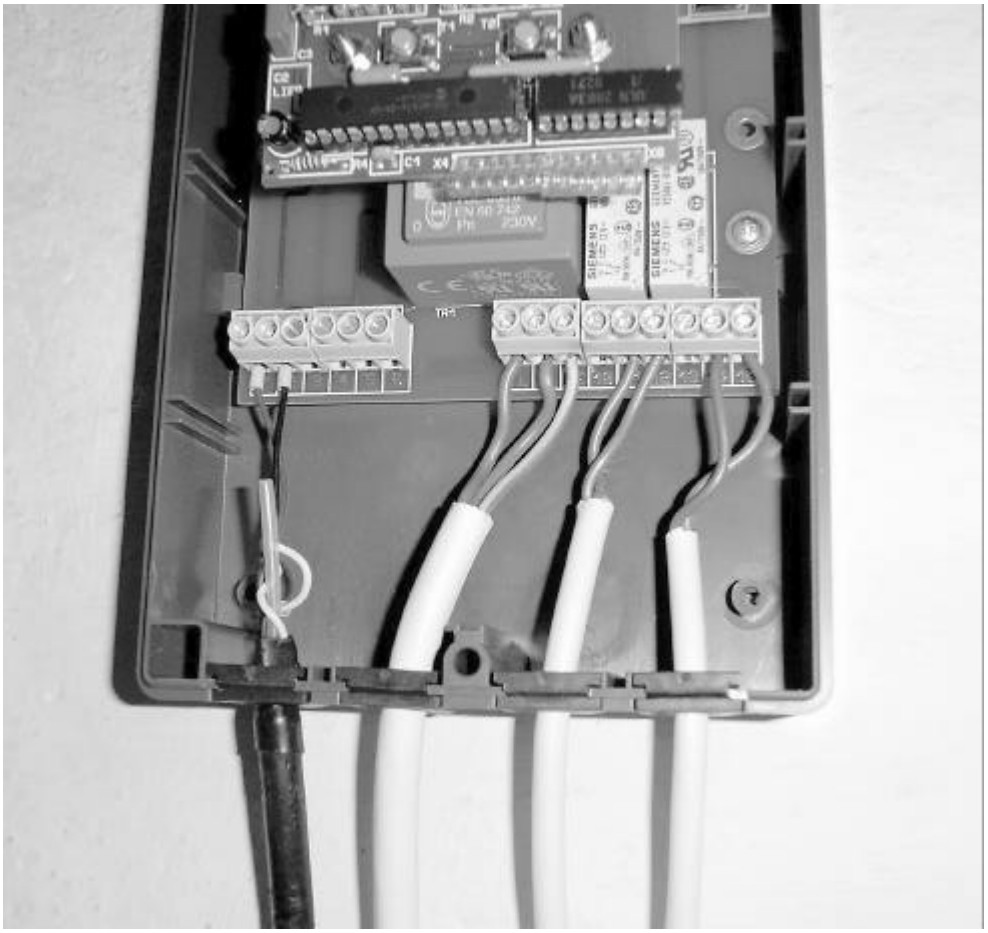
Left button => **minus** , right button => **plus**.

During the correction the display is blinking. Holding down the button will change the value quickly. This entry overwrites the saved input value of step 4, this means these steps can be done alternatively.

Error codes:

When an invalid value occurs during zero-point correction or setup, an error code will be displayed and the display is blinking.
To confirm this error information the OK button has to be pressed.

Code	Meaning
E 0 0 1	Entered value is invalid
E 0 0 2	Probe measure value is too small. Perhaps probe not connected correctly. - At zero-point correction: If probe current is less than 3,5 mA then the probe is defective. - At programming step 4: Probe is not plunged. - At displ. mode: If probe current is 0 mA check connection. Otherwise probe could be defective.
E 0 0 3	Measured value is too large for zero-point correction. (**The probe must not be plunged during calibration**.) If probe signal is higher than 4,5 mA the probe could be defective.
E 0 0 4	Setup is possible only after zero-point correction (perform calibration again)
E 0 0 5	Entered height is greater than the tank height (wrong input)
E 0 0 6	Entered height is too large (Measured value is too small. **Probe has to be plunged**)
E 0 0 7	Entered volume is too huge (Measured value is too small. **Probe has to be plunged**)
E 0 0 8	Measured value too large. Probe current is too high. Switch unit off and on, repeat step 3 and step 4, repeat zero-point correction. At half full tank the probe signal should be less than 12 mA. At full tank the probe signal should be less than 20 mA. Otherwise the probe could be defective.



Tank-Observer: Display Unit DWA-5006

To the left**: measurement probe clamp**(+), (-)
In the middle: power line clamp L, N, PE
To the right: 2 relay outputs

Technical Data	**DWA-5006 :**	**Manufacturer:**
Supply:	230V, 50Hz, max. 2,3 VA	TECSON-DIGITAL Wulfsfelder Weg 2a
Measuring input:	4 - 20mA / U_0=15V / R_{Shunt}=100Ω	D-24242 Felde
Resolution:	10 Bit	
Precision:	+/- 1%	Phone: (+49)-4632 / 1544
Temperature range:	0 - 45 °C	Fax: (+49)-4632 / 87386
Relays outputs:	250V AC, max. 7A	Internet: www.tecson.de
CE- conformity:	Under terms of EN50081-1, EN50082-1	