

# FUEL CAT

**Indicator device for safety and convenience**

The 2 most important functions are monitoring  
and indicating

**fuel-Consumption And remaining Time**

INSTRUCTIONS FOR OPERATION AND INSTALLATION

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SUBJECT TO ALTERATION

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## **1. General description**

The FUEL-CAT is a modern, micro-processor controlled combi-indicator device for monitoring fuel reserves, fuel consumption, remaining flying time, battery voltage and hours of engine operation. Optionally, fuel pressure can also be included.

The 80 Ø standard box has 2 large, legible LCD displays, which can be set to show the desired values

For through-flow and fuel reserves, the choice lies between international and US-American units, [litres or US gallons, or litres per hour and US gallons per hour]. Similarly for the optional fuel pressure, [bar or psi].

*The FUEL-CAT is very easy to operate.*

Easy-to-recognise symbols for the different functions and a logically designed layout of touch-pads and switches ensure that anyone can operate the device successfully in the minimum time, even without the handbook. Nevertheless these operating instructions should be read through carefully before installation and before first use of the device.

*The FUEL-CAT is universally usable.*

Various indicators are available to show fuel level; the FUEL-CAT detects automatically what indicators are connected. The maximum limits in the individual categories of measurement and other system parameters can be easily modified via special installation menus.

2 alternative different means of measuring the amount of fuel remaining in the tank are already provided.

### A] through-flow indicator {standard}

This can be fitted universally, as the shape of the tank and the attitude of the aircraft do not affect the reading. The obligatory up-dating of the fuel gauge after filling-up can be optionally replaced by a "full tank" indication.

### B] floating tube indicator {optional}

An alternative arrangement for simple tank shapes [canisters, or similar] is available in the form of a floating tube, which works like a swimmer. By this the input of the measure of fullness after filling up is not required. This system is not suitable for tanks whose cross-section changes according to the level of fuel.

### C] fuel pressure sensor {optional}

This sensor has 2 tasks. One is to indicate the fuel pressure in the carburettor. The other is in case there is a return [back-flow] to the tank built in. Such a back-flow would seriously distort the reading of the through-flow. This error can only be rectified electronically in the back-flow tubing by means of the fuel pressure and the throttle opening.



## 1.2 Switching on

After the FUEL-CAT and the corresponding indicators have been assembled according to the installation instructions and connected to the on-board network/[system], the device can be switched on. There then appears on both displays for 0.5 seconds all digits as 8, and 8 points as indicators of the self-test which the device carries out when it is switched on. In addition, the optional red warning light flashes on briefly.

## 2 Normal operation

In this mode of operation the fuel data are monitored and indicated. The pilot selects via T1 and T3 the desired values on the relevant displays.

If the designated limits for fuel reserves, battery voltage or fuel pressure are exceeded [too low or too high], then the value affected is automatically displayed [switched on] and begins to blink. At the same time the optional red warning light begins to flash, to attract attention. To program in these limits, see chapter 4.

If one of the categories being measured is exceeded or an indicator or connection is faulty, then the corresponding display shows an Over Limit warning : "-OL-".

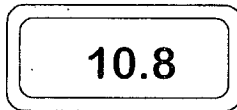
*Note : Irrespective of whatever display mode has been selected, the FUEL-CAT is continuously monitoring all data,, unless SET menu or SYSTEM ADAPTING menu is selected.*

### 2.1 Upper display

This shows the fuel through-flow. A choice can be made between the value at that moment and an average value by pressing briefly the button T1.

#### 2.1.1 Actual fuel consumption

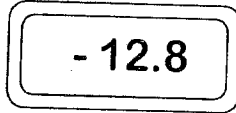
Symbol :



limits of measurement : 1.8.....50 litres / hour [0.48.....13.1 US gallons/hour]

2.1.2 Average fuel consumption

Symbol :

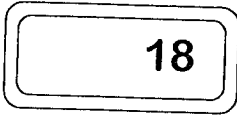


limits of measurement : 1.8.....50 litres / hour [0.48.....13.1 US gallons/hour]

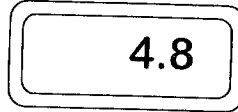
2.2 Lower display

2.2.1 Fuel reserves T2: middle °

Symbol :



or



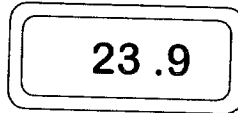
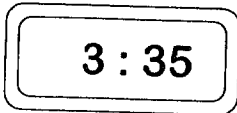
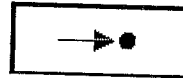
limits of measurement : 0.....199 l.

0.....52.9 US gallons

The amount of fuel remaining in the tank is stored, even when the FUEL-CAT is switched off.

2.2.2 Remaining flying time / fuel consumed T2: left ←

Symbol :

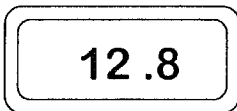
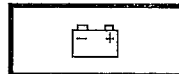


limits of measurement 0.00.....99.59 hours:minutes 0...199.9l. [0...52.9 US gallons]

If T2 is kept pressed down to the left, then the lower display will show alternating every 3 seconds [a] the remaining flying time, based on the current level of fuel consumption, or [b] the amount of fuel consumed since the last time FUEL-CAT was switched on. When the device is switched off, both these values are extinguished

2.2.3 Battery power

T2: right ⇒ Symbol :



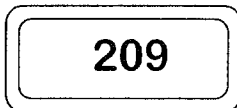
limits of measurement

0.....16V

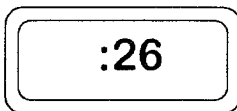
The critical minimum and maximum values for battery power have been set at 10,9 and 14,7V. If the reading for battery power does not fall between these values, then the display begins to blink.

2.2.4 Flying hours

T3 pressed Symbol :



hours



minutes

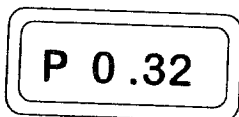
The flying time reckoner adds up the periods when the engine is running and stores them when the device is switched off.

This display appears for 3 seconds after T3 is pressed. If T3 is activated for a longer period, then, if available, the information on fuel through-flow is shown on the lower display. If no fuel flow monitor is connected, then the flying time total is displayed as long as T3 is pressed down.

To *re-set* the flying time reckoner, the 2 buttons T1 and T3 and the switch T2 must all be pushed to the right while the FUEL-CAT is switched on. There then appears on the upper display the number of hours flown, and on the lower display the number of minutes. Now the FUEL-CAT can be switched off, without the data being lost. If the flying time reckoner is to be set back to zero intentionally, then once the flying time has been displayed, switch T2 must be pushed to the left. Both displays will then revert to "0": the flying time is extinguished.

This procedure should prevent any inadvertent loss of data.

2.2.5 Fuel pressure [optional] holding down T3 Symbol :



limits of measurement

0.....1 bar [0.....14.5 psi]

When a fuel flow monitor has been connected, then after 3 seconds the lower display shows the current fuel pressure. To indicate the category of measurement, a "P" for pressure appears on the left in the display. This should exclude the possibility of confusion with any other readings in the lower display.

#### 2.2.6 Important notes on the fuel displays.

##### Through flow monitor

In the standard version without float tube, the amount of fuel remaining in the tank is calculated by subtracting the volume measured by the flow monitor from the total measured as having been put into the tank [in the first place].

To obtain an accurate reading it is therefore imperative that the flow monitor is working perfectly, i.e. it must be installed in precisely the right position, and there must be no gas bubbles as a result of leaks or drop in pressure in the fuel line.

Check carefully after the first flights and before every start that the amount remaining in the tank agrees with what is shown on the display!

If there are very obvious discrepancies, then the flow monitor can be recalibrated [see chap. 4]

If the tank is ever actually flown to empty, then it might take a few minutes after refilling and restarting before the flow monitor has ventilated itself and is working again normally. This bleeding can be accelerated by tapping the casing.

##### "Reserve" display [optional]

If the fuel recorder in the tank sinks below the level at which the fuel reserve indicator is installed, then on the far left of the display appears a winking "L", for "leer" = empty. This display is independent of the other means of measuring the fuel remaining in the tank and is only active when the fuel reserve registers either 0 litres or 0 gallons!



### Floating tube monitor [optional]

If a float tube monitor is connected, then this is sufficient to indicate the amount of fuel remaining in the tank. A "volume remaining" monitor is then redundant. In this situation the through-flow meter delivers only data concerning the fuel consumption from moment to moment and the volume of fuel consumed. The reserve warning is triggered automatically by further features [see chap. 4] incorporated in the system-friendly menu.

### General

Independently of any other indicators in use, the "tank capacity = maximum utilisable quantity of fuel" must be correctly programmed. The setting is described in chapter 4. To obtain the correct value to be entered, the easiest procedure is to fill the tank, let it run empty across the flow meter and read off the amount of fuel consumed from the FUEL-CAT. To be on the safe side, programme in a slightly smaller quantity, so that there is some fuel in reserve, even when the display is showing "0".

### Operating notes

1] If only the flow meter and "fuel remaining" gauge are connected, then the actual amount of fuel remaining must be entered in the SET-menu after every filling or [part]emptying of the tank [see chapter 3]. The range of settings is calibrated in steps of 1 litre resp. 0,1 US gallons from 0 to the pre-established maximum [see note above].

The amount of fuel left in the tank is always stored in the FUEL-CAT, even when it is switched off.

2] If the optional "tank full" indicator is installed, then this is entered automatically, whenever the tank is filled up [the FUEL-CAT must of course be switched on!]. If the tank is only part-filled, then proceed as in [1] above.

To enter the tank capacity, use the amount of utilisable fuel in the tank when the display shows "tank full".

N.B. The FUEL-CAT display does not jump to the correct value until 3 seconds after the full level has been reached. Do not run the engine while you are filling up!

3] If a float tube is installed, then the amount of fuel in the tank does not need to be entered; just programme in the capacity of the tank. The re-set-menu cannot therefore be called up. In the SET-menu, the tank contents field will automatically be by-passed. After installation the FUEL-CAT must be calibrated *onto this gauge [i.e. the float tube]*. The procedure is described in chapter 4.

If the float tube does not reach all the way to the bottom of the tank, then obviously the complete contents of the tank will not be recorded. This should be taken into account when programming in the tank capacity, so that the readings for tank contents and fuel remaining match!

### 3. Re-tuning menu "SET"

T1 : Hold down for 6 seconds

Symbol :

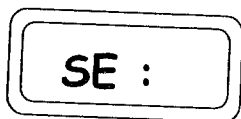


If a float tube is connected, this menu cannot be called up.

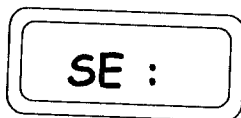
In this menu the amount of fuel in the tank can be re-set after putting fuel in.

To open the SET-menu from normal operation, hold down T1 for 6 seconds. As confirmation, "SE" appears on the upper display. Adjust the tank contents reading, using T2. To the right *raises* the value; to the left *lowers* the value.

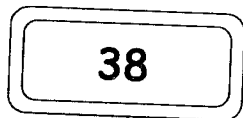
If the display is showing litres, the value moves in steps of one litre; if the display is showing gallons, the value moves in steps of 0.1 gallons. The adjusted value is locked by means of T1. The value entered is stored.



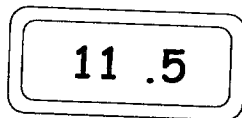
SE=SET



SE=SET



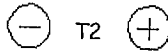
contents of tank in litres



contents of tank in gallons

Operation in the tuning fields [also in system menu] :

T1 = next field



Note : the SET-menu should only be switched on *on the ground*, so that no fuel is being consumed during the re-setting procedure and no monitoring of values takes place.

#### 4 System-specific menu

In this menu the following system parameters can be adjusted :

On the first page :

|                                    | range of values         |
|------------------------------------|-------------------------|
| display in litres or in US gallons | L / G                   |
| float tube calibration             | yes / no                |
| capacity of tank                   | 0 ..... 199 litres      |
|                                    | 0 ..... 52.9 US gallons |

On the second page :

|   |                 |
|---|-----------------|
| calibration factor                                    | 0.00 ..... 1.99 |
| for the through-flow meter                            |                 |
| integration time for average rate of fuel consumption | 1....60 min     |

On the third page :

|                       |                       |
|-----------------------|-----------------------|
| reserve tank capacity | 0 ..... 20 litres     |
|                       | 0..... 5,9 US gallons |

On the fourth page :

|                       |                     |
|-----------------------|---------------------|
| unit of pressure      | B / PSI             |
| minimum fuel pressure | 0.00 ..... 0.99 bar |
| [warning threshold]   | 0.0..... 14.4 psi   |

On the fifth page :

|                        |                    |
|------------------------|--------------------|
| throttle hole diameter | 0.00 ..... 1,99 mm |
|------------------------|--------------------|

To call up this menu, hold down T1 as you switch on the FUEL-CAT. In this way any inadvertent access by unauthorised persons is effectively prevented.

The menu is divided in total into 5 pages, each with two settings, which follow one another in sequence with the current field blinking. The operation is carried out by means of the same buttons as in the SET-menu :

T1 = "next" , T2 left = " - " , T2 right = " + "

The individual fields appear in the following sequence :

The first page shows the 2 displays with the following division of adjustment fields with float tube recorder

EO : L

calibration yes/no - capacity in litres

5 1

tank capacity in litres

without float tube recorder

: G

no calibration - capacity in US gallons

13 .7

tank capacity in US gallons

Float tube recorder - calibration field

If no float tube is connected, then one goes straight to selection of units to measure tank capacity ; if a float tube is connected, one goes to the calibration field, which will show "EO".

To carry out a calibration [necessary when newly installing the float tube], press T2 to the right [ + ] ; the display switches to E1. Pressing T1 now triggers the calibration of the float tube. Do not forget to check that the float tube is correctly connected and the tank is completely empty.

If the calibration is successful, i.e. the recorder is correctly connected and the tank is completely empty, then the calibration field shows EE. If the display shows " E - " , then no calibration can be carried out. There must be a fault [e.g. tank not completely empty, faulty connection in the wiring]. After correcting the fault, call up the menu again and repeat the calibration.

If no calibration is required, press T1 again to move on to units of measurement of tank capacity

### Units of capacity

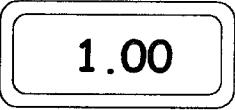
To choose between **L** for litres and **G** for gallons, press T2, in either direction. The display alternates between **L** and **G**. To confirm your selection, press T1 and the lower display will adjust its reading accordingly.

### Tank capacity field

Using T2 to the left [ - ] or to the right [ + ], enter the desired value in litres or gallons. If the measurement of the contents of the tank is derived only from the evaluation of the signal from the flow meter, then enter the entire utilisable volume of fuel [normal tank capacity and eventually additional tanks]. If a float tube is connected, enter only the capacity of the tank in which it is installed. If the tank capacity is shown in gallons, the display will show first whole gallons, then tenths of a gallon. To move on to the next field, press T1 again.

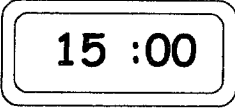
After all fields on page 1 have been entered, press T1 a final time and the device will show the second page :

Second page :



1.00

flow meter - calibration factor



15 :00

integration time

### Flow meter initial lines -calibration factor field

When first installing the Fuel-Cat, check before the first flight that the through-flow meter is working accurately. To this end, run a measured amount of fuel through the through-flow meter, with the Fuel-Cat switched on. Divide the fuel line from the fuel pump on the engine and take off the fuel discharge into a maximum capacity, calibrated, transparent fuel container. The larger the amount you measure, the more accurate will be your result.

The correction factor is easily calculated:

$$\text{Factor} = \frac{\text{amount of fuel actually consumed}}{\text{amount of fuel shown on display as having been consumed}}$$

If there is no return flow, this factor can be calculated from the fuel actually consumed and the amount shown as consumed, according to the above formula. If after a fairly long flight there is more fuel in the tank than the display indicates [assuming that displays and fuel content were in agreement before the flight began], then the factor must be reduced and inverted.

If there is a return flow, then a measurement made while the engine is running, will be grossly inaccurate.

Enter first the place before the decimal point [range : 0... 1], then the places after the decimal point [range 0... 99].

This offers a theoretical range of 0 ... 1.99

Note : If the discrepancy requires an adjustment by a factor of <0.50 or >1.99, then in all probability there is a fault in the installation or a defect in the flow meter.

### Integration time

This establishes the period of time in minutes which is used to determine the average rate of fuel consumption.

Minutes and seconds are shown on the lower display, divided by a colon. Enter only the minutes [range : 1 ... 60]

If no float tube is connected, then the system-friendly menu finishes here and the FUEL-CAT reverts to normal operating mode.

The third page :

7

amount of fuel remaining in litres

free

free

1 .8

amount of fuel remaining in US gallons

free

free

Amount of fuel remaining

In order to be warned when fuel is running low, enter here the level below which you would like to receive a warning. In normal operating mode, when fuel reserves fall below this level, a blinking L appears on the far left of the lower display.

If an optional reserve indicator is connected, then enter 0 here.

If no fuel pressure sensor is connected, then the system-friendly menu finishes here and the FUEL-CAT reverts to normal operating mode.

The fourth page :

8

unit : bar

P S I

unit : psi

PO .33

minimum pressure in bar

P 4 .8

minimum pressure in psi

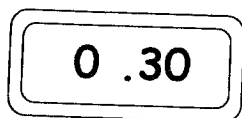
To set the units of fuel pressure

To choose between "8" for bar and "PSI" for "pounds per square inch", press T2, in either direction. The display alternates between "8" and "PSI". To confirm your selection, press T1 and the lower display will adjust its reading accordingly.

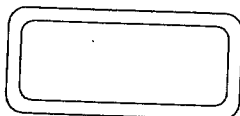
Fuel pressure - warning threshold

Now enter the minimum fuel pressure level, below which you wish to see a warning. If this threshold is breached while the engine is running, then the value is shown blinking, with a P on the left edge of the display, to avoid confusion with the indication of battery power. The threshold may be set at any point in the range, from 0 ... 0,99 bar, or 0 ... 14.5 psi. As long as the engine is still, i.e. no fuel flow is measurable, no warning is indicated.

The fifth page:



throttle hole diameter in mm



free

### Throttle hole diameter

If no fuel return flow is provided, enter "0,00".

To compensate for the error in the flow meter reading, which is caused by flow-back of part of the fuel into the tank, you need the diameter of the throttle hole. You can obtain this figure from your engine- or UL-handbook or from your dealer.

If you have less fuel in the tank than the fuel gauge shows, then the fault lies in the flow meter calibration. Repeat the flow measure calibration procedure on page 15.

If the measurement on page 15 shows no discrepancy, then equally a calibration must be carried out. This requires a fuel pump which is independent of the engine. Switch the lower display on the Fuel Cat to the control on the actual fuel pressure (see 2.2.5). With the engine still, the fully installed fuel system must also have the additional fuel pump switched on. With correct size of throttling nozzle installed, the fuel flow meter remains at 0.00. If the display shows "OL" immediately after switching on the fuel pump, then the calculated amount of fuel through the return



flow is greater than the amount measured by the through-flow-meter. Throttling nozzle diameter must be reduced.

If the fuel flow display shows values which are greater than zero, then the throttle hole diameter must be increased.

When installing the place before the comma must be programmed in first (range 0...1) followed by the places after the comma (range 0...99).

You can enter values between 0.00mm and 1.99mm in steps of 0.01mm.

Now all the essential values have been entered, and the FUEL-CAT reverts to normal operating mode.

## **5 Installation**

Please read the following notes carefully, before commencing the installation. Should any problems arise, please contact your dealer.

### **5.1 Display device**

The FUEL-CAT is designed to be installed in the instrument panel. A template is provided to assist you to make the necessary cut-out. Place the device in such a position that there is a minimum distance of 20cm from the compass, and 100cm from the radio antenna [aerial]. If these distances are not maintained, then there may be mutual interference, whose effects in exceptional cases must be scrutinised.

Make sure that the chosen position does not expose the device to strong sunlight, which might cause it to overheat.

For fixing, 4 M3x8 screws are enclosed, assuming an instrument panel thickness of 3mm.

#### **Wiring**

The standard wiring pack for the FUEL-CAT includes 15-pole plug for the FUEL-CAT.

ground wire [blue], is connected to the [-] pole of the battery or to ground circuit.

+12V cable [red], is connected across the main switch to the [+] pole of the battery. Recommended fuse : 0.2 amps middle inert.

cable to the flow meter with connection plug.

cable to the fuel left sensor.

These cables are already wired into the connection plug. The other meters will have to be connected separately, each according to its particular configuration. When laying the cables, check carefully that they are lying completely free of any pressure, that they are not being squeezed, cut by any sharp edge, nor pulled in any way.

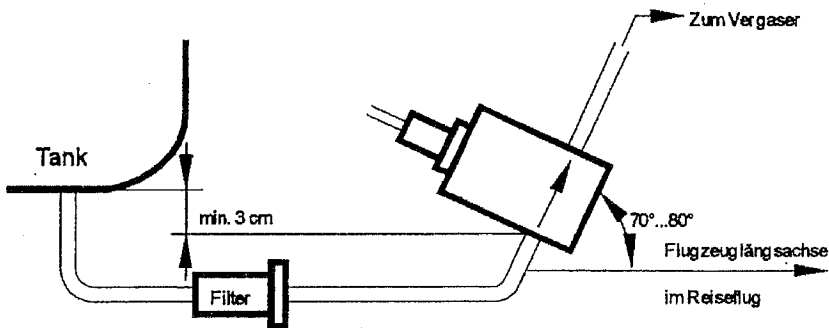
## 5.2 Meters

All meters are supplied with sufficiently long connections, which can be shortened if necessary. For electrical connection, see the wiring plan in the appendix.

### 5.2.1 Flow meter

To ensure the accuracy of the fuel reserve display, it is essential to install the flow meter correctly. It consists essentially of a precise measuring turbine, whose rev count is scanned opto-electronically.

The following sketch shows the correct installation position :



This position [angle 70°, plug upwards] is essential to prevent air bubbles gathering in the turbine, which might corrupt the measurement or actually make it impossible. Also, the meter needs to be fixed at the lowest point in the fuel system, where the pressure is greatest and therefore the danger of gas bubbles is minimal. When fastening the meter in place, use an appropriate piece of foam or cellular rubber, or something similar to cushion it from vibration.

### **A fuel filter must be installed between the tank and the flow meter !**

Note : The measuring turbine produces a drop in pressure [depending on the speed of flow] in the fuel line. It is essential therefore, after installation, to check carefully the pressure in the carburettor to maintain the appropriate range. If necessary, an additional pump will have to be installed. It is possible for the measuring turbine to become blocked by contamination. Against this eventuality we vigorously recommend the installation of a by-pass valve to safeguard the fuel supply !

If the tank is ever flown to empty, let the engine run for a few minutes to ventilate the fuel system, and in particular the flow meter. This process can be speeded up by tapping the meter.

### 5.3 Fuel running low sensor

This indicator shows when the fuel gauge in the tank drops below the level at which the sensor is installed. To determine this level, one must first establish the amount of fuel which should be left in the tank when the warning is triggered. Experience indicates that [depending on the size of the engine] 5 ... 10 l. should be enough to reach the nearest airfield. Given by desired quantity of fuel left and the cross-section of the tank, the level at which the meter should be installed may be calculated as follows [H = height in cm above the bottom of the tank] :

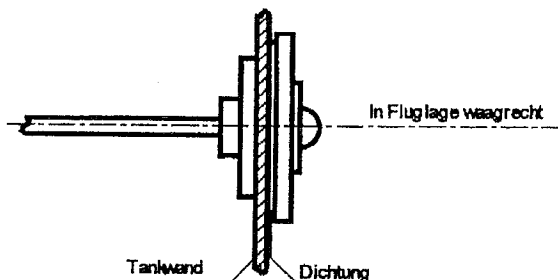
$$H = \{ \text{quantity of fuel (in litres) } \times 1000 \} / \{ \text{length (cm) } \times \text{width (cm) of tank bottom} \}$$

The position of the meter should be fixed where the level of the fuel is as independent as possible of the attitude of the plane.

Example : in a right-angled tank [canister] this will be found mid-way between the front and back edges of the tank.

To fit this meter, bore a hole 12mm in diameter, **carefully deburring inside and out**. Then pass a wire, or similar, from outside into this hole and out again through the filling nozzle. Fasten the meter to the wire on the plug side [not forgetting a washer !] and pull it down through the hole. Now screw a nut from outside, holding the meter carefully with pliers to prevent it twisting. If the bore is too large, pack with silicon; secure the nut with protective lacquer, Loctite, or similar.

Note : the nut must not be tightened more than 1.5 Nm, or the plastic thread on the meter will be damaged ! The meter must be installed with a horizontal axis of symmetry, otherwise it will fail to give an accurate reading [also applies to "tank full" meter].



### 5.3.1 "tank full" sensor (optional)

The "tank full" sensor provides automatic control of the maximum tank contents when filling up with fuel. This meter corresponds to the "fuel low" meter, except that this one is fitted at the top of the tank. When entering the tank capacity in the system-specific menu, only take account of the volume up to the bottom edge of the "tank full" meter !

### 5.3.2 float tube indicator (optional)

Choose a position for this indicator such that the fuel gauge is as independent as possible of the angle of attack of the aircraft [see chap 5.3]. This is the only way to maintain a consistent reading of fuel contents at different flying speeds. In tanks with a right-angled cross-section [e.g. canister], this position will be found in a plane mid-way between the front and rear walls of the tank [viewed in the direction of flight].

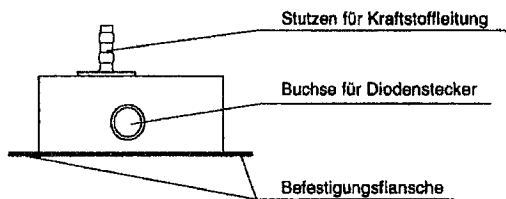
If the tank is not symmetrical in shape, then it is usually either impossible or only approximately possible to have a reading from the float tube which is linear and independent of the attitude of the aircraft. The best solution is then to make use of a compensation table, which gives the deviations according to angle of flight.

To install, you need a flat area on the upper surface of the tank of about 80mm diameter. In the middle, make a hole of diameter 41, to insert the meter into the tank. Fasten with 5 screws M5 [not forgetting the washer !]. The transport safety-pin must be removed before the final installation. At that point check

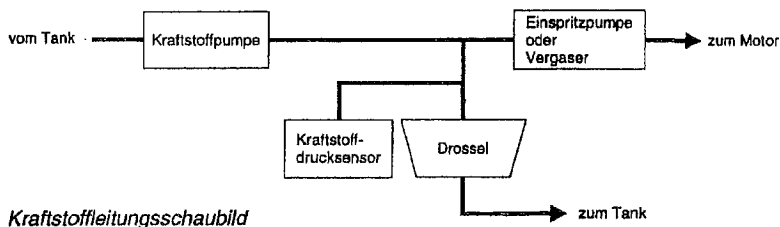
whether the floater inside the meter is able to move freely. When connecting the cable, make sure that the cladding is fastened to the meter housing.

### 5.3.3 Fuel pressure gauge (optional)

The fuel pressure gauge is accommodated in a metal housing between two fixing flanges. The flanges have fixing holes, 5 mm diameter. The fuel line is pushed back on the brass nipple and fixed with a clamp. The electrical connection is made via a three-pole diode plug with a Renk lock. It is essential that the locking ring is turned all the way to the end, so that engine vibration does not loosen the connection and allow the plug to fall out. The fixing position is where you choose, but take care to avoid the fuel line and the connection cable hanging free; fix them at regular intervals. The ideal solution is a fixing onto the engine mount, so that there is no relative movement between the fuel line and the sensor exerting unnecessary load on the housing and on the nipple.



If there is a return flow into the tank, then the fuel pressure gauge needs to go in front of the throttle. It is quite important to ensure that the return flow line has an internal diameter of about 10 times that of the throttle, so that the fuel runs through NOT under pressure.



## 5.4 first trial run

Once the display device and all meters have been installed and connected correctly, the FUEL-CAT can be switched on for the first time.

First of all the FUEL-CAT goes into normal operating mode.

Now turn the device off briefly, and when you switch it on again, hold down T1.

That brings you into the system-specific menu [see chap. 4]

Now enter the data about configurations and value limits. If a float tube is installed, then a calibration procedure has also to be triggered. If no float tube is installed, after the device reverts to normal mode, call up the SET-menu, to set the fuel contents.

In normal mode, check the correct operation of all meters. When everything is functioning, it only remains to switch off or set back the flying time counter. (see chap. 4 resp. 2.2.4)

Now the FUEL-CAT is ready for action.

## 5.5 Tips for diagnosing and correcting faults.

| Type of fault  | Suggested remedy   |
|--|--|
| The FUEL-CAT is switched on, but shows no display                            | Check the electricity supply :<br>- is the battery connected properly ?<br>- has the ground cable a good contact with the [-] pole of the battery?<br>- has the fuse burnt out ? |
| Fuel through-flow displays nothing or is fluctuating wildly                  | Check that the flow meter is installed in the correct position and properly connected<br>Is the fuel system free of leaks ?  |
| Fuel flow display does not agree with the quantity of fuel actually consumed | Alter the calibration factor in the system-specific menu   |

## 6 Conditions of Guarantee

The period of guarantee for the entire device is **1 year** from date of purchase

Every guarantee is subject to the following conditions :

All seals on the device[s] are undamaged

The devices have been correctly installed and operated at the correct voltage

The prescribed fuses were used

Free servicing of the device

The registration card enclosed is returned or made available

The following liabilities are excluded from the guarantee :

Damage in transit

Damage due to external causes [e.g. switch broken off, display scratched etc.

Damage due to fair wear and tear

Damage due to imperfect installation [e.g. worn, broken cable, contamination of the flow meter as a result of filter failure, etc.]

Damage as a result of inappropriately high voltages [e.g. through failure of the electric regulator]

In the event of a claim, send the defective article to :

Automatex Rolf Lieb KG

Am Flugplatz 11

D-88367 Hohentengen

GERMANY

## 7 Appendix

- a Technical data
- b Registration card
- c Template for cut-out in instrument panel
- d Wiring plan

a Technical data

|                |                       |               |    |
|----------------|-----------------------|---------------|----|
| Display device | weight                | 0.2           | kg |
|                | dimensions [ W*H*D ]  | 80x80x46      | mm |
|                | voltage               | 10 ..... 15   | V  |
|                | maximum electrical    | 0.2           | A  |
|                | operating temperature | -10 ..... +60 | °C |

Accuracy of measurements :

|                   | <i>cancellation ?</i> | typical/max error | unit |
|-------------------|-----------------------|-------------------|------|
| battery power     | 0.1                   | ±0.1              | V    |
| fuel through-flow | 0.1                   | ±0.5              | l/h  |
| fuel pressure     | 0.01                  | ±0.1              | bar  |

These levels of accuracy are based on the meters being correctly installed as part of the whole device and operating at the temperatures specified above.



b Registration card

Customer information :

Name.....

Street.....

Place/Telephone number.....

Device data :

type of device.....

factory number.....

additional options installed.....

Description of fault [*needing repair*] .....

Sold by.....

Date of sale.....

Installed by.....

Date.....

Signature.....

Please send to :

Automatex Rolf Lieb KG

Am Flugplatz 11

88367 Hohentengen/ GERMANY

c Template for cut-out in instrument panel

