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# Operating and Installation Manual

# **ALPHAMFD**

Hardware Rev 401, Software Ver 3.15x 29.07.2003  
Technical specifications subject to change without notice!  
This operating manual must be given to customer with every **ALPHAMFD**  
purchase!



 **BRAUNIGER**  
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## 1 Introduction

With its innovative ideas and modern technology the **ALPHAMFD** offers a complete system for flight and engine-management for ultralight/microlight pilots. Important information for navigation and engine control are easily readable, presented on an integrated Liquid Crystal Display.

The **ALPHAMFD** was carefully designed to be extremely reliable, safe and maintenance free. A self-test on power-on, detection and warning of faulty senders and the audio alarm through the Intercom make the **ALPHAMFD** an extremely reliable and safe flight information system.

Using modern processors and a flash-memory, the software of the **ALPHAMFD** can be updated any time and thus being updated to the latest software version without hassle and cost. The **ALPHAMFD** is a sound long-term investment.

In order to avoid information overload of the pilot, only the most important information like speed, vario, altitude, RPM, EGT, CHT or water/oil-temperature, flight time, real-time, fuel state and consumption, are permanently displayed. More information can be called up by pressing only a few keys, e.g. flight log or engine hours, etc.

The innovative LC-display is easy to read in any light conditions, all read-outs are designed following ergonomic rules.

Because of the logical and clearly structured menus, the **ALPHAMFD** is very easy to operate. You basically only have to switch on the instrument and off you go. However we strongly recommend you read the operation manual carefully to make the best out of the many functions the **ALPHAMFD** offers.

We wish you many fantastic and safe flights with your new **ALPHAMFD**.

### Note:

The operating instructions contain many important information which are necessary for a safe operation of the **ALPHAMFD**. Please read the instructions carefully! If you do not understand something, you must not use the **ALPHAMFD**. If you have questions, please contact the nearest **BRÄUNIGER** Service Centre or **BRÄUNIGER** directly.



**WARNING!** This icon designates important safety information in the operating manual. Please read carefully!

## 2 Mounting and Connections

### 2.1 Warning

The **ALPHAMFD** is not certified by LBA/FAA/JAA as this is not required for Ultralights in most countries. However, if such a certification will be required in the future, the certification will be completed. The instrument is designed following the most state of the art technologies and it is extensively tested following the procedures of LBA!

Although the **ALPHAMFD** is an electronic and very precise instrument, incorrect values can be shown, mistakes in operation can be made and shown values can be misinterpreted. By operating the **ALPHAMFD**, the user confirms that he knows about these dangers and he is accepting responsibility for any possible risks.

In order to minimize these risks, the operating instructions MUST be read carefully. If you have questions, please contact **BRÄUNIGER** or a **BRÄUNIGER** Service Centre.

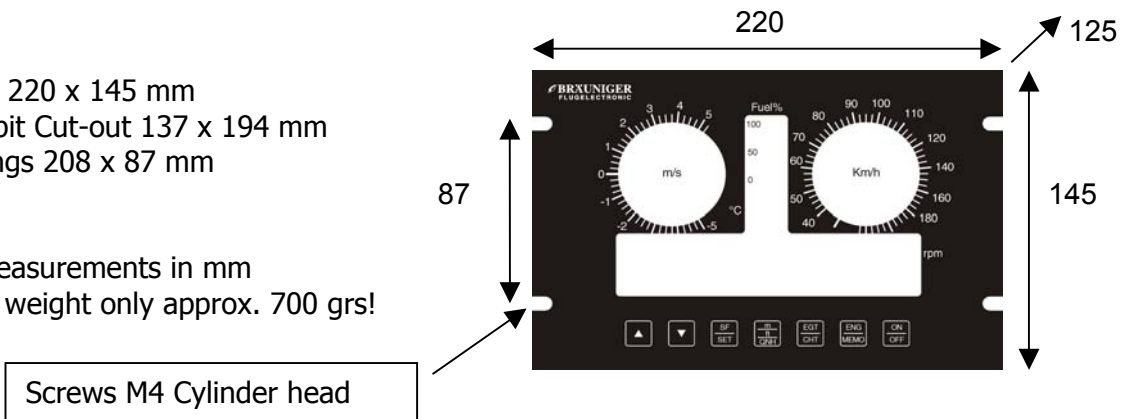
### 2.2 Mounting into Cockpit

It is very easy to mount the **ALPHAMFD** in your cockpit. You only need a little skill, no special tools are required.

Dimensions of **ALPHAMFD**:

Front 220 x 145 mm  
Cockpit Cut-out 137 x 194 mm  
Drillings 208 x 87 mm

All measurements in mm  
Total weight only approx. 700 grs!





**WARNING:**

**The following points must be carefully observed:**

- Protect the unit from too high or too low temperatures. The unit works reliably in a temperature range of -10°C to 50° Celsius.
- Protect the unit from excessive shock or vibrations. It might be necessary to mount the unit with suitable shock absorbing materials.
- Protect the unit from dirt and moisture and all kinds of oils and gasoline.
- The display must be easy to read, protect the unit from glare and ensure a good field of view.
- Mount instrument as far away from radio / transponder antennae as possible.

**All points must be observed for longevity and reliability!**

### **2.3 Electrical Connections**

If you have never before installed electrical instruments and you are not exactly sure what to do, please ask someone who has experience to help you with the installation.

When working with senders, please handle carefully, as they are sensitive electronic parts.

Only use high-quality cables (highly flexible, stranded and shielded) and connectors. Check that your cables run untangled and clean. Disconnect the aircraft battery before working on electrical components!

Ni-Cr-Ni temperature senders require special cables which are supplied with the senders!



**WARNING:** All wires should be protected by small metal terminals to ensure a lasting and safe connection to the **ALPHAMFD**. All cables and the Pitot tube should be secured against pull. There is a special mounting bracket on the rear of the **ALPHAMFD** for securing against pull.

**When mounting the senders the following points must be observed:**

- Protect the sender leads against high temperatures.
- Protect the sender leads from excessive vibration. However, a certain amount of movement must be allowed.
- The sender leads must not be sharply bent or abraded.
- The threads of EGT, CHT, water- and oil temp senders must be treated with Loctite Anti Seize (or a similar agent) to ensure trouble-free unscrewing.

**Type K temperature senders (NiCrNi) MUST** be extended with specially compensated extension leads. If the leads of the senders are too short and must be extended, the special Type K extension leads and Type K plug and sockets **MUST** be used. These leads are available from **BRÄUNIGER**:

**Type Pt100 temperature senders** do not need specially compensated extension leads but can be extended with standard copper leads.

**Please observe, that the *ALPHAMFD* is equipped with two different types of temperature ports: Type K and Pt100. These ports can ONLY be used with the respective type of sender.**

Please follow the technical information of the senders you are using.

**NOTE: *BRÄUNIGER*** provides complete cable looms and sender kits as an option for some popular engines. With these connection kits, it is even easier to connect the ***ALPHAMFD***.

### 2.3.1 Switch-Off unused Temperature Ports

The ***ALPHAMFD*** has six different ports where temperature senders can be connected (Two Type Pt100 and four Type K). Because with some engine configurations some ports are not used, they can be switched off.

Because of their technical characteristics, temperature ports still show temperatures even when no senders are attached, and these temperatures are of course "nonsense". Therefore the ports can be switched off and "nonsense" values are suppressed.

Switching-off ports is done in SET-Modes 31 through 36.

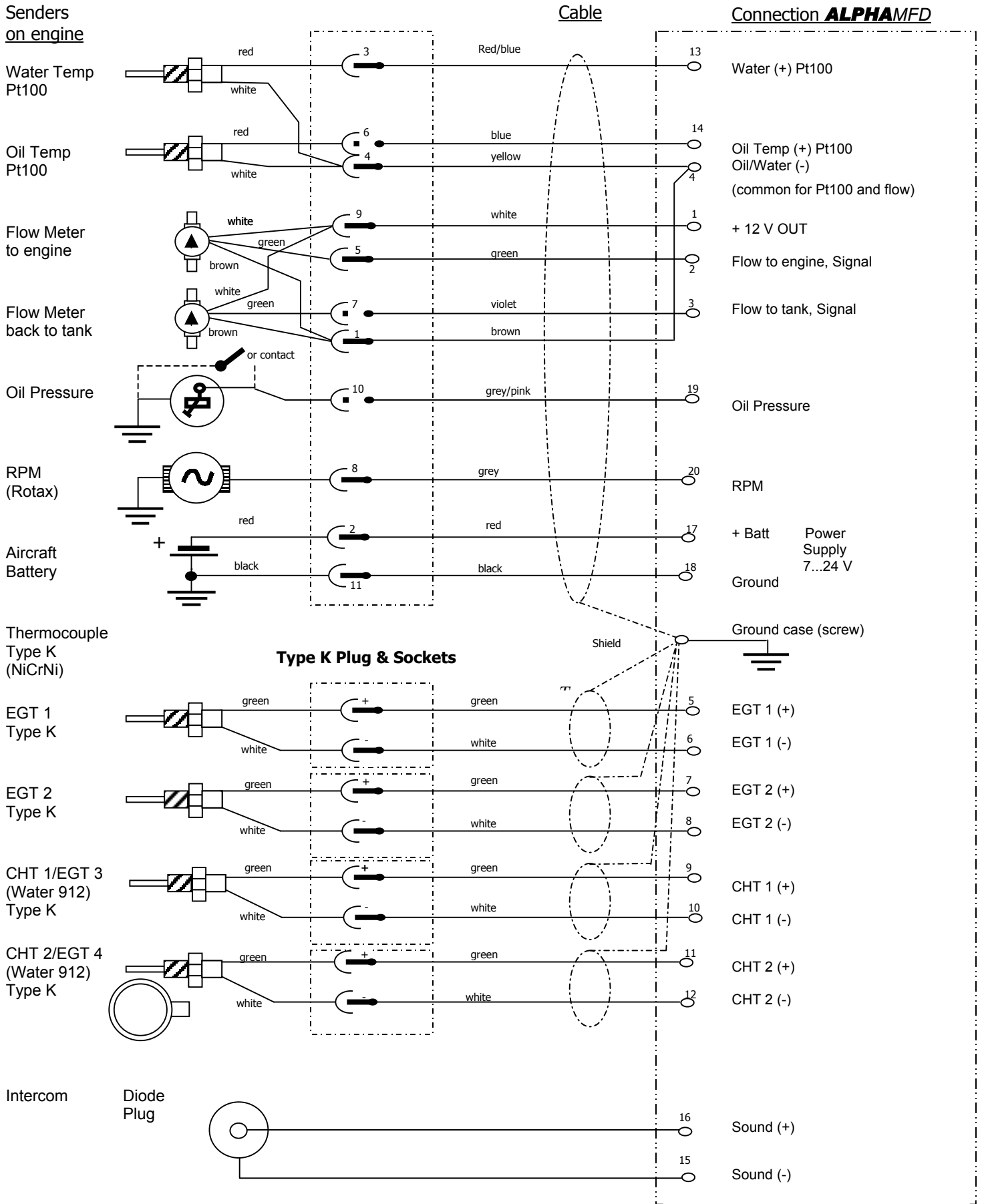
SET Mode Number	Temperature Port	Display Text	Options
31	Pt100 WaterTemp	Use Water Temp Port	YES / NO
32	Pt 100 Oil temp	Use Oil Temp Port	YES / NO
33	EGT 1	Use EGT 1 Port	YES / NO
34	EGT 2	Use EGT 2 Port	YES / NO
35	CHT 1	Use CHT 1 Port	YES / NO
36	CHT 2	Use CHT 2 Port	YES / NO

Note: The factory setting is all temperature ports ON!



**WARNING:** Make sure only **unused** temperature ports are switched off! If a used temperature port with a connected sender is accidentally switched off, the temperature is **not displayed and also the alarm function is inoperative!**

### 2.3.2 Connection Plan **ALPHAMFD** (Hardware Rev 401)



### 2.3.3 Connection Board (Hardware Rev 401)

1	+	12V Out FLOW	1	12 V Power for Fuel Flow Senders 1 and 2
2	+	FLOW to engine	2	Fuel Flow Sender 1 from tank to engine
3	+	FLOW to tank	3	Fuel Flow Sender 2 from engine back to tank
4	-	GND Pt100/Flow	4	Common Ground for both Fuel Flow Senders and both Pt100 temperature senders
5	+	EGT 1 (Type K)	5	Exhaust Gas Temperature EGT 1 (Type K)
6	-		6	
7	+	EGT 2 (Type K)	7	Exhaust Gas Temperature EGT 2 (Type K)
8	-		8	
9	+	CHT 1 (Type K)	9	Cylinder Head Temperature CHT 1 (Or Water 1 for Rotax 912) or EGT 3 (Type K)
10	-		10	
11	+	CHT 2 (Type K)	11	Cylinder Head Temperature CHT 2 (Or Water 2 for Rotax 912) or EGT 4 (Type K)
12	-		12	
13	+	Water Temp (Pt100)	13	Water temperature (Type Pt100)
14	+	Oil Temp (Pt100)	14	Oil temperature (Type Pt100)
15	-	Intercom	15	Intercom connection for alarm sounds
16	+		16	
17	+	BATT 7...28 V In	17	Main power supply from aircraft 7 to 28 Volts
18	-	BATT Gnd	18	Main aircraft ground
19	+	Oil Press	19	Oil pressure analog signal or switch
20	+	RPM Signal	20	RPM signal



Screw on **ALPHAMFD** case:  
Ground for shield of leads

Numbers are based on numbers of sticker on case and on connection plan.

Connection of leads: Open cable clamps with suitable tool (screw driver) and insert leads. Always use cable terminators!

## 2.4 Mounting Fuel Flow Sender

### 2.4.1 General Notes

The fuel capacity indicator of the **ALPHAMFD** works with a special fuel flow sender. We recommend only to use the sender supplied by **BRÄUNIGER**, because other senders are not adapted to the **ALPHAMFD** and precise function can not be guaranteed. The fuel flow senders transmits pluses according to the actual fuel consumption to the **ALPHAMFD**. These pulses are added up to a fuel capacity indicator. The sender can be used with all kinds of fuel.

The **BRÄUNIGER** fuel flow sender is looped in the fuel line between filter and engine. Make sure all connections of fuel line are leak proof and secure. Secure all line connections with suitable parts, e.g. hose clamps.

The fuel flow sender is designed in such a way, that even when the sensor wheel is blocked, there is always enough fuel throughput to keep the engine running. Of course the fuel flow can not be measured with a blocked sensor wheel.

#### 2.4.2 Important Safety Notes



**WARNING!** To prevent air bubbles from getting stuck inside the fuel flow sender, the sender **MUST** be mounted in an angle of **optimal 90°** and minimum 60° relative to the longitudinal axis of the aircraft. Only this way a precise measurement can be achieved. The direction of the fuel flow **MUST** be **from bottom to top!** Take care of the correct flow direction indicated by the arrow on the sender.



**WARNING!** The fuel flow sender **MUST** be mounted **AFTER** the fuel filter so that foreign matter in the fuel cannot block the sensor wheel!



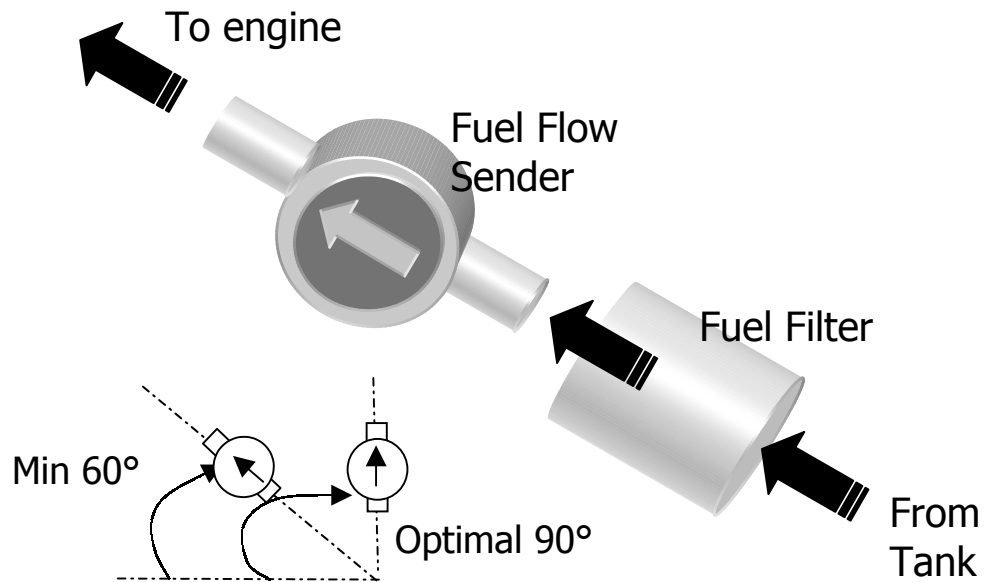
**WARNING!** When mounting the fuel flow sender you **MUST** observe the safety and operation notes of the engine manufacturer!

#### 2.4.3 Recommendations to Achieve Precision Measurements

Because most fuel pumps create strong vibrations in the fuel line and these vibration can negatively influence the precision of the fuel flow sender, the sender should be mounted far away from the fuel pump.

The fuel flow sender should be mounted close to the tank. The high temperatures in the engine compartment can change the viscosity of the fuel which can negatively influence measurement precision!

2.4.4 Drawing: Fuel Flow Sender Mounting



Fuel Flow Sender Mounted on Rotax 912 S as described in Section 5.3.6

## 2.5 Pitot Tube and Static Port

There are 2 different pressure ports on the backside of the case:

### 2.5.1 Static Port

This is the port for the static pressure. It must be connected to the static port of the aircraft. If you don't know where the static port of your aircraft is, ask the manufacturer of the aircraft. A static pressure port is only necessary for aircraft with closed passenger cabin. Open flex-wing Ultralights can leave the static port open without connecting it anywhere.

### 2.5.2 Pitot Port

This is the port for the pitot pressure. The pitot tube of the aircraft is connected to the pitot port. This is done with standard silicone hose. Check that the tube is neither tangled nor sharply bent on its way from the pitot tube to the **ALPHAMFD**. The pitot tube should be free of turbulences for precise measurements. The pitot should be mounted parallel to the aerodynamic air flow during cruise flight.

Because the ideal mounting of the pitot tube is different for every aircraft type, please contact your aircraft manufacturer for special information.

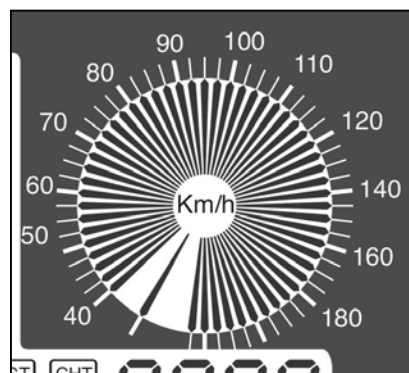
## 3 Power On and Built - In Self-Test (BIT)

By pressing the <ON/OFF>-key the instrument is switched on. For a short period of time all segments of the LC-display are illuminated in order to test the function of the display. Next the instrument goes into CHECK-Mode. An internal self-test is executed and all senders are checked for correct signals. If the **ALPHAMFD** discovers a fault, it displays an ERROR-code. A list of all possible ERROR-codes is listed in section 8.1.7. If everything is OK, you will see several "CHECK OK" messages and the instrument is ready for operation. Among others the speed range (which is set by the factory) is displayed. This is an additional safety check for the pilot.

## 4 Flight Management

### 4.1 Air Speed Indicator (IAS, CAS)

The **ALPHAMFD** has an easy to read large analogue display of the air speed. By using a standard Pitot tube the Indicated Air Speed (IAS) is displayed. Note: IAS shows the speed in every altitude according to the measured dynamic air pressure. At high altitudes the actual True Air Speed (TAS) is higher than the IAS. Displaying the IAS has several advantages and is also required by various aviation authorities. For example the speed never to exceed (Vne) or the stall speed (Vso or Vs1) can always be read at the same spot of the



scale at every altitude.

Standard, commercially available, Pitot tubes are used for speed-senders. The speed indicator is calibrated by **BRÄUNIGER** according to the corresponding dynamic air pressure.


#### 4.1.1 Calibration of Air Speed (CAS)

The pilot can individually calibrate the speed indicator in SET-Mode 15 by adjusting the SPEED GAIN factor. This way measurement errors, caused e.g. by a not optimal position of the Pitot tube, can be individually corrected. After calibration, CAS (Calibrated Air Speed) is indicated. The default value is >100<. If you adjust the SPEED GAIN e.g. to <110> the speed indication will show a approx. 10% higher CAS.

The easiest way to calibrate the air speed indicator is to use a GPS. On a day with no wind the Ground Speed is compared to the Indicated Air Speed. You should fly your entire speed range, i.e. landing speed, medium speed, cruise speed and close to the Vne. The differences in GS to IAS will probably vary through the speed range. It is optimal to calibrate close to landing speed. It is also recommended to fly different courses (e.g. 360°, 270°, 180° und 90°) to eliminate possible wind influences.

Additionally the speed zero point can be calibrated. This is done in SET-Mode 16 (SPEED ZERO).

•



**WARNING!**  
The possibility to calibrate the Air Speed Indicator allows for a very accurate calibration of the Calibrated Air Speed. But if the calibration is **done incorrectly**, the CAS indication can show **inaccurate speeds** which can **lead to serious accidents (landing!)** **Utmost care must be used when calibrating the Air Speed!**  
It is also highly recommended to **calibrate** the speed zero point every **2-3 months** to preserve accuracy.

#### 4.1.2 Speed Indication "Stretching Schemes" / Units Air Speed

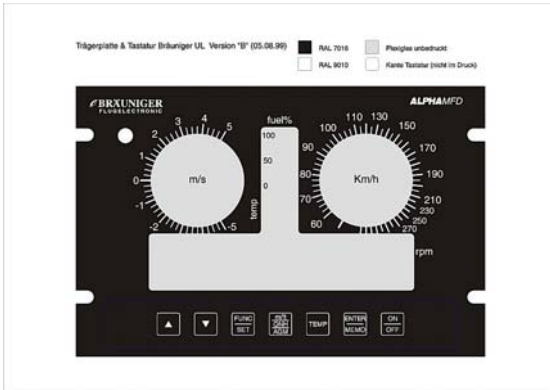
The **ALPHAMFD** is available in 6 different versions:

Version	Speed-Units	Speed-Range	VSI Units
Version A	Km/h	40 – 220 km/h	m/s
Version B	Km/h	60-340 km/h	m/s
Version C	Knots or mph	24 –130 kts	ft/min
Version D	Knots or mph	32 – 190 kts	ft/min

Knots-versions can be converted to mph-versions. This must be done at the factory. Km/h-versions can also be converted to kts or mph versions. Again this must be done at **BRÄUNIGER**.



**WARNING:** To get a precise indication of the air speed, some scales are "stretched". Please note the **different resolutions** of the scales. The increment between two marks can indicate speed differences from 2.5 km/h to 10 km/h!



### **Example:**

**ALPHAMFD** version B (340 km/h) uses the following "stretching scheme":

- From 60 km/h to 110 km/h every mark indicates a speed resolution of 2,5 km/h (important for precise indication of speed for landing or to prevent stalling)
- From 110 km/h to 210 km/h every mark indicates a speed resolution of 5 km/h
- From 210 km/h to 340 km/h every mark indicates a speed resolution of 10 km/h

Additional details in section 11 "Technical data"

In SET-Mode 16 two different pointer styles can be chosen according to personal preferences: Sectional pointer or single pointer. More in section 4.4.1 and 4.4.2

Because it is very important to comprehend the different speed ranges at a single glance, self adhesive coloured marker rings in white, green, yellow and red are included with every **ALPHAMFD**. These rings can be mounted to the speed indicator corresponding to the speeds of the individual aircraft (Vno, Vne, Vso, Vs1, etc.)

#### 4.1.3 Stall-Alarm

**Stall-Alarm:** In SET-Mode 6 the audio warning for stall speed in landing configuration (Vso) can be programmed. After switching to SET-Mode by pressing the **>FUNC/SET<** key (SF = special functions) for a few seconds, select SET-Mode 6 = STALL ALARM by pressing the **>ARROW<**-keys. After pressing the **>ENTER/MEMO<** key the **<SET<** icon will start flashing. Now the speed of the stall alarm can be adjusted. By pressing **>ENTER/MEMO<** again, the new value is stored. Pressing the **>FUNC/SET<** key leaves the SET-Mode.

#### 4.1.4 Vne-Alarm

**Vne-Alarm:** In Set-Mode 7 the Velocity never to exceed is set in the same way as described above. If you exceed this maximum allowable speed an acoustic and visible (flashing speed pointer) is activated.

**Note:** Neither the Stall- nor the Vne - Alarm can be switched off.



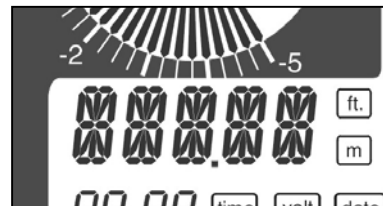
**WARNING!** If the Indicated Air Speed is **faster than 50 km/h**, the **ALPHAMFD** cannot be switched off! This prevents the pilot from accidentally switching off the **ALPHAMFD** during flight.

## 4.2 Altimeter and Air Pressure

We recommend setting the correct QNH prior to every flight. This is easily done by just pressing the >ARROW< keys.

### 4.2.1 Altitude MSL (QNH)

Usually the altimeter is set to altitude above mean sea level MSL. If the >**m/ft/QNH/AGM**< key is pressed once, the display switches over from meter to feet. If the same key is pressed again, the corresponding QNH is displayed in hPa (or inHg).



### 4.2.2 Altitude above GND / AGL (QFE)

It is also possible to set the altimeter to zero while on the ground. This way the altitude shows Above Ground Level (AGL or GND). When switching over to air pressure while AGL is set, the **ALPHAMFD** automatically calculates the corresponding QFE. On many airports the QNH is given by ATC prior to take-off. You can also set the QNH by pressing the >ARROW< keys and the **ALPHAMFD** automatically calculates the corresponding altitude above MSL. (Kollsman-Window)

### 4.2.3 Flight Level (FL, QNE)

In some air spaces pilots are required to fly by flight levels. All aircraft set their altimeter to the ICAO standard air pressure of 1013,2 hPa.

The **ALPHAMFD** has a special function to set this very easily. By pressing the >ARROW UP< and >ARROW DOWN< keys simultaneously, the altimeter is set very quickly to 1013,2 hPa (QNE). Now the altitude is shown in flight level. Changing the altitude to flight level is indicated by "QNE" in the display.

If you want to revert to altitude MSL, just get the new actual QNH from the nearest air field and adjust the altimeter accordingly using the >ARROW< keys.

## 4.3 Altitude Guidance Mode (AGM)

The Altitude Guidance Mode (AGM) helps pilots to maintain a chosen altitude with the help of an acoustic alarm. If the chosen altitude is exceeded, either too high or too

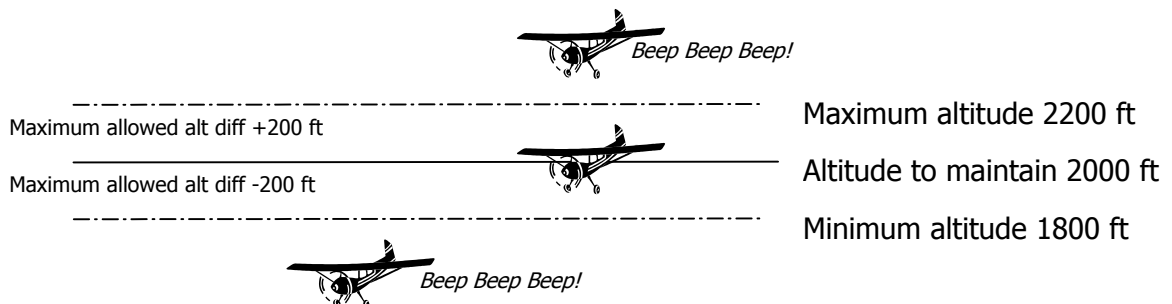
low, by a difference set in the SET-Mode 5, an audio alarm starts to sound through the Intercom and the altitude display starts flashing.

Example: A pilot flies 2000 ft MSL and wants to maintain this altitude for a longer period of time because he would otherwise enter controlled airspace when flying higher. He doesn't want to check the altimeter all the time so he activates AGM which will warn him if he flies too high or too low. The altitude difference which triggers the alarm can be set in SET-Mode 5. As soon as the desired altitude to be maintained is reached, the AGM is activated by pressing **>m/ft/QNH/AGM<** for several seconds. The display shows **<AGM ON>**.

By pressing **>m/ft/QNH/AGM<** again for several seconds, AGM is deactivated and **<AGM OFF>** is displayed.

Example:

2000 ft shall be maintained. Altitude difference of 200 ft or greater above 2000 ft and 200 ft and greater below 2000 ft will trigger the audio alarm. As soon as the pilot inadvertently climbs to 2200 ft and more, the alarm goes off and the altitude display starts flashing. The same happens if the pilots descends to 1800 ft or less. As soon as the pilot returns to within the desired altitude range (2000 ft + 200 ft or – 200 ft), the alarm stops automatically and the altitude display stops flashing.



The altitude range is set in SET-Mode 5, the set value represents the maximum allowed altitude difference for above and below the desired altitude

**4.4 VSI (Vertical Speed Indicator)**

Climbing or descending speeds are shown on a large, easy to read, analogue display with a resolution of 0.25 m/s. Values between +/- 10 m/s are displayed (or the equivalent in ft/min)

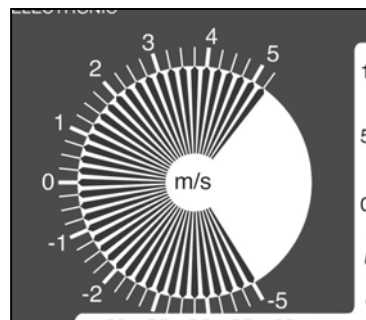
The **ALPHAMFD** has two different ways of indication values on the round analogue scales. They can be chosen according to personal preferences in SET-Mode 16.

**4.4.1 Single Pointer Display**

The Single Pointer Display indicates rate of climb or sink with a conventional single pointer. If the climb or sink rate exceeds +/- 5 m/s, the values from 5 m/s to 10 m/s are displayed in a second stage which is indicated by a second pointer at 5 m/s.

#### 4.4.2 Sector Display

The Sector Display indicates climb or sink rate by an "increasing" sector. If the climb or sink rate exceeds +/- 5 m/s, the values from 5 m/s to 10 m/s are displayed in a second stage which is indicated by the sector being cleared. We recommend using the Sector Display in low temperatures, because in low temperatures the LC-display becomes slow and the Sector Display is better to read.



The VSI of the **ALPHAMFD** works electronically and therefore works much faster, crisper and more precise compared to conventional mechanical VSI instruments with their inherent long time lag.

#### 4.4.3 Variometer Acoustic

If the motor of the airplane is switched off and the unit is climbing an acoustic signal will be transferred to the intercom. A stronger climbing corresponds to higher frequency and faster beep intervals.

### 4.5 Flight Time, Take-Off Time and Date of Flight

The flight time is measured as soon as the speed exceeds 50 km/h IAS. This moment is also registered as take-off time and can later be called up in the MEMO-Mode. The flight time is stopped as soon as the **ALPHAMFD** registers speeds of less than 50 km/h IAS.



**WARNING!** The **ALPHAMFD** cannot be switched off as long as it registers an **air speed of faster than 50 km/h**. This prevents the pilot from inadvertently switching off the instrument during flight.

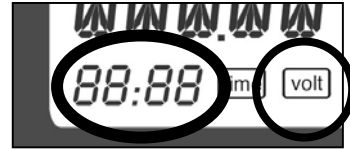
### 4.6 Temperature and Voltmeter

By pressing the >**FUNC/SET**< key twice, the altimeter display is switched to voltmeter and temperature. In SET-Mode 22 (UNIT TEMPERATURE) you can choose between °C Celsius or °F Fahrenheit.



**WARNING!** The **ALPHAMFD** measures the temperature of the instrument board (which approx. corresponds to outside temperature in open flex-wing ultralights/microlights or the cabin temperature of closed fix-wing ULs). The indicated temperature is not the actual outside temperature OAT. The temperature is used for internal temperature compensation. **It may NOT be used for calculations of correcting factors to ICAO standard atmosphere (density altitude).** It is only suitable for informal information!

At the same time the actual voltage of the aircraft system is displayed. After a few seconds both displays switch back to altitude and real-time. When the **ALPHAMFD** switches over to emergency power for any reason, the Voltmeter indicates the voltage of the back-up battery.



**WARNING! Never disconnect** the power supply of the **ALPHAMFD** before switching it off. If the **ALPHAMFD** is disconnected before it is switched off, it **cannot write information** (like engine hours) into its memory and the values are permanently lost. It can also happen that the **ALPHAMFD** switches over to emergency power supply and unnecessarily drains the back-up battery!



**WARNING!** When the **ALPHAMFD** switches over to emergency power supply by the back-up battery, the voltage of the back-up battery is indicated. If this value drops to 7,2 V or below you must IMMEDIATELY exchange the battery. You MUST NOT fly with a voltage of 7.2 V or below because the emergency power supply can not be guaranteed!

#### 4.7 Real-Time

The time is shown in hh:mm.

Time and date are set in SET-Modes 19, 20, and 21.

## 5 Engine Management

### 5.1 Engine RPM

Engine RPM is digitally indicated to 9990 RPM with a resolution of 20 RPM.



#### 5.1.1 RPM Measurement RPM Port

Most engines have a dedicated 12 V port for measuring the engine RPM. In SET-Mode 18 the **ALPHAMFD** can be programmed to read the RPM signal depending on engine type and ignition sequence. It is possible to set a factor "multiplied by 4, 2, or 1 or "divided by 6, 4, 2".

The generators of Rotax 582 and 503 engines give 6 pulses per revolution, so the **ALPHAMFD** must be set to "divided by 6" for use with these engines.

For Rotax 912 engines the factor must be set to \*1.

The factors for other engines can be obtained from the manufacturers.

Because Engines use a special RPM signal, the **ALPHAMFD** can be programmed to understand this signal with a filter. This filter can be activated or deactivated in SET-Mode 27 (Default is ROTAX). This enables the unit to understand pulses from 6 ... 200 Volts.



**WARNING!** As long as the **ALPHAMFD** reads RPM from a running engine, it **cannot be switched off**. This is to prevent the pilot to inadvertently switch off the instrument during flight.

### 5.1.2 Capacitive RPM Measurement at ignition cable **(This function is not supported any longer)**



## 5.2 **Engine Hour Meter**

The **ALPHAMFD** distinguishes between flight time and engine running time per flight. Both values are displayed and stored for every flight. They can be recalled in MEMO-Mode (see section 6) with a resolution of 1 minute.

Additionally, the total running time of the engine of all flights (Engine Hour Meter) is displayed in SET-Mode 4. This value can not be changed and does not get lost when disconnecting the power of the **ALPHAMFD**. The value is shown in full hours.



**WARNING!** Never disconnect the **ALPHAMFD** from its power supply before switching it off. If it is disconnected from the power supply without prior switching it off, it cannot store some information (e.g. engine hours) in its memory. Important data will be lost!

## 5.3 **Fuel State and Fuel Flow (Consumption)**

### 5.3.1 Important Safety Information

The fuel state is determined by a special flow sender. It is highly recommended to only use the flow sender supplied by **BRÄUNIGER**, because other senders are not adapted to the **ALPHAMFD** and correct function cannot be guaranteed.



## **WARNING! IMPORTANT SAFETY INFORMATION!**

The Fuel Flow Meter has been designed with very precise industrial measuring devices. During practical tests and calibration trials it became evident, that the entire system can be very precisely calibrated. But external factors, such as temperature of fuel can negatively influence the precision. Even different fuel versions with their inherent differences in viscosity can degrade precision of measurement.

Although the fuel flow meter and fuel state are relatively precise, the pilot in command **must check the fuel prior to flight** and must make sure there is enough fuel in the tanks for the planned flight. The fuel state indication of the **ALPHAMFD does not relieve the pilot from completing prudent range calculations during flight planning!**

The fuel flow meter and fuel state are only to be taken as **additional information** for the pilot. Negative external factors, the incorrect operation of the system or a break down of the **ALPHAMFD** can lead to the indication of **INCORRECT** values!

### 5.3.2 Fuel Flow Meter

The BRÄUNIGER fuel flow sender is looped into the fuel line between engine and fuel filter. For details see section 2.4.



**WARNING!** The fuel flow sender must be installed **AFTER the fuel filter**, so that foreign matter and dirt in the fuel cannot block the sensor wheel. The fuel flow sender **MUST** be installed in an **angle between 60° and 90°** relative to the longitudinal axis of the aircraft. The fuel must flow from bottom to top. Please observe the mounting instructions in section 2.4!

The sender is designed in such a way, that even when the sensor wheel is blocked, the engine still gets enough fuel for running. A fuel measurement is of course not possible with a blocked sensor wheel.

The fuel flow sender transmits pulses to the **ALPHAMFD** according to the actual fuel consumption. The **ALPHAMFD** converts these pulses to the fuel flow and fuel state indication.



**WARNING!** After filling up the aircraft, the **actual contents of the tank must be input into the ALPHAMFD** (see section 5.3.8). If the pilot forgets to input this correctly, the fuel state indication is **INCORRECT!**

### 5.3.3 Precision of Fuel Flow

The highest precision is achieved with normal RPM during cruise flight (Fuel consumption between 10 and 20 l/h). In the extreme corners of the RPM range, e.g. during full throttle or idle, the precision is slightly less. Below a fuel consumption of 5 litres/h the precision is rather low, therefore the **ALPHAMFD** does not indicate a fuel consumption below 5 litres/h. It always assumes a minimum fuel consumption of 5 litres/h, even when the engine idles.

### 5.3.4 Fuel Flow with Engines with Fuel Flow-Back System

Certain engine configurations not only have a fuel line from tank to engine, but fuel which is not consumed by the engine is transported back from engine to tank.

### 5.3.5 Measuring with **two** flow senders (engines with fuel flow back system)

Because the back-flow can be a significant portion of the fuel pumped to the engine, the **ALPHAMFD** can be used with a second fuel flow sender. The **ALPHAMFD** measures the fuel flow from tank to engine and also from engine back to tank. Both values let the **ALPHAMFD** calculate the actual fuel consumption.

In SET-Mode 37 the **ALPHAMFD** can be programmed, whether the aircraft uses a single fuel line (tank to engine, setting 1WAY) or a fuel flow back system (setting 2WAY).

Even when two senders are used, the fuel flow can be calibrated as described in section 5.3.6



**WARNING!** Because two fuel flow senders are used with engines with fuel flow-back configuration, possible measuring **errors could duplicate**. Therefore the **precision is lower** than with only a single fuel line in 1-way configurations and we do not recommend to use two flow senders.

### 5.3.6 **Recommended:** Measuring with **one** fuel flow sender (engines with fuel flow back system)

There is a second way of measuring the fuel consumption of engines with a fuel flow back system. This works with engines, where the fuel line is split to two carburettors AFTER the fuel line which leads back to the tank (e.g. some Rotax 912 and 912 S versions). Because it can be assumed that both carburettors receive approximately the same amount of fuel, only the fuel consumption of one carburettor is measured and then doubled.

The calibration factor in SET-Mode 3 must be set to double the indicated fuel flow. A setting of approx. 140-160 has shown to be right in various tests

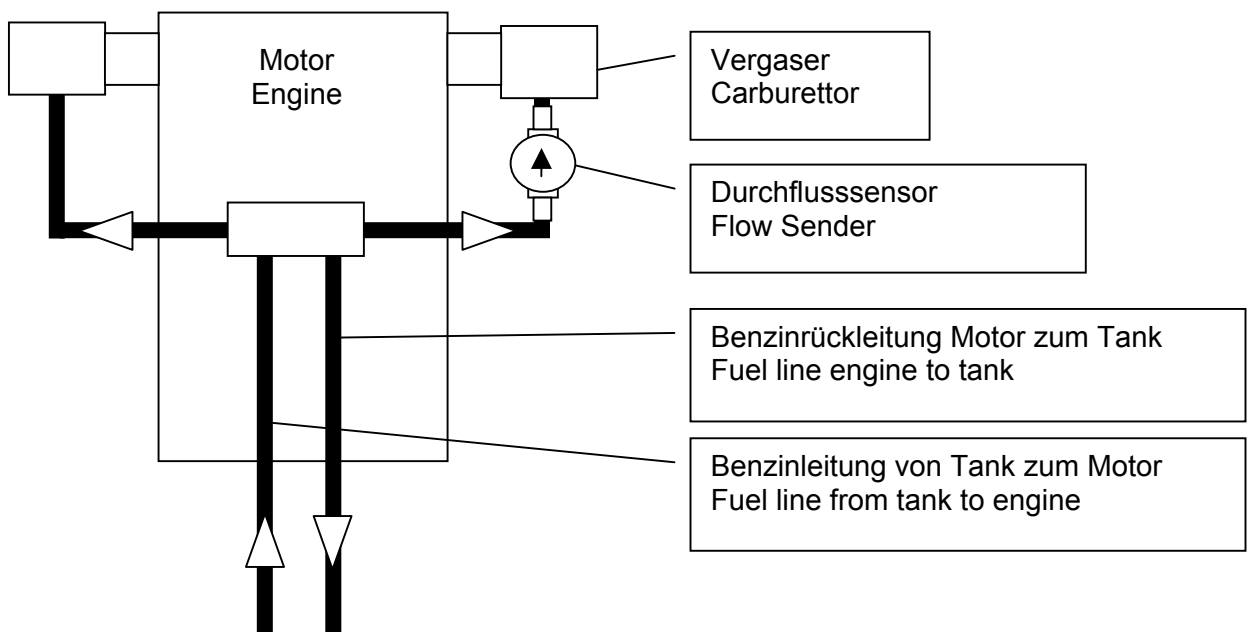
**The measuring method must be set to 1WAY in SET-Mode 37.**



**WARNING: We recommend using the measuring method with only one fuel flow sender for engines with a fuel flow back system.** The indicated values are not only more precise than when using two senders, you only have to buy and mount one sender.

**Recommended way of measuring:**

Measuring fuel flow with **ONE** Fuel Flow Sender for engines with fuel flow back system



**5.3.7 Display of Fuel Flow**

By pressing the **>FUNC/SET<** key, the altitude display is temporarily replaced by the fuel flow in either litres/hour or US-Gallon/hour. Pressing **>FUNC/SET<** again will switch back to altitude. The fuel flow units can be changed in SET-Mode 25 from litres/h to US-Gallon/h. For details see section 7.6.

**The fuel flow indication is averaged. If the RPM of the engine is changed, it can take a few seconds until the new fuel flow is indicated.**

**If the **>FUNC/SET<** key is not pressed a second time, for safety reasons the display automatically reverts to altitude after a few seconds.**

**5.3.8 Calibration of Fuel Flow Meter**

Because the fuel systems are different in every aircraft, we recommend calibration of the fuel flow meter. This can be done in SET-Mode 3. The default value is a factor of

100%. If the factor is increased, a higher fuel flow will be displayed. If the factor is decreased, a lower fuel flow is indicated.

Factor > 100 = higher fuel flow indication

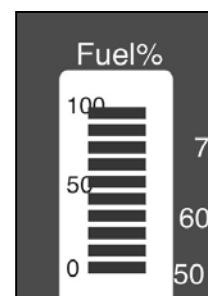
Factor < 100 = lower fuel flow indication



**WARNING!** If the calibration is done incorrectly, the **ALPHAMFD** will indicate **INCORRECT** fuel flow and tank state!

### 5.3.9 Display of Fuel State

The maximum tank capacity is set in SET-Mode 2. The fuel state is displayed with a easy to read bar graph, one bar of the graph represents 10% of the maximum fuel capacity. 10 bars represent 100% = tank full, 1 bar represents 10% = reserve! The fuel state is not measured directly in the tank but is computed from tank capacity and fuel flow. When 10% are reached, an audio alarm is sounded through the Intercom and the 10% bar starts flashing. Just before the tank is empty, all bars start to flash and the Intercom-Alarm is sounded.



### 5.3.10 How to enter the Actual Fuel State after filling up

Switch to SET-Mode 1 by pressing the >FUNC/SET< key for a few seconds. After pressing >ENTER/MEMO< the >SET< icon starts to flash. This indicates that a value can be changed. Now the maximum tank capacity is displayed. If you have really filled up the tank just press >ENTER/MEMO< again and the value for full tank is stored.

If the tank is not filled up completely (e.g. when filling up from Jerry cans) you can also store any value you want (in Litres or US-Gallons). The desired value is adjusted by pressing the >ARROW< keys.



**WARNING!** If **INCORRECT** values are put into the **ALPHAMFD**, there will also be **INCORRECT** values indicated by the **ALPHAMFD**!

## 5.4 **Cylinder Head Temperature (CHT) and Exhaust Gas Temperature (EGT)**

The temperatures of two cylinders are simultaneously monitored by the **ALPHAMFD** with standard NiCrNi thermoelements (Type K). By pressing the >TEMP< key, the exhaust gas temperature (EGT), the cylinder head temperature (CHT) and oil and water temperature can be displayed.

Of course the four Type K ports of the **ALPHAMFD** can also be used differently, e.g. for monitoring the EGT of 4 cylinders. This mode can be set in SET-Mode 28. In this

mode (EGT SCROLL MODE) the EGT-values of 4 cylinders, the oil temperature and water temperature are scrolled in the display. The actual temperature is displayed in the top field of the temperature fields, the bottom field shows the corresponding cylinder, e.g. CL1 for cylinder 1, CL2 for cylinder 2, etc. The oil temperature is indicated by OIL and the water temperature by H2O. Oil and water are only displayed, if the corresponding ports are activated (see section 2.3.1).

Type K thermoelements and –ports are suitable for monitoring high temperatures, e.g. CHT or EGT. For water and oil temperatures usually Pt100 senders are used, because they have a better resolution and precision at lower temperatures. The **ALPHAMFD** has 4 Type K ports and 2 Pt100 ports.

The **ALPHAMFD** constantly monitors all senders for faults, e.g. cable breaks. If an error is found, the audio alarm is sounded through the Intercom and the respective display starts flashing. The display of temperatures is substituted by three dashes (---).

Because of the way temperature senders work, they can only show a signal which corresponds to a difference in temperature of the source and a comparison point. To show the real actual temperature, the difference value must be compensated by the outside air temperature. The **ALPHAMFD** does this all the time with an internal temperature sender.



**WARNING!** As mentioned in section 2.3.1, unused temperature ports can be deactivated in Set-Mode 31 to 36 in order to de-clutter the display. If a temperature is not displayed even though a sender has been connected correctly, check if the port has **not mistakenly been deactivated!**

### 5.5 Water Temperature

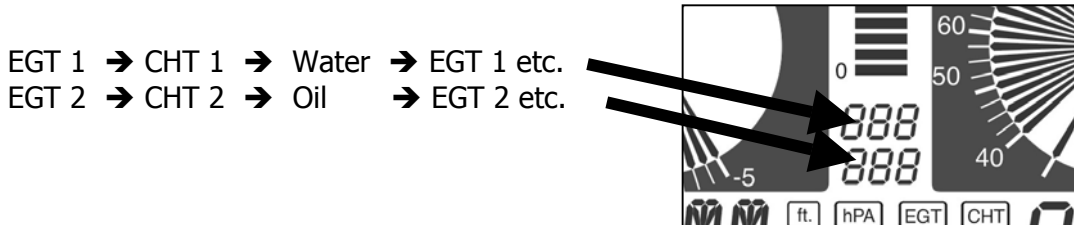
The water temperature is usually measured by a Pt100 temperature sender. It is displayed in the TOP temperature field of the **ALPHAMFD** display and is designated by the >Water/Oil Temp< icon. With some engines, e.g. Rotax 912, CHT and water temperature are measured together, i.e. the water temperature is measured at two cylinder heads. In this case it is recommended using two Type K senders at the two CHT ports of the **ALPHAMFD**.

### 5.6 Oil Temperature

The oil temperature is measured with a Pt100 sender. The sender is connected to the Pt100 Oil Temp port on the **ALPHAMFD**. It is displayed in the LOWER temperature field of the **ALPHAMFD** display and is also designated by the >Water/Oil Temp< icon. For further details see the following section 5.7.

## 5.7 Display of Temperatures

The temperature display fields are scrolled by pressing the >**TEMP**< key. Pressing repeatedly switches to the next temperature. The displayed pair of temperatures is designated by the Icons >CHT<, >EGT<, or >Water/Oil Temp<.



In case the EGT Scroll Mode is activated in SET-Mode 27, the top field shows the actual temperatures and the lower field shows the cylinder designation, e.g. CL1, CL2, etc. Water Temperature is designated by H2O and Oil is designated by OIL.

Because the **ALPHAMFD** constantly monitors ALL engine temperatures, it is not necessary to display all temperatures on the display. This would clutter the display and make it very hard to read (information overload!). The pilot can choose the temperature pair which interests him most. **All other temperatures are still monitored even when not displayed.** If a temperature value is exceeded according to the programmed max values, an alarm tone is sounded through the Intercom and the excessive value is displayed together with its designator (Icon) so it can easily be identified.

**Attention:** To come back from an alarm temperature to an other one, for example EGT to CHT, first press the **ON/OFF** button suppressing the audio alarm, than press the EGT/CHT button!

**Note:** The instrument is not switched off during flight when pressing the >**ON/OFF**< key!

## 5.8 Oil Pressure and Low Oil Pressure Warning

The **ALPHAMFD** can monitor oil pressure in two different ways, depending on the type of the oil pressure sender being used: You **have** to set the type of oil pressure sender in SET-Mode 29.

### SET-Mode Options:

DIGI = Oil pressure switch (On/Off)

ANA = Analogue oil pressure sender (e.g. Rotax 912)



**WARNING!** If the **INCORRECT** type of oil pressure sender is set, the oil pressure is **NOT MONITORED!** There will be no warning if something goes wrong with the oil pressure!

### 5.8.1 Oil Pressure Switch

The oil pressure switch does not monitor the exact oil pressure, but indicates when the permissible oil pressure drops below a certain value. This value is built into the switch and cannot be set in the **ALPHAMFD**.

When starting the engine, the >OIL< Icon is illuminated. This can last up to approx. 15 seconds after starting the engine. This is not a warning, but shows, that the engine has not yet reached the operation oil pressure. As soon as the normal operating oil pressure is reached, the icon extinguishes.

**If the >OIL< icon starts flashing during flight and an alarm is sounded through the Intercom, the oil pressure is too LOW!**

### 5.8.2 Analogue Oil Pressure Sender

If an analogue oil pressure sender is used, the **ALPHAMFD** indicates the exact oil pressure in bar (or PSI). The value is displayed in the right hand corner of the display in the following formats:

Example:

5:7 represents an oil pressure of 5,7 bar  
10:3 represents an oil pressure of 10,3 bar

25 represents an oil pressure of 25 PSI  
56 represents an oil pressure of 56 PSI



The oil pressure is displayed with 3 digits and a resolution of 0.1 bar (or 1 PSI). The oil pressure unit can be set in SET-Mode 26, bar or PSI is possible.

**The **ALPHAMFD** is designed to be used with the VDO Oil Pressure sender. It will not indicate correct values with other types of oil pressure senders.**

The **ALPHAMFD** monitors the minimum and maximum permissible oil pressure values. They can be set in SET-Mode 13 and 14. If the values are exceeded, the >OIL< icon and the oil pressure display start to flash and an alarm is sounded through the Intercom. If the oil pressure display is not activated at the time of the alarm (e.g. the flight time is displayed instead), the oil pressure display automatically shows up.

The oil pressure display can be activated by pressing the >**ENTER/MEMO**< key, the display is designated by the >OIL< icon.

If the engine is started, the oil pressure display is automatically activated and the oil pressure is shown for approx. 15 seconds. If the engine reaches the normal operating oil pressure range (defined by the minimum and maximum values in SET-Mode 13 and 14) during those 15 seconds, the display switches back to the previously selected display (e.g. flight time).

**If during flight the oil pressure drops below the minimum oil pressure or exceeds the maximum oil pressure, the >OIL< icon and the oil pressure display start to flash and an alarm is sounded through the Intercom. If the oil pressure display is not activated at the time of the alarm (e.g. the flight time is displayed instead), the oil pressure display automatically shows up.**

## 5.9 Voltmeter

After pressing the >**FUNC/SET**< key twice, the altitude display changes to temperature and the real-time display changes to voltage indicated by the >**VOLT**< icon. If the voltage of the aircraft drops below 11.5 V an audio alarm sounds through the Intercom and the real-time display alternates with the voltmeter display. If the **ALPHAMFD** switches to emergency power supply, the voltage of the back-up battery will be displayed.



## 5.10 Back-Up Power Supply

If the aircraft power was cut off during flight, the **ALPHAMFD** would stop working. Therefore the **ALPHAMFD** has an integrated back-up power supply. The instruments switches automatically over to the back-up battery when the normal power supply drops below the safety margin of 11.0 V or is cut of completely. The switch to back-up battery is indicated by an alarm through the Intercom and the flashing of the voltmeter display.

The back-up battery is a normal 9V alkali-manganese 6LR61 block, which is stored in a compartment on the side of the instrument. It can easily be replaced by opening the drawer.

The **ALPHAMFD** checks the back-up battery every time it is switched on. If the voltage of the back-up battery is too low and not sufficient to power the **ALPHAMFD** in case of emergency, the message "BACK-UP BATTERY LOW" is displayed. **The back-up battery must be replaced as soon as possible!**

For safety reasons, the **ALPHAMFD** can only be switched on when the normal aircraft power supply is sufficient. It will only switch over to the back-up battery, when the aircraft power supply is faulty during flight. This way the pilot cannot take off with a faulty aircraft power supply!



**WARNING!** When the **ALPHAMFD** switches over to emergency power supply by the back-up battery, the voltage of the back-up battery is indicated. If this value drops to 7,2 V or below you must IMMEDIATELY exchange the battery. You MUST NOT fly with a voltage of 7.2 V or below because the emergency power supply can not be guaranteed!



**WARNING!** Depending on the wiring of the **ALPHAMFD** connection, the **ALPHAMFD** might be completely disconnected from the aircraft power supply. If you switch off your engine, the main power supply can be interrupted and the **ALPHAMFD** will switch to emergency power supply. In this case, the **ALPHAMFD** will switch off automatically after 5 minutes. This will only happen, if the **ALPHAMFD** measures no air speed during these 5 minutes. If air speed is measured, the **ALPHAMFD** will NOT switch off automatically. This is a power saving feature so the back-up battery is not drained early when the aircraft is parking.



**WARNING!** For safety reasons the back-up battery should be **replaced once a year, no matter how much voltage is left!**

## 6 Flight Data Recorder

### 6.1 MEMO-Mode

The modern processor technology of the **ALPHAMFD** allows storage of the flight data of the last 25 flights. After pressing the **>ENTER/MEMO<** key for several seconds, the instrument switches to MEMO-Mode. This can be done at any time, even during a flight. The following data is displayed:

The MEMO-Mode shows the following information:

- Maximum rate of climb and sink
- Maximum engine temperatures: CHT, EGT, water temperature and oil temperatures switch by pressing **>TEMP<**
- Maximum speed IAS
- Maximum RPM
- Maximum altitude
- Date of flight
- Take-off time (as soon as 50 km/h IAS are exceeded)
- Flight time and engine running time during flight, switch by pressing **>ENTER/MEMO<**

Note: A flight is only saved as a flight if the engine runs for at least 1 minute and an altitude change of at least 25 m is detected.

By pressing the **>ARROW<** keys you can scroll through the last 25 flights and call up the corresponding maximum values. The flight can be identified by date. Additionally the internal flight number is displayed for a short period of time in the RPM display. If the memory is filled with 25 flights, the oldest flight no. 25 is erased when a new flight is made. The new flight becomes no. 1.

Pressing the **>FUNC/SET<** key leaves the MEMO-Mode.



**WARNING!** For safety reasons the you cannot switch to MEMO-Mode if the **ALPHAMFD** measures an Air Speed of 50 km/h and above.

## 7 Other Functions

### 7.1 Acoustic and Optical Warnings

#### Acoustic Alarms:

The **ALPHAMFD** has a special port for connecting to the Intercom (see section 2.3.3). The alarm, when sounded, consists of several short beeps. The beeps are repeated every 30 seconds until the pilot switches the alarm off by pressing **>ON/OFF<**.

#### Optical Alarms:

Optical Alarms are always represented by flashing display fields. If e.g. an engine temperature gets too high, the respective data field starts to flash. If the data field is not activated, i.e. it is not displayed at the time of the alarm, the data field will automatically be displayed.

**Note: The instrument is not switched off during flight when pressing the >ON/OFF< key!**

The following audio alarms are implemented:

#### 7.1.1 Stall-Alarm and Vne-Alarm

When the aircraft flies slower than the set stall speed (e.g.  $V_{so}$ ) (adjusted in SET-Mode 6), or lies faster than the set maximum Speed  $V_{ne}$  (adjusted in SET-Mode 7) an acoustic alarm sounds. This sound (low frequency beeps) only stops when the stall speed is exceeded or the  $V_{ne}$  is falling short of. The alarm can not be switched off. Below 44 km/h the stall alarm is not active.

#### 7.1.2 Low Voltage

If the power supply of the aircraft drops below 12 V a single alarm sounds (several beeps) through the Intercom. Additionally the real-time display alternates with the voltmeter. This alarm is also activated, when the **ALPHAMFD** switches over to the back-up battery. In this case, the voltage of the back-up battery is displayed.

#### 7.1.3 Low Fuel

If the fuel gets below the 10% reserve mark, a single alarm sounds through the Intercom and the 10% bar starts to flash. If the fuel gets even lower, this critical condition is signalled by the continuous repetition of alarm beeps in the Intercom. Additionally all bars of the fuel display start to flash

#### 7.1.4 Cable Breakage of Temperature Senders

If the system detects a cable breakage of a temperature sender, an audio alarm is sounded through the Intercom and the corresponding display field starts to flash. The temperature read-outs are replaced by 3 dashes (---).

#### 7.1.5 Engine Temperatures too high

If the engine temperature thresholds are exceeded (can be defined in SET-Mode 7, 8, 9, and 10) the audio alarm sounds and the corresponding temperature read-out starts to flash. The temperatures continue to be displayed.

#### 7.1.6 Altitude Guidance Mode

The AGM is an audio warning system which helps pilots to maintain a certain altitude without having to permanently check the altimeter. Detailed information on the AGM can be found in section 4.3.

#### 7.1.7 Oil Pressure too low or too high

If the oil pressure drops below the minimum oil pressure (SET-Mode 12) or exceeds the maximum oil pressure (SET-Mode 13), the alarm is sounded. This works only with an analogue oil pressure sender. If a oil pressure switch is used, the alarm is activated only when the oil pressure drops below a certain threshold defined by the switch.

#### 7.1.8 RPM too high

If the maximum RPM are exceeded (set in SET-Mode 11), the alarm is activated and the RPM display starts flashing. The RPM are still displayed.


#### 7.1.9 ERORR-Messages during Power on Self-Test (BIT)

The **ALPHAMFD** performs an automatic Self-Test when powering up. All senders are checked for plausible and correct data and the instrument checks itself.

If the **ALPHAMFD** detects a problem, an ERROR-Code will be displayed.

7.1.10 List of ERROR-Codes

<b>ERROR-Code</b>	<b>Cause</b>	<b>What to do</b>
ERROR 1-16	Internal error	Send instrument to manufacturer
ERROR 17 – NO EGT1	Defect at sender EGT 1 or no sender connected	Check sender EGT 1
ERROR 18 – No EGT 2	Defect at sender EGT 2 or no sender connected	Check sender EGT 2
ERROR 19 – NO CHT 1	Defect at sender CHT 1 or no sender connected	Check sender CHT 1
ERROR 20 – NO CHT 2	Defect at sender CHT 2 or no sender connected	Check sender CHT 2
ERROR 21 – NO WATERTEMP	Defect at sender water temp or no sender connected	Check water temperature sender
ERROR 22 – NO OILTEMP	Defect at sender oil temp or no sender connected	Check oil temperature sender
ERROR 23 to 29	Altitude sensor defect	Send instrument to manufacturer
ERROR 30-31 - USPEED TOO SMALL/BIG	Speed sensor defect	Check dynamic pressure hose, otherwise send instrument to manufacturer
ERROR 32 – UTEMPERATURE OUT Of RANGE	An engine temperature is out of allowed temperature range	Check temperature senders
ERROR 33-34	Internal Error	Send instrument to manufacturer
ERROR 35 – NO SERIAL NUMBER	Internal Error, instrument has initialised itself	Send instrument to manufacturer
ERROR 36-NO FUEL SENSOR	Fuel flow sender not connected or defect	Check fuel flow sender
ERROR 37 – NO MOTROR OIL PRESSURE SENSOR	Oil pressure sender defect or not connected	Check oil pressure sender

	<p><b>WARNING!</b> All other error messages – send <b>ALPHAMFD</b> to manufacturer for checking and repair! Do not fly!</p>
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## 7.2 Theft prevention and Password

Every **ALPHAMFD** is identified by a unique, unchangeable serial number (can be called up in SET-Mode 39). Every customer receives an alphanumeric password with his **ALPHAMFD**. The theft prevention function is not activated by default. It can be activated in SET-Mode 30. For this you have to enter the password. Serial number and corresponding password are printed on the back cover of this operating manual and on your original invoice.

There are three different password functions. They can be selected in SET-Mode 30:

### 7.2.1 Password Function "Off"

#### **SET-MODE >OFF<**

The password is deactivated, the **ALPHAMFD** can be switched on without entering the password.

### 7.2.2 Password-Function "Car Radio"

#### **SET-MODE >NOPWR<**

Operation: After disconnecting the **ALPHAMFD** from the power supply (just as if someone took it out the aircraft) the instrument is being locked and can not be used without first entering the correct password.

If the instrument is connected to power again and switched on, the password must be entered. "AAAAA" is displayed where every "A" must be replaced by the correct digit/letter by pressing the >ARROW< keys and scrolling through the alphabet. After entering each letter/digit confirm by pressing >**ENTER/MEMO**< and the instrument will jump to the next character.

### 7.2.3 Password Function "Maximum"

#### **SET-MODE >ON<**

This mode gives maximum theft protection, not only of the **ALPHAMFD** itself but also for the entire aircraft assuming it can not be flown without air speed indicator and other vital indications.

The password must be entered **EVERYTIME** the **ALPHAMFD** is switched on.

When the **ALPHAMFD** is switched on, "AAAAA" is displayed where every "A" must be replaced by the correct digit/letter by pressing the >ARROW< keys and scrolling through the alphabet. After entering each letter/digit confirm by pressing >**ENTER/MEMO**< and the instrument will jump to the next character.



**WARNING!** A forgotten password can only be obtained from the manufacturer. Proof of ownership (invoice) must be produced without exception. This Service is not free and you must expect to be billed!

**The password function can be disabled in Set-Mode 30 (OFF), but the correct password must be entered prior to deactivation!**

### 7.3 Selection of Units

In order to be able to use the **ALPHAMFD** internationally, the units of all numerically displayed values, such as temperatures, air pressure, fuel and fuel consumption, and altitude can be changed.

Engine temperature and cabin/instrument temperature:	°C Celsius or °F Fahrenheit
Air pressure:	hPa or inHg
Oil pressure:	Bar or PSI
Altitude	Meter or Feet
Fuel and fuel consumption	Litres and litres/h or US-gallon and US-gallon/h

### 7.4 Software Update


The internal software of the **ALPHAMFD** is continuously being improved. Because the **ALPHAMFD** works with modern processors and flash-memory technology, it can be upgraded to the latest software version at any time. You merely have to send the instrument back to the manufacturer. Because of the possibility for software upgrades, every **ALPHAMFD** is a safe long-term investment.

## 8 SET-Mode

In order to use the many functions of the **ALPHAMFD** and to be able to adjust it to one's personal needs and preferences, some functions can be individually adjusted. The SET-Mode is activated by pressing the **>FUNC/SET<** key for several seconds. Once the SET-Mode is activated, a **>SET<** icon appears in the display. With the **>ARROW<** keys you can scroll through the SET-menus. A SET-Mode number is displayed, so it is easier to get oriented.

If you want to change a function, press the **>ENTER/MEMO<** key. Now the **>SET<** icon starts to flash which indicates that a value or setting can be changed by pressing the **>ARROW<** keys. Pressing the **>ENTER/MEMO<** key again stores the new

setting. If the new settings shall not be stored, press >**FUNC/SET**< instead of >**ENTER/MEMO**<. Also if you want to leave the SET-Mode, press >**FUNC/SET**<.

	<p><b>WARNING!</b> For safety reasons the you cannot switch to SET-Mode if the <b>ALPHAMFD</b> measures an Air Speed of 50 km/h and above.</p>
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### 8.1 Restore Factory Settings

In SET-Mode 40 the **ALPHAMFD** can be reset to default factory settings. All settings with a \* in the list below will be restored to the default values. This **Reset** also helps if your **ALPHAMFD** shows some unexpected behaviour.

### 8.2 SET-Mode Settings

No.	Remarks	Text in Display	Setting	Default Value
1	Actual Fuel Capacity	ACTUAL FUEL IN TANK	Numerical	100 (*)
2	Maximum Fuel Capacity	MAX FUEL TANK CAPACITY	Numerical	100 (*)
3	Fuel Flow Calibration	FUEL FLOW CALIBRATION TO ENGINE %	Numerical	100 (*)
4	Engine Hour Meter	ENGINE HOURS	Numerical	
5	AGM Range	AGM RANGE +/-	Numerical	100 m (*)
6	Stall Alarm	STALL ALARM	Numerical	40 km/h (off), depending on version (*)
7	Velocity never to exceed	Vne	Numerical	250 km/h
8	EGT Alarm	EGT ALARM	Numerical	680 °C (*)
9	CHT Alarm	CHT ALARM	Numerical	150 °C (*)
10	Oil Temp Alarm	OIL TEMP ALARM	Numerical	150 °C (*)
11	Water Temp Alarm	WATER TEMP ALARM	Numerical	95 °C (*)
12	RPM Alarm Threshold	RPM ALARM	Numerical	7000 (*)
13	Oil Press Minimum Threshold	MIN OIL PRESSURE	Numerical	1 bar
14	Oil Press Max Threshold	MAX OIL PRESSURE	Numerical	8 bar (*)
15	Calibration Air Speed	AIR SPEED CALIBRATION %	Numerical	100 (*)
16	Speed Zero of Air Speed Indicators	AIR SPEED ZERO	ZERO	
17	Pointer Style (Single Pointer or Section)	POINTER STYLE	See Vario Display	Section (*)
18	RPM Factor Adaptation	RPM FACTOR	*1, *2, *4, /2, /4, /6	*1 (*)

19	Time	SET TIME	12:34	12:00
20	Date	SET DATE	01:01	01:01
21	Year	SET YEAR	2000	2000
22	Change Temperature Units	UNITS TEMPERATURE	°C <i>or</i> °F	Depending on version
23	Change Altitude Units	UNITS ALTITUDE	METER <i>or</i> FEET	Depending on version
24	Change Air Pressure Units	UNITS AIR PRESSURE	HPA <i>or</i> INHG	Depending on version
25	Change Fuel Units	UNITS FUEL	LITERS <i>or</i> USGAL	Depending on version
26	Change Oil Pressure Units	UNITS OIL PRESSURE	BAR <i>or</i> PSI	Depending on version
27	RPM Sensor Filter	RPM SENSOR MODE	ROTAX <i>or</i> SPARK	ROTAX (*)
28	4*EGT Mode	4*EGT SCROLL MODE OR 2*EGT+2*CHT MODE	4EGT <i>or</i> 2C+2E	2C+2E (*)
29	Type of Oil Pressure Sender	OIL PRESSURE SENSOR	DIGI ( <i>switch</i> ) <i>or</i> ANA ( <i>analogue sender</i> )	
30	Password Function	USE SECURITY CODE	OFF <i>or</i> NOPWR <i>or</i> ON	NO
31	Pt100 WaterTemp Port on/off	USE WATER TEMP PORT	YES / NO	YES (*)
32	Pt 100 Oil Temp Port on/off	USE OIL TEMP PORT	YES / NO	YES (*)
33	EGT 1 (Type K) Port on/off	USE EGT 1 PORT	YES / NO	YES (*)
34	EGT 2 (Type K) Port on/off	USE EGT 2 PORT	YES / NO	YES (*)
35	CHT 1 (Type K) on/off	USE CHT 1 PORT	YES / NO	YES (*)
36	CHT 2 (Type K) on/off	USE CHT 2 PORT	YES / NO	YES (*)
37	Type of fuel system (single or flow-back)	FUEL FLOW MODE	1WAY <i>or</i> 2WAY	1WAY (*)
38	Firmware Version	SOFTWARE VERSION	Numerical	(no setting possible)
39	Serial Number	SERIAL NUMBER	Numerical	(no setting possible)
40	Reset to Factory Settings	RESTORE FACTORY SETTINGS	SURE?	

(\*) These values are reset when a RESTORE FACTORY SETTINGS is performed.

**Note: All values shown above are just examples and may not be correct for your type of aircraft or engine.**

## 9 Information for certain Engines

**Note:** The following information is dated November 1999. Because engine configurations can change, some data can be outdated. You can get the latest information by contacting **BRÄUNIGER**. Also you can get information on engines which are not listed.

### 9.1 Rotax 582

Connection on engine	Sensor-Type	<b>BRÄUNIGER</b> Art. No.	Connection on <b>ALPHAMFD</b>	Flag in Display
Exhaust Cyl 1	Typ K M8x1 Gewinde	F0307	EGT 1	EGT
Exhaust Cyl 2	Typ K M8x1 Gewinde	F0307	EGT 2	EGT
Watertemp Cyl Head	Typ Pt100 1/8" NPT	F0308	WaterTemp (Pt)	Water/Oil
RPM Factor /6				

### 9.2 Rotax 912/912 S/914

Connection on engine	Sensor-Type	<b>BRÄUNIGER</b> Art. No.	Connection on <b>ALPHAMFD</b>	Flag in Display
Exhaust Cyl 2	Typ K M8x1 Gewinde	F0307	EGT 1	EGT
Exhaust Cyl 3	Typ K M8x1 Gewinde	F0307	EGT 2	EGT
Watertemp/CHT Cyl head 2	Typ K M10x1,5 Gewinde	F0305	CHT 1	CHT
Watertemp/CHT Cyl head 3	Typ K M10x1,5 Gewinde	F0305	CHT 2	CHT
Oil temp	Typ Pt100 M10X1,5 Gewinde	F0315	OilTemp (Pt)	Water/Oil Temp
Oil Press	VDO analogue	F0310	Oil Press	Oil
RPM Factor *1				

### 9.3 Rotax 503

Connection on engine	Sensor-Type	<b>BRÄUNIGER</b> Art. No.	Connection on <b>ALPHAMFD</b>	Flag in Display
Exhaust Cyl 1	Typ K M8x1 Gewinde	F0307	EGT 1	EGT
Exhaust Cyl 2	Typ K M8x1 Gewinde	F0307	EGT 2	EGT
Cylinder Head 1	Typ K Sparkplug ring 14 mm	F0304	CHT 1	CHT
Cylinder Head 2	Typ K Sparkplug ring 14 mm	F0304	CHT 2	CHT
RPM Factor /6				

### 9.4 Notes on using the **ALPHAMFD** on flex-wing Ultralights

The **ALPHAMFD** is also very well suited for using it with flex-wing Ultralights. We recommend using the special **ALPHAMFD** Pod.

Because the instrument is not protected on flex-wing Ultralights by a closed compartment, under certain climatic circumstances it can happen, that water condenses in the **ALPHAMFD**. Normally this is no reason for worry, because the condensed water usually evaporates within a short period of time. If it doesn't, bring the **ALPHAMFD** to a warm and dry place (park the aircraft in the sun).



**We highly recommend covering the **ALPHAMFD** and Pod with a protective cover during parking!**

## 10 Periodical Check

Although the **ALPHAMFD** works completely maintenance free, we recommend sending it every 3 years to the manufacturer for checking and calibration. Thus the precise operation of your **ALPHAMFD** is maintained for a long period of time. Additionally it can be upgraded to the latest software version.

## 11 Technical Data

### Altimeter

Measuring Range: -500 to 9990 m (-1500 ft to 19999 ft)  
Resolution: 1 m (3ft)  
Sampling Rate: 1 samples / second  
4 ½ digit digital display in meter or feet

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### VSI (Vario)

Measuring Range: +/- 10 m/s (+/- 2000 ft/min)  
Resolution: 0,25 m/s (50 ft/min)  
Sampling Rate: 5 samples / seconds  
Hardware Time Constant: approx. 2 sec.  
Display in m/s or ft/min depending on version

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### Fuel State

Bar graph with 10 bars  
In 10% increments from 100% = full to 10% = reserve  
User has to enter maximum fuel tank capacity (in litres or US-gallons)  
Fuel Flow Meter from 5 to 49,9 litres/h, display in litres/h or US-gallons/h

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### Air Speed

#### **ALPHAMFD** Version A

Display Range: 40 – 220 km/h  
Resolution: 2,5 km/h

#### **ALPHAMFD** Version B

Display Range: 60 – 340 km/h  
Resolution 60 – 110 km/h: 2,5 km/h  
Resolution 110 – 210 km/h: 5 km/h  
Resolution 210 – 340 km/h: 10 km/h

#### **ALPHAMFD** Version C

Display Range: 24 – 130 kts  
Resolution: 2 kts  
Instrument also available in mph

#### **ALPHAMFD** Version D

Display Range: 32 – 190 kts  
Resolution 32 – 70 kts: 2 kts  
Resolution 70 – 120 kts : 2,5 kts  
Resolution 120 – 190 kts : 5 kts  
Instrument also available in mph

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### **Time**

Real Time with Date  
Engine Hour Meter (cannot be changed by user)  
Flight time or engine running time per flight

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### **RPM**

Display: 4-digit digital Display, Max. 9990 RPM  
Sample Rate: 1 sample / sec  
Factors: Multiplied by 4, 2, 1 and divided by 2, 4, and 6  
Resolution: 20 RPM

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### **Engine Temperatures**

4 ports for Type **NiCrNi Sensor (Type K)** for CHT or EGT  
Range 0°C to 999 °C at 25°C Clamp Temperature, Precision +/- 5°C

2 Ports **Typ Pt100** for Water or Oil  
Range 0°C to 250 °C, Precision +/- 2°C

4-digit digital display in °C or °F

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### **Oil Pressure**

Analogue or Switch  
Range 0 to 10 bar (Analogue)  
Precision +/- 0,1 bar (Analogue)

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### **Power Supply**

8 V to 28 V

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### **Back-up Battery**

Standard Alkali-Manganese 9V Block 6LR61 or Lithium 9V Block for low temperature operation recommended

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### **Power Consumption**

Instrument On 35 mA  
Instrument Off 0,5 mA

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### **Operating Temperature Range**

Operating Temperature -0 °C to +60 °C (32°F to 140°F)  
Environment Temperature -20°C to +60°C (-4°F to 140°F)

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## 12 Warranty

**BRÄUNIGER** offer a 24 month international warranty on material and workmanship on all **ALPHAMFD** from the date of purchase. In case of repair please send instrument directly to **BRÄUNIGER** or to the nearest **BRÄUNIGER** Service Centre.

### NOTES:

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#### High Voltage protection for **ALPHAMFD**

To avoid damages by high voltage causing by defective voltage regulators the Alpha-MFD has since 2002 an integrated voltage protection circuit.

In case of a defect voltage regulator the external fuse will fail and the **ALPHAMFD** is supplied by the 9 volt back-up battery – battery display is blinking now.  
After repair, please replace the defect fuse ( 150 ... 200 mA )

## **WARNING**

The activity of flying can be dangerous and can result in personal injury including death. No instrument and no aircraft is perfect. In rare occasions it can happen that instruments fail or show incorrect values. The pilot in command is always fully responsible for a safe conduct of all flights. **BRÄUNIGER** assumes no liability!

Prior to operating the **ALPHAMFD**, the operating manual must be carefully read. If something is unclear you must not operate the **ALPHAMFD**. Please understand, that the instrument didn't have any redundant function except the 9V back up battery which allows a certain time of instrument use if normal battery fails.

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<b>Serial Number:</b>	
<b>Password:</b>	



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