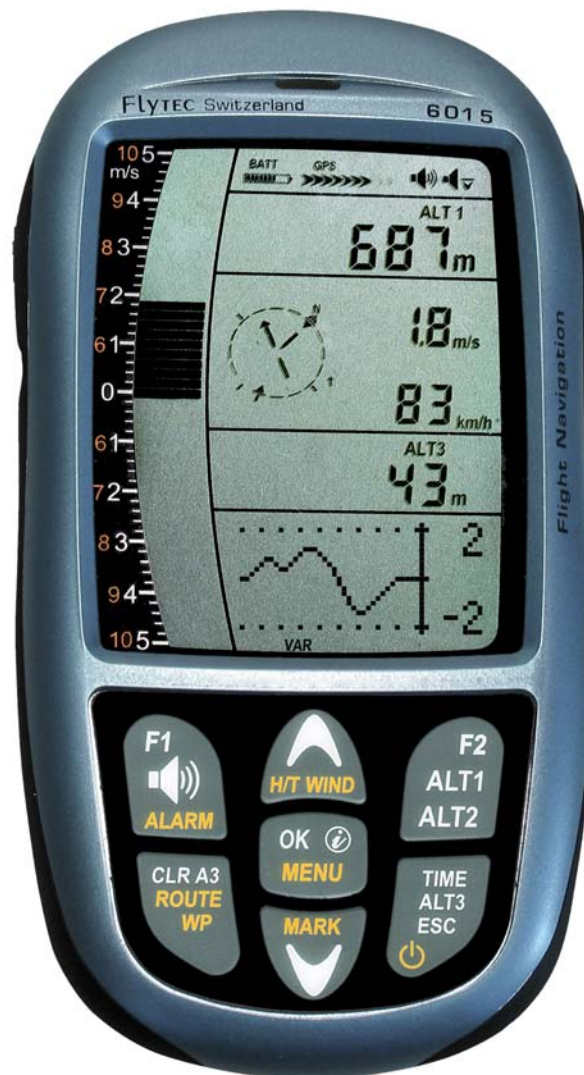


# Flytec 6015 GPS

## Operation manual



Firmware Vers.1.2.00 28.10.2009  
Revision: 28.10.2009

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# 1 Operation

## 1.1 Instrument overview



- 1 ON / OFF key
- 2 Page indicator
- 3 Graphics and data display
- 4 Differential altimeter / time / flight time / QNH
- 5 Speed
- 6 USB PC-interface
- 7 Digital Vario display
- 8 Altimeter display ALT1 / ALT2
- 9 Audio Acoustics indicators
- 10 GPS Satellite Indicator
- 11 Loud speaker
- 12 Battery capacity
- 13 Compass rose
- 14 Analogue Vario display
- 15 Jack for speed sensor
- 16 Keypad
- 17 Safety cord

## 1.2 6015-GPS Switch-on and –off

### 1.2.1 Instrument switch-on



The instrument is switched-on by pressing the **On/Off** key.

Switch-On ?  
Press OK !

To prevent unintentional switch-on, it needs to be acknowledged upon display prompt: **Switch-On?** by pressing the **OK** key.



Following acknowledgement the display will shift for approx. 15 sec. to the **switch-on display screen** with following information:

Test Batt.  
2.86 V

- Battery state, serial number, pilot's name, instrument type and
- Software (Firmware) Version.

After switch-on the normal flight screen shall appear with flashing altitude data display. The device needs approx. two minutes to calculate the precise 3D-GPS position. As soon as the GPS receives stabilised altitude data, the **pressure altimeter is automatically adjusted**, the altitude data display stops flashing and the symbol **GPS** appears over the GPS data display.

### 1.2.2 Instrument switch-off / stop flight recording



For switch-off the **On/Off** key needs to be pressed until the question: **Switch-off? Press OK** is prompted on the screen.

Switch-off ?  
Press OK !

Again, to prevent unintentional switch-off, also this action needs to be acknowledged by pressing the **OK** key!



1. If no flight recording has been programmed, the instrument is immediately switched-off following acknowledgement by **OK**.

End recording?  
Switch-off ?  
Press OK !

2. Following an active flight recording the read-out screen **Flight – Analysis** is displayed during 60sec. before switch-off. If you want to quit the flight analysis display early, press shortly the **Off-key**, the instrument will then be switched-off immediately.

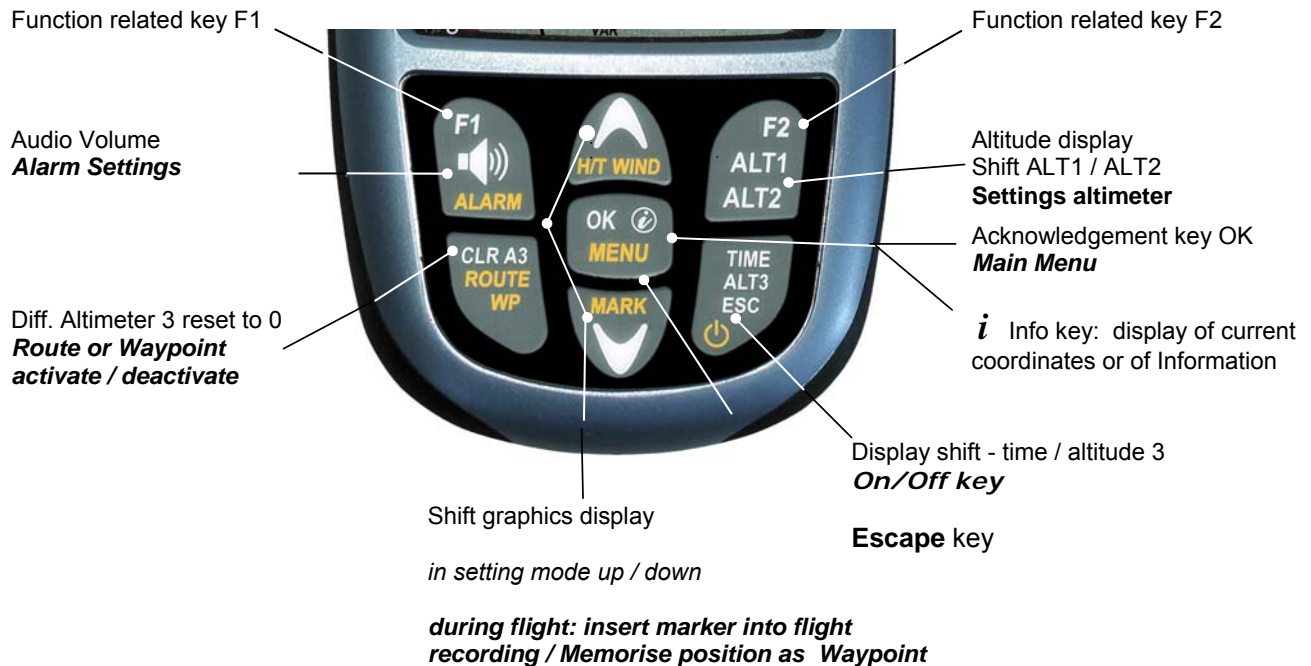


3. **Automatic switch-off:** the flight analysis appears automatically after landing and shall be displayed for about 60sec. Without key stroke the 6015-GPS is switched-off automatically.

#### 4. Automatic switch-off at non-use

If the device does not detect a keystroke or flight related parameters during 30 minutes, it will be switched-off automatically.

## 1.3 Keypad



## 1.4 Operation philosophy

The 6015-GPS instrument is very easy to handle and intuitive. Just try it a few times, and you will discover that one can get along very rapidly with the simple menu structure. However, please note some essential instructions regarding the various functions.

- **White key lettering:** display screen shifts such as for ex. ALT1 / ALT2, Vario- acoustic settings, F1 / F2 key commands and the (*i*) information retrieval, can be performed speedily during the flight by **short pressure** on the key.

- **Yellow key lettering:** by **long pressure** of 3 sec. important functions may be called up directly during the flight and may also be edited. The selected function is switched-off after approx. 8 seconds in case of non-use!

- **Main menu:** all instrument settings, but also Waypoints-, Routes- and flight memory, can be set prior to the flight via the **Main menu** (MENU key). It is possible to select within the menu submenus by use of the up-/down keys and to enter adjustments. The main menu is quitted automatically at 30 seconds after the last entry.

**Tip:** all instrument settings of the Main menu can be set comfortably by use of the freebie PC-Software Flychart on the PC and be transferred via USB-interface onto the instrument.

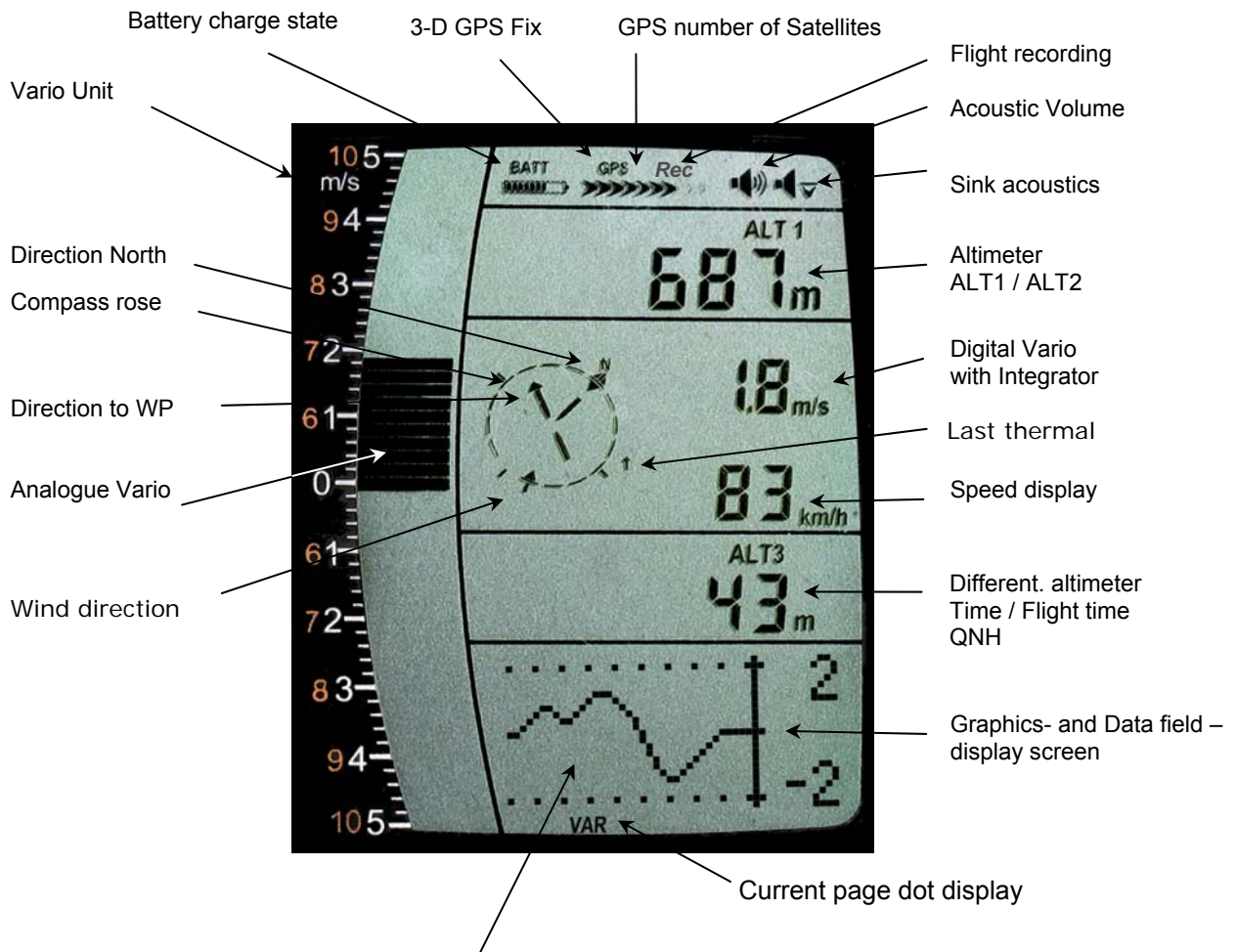
### 1.4.1 Function related keys F1 and F2

Both keys **F1** and **F2** alter their setting possibility according to selected function or readout screen. The meaning of the related key is indicated on the display screen.

Example: in setmode ALT 1 the function of F1 is "**accept GPS altitude**" and the function of F2 is to set the altimeter to „**FL 1013mB pressure**“!



## 1.5 Display screen



### 1.5.1.1 Chart / shift page of data fields

In normal flight mode it is possible to shift the chart page by short pressure on the keys ▲UP or ▼DOWN. After switch-on the the altitude chart (ALT) is displayed. The page number is shown on the display bottom.

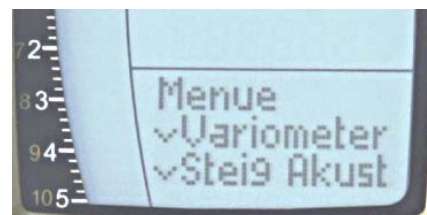
\*order: ALT, VAR, 1, 2, 3....

*\*the number of pages is depending on the firmware version*

## 1.6 The setting menus

By long pressure on the **MENU** key access is given to the Menu setting mode. Using the keys ▼ and ▲ one of the Menu items (flashing line) is selected and pressing the **OK** key gives access to the corresponding menu or submenu.

Flashing values can be modified by use of the ▲UP or ▼DOWN key. By pressing the **OK** key the setting is memorised. Using the **ESC** (escape) key operates the return to the normal flight display screen. If there is no keystroke effected during 30sec., the instrument returns automatically to the flight display screen.



## 1.6.1 Menu Overview

| Menue                             | Display 6015     | Range                          | Page      |
|-----------------------------------|------------------|--------------------------------|-----------|
| <b>Flight memory</b>              | Flight Mem       |                                | 23        |
| >Flights (flight memory)          | Flights          |                                | 23        |
| > Recording interval              | Scanrate         | 1 – 60 Sec.                    | 23        |
| > Delete all flights              | delete           |                                | 23        |
| > Recording Auto/Man              | Rec Mode         | Auto / Man                     |           |
| <b>Waypoints</b>                  | <b>Waypts</b>    |                                | <b>17</b> |
| >List                             | WP List          | 40 WP                          | 18        |
| >New                              | New WP           | 16 Zeichen                     | 18        |
| >Delete                           | Del WP           |                                | 18        |
| <b>Route</b>                      | <b>Route</b>     |                                | <b>20</b> |
| >Edit                             | Edit Route       | 20 WP                          | 20        |
| >Delete                           | Del Route        |                                | 20        |
| <b>Variometer</b>                 | <b>Vario Set</b> |                                | <b>10</b> |
| >Digital Vario Integrator         | Vario Dig        | 1 – 30 Sec.                    | 10        |
| >Threshold Thermal Exit           | Vario Filt       | 0,5 – 3,0 m/s                  | 11        |
| >Basic filter                     | Vario Thr        | 0 – 1 – 2 – 3                  | 11        |
| <b>Variometer Climb Acoustics</b> | <b>Climb Aud</b> |                                | 12        |
| >Climb threshold                  | Climb Thr        | 0 – 20 cm/s                    | 12        |
| >Basic frequency                  | Climb Freq       | 600 – 1400 Hz                  | 12        |
| >Frequency modification           | Freq Adj         | 0 – 1 – 2 – 3 – 4              | 12        |
| >Pitch modification               | Pitch Adj        | 0 – 1 – 2 – 3 – 4 – 5          | 12        |
| >Pitch Mode (lin. / exp.)         | Pitch Mode       | lin. / exp.                    | 12        |
| <b>Variometer Sink Acoustics</b>  | <b>Sink Aud</b>  |                                | 13        |
| >Sink threshold                   | Sink Thr         | - 0.1 ... 20.0 m/s             | 13        |
| >Basic frequency                  | Sink Freq        | 300 – 1000 Hz                  | 13        |
| >Sink Alarm                       | Sink Alarm       | - 0.1 ... 99.9 m/s             | 13        |
| <b>Speed</b>                      | <b>Speed</b>     |                                | <b>14</b> |
| >Stall Alarm                      | Stall Alarm      | 0 – 10 ... 99 km/h             | 14        |
| >Impeller Corr.                   | Spd Corr         | 50...100 ... 150               | 14        |
|                                   | Polar            |                                |           |
| <b>Pilot</b>                      | <b>Pilot</b>     |                                | <b>26</b> |
| >Pilot's name                     | Pilot Name       | 16 Zeichen                     | 26        |
| >Type of aircraft                 | AC Type          | 16 Zeichen                     | 26        |
| >Aircraft ID                      | AC ID            | 16 Zeichen                     | 24        |
| <b>Instrument settings</b>        | <b>Inst Set</b>  |                                |           |
| >Display contrast                 | LCD Contr        | +/- 3                          | 26        |
| >Battery type                     | Batt Type        | Prim. / Accu                   | 15        |
| >Time zone                        | Time Zone        | +/- 13 Std.                    | 26        |
| <b>&gt;Units</b>                  | <b>Units</b>     |                                |           |
| Altimeter                         | Alt Unit         | m / ft.                        |           |
| Speed                             | Spd Unit         | kmh / mph / kt                 |           |
| Temperature                       | Temp Unit        | °C / °F                        |           |
| Pressure                          | Press Unit       | hPa / inHg                     |           |
| Vario                             | Vario Unit       | m/s / ft.Min*100               |           |
| Time format                       | Time Form        | 12h / 24h                      |           |
| Coordinates format                | Coord Form       | dd.ddddd / dd'mm.mm / dd'mm'ss |           |
| <b>Factory settings</b>           | <b>Fact Set</b>  |                                |           |

Menu items marked in blue colour are in option, i.e. they are not activated in the current firmware version.



## 2 Functions

### 2.1 Altimeter and atmospheric pressure

The 6015-GPS provides 3 altitude displays and 1 QNH pressure indicator.

|      |   |
|------|---|
| ALT1 | The altimeter absolute altitude shows the altitude over sea level. (meter „m“ or feet „ft“)                                   |
| ALT2 | alternatively: GPS altitude<br>Flightlevel pressure altimeter display in relation to 1013hPa<br>meter or feet inverse to ALT1 |
| ALT3 | The altimeter relative altitude shows the altitude towards a reference point.   |
| QNH  | Actual air pressure at sea level in relation to ALT1  |

#### 2.1.1 Altimeter Alt1, absolute altitude

Shifting between display screens Alt1 and Alt2 is effected by shortly pressing the Alt1/Alt2 key.



Altitude display **Alt1** indicates always the absolute pressure altitude above sea level. After switch-on the altimeter ALT1 is automatically adjusted to GPS altitude by the instrument. After switch-on the display is flashing until the GPS-receiver has calculated a precise altitude for adjustment.

Units m / ft. - re-setting: see *Menu* → *Instrument settings* → *Units*

##### 2.1.1.1 Manual setting of altimeter Alt1

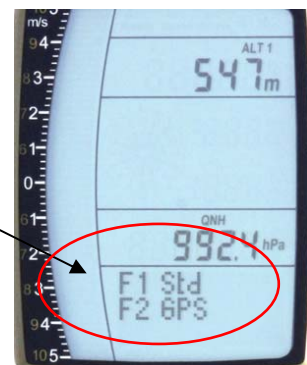
Set mode A1 of altimeter is called-up by long pressure on the ALT1 key. The possible settings are shown in the information field.

By brief pressure on one arrow key the readout value can be adjusted meter by meter. Under keystroke the display shall be changed automatically until the key is released.

Due to this adjustment the QNH display is also altered.

##### Adopt GPS altitude with F2 key

By brief pressure on the **F2 key** it is possible to adopt the GPS altitude. Please consider that the GPS-receiver does not always provide the reliable altitude value! In case of poor Satellite constellation or bad reception, altitude deviation of +/- 50 m will occur!



##### Setting altitude to pressure standard 1013hPa with F1 key

By brief pressure on the **F1 key** the altitude is set to 1013hPa (Flightlevel).

**Tip:** If the user does not know the altitude of his present location, he may operate the QNH field and, using the arrow keys, by changing the altitude value until it matches the actual QNH as per weather forecast or indication issued by air traffic management.

## 2.1.2 Altimeter display Alt2

Shifting between display screens Alt1 and Alt2 is effected by shortly pressing the Alt1/Alt2 key.



Altimeter display ALT 2 is appropriate to indicate the following values:

**GPS altitude** = display of GPS altitude

**ALT1 m/ft-Inv** = display of altitude ALT1 inverse to unit of ALT1 in **ft** or **m**

**Flight-Level** = Flightlevel altitude in ft relating to 1013 hPa, e.g. display Fl 14 stands for being in Flight Level 1400 ft ( display in steps of 100 ft )

### 2.1.2.1 Altimeter display Alt2 - definition

Set mode of Altimeter A2 is called-up by long pressure on the ALT2 key. By brief pressure on one arrow key it is possible to shift between the possible display screens. The current selection is shown in the information field.

**Tip:** *in the altimeter display ALT2 the altitude A1 may be selected in ft (inverse to ALT1 in m). This information may be of importance when being in contact with the air traffic controller of Restricted Areas (CTR's).*

## 2.1.3 Altimeter display Alt3 (differential altimeter)

Altimeter **Alt3** is in any case a differential altimeter. It indicates always the difference in regard to the altitude value on which it has been reset to zero for the last time. This function is often required to measure the elevation above the start site, or to detect easily during the flight in a weak thermal the height gain – or loss.

**Example:** *altitude ALT3 is set automatically to 0 m at start site, after take-off the altitude display Alt3 shall always indicate the altitude above start site.*

### **Reset altitude ALT3 to 0m**

*By brief pressure on the **CLR ALT3** key the altitude ALT3 may be reset to 0m at any time.*

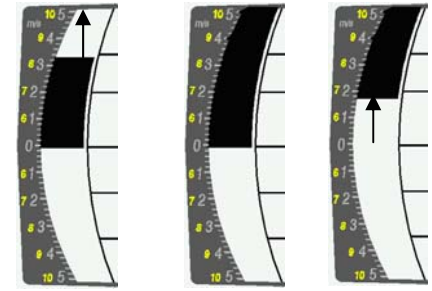
## 2.2 Variometer functions

### 2.2.1 Analogue-Vario

The most important indication for a non-motor driven aircraft is without any doubt the Variometer.

It displays the vertical speed in meter/second and informs the pilot about the actual climb or sink rate.

It is only possible for the pilot by using the Vario (and its accompanying acoustics) to determine the most efficient thermal climb, and in the opposite situation, to recognise when he is sinking too rapidly in downwind which he should leave at best speed.



Vario 3.2      5,0      6.8m/s

The scale of the analogue display is consistently 0,2 m/s over both scale ranges! (Flytec AG Patent!) The range of the first scale extends from 0 up to +/- 5m/s. Thereafter the scale display switches automatically to the second scale range which extends from 5 up to 10m/s. The second scale is afterwards displayed with a white bar on black field.

### 2.2.2 Digital-Vario (average value-Vario)

The Digital Vario has a scale of 10 cm/s and an extensive measuring range of up to +/- 100 m/s. It is therefore also appropriate to display and record even measuring flights up to the free fall.

#### 2.2.2.1 Average value-Vario (integrating Vario)

The digital Vario display can be set under *Main Setup Menu* → *Variometer* → *Digital* as average value Vario (also designated as integrating Vario) with a time constant of 1 to 30s. The values are recalculated per second and indicate the average value of climb or sink rate within the adjusted time span. At gruff narrow hillside up-wind this helpful readout may be used to determine if a circle or aft flight would provide better climb values. Integration time should be selected more longer in accordance to the thermal's roughness.

Based upon practical experience, we recommend an average value of 5 - 10 seconds.

### 2.2.3 Variometer Acoustics and volume level (Sound)

In order to enable the pilot to follow the current climb- resp. sink rate without looking on the instrument, the Vario-Acoustics generate a tone sequence dependent on the value data.


It varies in relation to climb- and sink rate in tone pitch, as well as for interval frequency (number of beep tones per second).

The Vario-Acoustic corresponds always to the value of Analogue-Vario and is therefore reproducing the direct values, i.e not the average values being selected in the digital Vario readout screen.

The Variometer Climb- and Sink Acoustics can be adapted with high flexibility on the 6015-GPS in manifold fields to one's individual and personal requirements.

#### 2.2.3.1 Audio level



By use of the key **Audio level** the sound volume of the built-in loud speaker is adjusted. Indeed five sound levels may be set, from soundless to maximum sound volume. The selected value is displayed with the Audio Symbol  and is confirmed with a short beep or double-beep. The selectable sound levels are: 0 - 25% - 50% - 75% - 100% - 0.

Short pressure on the Audio Level-key shall increase the volume level each time by 25 %.

## 2.2.4 Menu Settings Variometer

**Tip:** By use of the PC Software Flychart *Extras* -> *Flight instrument Options*, all instrument characteristics can be set easily and comfortably.  
By use of the feature tone simulation the adjusted values can be checked easily!

### 2.2.4.1 Digital-Vario Integrator

Main Setup Menu → Variometer → Digital

Setting of average value time constant from 1 – 30 seconds for the digital Variometer display.

### 2.2.4.2 Threshold value last thermal

Main Setup Menu → Variometer →

Threshold for the display arrowhead of last thermal, the range can be set between 0,5 up to 3 m/s. The thermal arrowhead in the compass rose points to the direction, where the integrated Vario was the last time higher than this threshold value.

### 2.2.4.3 Basic filter (Turbulence filter)

Main Setup Menu → Variometer → Filter .

The response characteristics of Variometer display and of climb- or sink acoustics can be adapted within a wide range in accordance to the pilot's needs or the weather conditions. In order to simplify the settings, Flytec has defined 4 basic- resp. turbulence filters.

## Variometer - sensitivity / response characteristics

|            |                                |   |
|------------|--------------------------------|---|
| Filter No. |                                |   |
| 0          | weak filtering                 | for very calm air in Winter                 |
| 1 Default  | normal filtering               | for enjoyment thermal with light turbulence |
| 2          | high filtering                 | thermal with turbulence                     |
| 3          | very high turbulence filtering | for very rough and strong thermal           |

## 2.2.5 Variometer - Acoustic settings

The climb tone is a frequency modulated beep tone whose pitch and beep tone sequence rises rhythmically at increasing climb rate. The pulse/pause ratio is 1:1.

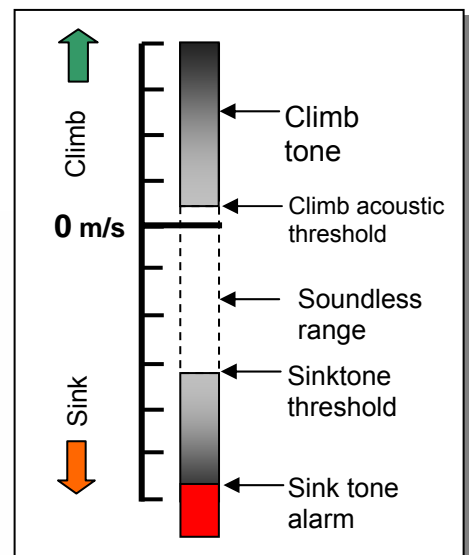
Following settings are possible under *Main Setup Menu* → *Variometer Climb Acoustic* and *Variometer Sink Acoustic*:

### Climb Acoustic settings:

- Climb threshold:** = climb acoustic threshold
- Basic frequency** = basic tone pitch Vario climb
- Frequency change** = increase of tone pitch (frequency modification per m/s)
- Pitch modification** = increase of beep interval per m/s
- Pitch mode** = linear or exponential increase of climb acoustic

### Sink Acoustic settings:

- Sink threshold:** =Sink tone threshold



**Basic frequency** =basic tone pitch Vario sink —  
**Sink Alarm** =Sink alarm threshold

**2.2.6 Variometer – climb acoustic**

**2.2.6.1 Climb acoustic threshold**

Main Setup Menu → Variometer Climb Acoustic → Climb threshold

In order to avoid the climb acoustics get started with immobile aircraft, for ex. at take-off area, or at only slight climb, the climb acoustics starting point can be set in the range from 0 cm/s up to 20 cm/s.

**2.2.6.2 Basic frequency**

Main Setup Menu → Variometer Acoustic → Basic frequency

The frequency audible at starting climb tone.

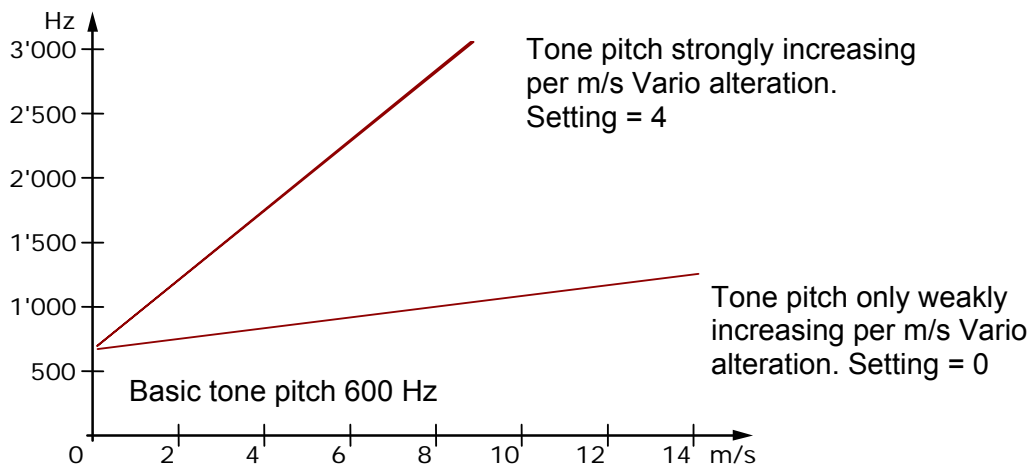
Range: 600 -1400 Hz (factory setting 700 Hz)

**2.2.6.3 Variometer climb acoustic → Frequency change**

Main Setup Menu → Variometer Acoustic → Frequency change

The interrelation may be seen on graphic below.

Range: 0 up to 4 (factory setting 2)



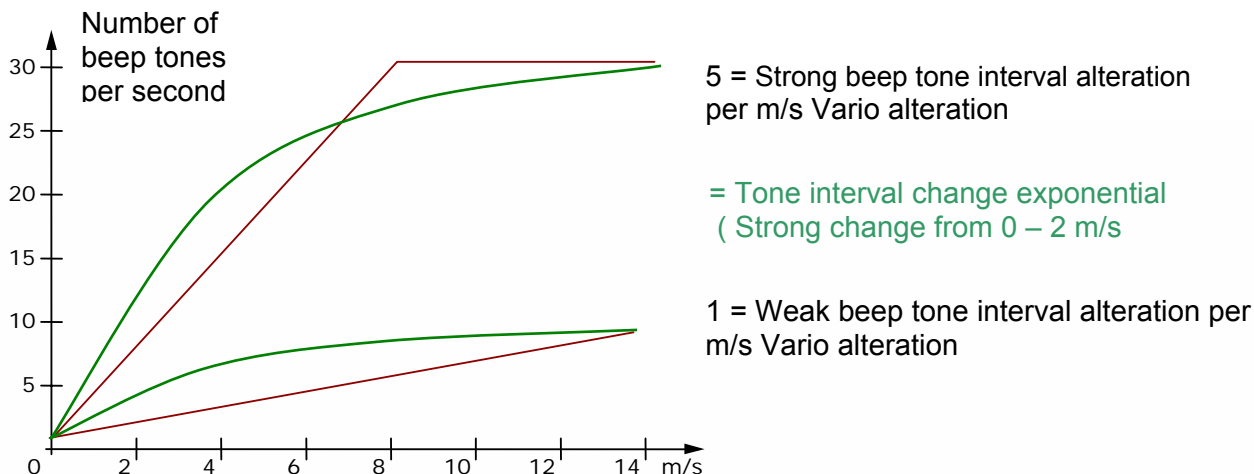
**2.2.6.4 Variometer Climb acoustic → Pitch change / increase of tone interval per m/s**

Main Setup Menu → Variometer Acoustic → Pitch change

Main Setup Menu → Variometer Acoustic → PitchMode

The interrelation may be seen on graphic below.

Range: 1 up to 5 (factory setting 2)



## 2.2.7 Variometer – sink acoustic

### 2.2.7.1 SinktoneF = Basic Tone pitch Variometer Sink

*Main Setup Menu → Variometer Acoustic → Basic frequency*

The basic tone pitch is the pitch at starting sink tone. The sink tone is discreetly heard with deeper sound pitch at increasing sink speed, and is slowly increasing in frequency again when approaching rising air. The basic tone pitch of sink acoustics may only be set equally to the basic tone pitch for climb acoustics.

#### Sinktone threshold

*Main Setup Menu → Variometer Acoustic → Sinktone Threshold*

#### Application point



As for climb acoustics, the application point of sink acoustics can be selected. The threshold can be set by use of the up▲ and down▼ arrow keys between -0,1 and -20,0m.

During flight the sinktone can be switched-on or switched-off by prolonged pressure on the **key Alarm** → Sinktone by use of the keys F1 / F2.

#### Sink Alarm threshold

*Main Setup Menu → Variometer Acoustic → Sinkalarm threshold*

The sink alarm is a continuous tone which sounds upon reaching the sink alarm threshold.

#### Application point



The alarm threshold can be set by use of the up▲ and down▼ arrow keys between -0.1 and -20m.

During flight the sinktone can be switched-on or switched.-off by prolonged pressure on the **key Alarm** → Sinktone by use of the keys F1 / F2.

**Tip:** by use of the PC-Software Flychart 4.52 *Extras – Flight instrument Options -> Acoustic*, all Vario acoustic characteristics can be set easily and comfortably. The adjusted values can easily be checked with the feature tone simulation!



## 2.3 Speed

Apart from Vario and altitude the flight through the air (= Airspeed) is indeed one of the decisive messages. By use of a precisely indicating speedometer it is possible to increase air safety.

### 2.3.1 Wind vane sensor

The 6015-GPS is provided with a very precise speed measuring system, i.e. one entry with evaluation electronics for Flytec wind vane sensors. Advantage: wind vane sensors trigger correct readout already from approx. 1 km/h speed, these sensors are also perfectly suitable for detection of weakest wind strength values at starting site. (Wind vane sensor optional)

The speed indicator can be precisely gauged by correction factor.

Factory setting is 100% by default.

*Main Setup Menu* → *Speed* → *Sensor setting wind vane*

Due to these speed dependent correction factors it is possible to slightly rectify faulty measurements caused by inappropriate placing of the sensor inside lee position, or of the blister in front of the body.

The wind vane sensor measures the true speed of the air - True airspeed = TAS.

### 2.3.2 Stallalarm

This function is only enabled when using the optional wind vane sensor.

This alarm is consisting of a deep tone with short beeps and always with 100% sound level.

Under *Main Setup Menu* → *Speed* → *Stallalarm* it is possible to determine the speed of stallalarm.

If the stall alarm is set to the value of 0 km/h, the alarm is then switched-off.



During flight the stall alarm can be switched-on or switched-off by prolonged pressure on the **key Alarm** → Stall by use of the keys F1 / F2.

### 2.3.3 Speed without speed sensor

Frequently pilots fly **without any speed sensor**. In this case only the speed over ground (GPS speed) shall be displayed.

## 2.4 Time of day and Date

**Remark:** time of day and the date do not need to be adjusted. They are taken automatically from the GPS-Receiver. However, any time zone difference from UTC (World Time) needs to be entered with a positive value if the time zone is located East of Greenwich, or a with a negative value, if it is at the West of it. Time zones with 0.5h UTC offset are also adjustable.

This setting is entered with *Main Setup Menu* → *Instr. Settings* → *Timezone*.

**Important:** all internal calculations of the instrument are made in UTC (Coordinated Universal Time). The local time is just used as „Time“ display and calculates simply the UTC plus or minus the UTC offset.

For the take-off time the local time is binding.

### 2.4.1 Flight duration (flight time)

The take-off time is automatically recorded. For this purpose the GPS needs to be activated. Moreover, only flights which are lasting more than 2 minutes are log recorded.

The flight time and all min. / max. values are presented on the Info page → short pressure on the key *i*- Info. After 20sec. the previous display screen shall automatically reappear again.

See also page: 23 Flight logbook and Flight Analysis .

The unit will also recognise autonomously the end of the flight. It is the basic condition for the end of the flight that neither speed over ground has been measured with more than 10 km/h during min. 60s, nor that the Vario has pointed to more than 0.1 m/s.

[Under Basic-Settings one can select the manual flight recording instead of the automatic recording.](#)

## 2.5 Temperature

The 6015-GPS is provided with a temperature sensor for the temperature compensation of pressure sensors, as well as for the automatic display contrast control. Temperature reading is possible in degree Centigrade or Fahrenheit. *Main Setup Menu* ⇒ *Instr. Settings* ⇒ *Units*.

**Remark:** the temperature sensor measures the internal circuit board temperature, but in no way the outside air temperature! The inside temperature of the casing may be higher or lower than the ambient air temperature, especially when the instrument is exposed to direct sunlight.

## 3 Navigation

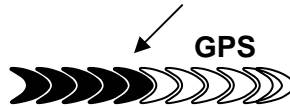
Navigation activities without operating GPS-Receivers is unthinkable these days. Indeed a chain of satellites is orbiting the Globe. It provides the possibility to determine worldwide one's own position very precisely, if minimum 4 satellites are received simultaneously. The Flytec 6015-GPS calculates several readouts by position determination made by GPS.

### 3.1 Assessment of GPS reception quality

The 6015-GPS is fitted with a 20-channel GPS-receiver which is featured with lesser power consumption and also a significantly shorter satellite detection time. Precision of position is between 5 to 40m. As an average one may assume approx. 20 m.

Because the receiving strength of the satellite signals is only approx. 1/1000 of mobile radios, these radio sets and other disruptive factors (like notebooks) should be operated as far away as possible from the 6015-GPS.

The number of received satellites is shown on the upper right side of the bar scale. The longer the bar, the more precise the reception quality is.



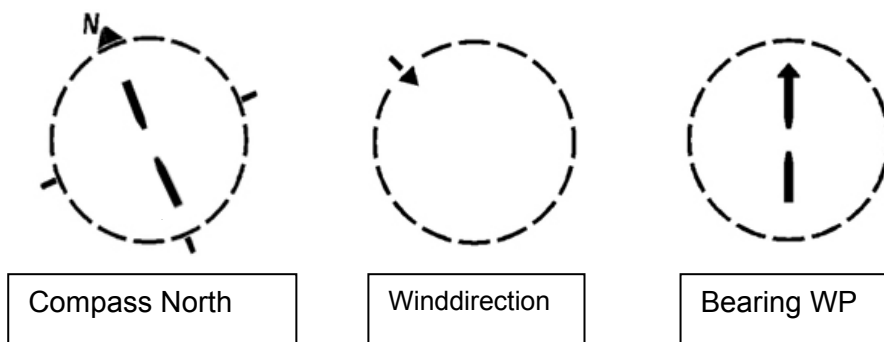
As soon as the instrument has sufficient GPS satellite reception after energising (min. four), the symbol **GPS** is shown. All functions related to GPS mode are operative when the GPS symbol is visible.

### 3.2 Compass and flight direction

In contrast to a standard magnetic compass which is oriented to the magnetic lines of force of the Globe, the GPS compass can show direction only when the user moves about. However, it has the advantage that it is not subject to any grid deviation and does not show any deviation as a result of iron or any magnetic material either. Its zero point always corresponds with true geographic north (= 0 or 360 degrees).

The course, that is the flight direction (= Track), is calculated from a series of positions. If the user remains stationary at the same location, then the course (track) and compass needles are undefined. The exact course, (this is the direction in which the user travels over ground), is always at the top of the compass, but can also be read in the display *Track*. The course is displayed from 3km/h speed.

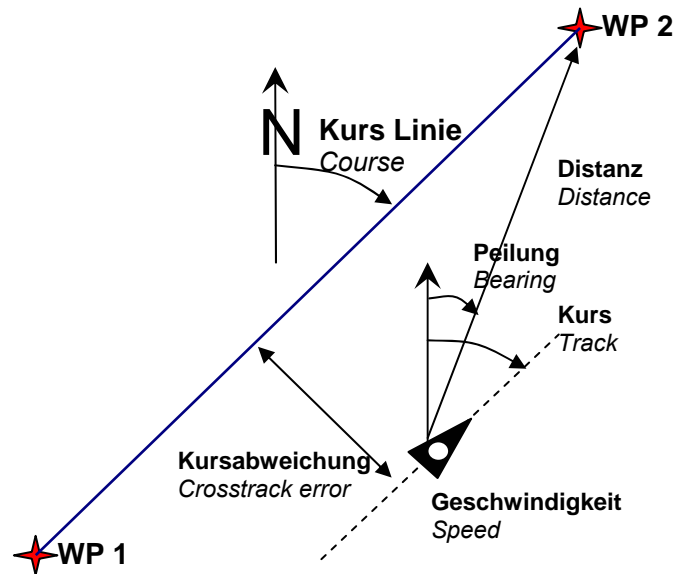
### 8. Pointer illustration in the compass rose



### 3.2.1 Track and Bearing

Track is the direction into which an aircraft is moving over ground. The geographic true North is always 0 or 360 degrees. (East = 90 ; South = 180 ; West = 270 Grad)

Bearing is the direction (according to the system described above) to a selected Waypoint seen from the viewer.



**Caution:** Track or Tracklog is also called the sequence of recorded positions during one flight.

### 3.3 Waypoints and Coordinates

A waypoint is any single point on the earth's surface that you would like to go to.

The 6015-GPS can save up to 20 waypoints. Each name of a waypoint can have up to 16 characters, e.g.: "**Fiesch Airfield**". In determining the waypoint, it is also necessary to enter the altitude, e.g.: "**1123**" meters (always above sea level). Now we only need the position of Waypoint on the earth's surface. For this purpose the 6015-GPS uses the geographical map system named **WGS84** (World Geodetic System 1984). This reference system assumes that latitude is measured from the equator to the North Pole, 90 ° N, and to the South Pole - 90 ° S. Longitude is measured from the Greenwich zero meridian (near London), East is counted positive and West is negative up to +/-180°.

In Basic Settings / Coordinate Format the data entry format is selectable between:

- 1) **degrees minutes decimal places of minutes (dd°mm.mmm) (factory setting)**
- 2) degrees minutes seconds (dd°mm'ss")
- 3) degrees decimal places of degrees (dd.ddddd)
- 4) *UTM (a grid system with 1 km raster in both N-S as also in E-W direction)*

Basically one should always try to use possibility no. 1 (=factory setting), because only this format is using exactly the same calculation format as the GPS receivers do. With all the other formats rounding errors could sum up to 20 m.

It is exclusively calculated with the WGS84 system. Differing geodetic systems are no longer selectable.

### 3.3.1 Display of actual coordinates

If the 6015-GPS receives satellites by GPS-Receiver, the actual position is displayed in the information field of the instrument by briefly pressing the key *i Info*.

After 20 sec. the previous display screen will automatically reappear. This function is useful in relaying your location to some person after landing for your pick-up from there. Also when entering a Waypoint with **WP** → **OK Memorise Pos.** the coordinates are displayed.

### 3.3.2 Memorising the actual position

It may happen from time to time that the current position should be saved as a Waypoint. For this purpose the **WP** key should be pressed for 3 seconds and subsequently ⇒ **OK Memorise Pos.** In response a beep will chime and the momentary coordinates shall be saved in the memory as a waypoint.

As the Waypoint name the 6015-GPS uses the letter **W** (for Waypoint) followed by the actual date and the time of day in UTC.

Example: W220409 111645 stands for 22nd April at 11 hours 16 min 45 sec (UTC).

Naturally this Waypoint name may later be amended into a more meaningful name, for ex. „Fiesch Airfield".  
(see keypad functions 3.3.3.1)



F1 → Goto  
F2 → Route  
OK → Memorise Pos

### 3.3.3 Waypoints, alter, delete or adding

Waypoints can be managed and edited in the Main menu → Waypoints.  
(Menu → Waypoints)

By use of the keys ▲ up or ▼ down a WP is selected.

#### F1 = adding WP

Using the F1 it is possible to create a new Waypoint. (see keypad functions 3.3.3.1) By use of the **OK** key the new waypoint is memorised and added to the WP list in alphabetical order. In total 40 WP can be saved in the 6015-GPS.

F1 ↪ WP    F2 ☒ WP  
>Flytec  
>Stanserhorn

#### F2 = delete WP

Pressing the **F2** key (Del WP) enables the delete function. For data safety the 6015-GPS is asking again: „delete WP?". Using the OK key the deletion can be confirmed or discontinued with the **ESC** key and return to one level before.

Delete WP ☒  
>Flytec  
Yes=OK    No=Esc

#### OK = Edit Waypoint

A brief keystroke of the **OK** key gives access to the Menu Edit WP.

### 3.3.3.1 Keypad functions in Menu Edit

After calling the Menu Edit WP the 1st letter of the WP-name will blink. Using the keys **↑** and **↓** the required letter is selected, there are numbers, letters, as well as a set of special characters to choose from. Using the keys **←** **→** you move to the next or previous letter.

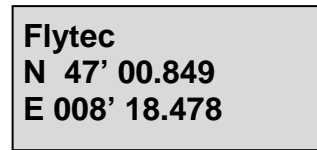
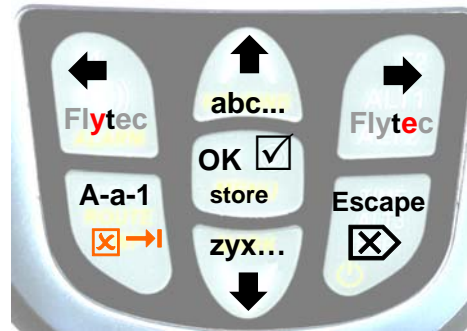
The key **A-a-1** allows to shift between capital and small type letters as well as the case shift.

By prolonged pressure on the same key one single character is deleted (Rub out).

The name may contain max. 16 characters.

On the middle and bottom row the position of WP has to be entered. In the middle the latitude is prompted (**N**orth or **S**outh) and on the bottom line the longitude – (**E**ast or **W**est).

Once the entry of one row is completed, it is saved by pressing the **OK** key and the cursor skips to the next row.



**Tip:** by use of the PC-Software „Flychart 4.52“ Waypoints can be set easily and comfortably on the computer for transmission via PC-interface to the instrument.

**Remark:**

the more Waypoints are saved in the memory, the more slowly the navigation becomes in Main Setup Menu, as the list is rearranged again in the background over and over.

### 3.3.4 Goto-Function

By use of the Goto function it is possible to navigate to a certain waypoint at anytime, even when a Route is activated. The Goto function is activated by prolonged pressure on the key **WP** and brief pressure on the **F1** key. This function allows for searching a waypoint stored in the memory of the 6015-GPS and to select it for a flight to goal.

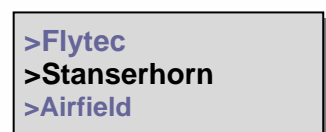
If a WP was selected with the **↑** or **↓** arrow key, it can be confirmed with the **OK** key.

In the compass rose the arrow to the Goto waypoint shall appear.

**Tip:** on page 3 Navigation the distance and the direction to the Goto waypoint shall be indicated!



The active Goto function may be deactivated by the key **F2** ( **☒** Canc Goto ).





### 3.4 Routes

A route is an arrangement of various Waypoints over which one would like to reach a goal. Of course, the Waypoints used on a Route have to be saved in the unit's memory. Upon arriving at the WP cylinder a long, unmistakable tone signalling „**Waypoint reached**“ sounds during 2sec. and the instrument skips automatically to the next waypoint of the Route.

It makes sense to store many well-known thermal sources as Waypoints along a route. The pilot does not have to feel compelled to reach these Waypoints, at times he may be high enough to jump a Waypoint on a Route, while at another time he may have already found the thermal he had hoped for one or more kilometers before reaching the WP. Of course there is still the option of looking up other, possibly closer, Waypoints without leaving the current Route by using the Goto-function.

Altogether the 6015-GPS provides the definition of up to 20 WP. The one and same WP can be used more than once along one Route

#### 3.4.1 Creating a Route

In *Main Setup Menu* ⇒ *Routes* → *Edit* it is possible to arrange a Route by inserting individual waypoints from the waypoints list into the Route.

##### F1 = adding WP

After pressing the F1 key the waypoint list is opened. Search with the **↑** or **↓** arrow key a certain WP and confirm its entry with the **OK** key. The new WP shall be added to the Route list always before the selected WP or on the last empty row.

```
Route
> Edit
> Delete all WP
```

```
F1 ↗WP    F2 ✕WP
>Flytec
>Stanserhorn
```

```
Waypoints list
>Stanserhorn
>Galm
```

##### F2 = delete WP

Pressing the key **F2** (Del WP) deletes the selected WP from the Route list. For data safety the 6015-GPS inquires again: „delete WP?“. Deletion is to be confirmed with the **OK** key or cancelled with the **ESC** key.

```
Delete WP ✕
>Demo
Yes=OK    No=Esc
```

##### OK = modify WP characteristics

In the list Routes WP it is possible to define individually for each WP the cylinder circumference. After pressing the **OK** key the window of WP characteristics is opened. With the **▲**up or **▼**down key the cylinder circumference can be set between 50 and 2'000 meters.

As default a cylinder circumference of 400 m is preset.

```
Waypoint Def.
Stanserhorn
Radius: 0400 m
```

##### ESC = Route editing - memorise and escape

When the Route has been created completely, press the **ESC** key to save and to escape. After saving the data, the instrument shall return to Main Setup Menu.

```
Route saved!
>Galm
```

### 3.4.2 Flying Routes

Selection and activation (Start) of a Route is performed by prolonged pressing of the **Route** key and confirmation with the **F2** key.

Once a Route has been activated, it is kept enabled even after switch-off and switch-on of the instrument. At this point it can only be deactivated by the command **Route Stop** by pressing the **F2** key!



F1 → Goto  
 F2 → Route Start  
 OK → Save Pos

F1 → Goto  
 F2 → Route Stop  
 OK → Save Pos

In the compass rose shall appear the arrow to the first (next) Waypoint.



*Tip: on page 3 Navigation the distance and the direction to the next Waypoint shall be indicated!*

#### 3.4.2.1 Waypoints - skip / backspace

In the window Routes (prolonged pressure on the **Route** key) it is possible to skip by use of the ▼ arrow key to the previous waypoint and with the ▲ arrow key to the next waypoint. Upon pressing one of the arrow keys, the Information field shall display the last, the current and the next Waypoint.

>Haldigrat  
 >Stanserhorn  
 >Pilatus

**Remark:**

Because the GPS-Receiver of the 6015-GPS identifies its new position every second, it takes only this one second to inform the pilot about his crossing of the turning point of cylinder circumference. In this case a long, unmistakable tone sounds during 2 sec. signalling „**Waypoint reached**“ and the instrument automatically skips forward to the next Waypoint of the Route. Independently of which recording interval for saving is used during a standard flight, it is anyway ensured that several track log points are saved at one second intervals in the memory of the 6015-GPS when crossing the cylinder circumference.

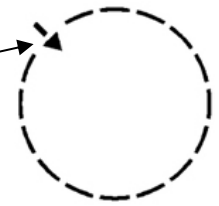
## 3.5 Flight optimisation

### 3.5.1 Groundspeed (speed over ground)

The GPS-Receiver calculates its new position once every second. Speed over Ground is derived from the distance between these positions. It is possible to reach conclusions about the wind's influence from the difference between flying speed (Airspeed) and the speed over ground.

### 3.5.2 Wind direction and Wind strength

It is very important to know the wind in direction and strength, especially in case of an out landing. The wind strength can be selected within the user defined fields. For this purpose it is however necessary to fly one or two complete circles at similar speed as possibly can be done. Duration time for one full circle should at least be 16 seconds, some more time would be better. Whilst circling, the 6015-GPS determines the direction of least speed over ground, and checks also synchronously if in opposite direction there might be the fastest speed over ground.



The calculation of wind speed and wind strength is the result hereof.

Wind direction is shown in the compass rose at the position from where the wind is blowing by a small, inwardly pointing arrow. It indicates from where the wind is blowing.

in die Kompassrose an der Stelle, aus welcher der Wind weht, ein kleiner, nach innen zeigender Pfeil eingeblendet. During the landing approach this symbol should always be at the top.

### 3.5.3 Glide ratio (= L/D ratio)

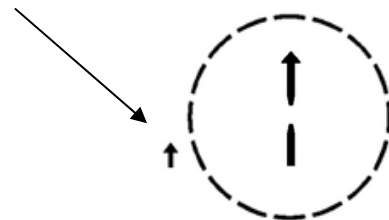
By definition, the glide ratio is calculated by taking the horizontal distance traveled and dividing it by the height which was lost. If instead of the horizontal speed the speed through the air is accounted for, the error is 2% at glide ratio 5 and just only 0,5% at glide ratio 10. This small inaccuracy may be disregarded.

### 3.5.4 Relocating thermals



With weak or widely dispersed thermals this function helps to relocate any lost thermals. A small arrow pointing up in the compass rose shows the direction to the last thermal with at least a 1 m/s climb rate. If this arrow is positioned **at the top** of the display, one is flying towards the thermal, however, if it is **at the bottom** of the display, one is flying away from the upwash.

In order to use this function, the indicator page "**Dist Therm**" should in addition be activated. This value indicates the distance from the pilot to the last thermal.



The threshold to which the arrow should be pointed can be set under *Main Setup Menu* → *Variometer* → *Thermal threshold* from 0.5 up to 3m/s.

Therefore the arrow is not pointing directly to the centre of the thermal, but to its circumference, as one needs to relocate the entry area.

## 4 Flight-Memory and Flight-Analysis

### 4.1.1 Flight logbook and Flight Analysis

The recording mode does not need to be specifically activated. Each flight is automatically saved. The flight memory provided with the 6015-GPS not only records flight altitude but it also logs the position and the GPS-altitude of the pilot in the WGS84-coordinate system.

In *Main Setup Menu* → *Fight memory* → *Rec.Interval* it is possible to set the recording interval. The selected value determines the time interval in seconds according to which a new data set is entered into the memory. The lowest value is 1 second, which corresponds to a recording time of approx. 4 hours. At the maximum value of 60s interval, the recording time will add up to approx. 291 hours.

For the normal OLC recording the *Rec.Interval* is recommended to be between 5 and 10sec. Hereby also narrow curves are well recognisable and the number of data points for the external calculation of the OLC points is kept conveniently clear. Factory setting is 10 sec.

For the start of a flight the following agreement is applicable:

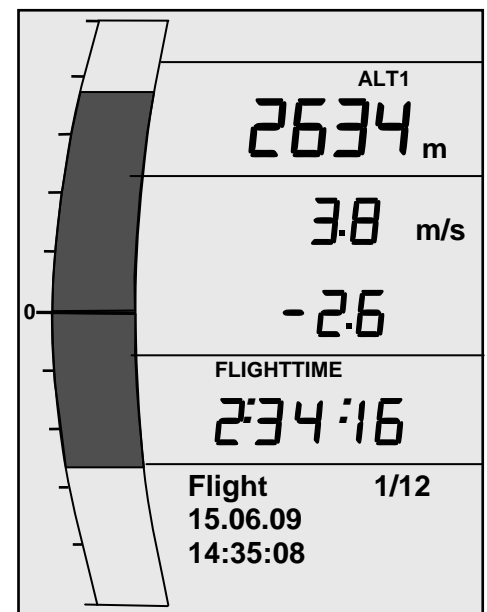
**Start** is recognised as soon as groundspeed reaches for at least 5sec. more than 10km/h or if altitude difference of more than 30m was detected within 60sec., or the Vario value higher than 1,5 m/s during at least 5sec. was performed.

In each case the previous flight history covering 5 minutes before take-off is logged into the memory of the 6015- GPS.

**The end of the flight** is recognised in automatic recording mode, if less than 10km/h GPS-speed or air speed was detected during min. 60sec. and also no Vario higher than +/- 0.1m/s was performed.

The instrument displays automatically the flight analysis page after end of the flight. By brief pressure on the **ESC** key, or after 30sec. the instrument shall be switched-off automatically!

**Tip:** if during display of flight analysis page the OK key is actuated, the device is not switched-off but returns to normal operation mode.



**Caution:** make sure before take-off that the GPS-Receiver indicates to receive at least 4 Satellites and that the **GPS** symbol is displayed.

Begin of the recording is visible by the running „Flight time“- counter or the **REC** symbol above the satellite indicator.

**Comment 1:** in the Flight Analysis min. or max. values are displayed which occurred during the flight.

The display screen is updated every second and saved for the flight analysis. If one undertakes the download of such a flight afterwards on the PC using a program such as SeeYou, CompeGPS, MaxPunkte etc., these programs are only appropriate to evaluate the flight records in IGC format. In the IGC file peak values and Variometer values are not recorded! In the IGC file are saved per track point the time (UTC), position, barometric altitude, GPS-altitude and True Air Speed. Most programs calculate the Variometer values from the altitude data. If for instance, one has set a recording interval of 10sec., and has covered a height difference of 15m during these 10 seconds, there will be calculated a Vario value of 1.5 m/s. However, during this time a peak Vario value of 2,4m/s may have been performed. The flight analysis peak values are also presented in Flychart and are subject to separate readout.

**Comment 2:** although the instrument is capable to store up to 50 flights, we recommend to save the flights in regular intervals from the instrument to a PC and to reformat the flight memory afterwards under *Main Setup Menu* ⇒ *Memory* ⇒ *Delete all Flights*. This procedure ensures the safe data storage of your precious flights and that the instrument may perform new recordings again with a „refreshed“ flight memory

## 5 Data transfer

The memory of the 6015-GPS contains all data entered by the pilote, such as Waypoints, Routes, name of the pilote etc., as well as the automatically recorded track log points of the flights which were performed.

Each one of these track log points contains time of day, position, GPS-altitude, barometric altitude, as well as the flight speed. In this way, it is possible to graph the Barogram, variogram, speed diagram and course of the flight on a map for later evaluation. In Flychart 4.52 it is even possible to show the flight on the PC monitor in 3D over the corresponding landscape.

For this purpose the program Google Earth needs to be installed, along with an active internet connection.

### 5.1 Data exchange via PC

The basic equipment of the 6015-GPS includes a data cable for the USB interface Mini B. Due to this feature the data transfer can be carried out in both directions. The data transmission is effected via serial interface COMX with: 57.600 baud; 8 databit; 1 stopbit; no parity; no Xon/Xoff.

The 6015-GPS can also be operated for **data readout and entry** via USB interface:

- entire instrument configuration (Menu all functions)
- list of Waypoints
- list of Routes

**Only readout** of flights saved in the flight memory is possible.

**Important:** for transmission of a.m. data the connection cable to the PC may only be plugged into the 6015-GPS **while it is switched-off**. The instrument shifts automatically to PC-USB transmission mode.

**Important:** at first the USB driver from Prolific included in the scope of supply needs to be installed from the CD. For the installation of Flychart the installation of USB driver is effected automatically.

For transmission of a saved flight the instructions of the used software are to be followed.

Various software programs allow to create IGC-Files, to some extent even OLC Files.

More detailed information under <http://www.onlinecontest.de/holc/> .

We recommend the use of Flychart, which you can download from our website [www.flytec.ch](http://www.flytec.ch).

With Flychart it is possible to perform all instrument settings comfortably on the PC!

#### 5.1.1 Flight instrument settings

All settings, such as pilot's name, time zone, battery type and also all units for the display of altitude, speed, temperature etc. may be set in *Main Menu* → *Instrument settings* to the personal requirements. By use of the PC software Flychart, it is possible to adjust all characteristics of the instrument simply and comfortably, and to memorise and save them in a file. The management of several instrument settings is also possible, which may be transmitted again to the 6015-GPS at anytime.

#### 5.1.2 Waypoints and Routes

Within the same Menu it is also possible to transmit in Flychart the Waypoints and Routes to the instrument. Flychart is also suitable to import Waypoint files from SeeYou or CompeGPS or Garmin for transmission to the instrument.

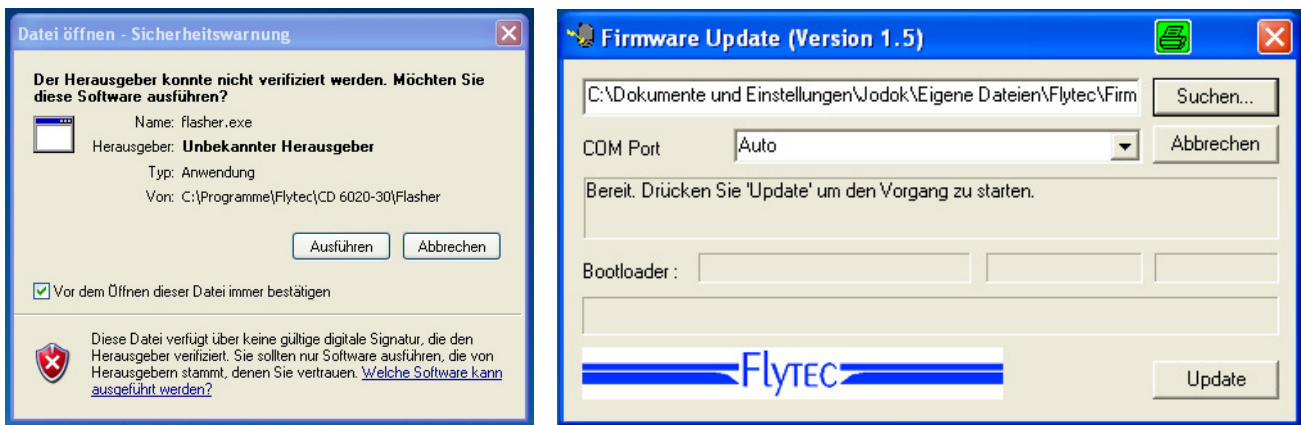
## 6 Transmitting new Software-(Firmware) to the 6015-GPS

As is the case with many other present-day instruments, there is also the possibility to up-date the software (firmware) version. Hereby even future requirements presented by pilots may be rapidly implemented. The manufacturer Flytec AG shall post from time to time program up-dates of the 6015-GPS -Firmware on its Internet homepage, which can be downloaded by the user free of charge for storage and subsequent transmission to the 6015-GPS.

In order to be able to write into the 6015-GPS flash memory with a PC, the program „**Flasher.exe Vers. 1.5 or higher**“ is required, which is available in zipped file format under the name of “Flasher.zip”. Moreover also the intrinsic firmware to be uploaded needs to be obtained from the homepage. Its name is e.g. "6015 V1\_1\_05 Ger.moc" (approx. 127 KB) which is equivalent to the German version 1.1.05.

**Tip:** we recommend to store all the related files in one single subdirectory (e.g.: \Programs\FlytecFlasher\). After decompressing the ZIP file a number of files are created.

Double click on the file " Flasher.exe" starts the program.



For the safety warning press „**execute**“ (**Ausführen**), after this the program will start.

With „Search“ ("Suchen") you select the program to be transferred and ending " **\*.moc** ", e.g. **6015 V1\_2\_05 Ger.moc** or or you drag it from the Explorer by „drag & drop“ into the field. Now connect the USB cable with the instrument. Afterwards you can set the interface in the field Com Port, or if it is unknown to you, set to **Auto** and have thereby an automatic search prompted. The virtual COM interface should be positioned between 1 and 9. Above this value the Flasher can no longer recognise the interface.

Start the data transfer by clicking on **Update**. Then the version of the instruments's Bootloader shall appear and the relevant bit rate. The numbers appearing in the field on the right are the response data of the instrument.

**Important:** make sure that the 6015-GPS is **not switched-on** when the connection cable to the PC is plugged to the instrument.

**Caution:** never leave the PC cable hooked to the instrument for a longer period when it is turned off. Indeed this is energy consuming and the battery could be discharged unnoticed.

**Tip:** in Windows the characteristic noise for USB devices should be audible when the unit is plugged.



## 7 Miscellaneous

### 8 Batteries

2x Type AA, 1.5V Alkaline or 2x Type AA 1.2V NiMh Accum.  
Operating time with 2 Alkaline batteries is more than 40 hours.

#### 8.1 Batterie charge state

Upon switch-on of the instrument, the actual charge state of the batteries is displayed on the start-up display screen.

As long as the instrument is operative, the charge state is continuously monitored and is indicated with the corresponding symbol on the display screen.



#### 8.2 Battery replacement

Replace batteries only, when the instrument is switched-off!

The correct battery type needs to be set under *Main Setup Menu* ⇒ *Instr.sett.* ⇒ *Battery type*.

**A wrongly entered setting may lead to the result of the instrument's premature switch-off and thus provides incorrect status information!**

We recommend not to use NiCd Accumulators. These batteries have significantly reduced capacity and they are less environment-friendly. Also the switching threshold is not laid-out for NiCd Accum.

**Remark:** the estimated operation time as mentioned before is based on normal temperatures of approx. 20 – 25 °C.

At low temperatures the batteries and accumulators have a markedly shorter service life.

**In case of prolonged non-use, the batteries should always be removed!  
Defective batteries may damage the instrument by leaking acid!**

**Corrosion damage caused by defective batteries is not covered by the warranty!**

## 9 Additional Information

### 9.1 Altimeter

#### 9.1.1 How does an altimeter work?

An altimeter is really a barograph because it doesn't directly measure altitude, but air pressure. The barometric altimeter calculates altitude from the prevailing air pressure of the atmosphere.

However, air pressure decreases with increasing altitude.

Why does pressure change with height?

Air pressure at any given point on the earth is created by the weight of air in the atmosphere above it. As air can be compressed, the pressure drop is not linear, but indeed exponential. For this reason air pressure is decreasing in altitude – one has less air above the head!

In practice, however, it is not as simple as that because of the many other factors that influence air pressure. Therefore, air pressure is also depending on temperature and of course, on weather conditions. On a stable day, temperature induced barometric variations of 1mbar may occur, which corresponds to an altitude change of approx.  $\pm 10$ . Depending on weather conditions, air pressure at sea level (QNH) may vary from 950 mbar to 1050 mbar. In order to eliminate this influence of weather, the altimeter has to be calibrated at certain intervals. This means that the altimeter has to be set to a known altitude and that it must then show this value.

The basis for altitude calculation in aviation is an international formula which defines a standard atmosphere.

In the **CINA- Standard atmosphere** the basic pressure on sea level is **1013,25 hPa** (Hektopascal) at a temperature of **15°C**. Furthermore it defines a continuous temperature decrease at increasing height of **0,65°C per 100m** ascent.

Therefore is binding: a barometric aviation altimeter displays the precise altitude only if weather conditions are in exact accordance to the standard atmosphere. In practice, such compliance is more likely to be the exception!

Air weight and pressure are strongly influenced by air temperature. If temperature deviates from standard atmosphere, the display of altitude calculated as per the international formula is no longer correct. The altimeter displays during summer, when temperatures are higher, indeed altitude parameters which are too low, and during wintertime it is exactly the contrary!

Flying at lower temperatures is effectively done at lower altitude, and at higher temperatures flight altitude is higher than the altimeter displays! The deviation of 1 °C per 1000 height meters induces approx. 4 m error. (This empirical formula is valid for up to 4000m!)

If you are flying during summer through 2000 height meters in an air mass being too warm by 16 °C compared to standard atmosphere, the altimeter will then display  $2 \times 4 \times 16 = 128\text{m}$  difference in altitude below real height! Based upon the internationally determined altitude calculation with standard values, this display error caused by air temperature shall not be rectified by the instrument.

Air pressure changes in relation to weather conditions. In order to compensate for display variations, an altimeter always needs to be gauged. This means that the altimeter has to be set precisely before take-off for any flight to a well-known altitude value. The 6015-GPS sets altitude after energising automatically to GPS-altitude. However, it may also be subject to variations.

Caution: the atmospheric pressure may change during the timeline of one day up to five Hektopascal (for ex. cold front). As a result this is after all the equivalent of more than 40 meters height difference. There is another possibility to gauge the altimeter which is to enter the current QNH pressure value. The QNH (Question Normal Height) applied in aviation matches the current local air pressure, as it would be at sea level, so that the altimeter would indeed display 0m.

Due to this process the local pressure data recorded by the various measurement stations is area-wide comparable, irrespective of the geographical height.

The QNH-value is subject to be continuously updated and may be read in the flight weather report, or required by radio from airfields, or by enquiry on the Internet.

## 9.2 Navigation

### 9.2.1 Reception quality of GPS

The GPS-receiver can follow up to 20 satellites simultaneously. After switch-on of the unit, it is necessary to have at least 4 satellites in reception in order to fix the position for the first time.

For the valid IGC-recording the instrument needs in any case reception of 4 satellites.

There is a table inside the receiver, **the Satellite-Almanach**, in which the path, place, and time data of all satellites are kept with reference to the receiver. The Almanac is continuously updated during signal reception. If the instrument is switched-off, the Almanac has to be re-established.

Normally the instrument recognizes its position under unobstructed view conditions after 2 minutes, a few minutes. If the receiver is switched-off for a short time (less than 2 hrs.), the time for new position

If one is in movement, or if buildings, mountains or thick forest affect the reception of the receiver, it may take some time. Therefore, you should always look for the best possible visibility around you and the antenna in the casing should point upwards if possible. Due to the fact that receiving strength of the satellite signals is only approx. 1/1000 of mobile radios, these radio sets and other disruptive factors (like notebooks) should be operated as far away as possible from the 6015-GPS.

The 6015-GPS is fitted with a highly sensitive Sirf III 20-Kanal GPS-receiver, which is featured with lesser power consumption and also a significantly shorter satellite detection time.

Accuracy is between 7 to 40 m. As an average one may assume approx. 15 m.

### 9.2.2 Accuracy of GPS altitude

A good explanation on the GPS Altitude accuracy is found on the following website:

<http://www.kowoma.de/en/gps/errors.htm>

First of all the word accuracy has to be defined. On the website mentioned above you can read: "The declaration of the accuracy used by Garmin for their GPS receivers leads sometimes to confusion.

What does it mean if the receiver states an accuracy of 4 m? This readout refers to the so-called 50 % CEP (Circular Error Probable). This means that 50 % of all measurements are expected to be within a radius of 4 m. On the other hand, it also means that 50 % of all measured positions are outside of this radius.

Assuming a norm repartition, 95 % of all measured positions are within a circle of twice this radius, i.e. 8m and 98.9 % are within a circle of 2.55-fold of the radius, that is in this case within a radius of 10 m.

## 9.3 Flight Memory and IGC File

### 9.3.1 Evidence of flights – Security against manipulation

The popularity of decentralized competitions has been growing enormously over recent years. Meanwhile 26 countries have accepted the OLC (Online Contest) convention. These agreements signify that any pilot can submit flights at will over the Internet for approval and evaluation. The submission has to be compliant to IGC-format (WGS84) and must have a digital signature. Inside the IGC file are saved all important data of the flight in readable form. The readout of the IGC file is possible with any editor.

The FAI (Fédération Aéronautique Internationale) and its subgroup IGC (International Gliding Committee) require a recording format which, while memorizing continuously the time of day, position and also the flight altitude. When transmitting flight data to the pilot's PC, a so-called IGC-File is created, which receives a digital signature (=G-Record), authenticating the flight data and making it fraud-resistant. Although editing and altering is possible, if only one character of the file containing the flight data would be changed, the signature would no longer be compliant to the data and the judging committee would be aware of the manipulation.

**Therefore the misuse is practically impossible.**

The IGC file can be sent directly to the judging committee of the OLC via the Internet. (At present, the OLC is evaluated in Germany by the DHV).

Since the proof of a completed flight depends entirely on the GPS recording, it is important to ensure before take-off that the GPS-receiver indeed receives satellite signals. Therefore please switch-on the 6015-GPS at least two minutes before take-off so that even pre-flight events are included in the recording.

**After completion of a flight this „Digital Signature“ is calculated autonomously by the 6015-GPS and subsequently attached to the flight data file as so-called G-record. A correlative remark „Generating Digital Signature“ is displayed in the information field of the instrument. As this calculation is extremely complicated, it may take several minutes following a long flight with setting of a short scan rate. Please wait until this message will disappear.**

Sometimes it is helpful if one can import to Excel the raw data being stored in the IGC File in order to practice own calculations. The document providing a detailed description can be downloaded from the Flytec homepage [www.flytec.ch](http://www.flytec.ch) → Support → FAQ → IGC\_File.pdf

More detailed information in regard to IGC Format is available on the **FAI Website** under: [http://www.fai.org/gliding/qnss/tech\\_spec\\_qnss.asp](http://www.fai.org/gliding/qnss/tech_spec_qnss.asp)

## 10 Maintenance

This premium-quality multi function instrument is fitted with sensitive sensors which necessitate a gentle handling of the instrument. Excessive pressure, as may be caused by vehemently slamming the trunk lid of an automobile, must absolutely be avoided. This also applies to storage in humid environment (humid paraglider bag).

The optimal cleanup should be performed by use of a slightly humidified, soft drapery. Optimal storage is ensured with the textile bag as was supplied along with the instrument. Self-evidently this bag needs to be clean and dry. In case of malfunction it is necessary to retrieve the batteries for min. 5 minutes from the instrument. As a result of this time span the instrument shall perform a self-test after re-installation of the power source. If the malfunction continues to exist, please return the instrument with a short but complete statement about the problem to your dealer or directly to the manufacturer FLYTEC AG.

### 10.1.1 Exposure to water

If the instrument was immersed under water or was exposed to water ingress, the **batteries need to be removed immediately** in order to prevent a destructive short-circuit and electrolysis damage.

In the case of salt water, rinse the instrument and all parts affected by the salt water with clean, hand-hot soft water in order to avoid corrosion.

Thereafter dry the instrument carefully by blowing warm air of max. + 60 °C (hair dryer).

**Never place the instrument into a microwave-stove! Microwaves shall destroy the instrument immediately!**

After complete drying please return imperatively the instrument to your dealer or directly to FLYTEC AG Switzerland for inspection.

**Any claim under Warranty is void after a water landing.**

## 11 Warranty

Flytec provides the warranty that this instrument does not carry any material or manufacturing defect for the period of **two** years from the moment of its first purchase.

The warranty extends to manufacturing defects and failures for which the owner is not responsible.

The warranty will become invalid in case of inappropriate handling, or exposure of the instrument to strong heat or to water and also when unauthorised manipulations to the inner parts of the instrument have been effected.

If defects should occur within the two-years warranty period, please contact your dealer from whom you have purchased the instrument, or contact directly the manufacturer, FLYTEC AG Switzerland.

Please study this Operation Manual carefully and to its entire content before asking questions or presenting complaints to the dealer or manufacturer.

### Disclaimer of Warranty:

In rare cases it might not be excluded that the instrument does not provide any data at all or incorrect data. In regard to the legal fact that it is solely the pilot who has the responsibility of The performance of his flights, the Company FLYTEC AG shall reject any claim on damage resulting from data loss or wrong data of your instrument.

## 12 Technical Data

|                                |  |
|--------------------------------|--|
| Altimeter:                     | max. 12'000 m - Scale 1m   |
| Variometer:                    | analog $\pm 10$ m/s - Scale 0,2 m/s<br>digital $\pm 300$ m/s . Scale 0,1 m/s                     |
| GPS:                           | 20 channel receiver<br>Compass function, speed, position   |
| Speed:                         |  |
| GPS                            | from 1 km/h speed over ground  |
| Wind wheel (optional)          | 0 up to 120 km/h   |
| Waypoints:                     | 40 WP  |
| Routes:                        | 1 Route with max. 20 WP  |
| Max. storage time:             | 48 hours flight time at 10sec. recording interval<br>max. 291 hours at 60sec. recording interval |
| Memory:                        |  |
| Number of Tracklog-Points:     | 20'000   |
| Number of flights:             | max. 50  |
| Flight memory min / max values | max. 50 flights  |
| Dimensions:                    | 138 x 74 x 23 mm   |
| Weight:                        | 178 grammes (batteries included, without holder)   |
| Power supply:                  | 2 x Alkaline batteries AA 1.5V, or 1,2V NiMH Accum.  |
| Operation time:                | approx. 40 hours   |

Data storage and transmission according to IGC format

|                        |                  |
|------------------------|------------------|
| PC-connection:         | USB 1.1          |
| Operating temperature: | -20 °C to +60 °C |

Holders for hang gliders and para gliders are available.

Technical data are subject to be altered without prior notification at anytime. Software upgrades can be made via Internet by downloading the latest firmware version from our homepage via user's PC.

## 13 Approval / Conformity

### Europe

|                         |             |
|-------------------------|-------------|
| Manufacturer:           | Flytec AG   |
| Country of manufacture: | Switzerland |

**Type: 6015**      Marking: **CE**

The instrument was tested according to following Standards and is compliant to the required Standards.

- ETSI EN 301 489-1 V1.6.1/ETSI EN 301 489-3 V1.4.1
- IEC/EN 60950-1:2006: Safety Europe.

### USA /Canada

**FCC** according 47CFR15, ICES-003, Issue 4

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.