

# VT-02

## Secondary Surveillance Radar Transponder Mode-S

# User manual

Add this manual to the flight instruction manual of your aircraft



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### Record of Revisions

Always keep this page in front of this document.

Date	Revision	Page(s)	Description of Change	Inserted by
01.03.2007	1.0	all	initial release	JG
11.02.2008	1.1	all	added: Features of UI FW-Rel. 1.20	JG

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## 1. Preface

This manual contains operating instructions for the Mode-S transponder VT-02. It should be read before installing your VT-02 transponder.

Safety symbols:

The following symbols and terms are used in this manual:

	<p><b>Warning</b> <i>Warning statements identify conditions or practices that could result in injury or loss of life</i></p>
	<p><b>Caution</b> <i>Caution statements identify conditions or practices that could result in damage of this product or other property.</i></p>
	<p><b>Important note:</b> <i>Indicates important or usefull information. It is strongly recommended to read, understand and follow the statement.</i></p>



**To prevent damages caused by overvoltage or voltage spikes, always switch off the system when starting or stopping the aircraft's engine. Damage caused by spikes or overvoltage can be determined by the manufacturer and are not covered by the manufacturer's warranty.**

## 1.1. Input devices

Picture of front panel with Input devices



The system will be operated using the following devices:

Nr.	Description	Function
1	On/Off key	Switches the system On or Off
2	Flight-ID Key	Invokes the menu to setup the flight ID
3	Mode – key	Selects the operating mode
4	Ident – key	Invokes the Ident Mode for 18 sec.
5	Double shaft Encoder with Push on capability	Enters or modifies values

## 1.1. On/Off key

To enable the system, press key 1 shortly. After the start, the unit performs the built in test and shows the operating mode. For switching off, press key 1 for at least 3 seconds Release the key, when the LCD becomes blank

## 1.2. Flight-ID Key

Pressing the flight ID key invokes the menu to setup the flight ID. Refere to chap. 3.2 for detailed information about proper setting of the flight ID:

### 1.3. Mode-key

Key 3 selects the following modes:

- SBY Standby - System is switched on, no replies or squitters will be sent.
- ON Selected reply code will be replied for Mode-A/C interrogations, altitude information is set to zero, squittering is enabled, Mode-S interrogations will be replied
- ALT Selected reply code will be replied for Mode-A/C interrogations, altitude information is set to indicated value, squittering is enabled, Mode-S interrogations will be replied

### 1.4. Ident key

Pressing key 2 invokes the ident mode for 18 seconds. Use this function only when ATC requires to squawk ident.

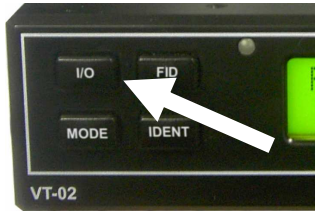
### 1.5. Double shaft rotary encoder

Main input device for setting values is the double shaft rotary encoder. Rotating the outer knob selects the position to be modified. Rotating the inner knob changes the selected value.

The edit mode will be started rotating the inner or outer knob of the double shaft encoder.

Pushing the inner knob confirms the selected value and cancels the edit mode.

## 2. Switching on and off



Press the On/Off key shortly to switch on the unit. After the system start, the screens shown below are displayed. If the system power is interrupted shortly (less than 10 seconds.), the unit restarts in a quick boot mode and continues operation within 1 second. In this case the screenshots shown below will be skipped automatically.

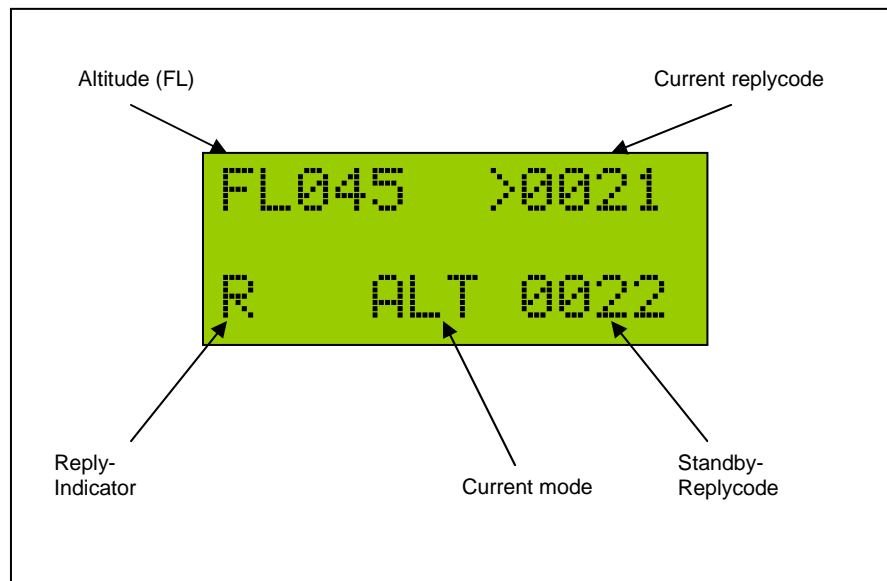
<pre>Garrecht VT-02</pre>	<p>Start screen showing system name and manufacturer</p>
<pre>SteeringUnit Softw. v 1.20</pre>	<p>Information about Steering unit (=CPNL)</p> <ul style="list-style-type: none"> <li>• S/N = Serial number</li> <li>• HW = Hardware release</li> <li>• SW = Firmware release</li> </ul>
<pre>Mode-S Addr. 12AB34 hex</pre>	<p>Entered Mode-S Adress (hex format)</p> <p><b>Note: If no Mode-S Adress has been entered, confirm the Messages below by pressing any key except ON/OFF</b></p>
<pre>Mode-S Addr. INVALID</pre>	<p>This screen will be shown only, if no Mode-S address has been entered. Confirm it by pressing any key except ON/OFF.</p>
<pre>running in A/C mode</pre>	<p>This screen will be shown only, if no Mode-S address has been entered. Confirm it by pressing any key except ON/OFF.</p>
<pre>FL045 &gt;0021 SBY 0022</pre>	<p>Main screen of the operating system after performing self tests and showing all the screens above. When switched on manually or after power interruption greater than 10 seconds the system is set to the Standby (SBY) mode always.</p>

Next page: wait for 3 seconds or press any key

To switch off the system, press the on/off key and hold it for at least 3 seconds. When holding the key, the system counts down from 3 seconds to zero. When the screen is blank, release the key.

### 3. Normal Operation

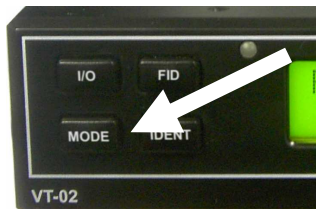
When in normal operation mode, the following screen is shown by the system:



The current pressure altitude (related to 1013,25 hPa) will be shown as Flightlevel (FL) in the upper left corner of the LCD screen.

Replies are indicated by a blinking <R> in the lower left corner of the LCD screen.

#### 3.1. Selecting a Mode



The current mode is shown in the centre of the bottom line of the screen. Pressing the mode key circulates through the following modes:

Screen	Mode	Description/function
SBY	Standby	Standby - System is switched on, no replies or squitters will be sent.
ON	System operating, no alticode will be replied	Selected reply code will be replied for Mode-A/C interrogations, altitude information is set to zero, squittering is enabled, Mode-S interrogations will be replied. Switch to this mode only if required by ATC .
ALT	System operating, alticode will be replied	Selected reply code will be replied for Mode-A/C interrogations, altitude information is set to indicated value, squittering is enabled, Mode-S interrogations will be replied.



## 3.2. Setting up pilot specific data

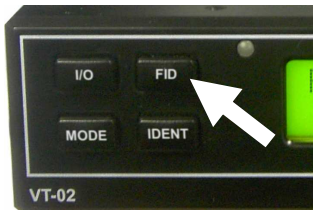
### 3.2.1. Flight id / aircraft registration / company callsign

A Mode-S transponder broadcasts the flight id (FID, company callsign for commercial aircraft or the aircraft registration for smaller private operated aircraft).

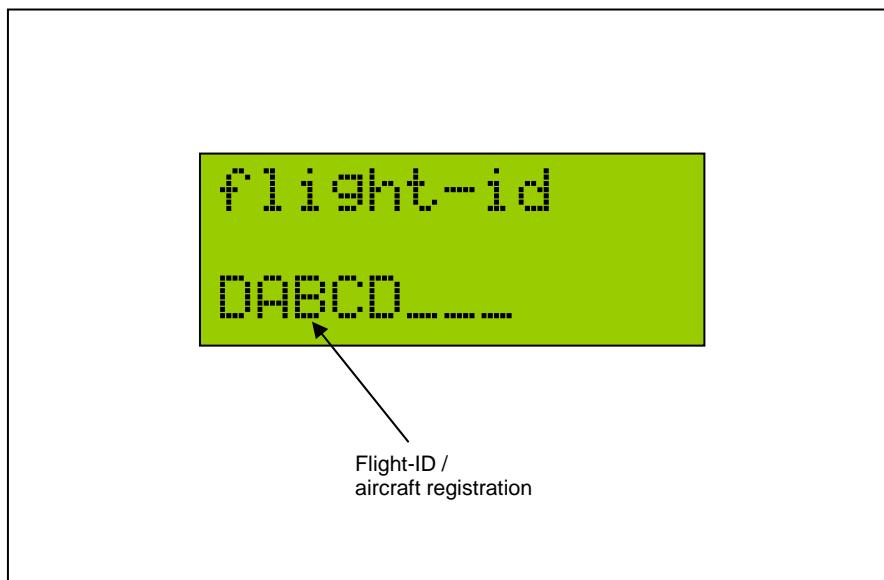


The flight id may be changed if required. Usually the FID is the callsign of your aircraft unless field 7 of the flight plan contains other data. **Always check before each flight if your flight id has been set correctly.**

Follow these steps to set the flight id / aircraft registration:



- Set the unit to standby (SBY) mode
- Press the flight ID key
- The current flight id will be shown on the screen now.



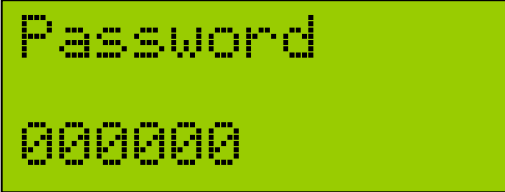


- To modify the flight id, press the inner knob of the double shaft rotary encoder. The underlined first digit of the flight id indicates the edit mode.
- Use the outer knob of the rotary encoder to select the position to be modified. Use the inner knob of the rotary encoder to modify the selected value. Do not enter dashes or blanks even when used in your aircraft registration or company callsign. The data must be entered left aligned.
- To finish editing the flight id press the inner knob of the rotary encoder.
- Exit the flight id page by pressing the FID key.

### 3.2.2. Display illumination and contrast

Depending on pilot's preferences, the display and button illumination can be configured and the contrast can be adjusted.

How to set up the illumination and adjust LCD contrast:

- Set unit to standby (SBY) mode
- Enter the installation set up by simultaneously pressing key 1 (power-on/off) and the push button of the rotary encoder.
- The LCD now shows password. Rotate the outer knob of the double shaft rotary encoder to select the menu illumination or LCD contrast
- Press the inner knob of the double shaft rotary encoder to invoke the edit mode.
- Rotate the inner knob double shaft rotary encoder to select the desired value.
- Leave the menu by pressing the <Mode> key.

	<p>Use the outer knob of the double shaft rotary encoder to select the desired submenu.</p>
	<p>Possible values:</p> <p><b>on</b> LCD backlight and button illumination on, automatic brightness control</p> <p><b>off</b> LCD backlight and button illumination always off.</p> <p><b>30s</b> Illumination will be switched off automatically 30 sec. after the last user input. Pressing a button or using the rotary encoder switches on the illumination again.</p> <p>Press the inner button of the double shaft rotary encoder and rotate it then to set up the desired values.</p>
	<p>Sets the basic value for the LCD contrast.</p> <p>Additionally, the system provides an automatic temperature dependent contrast control.</p>

### 3.2.3. Standard VFR-Code presetting

To simplify operation, the VT-02 provides a pre-programmable VFR code, which can be invoked by pressing the inner knob of the rotary encoder longer than 2sec.

For modification of the VFR code, please follow the steps shown below:

- Set unit to standby (SBY) mode
- Enter the installation set up by simultaneously pressing key 1 (power-on/off) and the push button of the rotary encoder.
- The LCD now shows password. Rotate the outer knob of the double shaft rotary encoder to select the menu **VFR-Preset** contrast
- Press the inner knob of the double shaft rotary encoder to invoke the edit mode.
- Rotate the inner knob of the double shaft rotary encoder to modify the selected value. Use the outer knob of the double shaft rotary encoder to select the desired digit position.
- Leave the menu by pressing the <Mode> key.

 The image shows a green LCD screen with the text "VFR-Preset" on the top line and "7000" on the bottom line, both in a pixelated font.	<p><b>Standard VFR-Codes (as of 1. January 2008):</b></p> <p>Europe:       7000 (default setting) USA:           1200</p> <p>To obtain VFR codes for other regions, please contact your national aviation authority</p>
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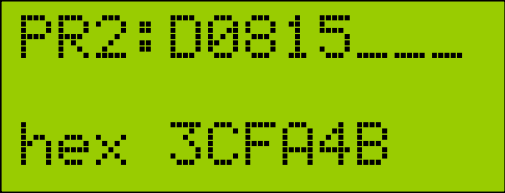
### 3.2.4. multiple profiles (optional function)

The VT-02 offers a multiple profile feature optionally. Profiles allow to store five different sets of aircraft specific data, such as Mode-S Adress, Flight ID and other settings related to the aircraft. When moving the transponder to another aircraft (especially in the balloons), you can easily select the appropriate configuration for this aircraft, if entered before. Refer to the installation manual to learn more about setting up the profiles.

In the standard configuration, only one profile is provided. This function needs to be purchased by the manufacturer or it's representative.

How to select an entered profile:

- Set unit to standby (SBY) mode
- Enter the profile setup by simultaneously pressing key 1 (power-on/off) and the push button of the rotary encoder.
- The LCD now shows password. Press the inner knob of the double shaft rotary encoder to invoke the edit mode.
- Enter the following password: **080000** using the rotary encoder. Rotate the inner knob of the double shaft rotary encoder to modify the selected value. Use the outer knob of the double shaft rotary encoder to select the desired position in the string .
- After entering the password above, the system LCD shows:

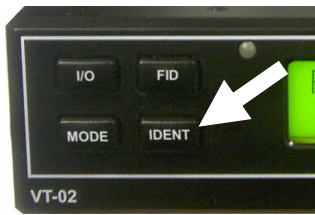
 <p>PR2: D0815..... hex 3CFA4B</p>	<p>The upper line shows the number of the selected profile and the flight ID / callsign.</p> <p>The lower line shows the Mode-S adress for this profile entered in the post installation setup.</p> <p>Rotating the inner or outer knob of the encoder selects the desired profile.</p> <p>Confirm your selection by pressing the inner knob of the rotary encoder or just wait for 10 sec.</p>
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Modifications are not possible in this menu, except the Flight ID. For entering the data shown above, please refer to the installation manual.

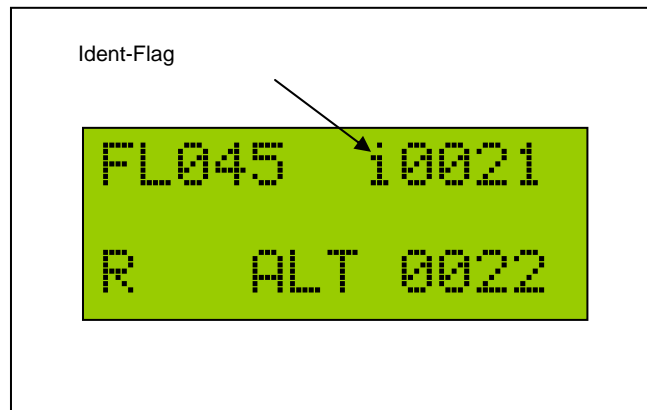


**If you have not purchased for the multiple profiles feature, the system offers one profile only. Selecting another profile than profile-1 is not possible.**

### 3.3. Ident function



If required by ATC, press the IDENT key.



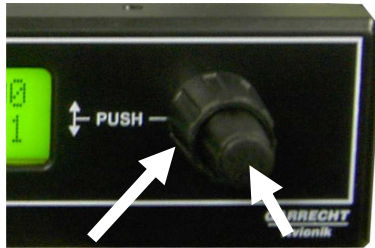
Pressing the ident key invokes the ident mode for 18 sec. Ident activity is shown by a **1** in the middle of the upper line on the LCD screen, which starts blinking after 4 sec. as long as ident is active.



***Press the ident key only if requested by ATC!***

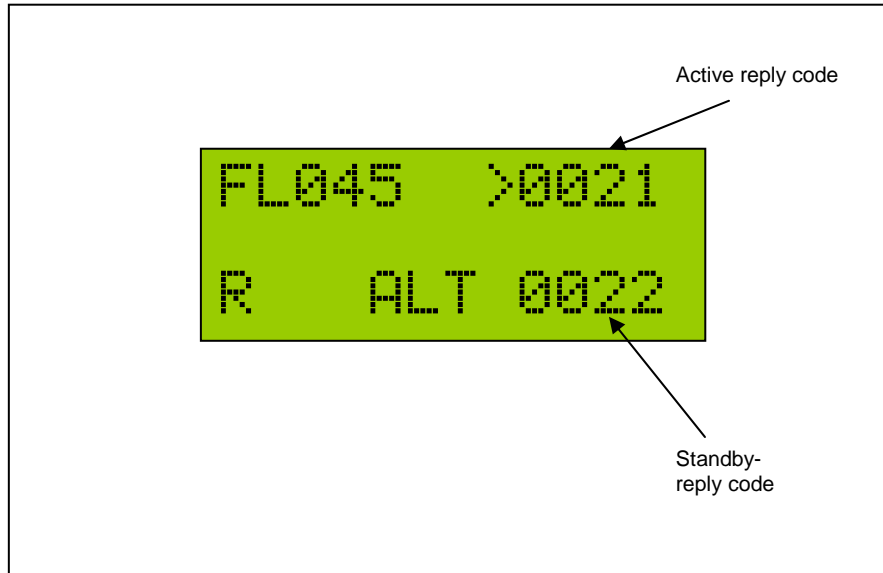
### 3.4. Selecting the reply code

Use the double shaft rotary encoder to select or modify the standby reply code of your transponder.



inner Knob      outer Knob

- Select the position to be modified by rotating the outer knob. The selected position will be indicated by an underlined cursor
- Use the inner knob to set the required value.
- If all positions of the standby reply codes contain the required values, press the inner knob of the rotary encoder to activate the modified code.
- It will replace the code shown in the position of the active reply code.



#### Sample:

Mode-A reply code needs to be changed. Use the outer knob of the double shaft encoder to select the position of the code to be modified. A blinking cursor is indicating the selected position. Use the inner knob to modify the value at the selected position. When all changes are done, press the inner button to activate the modified standby code.

### 3.5. VFR Function

To simplify operation, the VT-02 provides a pre-programmable VFR code, which can be invoked by pressing the inner knob of the rotary encoder longer than 2sec.

The previous active reply code will then be moved to the bottom line (inactive area) and overwrites the existing value there.

If the pre-programmed reply code is identical with the reply code in the bottom line, active and standby reply code will just be swapped.

## 4. Warnings / Error messages

System failures will be detected by the internal self test function that is performed continuously.

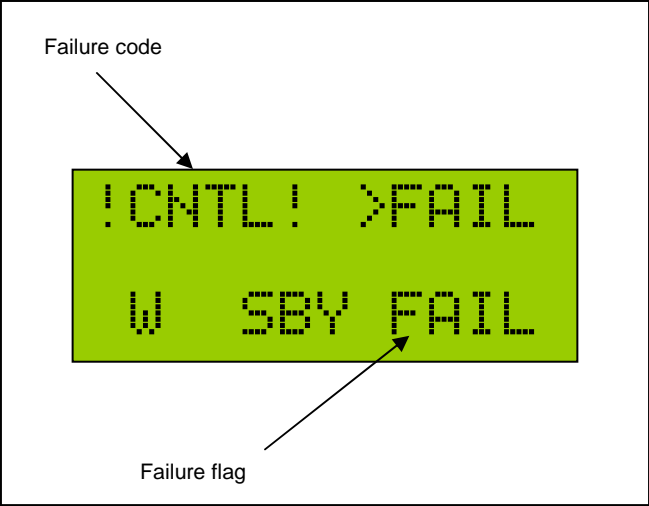
Failures are detected malfunctions, which can not be eliminated by the user. Warnings are conditions, which may be followed by a failure. Warnings can be eliminated by the user under several conditions.

Failures and warnings will be indicated by a visual and audible signal.

If restarting the unit continues to generate the same error, please contact your avionic shop or your dealer.

In case of malfunction, error codes will be shown at the usual position, but more detailed. Please write down the error code shown on the screen to improve our service.

### 4.1. Failure messages

 <p>Failure code</p> <p>Failure flag</p>	<p>In case of failure, the system shows a <b>W</b> on the LCD screen. Additionally, a frequently repeated audible signal occurs. Both can be terminated by pressing the on/off key shortly.</p> <p>In case of detecting a severe failure, the system will be switched into Standby (SBY) mode. All system operating will be terminated to prevent damages to system components. In this case, the system screen will show <b>FAIL</b> instead of active and standby reply code.</p> <p>General: In case of failure or warning, an abbreviated failure message will be displayed alternating with the displayed alticode.</p> <p>Pressing the mode key to select mode on or alt, the system continues operating until a new failure is detected.</p>
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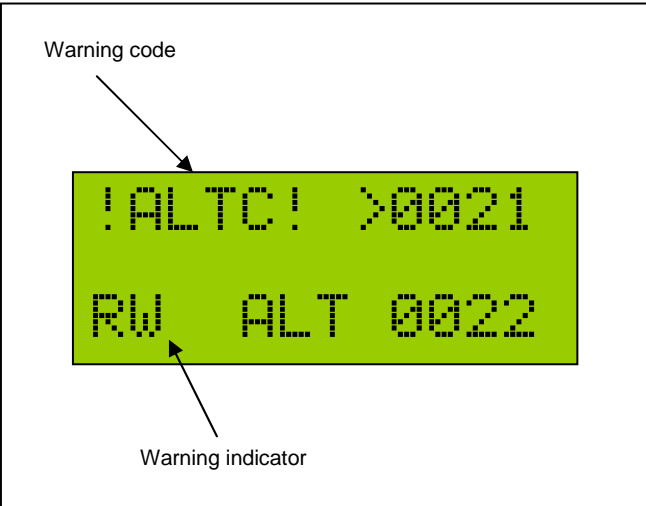

**If a system failure has been detected by the system, always inform ATC, if you are flying in a transponder mandatory zone or other airspace, where a transponder is required. Never try to find the reason for a system failure or warning during the flight!!!**



## 4.2. Warnings

The system warns the pilot if malfunctions have been detected that could lead to a severe failure. It is up to the pilot to eliminate these conditions.

Warnings are indicated in case of undervoltage or operating the system out of the certified altitude range.

 <p>Warning code</p> <p>Warning indicator</p>	<p>In case of warning, the system shows a  on the LCD screen. Additionally, a frequently repeated audible signal occurs. Both can be terminated by pressing the on/off key shortly.</p> <p>The system continues operation, but it may be limited.</p> <p>If an error of the alticoder unit is detected or the system is operated out of the certified altitude range, the replied alticode will be set to zero (same as mode <b>ON</b>)</p> <p>General: In case of failure or warning, an abbreviated failure message will be displayed alternating with the displayed alticode.</p> <p>Pressing the mode key to select mode on or alt, the system continues operating until a new failure is detected.</p>
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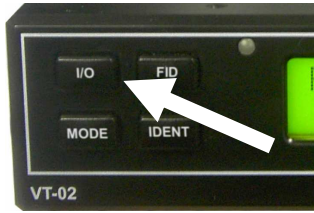
**If a system failure has been detected by the system, always inform ATC, if you are flying in a transponder mandatory zone or other SUA, where a transponder is required. Never try to find the reason for a system failure or warning during the flight!!!**

## 4.3. Error codes

The following table shows the meaning of displayed failure and warning codes. Failures marked with an \* may be caused in the system installation. Other failure or warning codes are caused by internal malfunctions. In this case the system needs to be repaired by an authorised repair shop.

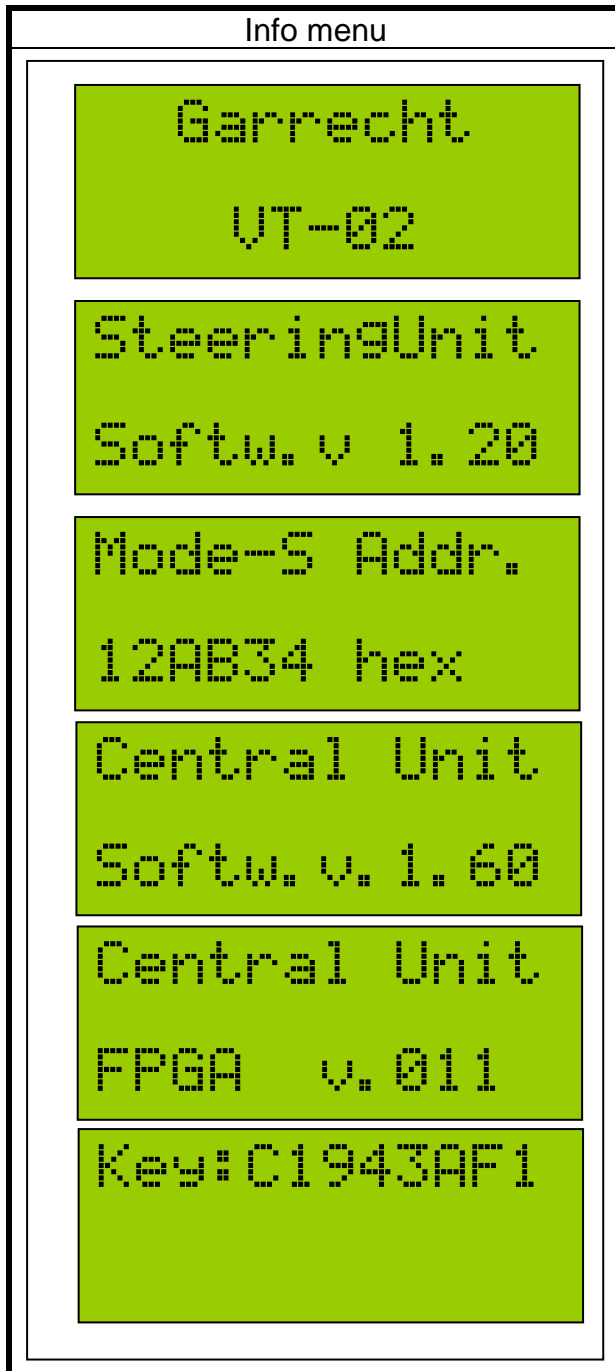
Code		Description	Possible reason
!SQUIT!		Squitter Error	Malfunction in transmitter module
!VSUP!		Supply voltage low	Battery empty
!ANT !	*	Antenna failure	Bad antenna or antenna cable
!PRSS!		Pressure sensor failure	Internal malfunction
!COMM!	*	CAN bus communication error	Short in CAN-bus or internal malfunction
!TXPL!		Transmitter PLL failure	Internal malfunction
!FPGA!		FPGA checksum failure	Internal malfunction

## 5. Info menu



For maintenance and diagnostics, the firmware version can be read following the steps shown below:

- Press the on/off key and hold it. Then Press the ident key within 3 sec.
- The LCD screen shows **Info.**
- Press the inner knob of the rotary encoder to start displaying the following information.



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