

Emergency Locator Transmitters

Orolia S.A.S. - A Company of the Orolia Group

## INSTALLATION MANUAL OPERATION MANUAL



## ELT KANNAD 406 AF-COMPACT 406 AF-COMPACT (ER)

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## SYSTEM FUNCTIONAL DESCRIPTION AND OPERATION

### 1. Transmitter Functional Description

#### **A. Transmission**

The transmitter can be activated either automatically when the crash occurs (thanks to a shock sensor) or manually (thanks to a switch on the transmitter itself or on a RCP).

The transmitter is designed to transmit on two frequencies (121.5 and 406 MHz). The 121.5 Mhz is mainly used for homing in the final stages of the rescue operations. The 406 MHz frequency is used by the COSPAS-SARSAT satellites for precise pinpointing and identification of the aircraft in distress.

Once activated, the transmitter operates continuously on 121.5 MHz with an output power of 100 mW. The modulation is an audio frequency sweeping downwards from 1420 Hz to 490 Hz with a repetition rate of 3 Hz.

During operations, a digital message is transmitted on 406.028 MHz every 50 seconds. The output power on 406 MHz is 5 W typical.

#### **B. Controls & Connectors**

The following controls are to be found on the ELT front panel (from left to right):

1. 3-position switch ARM/OFF/ON;
2. Visual indicator (red);
3. DIN 12 socket for connection to an optional Remote Control Panel, a programming dongle or a programming equipment;
4. BNC connector for the antenna.

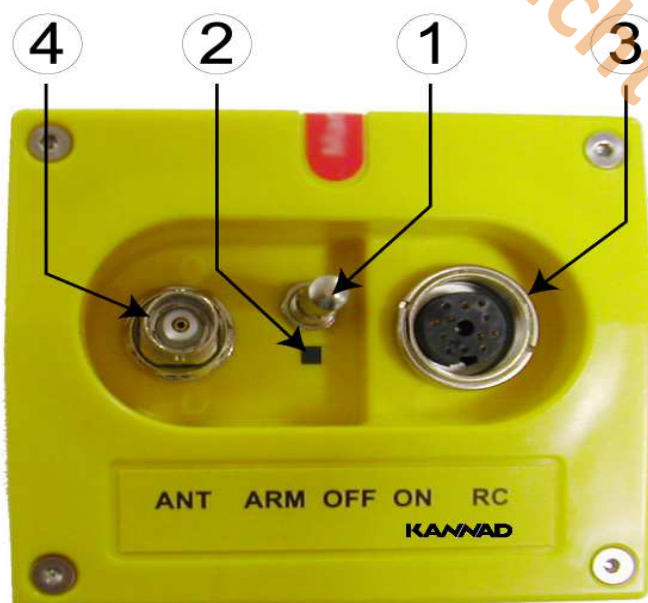


Figure 201: Front Panel

The red light gives an indication on the working mode of the beacon:

- after the self test:
  - a series of short flashes indicate the self test failed;
  - one long flash indicates a correct self test;
- in operating mode:
  - periodic flashes during 121.5 transmission;
  - long flash during 406 transmission.

A buzzer gives audio information on the beacon working:

- continuous tone during self test;
- 2 beeps per second during 121.5 transmission;
- silence during 406 transmission.

### **C. Working mode information**

The ELT has 4 different modes:

- Off.
- Self-test (temporary mode).
- Armed (standby mode to enable automatic activation by the shock sensor or by an optional remote control panel).
- On (transmission).

Transmission is effective if the beacon is activated (either manually on the ELT control panel, automatically by the shock sensor, or remotely by the "ON" switch of an optional remote control panel when connected).

#### *(1) Off*

The ELT is off when the switch is in position "OFF", no part of the ELT is energized.

This mode must **only** be selected when the ELT is removed from the aircraft or when the aircraft is parked for a long period or for maintenance.

#### *(2) Self-Test*

The self-test mode is a temporary mode (max duration 15 sec) in which the ELT checks the main characteristics of the transmitter (Battery voltage, Programming...) and enables digital communication with programming and test equipment.

This mode is selected:

- when switching from "OFF" to "ARM";
- when switching to "RESET / TEST" on an optional Remote Control Panel (provided that the switch of the ELT is in position "ARM");
- when switching to "ON" prior to transmission.

The buzzer operates during the self-test procedure.

After about 10 seconds, the test result is displayed on the visual indicator as follows:

- One long flash indicates valid test.
- A series of short flashes indicates false test result.

The number of flashes indicates the type of failure:

- 3 + 1 = LOW BATTERY VOLTAGE.
- 3 + 2 = LOW TRANSMISSION POWER.
- 3 + 3 = FAULTY VCO LOCKING (FAULTY FREQUENCY).
- 3 + 4 = NO IDENTIFICATION PROGRAMMED.

It is recommended to test the ELT regularly in order to detect any possible failure ([Refer to A. Periodicity, page 301](#)).

The number of self-tests carried out is recorded. This information is available when the ELT is connected to a programming and test equipment (PR600).

### (3) Armed

In order to enable activation by the G-Switch or with an optional Remote Control Panel, the ELT must be in standby mode with the switch in the "ARM" position.

**This mode is mandatory during flight.** The ELT should remain in the "ARM" position except when the aircraft is parked for a long period or for maintenance.

### (4) On

This mode is selected:

- manually by switching the ELT to "ON";
- by switching an optional Remote Control Panel switch to "ON" (provided that the ELT switch is in the "ARM" position);
- automatically when a crash occurs (provided that the ELT switch is in the "ARM" position).

When this mode is selected, the ELT starts transmitting after 50 seconds:

- on 406 MHz (one 406 MHz burst every 50 seconds);
- on 121.5 MHz (continuous transmission between each 406 MHz burst).

The red visual indicator on the ELT (and on an optional remote control panel when connected) flashes and the buzzer operates.

- Red visual indicator:
  - 1 short flash during ELT transmission on 121.5 MHz (every 0.7

seconds);

- 1 long flash during ELT transmission on 406 MHz (every 50 seconds).
- Buzzer:
  - 1.5 Hz pulse signal (recurrence 0.7 s) during ELT transmission on 121.5 MHz.

In case of accidental activation, the ELT can be reset either by switching it to "OFF" or by switching to "RESET" on an optional Remote Control Panel when connected.

The number of 406 MHz bursts transmitted is recorded. This information is available when the ELT is connected to a programming and test equipment (PR600).

#### **D. Autonomy**

The energy is provided by a battery pack composed of a LiMnO<sub>2</sub> two-element battery (See pages 106 & 602 for Kit battery reference).

***Lithium cells, lithium batteries and equipment containing such batteries are subjected to regulations and classified under class 9 as from 1st of January 2003.***

The transmitter battery expiry date is fixed at 6 years after manufacturing. If no activation of the ELT occurs during the battery lifetime, it shall be replaced 6 years after date of manufacture<sup>(see note below)</sup>.

NOTE: The useful life time of batteries is twelve (12) years. To be in compliance with FAR regulations, they have to be replaced six (6) years after date of manufacture when 50 percent of their useful life has expired.

##### **(1) KANNAD 406 AF-COMPACT (P/N S1840501-01)**

The duration of the 121.5 transmissions is over 48 hours at -20°C.

Unlike other ELTs, the 406 MHz transmission of KANNAD 406 AF-COMPACT is not stopped after 24 hours and 406 MHz transmission is continuing beyond 48 hours.

##### **(2) KANNAD 406 AF-COMPACT (ER) (P/N S1840501-04)**

The duration of the 121.5 transmissions is over 48 hours at -40°C.

As it is therefore preferable to keep the battery power for 121.5 MHz homing frequency transmission for the rescue operations, in compliance with COSPAS-SARSAT specifications, the 406 MHz transmission is deliberately stopped after 24 hours to extend the 121.5 MHz transmission for as long as possible.

**E. Electrical interfaces**

**J1**

DIN 12 socket J1 is dedicated for connection to an optional Remote Control Panel, to a Programming or Maintenance Dongles or to a programming equipment (PR600).

**IMPORTANT: Shielded cables are recommended. The required wires are AWG24.**

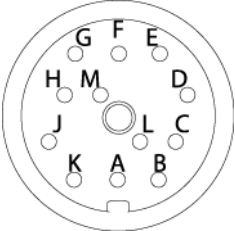
J1	PIN	Signal Name	Destination	Direction
<p>Viewed from Front Face</p> 	J1-A	RCP TEST/RESET	RCP	IN
	J1-B	DONGLE RX	SMM / PGM	IN
	J1-C	DONGLE CS	SMM	OUT
	J1-D	DONGLE SK	SMM	OUT
	J1-E	DONGLE TX	SMM / PGM	OUT
	J1-F	DONGLE ALE2P	SMM	OUT
	J1-G	RCP COMMON	RCP	OUT
	J1-H	RCP BUZZER	Not used	
	J1-J	RCP LED	RCP	OUT
	J1-K	RCP	RCP	OUT
	J1-L	DONGLE GND	SMM / PGM	OUT
	J1-M	COMMON	RCP	OUT

Table 1: J1 connector pin-out

**J2**

BNC female connector J2 is used to connect the outside antenna through a 50 Ω coaxial cable.

**IMPORTANT NOTICE: The length of the coaxial cable should not exceed 2.7 meters (9 ft) for a standard RG58 or equivalent coaxial cable. If the cable length exceeds 2.7 meters, a low loss cable of attenuation less than 1 dB@400 MHz must be used (See Important notice Section C. Outside antenna, page 6).**

**F. Transmitter Technical Specifications**

<p><b>TYPE</b></p> <ul style="list-style-type: none"> <li>• Two-frequency ELT (121.5 / 406.028 MHz)</li> <li>• Automatic fixed</li> <li>• COSPAS-SARSAT Class</li> </ul> <p><b>COMPACT:</b> Class II, -20°C to +55°C.</p> <p><b>COMPACT (ER):</b> Class I, -40°C to +55°C.</p> <p><b>406 MHz TRANSMISSION</b></p> <ul style="list-style-type: none"> <li>• Frequency: 406.028 MHz+/-1 kHz</li> <li>• Output power: 5W (37 dBm +/- 2 dB)</li> <li>• Modulation type: 16K0G1D (Biphase L encoding)</li> <li>• Transmission duration: 440ms (short message) every 50 s.</li> <li>• Autonomy</li> </ul> <p><b>COMPACT:</b> over 48 hours @-20°C</p> <p><b>COMPACT (ER):</b> 24 Hours @-40°C</p> <p><b>121.5 MHz TRANSMISSION</b></p> <ul style="list-style-type: none"> <li>• Frequencies: 121.5 MHz +/- 6 kHz</li> <li>• Output power: 100 to 400 mW (20dBm to 26 dBm)</li> <li>• Modulation type: 3K20A3X</li> <li>• Modulation rate: &gt; 85 %</li> <li>• Frequency of modulation signal: 1420 Hz to 490 Hz with decreasing sweep</li> <li>• Autonomy</li> </ul> <p><b>COMPACT:</b> over 48 hours@-20°C.</p> <p><b>COMPACT (ER):</b> over 48 hours@-40°C</p> <p><b>CONTROLS</b></p> <ul style="list-style-type: none"> <li>• ARM / OFF / ON switch</li> <li>• DIN12 socket for RCP and pin programming option.</li> <li>• Bright red visual indicator</li> </ul>	<ul style="list-style-type: none"> <li>• Buzzer</li> <li>• BNC antenna connector</li> </ul> <p><b>G-SWITCH SENSOR</b> Mechanical G-switch sensor compliant with EUROCAE ED62 specifications</p> <p><b>BATTERY</b> KIT BAT200, P/N: S1840510-01 LiMnO<sub>2</sub> two-element battery for transmitter power supply Replacement 6 years after date of manufacture</p> <p><b>HOUSING</b> Material: Polycarbonate Color: Yellow (color compounded) Transmitter dimensions: 131 x 86 x 75.4 mm ( 5.157 x 3.385 x 2.968 inches) Overall dimensions with mounting bracket: max 140 x 98 x 86.4 mm (5.512 x 3.858 x 3.4 inches) Weight including batteries:  <ul style="list-style-type: none"> <li>• typical 850 gr. (1.874 lb);</li> <li>• max 875 gr. (1.929 lb).</li> </ul>                     Tightness: O-ring</p> <p><b>ENVIRONMENTAL CONDITIONS</b> RTCA DO-160E / EUROCAE Section 4 to 26: C1X[ED62]A[ED62][SYLMC/UG]EYXXXXZXXX[ZC] [ED62]B[XXXXX]XXX[ED62]</p> <p><b>QUALIFICATIONS</b> ETSO-2C91a &amp; ETSO-2C126 TSO-C126 FOR USE OUTSIDE OF THE USA OR EASA RULES, CONTACT YOUR LOCAL CIVIL AVIATION AUTHORITY.</p>
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**2. Equipment limitations**

None

### 3. Activation

#### A. Standby mode for automatic activation

In order to be automatically activated by the crash sensor, the ELT must be in standby mode. This mode is mandatory during the flight. We recommend to switch off the ELT only when removed from the aircraft or when the aircraft is parked for a long period or for a maintenance operation.

- Check that the antenna is correctly connected.
- Switch to " ARM".

To operate the ELT with an optional Remote Control Panel, ensure that:

- The ELT switch is the "ARM" position .

#### B. Manual activation

- Check that the antenna is correctly connected.
- Switch to " ON " (either on the ELT or on an optional Remote Control Panel when connected):
  - The ELT starts with the self-test sequence then, after 50 sec., transmits on:
    - 406 MHz (one 406 MHz burst every 50 seconds);
    - 121.5 MHz (continous transmission between each 406 MHz burst).
  - During transmission, the buzzer operates and the red visual indicator flashes.

### 4. Off

It is possible to stop the ELT in case of unintentional activation:

- Switch to " OFF ".

***Regulations state that no transmission must be interrupted unless every means are used to contact and inform the Air Traffic Controller of this action.***

***Important notice: As 406 MHz transmission is effective 50 seconds after the ELT activation, if it is switched off within this delay, no further radio contact will be necessary.***

### 5. Self-Test

[Refer to 1. Self-test, page 301](#)



**CHECK**

**1. Self-test**

**A. Periodicity**

It is recommended by the manufacturer to test the ELT to detect any possible failure.

Operational check must be performed regularly by a pilot or maintenance personnel from the cockpit (Remote Control Panel). It is recommended to perform a self-test once a month but it **should not be done more than once a week**.

Each self-test consumes energy from the battery. Should self-tests be carried out more often than the maximum allowed, the battery life-time might be shorter than specified.

**B. Self-test procedure**

- Check that the antenna is correctly connected  
**Do not perform self-test without antenna connected.**
- Tune aircraft radio to 121.5 MHz and ensure you can hear it.
- Switch from position "OFF" to position "ARM" or press RESET & TEST on the Remote Control Panel (ensure that the ELT switch is in position "ARM").
- Listen for the buzzer or watch the LED - it operates during the whole Self-test procedure. Close to the end of self-test a short (3-4 sweeps) 121.5 transmission is made - confirm this on the aircraft radio.
- 10 seconds after the beginning of the self test, the test result is displayed with the red visual indicator and the buzzer will sound:
  - One long flash (duration 1 seconds) indicates that the system is operational and that no error conditions were found.
  - A series of short flashes (200 ms) indicates the test has failed.

**Remark: The number of flashes gives an indication of the faulty parameter detected during the self-test.**

3+1	LOW BATTERY VOLTAGE
3+2	LOW RF POWER
3+3	FAULTY VCO LOCKING (FAULTY FREQUENCY)
3+4	NO IDENTIFICATION PROGRAMMED

**If self-test fails, contact the distributor as soon as possible. Unless a waiver is granted, flight should be cancelled.**

## 2. Operational tests

These tests must be performed by maintenance personnel when performing the first power up procedure or to check the transmitter ([Refer to B. 406 and 121.5 MHz transmission test](#)).

### A. ELT operational tests

NOTE: ELT operational tests only provide the aircraft operator with an indication that the ELT is transmitting; however, a positive result cannot be interpreted as meaning that the ELT meets all operational parameters.

- connect the outside antenna to J2;
- switch the ELT from OFF to ARM;
- check that the Self-Test result is OK (one long flash).

### B. 406 and 121.5 MHz transmission test

NOTE: Transmissions tests only provide the aircraft operator with an indication that the ELT is transmitting; however, a positive result cannot be interpreted as meaning that the ELT meets all operational parameters.

#### (1) 406 MHz

This test must be carried out with a COSPAS-SARSAT decoder.

- Perform self-test (switch ELT from OFF to ARM).
- Check with the COSPAS-SARSAT decoder that, except for the 5th and the 6th digits, the decoded message is identical to the programmed message.

NOTE: *The message transmitted during self-test sequence always begins with FF FE D0 whereas a programmed message begins with FF FE 2F.*

*Example of message programmed in ELT:*

*FF FE 2F 53 C3 24 97 38 0B A6 0F D0 F5 20*

*Example of same message decoded by Cospas-Sarsat Decoder:*

*FF FE D0 53 C3 24 97 38 0B A6 0F D0 F5 20*

(2) 121.5 MHz

***This check shall only be conducted during the first five minutes of any UTC, (co-ordinated universal time) hour, and restricted in duration to not more than five seconds. Be sure to notify any nearby control tower of your intentions.***

This test must be carried out with a VHF receiver (Aircraft VHF receiver may be used).

- Tune VHF receiver to 121.5 MHz;
- Start transmission:
  - Switch ELT to ON.
- Only 2 "sweep tones" are heard after 5 seconds, then the 121.5 MHz stops.
- Stop transmission:
  - Switch to OFF;
  - continue to listen to 121.5 MHz for a few seconds to ensure that the ELT does not continue to transmit after the test is terminated.

**IMPORTANT: If the ELT operates for approximately 50 seconds, a 406 MHz signal is transmitted and is considered valid by the satellite system.**

- Switch ELT to ARM.

*Nur für den Unterricht*

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## TROUBLESHOOTING

### 1. General

Procedure for fault isolation onboard uses the indicator light (red visual indicator) of the ELT's front panel. This indicator light is activated by a self-test capability within the ELT.

### 2. Faults on Self-test

#### A. Visual Indicator

When the self-test is carried out, the number of flashes gives an indication of the faulty parameter detected during the self-test.

(1) 3+1 flashes

- Low battery voltage:  
Replace battery: refer to relevant CMM for tests and repair.

(2) 3+2 flashes

- Low RF power:  
Check 406 MHz power: refer to relevant CMM for tests and repair.

(3) 3+3 flashes

- Faulty VCO locking (faulty frequency):  
Check frequencies: refer to relevant CMM for tests and repair.

(4) 3+4 flashes

- No identification programmed  
Check programming: refer to relevant CMM for tests and repair.

Note: for CMM download and other servicing instructions, refer to Service & Support section of Orolia S.A.S. website.

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