

# VS3000 GTW

The versatile mobile radio

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**elettra-tetra**  
Digital Mobile Radio Solution

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VS3000 GTW - The versatile mobile radio

## VS3000 GTW The versatile mobile radio

### 1. OVERVIEW



**VS3000** mobile radio unit is the new digital mobile radio designed for the use in Private Mobile Radio (PMR) systems. It's based on the TETRA standard with a ***wide range of professional options.***

**VS3000** combines extreme solid construction with compact size and its control panel has a high contrast display with large fonts, a large keyboard and separate knobs for volume control and group selection.

**VS3000's** a powerful and flexible architecture specifically designed for different applications: cars, fixed and naval installations. It's include an internal GPS and a Gateway/Repeater together with a wireless interface for audio and data accessories **VS3000** unit has the conventional (analogue) mode capability <sup>§</sup> and it's available in two frequency bands, 380 to 430 MHz and 410 to 470 MHz, fully usable in TMO and DMO.

**VS3000** equipment has:

- Remote control panel.
- High quality loudspeaker coupled to a high power audio amplifier that allows use in particularly noisy environments. An optional telephone style handset is available for private calls.
- Hand-free and echo cancelling functions.
- Many optional audio accessories for vehicular and vessel installations

The **control panel** of the VS3000 equipment has:

- High contrast display with very large fonts

<sup>§</sup> Feature subject to software license

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- Large keypad
- A 16-step rotary knob for audio volume selection
- A 16-step rotary knob for group / channel selection
- Emergency key (red colour)
- Dedicated connector for audio accessories
- Primary connector for data accessories (on the front)
- Secondary connector for data accessories (on the rear)

The high contrast LCD display with large fonts (about 2,5 x 4,5 mm) allows the best visibility in all light conditions. The backlight of display and keypad may be continuous, timed or excluded. Any audio signals can be individually selected as off, low, medium or high. Low, medium and high levels are proportional to the voice volume, so the volume rotary knob allows the tuning of audio signals also. The user can quickly select the preferred mode between TMO and DMO through a dedicated mode selection key.



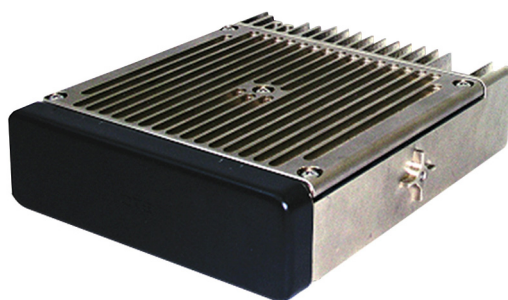
- **Solid transceiver compliant to the most severe ambience specifications.**
- **Two frequency bands: 380÷430 and 410÷470 MHz.**
- **Advanced PEI with extended AT commands.**
- **Five logical I/O ports for peripheral devices.**
- **Multi slot capability for Circuit and IP Packet Data applications.**
- **Car, truck, and motorboat installations.**

### 1.1 MOBILE UNIT VS3000

The VS3000 unit is the new solid digital mobile radio designed for the use in Private Mobile Radio (PMR) systems based on the TETRA standard with a wide range of professional options.

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VS3000 GTW can operate both as **DM repeater** and **DM Gateway**. Its [wireless interface](#) allows the unit to communicate with wireless audio and data accessories and allows to transfer information from/to Pc or external instruments' \*\*.



VS3000 is the [first mobile TETRA radio that can operate also as a conventional FM equipment](#). Professional users are able to talk both to analogue or TETRA equipment. Vehicular VS3000, and the hand portable PumaT3DM also, permits a [soft migration from Conventional to TETRA network](#).

VS3000 is the complete solution for the TETRA applications. It supports all voice and [data services](#) at the [higher level of security](#).

Authentication, **dynamic key "Air interface Encryption"** and **"End-to-End Encryption"** offer a high degree of communication security and protect the critical speech and/or data communications by potential eavesdropper. A special tamper proof version of the VS3000 is available.

The VS3000 supports at the [higher possible data rate capability](#) for the Tetra equipment, with [multi-slot Circuit Data and IP Packet Data](#) for file transfer, messaging, database interrogation/update, and image / video transfer applications.

The VS3000 has a [secondary interface](#) for customer defined wired applications, such as double control panel, remote audio accessories or data terminal equipment.



VS3000GTW includes a high sensitivity [internal GPS](#) to get the location of the vehicle with an accuracy of few meters. The VS3000 is also designed to allow the full set\*\* of TETRA services, security services and data applications.

VS3000 is capable of operating on a TETRA standard digital network supporting both **Trunked Mode (TMO)** and **Direct Mode (DMO)** operations:

- **Trunking Mode (TMO):** communications through the TETRA network

\*\* Some features can depend on TETRA Infrastructure and/or the SW version.

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- **Direct Mode (DMO):** direct communications between terminal equipment, without the presence of the network.
- **Direct Mode under DM Repeater coverage:** communication between terminals through a DM repeater without the presence of the network.
- **Direct Mode under a DM Gateway coverage:** communication between the radio and the network through a DM Gateway

In DMO VS3000 automatically performs communication through DM Gateways and repeaters if their presence is perceived without needing any further user action to select the operating mode.

As **DM Gateway** VS3000 puts a DMO equipment through to TETRA network (figure 1).

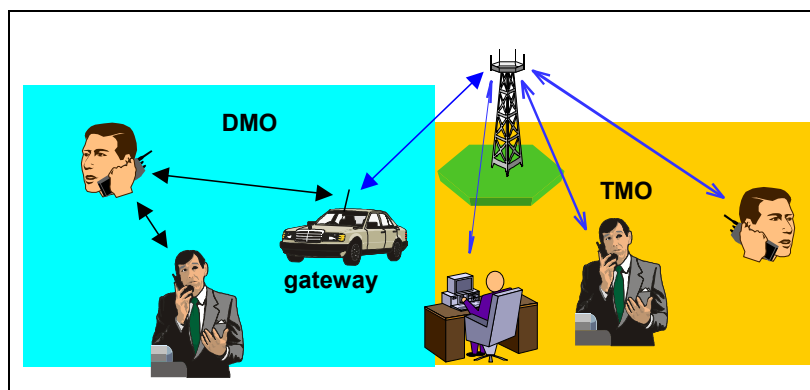


Figure 1: DM Gateway

As **DM Repeater (1A)** VS3000 extends the radio coverage of the equipment in Direct mode (figure 2)

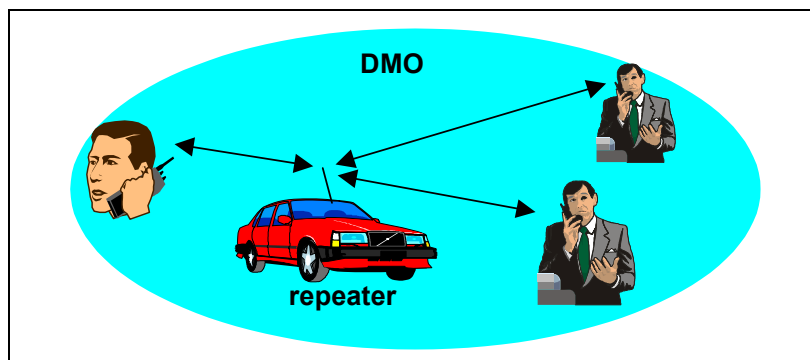


Figure 2: DM Repeater (1A)

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**1.2 CONTROL PANEL FPG1**

The water-resistant control panel FPG1 is equipped with:

- ON/OFF key;
- Standard telephonic keyboard (12 alphanumeric keys);
- Three menu navigation keys;
- Six functions keys;
- Dedicated key for Emergency Call;
- Two dedicated keys for accept/terminate conversation;
- Connector for audio accessories (microphone with PTT or handset);
- Two data connectors (one on the side and other on the rear equipment side) as explained in the following paragraph.



Photo 1: control panel FPG1

FPG1 provides the interfaces towards the user and is composed of:

- a LCD high efficiency display capable of modifying the light intensity through a keyboard function. The backlight LCD display matrix has a resolution of 160x80 dots. It allows displaying of 1 symbols line and 3 character lines (12 characters each). Two LED's beside the display (one red and one green) indicate transmitting and the receiving phase.
- The keyboard doesn't stick out of the profile of the radio, avoiding unintentional activation.

## 2. FEATURES AND SERVICES

VS3000 has a powerful and flexible architecture ready to perform a very complete set of services. The actual set of features provided by the unit depends on TETRA Infrastructure and/or SW license.

### 2.1 DATA STORAGE CAPACITY

- more than 1400 TMO / DMO talk groups
- 1000 static entries in the phone directory
- 100 phone book entries
- 10 predefined or user defined text messages
- 72 predefined status messages
- 20 recent individual calls
- 20 recent received messages

### 2.2 VOICE SERVICES

#### Individual half and full duplex voice calls

- Half and full duplex voice calls with other TETRA users;
- Dedicated key for quick call to selected group dispatcher;
- On/off hook and Direct through-connect set-up modes;
- Calling Line Identity Presentation (nickname presentation if present in the local phone book).

#### Telephony calls

- Half and full duplex individual calls with PABX / PSTN users;
- PABX / PSTN users involved in group calls;
- DTMF over-dial.

#### Group calls

- Normal group calls;
- Broadcast calls;
- Late Entry and joining to existing group call;
- Talking Party Identity Presentation (nickname presentation if present in the local phone book);
- DGNA group specific repository.
- Priority group scanning

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### Emergency calls

- Individual or group emergency calls through dedicated emergency key;
- Programmable simultaneous sending of an alarm status messages (potentially to a different destination);
- Busy User Pre-emption.

## 2.3 DATA SERVICES

### Data / text messaging

- Status messaging
- Short data messaging (SDS):
  - Text messaging;
  - Transport Layer protocol support;
  - Short Data Service (SDS) for data application (e.g. positioning and telemetry information transfer);
- Concurrent voice and status / SDS messaging.

### Circuit data

- Single-slot Circuit Mode Transfer:
  - Half duplex data calls;
  - Full duplex data call;
- Multi-slot half duplex Circuit Mode Transfer (up to 4 slot)
- Support of 3 levels of data protection:
  - no protection (7.2 Kbit/s per slot);
  - low protection (4.8 Kbit/s per slot);
  - high protection (2.4 Kbit/s per slot).

### PEI support

VS3000 provides "*Peripheral Equipment Interface (PEI)*" for external RS232 status message devices and short / circuit / packet data devices.

## 2.4 SUPPLEMENTARY SERVICES

VS3000 supports:

- User selection of the call priority (Normal / High / Pre-emptive)
- Pre-emptive Priority Call (Busy User Pre-emption and Manual user selection of preferred call)
- Dynamic Group Number Assignment (with a DGNA specific group repository)

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- Call authorised by Dispatcher
- Ambience Listening (*soon available*)
- Chinese Language (*soon available*)

## 2.5 SECURITY SERVICES

### Local security services

- Keypad lock
- PIN / PUK code access
- Permanent terminal disable

### Authentication

- MS authentication
- Authentication Key Distribution (according to TETRA MoU SFPG Rec. 01)

### Air Interface Encryption

- Security Class 2 (Static Key Encryption - SCK)
- Security Class 3 (Dynamic Key Encryption - DCK & CCK)
- TEA1, TEA2 algorithm support

Note: TEA1 products can be supplied without Export licences; TEA2 products can be supplied without authorisation and/or Italian export licence to public safety organisations (e.g. Police, Fire brigade, Customs and Excise, Ambulance and Emergency Medical Service, Coast Guard) of the European Community.

### End-to-End Encryption

- IDEA standard algorithm  
Note: the equipment can be supplied without Export licences in the European Community and in Australia, Canada, Japan, Norway, New Zealand, USA and Switzerland. The export to other countries is subject to Export licences.
- Export version of End-to-End Encryption algorithm that does not require Export licences.

### Terminal Enable/Disable

- Terminal temporary disable
- Terminal enable

## 2.6 USER INTERFACE

- 3 softkeys / 4 menu navigation keys
- Function Menu
- 10 function keys:

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- TMO / DMO mode switch
- Enable / disable encryption
- WPS selection
- Enable / disable group scanning
- Text message registry
- Enable / disable Late Entry functionality
- Enable / disable Transmit Inhibit functionality
- Equipment Info display
- Open Group selection (DMO only)
- Priority selection
- One-touch status messaging (speed sending of status message, location 1-9)
- Text / status message notification and ability to read them during calls
- Text / status message sending during calls
- Full access to phone book, phone directory and menu navigation during calls
- Alert tones proportional to audio volume
- Flexible dialling:
  - Direct dialling
  - Shortened dialling
  - Search and call from phone book (using list scroll / alphabetic search)
  - Search and call from phone directory (using list scroll / alphabetic search) · Last number redial
  - Recall from last calls registry
  - Recall from last received text messages registry

## 2.7 SAFETY FUNCTIONS

- Dedicated Emergency button
- Transmit Inhibit (TXI)
- Capability to switch off all acoustic tones for covert operations.

## 2.8 OTHER SERVICES

VS3000 provides also:

- Common Secondary Control Channels support;
- Multiple MNI support:
  - Support of up to 5 MNI values
  - Support of a DMO specific MNI

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## 2.9 DIRECT MODE

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### Speech services

- Group call (also open channel type supported);
- Individual call;
- Emergency calls;
- Pre-emptive calls;
- Talking Party Identity Presentation (nickname presentation if present in the local phone book);
- Support of communications trough type 1A repeater;
- Support of communications trough DMO Gateway.

### Data services

- Status messaging
- Text Messaging

### Security services

- End-to-End encryption

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## 2.10 DMO REPEATER

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Type 1A repeater that supports:

- individual voice calls, with or without presence checking;
- group calls;
- emergency group calls;
- change over and pre-emption;
- calling line identity presentation;
- listen of the speech call;
- SDS;
- check of the received and transmitted SDS;
- End-to-End encryption.

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## 2.11 DMO GATEWAY

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Supports:

- individual voice calls (in either direction);
- group calls (in either direction);
- emergency group calls;
- talking party identification;

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- calling line identity presentation;
- change over and pre-emption;
- listen of the speech call;
- End-to-End encryption;
- late entry;
- monitoring.

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### 3. TECHNICAL DATA

#### 3.1 GENERAL

<b>Equipment type:</b>	TETRA (TErrestrial Trunked Radio) mobile radio
<b>Frequency bands:</b>	380÷430 MHz 410÷470 MHz
<b>RF Power class:</b>	10 W nominal
<b>AF Power:</b>	8 W on 4 Ohm
<b>Power supply:</b>	+13,8 Vdc nominal, negative ground

##### 3.1.1 Radio specifications

Specifications	Value / Reference standard
<b>Power class:</b>	ETSI EN 300 392-2 / 300 396-2 class 2
<b>Power control:</b>	Compliant ETSI EN 300 392-2 (Open Loop and Closed Loop at steps of 5 dB from 0.03 W to 1W)
<b>Modulation:</b>	π/4-DQPSK
<b>Speech Codec:</b>	TETRA speech Codec (ETSI EN 300 395-2)
<b>RX Class:</b>	ETSI EN 300 392-2 / 396-2 Class A + B
<b>Power on adjacent channel:</b>	Compliant to: ETSI EN 300 392-2 ; ETSI EN 300 396-2 ; ETSI EN 300 394-1
<b>Vector error RMS value:</b>	
<b>Static RX sensitivity:</b>	
<b>Dynamic RX sensitivity:</b>	
<b>RF channels spacing:</b>	25 kHz
<b>Antenna connector:</b>	BNC, 50 ohm
<b>Data capability:</b>	Up to 4 slot / 28.8 kbit/s half duplex
<b>Data terminal interface:</b>	TETRA PEI (ETSI ETS 300 392-5)
<b>EMC:</b>	ETSI EN 301 489-18

##### 3.1.2 Environmental conditions

Specifications	Reference standard
<b>Climatic condition:</b>	ETSI EN 300 019-1-5 Class 5.1 (-25° +70°C)
<b>Conformance testing specifications for TETRA equipment:</b>	ETSI EN 300 394-1 (-20° ÷ +55°C)

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<b>Water and dust protection:</b>	IEC 60529 class IP66 and IP67 (transceiver), class IP54 (control panel)
<b>Mechanical conditions :</b>	<ul style="list-style-type: none"> <li>• ETSI EN 300 019-1-5 &amp; IEC 721-3-7 Class 5M3</li> <li>• ETSI EN 300 019-1-6 Class 6M3</li> <li>• MIL STD 810 E/F - Method 516.4/5, procedures I / V</li> <li>• MIL STD 810 E/F - Method 514.4/5, procedure I, category 20 (Vibration Tests for U.S. highway truck transportation and composite wheeled vehicle transportation)</li> <li>• EUROCAE ED-14D/RTCA DO-160D Section 8 "Vibration" Cat. U, curve F and F1 (transceiver only)</li> <li>• EUROCAE ED-14D/RTCA DO-160D Section 7 "Operational Shock and Crash Safety" Category B (transceiver only)</li> </ul>
<b>Transportation temperature:</b>	ETSI ETS 300 019-1-2 Class 2.3 (-40° C ÷ +70°C)
<b>Storage temperature:</b>	-40° C ÷ +70°C

3.1.3 GPS

Specifications	Value
<b>Tracking Capability:</b>	12 channels
<b>Time to First Fix:</b>	< 6 seconds typical Hot Start <sup>††</sup> @ -137dBm < 30 seconds typical Warm Start <sup>‡‡</sup> @ -137dBm < 40 seconds typical Cold Start <sup>§§</sup> @ -137dBm
<b>Accuracy:</b>	5 meter 50% ; 10 meter 95%
<b>Sensitivity:</b>	-142dBm acquisition and tracking

3.1.4 Mechanical specifications

Dimensions and Weight	Value
<b>Dimensions:</b>	48 x 172 x 188 mm (transceiver)
<b>Weight:</b>	1850 g (transceiver)

<sup>††</sup> Hot Start = with current almanac, position, time and ephemeris stored by the GPS receiver  
<sup>‡‡</sup> Warm Start = with current almanac, position and time stored  
<sup>§§</sup> Cold Start = no stored information

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## 4. CONFIGURATIONS

### 4.1 VEHICULAR INSTALLATION

VS3000 in standard (vehicular) configuration includes (figure 3):

- Radio unit installed into the boot (or in other position inside the vehicle);
- Control panel installed in the dashboard vehicle;
- microphone with PTT key or "telephone like" handset connected to the control panel;
- loudspeaker connected to the radio unit;

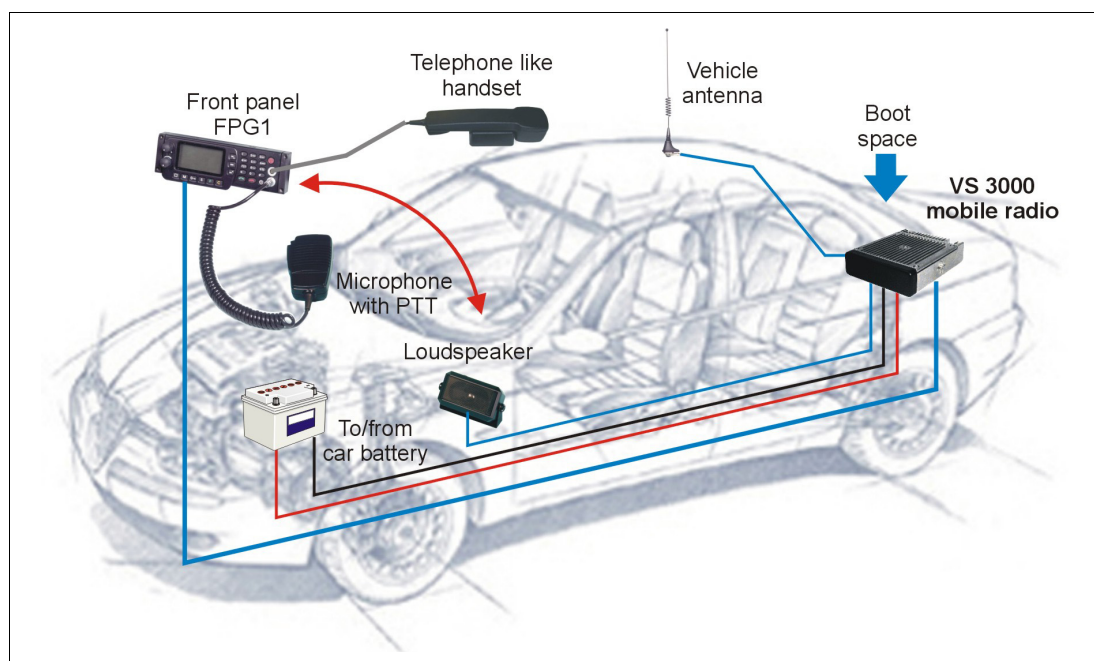


Figure 3: typical vehicle installation

The equipment functionalities can be extended using the following optional accessories:

- **Handsfree kit** a set of a microphone mounted on the fin parasol and a PTT installed on the steering in order to drive in safety.
- **Data cable for FPG1** allows connection between Pc and the FPG1 for sending and receiving data.
- **Data cable for radio unit** allows the connection between Pc and the radio unit for a "mobile offices" solution.

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**4.2 VESSELL CONFIGURATION**

VS3000 radio equipment can be installing on a motorboat. The standard loudspeaker is suitable for the installation inside the motorboat cabin; a waterproof loudspeaker is available for the outdoor installation.

A typical installation inside a motorboat's cabin is depicted below.



Photo 2: example of installation in patrol motorboat

Note: suitable accessories are necessary if the equipment is exposed to water, waves or to water splashes.

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## 5. FC3000 - FIXED STATIONS

Fixed station **FC3000 GTW** is an efficient TETRA desktop radio unit. It's easy to allocate on the desk, in order to realise an operating station with low installation costs and training (photo 3). The FC3000 uses the same control panel of the vehicular station so no additional training is necessary to use the fixed station.

Additional software for Windows platform PC is available. The user friendly interface - dispatcher like - makes the use of the station extremely easy (photo 6).

The FC3000 includes an internal loudspeaker and it is provided with a high quality desktop microphone. The installation kit only requires the antenna and the power supply 110-220 V AC.



Photo 3: typical FC3000 fixed configuration



Photo 4: FC3000 station



Photo 5: FC3000 Interfaces

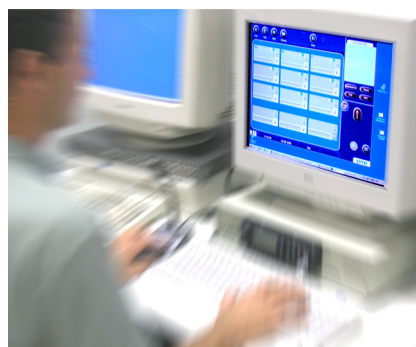


Photo 6: User Interface

In order to support data services using a personal computer FC3000 has two PEI interface on the rear panel (photo 5).

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FC3000 is also provided with the following interfaces:

- **Serial Sec Link:** for downloading crypto Keys
- **Serial FC\_to\_PC:** for managing a remote control panel.
- **Audio 4Wire I/F:** for external audio accessories.
- **2 RCA connectors:** AF for external audio recording.
- **2 plug (3,5 mm jack)** for remote emergency key and a PTT foot pedal
- **SMA Connector:** for a Bluetooth antenna

**5.1 CONFIGURATIONS AND ACCESSORIES**

**FC3000 GTW** is a fixed station based on VS3000GTW mobile radio.

It includes also the Gateway / Repeater functionalities and a wireless interface for audio and data accessories

Optional accessories:

- **Headset** (call center like);
- **PTT** foot pedal;
- **Handset** (telephone like) with PTT.

**5.2 TECHNICAL DATA**

**5.2.1 General**

Equipment type	
<b>Equipment type:</b>	TETRA (TErrestrial Trunked Radio) fixed radio
<b>Frequency bands:</b>	<ul style="list-style-type: none"> <li>• 380÷430 MHz</li> <li>• 410÷470 MHz</li> </ul>
<b>RF Power class:</b>	10 W nominal (class 2)
<b>AF Power:</b>	8 W on 4 Ohm
<b>Power supply:</b>	110/220 Vac

**5.2.2 Radio specifications**

Specifications	Value / Reference standard
<b>Power class:</b>	ETSI EN 300 392-2 / 300 396-2 class 2
<b>Power control:</b>	Compliant ETSI EN 300 392-2 (Open Loop at steps of 5 dB from 0.03 W to 1W)
<b>Modulation:</b>	Π/4-DQPSK
<b>Speech Codec:</b>	TETRA speech Codec (ETSI EN 300 395-2)

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<b>RX Class:</b>	ETSI EN 300 392-2 / 396-2 Class A + B
<b>Power on adjacent channel:</b> <b>Vector error RMS value:</b> <b>Static RX sensitivity:</b> <b>Dynamic RX sensitivity:</b>	Compliant to: ETSI EN 300 392-2 ; ETSI EN 300 396-2 ; ETSI EN 300 394-1
<b>RF channels spacing:</b>	25 kHz
<b>Antenna connector:</b>	Type "N" , 50 ohm
<b>Data capability:</b>	Up to 4 slot / 28.8 kbit/s half duplex
<b>Data terminal interface:</b>	Two TETRA PEI (ETSI ETS 300 392-5) on the rear of the equipment
<b>Digital I/O:</b>	<ul style="list-style-type: none"> <li>• Alarm (to connect and external emergency pushbutton)</li> <li>• Logical Ring (to manage an external visual or audio warning associated to the on/off-hook incoming calls)</li> </ul>
<b>EMC:</b>	ETSI EN 301 489-18

5.2.3

Environmental conditions

Environmental specifications	Reference standard
<b>Climatic condition:</b>	ETSI EN 300 019-1-3 Class 3.1E
<b>Operative temperature:</b>	<ul style="list-style-type: none"> <li>• -20°C ÷ +55°C voice TMO/DMO and single slot data services</li> <li>• -20°C ÷ +45°C Voice GTW/REP and multiple slot data services</li> </ul>
<b>Storage temperature:</b>	-40° C ÷ +70°C
<b>Transportation temperature:</b>	ETSI EN 300 019-1-2 Class 2.3 (-40° C ÷ +70°C)
<b>Water and dust protection:</b>	IEC 60529 class IP20

5.2.4

Mechanical specifications

Dimensions and Weight	
<b>Dimensions:</b>	435 x 306 x 110 mm
<b>Weight:</b>	9,1 Kg
<b>Maximum acceptable weight on the FC3000 :</b>	10 Kg (note: the maximum data rate capability of the equipment could be reduced if the radiator grid is partially closed)

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