PRODUCT FACT SHEET

MIX 4000 SERIES

OVERVIEW

The MiX 4000 LTE is a high-end fleet product that incorporates the latest market trends. It consists mainly of an on-board computer, a LTE CAT M1 modem, a GNSS, an accelerometer, Low Energy Bluetooth, I/O, 2 x CAN, 2 x RS232, 4 x positive drives and 434 / 915 MHz short range transceiver.

There is also a 2G version of the MiX 4000.

All these variants make use of the same PCB, the only difference is the modem to be populated (all these modems have the same foot print).

Part Number	Official Product Name	Description
440FT0082	MiX 494C-2G	MiX 4000 2G (Model 494C-2G) Electronic Unit with Magix 434MHz
440FT0088	MiX 494C-2G-B	MiX 4000 2G (Model 494C-2G) Electronic Unit with backup battery plugged in and with Magix 434MHz support
440FT0187	MiX 45MC-4G	MiX 4000 LTE (Model 45MC-4G) Electronic Unit with Magix 434MHz as well as 915MHz support
440FT0191	MiX 45MC-4G-B	MiX 4000 LTE (Model 45MC-4G) Electronic Unit with Battery and with Magix 434MHz as well as 915MHz support
440FT0194	MiX 46MC-4G	MiX 4000 LTE with 2G fallback (Model 46MC-4G) Electronic Unit with Magix 434MHz as well as 915MHz support
440FT0195	MiX 46MC-4G-B	MiX 4000 LTE (Model 46MC-4G) Electronic Unit with Battery and with Magix 434MHz as well as 915MHz support

General Information for LTE	
Communication	LTE CAT M1
	Internal LTE antenna
	Over-the-air firmware downloads
	20,000 buffered messages for data logging during coverage loss.
General Information (on all variants)	
Location	High sensitivity GNSS
	Internal / External GNSS antenna
Events	Compatible with MiX Event Engine and supports any event. The list below is an example of some of the events that can be defined: • Over-speeding • Harsh Braking • Harsh Acceleration • Impact Detection • Low vehicle battery
Power	Low power modes
	Voltage monitoring
	Backup Battery
Driver Identification	Driver ID via code plug

Technical Specification	
General (on all variants)	
3 Axis accelerometer	The 3-axis motion sensor capable of measuring accelerations with an output data rate of 1 Hz to 5 kHz. Dynamically selectable full-scale: ±2g/±4g/±8g/±16g
Dimensions	L = 94 mm W = 103 mm H = 36 mm (Length with FAKRA connector is 110 mm) (Width with mounting ears is 116 mm)
Weight	~156 g (with battery included: ~208 g)
Environment (on all variants)	
Temperature	DIN EN 60068-2-1 DIN EN 60068-2-2 (Recommended Storage) 0°C to +45°C (Operating) -20°C to +60°C (limited by battery) (Charging) 0°C to +45°C Operating temperature functionality (without backup battery) extends to -25°C and +85°C
IP Rating	IP54
Vibration	In accordance with ISO 16750-3:2007(E) for 9h in each of the perpendicular axes. The vibration profile is as per table 14 of ISO16750-3:2007(E)
Shock	In accordance with Mil-Std-810F method 516.5 at a level 30g and with pulse duration of 11ms. The test consists of three shocks to be executed in each major axis and for both positive and negative directions resulting in a total of 18 shocks (in all 3 perpendicular axes).
Mechanics: Free fall	DIN EN60068-2-32: According to automotive guidelines 3 drops from 1 m height (outside packaging)
Humidity	Perform the test as specified in IEC 60068-2-30, Db, Variant 1 • Upper temperature: +55 °C, • Number of cycles: 6. Perform a functional test (operating mode 3.2 according to ISO 16750-1) when the maximum cycle Temperature is reached.
Power Supply (on all variants)	
Primary power supply	Rated voltage ($V_{nominal}$): 10.5 to 33 VDC
Current Consumption at 12V (primary side)	Out of trip: < 20 mA (configurable) Airport Mode: < 2 mA Drive / Recovery Mode: < 180mA, consumption depends on instantaneous conditions

<table>
<tr><td>Current Consumption at 24V (primary side)</td><td>Out of trip: < 15 mA (configurable)
Airport Mode: < 1.5 mA
Drive / Recovery Mode: < 70mA, consumption depends on instantaneous conditions</td></tr>
<tr><td>Power Consumption</td><td>< 1800 mW</td></tr>
<tr><td>Circuit protection</td><td>ISO7637-2
Over voltage rating: 56 V DC for 60 s</td></tr>
<tr><td>Reverse Polarity Protection</td><td>ISO7637-2
Reverse Polarity rating: -30 V for 60 s</td></tr>
<tr><td>Backup Battery</td><td>3,2 V; 1600 mAh LiFePO4 Battery
(60.5 x 50.5 x 6.5 mm)
(>24 hours in the absence of vehicle battery power, *dependent on operational conditions)</td></tr>
<tr><td colspan="2">GNSS (Internal / External antenna) (on all variants)</td></tr>
<tr><td>Receiver Type</td><td>ZOE-M8Q

72-channel u-blox M8 engine
GPS L1C/A, SBAS L1C/A, QZSS L1C/A, QZSS L1 SAIF, GLONASS L1OF, BeiDou B1I, Galileo E1B/C</td></tr>
<tr><td>Protocols</td><td>NMEA, UBX binary and RTCM</td></tr>
<tr><td>RTC</td><td>Onboard RTC crystal for faster warm and hot starts</td></tr>
<tr><td>Max Navigation Update Rate</td><td>
<table>
<tr><th>GNSS</th><th>GPS & GLONASS</th><th>GPS</th><th>GLONASS</th><th>BeiDou</th><th>Galileo</th></tr>
<tr><td>ROM
Flash</td><td>10 Hz
5 Hz</td><td>18 Hz
10 Hz</td><td>18 Hz
10 Hz</td><td>18 Hz
10 Hz</td><td>18 Hz
10 Hz</td></tr>
</table>
</td></tr>
<tr><td>Accuracy Horizontal Update Rate
CEP, 50%, 24 hours static, -130 dBm, > 6 SVs</td><td>
<table>
<tr><th>GNSS</th><th>GPS & GLONASS</th><th>GPS</th><th>GLONASS</th><th>BeiDou</th><th>Galileo</th></tr>
<tr><td></td><td>2.5 m</td><td>2.5 m</td><td>4 m</td><td>3 m</td><td>TBC4</td></tr>
</table>
</td></tr>
<tr><td>Start-up Time / Acquisition[1]

([1] All satellites at –130 dBm, except Galileo at –127 dBm)</td><td>
<table>
<tr><td>Time-To-First-Fix[5]</td><td></td><th>GPS & GLONASS</th><th>GPS</th><th>GLONASS</th><th>BeiDou</th><th>Galileo</th></tr>
<tr><td></td><td>Cold start</td><td>26 s</td><td>29 s</td><td>30 s</td><td>34 s</td><td>45 s</td></tr>
<tr><td></td><td>Hot start</td><td>1 s</td><td>1 s</td><td>1 s</td><td>1 s</td><td>1 s</td></tr>
<tr><td></td><td>Aided starts 6</td><td>2 s</td><td>2 s</td><td>2 s</td><td>3 s</td><td>7 s</td></tr>
</table>
</td></tr>
<tr><td>Sensitivity [3]

([3] Demonstrated with a good active antenna)</td><td>
<table>
<tr><th></th><th>GPS & GLONASS</th><th>GPS</th><th>GLONASS</th><th>BeiDou</th><th>Galileo</th></tr>
<tr><td>Tracking & Navigation</td><td>–167 dBm</td><td>–166 dBm</td><td>–166 dBm</td><td>–160 dBm</td><td></td></tr>
<tr><td>Reacquisition</td><td>–160 dBm</td><td>–160 dBm</td><td>–156 dBm</td><td>–157 dBm</td><td>–153 dBm</td></tr>
<tr><td>Cold start</td><td>–148 dBm</td><td>–148 dBm</td><td>–145 dBm</td><td>–143 dBm</td><td>–138 dBm</td></tr>
<tr><td>Hot start</td><td>–157 dBm</td><td>–157 dBm</td><td>–156 dBm</td><td>–155 dBm</td><td>–151 dBm</td></tr>
</table>
</td></tr>
<tr><td>Operational Limits</td><td>Dynamics: ≤ 4 g
Velocity: 500 m/s</td></tr>
</table>

<table>
<tr><td></td><td colspan="3">Altitude: 50,000m (unpressurised)
Velocity Accuracy: 0.05 m/s
Heading Accuracy: 0.3 degrees</td></tr>
<tr><td>A-GPS</td><td colspan="3">Supports AssistNow Online and AssistNow Offline, OMA SUPL compliant</td></tr>
<tr><td colspan="4">GPS External Antenna (on all variants)</td></tr>
<tr><td>Centre Frequency</td><td colspan="3"><table>
<tr><th>GNSS</th><th>BAND</th><th>FREQ</th></tr>
<tr><td>GPS</td><td>L1-C/A</td><td>1563MHz-1587MHz</td></tr>
<tr><td>Galileo</td><td>E1-B/C (E1 only, excluding E2)</td><td>1587-1591MHz</td></tr>
<tr><td>GLONASS</td><td>L1-OF</td><td>1593MHz - 1610MHz</td></tr>
<tr><td>BeiDou</td><td>B1i</td><td>1561.098MHz</td></tr>
<tr><td>QZSS</td><td>L1-SAIF</td><td>1575.42MHz</td></tr>
</table></td></tr>
<tr><td>Bandwidth</td><td colspan="3">20 MHz min @ -10 dB</td></tr>
<tr><td>Impedance</td><td colspan="3">50 Ω</td></tr>
<tr><td>VSWR</td><td colspan="3"><1.5</td></tr>
<tr><td>Peak Gain</td><td colspan="3">4 dBic Min</td></tr>
<tr><td>Polarization</td><td colspan="3">RHCP</td></tr>
<tr><td colspan="4">Microprocessor (on all variants)</td></tr>
<tr><td>Processor</td><td colspan="3">STM32F2427IIH6</td></tr>
<tr><td>Memory capability</td><td colspan="3">a. 2 MB Program space
b. 256 + 4 kB of RAM
c. 16 MB of SPI NOR FLASH</td></tr>
<tr><td colspan="4">Modem</td></tr>
<tr><td>Variants</td><td>MiX 45MC-4G
MiX 45MC-4G-B</td><td>MiX 46MC-4G
MiX 46MC-4G-B</td><td>MiX 494C-2G
MiX 494C-2G-B</td></tr>
<tr><td>Modem</td><td>SARA-R410-02B</td><td>SARA-R412-02B</td><td>SARA-G450</td></tr>
<tr><td>Description</td><td>LTE Cat M1</td><td>LTE Cat M1 + 2G fallback</td><td>2G</td></tr>
<tr><td>Class</td><td>Power Class 3 (23 dBm)</td><td>Power Class 3 (23 dBm)
2G GMSK:
Class 4 (33 dBm) for GSM/E-GSM bands
Class 1 (30 dBm) for DCS/PCS bands
2G 8-PSK:
Class E2 (27 dBm) for GSM/E-GSM bands
Class E2 (26 dBm) for DCS/PCS bands</td><td>Class B[1]

Class 4 (2W) for GSM850
Class 4 (2W) for EGSM900
Class 1 (1W) for DCS1800
Class 1 (1W) for PCS1900

[1] Device can be attached to both GPRS and GSM services (i.e. Packet Switch and Circuit Switch mode) using one service at a time.</td></tr>
<tr><td>Band</td><td>FDD Band 12 (700 MHz)</td><td>FDD Band 12 (700 MHz)</td><td>GSM 850 MHz</td></tr>
</table>

	FDD Band 17 (700 MHz) FDD Band 28 (700 MHz) FDD Band 13 (700 MHz) FDD Band 20 (800 MHz) FDD Band 26 (850 MHz) FDD Band 5 (850 MHz) FDD Band 19 (850 MHz) FDD Band 8 (900 MHz) FDD Band 4 (1700 MHz) FDD Band 3 (1800 MHz) FDD Band 2 (1900 MHz) FDD Band 25 (1900 MHz) FDD Band 1 (2100 MHz) TDD Band 39 (1900 MHz)	FDD Band 17 (700 MHz) FDD Band 28 (700 MHz) FDD Band 13 (700 MHz) FDD Band 20 (800 MHz) FDD Band 26 (850 MHz) FDD Band 5 (850 MHz) FDD Band 19 (850 MHz) FDD Band 8 (900 MHz) FDD Band 4 (1700 MHz) FDD Band 3 (1800 MHz) FDD Band 2 (1900 MHz) FDD Band 25 (1900 MHz) FDD Band 1 (2100 MHz) TDD Band 39 (1900 MHz) 2G fall-back: GSM 850 MHz E-GSM 900 MHz DCS 1800 MHz PCS 1900 MHz	E-GSM 900 MHz DCS 1800 MHz PCS 1900 MHz
Data transmission/rate	LTE category M1: • up to 375 kb/s UL • up to 375 kb/s DL	LTE category M1: • up to 375 kb/s UL • up to 375 kb/s DL 2G GSM / GPRS / EGPRS	<u>Pack switched Data Rate:</u> GPRS multi-slot class 12[2] Coding scheme CS1-CS[4] Up to 85.6 kb/s DL[3] Up to 85.6 kb/s UL[3] <u>Circuit switched data rate:</u> Up to 9.6 kb/s DL/UL[3] Transparent mode Non-transparent mode [2] GPRS multi-slot class 12 implies a maximum of 4 slots in Down-Link (reception) and 4 slots in Up-Link (transmission) with 5 slots in total. The SARA-G450 modules can be configures as GPRS multi-slot class 10 by means of AT command [3]The maximum bit rate of the module depends on the current network settings

Protocol stack	3GPP Release 13	3GPP Release 13	3GPP Release 99
Antenna type	16-band	16-band	Quad band,
Antenna	50 Ω		
General	Jamming Detection Automatic thermal-shutdown		
SIM (on all variants)			
Format	Nano (4FF)		
BLUETOOTH (on all variants)			
Module	CC2564MODN (Texas Instruments)		
Features	Single-Chip Bluetooth Solution Integrating Bluetooth Low Energy (LE) Features, Fully Compliant with the Bluetooth 4.0 Specification Up to the HCI Layer		
Power	Class 1.5 TX Power up to +7dBm		
Relay Circuit (on all variants)			
Current Specifications for relay coil	< 250mA (Max)		
Maximum Continuous Voltage on Pin	33V		
Protection	Transients are clamped		
RS232 Ports (on all variants)			
Maximum Speed	115200 Baud (higher rates possible with hardware flow control)		
Protection (Transient)	IEC1000-4-2 Air Discharge, 15kV, IEC1000-4-2 Direct Contact,8kV		
Protection (DC)	-12V , +12V		
I^2C Bus (on all variants)			
Use	Driver ID		
Normal Operating Speed	Capable of rates up to 400 kbps		
Maximum Supply Current (CLK)	< 4mA		
Protection	ESD: ISO 10605:2001 level 2 DC +/-30V		
Real Time Clock (on all variants)			
Time Loss	< 10 Minutes per year (typical) < 5 seconds when a GPS is used (auto synchronization) *temperature change affects the accuracy of the RTC crystal; it's most accurate at +25°C.		
Battery Backup Life	> 5 Years (typical at -30° to +70°C)		

Auxiliary Inputs and Outputs (on all variants)	
Analog Inputs	2 x Analog Input with 12-bit accuracy (Voltages are measured in the range of 0 – 37.95 volts in steps of approximately 9.3 mV and 0 - 4.95 V in steps of 1.2 mV)
Ignition Input	Monitor the line state of the vehicle. Disconnection of this wire can be detected with open-wire detect (maximum 36 V input, impedance > 100k Ohm)
Frequency Input	2 x Frequency/Speed/RPM Inputs (0-5 V and 0-36 V) The input impedance is <100 kΩ. Frequencies of up to 20 kHz can be measured. Maximum signal voltage level = 36V Disconnection of this input can be detected using open-wire detect.
Outputs	4 x (1 x 1.5 A and 3 x 0.25 A with open load detect and current sense) The 0.25 A ports are the best choice to drive relays
Ignition Input	Used to monitor the ignition switch status. Maximum 36V input, impedance > 100kOhm
LED (on all variants)	
LED	1 Red and 1 Green LEDs available to provide feedback on the status of the unit
Buzzers (on all variants)	
Buzzer	1x Buzzer included in main harness

434 MHz Transceiver (on all variants)	
RF Transceiver	Receiver frequency: 434.3 MHz Frequency deviation: 10 kHz RF Bandwidth: 25 kHz RF Radiated Output Power: 10 mW max Modulation: 2 Level FSK Data rate: 19200bps
915 MHz Transceiver (on all variants, except on MiX 494C-2G and MiX 494C-2G-B)	
RF Transceiver	Receiver frequency: 915 MHz Channel spacing: 400kHz Channel 1 = 902.2MHz Channel 64 = 927.8MHz RF Radiated Output Power: 50 mW max Modulation: 2 Level FSK Data rate: 19200bps

Statutory and Regulatory Compliance plan

Product Range	Product variant	Modem	Features / Description	Type approvals required			
				CE/E11 (RSA, EU)	FCC (USA)	PTCRB (USA)	RCM (Aus/NZ)
MiX 4000	MiX 45MC-4G	SARA-R410-02B (LTE Cat M1)	MiX 4000 LTE (Model 45MC-4G) Electronic Unit		Yes	Yes	
	MiX 45MC-4G-B	SARA-R410-02B (LTE Cat M1)	MiX 4000 LTE (Model 45MC-4G) Electronic Unit with Battery (plugged in)		Yes	Yes	
	MiX 46MC-4G	SARA-R412-02B (LTE Cat M1 with2G fall back)	MiX 4000 LTE with 2G fallback (Model 46MC-4G) Electronic Unit	Yes	Yes	Yes	Yes
	MiX 46MC-4G-B	SARA-R412-02B (LTE Cat M1 with2G fall back)	MiX 4000 LTE with 2G fallback (Model 46MC-4G) Electronic Unit with Battery (plugged in)	Yes	Yes	Yes	Yes
	MiX 494C-2G	SARA-G450	MiX 4000 **2G**, based on same PCB as MiX 46MC-4G	Yes			
	MiX 494C-2G-B	SARA-G450	MiX 4000 **2G**, based on same PCB as MiX 46MC-4G (back up battery plugged in)	Yes			