

PRODUCT FACT SHEET - MIX 4000 SERIES

Overview

The MiX 4000 series is a range of fleet products that incorporates the latest market trends. It consists mainly of an on-board computer, a 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.

The range consists of variants with a LTE CAT M1 modem and variants with a 2G modem. All these variants make use of the same PCB, the only difference is the modem to be populated and all the modems have the same foot print.



Part Number	Official Product Name	Description
440FT0187	MiX 45MC-4G	MiX 4000 LTE (Model 45MC-4G) Electronic Unit with 434MHz and 915MHz RF transceiver (no backup battery)
440FT0191	MiX 45MC-4G-B	MiX 4000 LTE (Model 45MC-4G) Electronic Unit with 434MHz and 915MHz RF transceiver (with backup battery)
U0017MT	MiX 45MC-4G Kit	MiX 45MC-4G (MiX 4000 4G) Kit: Contains Electronic Unit (440FT0187), Main Harness MP10 (440FT0033), and Code Plug Harness with Socket CP4 (440FT0032)
U0018MT	MiX 45MC-4G-B Kit	MiX 45MC-4G-B (MiX 4000 4G Battery) Kit: Contains Electronic Unit (440FT0191), Main Harness MP10 (440FT0033), and Code Plug Harness with Socket CP4 (440FT0032)
U0032MT	MiX 44MC-3G	MiX 44MC-3G (SARA-U201) Electronic Unit
U0034MT	MiX 44MC-3G-B	MiX 44MC-3G-B (SARA-U201) with Backup Battery Electronic Unit
U0033MT	MiX 44MC-3G Kit	MiX 44MC-3G (SARA-U201) Kit: U0032MT: MiX 44MC-3G 440FT0032: Code Plug Harness 440FT0032 440FT0033: Main Harness MP10
U0035MT	MiX 44MC-3G-B Kit	MiX 44MC-3G-B (SARA-U201) with Backup Battery Kit: U0034MT: MiX 44MC-3G-B 440FT0032: Code Plug Harness 440FT0033: Main Harness MP10
440FT0082	MiX 494C-2G	MiX 4000 2G (Model 494C-2G) Electronic Unit with a 434MHz RF transceiver (no backup battery). It contains the SARA-G450 modem.
440FT0088	MiX 494C-2G-B	MiX 4000 2G (Model 494C-2G) Electronic Unit with a 434MHz RF transceiver (with backup battery). It contains the SARA-G450 modem.
U0019MT	MiX 494C-2G Kit	MiX 494C-2G (MiX 4000 2G) Kit: Contains Electronic Unit (440FT0082), Main Harness MP10 (440FT0033), and Code Plug Harness with Socket CP4 (440FT0032)
U0020MT	MiX 494C-2G-B Kit	MiX 494C-2G (MiX 4000 2G Battery) Kit: Contains Electronic Unit (440FT0088), Main Harness MP10 (440FT0033), and Code Plug Harness with Socket CP4 (440FT0032)
U0022MT	MiX 424C-2G	2G - MiX 4000 with Type4 Magix (433MHz). It contains the SARA-G350 modem.
U0023MT	MiX 424C-2G-B	MiX 4000 (Model 424C-2G) Electronic Unit with Battery plugged in and Magix 434MHz support. It contains the SARA-G350 modem.
U0024MT	MiX 424C-2G Kit	MiX 424C-2G (MiX 4000 2G) Kit: Contains Electronic Unit (U0022MT), Main Harness MP10 (440FT0033), and Code Plug Harness with Socket CP4 (440FT0032)

U0025MT	MiX 424C-2G-B Kit	MiX 424C-2G-B (MiX 4000 2G Battery) Kit: Contains Electronic Unit (U0023MT), Main Harness MP10 (440FT0033), and Code Plug Harness with Socket CP4 (440FT0032)
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Peripherals

Part ID	Picture	Official Name	Required / Optional	Description
440FT0033		Main Harness MP10	Required	Main Harness (Power, Ignition, Ground, Relay Socket, Buzzer, CAN Connector, 5V, 2 x Input, Positive Drive).
440FT0816		OBDII Main Harness MP4	Optional	Main Harness (Power, Ignition, Ground, Relay Socket, Buzzer, OBDII Connector, 2 x Input, Positive Drive).
440FT0931		Serial Harness SR1	Optional	Serial Harness (RX, TX, CTS, RTS, GND, DSR-DTR looped, RS232 with DB9 Male Connector).
440FT0032		Code Plug Harness with socket CP4	Optional	Code Plug Harness.
440FT0073		Driver Plug	Optional	Blue Driver Code plug.
440FT0933		External GNSS Antenna PA2	Optional	External GNSS (Global Navigation Satellite System) Antenna with FAKRA connector, compatible with MiX 4000 and MiX 6000 series.

General Information	
Communication	LTE CAT M1 or 2G or 3G(see list of variants above) Internal GSM antenna Over-the-air firmware downloads 20,000 buffered messages for data logging during coverage loss.
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 – Applicable to all variants unless otherwise specified	
General	
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: $\pm 2g/\pm 4g/\pm 8g/\pm 16g$
Dimensions	L = 94 mm (Length with FAKRA connector is 110 mm) W = 103 mm (Width with mounting ears is 116 mm) H = 36 mm
Weight	~156 g (with battery included: ~208 g)
Enclosure Material	Bayblend FR1514 (UL recognition 94 V-0 at 1.5 mm; flame retardant; Vicat/B 120 = 136°C; ball bend indentation temperature $\geq 125^\circ\text{C}$) (PC + ABS blend)
Environment	
Temperature	Standards: DIN EN 60068-2-1, DIN EN 60068-2-2 Recommended storage temperature: 0°C to $+45^\circ\text{C}$ Battery charging temperature: 0°C to $+45^\circ\text{C}$ Operating temperature with battery: -20°C to $+60^\circ\text{C}$ Operating temperature without battery: -25°C to $+85^\circ\text{C}$
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: $+55^\circ\text{C}$, - 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	
Primary power supply	Rated voltage (V_{nominal}): 10.5 to 33 VDC
Current consumption at 12V (primary side)	Out of trip: $< 20\text{ mA}$ (configurable) Airport Mode: $< 2\text{ mA}$ Drive / Recovery Mode: $< 180\text{mA}$, consumption depends on instantaneous conditions
Current consumption at 24V (primary side)	Out of trip: $< 15\text{ mA}$ (configurable) Airport Mode: $< 1.5\text{ mA}$ Drive / Recovery Mode: $< 70\text{mA}$, consumption depends on instantaneous conditions
Power consumption	$< 1800\text{ mW}$
Circuit protection	ISO7637-2 Over voltage rating: 56 V DC for 60 s
Reverse polarity protection	Standard: ISO7637-2 Reverse Polarity rating: -30 V for 60 s
Backup battery	3,2 V; 1600 mAh LiFePO4 Battery (60.5 x 50.5 x 6.5 mm) Backup period: $>24\text{ hours}$ in the absence of external power; *dependent on operational conditions
GNSS (Internal and External antennas)	
Receiver Type	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			
Protocols	NMEA, UBX binary and RTCM			
Operational limits	Dynamics: ≤ 4 g Velocity: 500 m/s Altitude: 50,000m (unpressurised) Velocity Accuracy: 0.05 m/s Heading Accuracy: 0.3 degrees			
A-GPS	Supports AssistNow Online and AssistNow Offline, OMA SUPL compliant			
Optional GNSS External Antenna				
Centre frequency	GNSS	BAND	FREQ	
	GPS	L1-C/A	1563MHz-1587MHz	
	Galileo	E1-B/C (E1 only, excluding E2)	1587-1591MHz	
	GLONASS	L1-OF	1593MHz - 1610MHz	
	BeiDou	B1i	1561.098MHz	
	QZSS	L1-SAIF	1575.42MHz	
Bandwidth	20 MHz min @ -10 dB			
Impedance	50 Ω			
VSWR	<1.5			
Peak Gain	4 dBic Min			
Polarization	RHCP			
Microprocessor				
Processor	STM32F2427IIH6			
Memory capability	2 MB Program space 256 + 4 kB of RAM 16 MB of SPI NOR FLASH			
Modem				
Variants	MiX 45MC-4G MiX 45MC-4G-B	MiX 44MC-3G MiX 44MC-3G-B	MiX 494C-2G MiX 494C-2G-B	MiX 424C-2G MiX 424C-2G-B
Modem	SARA-R410	SARA-U201	SARA-G450	SARA-G350
Description	LTE Cat M1	3G	2G	2G
Class	Power Class 3 (23 dBm)	WCDMA/HSDPA/HSUPA Power Class 3 (24 dBm) GSM/GPRS Power Class: Power Class 4 (33 dBm) for GSM/E-GSM bands Power Class 1 (30 dBm) for DCS/PCS bands Edge Power Class: Power Class E2 (27 dBm) for GSM/E-GSM bands Power Class E2 (26 dBm) for DCS/PCS	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.	Band III (1800 MHz), Band II (1900 MHz) Band V (850 MHz), Band VIII (900 MHz)
Band	FDD Band 12 (700 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)	3G: FDD Band 19 (850 MHz) FDD Band 5 (850 MHz) FDD Band 8 (900 MHz) FDD Band 2 (1900 MHz) FDD Band 1 (2100 MHz) 2G: GSM 850 MHz E-GSM 900 MHz DCS 1800 MHz PCS 1900 MHz	GSM 850 MHz E-GSM 900 MHz DCS 1800 MHz PCS 1900 MHz	GSM 850 MHz E-GSM 900 MHz DCS 1800 MHz PCS 1900 MHz

	FDD Band 25 (1900 MHz) FDD Band 1 (2100 MHz) TDD Band 39 (1900 MHz)			
Data transmission/ rate	LTE category M1: up to 375 kb/s UL up to 375 kb/s DL	3G: <u>PS (Packet Switched Mode)</u> HSUPA category 6, up to 5.76 Mbit/s UL HSDPA category 8, up to 7.2 Mbit/s DL WCDMA PS data, up to 384 kbit/s DL/UL <u>CS (Circuit Switched) data rate:</u> WCDMA PS data, up to 64 kbit/s DL/UL 2G: <u>PS (packet Switched) data rate:</u> GPRS multi-slot class 12, CS1-CS4 up to 85.6 kbit/s DL/UL EDGE multi-slot 12, MCS1-MCS9 up to 236.8 kbit/s DL/UL <u>Circuit switched data rate:</u> Up to 9.6 kb/s DL/UL ³ Transparent mode Non-transparent mode	<u>Pack switched Data Rate:</u> GPRS multi-slot class 12 ² Coding scheme CS1-CS4 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 configured 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	<u>Pack switched Data Rate:</u> GPRS multi-slot class 10 ⁴ Coding scheme CS1-CS4 Up to 85.6 kb/s DL ⁵ Up to 42.8 kb/s UL ⁵ <u>Circuit switched data rate:</u> Up to 9.6 kb/s DL/UL ⁵ Transparent mode Non-transparent mode ⁴ GPRS multi-slot class 10 implies a maximum of 4 slots in Down-Link (reception) and 4 slots in Up-Link (transmission) with 5 slots in total. ⁵ The maximum bit rate of the module depends on the current network settings
Protocol stack	3GPP Release 13	3GPP Release 7	3GPP Release 99	3GPP Release 99
Antenna type	16-band	Quad band		
Antenna	50 Ω			
General	Jamming detection Automatic thermal-shutdown			
SIM card				
Format	Nano (4FF)			
Bluetooth				
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				
Current specifications for relay coil	< 250mA (Max)			
Maximum continuous voltage on pin	33V			
Protection	Transients are clamped			
RS232 Ports				
Maximum speed	115200 kB/s (higher rates up to a maximum of 300 kB/s are possible with hardware flow control)			
Protection (Transient)	IEC1000-4-2 Air Discharge, 15kV, IEC1000-4-2 Direct Contact,8kV			
Protection (DC)	-12V , +12V			
I ² C Bus				
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 (RTC)	
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	
Analog inputs	2 x Analog inputs with 12-bit accuracy Voltages are measured in the two ranges: • 0 – 37.95 volts in steps of approximately 9.3 mV • 0 - 4.95 V in steps of 1.2 mV
Frequency inputs	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 output lines (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 > 100kΩ. Disconnection of this wire can be detected with open-wire detect
LED	
LED	1 Red LED (GSM) and 1 Green LED (GNSS) is available to provide feedback on the status of the unit
Buzzers	
Buzzer	1x Buzzer included in main harness

434 MHz Transceiver (MiX 45MC-4G and MiX 494C-2G 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 (MiX 45MC-4G variant)	
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 (LTE Cat M1)	MiX 4000 LTE (Model 45MC-4G) Electronic Unit	✓	✓	✓	✓
	MiX 45MC-4G-B	SARA-R410 (LTE Cat M1)	MiX 4000 LTE (Model 45MC-4G) Electronic Unit <u>with Battery</u> (plugged in)	✓	✓	✓	✓
	MiX 44MC-3G	SARA-U201	MiX 4000 3G (Model 44MC-4G) Electronic Unit	✓	✓		✓
	MiX 44MC-3G-B	SARA-U201	MiX 4000 3G (Model 44MC-4G) Electronic Unit <u>with Battery</u> (plugged in)	✓	✓		✓
	MiX 494C-2G	SARA-G450	MiX 4000 2G , based on same PCB as MiX 45MC-4G	✓			
	MiX 494C-2G-B	SARA-G450	MiX 4000 2G , based on same PCB as MiX 45MC-4G (<u>back up battery plugged in</u>)	✓			
	MiX 424C-2G	SARA-G350	MiX 4000 2G , based on same PCB as MiX 45MC-4G	✓			
	MiX 424C-2G-B	SARA-G350	MiX 4000 2G , based on same PCB as MiX 45MC-4G (<u>back up battery plugged in</u>)	✓			