POWERFLEET®
People Powered AIoT

Version 19

MiX 4000 MK3

Product Overview

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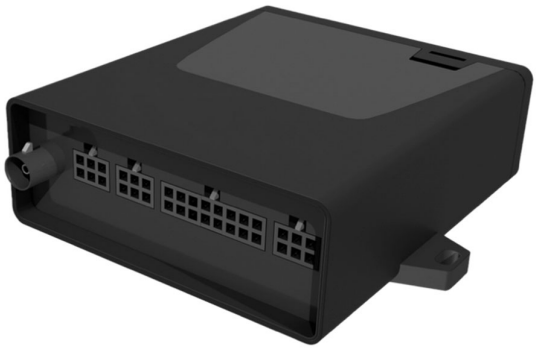
1 Overview

The MiX 4000 series is a Fleet Management product that 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 includes variants with LTE CAT1/CAT M1, with 2G fall-back modems. All these variants make use of the same PCB, the only difference is the modem to be populated.



Part Number	Official Product Name	Modem Type/Region	Description
U0071MT	MiX 4401	LTE Cat M1/2G (Global)	MiX 4401 Electronic Unit: Quectel BG96; MagiX 434MHz, 915MHz (for the North American AT&T network)
U0072MT	MiX 4000 Cat M1 Kit (ATT)		MiX 4000 Cat M1 Kit: Contains MiX 4401 Electronic Unit as well as A0059MT Main Harness MP22, 440FT0623 CODE PLUG SOCKET HARNESS+CLIP, 440FT0930 CODE PLUG HARNESS CP2 and 440FT0933 EXT GNSS Antenna
U0073MT	MiX 4401-B		MiX 4401 Electronic Unit with Backup Battery: Quectel BG96; MagiX 434MHz, 915MHz (for the Australian Telstra network)
U0074MT	MiX 4000 Cat M1 Battery Kit (TLA)		MiX 4000 Cat M1 Battery Kit: Contains MiX 4401 Electronic Unit with Backup Battery as well as A0059MT Main Harness MP22, 440FT0623 CODE PLUG SOCKET HARNESS+CLIP, 440FT0930 CODE PLUG HARNESS CP2 and 440FT0933 EXT GNSS Antenna (for Australia/NZ Telstra network)
U0138MT	MiX 4401 (VZN)		MiX 4401 Electronic Unit: Quectel BG96; MagiX 434MHz, 915MHz (for the North American Verizon network)
U0139MT	MiX 4000 Cat M1 Kit (VZN)		MiX 4000 Cat M1 Kit: Contains MiX 4401 (VZN) Electronic Unit as well as A0059MT Main Harness MP22, 440FT0623 CODE PLUG SOCKET HARNESS+CLIP, 440FT0930 CODE PLUG HARNESS CP2 and 440FT0933 EXT GNSS Antenna (for the North American Verizon network)
MiX 4412/-B is superseded by MiX 4452/-B			
U0075MT	MiX 4412	LTE Cat 1/2G (Region 1)	MiX 4412 Electronic Unit: Quectel EG912Y-EU; MagiX 434MHz

U0076MT	MiX 4000 Cat 1 Kit		MiX 4412 Kit: Contains MiX 4412 Electronic Unit (U0075MT) as well as A0059MT Main Harness MP22, 440FT0933-2 EXT GNSS ANT PA2, 440FT0623 CODE PLUG SOCKET HARNESS+CLIP, and 440FT0930 CODE PLUG HARNESS CP2
U0077MT	MiX 4412-B		MiX 4412 Electronic Unit with Backup Battery: Quectel EG912Y-EU; MagiX 434MHz
U0078MT	MiX 4000 Cat 1 Battery Kit		MiX 4000 Cat 1 Battery Kit: Contains MiX 4412 Electronic Unit with Backup Battery as well as A0059MT Main Harness MP22, 440FT0623 CODE PLUG SOCKET HARNESS+CLIP and 440FT0930 CODE PLUG HARNESS CP2
U0187MT	MiX 4452	LTE Cat 1/2G (Region 1)	MiX 4000 LTE Cat 1 with 2G fallback (EG915N-EA modem) Electronic Unit with MagiX 434MHz support
U0188MT	MiX 4000 Cat 1 Kit		MiX 4000 Cat 1 Kit: Contains MiX 4452 Electronic Unit as well as A0059MT Main Harness MP22, 440FT0623 CODE PLUG SOCKET HARNESS+CLIP and 440FT0930 CODE PLUG HARNESS CP2
U0189MT	MiX 4452-B		MiX 4000 LTE Cat 1 with 2G fallback (EG915N-EA modem) Electronic Unit with Backup Battery (plugged in) with MagiX 434MHz
U0190MT	MiX 4000 Cat 1 Battery Kit		MiX 4452-B Kit: Contains MiX 4452-B Electronic Unit (U0189MT) as well as A0059MT Main Harness MP22, 440FT0623 CODE PLUG SOCKET HARNESS+CLIP, 440FT0930 CODE PLUG HARNESS CP2, and EXT GNSS Antenna
U0127MT	MiX 4441	LTE Cat 1/2G (South America and Mexico)	MiX 4441 Electronic Unit: Quectel EG915U-LA; MagiX 434MHz, 915MHz
U0128MT	MiX 4000 Cat 1 (LA) Kit		MiX 4000 Cat 1 Kit: Contains MiX 4441 Electronic Unit as well as A0059MT Main Harness MP22, 440FT0623 CODE PLUG SOCKET HARNESS+CLIP and 440FT0930 CODE PLUG HARNESS CP2
U0129MT	MiX 4441-B		MiX 4441 with Backup Battery Electronic Unit: Quectel EG915U-LA; MagiX 434MHz, 915MHz
U0130MT	4000 Cat 1 (LA) Battery Kit		MiX 4000 Cat 1 Battery Kit: Contains MiX 4441 Electronic Unit with Backup Battery as well as A0059MT Main Harness MP22, 440FT0623 CODE PLUG SOCKET HARNESS+CLIP and 440FT0930 CODE PLUG HARNESS CP2

1.1.1 Peripherals

Part ID	Picture	Official Name	Required/ Optional	Description
A0059MT		Main Harness MP22	Required	Main Harness (Power, Ignition, Ground, Relay Socket, Buzzer, CAN Connector, 5V, 2 x Input, Positive Drive). Contains terminating resistors (P/N: A0060MT)
A0025MT		OBDII Main Harness MP14	Optional	Main Harness (Power, Ignition, Ground, Relay Socket, K-Line, Buzzer, OBDII Connector, 2 x Input, Positive Drive).
A0162MT		OBDII Main Harness MP27	Optional	OBDII Main Harness MP27 with T-type OBDII connector; Includes CAN terminating connectors (A0060MT); Compatible with MiX 4000 MK3 series
440FT0931		Serial Harness SR1	Optional	Serial Harness (RX, TX, CTS, RTS, GND, DSR-DTR looped, RS232 with DB9 Male Connector).
440FT0930		Code Plug Socket Harness CP2	Required (included in kit)	Code Plug Harness (1m).
440FT0623		Code Plug Socket Harness with circlip	Required (included in kit)	Code Plug Socket Harness (0.17 m).

440FT0073		Driver Plug Driver Plug	Optional	Blue Driver Code plug.
440FT0933 Alternative: A0151MT		External GNSS Antenna PA2 Alternative: Jinchang JCA201	Optional	External GNSS (Global Navigation Satellite System) Antenna with FAKRA connector.

2 General Information

Communication	LTE CAT M1 or LTE CAT1 (see list of variants above) Internal modem 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

3 Technical Specification

3.1 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: ±2g/±4g/±8g/±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 ≥ 125°C) (PC + ABS blend)

3.2 Environment

Temperature	Standards: DIN EN 60068-2-1, DIN EN 60068-2-2 Recommended storage temperature: 0°C to +45°C Battery charging temperature: 0°C to +45°C Operating temperature with battery: -20°C to +65°C Operating temperature without battery: -20°C to +85°C
IP Rating	IP40
Vibration	In accordance with ISO 16750-3:2007(E) for 8h 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 in all 3 perpendicular axes.

Mechanics: Free fall	DIN EN60068-2-32: According to automotive guidelines 3 drops from 1 m height (outside packaging)

3.3 Power Supply

Primary power supply	Rated voltage (Vnominal): 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
Current consumption at 24V (primary side)	In accordance with ISO 16750-3:2007(E) for 8h in each of the perpendicular axes. The vibration profile is as per table 14 of ISO16750-3:2007(E)
Power consumption	< 1800 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 hours* in the absence of external power; *dependent on operational conditions

3.4 GNSS (Internal and external antennas)

Receiver Type	MIA-M10Q Has a u-blox M10 receiver The MiX 4000 supports GPS L1C/A and GLONASS L1OF Extremely low power consumption (25mW)

Protocols	NMEA, UBX binary and RTCM
Operational limits	Dynamics: ≤ 4 g Velocity: 500 m/s Altitude: 80,000m (unpressurised) Velocity Accuracy: 0.05 m/s Heading Accuracy: 0.3 degrees
A-GNSS	Supports AssistNow Online and AssistNow Offline

3.5 Optional GNSS External Antenna with LNA

Centre frequency

GNSS	BAND	FREQ
GPS	L1-C/A	1563MHz-1587MHz
GLONASS	L1-OF	1593MHz - 1610MHz

Bandwidth	CF ±3MHz
Impedance	50 Ω
VSWR	<1.5
Peak Gain	30±2 dBic Min
Polarization	RHCP

3.6 Microprocessor

Processor	STM32F2427IIH6
Memory capability	2 MB Program space 256 + 4 kB of RAM 16 MB of SPI NOR FLASH

3.7 Modem

Variants	MiX 4401 MiX 4401-B	MiX 4412 MiX 4412-B	MiX 4452 MiX 4452-B	MiX 4441 MiX 4441-B
Modem	**BG96NOR FLAS**	**EG912Y-EU**	**EG915N-EA**	**EG915U-LA**
Description	LTE Cat M1/2G (Region 1&2&3)	CAT1/2G (Region 1&3)	CAT1/2G (Region 1&3)	CAT1/2G (Region 2)
Output Power Class	**LTE FDD:** Class 3 (23 dBm±2dB) **GSM850/EGSM900:** Class 4 (33 dBm±2dB) **DCS1800/PCS1900:** Class 1 (30 dBm±2dB) **GSM850/EGSM900 8-PSK:** Class E2 (27 dBm±3dB) **DCS1800/PCS1900 8-PSK:** Class E2 (26 dBm±3dB)	**LTE FDD/TDD:** Class 3 (23 dBm±2dB) **GSM850/EGSM900:** Class 4 (33 dBm±2dB) **DCS1800/PCS1900:** Class 1 (30 dBm±2dB) **GSM850/EGSM900 8-PSK:** Class E2 (27 dBm±3dB) **DCS1800/PCS1900 8-PSK:** Class E2 (26 dBm±3dB)	**LTE FDD/TDD:** Class 3 (23 dBm±2dB) **GSM850/EGSM900:** Class 4 (33 dBm±2dB) **DCS1800/PCS1900:** Class 1 (30 dBm±2dB) **SM850/EGSM900 8-PSK:** Class E2 (27 dBm±3dB) **DCS1800/PCS1900 8-PSK:** Class E2 (26 dBm±3dB)	**LTE-FDD:** Class 3 (23 dBm ±2 dB) **GSM850/EGSM900:** Class 4 (33 dBm ±2 dB) **DCS1800/PCS1900:** Class 1 (30 dBm±2dB)
Band	**LTE:** FDD Band 1 (2100 MHz) FDD Band 2 (1900 MHz) PCS FDD Band 3 (1800 MHz) FDD Band 4 (1700 MHz) AWS-1 FDD Band 5 (850 MHz) FDD Band 8 (900 MHz) FDD Band 12 (700a MHz) FDD Band 13 (700c MHz) FDD Band 18 (800 lower MHz) FDD Band 19 (800 upper MHz) FDD Band 20 (800 MHz) FDD Band 25 (1) (1900+ MHz) FDD Band 26 (2) (850+ MHz) FDD Band 28 (700 MHz) APT **2G:** PCS Band 2 (1900 MH) DCS Band 3 1800 MHz) GSM Band 5 (850 MHz) E-GSM Band 8 (900 MHz)	**LTE:** FDD Band 1 (2100 MHz) FDD Band 3 (1800 MHz) FDD Band 5 (850 MHz) FDD Band 7 (2600 MHz) FDD Band 8 (900 MHz) FDD Band 20 (800 MHz) FDD Band 28 (700 MHz) APT TDD Band 38 (TD 2600 MHz) TDD Band 40 (TD 2300 MHz) TDD Band 41 (TD 2600+ MHz) **2G:** PCS Band 2 (1900 MH) DCS Band 3 1800 MHz) GSM Band 5 (850 MHz) E-GSM Band 8 (900 MHz	**LTE:** FDD Band 1 (2100 MHz) FDD Band 3 (1800 MHz) FDD Band 7 (2600 MHz) FDD Band 8 (900 MHz) FDD Band 20 (800 MHz) FDD Band 28 (700 MHz) **2G:** DCS Band 3 1800 MHz) E-GSM Band 8 (900 MHz)	**LTE:** FDD Band 2 (1900 MHz) FDD Band 3 (1800 MHz) FDD Band 4 (1700 MHz) AWS-1 FDD Band 5 (850 MHz) FDD Band 7 (2600 MHz) FDD Band 8 (900 MHz) FDD Band 28 (700 MHz) APT FDD Band 66 (AWS-3 1700/2100 MHz) **2G:** PCS Band 2 (1900 MH) DCS Band 3 1800 MHz) GSM Band 5 (850 MHz) E-GSM Band 8 (900 MHz)

Data Transmission/ rate	**LTE FDD:** Max 375 Kbps (DL) / Max 375 Kbps (UL) **GPRS:** Max 107 Kbps (DL) /Max 85.6Kbps (UL) **EDGE:** 296 Kbps (DL) / 236.8 Kbps (UL)	**LTE:** FDD: Max 10 Mbps (DL) / **LTE TDD:** Max 8.96 Mbps (DL) / Max 3.1 Mbps (UL) Max 85.6 Kbps (DL) /Max 85.6Kbps (UL) **EDGE:** 236.8 Kbps (DL) / 236.8 Kbps (UL)	**LTE:** FDD: Max 10 Mbps (DL) / Max 5 Mbps (UL) **LTE TDD:** Max 8.96 Mbps (DL) / Max 3.1 Mbps (UL) **GPRS:** Max 85.6 Kbps (DL) /Max 85.6Kbps (UL) **EDGE:** 236.8 Kbps (DL) / 236.8 Kbps (UL)	**LTE FDD:** Max 10 Mbps (DL) / Max 5 Mbps (UL) **GPRS:** Max 85.6 Kbps (DL) /Max 85.6Kbps (UL)
Protocol stack	3GPP E-UTRA Release 13	3GPP E-UTRA Release 9	3GPP E-UTRA Release 9	3GPP E-UTRA Release 13
Antenna	50 Ω			
General	Jamming Detection Automatic thermal-shutdown			Automatic thermal-shutdown

3.8 SIM Card

Format	STM32F2427IIH6

3.9 Bluetooth

Module	nRF52832 (Nordic)
Features	2.4 GHz transceiver • -96 dBm sensitivity in Bluetooth® low energy mode • Supported data rates: 1 Mbps, 2 Mbps Bluetooth® low energy mode • 5.3 mA peak current in TX (0 dBm) • 5.4 mA peak current in RX • RSSI (1 dB resolution)
Power	-20 to +4 dBm TX power, configurable in 4 dB steps

3.10 Relay Circuit

Current specifications for relay coil	< 250mA (Max)
Maximum continuous voltage on pin	33V
Protection	Transients are clamped

3.11 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

3.12 K-line

Maximum speed	10400 kB/s
	Dedicated K-line interface suitable for interfacing with older vehicles and DTCOs. K-line uses a single physical wire for data transmission.

3.13 I^2C 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

3.14 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°C to +70°C

3.15 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 > 100kOhm Disconnection of this wire can be detected with open-wire detect
5V Auxiliary Output	400mA max

3.16 LED

Function	1 Red LED (GSM) and 1 Green LED (GNSS) provide feedback on the status of the uni

3.17 Buzzers

Function	1x Buzzer included in main harness provides audible feedback

3.18 MagiX: 434 MHz Transceiver (MiX 4412/-B, MiX 4452/-B, and MiX 4401/-B)

3.18.1 RF Transceiver

Receiver frequency:	434.3 MHz
Frequency deviation:	10 kHz
RF Bandwidth:	39.2 kHz
RF Radiated Output Power:	10 mW max
Modulation:	2 Level FSK
Data rate:	19200bps

3.19 MagiX 915 MHz Transceiver (not on MiX 4412 / MiX 4412-B/MiX 4452/MiX 4452-B)

3.19.1 RF Transceiver

Receiver frequency:	915 MHz
Channel spacing:	400kHz
Channel 1:	902.2MHz
RF Radiated Output Power:	50 mW max
Modulation:	2 Level FSK
Data rate:	19200bps

4 Statutory and Regulatory

4.1 California Proposition 65

CALIFORNIA PROPOSITION 65

WARNING

This product can expose you to chemicals including Carbon black and Nickel, which are known to the State of California to cause cancer, and including Bisphenol A and 1,3-Butadiene, which are known to the State of California to cause birth defects or other reproductive harm.

For more information go to www.P65Warnings.ca.za

4.2 Compliance

Modem	Technology	Model	Description	Region	Type/Network Approvals
BG96	LTE Cat M1/2G	MiX 4401	MiX 4401 Electronic Unit: Quectel **BG96**; Dual MagiX 434MHz, 915MHz	Global (LTE Cat M1/2G)	E11 FCC/PTCRB Network: AT&T and Verizon
		MiX 4401-B	MiX 4401 Electronic Unit with Backup Battery: Quectel **BG96**; Dual MagiX 434MHz, 915MHz	Australia/NZ	E11 RCM (U0074MT) Network: Telstra
EG912Y-EU	LTE CAT1/2G	MiX 4412	MiX 4412 Electronic Unit: Quectel **EG912Y-EU**; MagiX 434MHz	Africa ME	E11/UKCA ANATEL ICASA
		MiX 4412-B	MiX 4412 Electronic Unit with Backup Battery: Quectel **EG912Y-EU**; MagiX 434MHz		E11/UKCA ICASA, ANATEL, UAE, India, Ghana, Uganda, Kenya, Nigeria and Kazakhstan
EG915N-EA	LTE CAT1/2G	MiX 4452	MiX 4452 Electronic Unit: Quectel **EG915N-EA**; MagiX 434MHz	Europe Africa MEA	CE/E11/UKCA ICASA
		MiX 4452-B	MiX 4452 Electronic Unit with Backup Battery: Quectel **EG915N-EA**; MagiX 434MHz		
EG915U-LA	LTE CAT1/2G	MiX 4441	MiX 4441 Electronic Unit: Quectel **EG915U-LA**; MagiX 434MHz, 915MHz	LATAM & Mexico	ANATEL RAMATEL Chile Suriname Ecuador Uruguay Peru Colombia Bolivia Mexico
		MiX 4441-B	MiX 4441 with Backup Battery Electronic Unit: Quectel **EG915U-LA**; MagiX 434MHz, 915MHz		ANATEL Peru Colombia