SATEL®

SATELLINE®-M3

Radio Transceiver Module

SATELLINE-M3 uses
15 pin female D connector

The SATELLINE-M3 is a small and light-weight radio modem designed for integration into the user's terminal equipment. The modem and transceiver are enclosed in a steel or aluminium housing, depending on the frequency range selected. All the applicable radio, EMC and electrical safety requirements are met without any additional casing.

Depending on the specific requirements of the application, the user of the SATELLINE-M3 has available a number of options related to the technical specifications and functions of the radio transceiver module.

The selection of frequency ranges is ample: in addition to the ordinary UHF ranges between 330 and 470 MHz, VHF ranges 135–174 MHz or 218–238 MHz and the European licence-free 869 MHz band are available. The optional frequency ranges as well as the materials and connector types of the module housing are presented in the Selections table below.

The choice of frequency range influences the functionality of the module. A transceiver module operating on

the 869 MHz band is subject to restrictions on transmitter power and duty cycle. The SATELLINE-M3 operated on the VHF range is a remotely adjustable radio transceiver module controlled through the Master Station by the dedicated SATEL NMS software. In addition to ordinary communication functions, the NMS system offers configuration through radio, efficient diagnostics of the operating status of the radio module, and accumulation of operation statistics data.

In industrial applications, the SATELLINE-M3 is typically mounted inside an instrumentation cabinet equipped with a PLC and power supply, for example.

A SATELLINE-M3 transceiver module is compatible with other modules and SATELLINE-3AS(d) and Epic radio modems operated on the same frequency range.

SATEL Oy keeps developing and extending the list of transceiver module options. For the latest information, please visit our website or contact us or our local representative.

SATELLINE-M3
Radio Transceiver Module

Available options for SATELLINE-M3

Type and frequency range	UHF, 330-470 MHz *1)	UHF, 869 MHz	VHF, 135-174 MHz / 218-238 MHz *2)
Channel spacing	12.5 / 20 / 25 kHz	25 kHz	12.5 / 25 kHz
Antenna connector	TNC / SMA	TNC	TNC
Housing / casing material	Stainless Steel	Stainless Steel	Aluminium

*1) PCC compatible version available, in order to get more information please be in touch with your local SATEL distributor.

*2) TX duty cycle 70 % @ 1 min

Technical specifications for SATELLINE-M3

Type and frequency range	UHF, 330-470 MHz *1)	UHF, 869 MHz	VHF, 135-174 / 218-238 MHz *2)
Complies with the following international standards	• EN 300 113-1 (radio requirements) • EN 301 489-1, -5 (EMC requirements, applicable parts) • EN 60950 (Electrical safety requirements, applicable parts)	• EN 300 220-1 (radio requirements) • ETS 300 683 (EMC requirements, applicable parts)	• CFR47 part 90 • EN 300 220 at 25 kHz channel spacing • EN 300 113 at 12,5 kHz channel spacing • EMC standard EN 301 489 • Safety standard EN 60950

RADIO TRANSCEIVER

Frequency Stability	< ± 1.5 kHz	< ± 2.5 kHz	< ± 1 kHz
Type of Emission	F1D		
Communication Mode	Half-Duplex		

RADIO TRANSMITTER

Carrier Power	10 mW…1 W / 50 Ω	10 mW… 500 mW / 50 Ω	100 mW, 500 mW, 1 W/50 Ω
Carrier Power Stability	+ 2 dB / - 3 dB		

RADIO RECEIVER

Sensitivity (BER < 10 E-3)	-115 dBm @ 12.5 kHz (FEC ON)	-108 dBm @ 25 kHz (FEC ON)	-115 dBm @ 12.5 kHz (FEC ON)
Common Channel Rejection	> - 12 dB		> - 12 dB / -8dB
Adjacent Channel Selectivity	> 60 dB @ 12.5 kHz, > 70 dB @ 25 kHz	> 60 dB @ 25 kHz	> 60 / 70 dB
Intermodulation Attenuation	> 65 dB	> 60 dB	> 60 / 65 dB
Spurious Radiations	< 2 nW		

MODEM

Serial Interface	RS-232 / RS-485 / RS-422		
Serial Connector	D15, female		
Data Speed of Serial Interface	300–38 400 bps		
Data Speed of Radio Interface	19 200 bps (25 kHz channel) 9 600 bps (12.5 kHz channel)	19 200 bps (25 kHz channel)	19 200 bps (25 kHz channel) 9 600 bps (12.5 kHz channel)
Data format	Asynchronous RS-232 / RS-485 / RS-422		

GENERAL

Operating Voltage	+9.0…+30 VDC		
Power Consumption (average)	1.1 W (Receive) 5.0 W (Transmit) 0.05 W (in Standby Mode)	1.2 W (Receive) 3.6 W (Transmit) 0.05 W (in Standby Mode)	1.7 W max (Receive) 6.6 W max (1W Transmit) 0.05 W typical (when DTR is "0")
Temperature ranges			
Operating	-25 °C …+55 °C (tests acc. to ETSI standards) -40 °C …+75 °C (absolute minimum / maximum)		
Storage	-40 °C …+85 °C		

*1) PCC compatible version available, in order to get more information please be in touch with your local SATEL distributor.

*2) TX duty cycle 70 % @ 1 min

SATELLINE®-M3EC

Radio Transceiver Module

The SATELLINE-M3EC is a radio module consisting of a data modem and a UHF radio transceiver in a light-weight double PCB structure which conforms to the Eurocard Type B standard. The transceiver module was designed for integration into the user's terminal equipment.

The circuit blocks of the SATELLINE-M3EC are shielded by metal plates. The module is, however, subject to mechanical shocks, and is therefore to be mounted inside an instrumentation cabinet supplied by the user.

Implementation of the SATELLINE-M3EC module is similar to the SATELLINE-M3EC radio modem. The software of the radio module includes a set of auxiliary SL commands providing full control of the module functions in integrated use.

The SATELLINE-M3EC is compatible with the SATELLINE-3AS(d) and Epic radio modems and the SATELLINE-M3 and M3RM radio modules.

32-pin Eurocard connector type B
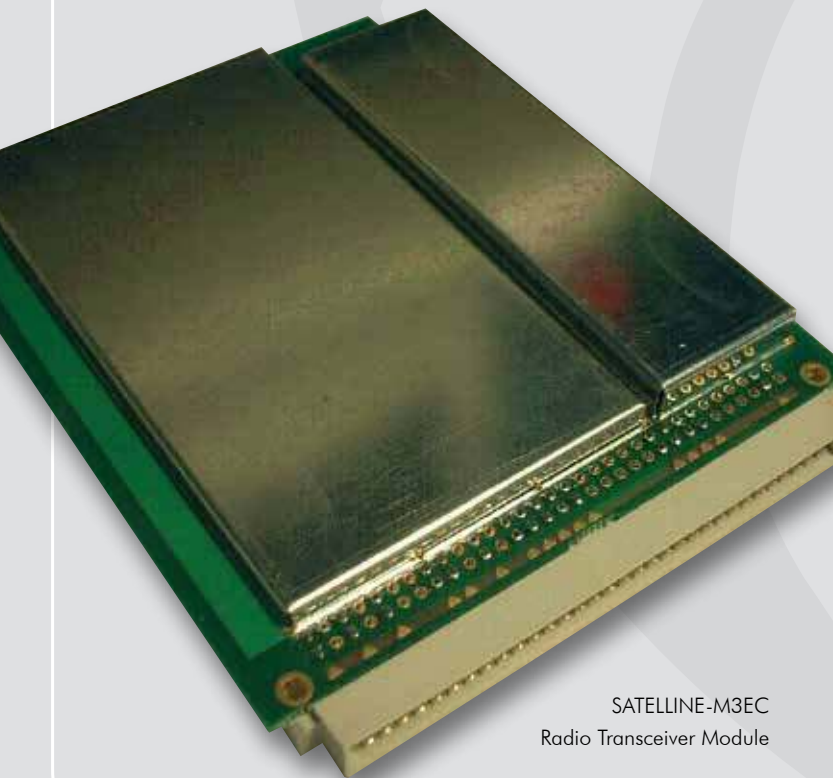
SATELLINE-M3EC
Radio Transceiver Module

Technical specifications

Complies with the following international standards:
• EN 300 113 (radio requirements)
• EN 301 489-1, -5 (EMC requirements, applicable parts)
• EN 60950 (Electrical safety requirements, applicable parts)
Note: The client is responsible for the final level of EMC and electrical safety characteristics in their product assembly.

RADIO TRANSCEIVER

Frequency Range	370–470 MHz
Channel Spacing	12.5 kHz / 25 kHz
Number of Channels	160 / 80 or (2 x 160 / 2 x 80)
Frequency Stability	< ± 1.5 kHz
Type of Emission	F1D
Communication Mode	Half-Duplex

RADIO TRANSMITTER

Carrier Power	10 mW...1 W / 50 Ω
Carrier Power Stability	+ 2 dB / - 3 dB

RADIO RECEIVER

Sensitivity settings (BER < 10 E-3)	- 115 dBm @ 12.5 kHz (FEC ON)
Common Channel Rejection	> - 12 dB
Adjacent Channel Selectivity	> 60 dB @ 12.5 kHz, > 70 dB @ 25 kHz
Intermodulation Attenuation	> 65 dB

MODEM

Serial Interface	RS-232
Serial Connector	32-pin Eurocard connector type B
Data Speed of Serial Interface	300 – 38 400 bps
Data Speed of Radio Interface	19 200 bps (25 kHz channel) 9 600 bps (12.5 kHz channel)
Data format	Asynchronous RS-232

GENERAL

Operating Voltage	+6.3...+14.0 VDC
Power Consumption (average)	1.7 VA (Receive) 5.5 VA (Transmit) 0.05 VA (in Standby Mode)
Temperature ranges	
Operating	-25 °C...+55 °C (tests acc. to ETSI standards) -40 °C...+75 °C (absolute minimum / maximum)
Storage	-40 °C...+85 °C
Antenna Connector	MMCX, 50 Ω, female
Housing	SATELLINE-M3EC is delivered without the housing. The component blocks on the PCB are covered by metal shields
Size H x W x D	13 x 100 x 123.5 mm
Weight	140 g

SATELLINE®-M3-TR3

Radio Transceiver Module

The SATELLINE-M3-TR3 is a small radio transceiver module in a lightweight single PCB structure. It is designed to be integrated into a host device, for instance for transfer GNSS correction data in a land surveying rover or RTK base station.

SATELLINE-M3-TR3 is equipped with all necessary features; such as 70 MHz tuning range (403...473 MHz) in one hardware, selectable channel width, AES128-bit encryption available for secure transmission and low power consumption. 1W output power in conjunction with a very sensitive receiver are the guarantee of a reliable data connection.

The configuration of the radio module can be made by using the SATEL SL-commands or SATEL Configuration Manager -software.

SATELLINE-M3-TR3 is compatible with widely used SATELLINE-3AS and -EASy radio modems and also with other manufacturers' radio protocols.

Technical specifications

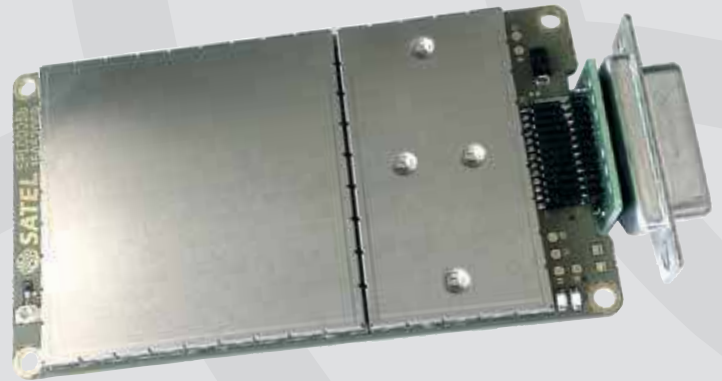| Complies with the following international standards: • EN 300 113-2 (radio requirements) • EN 301 489-1, -5 (EMC-requirements) • EN 60950-1 • FCC CRF47 Part 90	
TRANSCEIVER MODULE	
Frequency Range	403–473 MHz
Tuning Range	70 MHz
Channel Spacing	12.5 / 25 kHz software derived
Frequency Control	Synthesized 6.25 kHz tuning resolution
Modulation	4FSK, GMSK
Sensitivity (BER < 10 E-3)	-116 dBm (SATEL 3AS mode, 12.5 kHz, FEC ON)
Carrier Power	0.1, 0.2, 0.5, 1 W programmable
DATA MODEM	
Electrical Interface	CMOS-UART
Interface Connector	1.27 mm pitch socket
Data Speed of Serial Interface	1200–115200 bps
Data Speed of Radio Interface	19 200 bps (25 kHz channel) 9 600 bps (12.5 kHz channel)
Air Interface Encryption	AES128
GENERAL	
Operating Voltage	+4 VDC
Power Consumption (average)	0.73 W (Receive) 4.7 W (Transmit)
Temperature Range	
Operating	-25 °C…+55 °C (tests acc. to ETSI standards) -30 °C…+70 °C (functional)
Storage	-40 °C…+80 °C
Antenna Connector	HIROSE U.FL compatible type (Adapter cables available for TNC, SMA, MCX, MMCX)
Construction	PCB with RF-shielding
Size H x W x D	57 x 36 x 6.7 mm
Weight	18 g

SATELLINE®-M3-TR1

Radio Transceiver Module

SATELLINE-M3-TR1 radio transceiver module has been designed to operate on the wide 403...473 MHz frequency range, offering for use the whole 70 MHz tuning range. The M3-TR1 is a flexible product, enabling many user choices for its functioning and construction. It can be supplied without a housing as a small-size module or in an aluminium housing. Customer can also specify the interface connector type to be D15 female, 26-pin male strip or 26-pin female socket. The antenna connector can be TNC, SMA, MCX or MMCX. The applicable serial interfaces for M3-TR1 are RS-232, RS-422, LVTTL or TTL.

The available operating voltage has an effect on the choice of system components. This has been taken into account when designing SATELLINE-M3-TR1; this model has two operating voltage levels +3 ... +9 VDC and +6 ... +30 VDC. The level can be changed by replacing the PWR module.

To offer the user more flexibility, M3-TR1 is compatible with the widely used SATELLINE-3AS and -EASy radio modems and can also be included in systems based on other manufacturers' protocols. All the channel spacings 12.5, 20 and 25 kHz are software-selectable and thanks to good receiver sensitivity, the output power of 1 W enables a long radio range.

SATELLINE-M3-TR1
without housing

Technical specifications

Complies with the following international standards:
• EN 300 113-2 (radio requirements)
• EN 301 489 (EMC requirements, applicable parts)
• EN 60950 (Electrical safety requirements, applicable parts)
• FCC CFR47 Part 90

RADIO TRANSCEIVER	
Frequency Range	403...473 MHz
Tuning Range	70 MHz
Channel Spacing	12.5 kHz / 20 kHz / 25 kHz (SW selectable)
Sensitivity BER < 10E-3	-114 dBm (FEC ON)
Power Consumption, Typical	<1.2 W (Receive) 3 W @ 0.5 W output power 7 W @ 1 W ouput power
Carrier Power	100, 200, 500, 1000 mW

DATA MODEM	
Electrical Interface	Port1 fixed: RS-232 Port2 options: LVTTL, TTL or RS-232 / 422 (Port2 RS-232 / 422 is programmable)
Interface Connector	D15 female, 26-pin male strip, 26-pin female socket
Data Speed of Radio Interface	19200 bps @ 25 kHz 9600 bps @ 12.5 / 20 kHz
Data Format	Asynchronous data
Modulation	4FSK, GMSK

GENERAL	
Operating Voltage	+3 ... +9 Vdc or +6 ... +30 Vdc
Temperature Range	-25 °C…+55 °C complies with the standards -30 °C…+65 °C functional -40 °C…+80 °C storage
Antenna Connector	TNC, SMA, MCX, MMCX
Construction	Aluminium, Stainless Steel or without housing
Size L x W x T	89 x 49 x 9 mm PCB format
Weight	50 g PCB format

SATELLINE®-R3

Radio Receiver Module

The SATELLINE-R3 is a UHF data received module in a lightweight single PCB structure. It is designed to be integrated into a host device, fos instance land surveying rover for receiving GNSS correction data.

SATELLINE-M3-R3 is amazingly small (36x56 mm) and light (18 g) which makes it smaller than a matchbox. In spite of its small size M3-R3 is very sensitive and high quality, disturbance immune receiver with all necessary features; such as wide 70 MHz tuning range, selectable channel width (12.5 and 25 kHz) and it should not come as a surprise to anyone that its power consumption is also incredibly low.

The configuration of the radio module can be made by using the SATEL SL-commands or SATEL Configuration Manager -software.

SATELLINE-M3-R3 is compatible with widely used SATELLINE-3AS and -EASy radio modems and also with other manufacturers' radio protocols.

SATELLINE-M3-R3

Technical specifications

Complies with the following international standards:
• EN 300 113-1 (radio requirements)
• EN 301 489-1, -5 (EMC requirements, applicable parts)
• EN 60950 (Electrical safety requirements, applicable parts)
• FCC CFR47 Part 15

RECEIVER MODULE

Frequency Range	403...473 MHz
Tuning Range	70 MHz
Channel Spacing	12.5 kHz / 25 kHz (SW selectable)
Frequency Control	Synthesized 6.25 kHz tuning resolution
Modulation	4FSK, GMSK
Sensitivity BER < 10E-3	> -114 dBm (FEC ON)

DATA MODEM

Serial Interface	CMOS-UART
Serial Connector	1.27 mm pitch socket
Data Speed of Radio Interface	19200 bps @ 25 kHz channel 9600 bps @ 12.5 kHz channel 4800 bps @ 6.25 kHz channel

GENERAL

Operating Voltage	+4 Vdc
Power Consumption, Typical	0.5 W (Receive)
Temperature Range	-25 °C…+55 °C complies with the standards -30 °C…+70 °C functional -40 °C…+80 °C storage
Antenna Connector	HIROSE U.FL (Adapter cables available for TNC, SMA, MCX, MMXC)
Construction	PCB with RF-shielding
Size L x W x T	56 x 36 x 6 mm (w screw fasteners) 43 x 36 x 6 mm (w/o screw fastening)
Weight	18 g

Comparison table for technical specifications

	M3	M3EC	M3-TR3	M3-TR1	M3-R3
FREQUENCY RANGE					
UHF 330-470 MHz	•				
UHF 370-470 MHz		•			
UHF 403-473 MHz			•	•	•
UHF 869 MHz	•				
VHF 135-174 / 218 -238 MHz	•				
CHANNEL SPACING					
12.5 kHz	•*	•	•	•	•
20 kHz	•*	•		•	
25 kHz	•*	•	•	•	•
CARRIER POWER / 50 ohm	10mW…1W*	10mW…1W	10mW…1W	0.1…1 W	
INTERFACE					
RS-232	•	•		•	
RS-422 / RS-485	•			(RS-422)	
LV-TTL / CMOS			•	•	•
INTERFACE CONNECTOR					
D15 female	•			D-15 or customer specified	
D15 male					
32-pin Eurocard type B		•			
1.27mm pitch socket			•		•
OPERATING VOLTAGE VDC	+9…+30	+6.3…+14	+4	+3…+9 or +6…+30	+4 Vdc
SENSITIVITY DBM (BER<10 E-3)	-115 dBm* (FEC ON)	-115 dBm (FEC ON)	-116 dBm (FEC ON)	-114 dBm (FEC ON)	> -114 dBm (FEC ON)
ANTENNA CONNECTOR					
TNC	•			•	
SMA	•			•	
MCX				•	
MMCX		•		•	
U.FL compatible			•		•
SIZE H x W x D	Depends on the housing material	100 x 123.5 x 13 mm	57 x 36 x 6.7 mm	89 x 49 x 9 mm	56 x 36 x 6 mm
WEIGHT		140 g	18 g	50 g	18 g
STORE & FORWARD FUNCTION	•	•	•	•	
COMPATIBILITY WITH SATELLINE-3AS AND -EASy	•	•	•	•	•
COMPLIES WITH STANDARDS					
ETS 300 113	•*	•	•	•	•
EN 300 220-1	•*				
EN 301 489	•*	•	•	•	•
FCC CRF47 Part 90	•*		•	•	
EN 60950	•*	•	•	•	•
FCC CFR47 Part 15					•

* Depends on the frequency used

Masters in wireless data communication

SATEL Oy is a Finnish electronics and telecommunications company that specialises in the design, manufacturing and international marketing of radio modems for data communication and alarm transfer. We are a leading supplier in Europe, and are currently extending our business into other market areas.

One of the cornerstones of SATEL's success is the experienced personnel, many of whom have devoted a major part of their working lives to wireless data communications technology. Our product development team, in particular, is known for its innovativeness and efficiency. Consequently, SATEL possesses the world's widest selection of products in its field.

SATEL Products Ensure Reliable Data Transfer

Every SATEL radio modem is designed and manufactured in Finland and those are used in a variety of applications worldwide. SATELLINE radio modems are used at airports for different monitoring and control applications, in industrial plants to set up internal data transfer networks and in cities for monitoring and traffic control. SATELLINE radio modems have been used, for example, to set up citywide alarm transfer networks and location data based traffic monitoring systems to enable smoother running of public transport and accurate timetable information at bus stops.

Because of the diversity of the applications, SATEL has adapted the policy of providing every product with a reasonable number of parallel versions. Our mission is to help our customers solve their local area data communication problems. This is why we are always open to the response and wishes from our customers.

Please feel free to contact your local SATEL distributor or us to discuss of the existing customer specific products and your specify need. To locate your nearest SATEL distributor please visit http://www.satel.com/where-to-buy

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