METERING

ECOBox R-SIL

TCMS Interface for railways application

ECOBOX-RSIL is a device with SIL2 functions interfaced with the ECOMETER sensor family to receive real time voltage and current measurements and convert to requested analogue signal to interface with traction control unit and other train system. The one-way communication between the ECOMETER and the ECOBOX-RSIL is by optical fibre and by high-speed serial electrical interface.

The SIL2 safety level is related to the following functions and obtained in bundle with the ECOMeter:

- Catenary detection
- Short circuit detection
- Harmonics detection
- Analog output ripple detection

Key features of the device are high accuracy, slow time delay of provided data information, flexibility in configure the output signals and easy integration.

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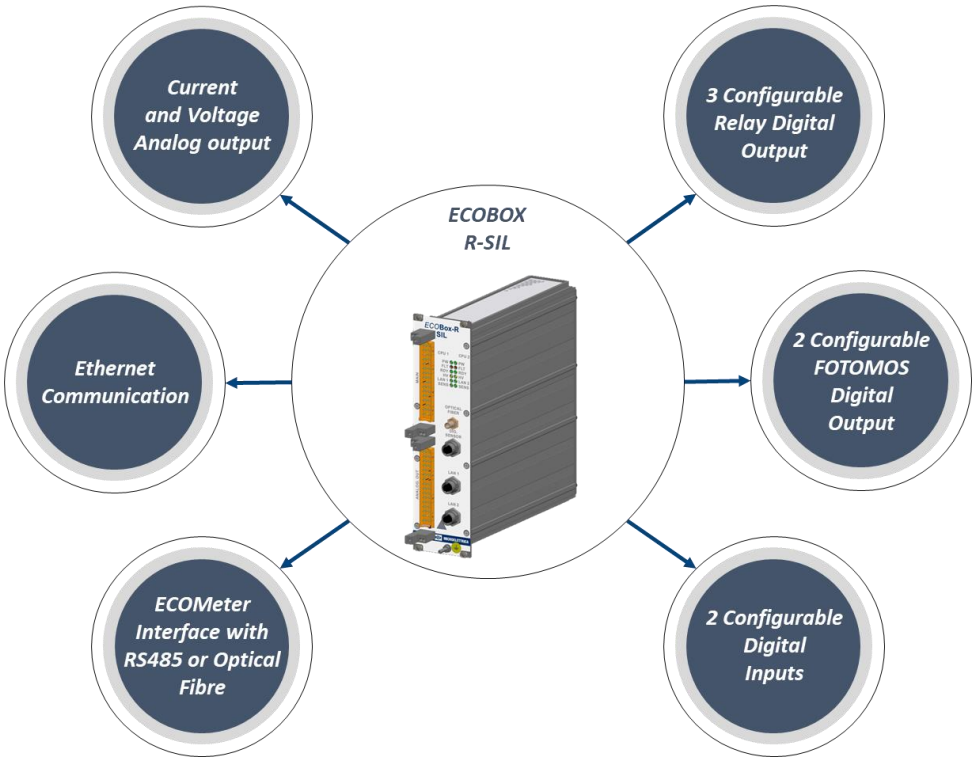
Characteristics

Mechanical Characteristics	Value	Reference
Metal Box	Rack type 6U - 14TE	
Weight	2,000 kg	
Fire and smoke class	Table 2 EL10 and Table 5 HL3	EN45545-2
Protection class	IP 40	EN60529
Insulation Coordination	**Value**	**Reference**
Over Voltage Degree	OV2	EN 50124-1
Pollution degree	PD2	
Auxiliary Power Supply	**Value**	**Reference**
Nominal supply voltage	24÷110 Vdc	
Power supply interruptions	Class S2	EN50155
Power supply change over	Class C2	
Power consumption	<20W	
Rated current (@ 24V and @ 25°C)	0,56 A	
Inrush current (@ 24V and @ 25°C)	12 A peak (over rated current for 20 ms)	
Environmental Conditions	**Value**	**Reference**
Maximum transverse acceleration class	GTX	EN 50125-1
Maximum longitudinal acceleration class	GL2	
Ambient temperature	TX range	EN 50155 EN 50125-1
Temperature yearly average	45°C	
Temperature variation	±3°C/s	
Altitude	Class AX - Up to 1800 m	EN50125
Average yearly relative humidity	h<75%	EN 50125-1
Continuous relative humidity	30 days 75% < h < 95%	
Absolute maximum humidity	30 g/m3	
Shocks and vibrations	Cat. 1 – Class B	EN 61373

Inputs/Output



Digital Input

There are two digital inputs for configurable different purpose. Usually those inputs are used to set the parameters of the ECOBox R-SIL with respect to the country in which the train is running (for the harmonic detection) or for example to let ECOBox know if the train is working with single or multiple traction.

Ethernet Communication

Two Ethernet communication ports are available and dedicated to the data transfer to the train communication network and diagnostic purpose. Mechanisms of protection and security can be applied to ensure both the integrity and the management of data transmitted over the line. Data exchange with TCMS is foreseen according to protocol specification to be defined.

Optical Fibre - High Speed Serial Communication

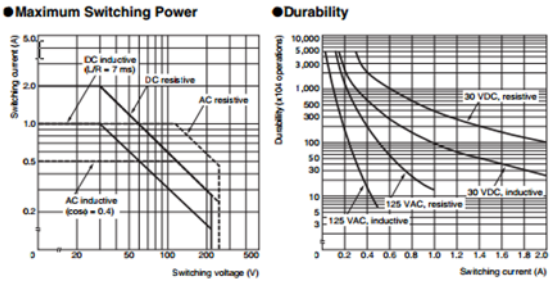
One optical fibre and one serial "digital sensor" at RS485 communication level are available to interface the ECOBox R-SIL with the ECOMeter. Optical fibre and digital sensor can be used both together or independently. The maximum cable length allowed in case of RS485 communication is 4m.

Relay and Solid State Digital Output

The ECOBox R-SIL provides 3+3 relays output to let available the detected catenary types and 1 relay for the device status. The following figure shows the main characteristics of the used relays.

●Contacts

Load / Item	Resistive load	Inductive load (cosϕ = 0.4; L/R = 7 ms)
Contact type	Bifurcated crossbar	
Contact material	Ag (Au-Alloy) contact	
Rated load	0.5 A at 125 VAC; 2 A at 30 VDC	0.3 A at 125 VAC; 1 A at 30 VDC
Rated carry current	3 A	
Max. switching voltage	250 VAC, 220 VDC	
Max. switching current	2 A	1 A



The ECOBox R-SIL provides also 1+1 fotomos clean contact solid state NO output with current output less than 70mA and 1+1 mosfet solid state NO output with current output less than 2A.

Current Analogue Output

Characteristic description	Values / remarks
Number of Current Analogue Outputs	4 independent channels
Maximum Output Current	CH1 and CH2 – 50 mA peak (200 mA peak as option) CH3 and CH4 – 50 mA peak
Load resistance for current output	100 Ω maximum for output 0÷50mA 40 Ω maximum for output 0÷200mA
Accuracy	< 1% (option 0,5R)
Bandwidth	Up to 10kHz

Voltage Analogue Output

Characteristic description	Values / remarks
Number of Voltage Analogue Outputs	4 duplicated channels
Maximum Output Voltage	200 V peak
Maximum Load (summary of all replicated outputs)	15mA peak at 200V peak
Accuracy	1,0R according to EN50463
Bandwidth	Up to 5kHz with software filter

Specific Application Requirements

Catenary Detection – SIL2

ECOBox R-SIL can detect the catenary connected to the ECOMeter and provide feedback through the digital outputs and eventually also by Ethernet communication through TRDP protocol.

Overcurrent Detection – SIL2

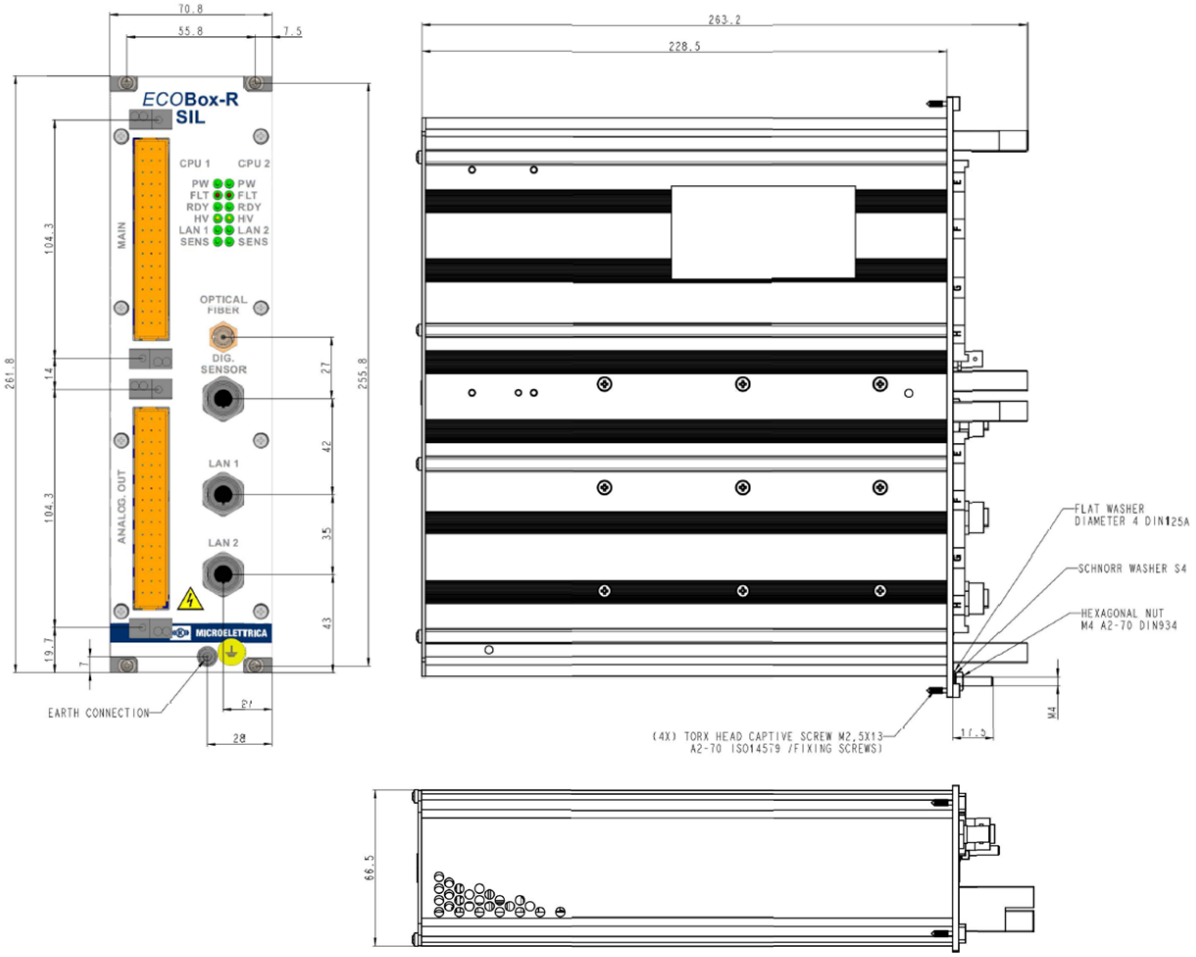
The overcurrent can be detected by the ECOBox R-SIL with the following options:

- AC/DC Fast Overcurrent Detection – Useful to drive the train VCB in case of short-circuit
- AC/DC Slow Overcurrent Detection – Useful to protect the system against overloads

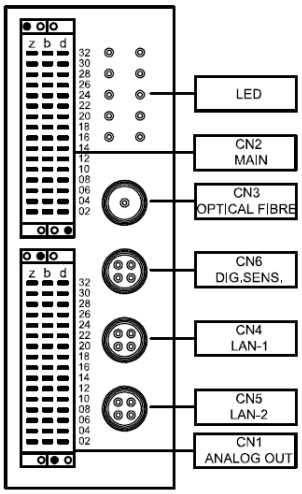
Harmonic Detection – SIL2

Harmonic detection function is one of the main features of the ECOBox R-SIL, different software filter can be implemented with order up to 8^{th} to detect the harmonics according to the specific national standards.

Dimension



Example of connection layout



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