

# VISUALISATION SOLUTIONS AND SPEED INDICATORS

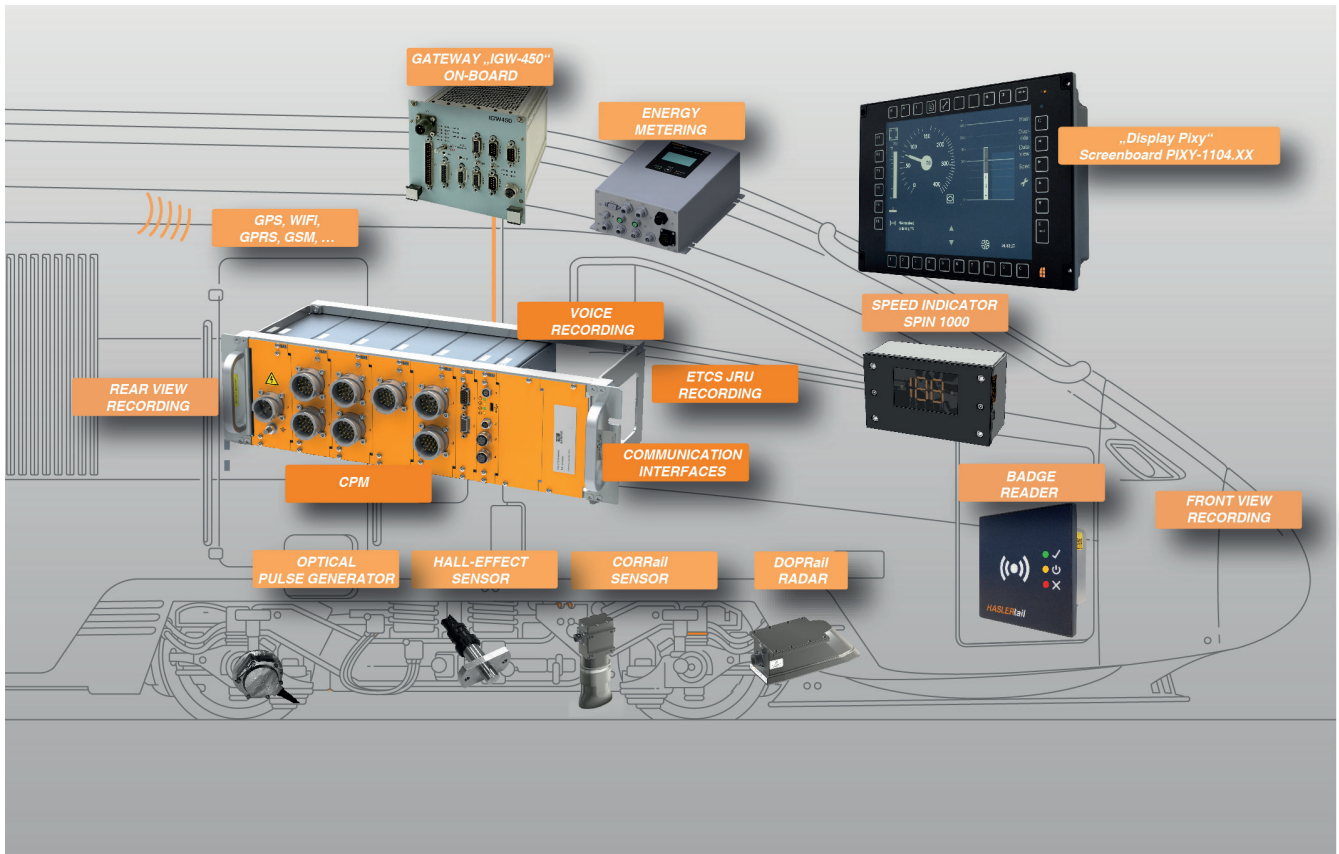
DIGITAL SPEED INDICATORS  
**SPIN 1000**



## Spin 1000

With the SPIN 1000, HaslerRail AG has fulfilled the wish to have a simple speed indicator available displaying the current speed from a single speed sensor. As an interface a pulse input (dual channel or quadrature) is supported, as well as a RS 485 serial input. Optional a digital input can be used to turn the display on and off.

## System overview



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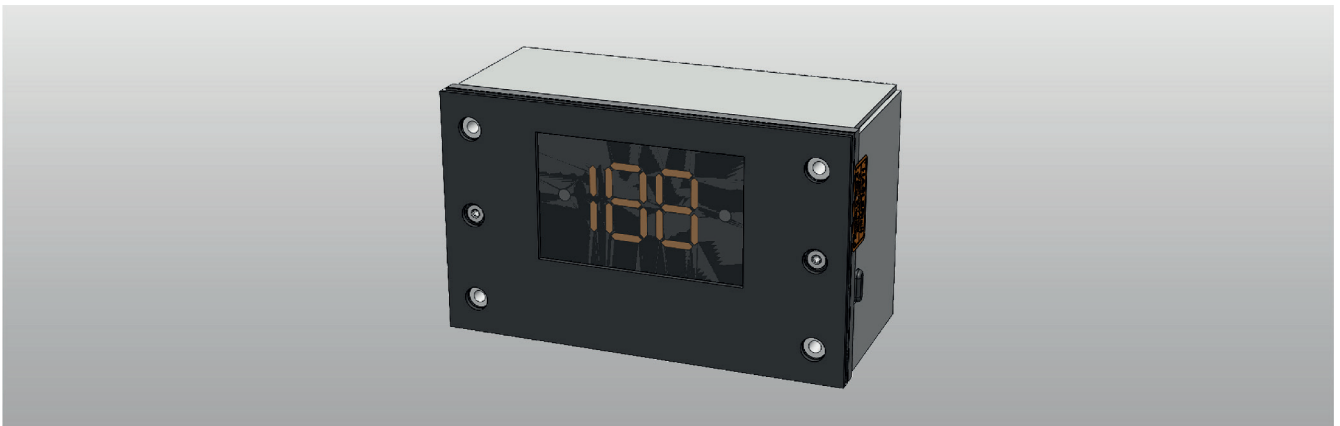
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## 1. Functional description

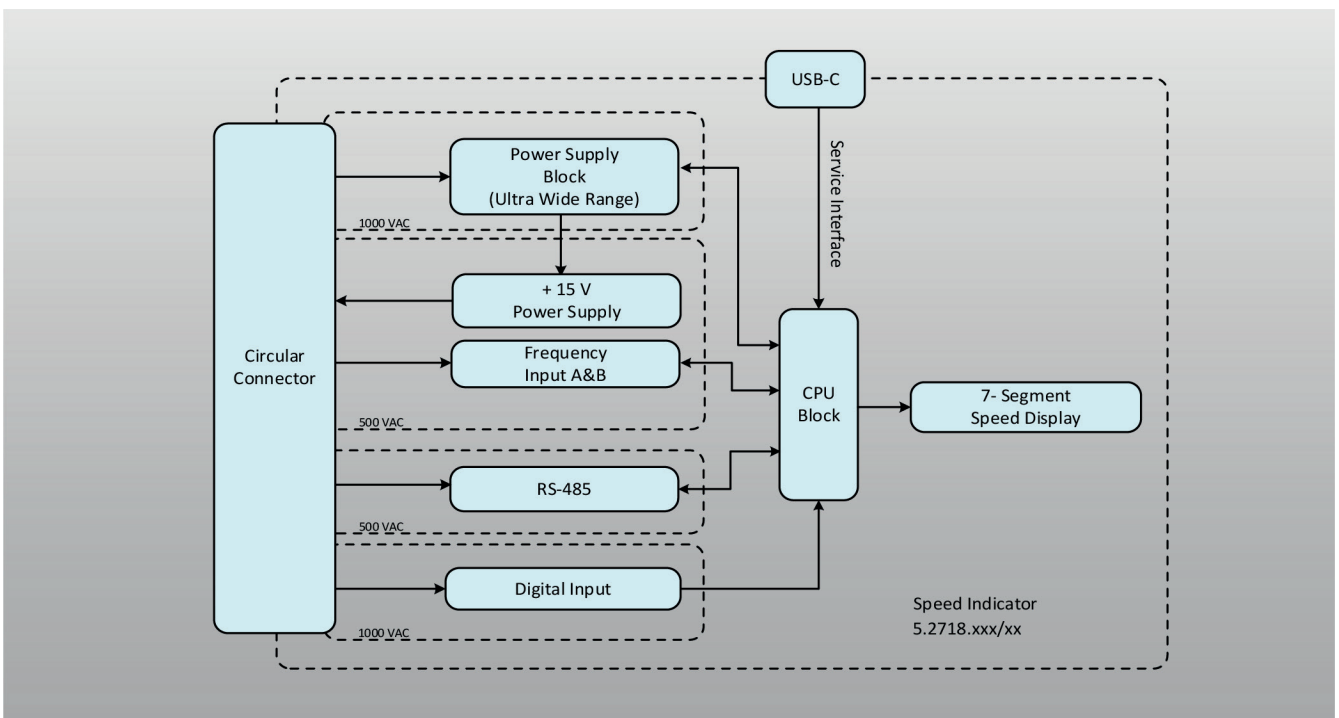
The SPIN 1000 provides the following functionalities:

- Capturing of the current speed using an isolated frequency interface.
- A +15 VDC power output in order to supply a pulse generator.
- Display of the current speed using a 7-segment display.
- Red Led on the front as an error indicator.
- Isolated digital input, which can be used to turn the display on/off (not yet implemented).
- An isolated full duplex serial interface which can be used as an alternative to the pulse input.
- Service port using a USB-C connector to set parameters, and perform maintenance tasks (system information, start of tests etc.).



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### 1.1 Hardware architecture



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## 1.2 Tachymetry block

Frequency inputs	Number of input channels	2x inputs (A and B), either as a quadrature channel or separate. HW variants for voltage or open collector compatible input stage
	Input signal shape	Rectangle
	Electrical insulation	500 VAC Tachymetry block against each other isolated bloc
	Voltage inputs: Input voltage range Input impedance	0 – 20 VDC 9.4 kΩ
	Open collector inputs: Pull-up resistor for Open Collector signals	1.3 kΩ to +15 VDC internal power supply
	Input frequency Duty cycle	0 Hz – 25 kHz 40 – 60 %
Power supply output	Output voltage Output current Short circuit protection Open circuit detection Overcurrent protection	15 VDC +/-10 % 60 mA Yes No Yes, power supply switches off after few seconds in overcurrent situation with auto-retry after some tens of seconds

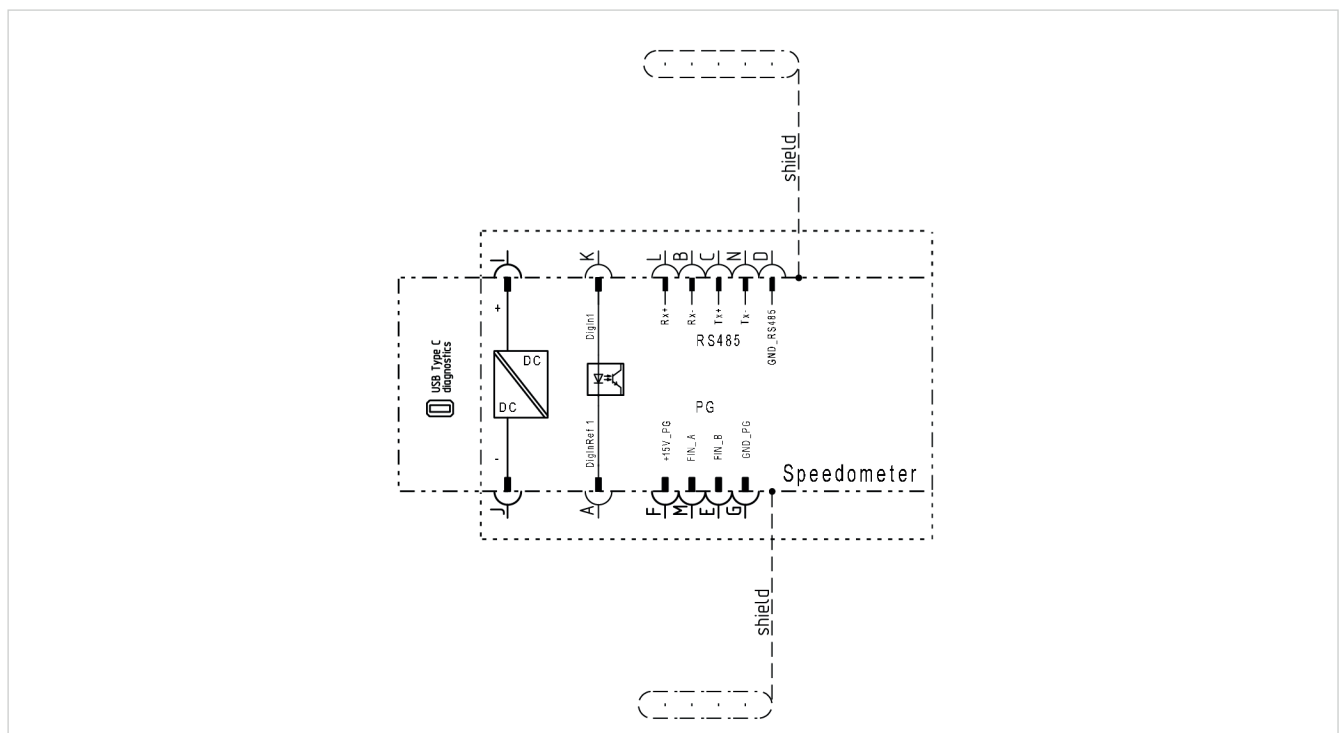
## 1.3 Digital inputs

General	Number of input channels	1
	Voltage range Reverse polarity protection Low-level High-level Input current Electrical insulation	0 – 45 VDC Yes < 5 VDC (standard version) > 14 VDC (standard version) Peak value 5 mA – 8 mA 1000 VAC Digital input against each other isolated block

## 1.4 RS485 interface

General	Supported baud rates	115.2 kbps
	Mode	Full- or Half-Duplex mode as HW option
	Bus termination resistor	120 Ωs, configurable
	Biasing resistors	680 Ωs to 5 V/0 V as HW option
	Electrical insulation	500 VAC RS485 interfaces against each other isolated block

## 1.5 Terminal connection diagram



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## 2. Technical features

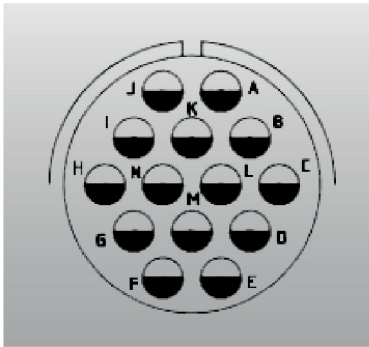
### 2.1 Characteristics

Ambient light sensor	Automatic adjustment of LED brightness. Configurable using service interface.
Red LED	Active on error. For example: <ul style="list-style-type: none"> <li>• Faulty configuration</li> <li>• Input frequency too high</li> <li>• Led self test failed</li> <li>• MCU error</li> </ul>
Frequency Input	minimal Frequency for non-standstill indication is >0.5Hz Automatic switch between channels to the active channel, if there is a mismatch between them after 2 seconds. Configurable using service interface.
Digital Input	Not yet implemented
Serial Port (RS-485)	Not yet implemented

### 2.2 Electrical features

Nominal supply voltage $U_n$	24 – 110 VDC Galvanically isolated, inverse polarity protection, short circuit protection	
Maximal power consumption	<10 W	
DC power supply fluctuation range	$U_n \leq U \leq 1.4 \cdot U_n$ for $\leq 0.1$ s	Performance criterion A
	$1.25 \cdot U_n \leq U \leq 1.4 \cdot U_n$ for $\leq 1$ s	Performance criterion A
	$0.6 \cdot U_n \leq U \leq U_n$ for $\leq 0.1$ s	Performance criterion A
Interruption on power supply voltage class	S2 (10 ms, Performance criterion A)	
Supply change-over class	C2	

## 2.3 System Connector



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System Connector: Gimota GR301 (Circular C-5015 connector, 14 poles, male, 20-27PN)

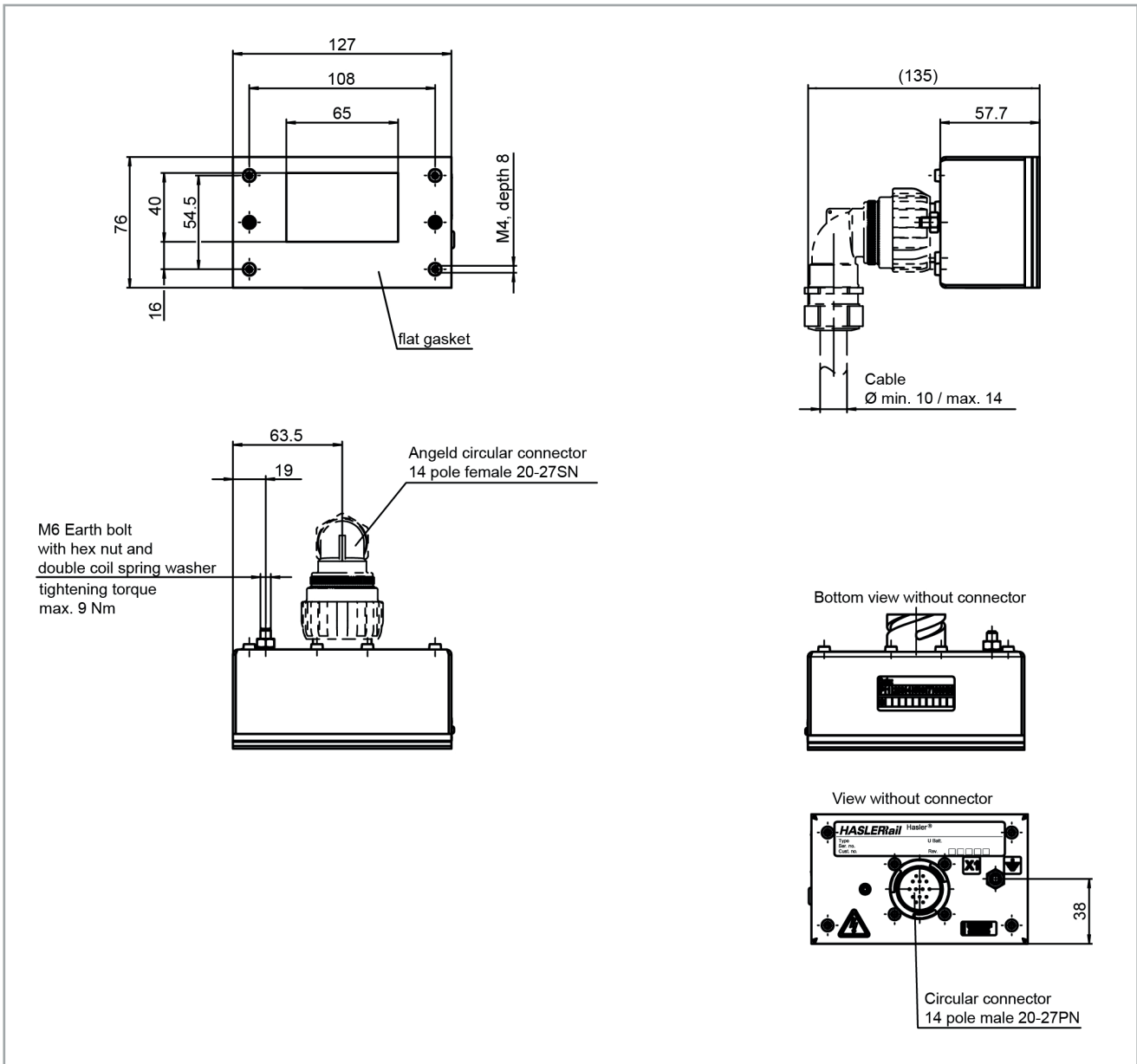
Pin	Signal	Comment / Function
A	D <sub>in-</sub>	Digital Input (currently not used)
B	RS-485 B (Rx-)	not yet implemented
C	RS-485 Y (Tx+)	not yet implemented
D	GND_RS485	not yet implemented
E	F <sub>in-</sub> B	Frequency input channel B
F	+15V_PG	Power supply for device on freq. input
G	GND_PG	Power supply for device on freq. input
H	NC	
I	U <sub>bat</sub> +	Power supply input
J	U <sub>bat</sub> -	Power supply input
K	D <sub>in</sub> +	Digital Input (currently not used)
L	RS-485 A (Rx+)	not yet implemented
M	F <sub>in-</sub> A	Frequency input channel A
N	RS-485 Z (Tx-)	not yet implemented

## 2.4 Mechanical features

Weight	< 0.85 kg
IP code	IP40 (housing) IP54 (front face)



## 2.5 Mechanical drawing



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## 2.6 Environmental features

Operating temperature range	-40 °C – +70 °C (ambient temperature) Class OT4 according to EN 50155:2017
Switch-on extended operating temperature	Class ST1, according to EN 50155:2017
Natural cooling or forced ventilation constraints	Natural convection, no active cooling required
Storage temperature range	-40 °C – +85 °C
Altitude	≤ 3000 MSL Class AX according to EN 50125-1:2014
Pollution degree conformance	PD3, according to EN 50124-1:2017
Shock and vibration categories & classes	EN 61373:2010 +AC:2017-09 category 2
Conformal coating type	PC2, according to EN 50155:2017
RoHS compliance	Yes, according to 2011/65/EU
REACH compliance	Yes, according to EU regulation (EG) Nr. 1907/2006
Fire behaviour compliance	HL3, according to EN 45545-2:2020

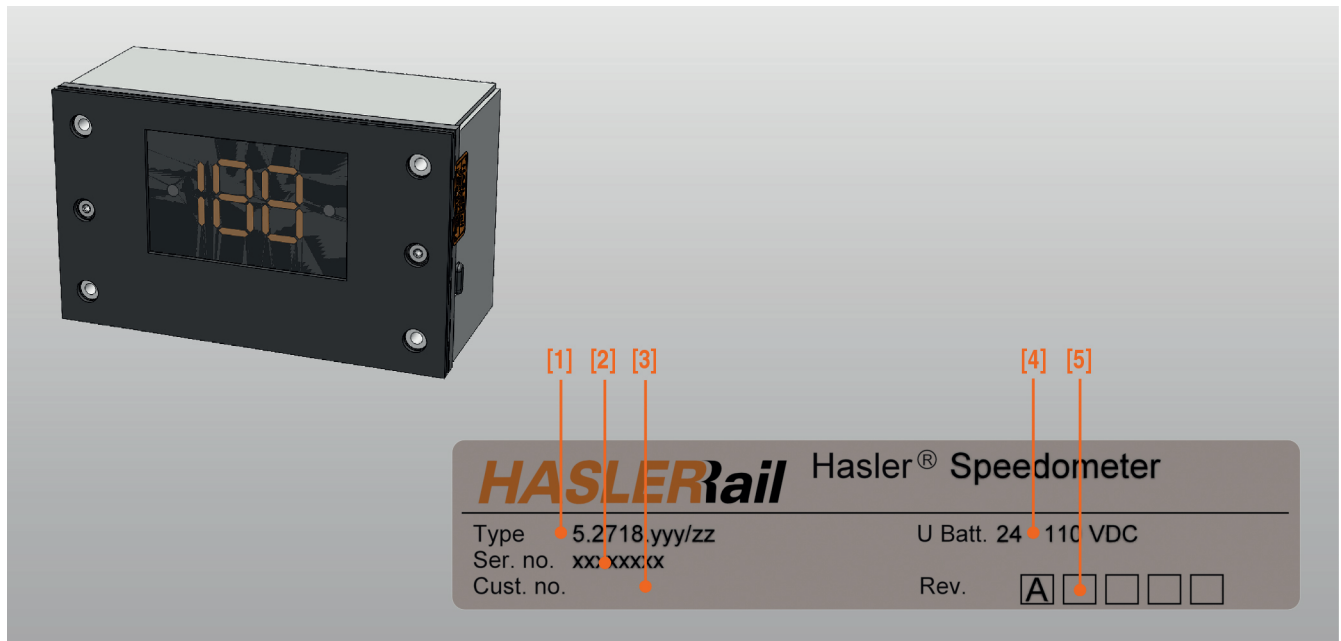
## 2.7 RAMS features

Useful life class	> 15 years
Storage precautions	In the range 0 °C – +45 °C with maximum temperature variation of 20 °C in one day the equipment is considered in storage. Storage time is not deducted from useful lifetime of the product, this being limited to the maximum duration of 3 years
Identification of commercial off-the-shelf equipment/components inside the electronic equipment	Not applicable
Periodic maintenance instructions	None
Reliability [MTBF hours]	2957 FIT [338000 hours] acc. IEC 62380
Reliability calculation model	Average temperature surrounding the device 1000 Te: 45 °C Diurnal temperature variation dT: 10 °C Use factor: 60 %
Functional safety reference	SPIN 1000 does not fulfill any applications requiring functional safety
Information relating to any implosion or explosion hazards	The device is not intended for use in potentially explosive atmospheres
Specification and demonstration of reliability, availability, maintainability and safety (RAMS)	EN 50126-1:2017 EN 50126-2:2017

## 2.8 Type plate

The SPIN 1000 contains a type plate with the article number [1], which stipulates the hardware for the device. Since SPIN 1000 devices are customer-specific and application-specific, a dedicated SPIN 1000 with its own article number [3] is defined for most applications.

The article number for SPIN 1000 is: 5.2718.yyy/zz [1]. The type plate also contains the voltage range [4], the device revision number [5] and the serial number [2].



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## 2.9 Routine and type test compliance

	Type test	Routine test	Standard	Performance criterion
<b>Railway applications - Rolling stock - Electronic equipment</b>	See details	See details	EN 50155:2017 IEC 60571:2012	See details
<b>Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock - Apparatus</b>	See details	See details	EN 50121-3-2:2016 +A1:2019 IEC 62236-3-2:2018	See details
Visual inspection	Yes	Yes	EN 50155:2017, 13.4.1	
Performance test	Yes	Yes	EN 50155:2017, 13.4.2	
Power supply test	Yes	No	EN 50155:2017, 13.4.3	Nominal voltage 24 – 110 V Interruptions of voltage supply class S2 Supply change over class C 1
Insulation test	Yes	Yes	EN 50155:2017, 13.4.9	Insulation resistance > 20 MΩ Insulation test voltage 1500 VDC
Low temperature storage test	Yes	No	EN 50155:2017, 13.4.6 EN 60068-2-1:2007 IEC 60068-2-1:2007	Test Ad @ temperature class OT4 (-40 °C) 16 hours in offstate After recovery performance criteria A
Low temperature start-up test	Yes	No	EN 50155:2017, 13.4.4 EN 60068-2-1:2007 IEC 60068-2-1:2007	Test Ad @ temperature class OT4 (-40 °C) 2 hours in operation
Dry heat test	Yes	No	EN 50155:2017, 13.4.5 EN 60068-2-2:2007 IEC 60068-2-2:2007	Test Bd @ temperature class OT4 (70 °C) 6 hours @ 70 °C, then 10 minutes @ 85 °C
Cyclic damp heat test	Yes	No	EN 50155:2017, 13.4.7 EN 60068-2-30:2005 IEC 60068-2-30:2005	Temperatures: +25 °C / +55 °C @ 93 % rH 2 cycles each 24 h, total duration 48 h
Salt mist test	Yes	No	EN 50155:2017, 13.4.10 EN 60068-2-11:1999 IEC 60068-2-11:1981 +COR1:1999	After recovery performance criteria A
Enclosure protection test (IP code)	No	No	EN 50155:2017,13.4.12 EN 60529:1991 +A1:2000 +A2:2013 IEC 60529:1989 +A1:1999 +A2:2013	IP40 / IP54

	Type test	Routine test	Standard	Performance criterion
Electromagnetic compatibility test	Yes	No	EN 50155:2017, 13.4.8 EN 50121-3-2:2016 +A1:2019 IEC 62236-3-2:2018 Conducted emission	Battery power supply: 0.15 – 0.5 MHz, 99 dB $\mu$ V quasi peak 0.5 – 30 MHz, 93 dB $\mu$ V quasi peak
			EN 50155:2017, 13.4.8 EN 50121-3-2:2016 +A1:2019 IEC 62236-3-2:2018 Radiated emission	Enclosure port: 30 – 230 MHz, 40 dB $\mu$ V/m quasi-peak at 10 m 230 MHz – 1 GHz, 47 dB $\mu$ V/m quasi-peak at 10 m 1 – 3 GHz: 76 dB $\mu$ V/m peak at 3 m 56 dB $\mu$ V/m avg. at 3 m 3 – 6 GHz: 80 dB $\mu$ V/m peak at 3 m 60 dB $\mu$ V/m avg. at 3 m
			EN 50155:2017, 13.4.8 EN 61000-4-2:2009 IEC 61000-4-2:2008 Electrostatic discharge	Contact discharge: $\pm$ 6 kV Performance criteria B
			EN 50155:2017, 13.4.8 EN 61000-4-3:2006 +A1:2008 +A2:2010 IEC 61000-4-3:2006 +A1:2007 +A2:2010 Radiated radiofrequency	80 – 1000 MHz: 20 V/m rms 1400 – 2000 MHz: 10 V/m rms 2000 – 2700 MHz: 5 V/m rms 5100 – 6000 MHz: 3 V/m rms Performance criteria A
			EN 50155:2017, 13.4.8 EN 61000-4-4:2012 IEC 61000-4-4:2012 Fast transient/Burst	Battery referenced ports: $\pm$ 2 kV Signal and communication ports: $\pm$ 2 kV Burst frequency: 5 kHz & 100 kHz Performance criteria A
			EN 50155:2017, 13.4.8 EN 61000-4-5:2014 +A1:2017 IEC 61000-4-5:2014 +A1:2017 Surge	Battery referenced ports: Line to ground: $\pm$ 2 kV, 42 $\Omega$ , 0.5 $\mu$ F Line to line: $\pm$ 1 kV, 42 $\Omega$ , 0.5 $\mu$ F Performance criteria B
			EN 50155:2017, 13.4.8 EN 61000-4-6:2014 IEC 61000-4-6:2013 Immunity to conducted disturbances	Battery referenced, signal and communication ports: 0.15 MHz – 80 MHz 10 V rms, 80 % AM, 1 kHz Performance criteria A

	Type test	Routine test	Standard	Performance criterion
Vibration and shock test	Yes	No	EN 50155:2017, 13.4.11 EN 61373:2010 +AC: 2017-09 IEC 61373:2010 +COR1: 2011	Category 1 Body mounted, Class B
Equipment stress screening test	Yes	Yes	EN 50155:2017,13.4.13 EN 61163-1:2006 IEC 61163-1:2006	
Rapid temperature variation test	Yes	No	EN 50155:2017, 13.4.14	Class H2
Electromagnetic Fields (0 Hz – 300 GHz)	Yes	No	EN 62311:2008	
Radio Equipment Directive (RED)	Yes	No	ETSI EN 305 550-2 V1.2.1 (2014-10)	

## 2.10 References

### Document references

Document number	Description
5.0303.167TEN	Installation&maintenance manual

## 2.11 Revision index

Revision	Date	Modification	Created	Reviewed	Released
A00	11.2022	First edition	APF	AMA	PFR

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