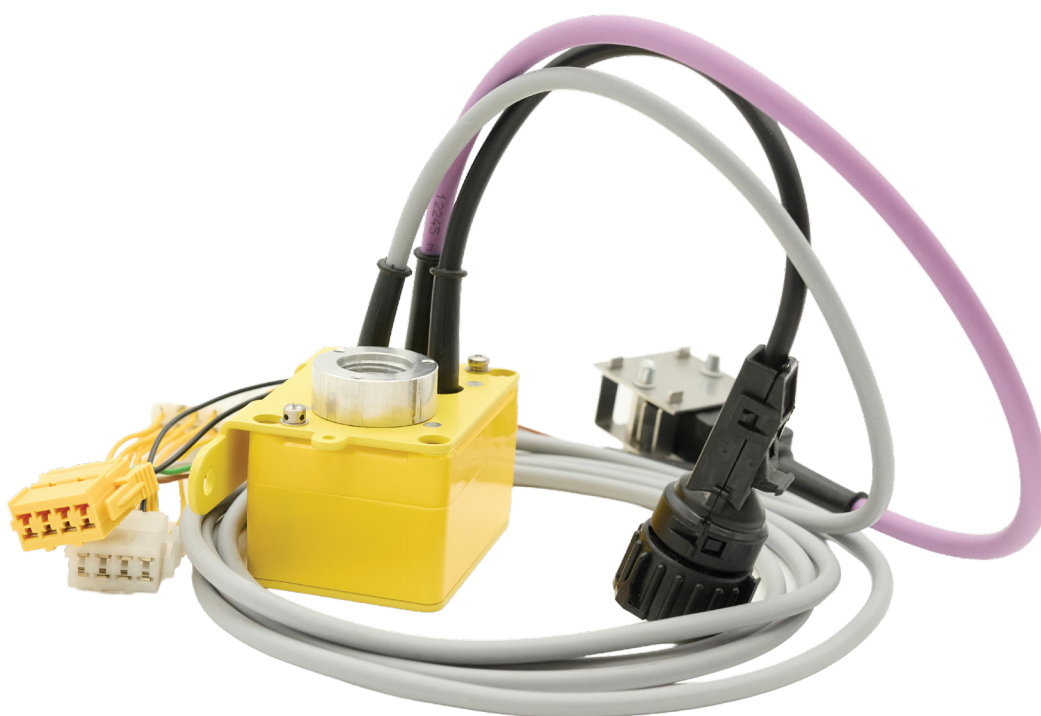


Technical Service Manual

BOGART M1N1 Adapter for Smart Tachographs



Product description:

The BOGART M1N1 adapter is a component of a digital/smart tachograph system. The device converts the vehicle speed signal (pulse input or CAN bus) into an output signal compliant with the requirements of the KITAS 4.0 2185 motion sensor (23.8 mm) and the tachograph. The BOGART M1N1 adapter complies with Regulation (EU) No 165/2014 with regard to tachograph components.

European type-approval certificate number: **e20 0002**

EAN code: **590507232166**

Application:

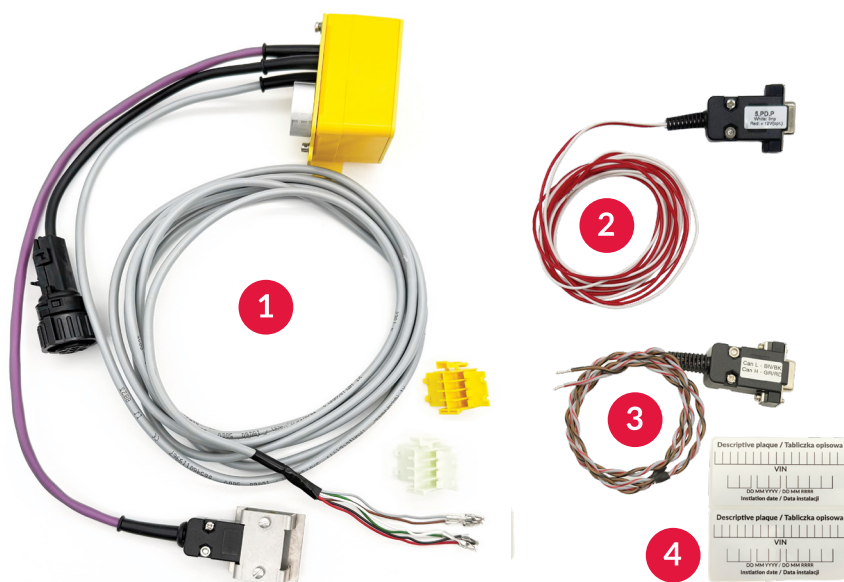
The adapter may be used exclusively in vehicles of categories **M1** and **N1**. It is used where installation of the standard motion sensor is not possible for mechanical reasons.

The M1N1 adapter is intended for use with digital and smart tachographs that comply with the requirements of **Regulation (EU) No 165/2014**.

NOTE

In the event of replacement of the vehicle unit (tachograph) for technical reasons, **there is no need to replace the BOGART M1N1 adapter** – only the single-pairing motion sensor must be replaced. During the subsequent calibration, the data of the new sensor must be entered on a new calibration plate.

This procedure is in line with Regulation (EU) 2016/799, in particular ADA_018, ADA_035 and ADA_036. Any interference with the sensor/adapter system must be detectable, and after service the installation must be sealed, calibrated, marked and verifiable. Therefore, the motion sensor may be replaced only by an approved workshop, without the need to replace the adapter.



Installation kit (without speed sensor):

1. M1N1 adapter integrated with wiring harnesses,
 - power supply wires,
 - signal wires,
2. **5.PD.P** cable (adapter) – for the pulse signal,
3. **CAN** cable (adapter) – twisted pair for the CAN bus,
4. Adapter descriptive plate.

When using the **BOGART M1N1** adapter, a **motion sensor for Smart 2 tachographs is required** – **KITAS 4.0 2185**, length **23.8 mm** (not included in the kit).

1. Mechanical installation

The BOGART M1N1 adapter must be installed in the vehicle as close as possible to the point where the pulse signal or CAN bus signal is generated. The adapter housing has two mounting holes.

A flat, uniform mounting surface must be selected.

The installation location must take into account the following environmental parameters:

- Operating temperature: -40 °C to +85 °C
- Humidity: 10–90%
- Ingress protection: IP65 (splash-resistant)

The adapter must be positioned to ensure:

- access to the adjustment elements during calibration,
- good visibility of the descriptive plaque for inspection authorities.

2. Electrical installation

After installing the adapter and routing the integrated grey wiring harness to the tachograph mounting location, prepare and route the power supply wires from the vehicle electrical system (battery) to the tachograph. Then connect the battery supply to the adapter power leads from the grey harness:

- **A1 (+)** – red wire
- **A5 (–)** – black wire (ground)

Connection to the existing tachograph wiring

- Crimp the power supply wires with the appropriate terminals and, according to **Table 2**, insert them into the tachograph **connector A** at positions **A1 (+)** and **A5 (–)** as shown in **Figure 2**.
- Crimp the **yellow connector B** according to **Table 1**, then connect the **adapter's B plug** to the tachograph **B socket**.
- Connect the **adapter's D-Sub 9 connector** to the vehicle speed signal:
 - via the **5.PD.P adapter** (pulse signal), or
 - via the **CAN adapter** (CAN bus).

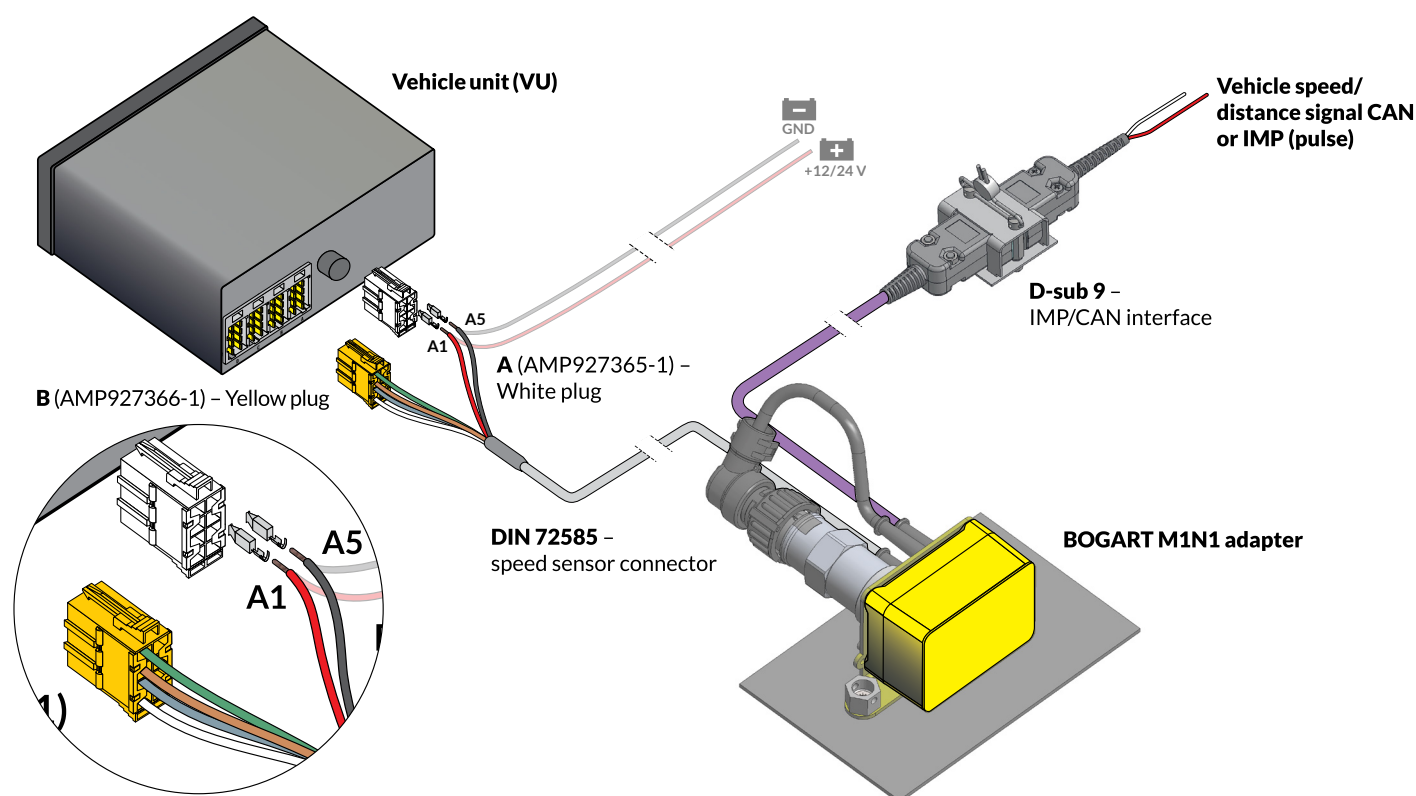


Figure 1: Connection overview of the BOGART M1N1 adapter

TABLE 1. Pin description/wire colour

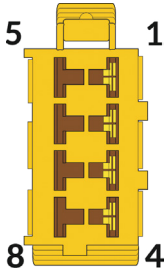
 AMP 927366-1 Yellow plug – B	1	Sensor supply [+]	Green
	2	Sensor supply [–]	Brown + Black
	3	Real Time Signal	Grey
	4	I/O Data Signal	White
	5	Not connected	–
	6		
	7		
	8		

TABLE 2. Pin description

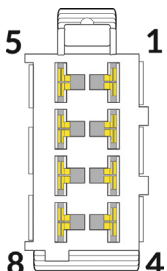
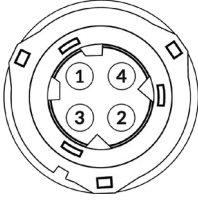
 AMP 927365-1 White plug – A2	1	[30] + RED	Permanent battery supply
	2	[58d] L	Lighting/display illumination
	3	[15] K	Ignition-switched supply
	4	CAN H	CAN high
	5	[31] – BLACK	Battery negative
	6	[31b] G	Electronics ground (sensor ground)
	7	CAN GND	CAN ground/shield
	8	CAN L	CAN low

TABLE 3. Signals from the BOGART M1N1 adapter

 DIN 72585 Speed sensor connector plug	1	Sensor supply [+]
	2	Sensor supply [–]
	3	Real Time Signal
	4	I/O Data Signal

NOTE

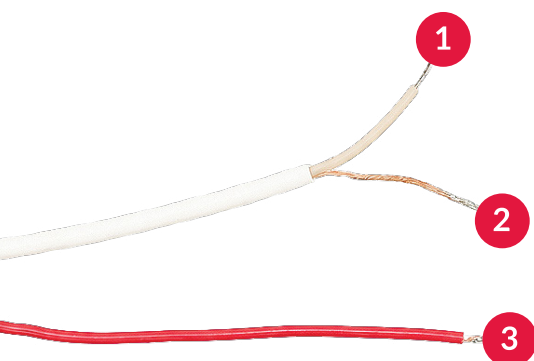
The wires from **pins A1** and **A5** must be connected via the dedicated power supply wiring directly to the battery, with the wire connected to **pin A1** routed through a **5 A fuse**.

3. Connection to the vehicle speed/distance signal source

After locating the speed signal source, it must be connected to the adapter input via the D-sub 9 connector.

Two adapter cables with a D-sub 9 connector are included in the kit:

- **5.PD.P adapter cable:** for the V pulse speed signal,
- **CAN adapter cable:** twisted pair for the CAN signal source.



Connection of the 5.PD.P cable:

White cable jacket:

- **White (1):** V signal – vehicle speed pulse
- **Golden (2):** ground

Red cable jacket (3):

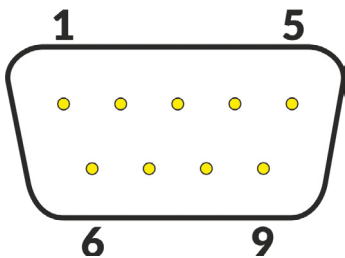
Signal boost input – to be used only if the amplitude of the **V pulse signal** is too low.



Connection of the CAN bus:

- **Brown/black (1):** CAN L
- **Grey/red (2):** CAN H

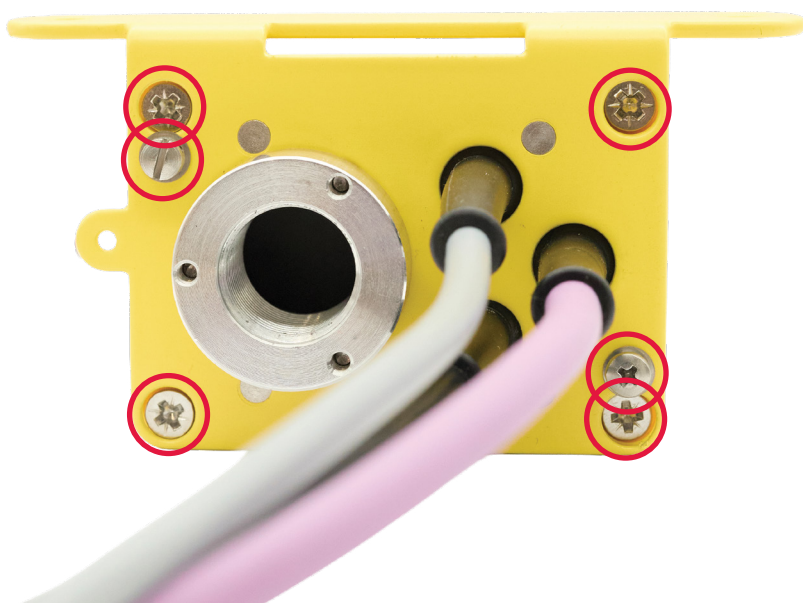
**TABLE 4. Pin assignment of the D-sub 9 connector
IMP/CAN interface of the BOGART M1N1 adapter**

	Pin	Code	Description
	1	+	Supply voltage (+)
	2		CAN L
	3	GND	Ground
	4	NC	Not connected
	5	NC	Not connected
	6	GND	Ground
	7		IMP or CAN H
	8	NC	Not connected
	9	K	Ignition-switched supply (K line)

4. Selection of adapter operating mode (IMP/CAN)

Depending on the vehicle manufacturer's specification, the vehicle speed signal may be available either as a pulse output from the road speed sensor (IMP mode) or as a digital signal transmitted via the CAN bus (CAN mode). The selected signal type determines the subsequent adapter configuration steps.

The **Bogart M1N1** adapter can connect directly to the CAN signal for selected vehicle configurations. The current list of supported vehicles (if applicable) is available at www.M1N1.eu. If the vehicle is not listed, pulse connection (IMP mode) should be used as the primary option. If the vehicle does not provide a pulse signal, an external CAN-to-pulse decoder compliant with tachograph requirements may be used.

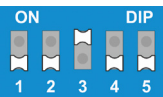
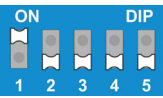
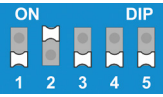
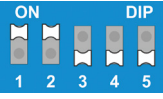
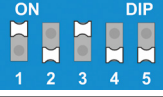
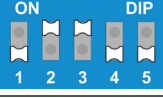
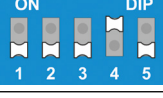
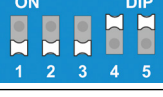


NOTE

The adapter operating mode is set using **DIP switches** located under the adapter housing cover. To access them, the cover retaining screws must be removed. After completing measurement, configuration and diagnostics, the cover must be refitted, secured and sealed according to the applicable tachograph workshop procedure.

The input operating mode (IMP/CAN) is set using switch **P4**, while the pulse signal divider/multiplier is set using switches **P1–P3**, in accordance with **Table 5**. In IMP mode, after installing the adapter, the vehicle characteristic coefficient “**w**” must be measured in accordance with the applicable approved procedure and, if necessary, the switch settings must be corrected according to **Table 5**.

TABLE 5. Adaptation of the BOGART M1N1 adapter for installation in vehicles with a speed signal sensor and a characteristic coefficient “w” in the range $500 \leq w \leq 80\,000$ [imp/km], and for use with the vehicle CAN bus speed signal.

Function	DIP switch setting	Range of vehicle w-factor [imp/km]	Signal
NO DIVISION: 1:1		$2\,400 \leq w \leq 12\,000$	PULSE
DIVIDER: $\div 2$		$10\,000 \leq w \leq 20\,000$	
DIVIDER: $\div 4$		$20\,000 \leq w \leq 40\,000$	
DIVIDER: $\div 8$		$40\,000 \leq w \leq 80\,000$ end for $w \geq 80\,000$ *	
MULTIPLIER: $\times 2$		$2\,500 \leq w \leq 4\,000$	
MULTIPLIER: $\times 4$		$1\,500 \leq w \leq 3\,000$	
MULTIPLIER: $\times 8$		$500 \leq w \leq 1\,500$	
TERMINATOR $120\,\Omega$ – OFF		$w \approx 7\,200$	CAN
TERMINATOR $120\,\Omega$ – ON			

*** maximal vehicle speeds $V_{\max}$ for “w” $\geq 80\,000$**

Vehicle factor “w” [imp/km]	80 000	100 000	120 000	150 000	180 000	200 000
Maximum speed $V_{\max}$ [km/h]	225	180	150	120	100	90

- The $120\,\Omega$ termination resistor, when set to **OFF/ON** as required, is compliant with the CAN bus standard and characteristic impedance, ensuring stable and reliable data transmission.

5. Measurement of the “w” factor and calibration

The characteristic coefficient “w” must be measured in accordance with the applicable approved procedure. The measured value is used to correctly configure both the adapter and the tachograph.

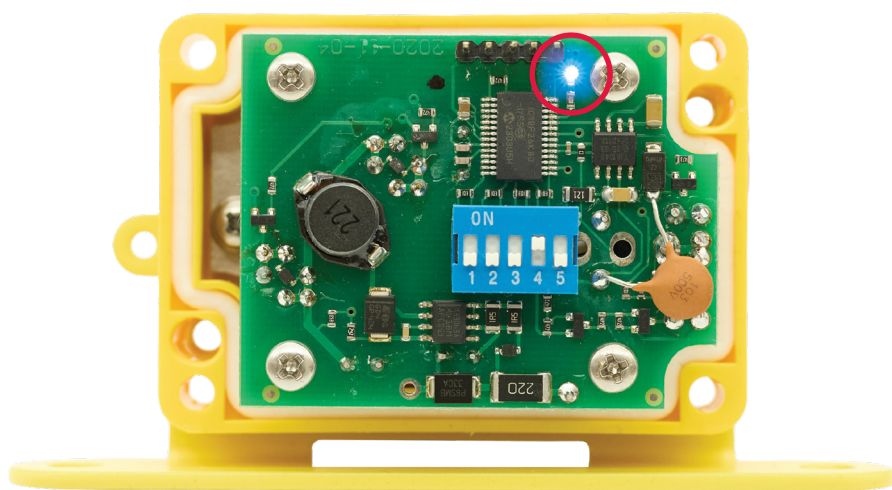
After calibration:

- set the tachograph constant $k = w$,
- repeat the measurement,
- consider the system to be functioning correctly if the deviation does not exceed $\pm 1\%$.

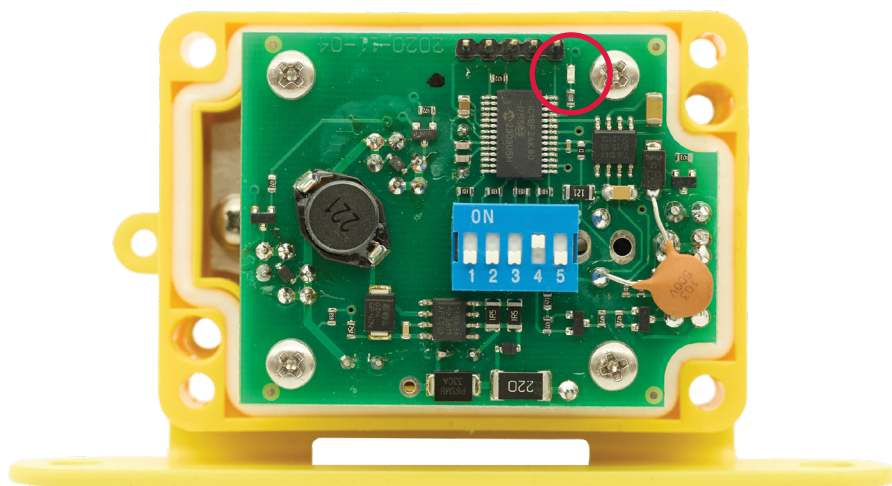
NOTE

After each change to the switch configuration, the M1N1 adapter must be **RESET by disconnecting and then reconnecting** its power supply.

CAN communication diagnostics – LED indicator



The LED lights up after switching on the ignition → no CAN communication



The LED goes out after switching on the ignition (after approximately 1–2 seconds) → CAN communication OK

6. Sealing the BOGART M1N1 adapter

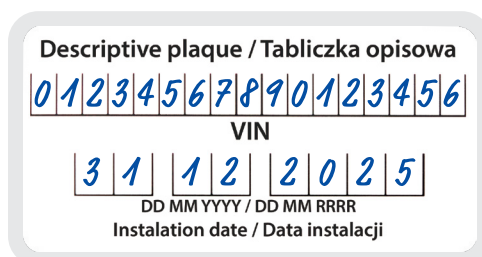
The adapter housing, the motion sensor connection to the adapter housing, and the relevant vehicle speed signal connections must be sealed in accordance with the applicable regulations and local tachograph workshop procedures.

The type of seals depends on the tachograph generation. For Smart 2 tachographs, seals compliant with EN 16882 must be used, with a unique seal number recorded in the tachograph.

7. Descriptive plaque for the BOGART M1N1 adapter

In accordance with the applicable regulations, the descriptive plaque of the M1N1 adapter must show, as a minimum, the installation date and the vehicle identification number (VIN). The descriptive plaque must be permanently attached to the M1N1 adapter in a location that remains visible after installation in the vehicle.

In addition, a separate tachograph calibration plate must be produced in accordance with the applicable regulations.



8. Technical parameters

Description	Min	Type	Max
General			
Permissible DC supply voltage range	9 V	–	28 V
Current consumption during operation	–	–	200 mA
Current consumption in standby mode (no speed signal for ≥10 s)	–	–	11 mA
Inputs – speed pulse signal			
Low-level input voltage UL	–12 V	–	1,3 V
High-level input voltage UH	1,8 V	–	24 V
Speed signal frequency	0,5 Hz	–	5 000 Hz
Corresponding vehicle speed range	3,6 km/h	–	225 km/h
Vehicle characteristic coefficient “w” range (with multiplier/divider)	500 imp/km	–	80 000 imp/km
Divider settings (DIV mode, for “w” ≥4 000 imp/km)	–	settings: 1/2/4/8	–
Multiplier settings (MUL mode, for “w” <4 000 imp/km)	–	settings: 1/2/4/8	–
Inputs – CAN (after conversion to pulses)			
Vehicle speed range	1 km/h	–	220 km/h
Vehicle characteristic coefficient “w” (after CAN conversion)	–	≈ 7 200 imp/km	–
Processor			
Microcontroller	–	8-bit SMD microcontroller (PIC18F26K80)	–
Microcontroller clock frequency	–	16 MHz	–
Operating and environmental conditions			
Operating temperature	–40 °C	–	+85 °C
Relative operating humidity	10 %	–	90 %
Enclosure protection class (IP)	–	IP65	–
Protections and compatibility			
Electromagnetic compatibility (EMC/EMV)	–	complies with UNECE Regulation No. 10	–
Resistance to electrostatic discharge (ESD)	–	compliant	–
Resistance to transients/surges in the vehicle electrical system	–	compliant	–
Overvoltage protection	–	yes	–
Reverse polarity protection	–	yes	–
Short-circuit protection/output short-circuit resistance	–	yes	–
Vibration resistance	–	yes	–
Housing/mechanics			
Housing material	–	metal with plastic elements	–
Device weight	–	~ 330 g	–