

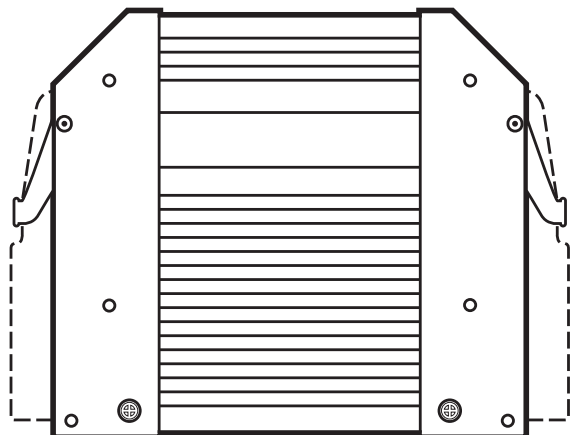


Installation instructions SmartController XL

ecomat100[®]

UK

CR2532



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1 Preliminary note

This document applies to devices of the type "SmartController XL" (art. no.: CR2532).



These instructions are part of the device.

This document is intended for specialists. These specialists are people who are qualified by their appropriate training and their experience to see risks and to avoid possible hazards that may be caused during operation or maintenance of the device. The document contains information about the correct handling of the device.

Read this document before use to familiarise yourself with operating conditions, installation and operation. Keep this document during the entire duration of use of the device.

Adhere to the safety instructions.

1.1 Symbols used

- Instructions
- > Reaction, result
- [...] Designation of pushbuttons, buttons or indications
- Cross-reference
-  Important note
Non-compliance can result in malfunction or interference.
-  Information
Supplementary note

1.2 Warning signs used

WARNING

Warning of serious personal injury.
Death or serious irreversible injuries may result.

CAUTION

Warning of personal injury.
Slight reversible injuries may result.

NOTE

Warning of damage to property.

2 Safety instructions

2.1 General

These instructions are part of the device. They contain texts and figures concerning the correct handling of the device and must be read before installation or use.

Observe the operating instructions. Non-observance of the instructions, operation which is not in accordance with use as prescribed below, wrong installation or incorrect handling can seriously affect the safety of operators and machinery.

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2.2 Target group

These instructions are intended for authorised persons according to the EMC and low-voltage directives. The device must only be installed, connected and put into operation by a qualified electrician.

2.3 Electrical connection

Disconnect the device externally before handling it. If necessary, also disconnect any independently supplied output load circuits.

If the device is not supplied by the mobile on-board system (12/24 V battery operation), it must be ensured that the external voltage is generated and supplied according to the criteria for safety extra-low voltage (SELV) as this voltage is supplied without further measures to the connected controller, the sensors and the actuators.

The wiring of all signals in connection with the SELV circuit of the device must also comply with the SELV criteria (safety extra-low voltage, safe electrical isolation from other electric circuits).

If the supplied SELV voltage is externally grounded (SELV becomes PELV), the responsibility lies with the user and the respective national installation regulations must be complied with. All statements in this document refer to the device the SELV voltage of which is not grounded.

The connection terminals may only be supplied with the signals indicated in the technical data and/or on the device label and only the approved accessories of ifm electronic gmbh may be connected.

2.4 Housing temperature

As described in the technical specifications below the device can be operated in a wide ambient temperature range. Because of the additional internal heating the housing walls can have high perceptible temperatures when touched in hot environments.

2.5 Tampering with the device

In case of malfunctions or uncertainties please contact the manufacturer. Tampering with the device can seriously affect the safety of operators and machinery. This is not permitted and leads to the exclusion of any liability and warranty claims.

2.6 Electromagnetic compatibility

This is a class A product. It can cause radio interference in domestic areas. In this case the operator is requested to take appropriate measures.

2.7 Electrical welding on vehicles and plants

Welding work on the chassis frame must only be carried out by qualified persons.

Remove and cover the plus and minus terminals of the batteries.

Disconnect all contacts of the controller from the on-board system prior to welding on the vehicle or plant. Connect the earth terminal of the welding device directly to the part to be welded.

Do not touch the controller or electric cables with the welding electrode or the earth terminal of the welding device.

Protect the controller against weld slag.

3 Functions and features

The freely programmable controllers of the "SmartController XL" series are rated for use under difficult conditions (e.g. extended temperature range, strong vibration, intensive EMC interference).

They are suited for direct installation in machines in mobile and robust applications. Integrated hardware and software functions (operating system) offer high protection for the machine.

The controllers can be used as CANopen master.

WARNING

The SmartController XL series is not approved for safety tasks in the field of safety of persons.

WARNING

The user is responsible for the safe function of the application programs which he created himself.

If necessary, he must additionally carry out an approval test by corresponding supervisory and test organisations according to the national regulations.

4 Installation

4.1 Fastening

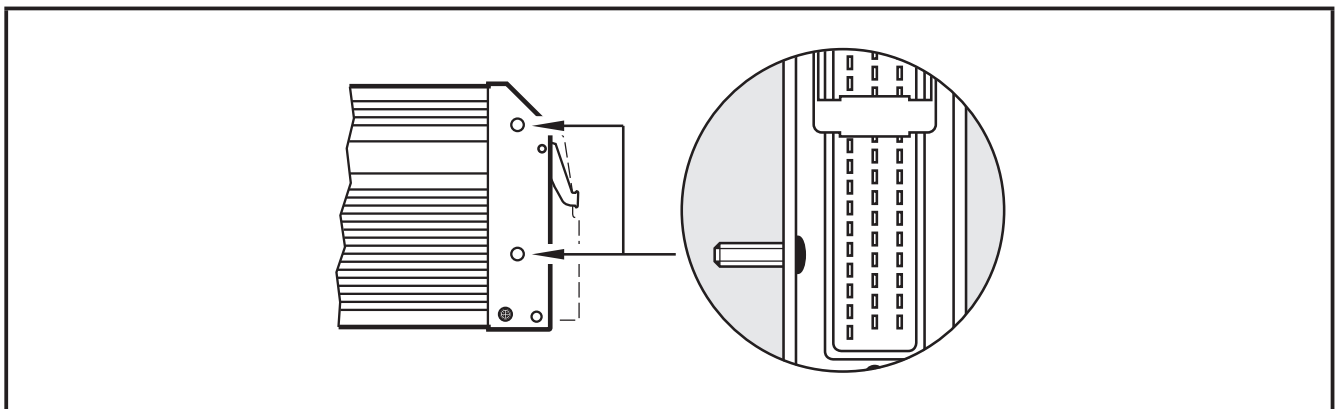
- Fix the controller to a flat surface using 4 M5 screws.
Screw material: steel or stainless steel
Tightening torque: 8 \pm 2 Nm

NOTE

Use screws with a low head to avoid that the connector is damaged when placed and locked.

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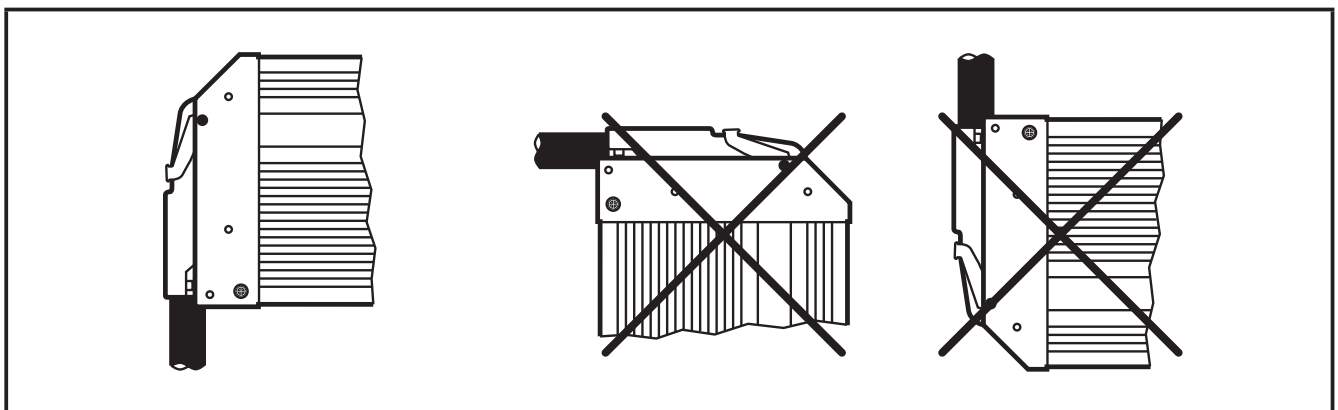
Screws to be used (examples)	Standard
Button head hexagon socket screws (M5 x L)	ISO 7380
Cylinder screws with hexagon socket and low head (M5 x L)	DIN 7984
Cutting screws for metric ISO thread with low head	DIN 7500



Example button head hexagon socket screw

4.2 Installation position

- Align the controller so that the cable entries of the connectors face downwards.



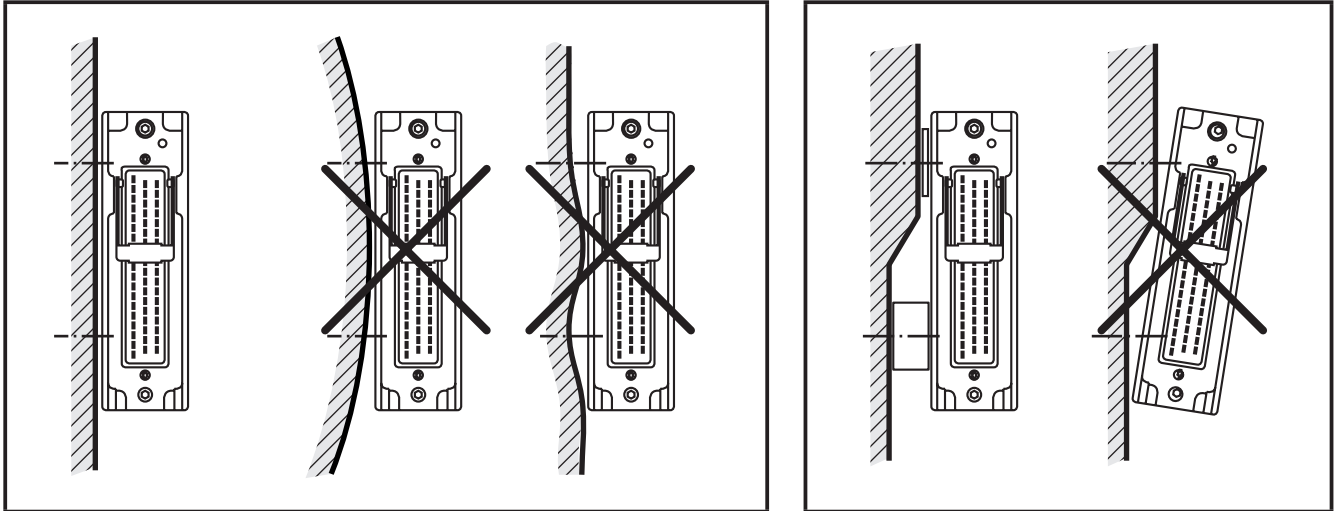
Preferred installation position

4.3 Mounting surface

NOTE

The housing must not be exposed to any torsional forces or mechanical stress.

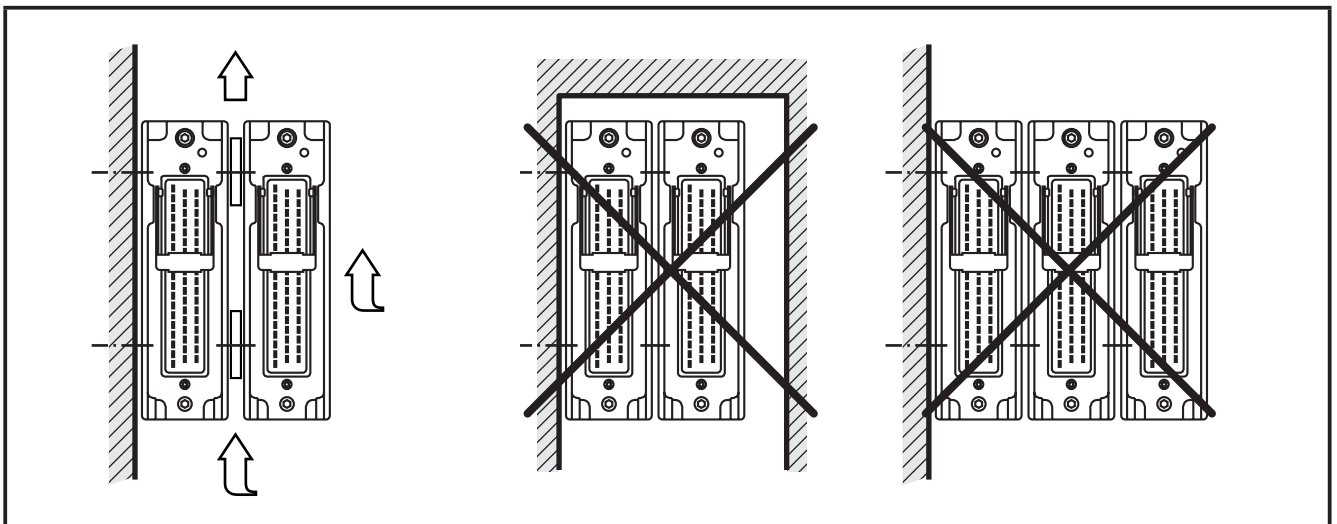
- Use compensating elements if there is no flat mounting surface available.



Mounting surface

4.4 Heat dissipation

- Ensure sufficient heat dissipation as the internal heating of the electronics is conducted away via the housing.
- In case of sandwich mounting of controllers use spacers.



Heat dissipation and sandwich mounting

5 Electrical connection

5.1 Wiring

Wiring (→ 7 Technical data)



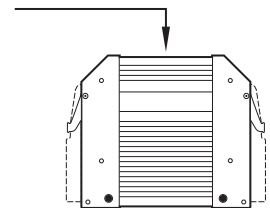
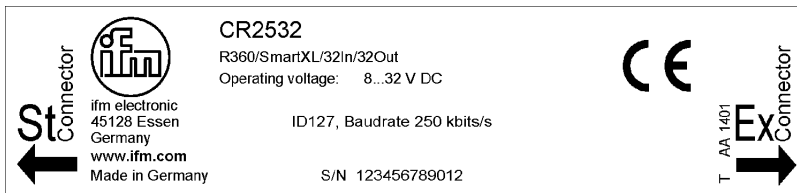
Only connect the connector pins as shown in the pin layout.
Unspecified connector pins remain unconnected.

- Connect all indicated supply cables and GND terminals (St and Ex connection side).

NOTE

Inversion of the Ex and St connection sides can lead to damage to a connected PC or notebook.

- Note the device label.

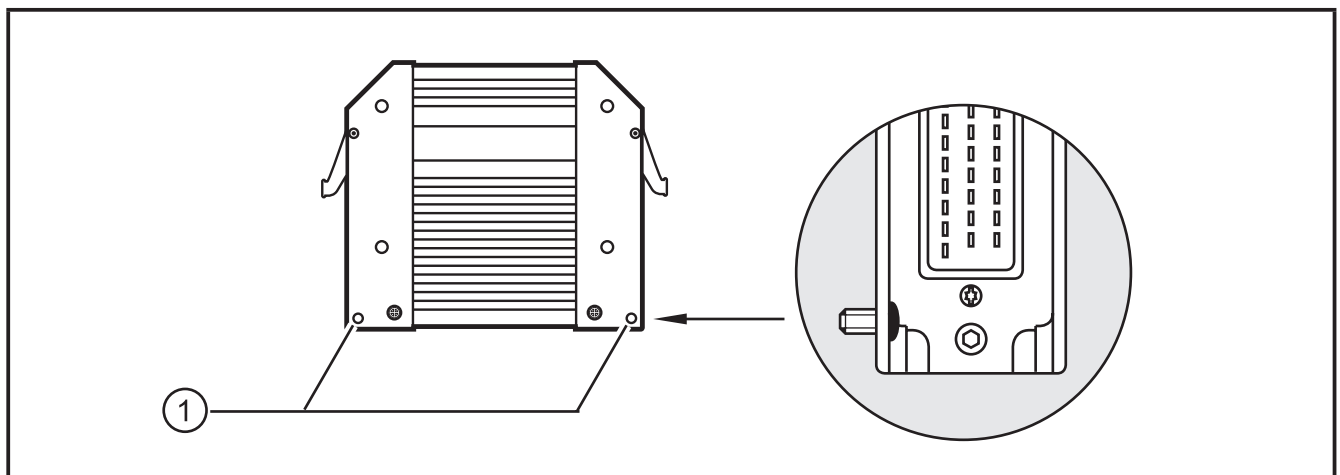


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5.2 Ground connection



To ensure the protection of the device against electrical interference, the housing must be connected to GND (e.g. to the ground of the vehicle).



1: Drill holes for ground connection

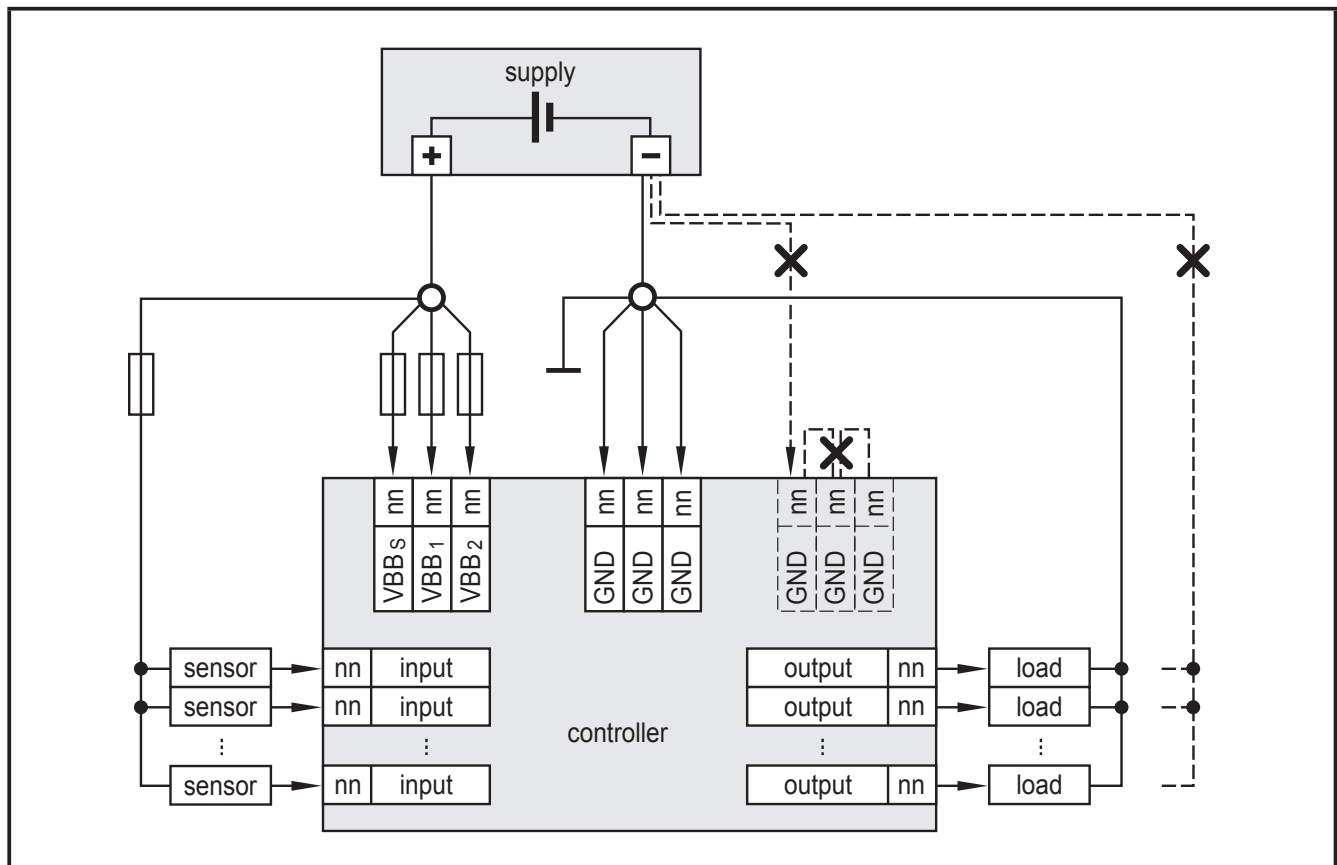
- Establish a connection between the device and the ground of the vehicle using M5 screws.
Screws to be used (→ 4.1 Fastening)

5.3 Fuses

- The individual electric circuits must be protected in order to protect the whole system.

Connection side	Description	Potential	Pin no.	Fuse
St (Standard)	Supply voltage sensors/module	VBB_s	St-10	≤ 2 A time-lag
	Supply voltage output group 1	VBB_1	St-19	≤ 15 A
	Supply voltage output group 2	VBB_2	St-01	≤ 15 A
Ex (Extended)	Supply voltage sensors/module	VBB_s	Ex-10	≤ 2 A time-lag
	Supply voltage output group 1	VBB_1	Ex-19	≤ 15 A
	Supply voltage output group 2	VBB_2	Ex-01	≤ 15 A

5.4 Laying the supply and signal cables



X = not permissible

⚠ WARNING

The linking of connections in the plug is not permitted and can affect the safety of operators and machinery.

- Basically all supply and signal cables must be laid separately.
- Connect supply and ground cables to the controller and the sensors/actuators via the respective common star point.



If a prewired connection cable is used, remove the cores with unused signal inputs and outputs.

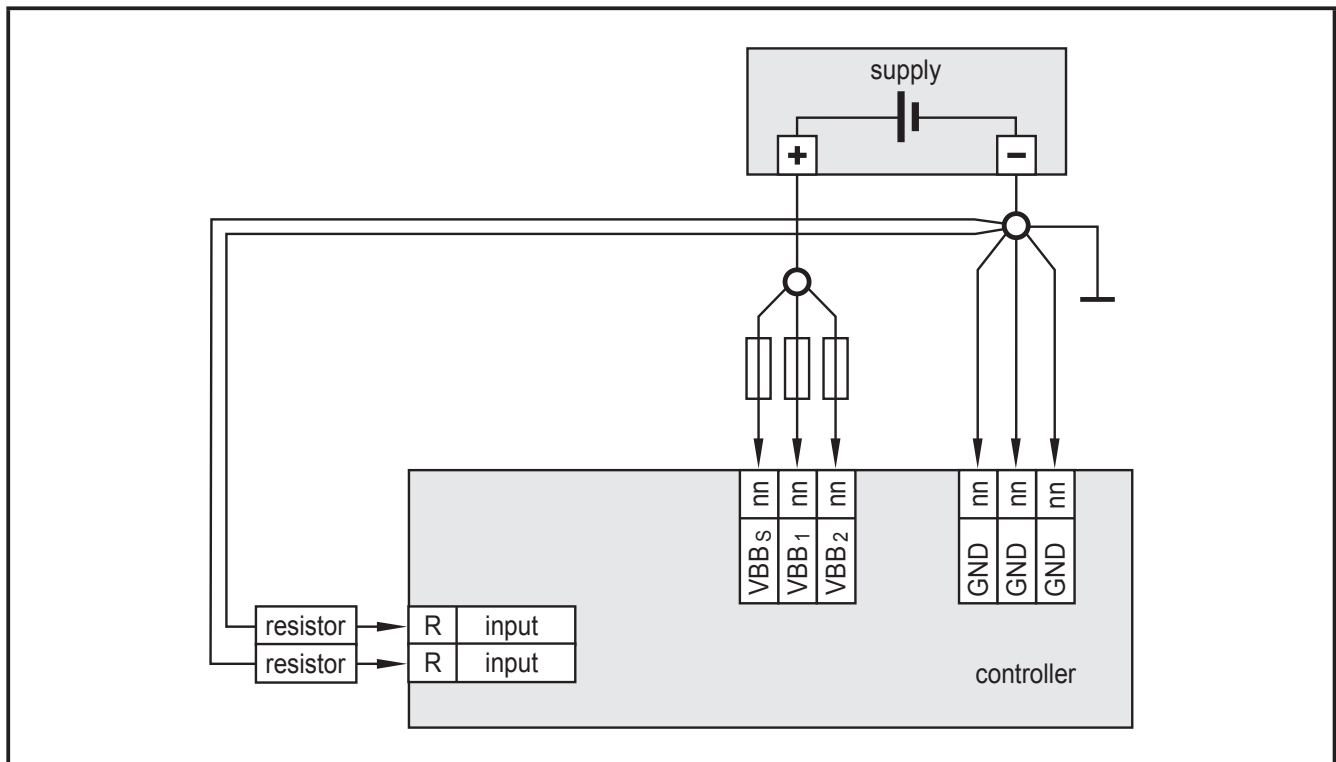
Unused cores, in particular core loops, lead to interference coupling that can influence the connected controller.

5.5 Frequency and analogue inputs

- Operate inputs with screened cables, so that useful signals are not affected by external interference.
- Connect screens to ground on one side.

5.6 Resistor inputs

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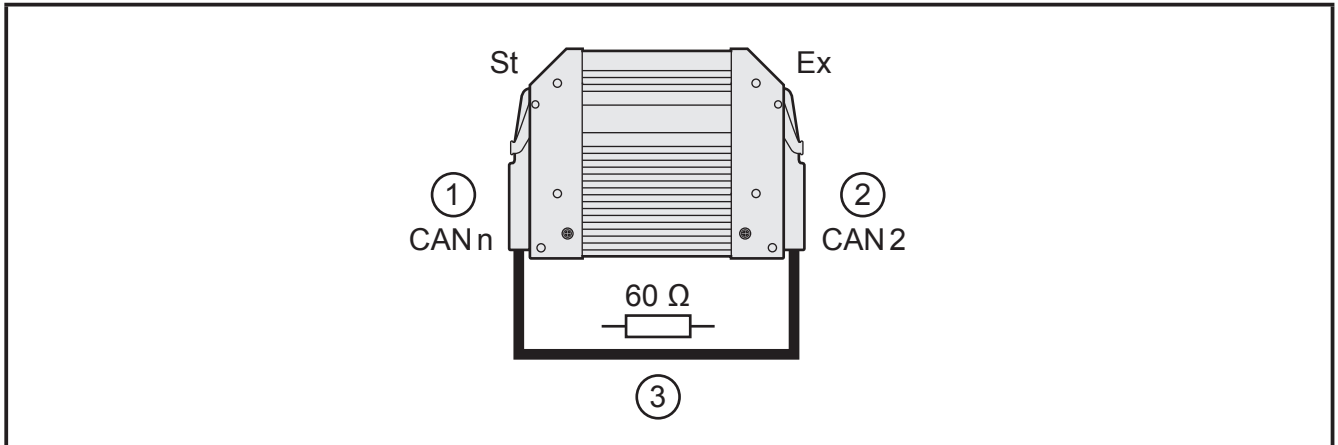


Ground return resistor inputs

- Equip each resistor with its own, separated ground return to ensure measurement accuracy.

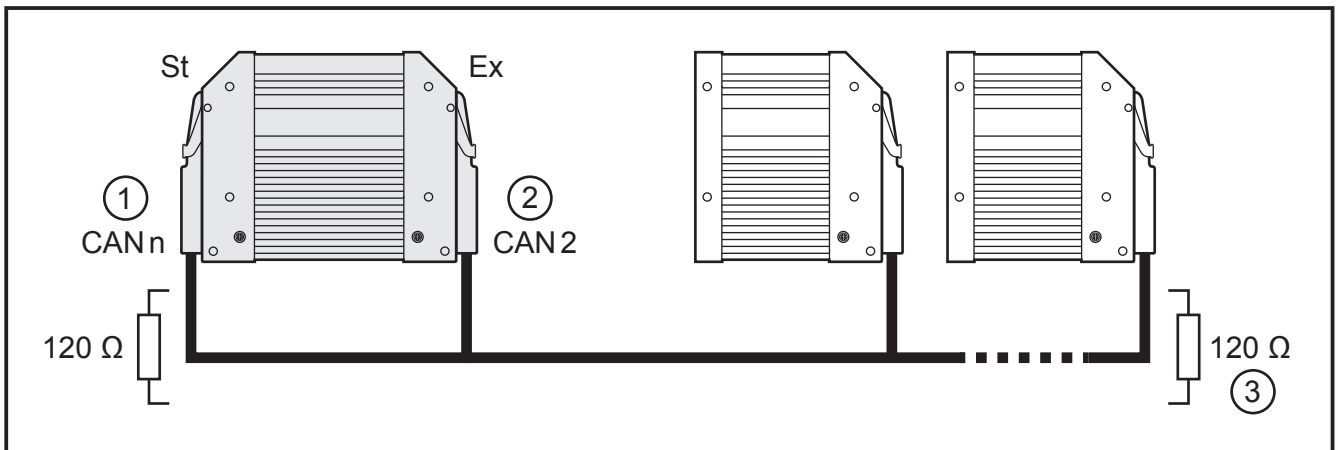
5.7 CAN wiring St/Ex side

5.7.1 Point-to-point wiring



1. Standard side: CANn (interface selectable)
2. Extended side: CAN2 (with factory pre-configuration)
3. Terminating CAN resistor in the cable

5.7.2 Open CANopen network



1. Standard side: CANn (interface selectable)
2. Extended side: CAN2 (with factory pre-configuration)
3. Terminating CAN resistors

► Screen the CAN bus cables in EMC-critical applications.

5.8 Connection technology

NOTE

Only connect the 55-pole connectors when the supply voltage is disconnected.
No "hot plugging" is permitted.

6 Set-up

6.1 Programming

The user can easily create the application software by means of the IEC 61131-3 compliant programming system CODESYS 2.3.



On delivery the extended side is pre-configured as CANopen slave.
However, the user can also program the extended side freely.

6.2 Required documentation

In addition to the CODESYS programming system, the following documents are required for programming and set-up of the device:

- Programming manual CODESYS V2.3
(alternatively as online help)
- SmartController XL system manual
(alternatively as online help)

The manuals can be downloaded from the internet:

www.ifm.com → Data sheet search → CR2532 → More information

CODESYS and SmartController XL online help:

www.ifm.com → Service → Download → Systems for mobile machines*

*) Download area with registration

7 Technical data

7.1 Mechanical and electric data

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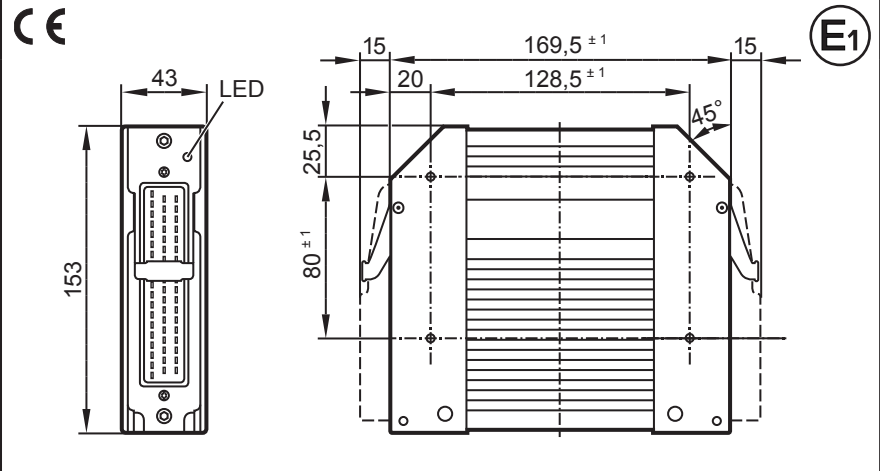
Mobile controller
SmartController XL

32 inputs
32 outputs

3 CAN interfaces

Programming according
to IEC 61131-3

8...32 V DC



Technical data

Mechanical data

Housing

Dimensions (H x W x D)

Installation

Connection

Weight

Housing/storage temperature

Protection rating

Electrical data

Input/output channels total

Inputs

Outputs

Operating voltage

Overvoltage

Undervoltage detection

Undervoltage shutdown

Reverse polarity protection

Current consumption

CAN interfaces 1...3

Baud rate

Communication profile

Processor

Note

Controller as black-box system to implement a central or decentralised system design

Closed, screened metal housing with flange fastening

153 x 169.5 x 43 mm

Screw connection by means of 4 M5 x L screws to DIN 7500 or DIN 7984
Mounting position horizontal or vertical to the mounting wall

2 55-pin connectors, latched, protected against reverse polarity, type AMP or Framatome
AMP junior timer contacts, crimp connection 0.5/2.5 mm²

1.3 kg

– 40...85 °C (depending on the load) / – 40...85 °C

IP 67 (for inserted connectors with individually sealed cores, e.g. EC2084)

64 (32 inputs / 32 outputs)

Configurable
Digital for positive/negative sensor signals, positive with diagnostic capabilities
Analogue (0...10 / 32 V, 0...20 mA, ratiometric)
Frequency (≤ 30 kHz)
Resistance measurement (16 Ω ...30 k Ω)

Configurable
Digital, positive switching (high side)
Analogue (0.02...10V)
PWM output (20...250 Hz), current-controlled

8...32 V DC

≤ 36 V for $t \leq 10$ s

if $U_B \leq 7.8$ V

if $U_B < 7.0$ V

yes

100 mA (at 24 V DC)

CAN interface 2.0 A/B, ISO 11898
50 Kbits/s...1 Mbit/s (default 250 Kbits/s)
CANopen, CiA DS 301 V4.01, CiA DS 306 V1.3
or SAE J 1939 or free protocol

Freescall PowerPC, 50 MHz

If not otherwise specified, the data apply to the St and Ex side.

CR2532	Technical data																					
Device monitoring	Undervoltage monitoring Watchdog function Checksum test for program and system Excess temperature monitoring																					
Physical memory	Flash: 1.5 Mbytes RAM: 592 kBytes Remanent memory: 2 Kbytes																					
Memory allocation	See system manual www.ifm.com → Data sheet search → CR2532 → More information																					
Software/programming																						
Programming system	CODESYS version 2.3 (IEC 61131-3)																					
Indicators																						
Status LED	LED red / LED green																					
Operating states	<table><tr><th>Colour</th><th>Status</th><th>Description</th></tr><tr><td>–</td><td>permanently off</td><td>No operating voltage</td></tr><tr><td>Red/green</td><td>1 x on</td><td>Initialisation or reset checks</td></tr><tr><td rowspan="3">Green</td><td>5 Hz</td><td>No operating system loaded</td></tr><tr><td>2 Hz</td><td>Application running (RUN)</td></tr><tr><td>permanently on</td><td>Application stopped (STOP)</td></tr><tr><td rowspan="2">Red</td><td>5 Hz</td><td>Application stopped due to undervoltage</td></tr><tr><td>permanently on</td><td>system error (fatal error)</td></tr></table>	Colour	Status	Description	–	permanently off	No operating voltage	Red/green	1 x on	Initialisation or reset checks	Green	5 Hz	No operating system loaded	2 Hz	Application running (RUN)	permanently on	Application stopped (STOP)	Red	5 Hz	Application stopped due to undervoltage	permanently on	system error (fatal error)
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	permanently on	system error (fatal error)																				
Note	If not otherwise specified, the data apply to the St and Ex side.																					

7.2 Test standards and regulations

CR2532	Technical data	
Test standards and regulations		
CE marking	EN 61000:6-2: 2005	Electromagnetic compatibility (EMC) Noise immunity
	EN 61000:6-4: 2007	Electromagnetic compatibility (EMC) Emission standard
E1 marking	UN/ECE-R10	Emission standard Immunity with 100 V/m
Electrical tests	ISO 7637-2: 2004	Pulse 1, severity level: IV; function state C Pulse 2a, severity level: IV; function state A Pulse 2b, severity level: IV; function state C Pulse 3a, severity level: IV; function state A Pulse 3b, severity level: IV; function state A Pulse 4, severity level: IV; function state A Pulse 5, severity level: III; function state C (data valid for the 24 V system) Pulse 4, severity level: III; function state C (data valid for the 12 V system)
Climatic tests	EN 60068:2-30: 2006	Damp heat, cyclic Upper temperature 55°C, number of cycles: 6
	EN 60068:2-78: 2002	Damp heat, steady state Test temperature 40°C / 93% RH, Test duration: 21 days
	EN 60068:2-52: 1996	Salt spray test Severity level 3 (vehicle)
Mechanical tests	ISO 16750-3: 2007	Test VII; Vibration, random Mounting location: vehicle body
	EN 60068:2-6: 2008	Vibration, sinusoidal 10...500 Hz; 0.72 mm/10 g; 10 cycles/axis
	ISO 16750-3: 2007	Bumps 30 g/6 ms; 24,000 shocks

7.3 St side / input characteristics

CR2532	St side / input characteristics														
IN00...03 Analogue / digital inputs	<table> <tr> <td>Resolution</td><td>12 bits</td></tr> <tr> <td>Accuracy</td><td>$\pm 1\%$ FS</td></tr> <tr> <td>Measuring ranges</td><td>0...10 V, 0...32 V, 0...20 mA, ratiometric</td></tr> </table>	Resolution	12 bits	Accuracy	$\pm 1\%$ FS	Measuring ranges	0...10 V, 0...32 V, 0...20 mA, ratiometric								
Resolution	12 bits														
Accuracy	$\pm 1\%$ FS														
Measuring ranges	0...10 V, 0...32 V, 0...20 mA, ratiometric														
Current input 0...20 mA (A)	<table> <tr> <td>Input resistance</td><td>390 Ω</td></tr> <tr> <td>Input frequency</td><td>≤ 1 kHz (default 35 Hz)</td></tr> </table>	Input resistance	390 Ω	Input frequency	≤ 1 kHz (default 35 Hz)										
Input resistance	390 Ω														
Input frequency	≤ 1 kHz (default 35 Hz)														
Voltage input 0...10 V (A)	<table> <tr> <td>Input resistance</td><td>65.6 kΩ</td></tr> <tr> <td>Input frequency</td><td>≤ 1 kHz (default 35 Hz)</td></tr> </table>	Input resistance	65.6 k Ω	Input frequency	≤ 1 kHz (default 35 Hz)										
Input resistance	65.6 k Ω														
Input frequency	≤ 1 kHz (default 35 Hz)														
Voltage input 0...32 V (A)	<table> <tr> <td>Input resistance</td><td>50.7 kΩ</td></tr> <tr> <td>Input frequency</td><td>≤ 1 kHz (default 35 Hz)</td></tr> </table>	Input resistance	50.7 k Ω	Input frequency	≤ 1 kHz (default 35 Hz)										
Input resistance	50.7 k Ω														
Input frequency	≤ 1 kHz (default 35 Hz)														
Voltage input ratiometric (A)	<table> <tr> <td>Input resistance</td><td>50.7 kΩ</td></tr> <tr> <td>Input frequency</td><td>≤ 1 kHz (default 35 Hz)</td></tr> </table>	Input resistance	50.7 k Ω	Input frequency	≤ 1 kHz (default 35 Hz)										
Input resistance	50.7 k Ω														
Input frequency	≤ 1 kHz (default 35 Hz)														
Digital input (B _{LH})	<table> <tr> <td>Input resistance</td><td>3.2 kΩ</td></tr> <tr> <td>Input frequency</td><td>≤ 1 kHz (default 35 Hz)</td></tr> <tr> <td>Switch-on level</td><td>$> 0.7 U_B$</td></tr> <tr> <td>Switch-off level</td><td>$< 0.3 U_B$</td></tr> <tr> <td>Diagnosis Short circuit to VBB</td><td>$> 0.95 U_B$</td></tr> <tr> <td>Diagnosis Short circuit to GND / wire break</td><td>< 1 V</td></tr> </table>	Input resistance	3.2 k Ω	Input frequency	≤ 1 kHz (default 35 Hz)	Switch-on level	$> 0.7 U_B$	Switch-off level	$< 0.3 U_B$	Diagnosis Short circuit to VBB	$> 0.95 U_B$	Diagnosis Short circuit to GND / wire break	< 1 V		
Input resistance	3.2 k Ω														
Input frequency	≤ 1 kHz (default 35 Hz)														
Switch-on level	$> 0.7 U_B$														
Switch-off level	$< 0.3 U_B$														
Diagnosis Short circuit to VBB	$> 0.95 U_B$														
Diagnosis Short circuit to GND / wire break	< 1 V														
IN04...05 Digital / resistor inputs	<table> <tr> <td>Resolution</td><td>12 bits</td></tr> </table>	Resolution	12 bits												
Resolution	12 bits														
Digital input (B _L)	<table> <tr> <td>Input resistance</td><td>3.2 kΩ</td></tr> <tr> <td>Input frequency</td><td>≤ 1 kHz (default 35 Hz)</td></tr> <tr> <td>Switch-on level</td><td>$> 0.7 U_B$</td></tr> <tr> <td>Switch-off level</td><td>$< 0.3 U_B$</td></tr> <tr> <td>Diagnosis Short circuit to VBB</td><td>$> 0.95 U_B$</td></tr> <tr> <td>Diagnosis Short circuit to GND / wire break</td><td>< 1 V</td></tr> <tr> <td>Voltage on the pin when not connected</td><td>≤ 0.2 V</td></tr> </table>	Input resistance	3.2 k Ω	Input frequency	≤ 1 kHz (default 35 Hz)	Switch-on level	$> 0.7 U_B$	Switch-off level	$< 0.3 U_B$	Diagnosis Short circuit to VBB	$> 0.95 U_B$	Diagnosis Short circuit to GND / wire break	< 1 V	Voltage on the pin when not connected	≤ 0.2 V
Input resistance	3.2 k Ω														
Input frequency	≤ 1 kHz (default 35 Hz)														
Switch-on level	$> 0.7 U_B$														
Switch-off level	$< 0.3 U_B$														
Diagnosis Short circuit to VBB	$> 0.95 U_B$														
Diagnosis Short circuit to GND / wire break	< 1 V														
Voltage on the pin when not connected	≤ 0.2 V														

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Resistor input (R)

St side / input characteristics

Measuring current	< 2.0 mA
Input frequency	50 Hz
Measuring range	16 Ω ...30 k Ω
Accuracy	$\pm 2\%$ FS: 16 Ω ...3 k Ω $\pm 5\%$ FS: 3...15 k Ω $\pm 10\%$ FS: 15...30 k Ω
Diagnosis Short circuit to VBB	> 31 k Ω

**IN06...11
Digital inputs**Digital input (B_i)

Resolution	12 bits
Input resistance	3.2 k Ω
Input frequency	≤ 1 kHz (default 35 Hz)
Switch-on level	> 0.7 U _B
Switch-off level	< 0.3 U _B
Diagnosis Short circuit to VBB	> 0.95 U _B
Diagnosis Short circuit to GND / wire break	< 1 V

**IN12...15
Digital / frequency inputs**Digital input (B_i)

Resolution	12 bits
Input resistance	3.2 k Ω
Input frequency	≤ 30 kHz
Switch-on level	> 0.35...0.48 U _B
Switch-off level	< 0.29 U _B
Diagnosis Short circuit to VBB	none
Diagnosis Short circuit to GND / wire break	none

Frequency input (FRQ)

Input resistance	3.2 k Ω
Input frequency	≤ 30 kHz
Switch-on level	> 0.35...0.48 U _B
Switch-off level	< 0.29 U _B

7.4 St side / output characteristics

CR2532	St side / output characteristics												
OUT00...01 digital/ PWM outputs	<table> <tr> <td>Protective circuit for inductive loads</td><td>integrated</td></tr> <tr> <td>Diagnosis wire break</td><td>via voltage feedback</td></tr> <tr> <td>Diagnosis short circuit</td><td>via voltage feedback</td></tr> <tr> <td>Diagnosis excessive current</td><td>integrated</td></tr> </table>	Protective circuit for inductive loads	integrated	Diagnosis wire break	via voltage feedback	Diagnosis short circuit	via voltage feedback	Diagnosis excessive current	integrated				
Protective circuit for inductive loads	integrated												
Diagnosis wire break	via voltage feedback												
Diagnosis short circuit	via voltage feedback												
Diagnosis excessive current	integrated												
Digital output (B _H)	<table> <tr> <td>Switching voltage</td><td>8...32 V DC</td></tr> <tr> <td>Switching current</td><td>0.02...2 A</td></tr> </table>	Switching voltage	8...32 V DC	Switching current	0.02...2 A								
Switching voltage	8...32 V DC												
Switching current	0.02...2 A												
PWM output (PWM)	<table> <tr> <td>Output frequency</td><td>20...250 Hz (per channel)</td></tr> <tr> <td>Pulse/pause ratio</td><td>1...1000 ‰</td></tr> <tr> <td>Resolution</td><td>1 ‰</td></tr> <tr> <td>Switching current</td><td>0.02...2 A</td></tr> </table>	Output frequency	20...250 Hz (per channel)	Pulse/pause ratio	1...1000 ‰	Resolution	1 ‰	Switching current	0.02...2 A				
Output frequency	20...250 Hz (per channel)												
Pulse/pause ratio	1...1000 ‰												
Resolution	1 ‰												
Switching current	0.02...2 A												
Current-controlled output (PWM _I)	<table> <tr> <td>Output frequency</td><td>20...250 Hz (per channel)</td></tr> <tr> <td>Control range</td><td>0.02...2 A</td></tr> <tr> <td>Setting resolution</td><td>1 mA</td></tr> <tr> <td>Control resolution</td><td>2 mA</td></tr> <tr> <td>Load resistance</td><td>≥ 6 Ω (at 12V DC) ≥ 12 Ω (at 24V DC)</td></tr> <tr> <td>Accuracy</td><td>± 1.5% FS</td></tr> </table>	Output frequency	20...250 Hz (per channel)	Control range	0.02...2 A	Setting resolution	1 mA	Control resolution	2 mA	Load resistance	≥ 6 Ω (at 12V DC) ≥ 12 Ω (at 24V DC)	Accuracy	± 1.5% FS
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OUT02...07 digital/ PWM outputs	<table> <tr> <td>Protective circuit for inductive loads</td><td>integrated</td></tr> <tr> <td>Diagnosis wire break</td><td>only if switched off $U_{OUT} > 27.5 \% V_{BB_S}$</td></tr> <tr> <td>Diagnosis short circuit</td><td>only in the logic ON state $U_{OUT} < 93.5 \% V_{BB_S}$</td></tr> </table>	Protective circuit for inductive loads	integrated	Diagnosis wire break	only if switched off $U_{OUT} > 27.5 \% V_{BB_S}$	Diagnosis short circuit	only in the logic ON state $U_{OUT} < 93.5 \% V_{BB_S}$						
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Output frequency	20...250 Hz (per channel)												
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OUT08...09 digital/ PWM outputs	<table> <tr> <td>Protective circuit for inductive loads</td><td>integrated</td></tr> <tr> <td>Diagnosis wire break</td><td>none</td></tr> <tr> <td>Diagnosis short circuit</td><td>none</td></tr> </table>	Protective circuit for inductive loads	integrated	Diagnosis wire break	none	Diagnosis short circuit	none						
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Switching voltage	8...32 V DC												
Switching current	0.02...2 A												

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PWM output (PWM)

OUT08_A...09_A
analogue outputs**OUT10...11**
digital/ PWM outputsDigital output (B_H)

PWM output (PWM)

OUT12...15
Digital outputsDigital output (B_H)Load current per output group
(VBB₁, VBB₂)Overload protection
(valid for all outputs)

Short-circuit strength to GND

St side / output characteristics

Output frequency	20...250 Hz (per channel)
Pulse/pause ratio	1...1000 ‰
Resolution	1 ‰
Switching current	0.02...2 A

Voltage range	8...32 V
Current rating	< 5 mA
Output voltage	0.2...10 V
Accuracy	± 6% FS
Residual ripple at 120 Hz	80 mV

Protective circuit for inductive loads	integrated
Diagnosis wire break	none
Diagnosis short circuit	none

Switching voltage	8...32 V DC
Switching current	0.02...4 A

Output frequency	20...250 Hz (per channel)
Pulse/pause ratio	1...1000 ‰
Resolution	1 ‰
Switching current	0.02...4 A

Protective circuit for inductive loads	integrated
Diagnosis wire break	none
Diagnosis short circuit	none

Switching voltage	8...32 V DC
Switching current	0.02...2 A

≤ 12 A
(for continuous operation ≤ 9 A; i.e. operation ≥ 10 min)

max. 5 minutes (at 100% overload)

Switch-off of the outputs is carried out via the output driver

7.5 Ex side / input characteristics

CR2532

IN00...03

Analogue / digital inputs

Current input 0...20 mA (A)

Voltage input 0...10 V (A)

Voltage input 0...32 V (A)

Voltage input ratiometric (A)

Digital input (B_{UH})

IN04...05

Digital / resistor inputs

Digital input (B_L)

Ex side / input characteristics

Resolution	12 bits
Accuracy	$\pm 1\%$ FS
Measuring ranges	0...10 V, 0...32 V, 0...20 mA, ratiometric

Input resistance	390 Ω
Input frequency	≤ 1 kHz (default 35 Hz)

Input resistance	65.6 k Ω
Input frequency	≤ 1 kHz (default 35 Hz)

Input resistance	50.7 k Ω
Input frequency	≤ 1 kHz (default 35 Hz)

Input resistance	50.7 k Ω
Input frequency	≤ 1 kHz (default 35 Hz)

Input resistance	3.2 k Ω
Input frequency	≤ 1 kHz (default 35 Hz)
Switch-on level	$> 0.7 U_B$
Switch-off level	$< 0.3 U_B$
Diagnosis Short circuit to VBB	$> 0.95 U_B$
Diagnosis Short circuit to GND / wire break	< 1 V

Resolution	12 bits
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Input resistance	3.2 k Ω
Input frequency	≤ 1 kHz (default 35 Hz)
Switch-on level	$> 0.7 U_B$
Switch-off level	$< 0.3 U_B$
Diagnosis Short circuit to VBB	$> 0.95 U_B$
Diagnosis Short circuit to GND / wire break	< 1 V
Voltage on the pin when not connected	≤ 0.2 V

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Resistor input (R)

Ex side / input characteristics

Measuring current	< 2,0 mA
Input frequency	50 Hz
Measuring range	16 Ω ...30 k Ω
Accuracy	$\pm 2\%$ FS: 16 Ω ...3 k Ω $\pm 5\%$ FS: 3...15 k Ω $\pm 10\%$ FS: 15...30 k Ω
Diagnosis Short circuit to VBB	> 31 k Ω

**IN06...11
Digital inputs**Digital input (B_i)

Resolution	12 bits
Input resistance	3.2 k Ω
Input frequency	≤ 1 kHz (default 35 Hz)
Switch-on level	> 0.7 U _B
Switch-off level	< 0.3 U _B
Diagnosis Short circuit to VBB	> 0.95 U _B
Diagnosis Short circuit to GND / wire break	< 1 V

**IN12...15
Digital / frequency inputs**Digital input (B_i)

Resolution	12 bits
Input resistance	3.2 k Ω
Input frequency	≤ 30 kHz
Switch-on level	> 0.35...0.48 U _B
Switch-off level	< 0.29 U _B
Diagnosis Short circuit to VBB	none
Diagnosis Short circuit to GND / wire break	none

Frequency input (FRQ)

Input resistance	3.2 k Ω
Input frequency	≤ 30 kHz
Switch-on level	> 0.35...0.48 U _B
Switch-off level	< 0.29 U _B

7.6 Ex side / output characteristics

CR2532	Ex side / output characteristics												
OUT00...01 digital/ PWM outputs	<table> <tr> <td>Protective circuit for inductive loads</td><td>integrated</td></tr> <tr> <td>Diagnosis wire break</td><td>via voltage feedback</td></tr> <tr> <td>Diagnosis short circuit</td><td>via voltage feedback</td></tr> <tr> <td>Diagnosis excessive current</td><td>integrated</td></tr> </table>	Protective circuit for inductive loads	integrated	Diagnosis wire break	via voltage feedback	Diagnosis short circuit	via voltage feedback	Diagnosis excessive current	integrated				
Protective circuit for inductive loads	integrated												
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Digital output (B_H)	<table> <tr> <td>Switching voltage</td><td>8...32 V DC</td></tr> <tr> <td>Switching current</td><td>0.02...2 A</td></tr> </table>	Switching voltage	8...32 V DC	Switching current	0.02...2 A								
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PWM output (PWM)	<table> <tr> <td>Output frequency</td><td>20...250 Hz (per channel)</td></tr> <tr> <td>Pulse/pause ratio</td><td>1...1000 ‰</td></tr> <tr> <td>Resolution</td><td>1 ‰</td></tr> <tr> <td>Switching current</td><td>0.02...2 A</td></tr> </table>	Output frequency	20...250 Hz (per channel)	Pulse/pause ratio	1...1000 ‰	Resolution	1 ‰	Switching current	0.02...2 A				
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OUT02...07 digital/ PWM outputs	<table> <tr> <td>Protective circuit for inductive loads</td><td>integrated</td></tr> <tr> <td>Diagnosis wire break</td><td>only if switched off $U_{OUT} > 27.5 \% V_{BB_S}$</td></tr> <tr> <td>Diagnosis short circuit</td><td>only in the logic ON state $U_{OUT} < 93.5 \% V_{BB_S}$</td></tr> </table>	Protective circuit for inductive loads	integrated	Diagnosis wire break	only if switched off $U_{OUT} > 27.5 \% V_{BB_S}$	Diagnosis short circuit	only in the logic ON state $U_{OUT} < 93.5 \% V_{BB_S}$						
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Output frequency	20...250 Hz (per channel)												
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Switching voltage	8...32 V DC												
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CR2532	Ex side / output characteristics										
PWM output (PWM)	<table> <tr> <td>Output frequency</td><td>20...250 Hz (per channel)</td></tr> <tr> <td>Pulse/pause ratio</td><td>1...1000 ‰</td></tr> <tr> <td>Resolution</td><td>1 ‰</td></tr> <tr> <td>Switching current</td><td>0.02...2 A</td></tr> </table>	Output frequency	20...250 Hz (per channel)	Pulse/pause ratio	1...1000 ‰	Resolution	1 ‰	Switching current	0.02...2 A		
Output frequency	20...250 Hz (per channel)										
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Resolution	1 ‰										
Switching current	0.02...2 A										
OUT08_A...09_A analogue outputs	<table> <tr> <td>Voltage range</td><td>8...32 V</td></tr> <tr> <td>Current rating</td><td>< 5 mA</td></tr> <tr> <td>Output voltage</td><td>0.2...10 V</td></tr> <tr> <td>Accuracy</td><td>± 6% FS</td></tr> <tr> <td>Residual ripple at 120 Hz</td><td>80 mV</td></tr> </table>	Voltage range	8...32 V	Current rating	< 5 mA	Output voltage	0.2...10 V	Accuracy	± 6% FS	Residual ripple at 120 Hz	80 mV
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Output voltage	0.2...10 V										
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OUT10...11 digital/ PWM outputs	<table> <tr> <td>Protective circuit for inductive loads</td><td>integrated</td></tr> <tr> <td>Diagnosis wire break</td><td>none</td></tr> <tr> <td>Diagnosis short circuit</td><td>none</td></tr> </table>	Protective circuit for inductive loads	integrated	Diagnosis wire break	none	Diagnosis short circuit	none				
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Digital output (B _H)	<table> <tr> <td>Switching voltage</td><td>8...32 V DC</td></tr> <tr> <td>Switching current</td><td>0.02...4 A</td></tr> </table>	Switching voltage	8...32 V DC	Switching current	0.02...4 A						
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OUT12...15 Digital outputs	<table> <tr> <td>Protective circuit for inductive loads</td><td>integrated</td></tr> <tr> <td>Diagnosis wire break</td><td>none</td></tr> <tr> <td>Diagnosis short circuit</td><td>none</td></tr> </table>	Protective circuit for inductive loads	integrated	Diagnosis wire break	none	Diagnosis short circuit	none				
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Switching voltage	8...32 V DC										
Switching current	0.02...2 A										
Load current per output group (VBB ₁ , VBB ₂)	≤ 12 A (for continuous operation ≤ 9 A; i.e. operation ≥ 10 min)										
Overload protection (valid for all outputs)	max. 5 minutes (at 100% overload)										
Short-circuit strength to GND	Switch-off of the outputs is carried out via the output driver										

7.7 St side / wiring

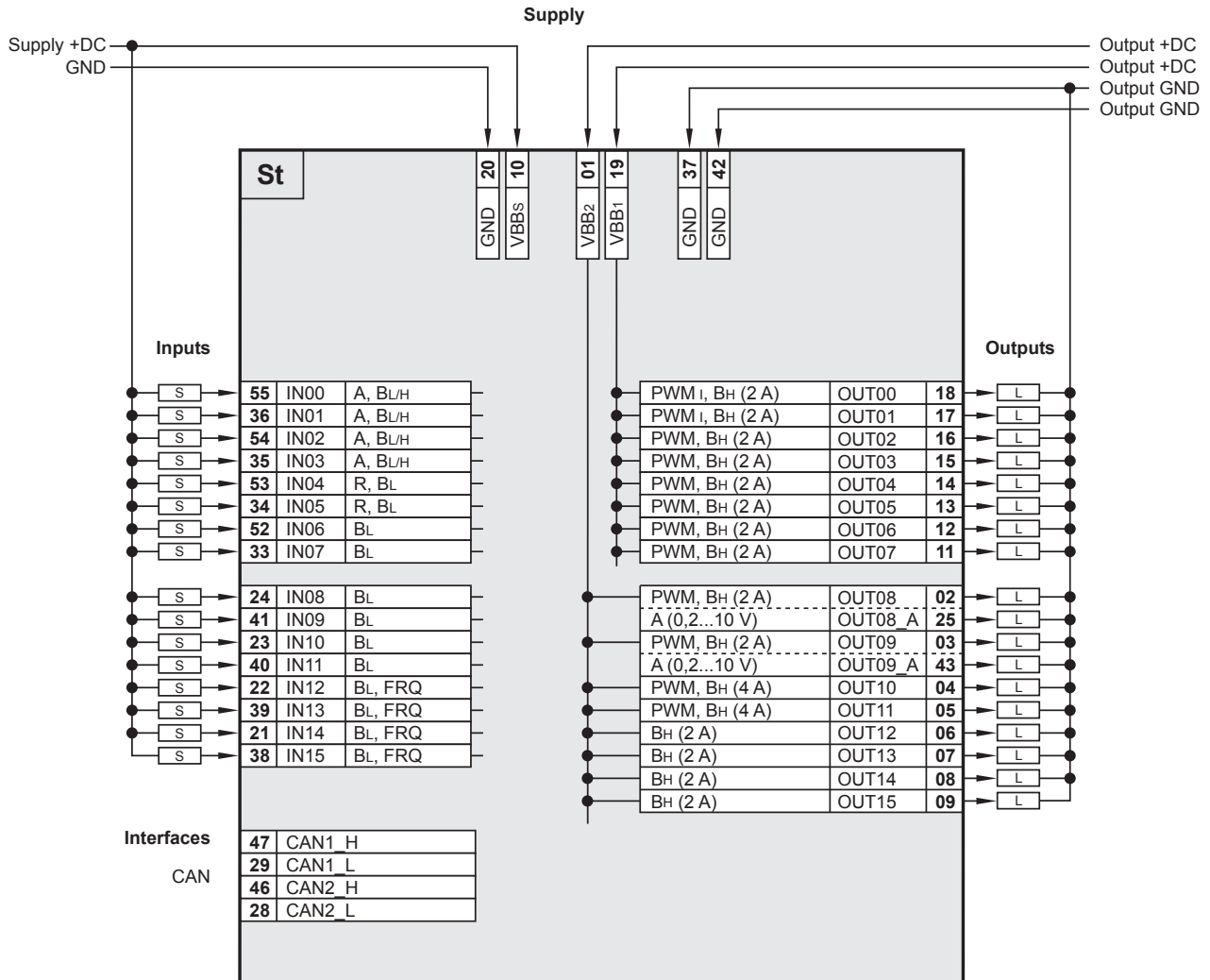
CR2532

Technical data

Wiring

St side

UK



Abbreviations

A	Analogue
B _H	Binary high side
B _L	Binary low side
FRQ	Frequency/pulse inputs
PWM	Pulse width modulation
R	Resistor input
VBB _s	Supply sensors/module
VBB ₁	Supply output group 1
VBB ₂	Supply output group 2

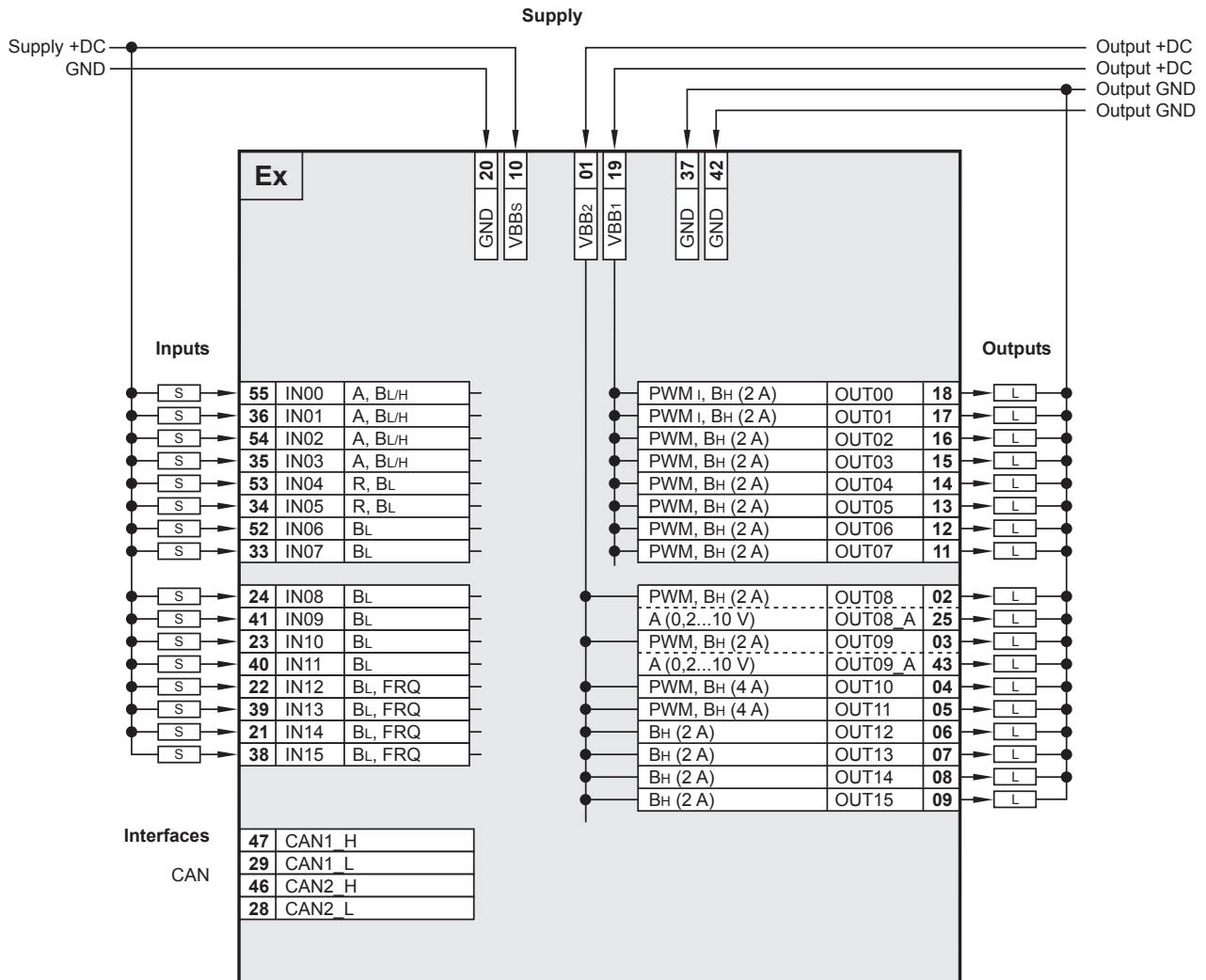
7.8 Ex side / wiring

CR2532

Technical data

Wiring

Ex side



Abbreviations

A	Analogue
B _H	Binary high side
B _L	Binary low side
FRQ	Frequency/pulse inputs
PWM	Pulse width modulation
R	Resistor input
VBB _s	Supply sensors/module
VBB ₁	Supply output group 1
VBB ₂	Supply output group 2

8 Maintenance, repair and disposal

The unit is maintenance-free.

- ▶ Do not open the housing as the device does not contain any components which can be repaired by the user. The device must only be repaired by the manufacturer.
- ▶ Dispose of the device in accordance with the national environmental regulations.

9 Approvals/standards

Test standards and regulations (→ 7 Technical data)

The EC declaration of conformity and approvals can be found at:
www.ifm.com → Data sheet search → CR2532 → Approvals

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