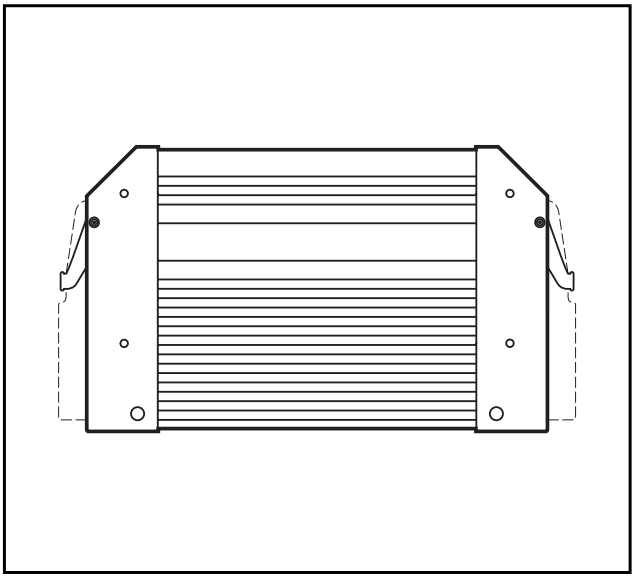
ifm electronic

Mounting and installation instructions

ecomat100®

ExtendedController R 360

CR0200



Sachnr. 7390427/02 09/2015

ENGLISH

Safety instructions

⚠ This description is part of the unit. It contains texts and drawings concerning the correct handling of the controller and must be read before installation or use.

Observe the information of the description. Non-observance of the notes, operation which is not in accordance with use as prescribed below, wrong installation or handling can result in serious harm concerning the safety of persons and plant.

The instructions are for authorised persons according to the EMC and low voltage guidelines. The controllers must be installed and commissioned by a skilled electrician (programmer or service technician).

If the unit 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 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 unit must also comply with the SELV criteria (safe extra-low voltage, safe electrical separation from other electric circuits).

If the supplied SELV voltage has an external connection to ground (SELV becomes PELV) the responsibility lies with the user and the respective national regulations for installation must be complied with. All statements in these operating instructions refer to the unit the SELV voltage of which is not grounded.

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

The unit can be operated within a wide temperature range according to the technical specification indicated below. Due to the additional self-heating the housing walls can have high perceptible temperatures when touched in hot environments.

In case of malfunctions or uncertainties please contact the manufacturer. Tampering with the unit can lead to considerable risks for the safety of persons and plant. It is not permitted and leads to the exclusion of any liability and warranty claims.

Contents

1. Function and features

The freely programmable controllers of the "ExtendedController R 360" series are rated for use under difficult conditions (e.g. extended temperature range, strong vibration, intensive EMC interference).
They are thus suited for direct mounting into machines in mobile and rugged applications. Due to their specification the inputs and outputs are especially rated for this use. Integrated hardware and software functions (operating system) offer high protection of the machine.
The controllers can be used as CANopen master.

⚠ The controllers "ExtendedController R 360" are not approved for safety-relevant tasks in the field of safety of persons.

2. Programming

The application software can be easily created by the user with the ifm programming system CODESYS according to IEC 61131-3.
In addition to the programming system the complete system manual is required to program the controller.
If this manual is not available, please contact one of the ifm branch offices overleaf for your free copy. The system manual (pdf format) can also be downloaded from the web.

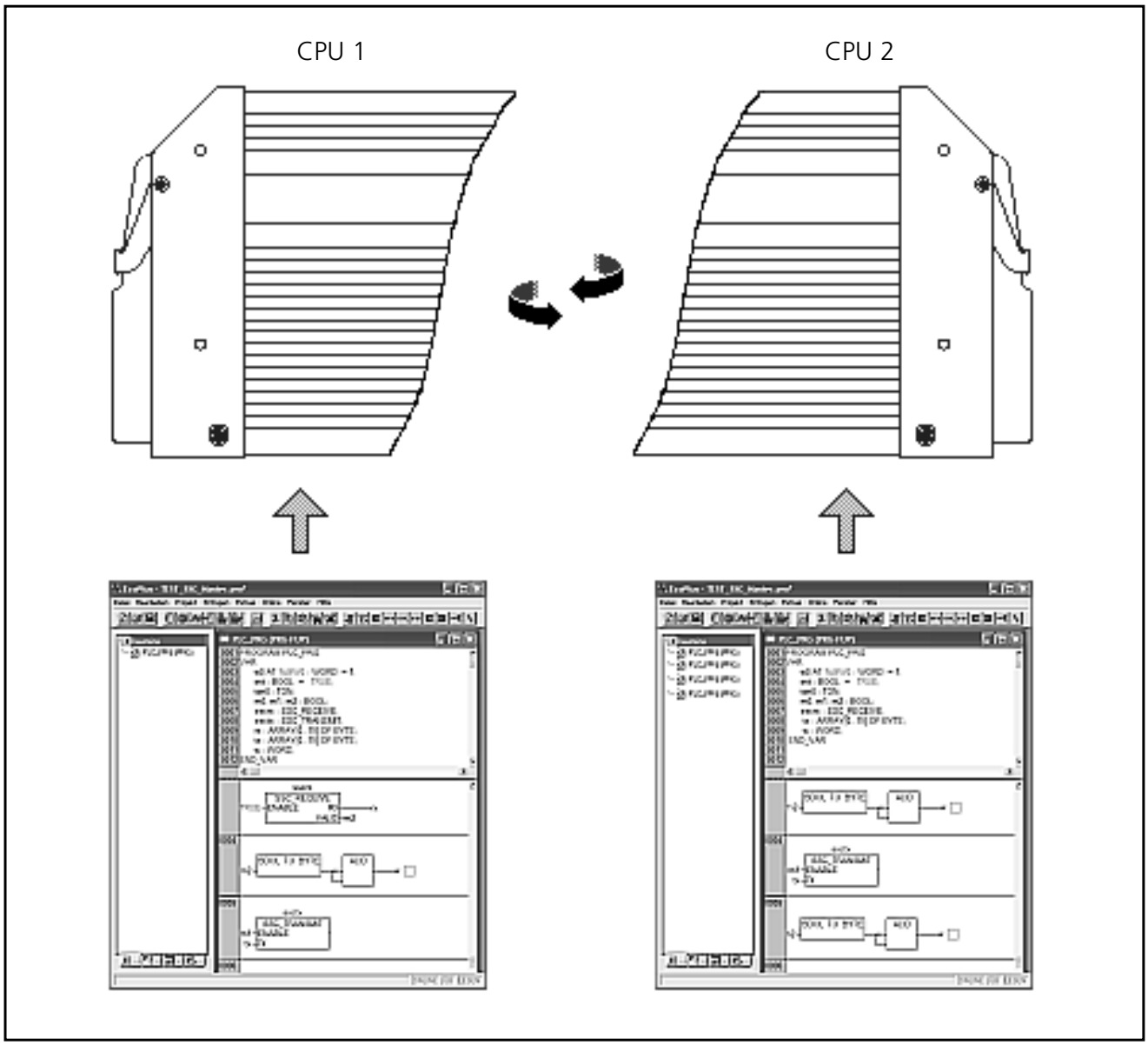
www.ifm.com ➔ Data sheet direct ➔ CR0200 ➔ Additional data

⚠ The user is responsible for the safe functioning of the application programs which he creates himself. If necessary, he must additionally obtain an approval according to the corresponding national regulations by the corresponding testing and supervisory organisations.

ENGLISH

2.1 Programming choices

■ Two independent and asynchronous user programs

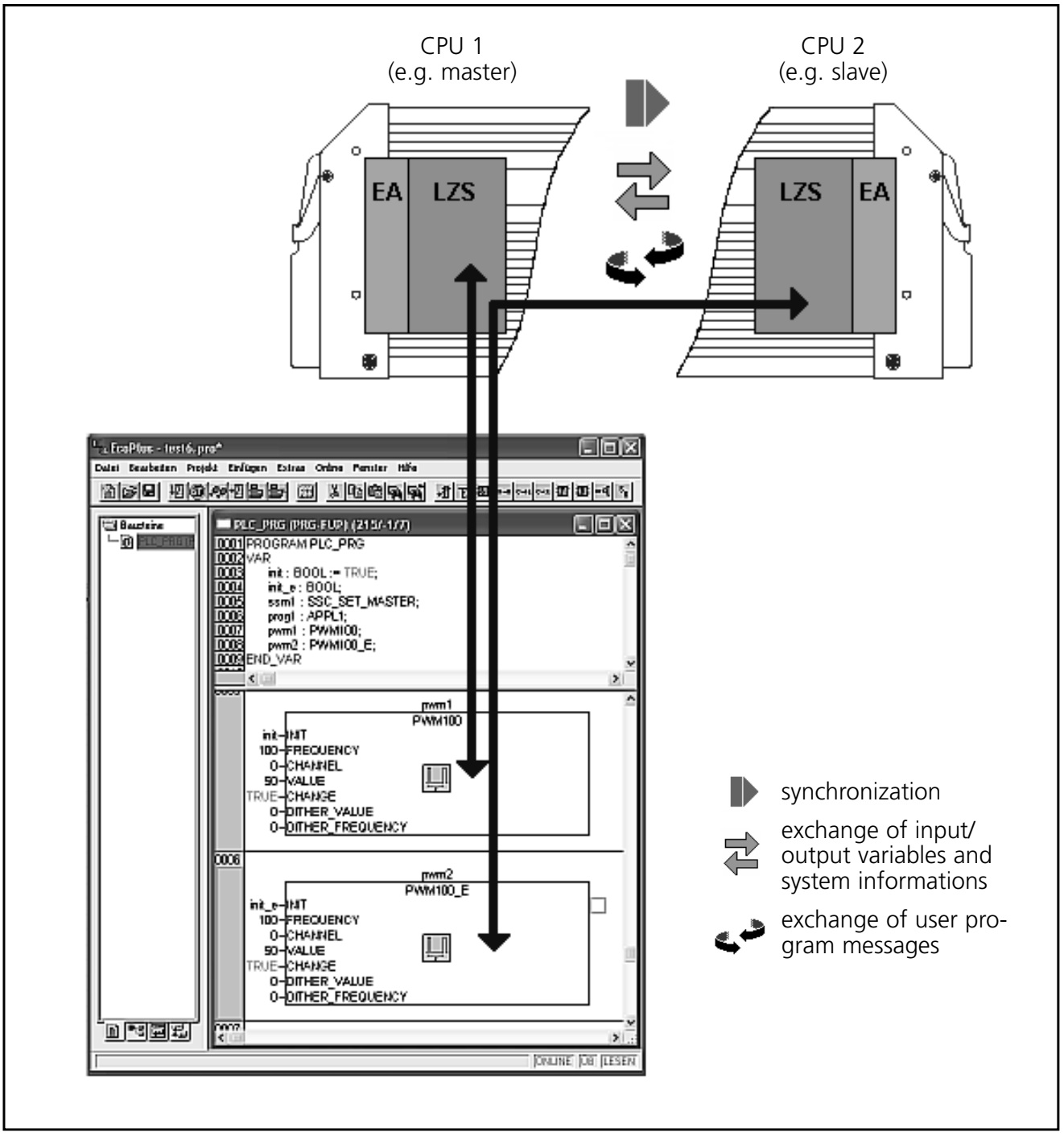


The 2 control units are treated by the programmer as 2 separate controllers. An IEC program is loaded into each control unit. The programs work in parallel and asynchronously.
This provides the best solution for real time requirements due to the asynchrony and the possibly different cycle times.

Internal communication between the 2 control units is ensured by a serial interface (2Mbps) by means of message exchanges between the user programs.

The controllers automatically determine which is the interface master and which is the slave.

■ One user program for both control units



The 2 control units are treated by the programmer as one controller. The IEC program is processed in sequence, i.e. without parallelism.

Assigned function blocks refer the program to the 2 control units. As shown in the figure above, the "PWM100" function block is executed in the master and the "PWM100_E" function block in the slave.
The functions are available in the "CR200_x.lib" library of ifm's CODESYS programming software.

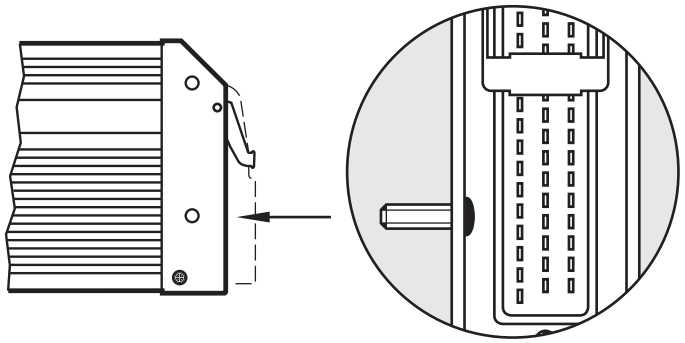
ENGLISH

3. Installation

3.1 Fastening

Fix the controller to a flat surface using 4 M5 screws.
Tightening torque: 8 $^{\pm 2}$ Nm

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

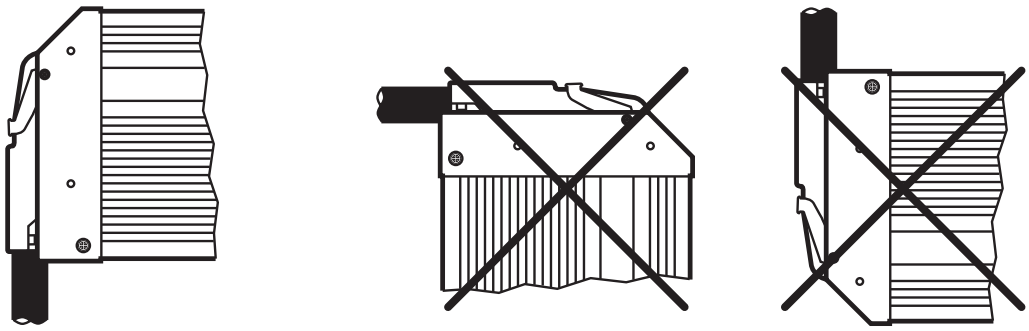


Example button head hexagon socket screw

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
Screw material: steel or stainless steel	

3.2 Installation position

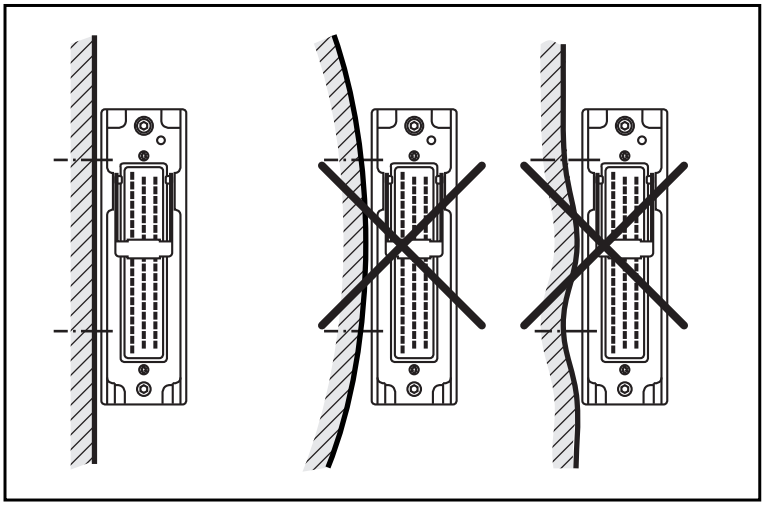
Align the controller in such a way that the cable entries of the connectors face downwards.

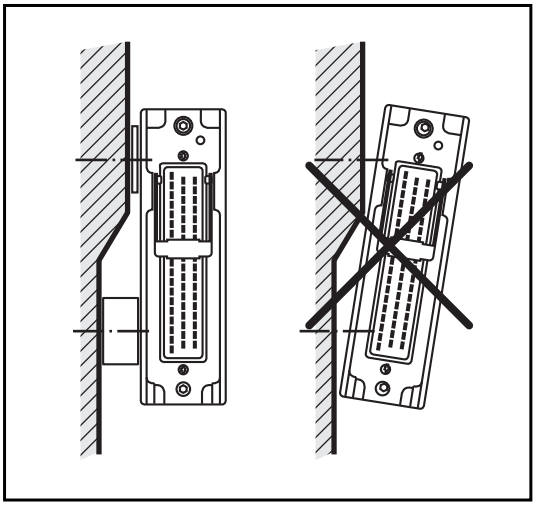


3.3 Mounting surface

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

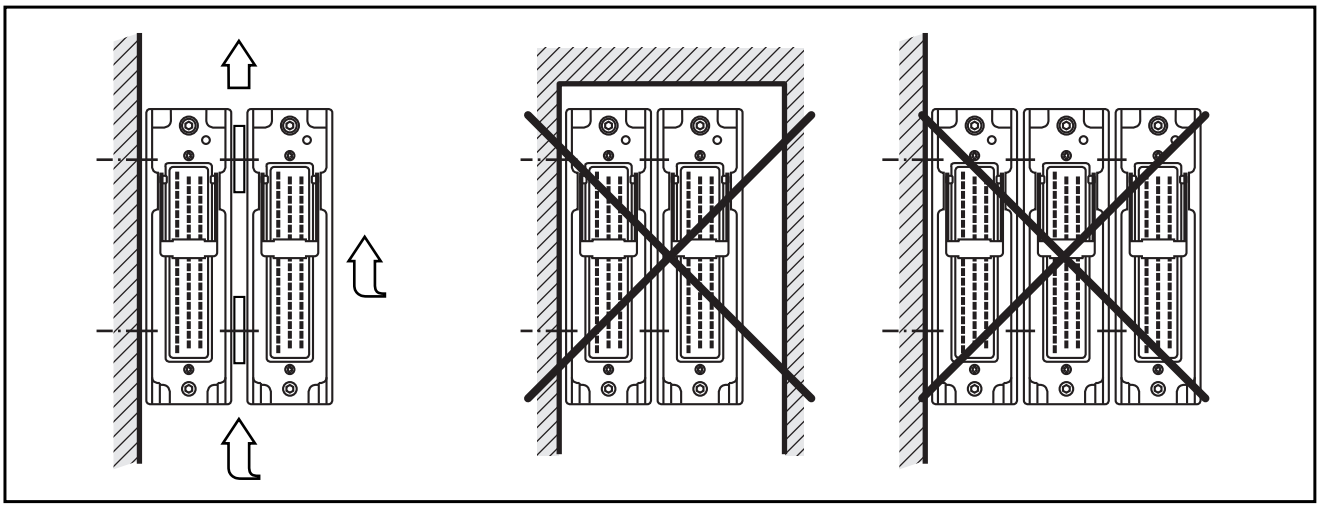
Use compensating elements if there is no flat mounting surface available.





3.4 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.



4. Electrical connection

4.1 Wiring

Wiring see technical data.

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

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

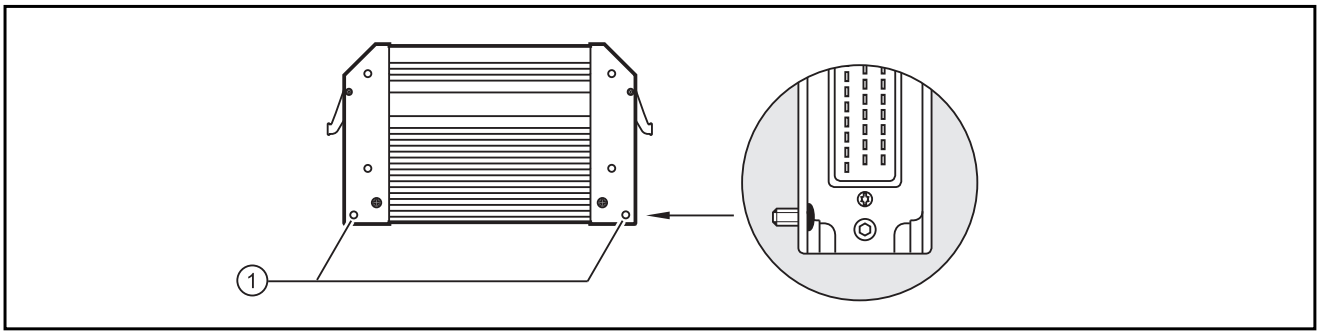
4.1.1 Assignment of the connectors

Note the device label.

⚠ Inversion of the connectors can lead to damage to a connected PC or notebook.

4.2 Ground connection

To ensure the protection of the device against electrical interference and the safe function of the device, the housing must be connected 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 see mounting.

4.3 Fuses

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

Designation	Potential	Pin no. *	Fuse
supply voltage sensors/module	VBB_S	23	max. 2 A T
supply voltage outputs	VBB_O	05	max. 15 A
supply voltage via relais	VBB_R	34	max. 15 A

*) per control unit

4.4 Interaction between the inputs and outputs within one group of connections

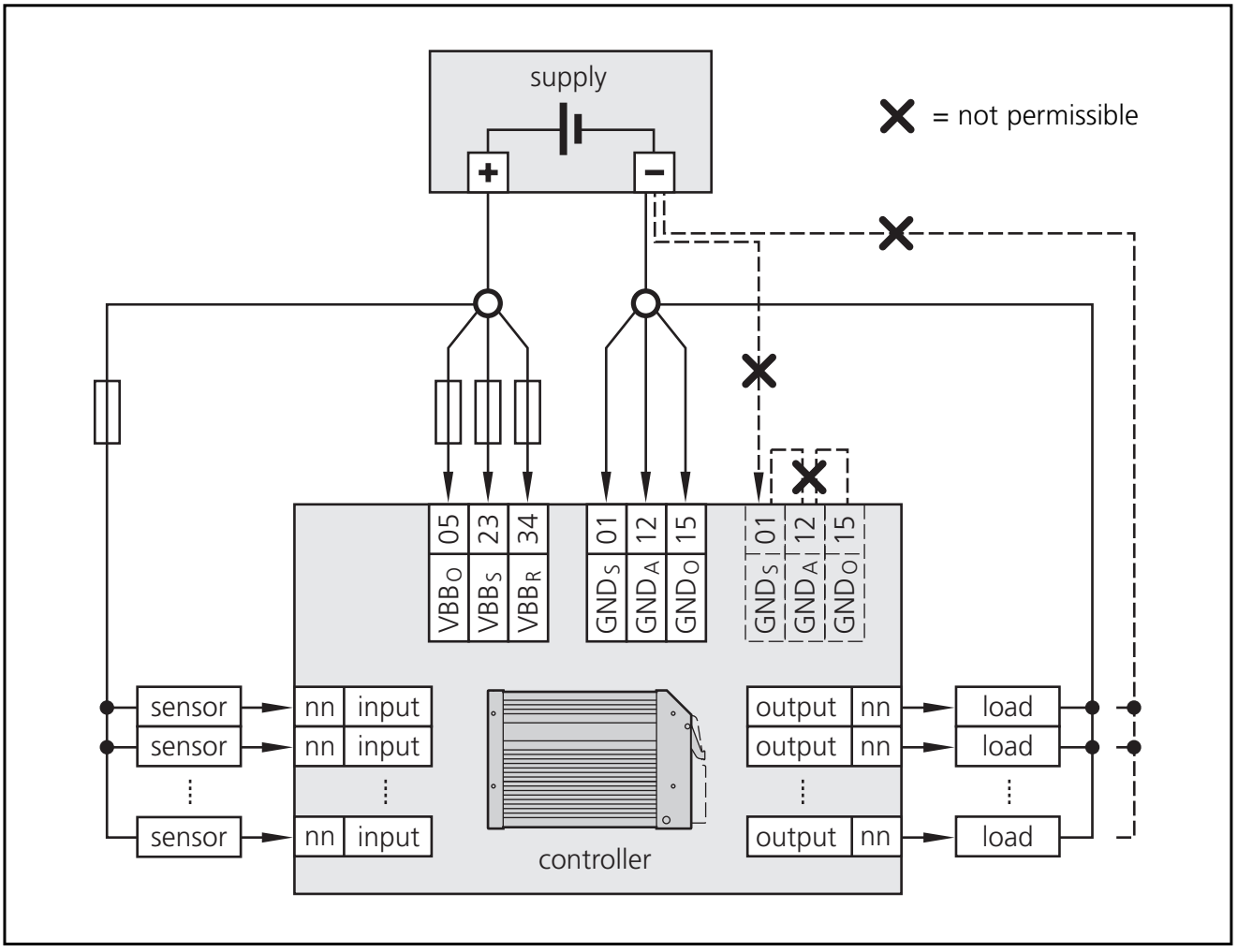
In the applications the following must be observed as regards the use of the terminals as input and output:

Within one output group inputs and outputs should not be mixed. One output group is marked by a common VBB_X potential.
The background is a possible internal cross-connection of the outputs from the externally supplied inputs. This may occur unexpectedly if the supply to the outputs is switched off externally.

Should a mixture still be carried out for reasons of optimising the terminals, please inform yourself in detail about the situations described in the system manual and the restrictions resulting from this. Follow these instructions for your application and keep records of this.

4.5 Laying the supply and signal leads

⚠ As a basic principle all supply and signal leads to be laid separately.
Supply and ground leads to the controller and to the sensors / actuators to be connected via a common neutral point.
Linking connections in the connector is not permitted and can lead to an incapacitation of men and machines.



ENGLISH

5. Maintenance, repair and disposal

As the Controller does not contain any components which must be maintained by the user, the housing must not be opened. The repair of the controller may only be carried out by the manufacturer. The disposal must be carried out according to the corresponding national environmental regulations.

6. Declaration of conformity

Test standards and regulations (➔ Technical data)

The EC declaration of conformity and approvals can be found at:
www.ifm.com ➔ Data sheet direct ➔ Art. no. ➔ Approvals

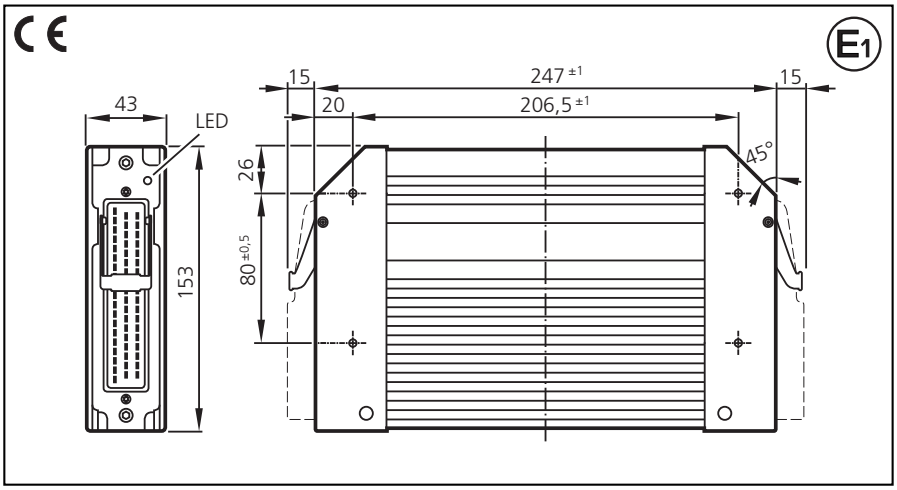
CR0200

Mobile controller
ExtendedController

2 control units
with a total of
80 inputs/outputs

Programming
according to IEC 61131-3

Operating voltage
10...32 V DC



Technical data	Controller as black box system for the implementation of a central or decentralised system design
Housing	closed, screened metal housing with flange fastening
Dimensions (H x W x D)	153 x 247 x 43 mm
Mounting	screw connection by means of 4 M5xL screws according to DIN 7500 or DIN 7984 mounting position horizontal or vertical to the mounting wall
Connection	2 x 55-pin connector, latched, protected against reverse polarity, type AMP or Framatome, AMP junior timer contacts, crimp connection 0.5/2.5 mm²
Weight	1.6 kg
Housing / storage temperature	–40...85 °C (depending on the load) / –40...85 °C
Protection	IP 67 (for inserted plug with individually sealed cores e.g. EC2084)
Input/output channels total	max. 2 x 40 (the total number which is available depends on the wiring and configuration of the controller)
Inputs	max. 2 x 40 (corr. to 0 outputs)

possible configurations

Number	Signal	Version	
2 x 8 or	digital analogue	for positive sensor signals, with diagnostic capability 0...10/32 V DC, 0/4...20 mA or ratiometric	B_L A
2 x 8	digital	for positive sensor signals	B_L
2 x 4 or	digital frequency	for positive sensor signals, with diagnostic capability max. 50 kHz	B_L I_L
2 x 4 or	digital frequency	for positive/negative sensor signals, with diagnostic capability * max. 1 kHz	$B_{L/H}$ I_L
2 x 8	digital	for positive/negative sensor signals, with diagnostic capability *	$B_{L/H}$
2 x 8	digital	for positive sensor signals, with diagnostic capability	B_L

*) only positive sensor signals with diagnostic capability

Outputs	max. 2 x 24 (corr. to 2 x 16 inputs)

possible configurations

Number	Signal	Version	
2 x 8 or or	digital PWM current-controlled	positive switching (High Side), with diagnostic capability PWM frequency 20...250 Hz 0,1...4 A	B_H PWM PWM_I
2 x 8	digital	positive switching (High Side), with diagnostic capability	B_H
2 x 4 or	digital PWM	positive switching (High Side), with diagnostic capability PWM frequency 20...250 Hz	B_H PWM
2 x 4	digital	positive/negative switching (High/Low Side) with diagnostic capability (can also be used as H bridge)	$B_{H/L}$ H bridge

Abbreviations

A	= analogue
B_H	= binary High Side
B_L	= binary Low Side
FRQ/CYL	= frequency inputs
I_H	= pulse High Side
I_L	= pulse Low Side
PWM	= pulse width modulation
PWM_I	= current-controlled output
%IWx	= IEC address for analogue input
%IX0.xx	= IEC address for binary input
%QX0.xx	= IEC address for binary output

CR0200	Technical data (per control unit)
Operating voltage U_B	10...32 V DC
overvoltage undervoltage detection switching-off in case of undervoltage	36 V for t ≤ 10 s for U_B ≤ 10 V for U_B ≤ 8 V
Current consumption	≤ 160 mA (without external load at 24 V DC)
CAN interface 1 Baud rate Communication profile	CAN interface 2.0 B, ISO 11898 50 kbits/s...1 Mbits/s (default setting 125 kbits/s) CANopen, CiA DS 301 version 4, CiA DS 401 version 1.4
Node-ID (CANopen)	hex 7F (= dec. 127)
CAN interface 2 Baud rate Communication profile	CAN interface 2.0 A/B, ISO 11898 50 kbits/s...1 Mbit/s (default setting 125 kbits/s) SAE J 1939 or free protocol
Serial interface Baud rate Topology Protocol	RS-232 C 9.6 / 19.2 / 28.8 / 38.4 / 57.6 kBit/s (default setting 57.6 kbits/s) point-to-point (max. 2 participants); master-slave connection predefined ifm protocol (INTELHEX)
Processor	CMOS microcontroller 16 bits C167CS cycle frequency 20/40 MHz
Device monitoring	undervoltage monitoring watchdog function check sum test for program and system excess temperature monitoring
Process monitoring concept	Two relays according to EN 954 monitor two groups of 12 outputs each
Physical memory	Flash: 2 MByte RAM: 256 kByte Remanent memory: 32 kByte
Memory allocation	See system manual www.ifm.com → Data sheet search → CR0200 → More information
Status indication	three-colour LED (R/G/B)
Operating states (Status-LED)	

LED colour	Status	Description
–	off	no operating voltage
yellow	1 x on	initialisation or reset checks
green	5 Hz	no operating system loaded
green	2.0 Hz on	Run Stop
red	2.0 Hz on	Run with error fatal error or stop with error

	Test standards and regulations
Climatic test	Damp heat to EN 60068-2-30, test Db (≤ 95% rel. humidity, non-condensing) Salt mist test to EN 60068-2-52, test Kb, severity level 3 Degree of protection to EN 60529
Mechanical resistance	Vibration to EN 60068-2-6, test Fc Shock to EN 60068-2-27, test Ea
Immunity to conducted interference	to ISO 7637-2, pulses 2, 3a, 3b, severity level 4, function state A to ISO 7637-2, pulse 5, severity level 1, function state A to ISO 7637-2, pulse 1, severity level 4, function state C
Immunity to interfering fields	to UN/ECE-R10 at 100 V/m (E1 type approval) and EN 61000-6-2 :2001 (CE)
Interference emission	to UN/ECE-R10 (E1 type approval) and EN 61000-6-4 :2001 (CE)
Tests for the approval for railway applications	to BN 411 002 (DIN EN 50155 clause 10.2)

CR0200	Characteristics of the inputs (per control unit)
Digital/analogue inputs (B_L, A) %IW03...10 %IX0.00...07 can be configured as ...	■ Voltage inputs input voltage 0...10/32 V resolution 12 bits precision ± 1.0% FS input resistance 50/30 kΩ input frequency 50 Hz
	■ Current inputs input current 0/4...20 mA resolution 12 bits precision ± 1.0% FS input resistance 400 Ω input frequency 50 Hz
	■ Digital inputs for positive sensor signals, with diagnostic capability *) switch-on level 0.7 U_B switch-off level 0.4 U_B input resistance 30 kΩ input frequency 50 Hz
Digital inputs (B_L) %IX0.08...11 %IX1.00...03 can be configured as ...	■ Digital inputs for positive sensor signals switch-on level 0.43...0.73 U_B switch-off level 0.29 U_B input resistance 3.21 kΩ input frequency 50 Hz
Digital inputs (B_L, I_L) %IX0.12...15 can be configured as ...	■ Digital inputs for positive sensor signals, with diagnostic capability *) switch-on level 0.7 U_B switch-off level 0.4 U_B input resistance 2.86 kΩ input frequency 50 Hz
	■ Frequency inputs for positive sensor signals with diagnostic capability, evaluation with integrated comparator switch-on level 0.43...0.73 U_B switch-off level 0.29 U_B input resistance 2.86 kΩ input frequency max. 50 kHz
Digital inputs ($B_{L/H}$, I_L) %IX1.04...07 can be configured as ...	■ Digital inputs for positive/negative sensor signals, positive with diagnostic capability* switch-on level 0.7 U_B switch-off level 0.4 U_B input resistance 3.21 kΩ input frequency 50 Hz
	■ Frequency inputs for positive sensor signals with diagnostic capability, evaluation with integrated comparator switch-on level 0.43...0.73 U_B switch-off level 0.29 U_B input resistance 3.21 kΩ input frequency max. 1 kHz
Digital inputs ($B_{L/H}$) %IX1.08...15 can be configured as ...	■ Digital inputs for positive/negative sensor signals, positive with diagnostic capability* switch-on level 0.7 U_B switch-off level 0.4 U_B input resistance 3.21 kΩ input frequency 50 Hz
Digital inputs (B_L) %IX2.00...07 konfigurierbar als...	■ Digital inputs for positive sensor signals, with diagnostic capability *) switch-on level 0.43...0.73 U_B switch-off level 0.29 U_B input resistance 3.21 kΩ input frequency 50 Hz
Test input	During the test mode (e.g. programming) the "TEST" connection must be connected to VBB_S (10...32 V DC). For the "RUN" mode the test input must not be connected. input resistance 3.21 kΩ
*) NAMUR inputs	■ Digital inputs with diagnostic capability can be used as NAMUR inputs when used with an external resistor connection. supply voltage 5...25 V; e.g. ifm NAMUR sensors NT5001...NN5002

CR0200	Characteristics of the outputs (per control unit)
Outputs (B_H, PWM, PWM_I) %QX0.00...07 can be configured as ...	■ Semiconductor outputs, with diagnostic capability positive switching (high side), short-circuit and overload protected switching voltage 10...32 V DC switching current max. 4 A output frequency max. 100 Hz (depending on the load)
	■ PWM outputs, diagnosis via current feedback PWM frequency max. 250 Hz mark-to-space ratio 1...99 % resolution depends on the PWM frequency load current max. 4 A
	■ Current-controlled outputs, diagnosis via current feedback load current 0,1...4 A load resistance min. 3 Ω (at U_B = 12 V DC) min. 6 Ω (at U_B = 24 V DC) setting resolution 1 mA control resolution 5 mA accuracy ± 2% FS
Outputs (B_H) %QX0.08...15 can be configured as ...	■ Semiconductor outputs, with diagnostic capability positive switching (high side), short-circuit and overload protected switching voltage 10...32 V DC switching current max. 2 A output frequency max. 100 Hz (depending on the load)
Outputs (B_H, PWM) %QX1.00, 03, 04, 07 can be configured as ...	■ Semiconductor outputs, with diagnostic capability positive switching (high side), short-circuit and overload protected switching voltage 10...32 V DC switching current max. 4 A output frequency max. 100 Hz (depending on the load)
	■ PWM outputs PWM frequency max. 250 Hz pulse ratio 1...99 % resolution depends on the PWM frequency load current max. 4 A
Outputs ($B_{L/H}$) %QX1.01, 02, 05, 06 can be configured as ...	■ Semiconductor outputs, with diagnostic capability positive/negative switching (high/low side), short-circuit and overload protected switching voltage 10...32 V DC switching current max. 4 A output frequency max. 100 Hz (depending on the load)
Overload protection (valid for all outputs)	max. 5 minutes (at 100%)
Internal relay outputs for electrically isolated deactivation of the outputs	Normally open contacts in series to 2 groups of 12 semiconductor outputs. Sustained forcing by means of hardware and additional controlling by means of user program.
	The relays must always be switched without load!
	total current max. 12 A per group switching current 0.1...15 A overload current 20 A number of operating cycles ≥ 10^6 (without load) switching-time constant ≤ 3 ms
Output Error	■ Semiconductor output, positive switching (high side) switching voltage 10...32 V DC switching current max. 100 mA overload current 0.5 A switching function OFF (0 V) in case of an error

Abbreviations

A	= analogue
B_H	= binary High Side
B_L	= binary Low Side
FRQ/CYL	= frequency inputs
I_H	= pulse High Side
I_L	= pulse Low Side
PWM	= pulse width modulation
PWM_I	= current-controlled output
%IWx	= IEC address for analogue input
%IX0.xx	= IEC address for binary input
%QX0.xx	= IEC address for binary output

ANSCHLUSSBELEGUNG / *wiring / branchement*			**CPU 1**
Pin	**Potential**	**Bezeichnung** / *description*	**Bemerkung** / *note*
23	VBB_S (10...32 V DC)	Versorgung Sensoren und Modul / *supply sensors and module*	
05	VBB_O (10...32 V DC)	Versorgung Ausgänge / *supply outputs*	relaisgeschaltet / *relay switched* (1)
34	VBB_R (10...32 V DC)	Versorgung über Relais / *supply via relay*	relaisgeschaltet / *relay switched* (2)
01	GND_S	Masse Sensoren und Modul / *ground sensors and module*	
15	GND_O	Masse Ausgänge / *ground outputs*	
12	GND_A	Masse Analogeingänge / *ground analogue outputs*	

CAN, RS-232, ERROR, TEST			
Pin	**Potential**	**Bezeichnung** / *description*	**Bemerkung** / *note*
14	CAN 1 $_H$	CAN-Interface 1 (High)	
32	CAN 1 $_L$	CAN-Interface 1 (Low)	
26	CAN 2 $_H$	CAN-Interface 2 (High)	SAE J 1939
25	CAN 2 $_L$	CAN-Interface 2 (Low)	SAE J 1939
33	GND	Masse / *ground* (RS-232/CAN)	
06	RxD	RS-232 Interface (Programmierung / *programming*)	Pin 03, PC D-Sub (9 pin)
07	TxD	RS-232 Interface (Programmierung / *programming*)	Pin 02, PC D-Sub (9 pin)
13	ERROR	Fehlerausgang B_H / *error output* B_H	
24	TEST	TEST-Eingang / *test input*	

EIN-/AUSGÄNGE / *inputs/outputs / entrées/sorties*

Pin *pin*	**EINGÄNGE** *INPUTS*	**Konfiguration** *configuration*	**AUSGÄNGE** *OUTPUTS*	**Konfiguration** *configuration*	**diagnosefähig*** *diagnostic capability** *INPUT / OUTPUT*	**relaisgeschaltet** *relay switched*
08	%IX0.00 / %IW03	B_L A	–	–	• / –	
27	%IX0.01 / %IW04	B_L A	–	–	• / –	
09	%IX0.02 / %IW05	B_L A	–	–	• / –	
28	%IX0.03 / %IW06	B_L A	–	–	• / –	
10	%IX0.04 / %IW07	B_L A	–	–	• / –	
29	%IX0.05 / %IW08	B_L A	–	–	• / –	
11	%IX0.06 / %IW09	B_L A	–	–	• / –	
30	%IX0.07 / %IW10	B_L A	–	–	• / –	
44	%IX0.08	B_L	%QX0.00	B_H PWM PWM_I	– / •	VBB_O (1)
45	%IX0.09	B_L	%QX0.01	B_H PWM PWM_I	– / •	VBB_O (1)
46	%IX0.10	B_L	%QX0.02	B_H PWM PWM_I	– / •	VBB_O (1)
47	%IX0.11	B_L	%QX0.03	B_H PWM PWM_I	– / •	VBB_O (1)
20	%IX0.12	B_L I_L (FRQ 0)	–	–	• / –	
02	%IX0.13	B_L I_L (FRQ 1)	–	–	• / –	
21	%IX0.14	B_L I_L (FRQ 2)	–	–	• / –	
38	%IX0.15	B_L I_L (FRQ 3)	–	–	• / –	
36	%IX1.00	B_L	%QX0.04	B_H PWM PWM_I	– / •	VBB_R (2)
54	%IX1.01	B_L	%QX0.05	B_H PWM PWM_I	– / •	VBB_R (2)
17	%IX1.02	B_L	%QX0.06	B_H PWM PWM_I	– / •	VBB_R (2)
53	%IX1.03	B_L	%QX0.07	B_H PWM PWM_I	– / •	VBB_R (2)
19	%IX1.04	$B_{L/H}$ I_L (CYL 0)	–	–	• / –	
55	%IX1.05	$B_{L/H}$ I_L (CYL 1)	–	–	• / –	
18	%IX1.06	$B_{L/H}$ I_L (CYL 2)	–	–	• / –	
37	%IX1.07	$B_{L/H}$ I_L (CYL 3)	–	–	• / –	
39	%IX1.08	$B_{L/H}$	%QX0.08	B_H	• / •	VBB_O (1)
03	%IX1.09	$B_{L/H}$	%QX0.09	B_H	• / •	VBB_O (1)
40	%IX1.10	$B_{L/H}$	%QX0.10	B_H	• / •	VBB_O (1)
22	%IX1.11	$B_{L/H}$	%QX0.11	B_H	• / •	VBB_O (1)
41	%IX1.12	$B_{L/H}$	%QX0.12	B_H	• / •	VBB_O (1)
42	%IX1.13	$B_{L/H}$	%QX0.13	B_H	• / •	VBB_O (1)
43	%IX1.14	$B_{L/H}$	%QX0.14	B_H	• / •	VBB_O (1)
04	%IX1.15	$B_{L/H}$	%QX0.15	B_H	• / •	VBB_O (1)
48	%IX2.00	B_L	%QX1.00	B_H PWM	• / •	VBB_R (2)
49	%IX2.01	B_L	%QX1.01	$B_{H/L}$ H-Bridge	• / •	VBB_R (2)
31	%IX2.02	B_L	%QX1.02	$B_{H/L}$ H-Bridge	• / •	VBB_R (2)
50	%IX2.03	B_L	%QX1.03	B_H PWM	• / •	VBB_R (2)
51	%IX2.04	B_L	%QX1.04	B_H PWM	• / •	VBB_R (2)
52	%IX2.05	B_L	%QX1.05	$B_{H/L}$ H-Bridge	• / •	VBB_R (2)
16	%IX2.06	B_L	%QX1.06	$B_{H/L}$ H-Bridge	• / •	VBB_R (2)
35	%IX2.07	B_L	%QX1.07	B_H PWM	• / •	VBB_R (2)

Note the double pin connection of inputs/outputs.

*) only positive sensor signals with diagnostic capability

ANSCHLUSSBELEGUNG / *wiring / branchement*			**CPU 2**
Pin	**Potential**	**Bezeichnung** / *description*	**Bemerkung** / *note*
23	VBB_S (10...32 V DC)	Versorgung Sensoren und Modul / *supply sensors and module*	
05	VBB_O (10...32 V DC)	Versorgung Ausgänge / *supply outputs*	relaisgeschaltet / *relay switched* (1)
34	VBB_R (10...32 V DC)	Versorgung über Relais / *supply via relay*	relaisgeschaltet / *relay switched* (2)
01	GND_S	Masse Sensoren und Modul / *ground sensors and module*	
15	GND_O	Masse Ausgänge / *ground outputs*	
12	GND_A	Masse Analogeingänge / *ground analogue outputs*	

CAN, RS-232, ERROR, TEST			
Pin	**Potential**	**Bezeichnung** / *description*	**Bemerkung** / *note*
14	CAN 1 $_H$	CAN-Interface 1 (High)	
32	CAN 1 $_L$	CAN-Interface 1 (Low)	
26	CAN 2 $_H$	CAN-Interface 2 (High)	SAE J 1939
25	CAN 2 $_L$	CAN-Interface 2 (Low)	SAE J 1939
33	GND	Masse / *ground* (RS-232/CAN)	
06	RxD	RS-232 Interface (Programmierung / *programming*)	Pin 03, PC D-Sub (9 pin)
07	TxD	RS-232 Interface (Programmierung / *programming*)	Pin 02, PC D-Sub (9 pin)
13	ERROR	Fehlerausgang B_H / *error output* B_H	
24	TEST	TEST-Eingang / *test input*	

EIN-/AUSGÄNGE / *inputs/outputs / entrées/sorties*									
Pin *pin*	**EINGÄNGE** *INPUTS*	**Konfiguration** *configuration*		**AUSGÄNGE** *OUTPUTS*	**Konfiguration** *configuration*			**diagnosefähig*** *diagnostic capability** *INPUT / OUTPUT*	**relaisgeschaltet** *relay switched*
08	%IX32.00 / %IW35	B_L A		–	–			• / –	
27	%IX32.01 / %IW36	B_L A		–	–			• / –	
09	%IX32.02 / %IW37	B_L A		–	–			• / –	
28	%IX32.03 / %IW38	B_L A		–	–			• / –	
10	%IX32.04 / %IW39	B_L A		–	–			• / –	
29	%IX32.05 / %IW40	B_L A		–	–			• / –	
11	%IX32.06 / %IW41	B_L A		–	–			• / –	
30	%IX32.07 / %IW42	B_L A		–	–			• / –	
44	%IX32.08	B_L		%QX32.00	B_H	PWM	PWM_I	– / •	VBB_O (1)
45	%IX32.09	B_L		%QX32.01	B_H	PWM	PWM_I	– / •	VBB_O (1)
46	%IX32.10	B_L		%QX32.02	B_H	PWM	PWM_I	– / •	VBB_O (1)
47	%IX32.11	B_L		%QX32.03	B_H	PWM	PWM_I	– / •	VBB_O (1)
20	%IX32.12	B_L I_L (FRQ 0)		–	–			• / –	
02	%IX32.13	B_L I_L (FRQ 1)		–	–			• / –	
21	%IX32.14	B_L I_L (FRQ 2)		–	–			• / –	
38	%IX32.15	B_L I_L (FRQ 3)		–	–			• / –	
36	%IX33.00	B_L		%QX32.04	B_H	PWM	PWM_I	– / •	VBB_R (2)
54	%IX33.01	B_L		%QX32.05	B_H	PWM	PWM_I	– / •	VBB_R (2)
17	%IX33.02	B_L		%QX32.06	B_H	PWM	PWM_I	– / •	VBB_R (2)
53	%IX33.03	B_L		%QX32.07	B_H	PWM	PWM_I	– / •	VBB_R (2)
19	%IX33.04	$B_{L/H}$ I_L (CYL 0)		–	–			• / –	
55	%IX33.05	$B_{L/H}$ I_L (CYL 1)		–	–			• / –	
18	%IX33.06	$B_{L/H}$ I_L (CYL 2)		–	–			• / –	
37	%IX33.07	$B_{L/H}$ I_L (CYL 3)		–	–			• / –	
39	%IX33.08	$B_{L/H}$		%QX32.08	B_H			• / •	VBB_O (1)
03	%IX33.09	$B_{L/H}$		%QX32.09	B_H			• / •	VBB_O (1)
40	%IX33.10	$B_{L/H}$		%QX32.10	B_H			• / •	VBB_O (1)
22	%IX33.11	$B_{L/H}$		%QX32.11	B_H			• / •	VBB_O (1)
41	%IX33.12	$B_{L/H}$		%QX32.12	B_H			• / •	VBB_O (1)
42	%IX33.13	$B_{L/H}$		%QX32.13	B_H			• / •	VBB_O (1)
43	%IX33.14	$B_{L/H}$		%QX32.14	B_H			• / •	VBB_O (1)
04	%IX33.15	$B_{L/H}$		%QX32.15	B_H			• / •	VBB_O (1)
48	%IX34.00	B_L		%QX33.00	B_H	PWM		• / •	VBB_R (2)
49	%IX34.01	B_L		%QX33.01	$B_{H/L}$		H-Bridge	• / •	VBB_R (2)
31	%IX34.02	B_L		%QX33.02	$B_{H/L}$		H-Bridge	• / •	VBB_R (2)
50	%IX34.03	B_L		%QX33.03	B_H	PWM		• / •	VBB_R (2)
51	%IX34.04	B_L		%QX33.04	B_H	PWM		• / •	VBB_R (2)
52	%IX34.05	B_L		%QX33.05	$B_{H/L}$		H-Bridge	• / •	VBB_R (2)
16	%IX34.06	B_L		%QX33.06	$B_{H/L}$		H-Bridge	• / •	VBB_R (2)
35	%IX34.07	B_L		%QX33.07	B_H	PWM		• / •	VBB_R (2)

Note the double pin connection of inputs/outputs.

*) only positive sensor signals with diagnostic capability