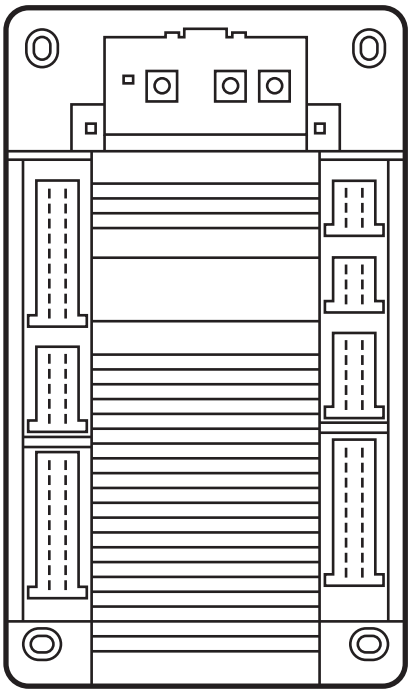
ifm electronic

CE

Device manual
Mobile controller
CabinetController
CR0303

UK

ecomat100



7390608/01 03/2015

Contents

1. Safety instructions

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

Observe the operating instructions. 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.

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

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-bord 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 supply 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 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 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.

The device can be operated within a wide temperature range according to the technical specification indicated below. Due to the additional internal 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 device can lead to serious risks for the safety of persons and plant. It is not permitted and leads to the exclusion of liability and warranty claims.

Attention

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

2. Functions and features

The freely programmable controllers of the "CabinetController" series are rated for use under difficult conditions (e.g. extended temperature range, strong vibration, intensive EMC interference). They are suitable for direct installation in mobile vehicles.

By means of the application software, the inputs and outputs can be configured to adapt to the respective application.

The controllers can be used as CANopen master or intelligent I/O module.

⚠ 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.

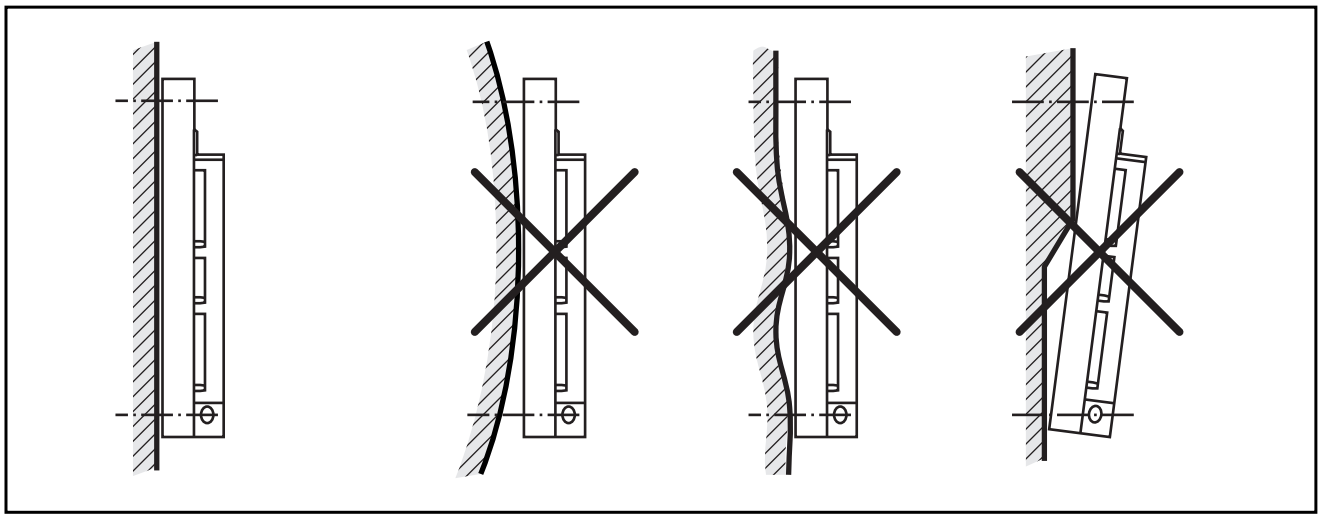
⚠ The controller is not approved for safety tasks in the field of safety of persons.

3. Mounting

3.1 Mounting location

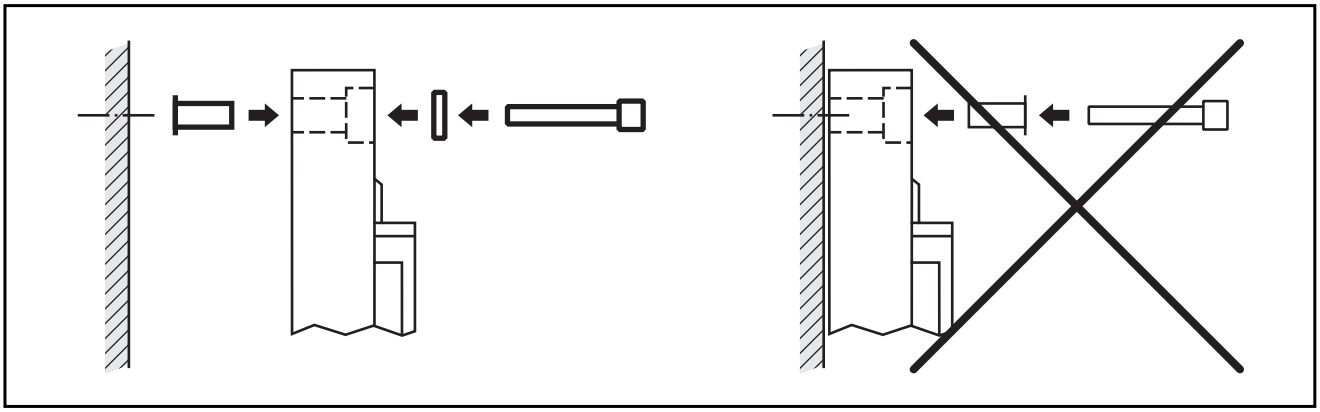
The controller is to be mounted in a dry and enclosed environment (e.g. control panel of the driver's cab, separate control boxes, etc.).

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



3.2 Fixing

Insert the enclosed tubular rivets from the back of the module in the 4 fixing holes.



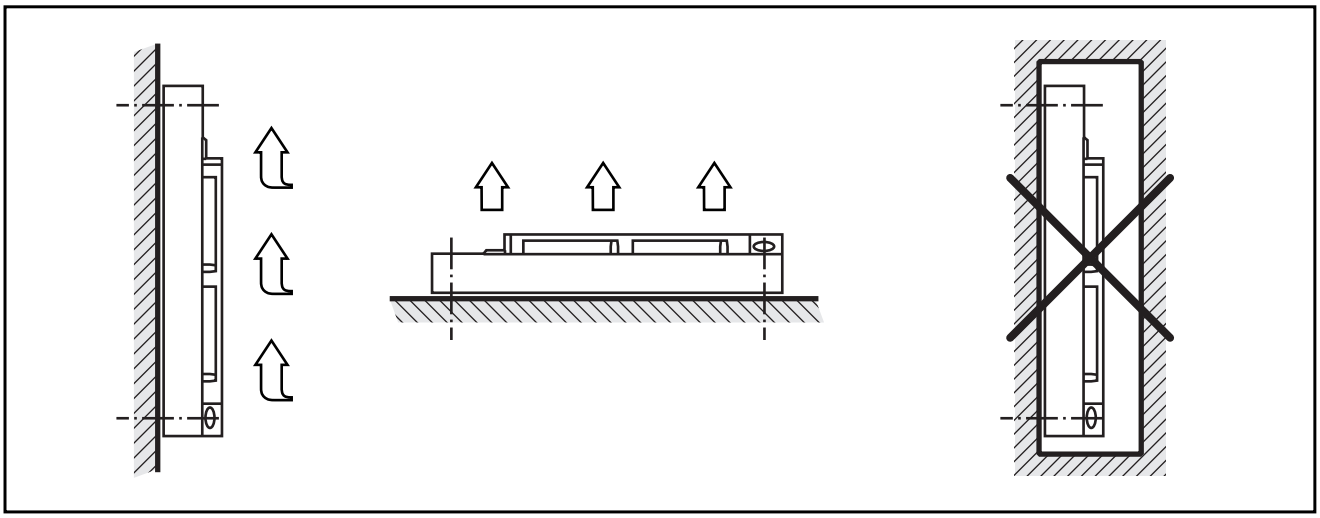
Fix the module using 4 washers and screws.
Tighten the screws alternately crosswise.

Torque: 1.5 Nm
Mounting position: any
Hole dimensions: see back of the controller or Technical data, page 9

Screws to be used (M4 x L), e.g.:	**Standard**
Cylinder screws with hexagon socket	DIN 912
Cylinder screws with hexagon socket and low head	DIN 7984

3.3 Cooling

As the internal heating of the electronics is conducted away via the housing, ensure sufficient heat dissipation.

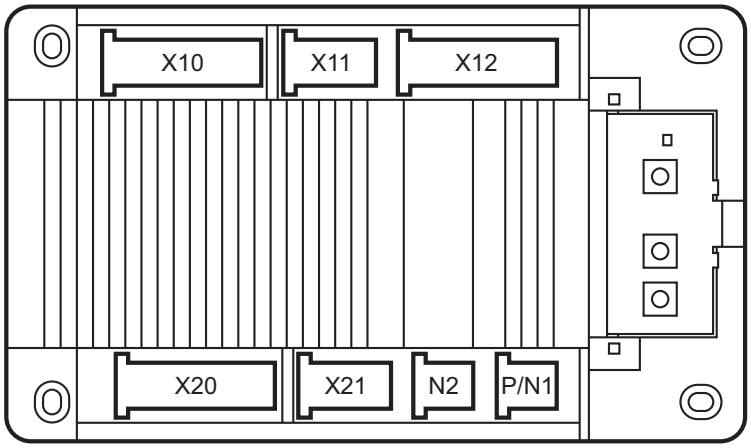


4. Electrical connection

4.1 Connectors

The supply cables, interfaces and inputs/outputs are connected via AMP crimp connectors on the front of the controller.

Plug	Connection	Number of poles
P/N1	supply, CAN interfaces	6
N2	RS-232, TEST	6
X10	inputs IN08...15	18
X11	inputs A_IN16...23	10
X12	inputs IN00...07	18
X20	outputs OUT08...17	18
X21	outputs OUT00...07	10



Pin connection see Technical data (data sheets), page 13.

Close unused connectors with unconnected sockets.

You can find more information about the available connector accessories at:
www.ifm.com ➔ Data sheet direct ➔ CR0303 ➔ Accessories

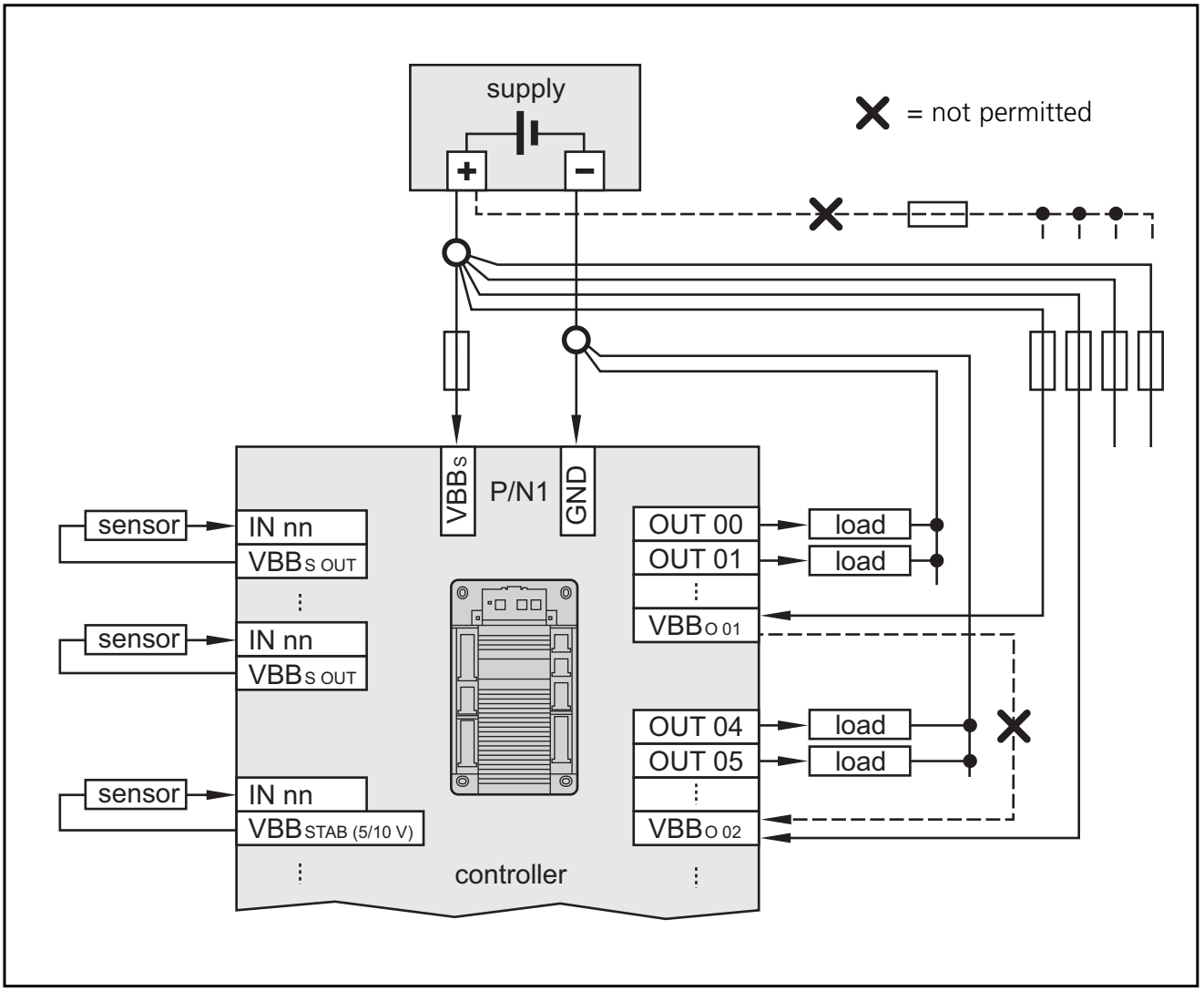
4.2 Fuses

To protect the whole system (wiring and controller) the individual electric circuits must be protected.

Designation	Potential	Plug:pin	Fuse
Supply voltage module	VBB_S	P/N1:01	max. 2 A T
Supply voltage OUT00...03	$VBB_{O\ 01}$	X21:05	max. 15 A
Supply voltage OUT04...07	$VBB_{O\ 02}$	X21:10	max. 15 A
Supply voltage OUT08...11	$VBB_{O\ 03}$	X20:13	max. 15 A
Supply voltage OUTxx (10 A) Protect high-current outputs separately !	$VBB_{O\ xx}$	X20:xx	max. 15 A

4.3 Laying of supply and signal cables

Basically all supply and signal cables are to be laid separately.
Connect supply and ground cables to the controller and the sensors/actuators respectively via a common star point
The linking of connections in the plug is not permitted and can impact safety of persons and machinery.



4.4 Frequency inputs

Operate frequency inputs with screened cables, so that useful signals are not affected by external interference.

Explanation of the abbreviations:

VBB_O = supply outputs
VBB_S = supply controller
$VBB_{S\ OUT}$ = supply sensors
VBB_{STAB} = supply sensors stabilised 5/10 V DC

5. Setup

5.1 Programming

The user can easily create the application software by means of the IEC 61131-3 compliant programming system CoDeSys 2.3.
Further to the programming systems the following documents are required for programming the controller:

- System manual R360
- Programming manual CoDeSys V2.3
  (alternatively online help CoDeSys)

If the system manual R360 is not available, please contact one of the ifm branch offices overleaf for your free copy.

Enquiry ➔ System manual R360, English (order no. EC2041)

As download file the documentation and the online help also are available on the internet.

www.ifm.com ➔ Data sheet direct ➔ CR0303 ➔ Download/Software [1)]

6. Technical data

(Data sheets see following pages 9...13)

[1)] Downloads with registration

CR0303

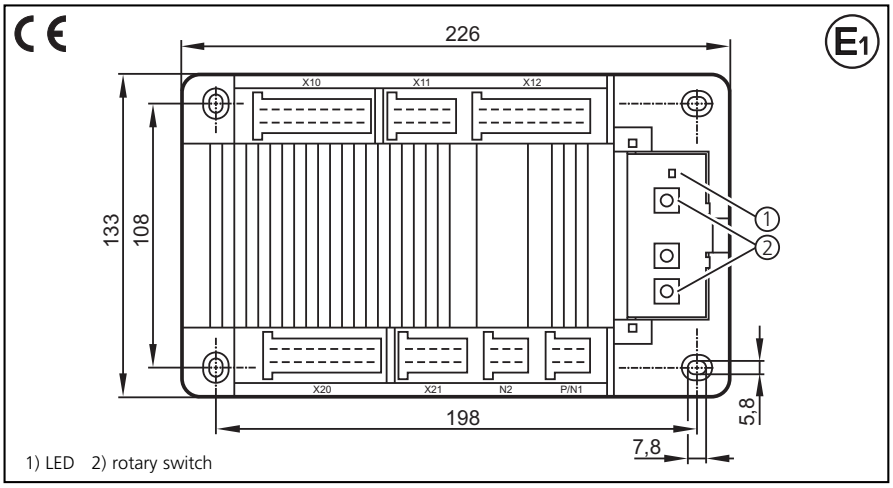
Mobile controller
CabinetController

24 inputs / 18 outputs

2nd CAN interface
for gateway function
according to SAE J 1939

Programming
to IEC 61131-3

10...32 V DC



1) LED 2) rotary switch

UK

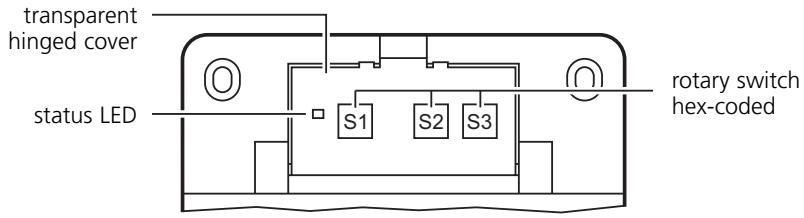
Technial data	Usable as CANopen master or intelligent I/O module
Housing	plastic housing (black) with transparent hinged cover for operating elements and indicators
Dimensions (L x W x H)	226 x 133 x 39 mm
Mounting	fixation via 4 screws M 4 to DIN 912 or DIN 7984 and 4 tubular rivets to DIN 7340 (tubular rivets are enclosed)
Connections	AMP crimp connector, to be clipped into place and thus vibration-resistant, protected against reverse polarity (AMP junior timer contacts)
inputs/outputs	2 x 10-pole, 3 x 18-pole
operating voltage, CAN bus	1 x 6-pole
programming, TEST	1 x 6-pole
Weight	0.68 kg
Operation/storage temperature	–40...85 °C
Protection rating	IP 20
Inputs	24
Possible configurations	

Quantity	Signal		
8	digital	for positive sensor signals, with diagnostic capability	B_L
4 or	digital frequency	for positive sensor signals, with diagnostic capability pulse inputs, max. 30 kHz	B_L I_L
4	digital	for positive/negative sensor signals,	$B_{L/H}$
8 or	analogue digital	0...10/32 V DC, 0...20 mA or ratiometric as binary voltage input	A B_L

Outputs	18
Possible configurations	

Quantity	Signal	Description	
8 or	digital PWM	positive switching (high side) PWM frequency max. 250 Hz	B_H PWM
4	digital	positive switching (high side), 4 A	B_H
6	digital	positive switching (high side), 10 A	B_H

Operating voltage U_B	10...32 V DC
Nominal voltage	12/24 V DC
overvoltage	36 V for t≤ 10 s
undervoltage detection	for $U_B \leq 9.5$ V
auto save	for $U_B \leq 9.0$ V
Current consumption	≤ 100 mA (without external load 24 V DC)

CR0303	Technical data
CAN interface 1 baud rate communication profile	2 x CAN interface 2.0 B, ISO 11898 50 Kbits/s...1 Mbit/s (default setting 125 Kbits/s) (adjustable via rotary switches or CANopen object directory) CANopen, CiA DS 301 version 4, CiA DS 401 version 1.4
Programming system	CoDeSys (as from version 2.3)
Node ID (default)	hex 7F (= dec 127) (adjustable via 2 rotary switches or CANopen object directory)
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-232C 9.6...57.6 Kbits/s (default setting 57.6 Kbits/s) point-to-point (max. 2 participants); master-slave connection predefined ifm protocol (INTELHEX) or free protocol
Controller	CMOS microcontroller 16 bits C167C, 40 MHz
Memory program memory data memory data memory (protected in case of power failure)	 576 Kbytes flash 80 Kbytes SRAM, 32 Kbytes flash, 2 Kbytes FRAM 256 bytes (auto save memory)
Operating elements and indicators	
Rotary switch coding	
Status indicator	RGB LED
Operating states (status indicator)	

Switch	Position	Description
S1 Baud rate	0 1 2 3 4 5 6 7 8...E F	1000 Kbit/s not supported 500 Kbit/s 250 Kbit/s 125 Kbit/s 100 Kbit/s 50 Kbit/s not supported not defined setting via application program
S2 Node ID H	0...7 F	high nibble, e.g. 20 hex (= 32 dec) setting via application program (S2+S3)
S3 Node ID L	0...E F	low nibble, e.g. 20 hex (= 32 dec) setting via application program (S2+S3)

LED colour	State	Description
–	off	no operating voltage
orange	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

CR0303	Characteristics of the inputs
Digital inputs (B_L) X12:02, 04, 06, 08, 12, 14, 16, 18 IN 00...IN 07 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 3.17 kΩ input frequency 50 Hz
Digital inputs (B_L, I_L) X10:02, 04, 06, 08 IN 08...IN 11 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 3.17 kΩ input frequency 50 Hz
	■ Frequency inputs for positive sensor signals, with diagnostic capability switch-on level > 0.4...0.7 U_B switch-off level < 0.2...0.24 U_B input resistance 3.17 kΩ measuring range max. 30 kHz
Digital inputs ($B_{L/H}$) X10:12, 14, 16, 18 IN 12...IN 15 can be configured as...	■ Digital inputs for positive sensor signals switch-on level > 0.7 U_B switch-off level < 0.4 U_B input resistance 3.17 kΩ input frequency 50 Hz
	■ Digital inputs for negative sensor signals switch-on level < 0.2 U_B switch-off level > 0.5 U_B input resistance 3.17 kΩ input frequency 50 Hz
Analogue inputs (A) X11:01...04, 07...10 A_IN 16...A_IN 23 can be configured as...	■ Voltage inputs input voltage 0...10 V or 0...32 V resolution 10 bits accuracy ± 1 % FS input resistance 69.3 kΩ (0...10 V), 46 kΩ (0...32 V) input frequency 50 Hz
	■ Current inputs with diagnostic capabiltiy input current 0...20 mA resolution 10 bits accuracy ± 1 % FS input resistance 400 Ω input frequency 50 Hz At a current of > 23 mA the input is switched to the voltage input!
	■ Voltage inputs, 0...32 V, ratiometric function (U_{IN} ÷ U_B) x 1000 ‰ value range 0...1000 ‰ input resistance 46 kΩ
	■ Binary voltage inputs for positive sensor signals switch-on level > 0.7 U_B switch-off level < 0.4 U_B input resistance 3.17 kΩ input frequency 50 Hz
TEST input N2:05	For the duration of the test operation (e.g. for programming) the TEST input must be connected to VBB_{TEST} (N2:01). For the "RUN" mode the test input may not be connected.
	wiring see page 5

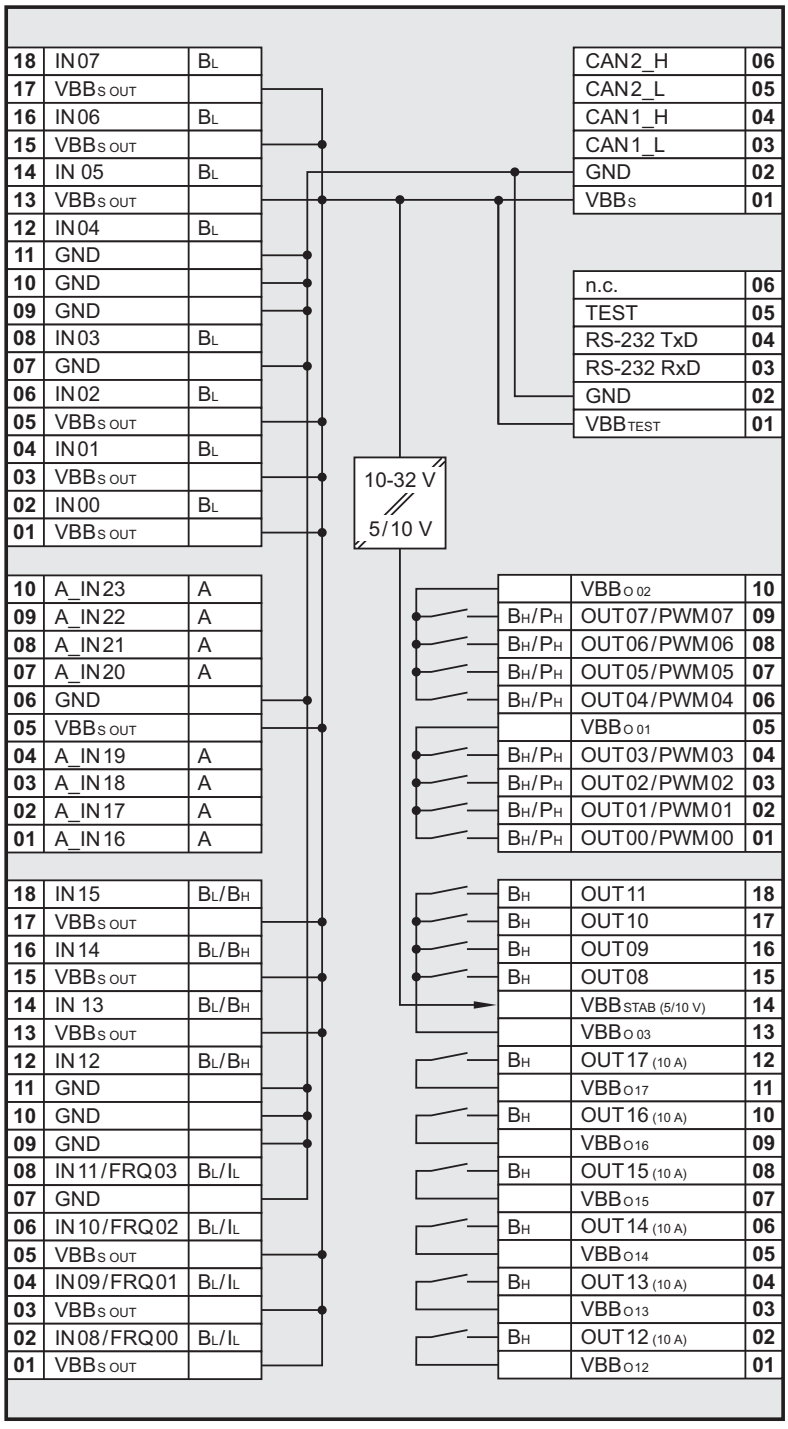
Abbreviations

A	= analogue
B_h	= binary high side
B_L	= binary low side
I	= current-controlled output
I_H	= pulse high side
I_L	= pulse low side
PWM	= pulse width modulation
%IWx	= IEC address for analogue input
%IX0.xx	= IEC address for binary input
%QX0.xx	= IEC address for binary output

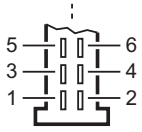
CR0303	Characteristics of the outputs
Digital outputs (B_H, PWM) X21:01...04, 06...09 OUT 00...OUT 07	■ Solid state outputs, positive switching (high side), short-circuit and overload protected switching voltage 10...32 V DC switching current max. 4 A total current max. 12 A
	■ PWM outputs PWM frequency max. 250 Hz setting resolution 0.1 % switching current max. 4 A
	OUT 00...03 are combined with a common VBB_O connection. OUT 04...07 are combined with a common VBB_O connection.
Digital outputs (B_H) X20:15...18 OUT 08...OUT 11	■ Solid state outputs, positive switching (high side), short-circuit and overload protected switching voltage 10...32 V DC switching current max. 4 A total current max. 12 A
	OUT 08...11 are combined with a common VBB_O connection.
Digital outputs(B_H) X20:02, 04, 06, 08, 10, 12 OUT 12...OUT 17 (10 A)	■ Solid state outputs, positive switching (high side), short-circuit and overload protected switching voltage 10...32 V DC switching current max. 10 A total current max. 30 A
	Value ranges for diagnosis and switch-off Warning 10...16.5 A (typ. 12 A) Error (switch-off) 13...21.5 A (typ. 16 A)
	OUT 12...OUT 17 each have a power supply connection VBB_O
Voltage output ($VBB_{STAB\ 5/10\ V}$) X20:14	■ Voltage output for the sensor supply voltage 5/10 V DC (can be selected, switched off or read back) The 10 V output requires at least 13 V supply voltage to work. current 400 mA accuracy ± 5 %
Note	free-wheeling diode for the connection of inductive loads is integrated
Overload protection (valid for all outputs)	max. 5 minutes (in case of 100 % overload)
Short-circuit stability (valid for all inputs/outputs)	max. 5 minutes contact +VBB with GND
	wiring see page 5

	Test standards and regulations
Climatic test	damp heat to EN 60068-2-30, test Db (≤ 95 % rel. air humidity, non-condensing) protection test to EN 60529
Mechanical resistance	vibration to EN 60068-2-6, test Fc shock to EN 60068-2-27, test Ea bump to EN 60068-2-29, test Eb
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	according to UN/ECE-R10 at 100 V/m (E1 type approval) and DIN EN 61326 (CE)
Interference emission	according to UN/ECE-R10 (E1 type approval) and DIN EN 61326 (CE)
Tests for the approval for railway applications	to BN 411 002 (DIN EN 50155 point 10.2 and DIN EN 50121)

CR0303 | **Wiring**



pin connection
(view from the top on the pin side)



Explanation of the abbreviations:

A = analogue
BH = binary (high side)
BL = binary (low side)
FRQ/CYL = frequency inputs
IL = pulse (low side)
PH = PWM (high side)
PWM = pulse-width modulated signals
RxD = RS-232 data received
TxD = RS-232 data transmitted
VBB_S = supply controller/sensors
VBB_O = supply outputs
VBB_{STAB} = supply sensors stabilised 5/10 V DC

7. Maintenance, repair and disposal

As the device does not contain any components which must be maintained by the user, the housing must not be opened. The maintenance of the device may only be carried out by the manufacturer.

The disposal must be carried out according to the corresponding national environmental regulations.

8. Approvals/standards

For test standards and regulations see Technical data (data sheets), page 12.

The CE-Declaration of Conformity and the e1-approval are available at:
www.ifm.com ➔ Data sheet direct ➔ CR0303 ➔ Approvals