

ifm electronic



Installation instructions

BasicController
and
BasicController *plus*

UK

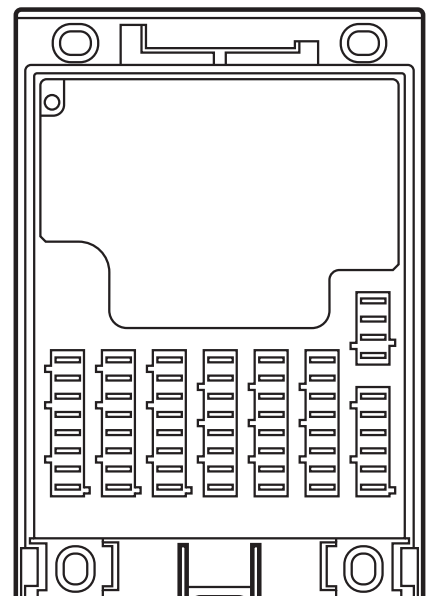
ecomat100[®]

CR0401

CR0403

CR0411

80010113 / 00 10 / 2014



Contents

1	Preliminary note	4
1.1	Symbols used	4
1.2	Warning signs used	4
2	Safety instructions	5
2.1	General	5
2.2	Target group	5
2.3	Electrical connection	5
2.4	Tampering with the device	5
3	Functions and features	6
3.1	Overview of the common characteristics	6
3.2	Application example	6
3.3	Devices of the Basic series (examples)	7
4	Installation	8
4.1	General installation instructions	8
4.1.1	Protection	8
4.1.2	Mounting surface	8
4.2	Fastening	8
4.3	Cover and cable seal	10
4.3.1	Installation of the cable seal	10
4.3.2	Removal of the cable seal	10
4.3.3	Installation of the cover	11
4.3.4	Removing the cover	11
5	Electrical connection	12
5.1	General electrical connection	12
5.2	Connection accessories	13
5.2.1	Example accessories	13
5.3	Frequency inputs	13
5.4	Fuses	13
6	Indicators	14
7	Set-up	15
7.1	Programming	15
7.2	Required documentation	15
7.3	Required hardware	15
8	Technical data	16
8.1	CR0401	16
8.2	CR0403	21
8.3	CR0411	27
9	Maintenance, repair and disposal	33
9.1	Maintenance	33
9.2	Cleaning the housing surface	33
9.3	Repair	33

9.4 Disposal 33
10 Approvals/standards 33



This document is the original instructions.
Valid as from device status CR0401AC, CR0403AD und CR0411AA
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1 Preliminary note

This document applies to devices of the type "BasicController" (art. no.: CR0401, CR0403) and "BasicController^{plus}" (art. no.: CR0411).



These instructions are an integral 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

- ▶ Instruction
- > Reaction, result
- [...] Designation of keys, 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 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.

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 connections 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 Tampering with the device

In case of malfunctions or uncertainties please contact the manufacturer. Any 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.

3 Functions and features

The freely programmable controllers of the "BasicController" and "BasicController^{plus}" 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 user can configure the inputs and outputs to adapt to the respective application. The controllers can be used as CAN controller, CANopen master or intelligent I/O module. (→ 8 Technical data).

Application-specific extensions and adaptations are possible in conjunction with additional products of the modular Basic series.

⚠ WARNING

The "BasicController" and "BasicController^{plus}" series are not approved for safety tasks in the field of safety of persons.

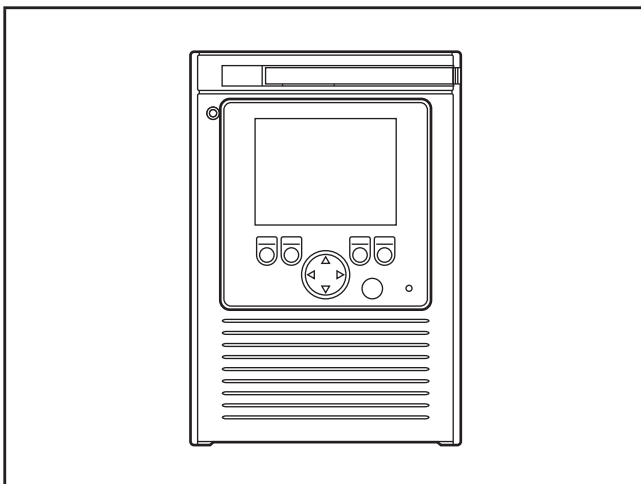
NOTE

"BasicController" and "BasicController^{plus}" are intended for installation in vehicle bodies, not in engines.

3.1 Overview of the common characteristics

- Freely programmable to IEC 61131-3
- 2 CAN interfaces (incl. interface for BasicDisplay CR0451 or CR0452)
- Configurable inputs/outputs
- Protection IP 20 (with cover and cable seal IP 54)
- Status LED

3.2 Application example



Use with cover and BasicDisplay

3.3 Devices of the Basic series (examples)

- BasicDisplay (art. no.: CR0451)
programmable 2.8 inch colour display with graphic capabilities
5 freely programmable backlit function keys
1 rocker switch for cursor function
- BasicDisplay XL (art. no.: CR0452)
programmable 4.3 inch colour display with graphic capabilities
6 freely programmable backlit function keys
1 rocker switch for cursor function
- BasicRelay (art. no.: CR0421)
freely wirable relay and fuse carrier for 6 automotive relays and 10 automotive fuses
- Cover (art. no.: EC0401)
- Cover with built-in display recess (art. no.: EC0402)
incl. cable seal to obtain protection rating IP 54

For information about the available Basic products see:
www.ifm.com → Products → Control systems
or directly
www.ifm.com → Data sheet search → e.g. CR0451

4 Installation

4.1 General installation instructions

4.1.1 Protection

The achievable protection rating of the device depends on the accessories used and the mounting position.

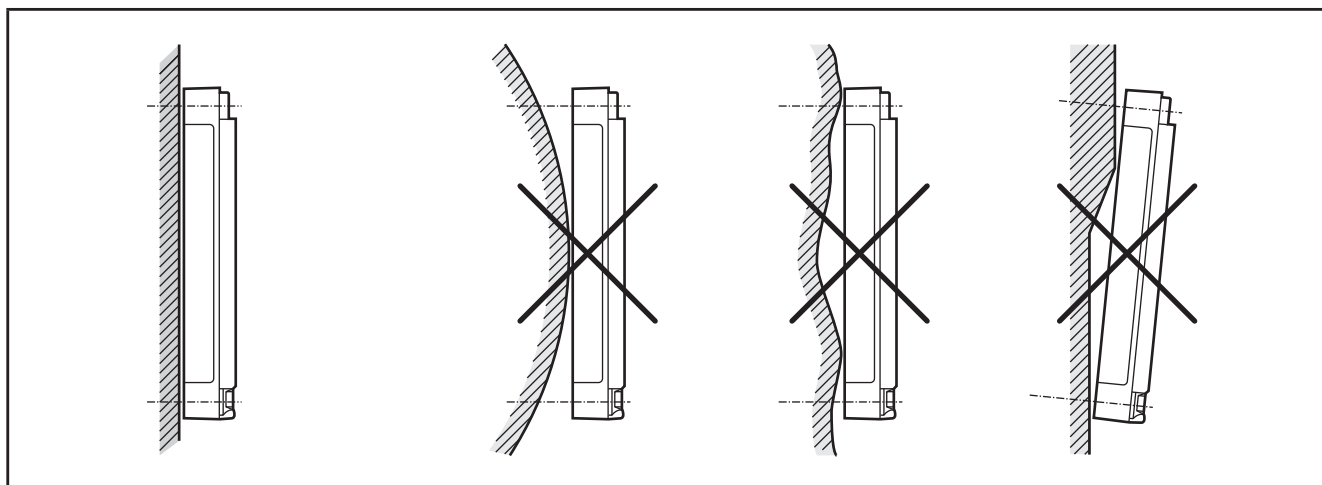
Protection	Accessories	Installation position	Art. no.
IP 20	–	freely selectable	–
IP 54	cover with cable seal	cable connection from the bottom	e.g. EC0401

4.1.2 Mounting surface

NOTE

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

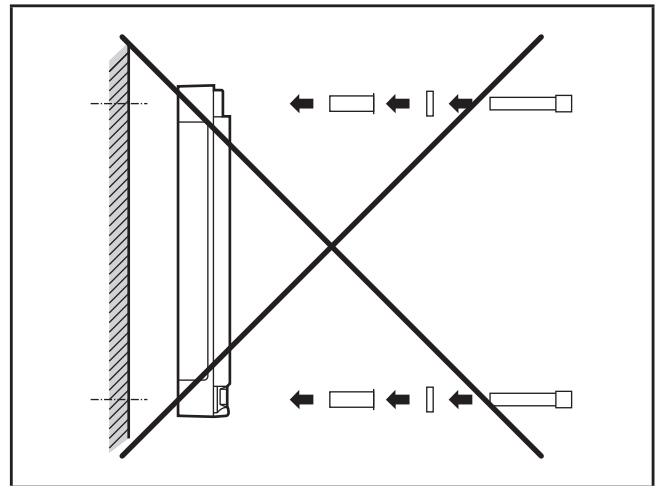
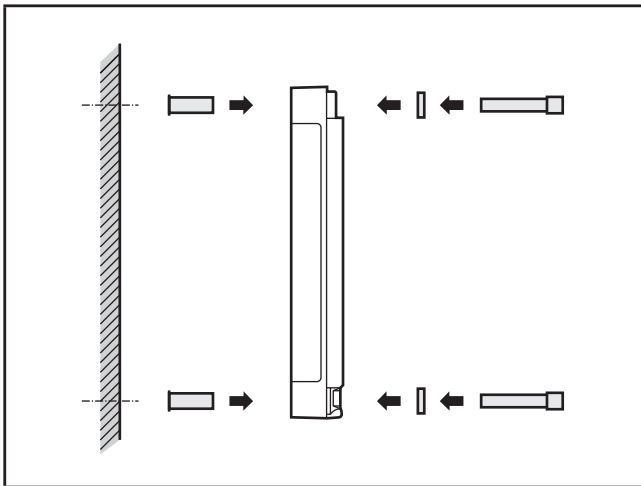
- ▶ Mount the device on a flat surface.
- ▶ Use compensating elements if there is no flat mounting surface available.



Mounting surface

4.2 Fastening

- ▶ Insert the enclosed tubular rivets from the back of the module in the 4 fixing holes.
- ▶ Fix the module using 4 washers and M4 screws. Tighten the screws alternately crosswise.



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Use of the tubular rivets

Tightening torque: 1.5 Nm

Hole dimensions (→ 8 Technical data)

Screws to be used (examples):	Standard
Cylinder screws with hexagon socket (M4 x L)	DIN 912
Cylinder screws with hexagon socket and low head (M4 x L)	DIN 7984

4.3 Cover and cable seal

NOTE

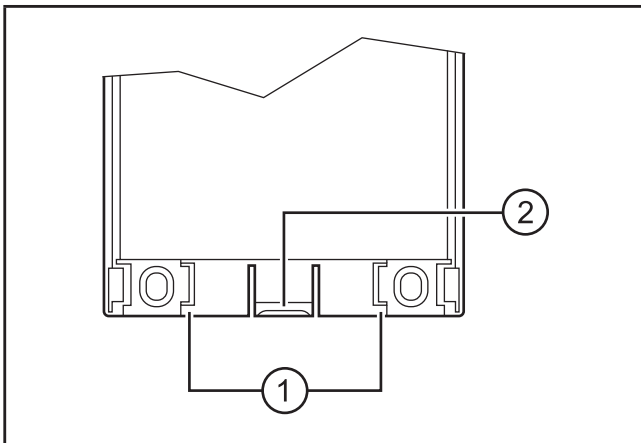
Protection IP 54 can only be guaranteed if the cover is used together with the cable seal.

NOTE

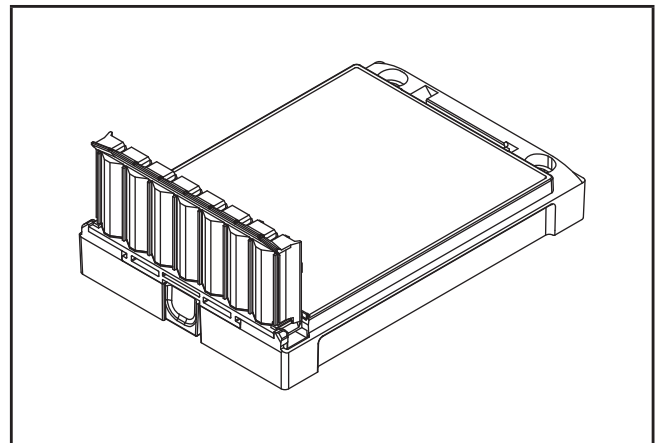
When a cover is installed, the device temperature can increase.

4.3.1 Installation of the cable seal

- ▶ Insert the cable seal into the locator from below.
- > The locking of the cable seal audibly clips into place.



1. Locator for cable seal
2. Locking



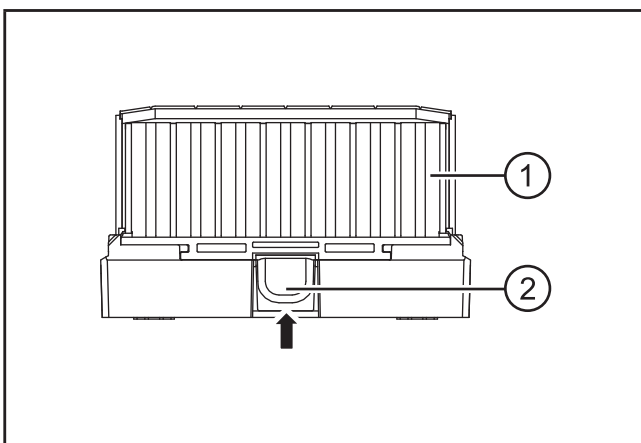
Mounted cable seal



The cable seal cannot be used as strain relief of the cables.
(→ 5.1 General electrical connection)

4.3.2 Removal of the cable seal

- ▶ Press the locking at the bottom of the device and remove the cable seal from the device by pulling downwards.

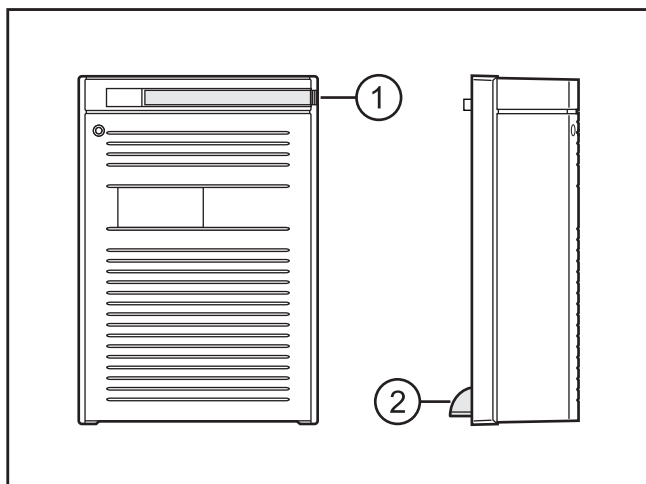


1. Cable seal
2. Locking

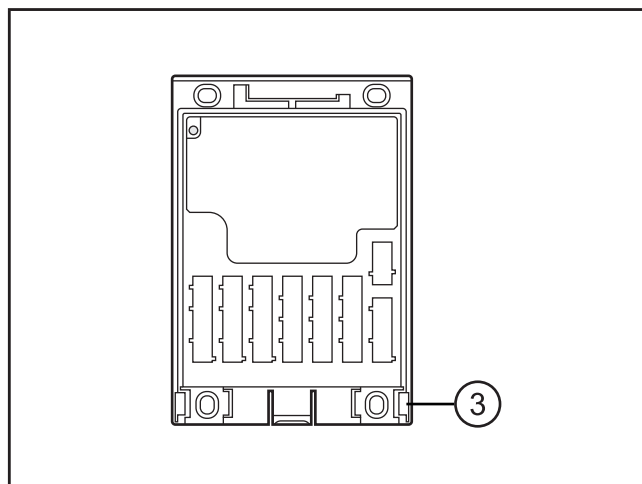
Bottom of the device

4.3.3 Installation of the cover

The covers of the Basic series feature a single-lever locking. Installation is done without tools.

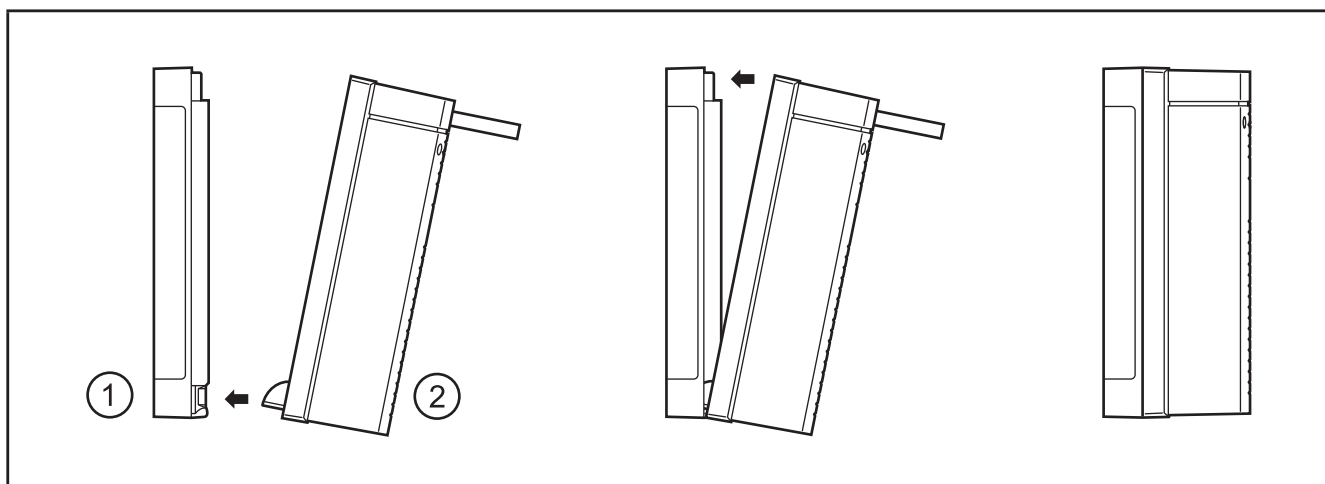


1: locking lever
2: cover guides



3: insertion slots for cover guides

- ▶ Pull out the locking lever and rotate it towards you.
- ▶ Place the cover diagonally onto the device.
Insert the 2 cover guides, found at the bottom of the cover, into the slots.
- ▶ Close the cover onto the lower part.
The 2 guides and slots provide a pivot point.
- ▶ Move the locking lever back into its initial position.
- > The cover is locked.



1: BasicController
2: cover

4.3.4 Removing the cover

- ▶ Pull out the locking lever and rotate it towards you.
- > The cover is unlocked and can be removed.

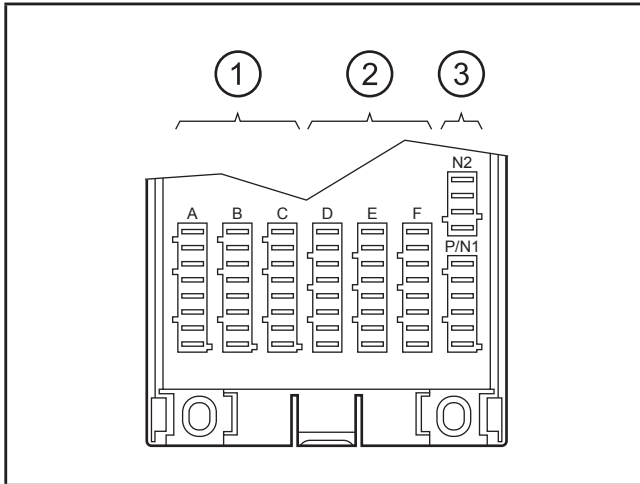
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5 Electrical connection

5.1 General electrical connection

The supply cables, CAN interfaces and input/outputs are connected via 6.3 x 0.8 mm blade male terminals on the front of the device.

Wiring (→ 8 Technical data)



- 1: Inputs
- 2: Outputs
- 3: Supply and CAN interfaces

Connector area (here e.g. CR0403)

Connector	Connection	CR0401	CR0403	CR0411	Number of poles
A	Inputs	IN0...3	IN0...3	IN0...3	8
B		IN4...7	IN4...7	IN4...7	
C		IN8...11	IN8...11	–	
D	Outputs	–	OUT0...3	OUT0...3	
E		OUT0...3	OUT4...7	OUT4...7	
F		OUT4...7	OUT8...11	–	
P/N1	CAN interface 1 and supply				6
N2	CAN interface 2 (e.g. for BasicDisplay CR0451 or CR0452)				4

– = not connected

NOTE

Wrong connection may cause damage to the device.

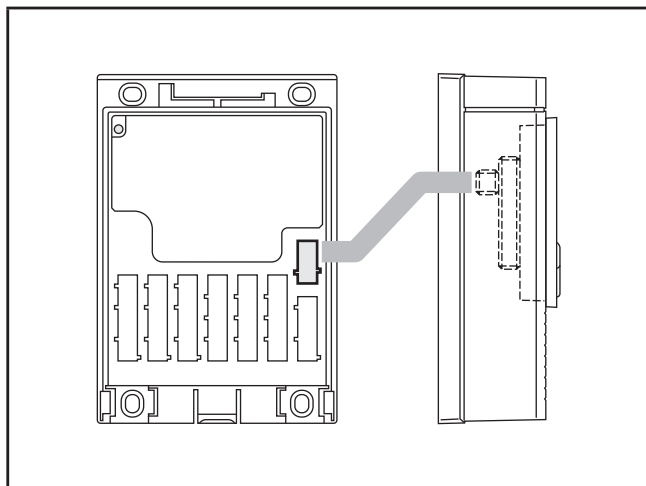
► Observe the safety instructions (→ 2.3 Electrical connection).

- Basically all supply and signal cables must be laid separately.
- Lay supply and signal cables away from the device using the shortest possible route.
- All connected cables must be provided with a strain relief at least 100 mm behind the cable entry.
- Protect unused terminals with unpopulated sockets if no cover is used.

5.2 Connection accessories

You can find more information about the available accessories at:
www.ifm.com → Data sheet search → e.g. CR0401 → Accessories

5.2.1 Example accessories



BasicDisplay CR0451
 cover with EC0402 built-in display recess
 EC0452 connection cable

Accessories and example connection

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5.3 Frequency inputs

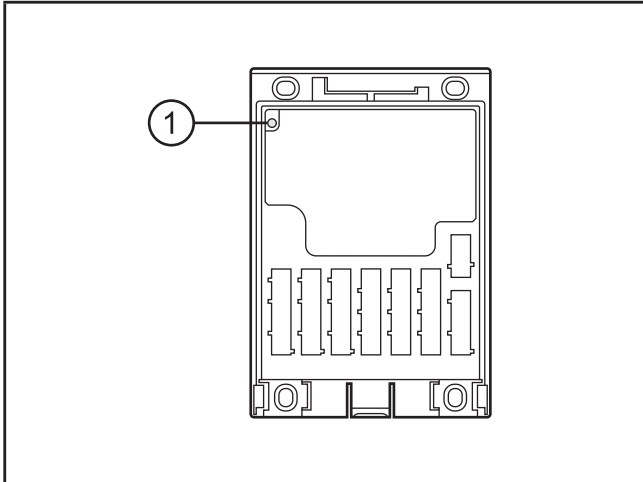
- ▶ Operate frequency inputs with screened cables, so that useful signals are not affected by external interference.

5.4 Fuses

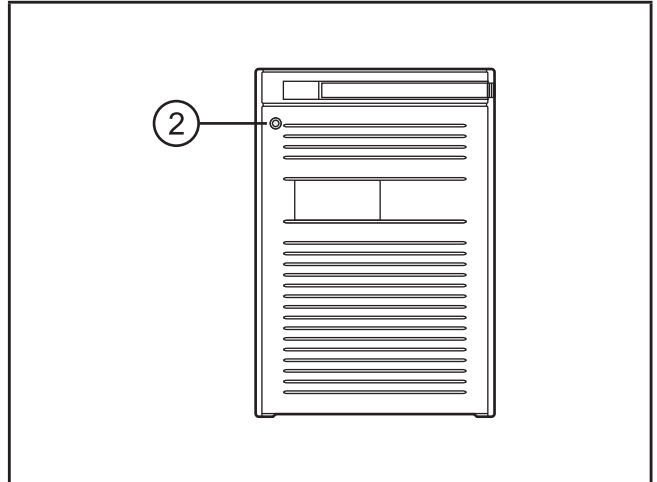
- ▶ The individual electric circuits must be protected in order to protect the whole system.

Description		Potential	Connector: pin	Fuse
VBB _s	Supply sensors/module	8...32 V DC	P/N1: 1	≤ 2 A T
VBB ₁	Supply outputs CR0401: OUT0...3 CR0403: OUT0...7 CR0411: OUT0...3	8...32 V DC	P/N1: 2	15 A
VBB ₂	Supply outputs CR0401: OUT4...7 CR0403: OUT8...11 CR0411: OUT4...7	8...32 V DC	P/N1: 3	15 A

6 Indicators



1: Status LED



2: LED lighting in the cover (e.g. EC0401)

Operating states (→ 8 Technical data)

7 Set-up

7.1 Programming

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

⚠ 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.

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7.2 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)
- BasicController system manual
(alternatively as online help)

The manuals can be downloaded from the internet:

www.ifm.com → Data sheet search → e.g. CR0401 → Additional data

CODESYS and BasicController online help

www.ifm.com → Service → Download → Control systems*

*) Download area with registration

7.3 Required hardware

A CAN interface for the connection to a PC or a notebook is required to load the application program to the device.

Example:

- CAN/RS232 USB interface CANfox (art. no.: EC2112)
- Adapter cable for CANfox (art. no.: EC2113)

You can find more information about the available accessories at:

www.ifm.com → Data sheet search → CR0451 → Accessories

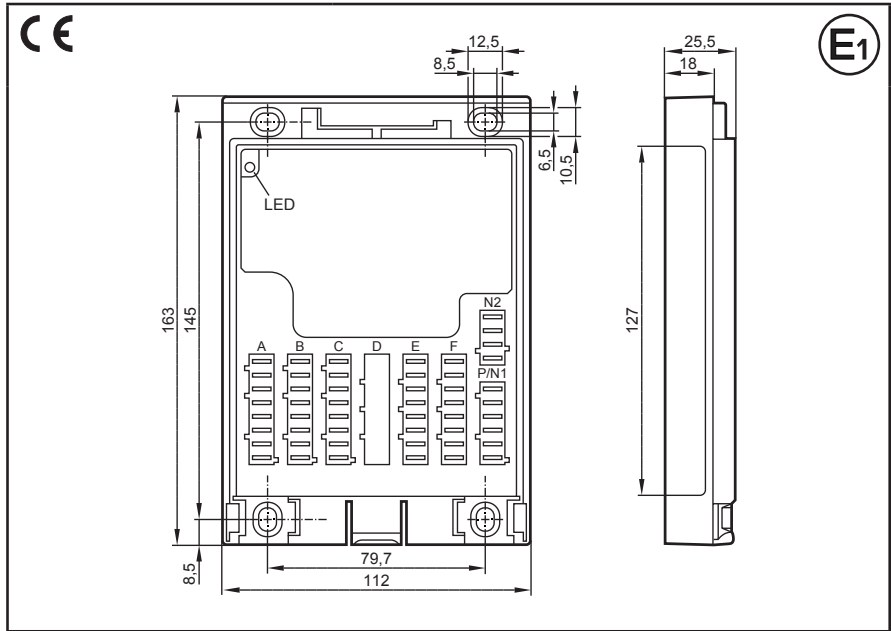
or directly

www.ifm.com → Data sheet search → EC2112

8 Technical data

8.1 CR0401

CR0401
Mobile controller BasicController 12 inputs 8 outputs 2 CAN interfaces Programming to IEC 61131-3 8...32 V DC



Technical data

Mechanical data

Housing
Dimensions (H x W x D) without cover with EC0401 cover with EC0402 cover and BasicDisplay CR0451
Installation
Connection
Inputs Outputs Operating voltage , CAN bus
Protection rating
Operating/storage temperature
Weight

Electrical data

Operating voltage
Current consumption
Overvoltage Undervoltage detection Undervoltage shutdown
Processor
Memory (total)
Memory allocation
Device monitoring

**Modular control system
Usable as CANopen controller or intelligent I/O module**

plastic housing (black)
163 x 112 x 25.5 mm 163 x 112 x 68 mm 163 x 112 x 73.4 mm
fixing by means of 4 M4 screws to DIN 912 or DIN 7984 and 4 tubular rivets to DIN 7340 (tubular rivets are supplied)
AMP blade male terminals 6.3 mm, to be clipped into place and thus vibration-resistant, protected against reverse polarity contacts AMP timer, CuZn pre-tin-plated core cross-section 0.5...2.5 mm ²
3 x 8-pole 2 x 8-pole 1 x 6-pole, 1 x 4-pole
IP 20 (with cover and cable seal IP 54)
-40...85° C / -40...85° C
0.30 kg
8...32 V DC
45 mA (at 24 V DC)
36 V for t ≤ 10 s at U _B ≤ 7.8 V at U _B ≤ 7.0 V
Freescle PowerPC, 50 MHz
208 Kbytes RAM / 1536 Kbytes Flash / 1 Kbyte FRAM
see BasicController system manual www.ifm.com → data sheet search → e.g. CR0401 → Additional data
undervoltage monitoring watchdog function checksum test for program and system excess temperature monitoring

CR0401	Technical data																							
CAN interfaces 1/2 Baud rate Communication profile	CAN interface 2.0 A/B, ISO 11898 20 kBit/s...1 MBit/s (default CAN1: 250 kBit/s, CAN2: 250 kBit/s) CANopen, CiA DS 301 version 4, CiA DS 401 version 1.4 or SAE J 1939 or free protocol																							
Software/programming																								
Programming system	CODESYS version 2.3 (IEC 61131-3)																							
Inputs	12 (configurable),																							
Configurations	<table border="1"> <thead> <tr> <th>Number</th> <th>Version</th> <th></th> </tr> </thead> <tbody> <tr> <td>4</td> <td>digital for positive / negative sensor signals analogue (0...10/32 V DC, 0..20 mA, ratiometric) frequency (≤ 30 kHz)</td> <td>B_L/B_H A FRQ</td> </tr> <tr> <td>4</td> <td>digital for positive sensor signals resistance measurement (0,016...3.6 kΩ)</td> <td>B_L</td> </tr> <tr> <td>4</td> <td>digital for positive sensor signals</td> <td>B_L</td> </tr> </tbody> </table> <p>positive sensor signals have diagnostic capabilities</p>	Number	Version		4	digital for positive / negative sensor signals analogue (0...10/32 V DC, 0..20 mA, ratiometric) frequency (≤ 30 kHz)	B _L /B _H A FRQ	4	digital for positive sensor signals resistance measurement (0,016...3.6 k Ω)	B _L	4	digital for positive sensor signals	B _L											
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4	digital for positive sensor signals	B _L																						
Outputs	8 (configurable),																							
Configurations	<table border="1"> <thead> <tr> <th>Number</th> <th>Version</th> <th></th> </tr> </thead> <tbody> <tr> <td>2</td> <td>positive switching (high side) PWM output (20...250 Hz), 2 A, diagnosis</td> <td>B_H PWM</td> </tr> <tr> <td>4</td> <td>positive switching (high side) PWM output (20...250 Hz), 1 A</td> <td>B_H PWM</td> </tr> <tr> <td>2</td> <td>positive switching (high side) PWM output (20...250 Hz), 4 A, diagnosis</td> <td>B_H PWM</td> </tr> </tbody> </table>	Number	Version		2	positive switching (high side) PWM output (20...250 Hz), 2 A, diagnosis	B _H PWM	4	positive switching (high side) PWM output (20...250 Hz), 1 A	B _H PWM	2	positive switching (high side) PWM output (20...250 Hz), 4 A, diagnosis	B _H PWM											
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Status LED	two-colour LED (red/green)																							
Operating states (preset)	<table border="1"> <thead> <tr> <th>Colour</th> <th>Status</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>–</td> <td>permanently off</td> <td>no operating voltage</td> </tr> <tr> <td>orange</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 is running (RUN)</td> </tr> <tr> <td>permanently on</td> <td>application stopped (STOP)</td> </tr> <tr> <td rowspan="3">red</td> <td>10 Hz</td> <td>application stopped (STOP with error)</td> </tr> <tr> <td>5 Hz</td> <td>application stopped due to undervoltage</td> </tr> <tr> <td>permanently on</td> <td>system fault (fatal error)</td> </tr> </tbody> </table>	Colour	Status	Description	–	permanently off	no operating voltage	orange	1 x on	initialisation or reset checks	green	5 Hz	no operating system loaded	2 Hz	application is running (RUN)	permanently on	application stopped (STOP)	red	10 Hz	application stopped (STOP with error)	5 Hz	application stopped due to undervoltage	permanently on	system fault (fatal error)
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	permanently on	system fault (fatal error)																						

UK

CR0401**Characteristics of the inputs**

Analogue inputs (A)
 Connection A: 02, 03, 06, 07
 IN0...IN3
 can be configured as:

Digital input (B_L)
 Connection B: 02, 03, 06, 07
 IN4...IN7
 can be configured as...

Technical data

● Voltage inputs	
Input voltage	0...10 V or 0...32 V
Resolution	12 bits
Accuracy	± 1% FS
Input resistance	65.6 kΩ (0...10 V), 50.7 kΩ (0...32 V)
Input frequency	≤ 500 Hz
● Current inputs, with diagnostic capability	
Input current	0...20 mA
Resolution	12 bits
Accuracy	± 1% FS
Input resistance	400 Ω
Input frequency	≤ 500 Hz
At a current of > 23 mA the input is switched to the voltage input!	
● Voltage inputs, 0...32 V, ratiometric	
Function	$(U_{IN} \div U_B) \times 1000 \text{ ‰}$
Value range	0...1000 ‰
Input resistance	50.7 kΩ
● Binary voltage inputs for positive sensor signals	
Switch-on level	> 0.7 U _B
Switch-off level	< 0.3 U _B
Input resistance	3.2 kΩ
Input frequency	50 Hz
Diagnosis wire break	> 0.95 U _B
Diagnosis short circuit	< 1 V
● Binary voltage inputs for negative sensor signals	
Switch-on level	> 0.7 U _B
Switch-off level	< 0.3 U _B
Input resistance	3.2 kΩ
Input frequency	50 Hz
● Frequency inputs	
Input resistance	3.2 kΩ
Input frequency	≤ 30 kHz
Switch-on level	> 0.35...0.48 U _B
Switch-off level	< 0.29 U _B

● Binary voltage inputs for positive sensor signals	
Switch-on level	> 0.7 U _B
Switch-off level	< 0.3 U _B
Input resistance	3.2 kΩ
Input frequency	50 Hz
Diagnosis wire break	> 0.95 U _B
Diagnosis short circuit	< 1 V
● Resistor input	
Measuring range	16...3.6 kΩ
Accuracy	± 3 %

CR0401

Digital input (B_L)
 Connection C: 02, 03, 06, 07
 IN8...IN11
 can be configured as...

Characteristics of the outputs

Digital outputs (B_H, PWM)
 Connection F: 01, 03,
 OUT4...OUT5

Digital outputs (B_H, PWM)
 Connection E: 01, 03, 05, 07
 OUT0...OUT3

Digital outputs (B_H, PWM)
 Connection F: 05, 07
 OUT6...OUT7

Free wheel diodes

Overload protection
 (valid for all outputs)

Short-circuit strength
 (valid for all inputs and outputs)

Max. total current of the output supplies
 VBB₁/VBB₂ (Continuous current load)

Technical data

- Binary voltage inputs for positive sensor signals

Switch-on level	> 0.7 U _B
Switch-off level	< 0.3 U _B
Input resistance	3.2 kΩ
Input frequency	50 Hz
Diagnosis wire break	> 0.95 U _B
Diagnosis short circuit	< 1 V

- Semiconductor outputs, positive switching (high side), short-circuit and overload protected. Diagnosis via voltage feedback, pullup resistance can be deactivated (wire break/ short circuit)

Switching voltage	8...32 V DC
Switching current	≤ 2A
<ul style="list-style-type: none"> PWM outputs 	
Output frequency	20...250 Hz
Pulse/pause ratio	1...1000 ‰
Switching current	≤ 2A

If only one output of the output pair is active, the switching current is ≤ 2.5 A.

Max. switch-on current	≤ 11 A
------------------------	--------

- Semiconductor outputs, positive switching (high side), short-circuit and overload protected

Switching voltage	8...32 V DC
Switching current	≤ 1 A
<ul style="list-style-type: none"> PWM outputs 	
Output frequency	20...250 Hz
Pulse/pause ratio	1...1000 ‰
Switching current	≤ 1 A

Max. switch-on current	≤ 11 A
------------------------	--------

- Semiconductor outputs, positive switching (high side), short-circuit and overload protected. Diagnosis via voltage feedback, pullup resistance can be deactivated (wire break/ short circuit)

Switching voltage	8...32 V DC
Switching current	≤ 4 A
<ul style="list-style-type: none"> PWM outputs 	
Output frequency	20...250 Hz
Pulse/pause ratio	1...1000 ‰
Switching current	≤ 4 A

Max. switch-on current	≤ 30 A
------------------------	--------

free wheel diodes for the deactivation of inductive loads are integrated

≤ 5 minutes (at 100% overload)

≤ 5 minutes (contact +VBB with GND)

permanently ≤ 50 % of the nominal current

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Abbreviations	<p>A = analogue B_H = binary high side B_L = binary low side FRQ = frequency/pulse inputs PWM = pulse width modulation VBB_S = supply sensors/module VBB₁ = supply OUT 0...3 VBB₂ = supply OUT 4...7</p>																																																																																	

8.2 CR0403

CR0403

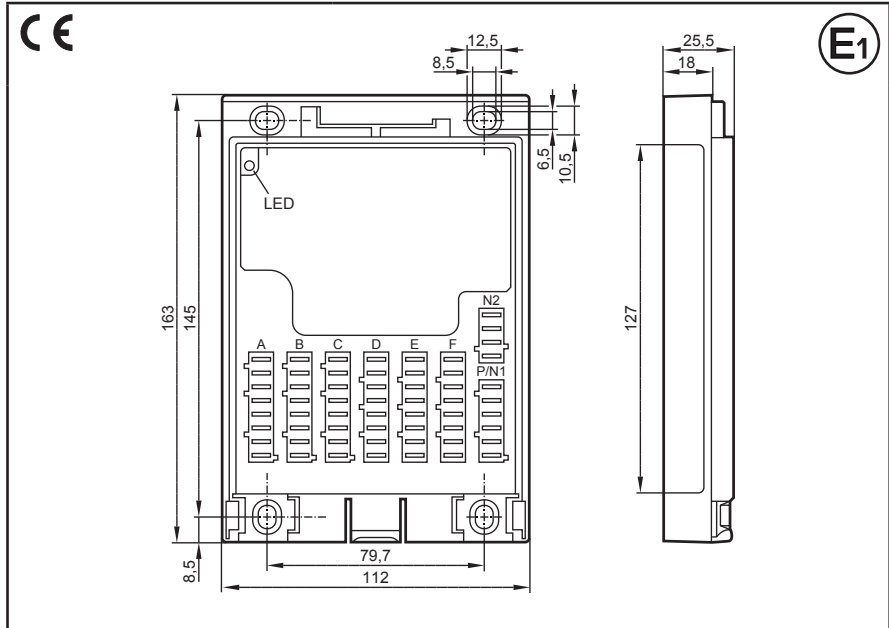
Mobile controller
BasicController

12 inputs
12 outputs

2 CAN interfaces

Programming
to IEC 61131-3

8...32 V DC

**Technical data****Mechanical data**

Housing

Dimensions (H x W x D)

without cover

with EC0401 cover

with EC0402 cover and BasicDisplay
CR0451

Installation

Connection

Inputs

Outputs

Operating voltage, CAN bus

Protection rating

Operating/storage temperature

Weight

Electrical data

Operating voltage

Current consumption

Overvoltage

Undervoltage detection

Undervoltage shutdown

Processor

Memory (total)

Memory allocation

Device monitoring

Modular control system
Usable as CANopen master or intelligent I/O module

plastic housing (black)

163 x 112 x 25.5 mm

163 x 112 x 68 mm

163 x 112 x 73.4 mm

fixing by means of 4 M4 screws to DIN 912 or DIN 7984 and 4 tubular rivets to
DIN 7340 (tubular rivets are supplied)

AMP blade male terminals 6.3 mm, to be clipped into place and thus vibration-
resistant, protected against reverse polarity
contacts AMP timer, CuZn pre-tin-plated
core cross-section 0.5...2.5 mm²

3 x 8-pole

3 x 8-pole

1 x 6-pole, 1 x 4-pole

IP 20 (with cover and cable seal IP 54)

-40...85° C / -40...85° C

0.30 kg

8...32 V DC

45 mA (at 24 V DC)

36 V for $t \leq 10$ s

at $U_B \leq 7.8$ V

at $U_B \leq 7.0$ V

Freescale PowerPC, 50 MHz

592 Kbytes RAM / 1536 Kbytes Flash / 1 Kbyte FRAM

see BasicController system manual
www.ifm.com → data sheet search → e.g. CR0403 → Additional data

undervoltage monitoring
watchdog function
checksum test for program and system
excess temperature monitoring

CR0403	Technical data																							
CAN interfaces 1/2 Baud rate Communication profile	CAN interface 2.0 A/B, ISO 11898 20 kBit/s...1 MBit/s (Default CAN1: 250 kBit/s, CAN2: 250 kBit/s) CANopen, CiA DS 301 version 4, CiA DS 401 version 1.4 or SAE J 1939 or free protocol																							
Software/programming Programming system	CODESYS version 2.3 (IEC 61131-3)																							
Inputs Configurations	12 (configurable) <table border="1"> <thead> <tr> <th>Number</th> <th>Version</th> <th></th> </tr> </thead> <tbody> <tr> <td>4</td> <td>digital for positive / negative sensor signals analogue (0...10/32 V DC, 0..20 mA, ratiometric) frequency (≤ 30 kHz)</td> <td>B_L/B_H A FRQ</td> </tr> <tr> <td>4</td> <td>digital for positive sensor signals resistance measurement (0,016...3.6 kΩ)</td> <td>B_L</td> </tr> <tr> <td>4</td> <td>digital for positive sensor signals</td> <td>B_L</td> </tr> </tbody> </table> <p>positive sensor signals have diagnostic capabilities</p>	Number	Version		4	digital for positive / negative sensor signals analogue (0...10/32 V DC, 0..20 mA, ratiometric) frequency (≤ 30 kHz)	B _L /B _H A FRQ	4	digital for positive sensor signals resistance measurement (0,016...3.6 k Ω)	B _L	4	digital for positive sensor signals	B _L											
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CR0403**Characteristics of the inputs**

Analogue inputs (A)
 Connection A: 02, 03, 06, 07
 IN0...IN3
 can be configured as:

Digital input (B_L)
 Connection B: 02, 03, 06, 07
 IN4...IN7
 can be configured as...

Technical data

● Voltage inputs	
Input voltage	0...10 V or 0...32 V
Resolution	12 bits
Accuracy	± 1% FS
Input resistance	65.6 kΩ (0...10 V), 50.7 kΩ (0...32 V)
Input frequency	≤ 500 Hz
● Current inputs, with diagnostic capability	
Input current	0...20 mA
Resolution	12 bits
Accuracy	± 1% FS
Input resistance	400 Ω
Input frequency	≤ 500 Hz
At a current of > 23 mA the input is switched to the voltage input!	
● Voltage inputs, 0...32 V, ratiometric	
Function	$(U_{IN} \div U_B) \times 1000 \text{ ‰}$
Value range	0...1000 ‰
Input resistance	50.7 kΩ
● Binary voltage inputs for positive sensor signals	
Switch-on level	> 0.7 U _B
Switch-off level	< 0.3 U _B
Input resistance	3.2 kΩ
Input frequency	50 Hz
Diagnosis wire break	> 0.95 U _B
Diagnosis short circuit	< 1 V
● Binary voltage inputs for negative sensor signals	
Switch-on level	> 0.7 U _B
Switch-off level	< 0.3 U _B
Input resistance	3.2 kΩ
Input frequency	50 Hz
● Frequency inputs	
Input resistance	3.2 kΩ
Input frequency	< 30 kHz
Switch-on level	> 0.35...0.48 U _B
Switch-off level	< 0.29 U _B

● Binary voltage inputs for positive sensor signals	
Switch-on level	> 0.7 U _B
Switch-off level	< 0.3 U _B
Input resistance	3.2 kΩ
Input frequency	50 Hz
Diagnosis wire break	> 0.95 U _B
Diagnosis short circuit	< 1 V
● Resistor input	
Measuring range	16...3.6 kΩ
Accuracy	± 3 %

UK

CR0403

Digital input (B_L)
 Connection C: 02, 03, 06, 07
 IN8...IN11
 can be configured as...

Characteristics of the outputs

Digital outputs (B_H, PWM, PWM-I)
 Connection D: 01, 03
 OUT0...OUT1

Digital outputs (B_H, PWM)
 Connection D: 05, 07
 OUT2...OUT3
 Connection F: 01, 03,
 OUT8...OUT9

Technical data

- Binary voltage inputs for positive sensor signals

Switch-on level	> 0.7 U _B
Switch-off level	< 0.3 U _B
Input resistance	3.2 kΩ
Input frequency	50 Hz
Diagnosis wire break	> 0.95 U _B
Diagnosis short circuit	< 1 V

- Semiconductor outputs, positive switching (high side), short-circuit and over-load protected
 Diagnosis via current feedback (wire break / overload)
 Diagnosis via voltage feedback, pullup resistance can be deactivated (wire break/ short circuit)

Switching voltage	8...32 V DC
Switching current	≤ 2 A
Load resistance	≥ 6 Ω (at 12 V DC) ≥ 12 Ω (at 24 V DC)

- PWM outputs

Output frequency	20...250 Hz
Pulse/pause ratio	1...1000 ‰
Switching current	≤ 2 A

- Current-controlled output

Output frequency	20...250 Hz
Control range	0.02...2 A
Setting resolution	1 mA
Control resolution	2 mA

If only one output is active, the switching current is ≤ 2.5 A.

Max. switch-on current	≤ 11 A
------------------------	--------

- Semiconductor outputs, positive switching (high side), short-circuit and over-load protected
 Diagnosis via voltage feedback, pullup resistance can be deactivated (wire break/ short circuit)

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

- PWM outputs

Output frequency	20...250 Hz
Pulse/pause ratio	1...1000 ‰
Switching current	≤ 2 A

If only one output of the output pair is active, the switching current is ≤ 2.5 A.

Max. switch-on current	≤ 11 A
------------------------	--------

CR0403

Digital outputs (B_H)
 Connection E: 01, 03, 05, 07
 OUT4...OUT7

Digital outputs (B_H, PWM)
 Connection F: 05, 07
 OUT10...OUT11

Free wheel diodes

Overload protection
 (valid for all outputs)

Short-circuit strength
 (valid for all inputs and outputs)

Max. total current of the output supplies
 VBB₁/VBB₂
 (continuous current load)

Technical data

- Semiconductor outputs, positive switching (high side), short-circuit and over-load protected

Switching voltage	8...32 V DC
-------------------	-------------

Switching current	≤ 1 A
-------------------	-------

- PWM outputs

Output frequency	20...250 Hz
------------------	-------------

Pulse/pause ratio	1...1000 ‰
-------------------	------------

Switching current	≤ 1 A
-------------------	-------

Max. switch-on current	≤ 11 A
------------------------	--------

- Semiconductor outputs, positive switching (high side), short-circuit and over-load protected
 Diagnosis via voltage feedback, pullup resistance can be deactivated (wire break/ short circuit)

Switching voltage	8...32 V DC
-------------------	-------------

Switching current	≤ 4 A
-------------------	-------

- PWM outputs

Output frequency	20...250 Hz
------------------	-------------

Pulse/pause ratio	1...1000 ‰
-------------------	------------

Switching current	≤ 4 A
-------------------	-------

Max. switch-on current	≤ 30 A
------------------------	--------

free wheel diodes for the deactivation of inductive loads are integrated

≤ 5 minutes (at 100% overload)

≤ 5 minutes (contact +VBB with GND)

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UK

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IN1	IN5	IN9	OUT1	OUT5	OUT9	CAN2_H	VBB ₂																																																																										
GND	GND	GND	GND	GND	GND	CAN2_L	GND																																																																										
GND	GND	GND	OUT2	OUT6	OUT10		CAN1_H																																																																										
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8.3 CR0411

CR0411

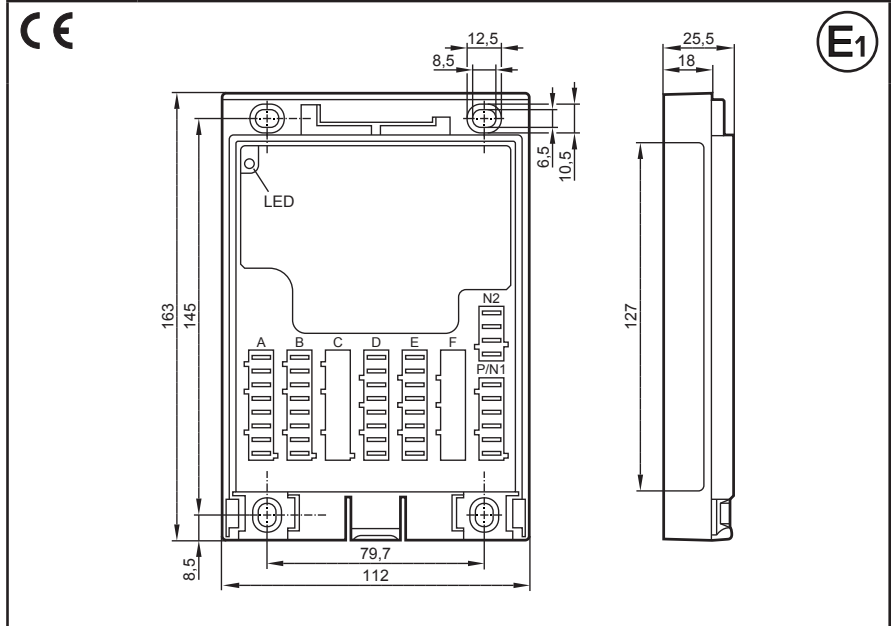
Mobile controller
BasicController *plus*

8 inputs
8 outputs

2 CAN interfaces

Programming
to IEC 61131-3

8...32 V DC

**Technical data****Mechanical data**

Housing

plastic housing (black)

Dimensions (H x W x D)
without cover
with EC0401 cover
with EC0402 cover and BasicDisplay
CR0451

163 x 112 x 25.5 mm

163 x 112 x 68 mm

163 x 112 x 73.4 mm

Installation

fixing by means of 4 M4 screws to DIN 912 or DIN 7984 and 4 tubular rivets to
DIN 7340 (tubular rivets are supplied)

Connection

AMP blade male terminals 6.3 mm, to be clipped into place and thus vibration-
resistant, protected against reverse polarity
contacts AMP timer, CuZn pre-tin-plated
core cross-section 0.5...2.5 mm²

Inputs
Outputs
Operating voltage, CAN bus

2 x 8-pole

2 x 8-pole

1 x 6-pole, 1 x 4-pole

Protection

IP 20 (with cover and cable seal IP 54)

Operating/storage temperature

-40...85° C / -40...85° C

Weight

0.30 kg

Electrical data

Operating voltage

8...32 V DC

Current consumption

45 mA (at 24 V DC)

Overvoltage
Undervoltage detection
Undervoltage shutdown

36 V for $t \leq 10$ s

if $U_B \leq 7.8$ V

if $U_B \leq 7.0$ V

Processor

Freescale PowerPC, 50 MHz

Memory (total)

592 Kbytes RAM / 1536 Kbytes Flash / 1 Kbyte FRAM

Memory allocation

see BasicController *plus* system manual
www.ifm.com → Data sheet search → e.g. CR0411 → Additional data

Device monitoring

Undervoltage monitoring
Watchdog function
Checksum test for program and system
Excess temperature monitoring

CR0411	Technical data																							
CAN interfaces 1/2 Baud rate Communication profile	CAN interface 2.0 A/B, ISO 11898 20 Kbits/s...1 Mbit/s (default CAN1: 250 Kbits/s, CAN2: 250 Kbits/s) CANopen, CiA DS 301 version 4, CiA DS 401 version 1.4 or SAE J 1939 or free protocol																							
Software/programming Programming system	CODESYS version 2.3 (IEC 61131-3)																							
Inputs Configurations	8 (configurable)																							
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Status LED	two-colour LED (red/green)																							
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Abbreviations	<p>A Analogue B_H Binary high side B_L Binary low side FRQ Frequency/pulse inputs H H-bridge function PWM Pulse width modulation PWM-I Pulse width modulation, current-controlled R Resistor input VBB_S Supply sensors/module VBB₁ supply OUT 0...3 VBB₂ supply OUT 4...7</p>																							

CR0411

Input characteristics

Analogue inputs (A, B_L/B_H, FRQ)
 Connection A: 02, 03, 06, 07
 IN0...IN3
 can be configured as...

Digital/resistor inputs (B_L, R)
 Connection B: 02, 03, 06, 07
 IN4...IN7
 can be configured as...

Technical data

● Voltage inputs	
Input voltage	0...10 V or 0...32 V
Resolution	12 bits
Accuracy	± 1% FS
Input resistance	65.6 kΩ (0...10 V), 50.7 kΩ (0...32 V)
Input frequency	≤ 500 Hz
● current inputs, with diagnostic capability	
Input current	0...20 mA
Resolution	12 bits
Accuracy	± 1% FS
Input resistance	400 Ω
Input frequency	≤ 500 Hz
At a current of > 23 mA the input is switched to the voltage input!	
● Voltage inputs, 0...32 V, ratiometric	
Function	$(U_{IN} \div U_B) \times 1000 \text{ ‰}$
Value range	0...1000 ‰
Input resistance	50.7 kΩ
● Binary voltage inputs for positive sensor signals	
Switch-on level	> 0.7 U _B
Switch-off level	< 0.3 U _B
Input resistance	3.2 kΩ
Input frequency	50 Hz
Diagnosis wire break	> 0.95 U _B
Diagnosis short circuit	< 1 V
● Binary voltage inputs for negative sensor signals	
Switch-on level	> 0.7 U _B
Switch-off level	< 0.3 U _B
Input resistance	3.2 kΩ
Input frequency	50 Hz
● Frequency inputs	
Input resistance	3.2 kΩ
Input frequency	≤ 30 kHz
Switch-on level	> 0.35...0.48 U _B
Switch-off level	< 0.29 U _B

● Binary voltage inputs for positive sensor signals	
Switch-on level	> 0.7 U _B
Switch-off level	< 0.3 U _B
Input resistance	3.2 kΩ
Input frequency	50 Hz
Diagnosis wire break	> 0.95 U _B
Diagnosis short circuit	< 1 V
● Resistor input	
Measuring current	< 2.0 mA
Input frequency	50 Hz
Measuring range	0.016...30 kΩ
Accuracy	± 2 % FS: 16 Ω...3 kΩ ± 5 % FS: 3...15 kΩ ± 10 % FS: 15...30 kΩ
Diagnosis	> 31 kΩ
Diagnosis short circuit	to V _{BB}

CR0411

Output characteristics

Digital outputs
(B_H, PWM, PWM-I)
Connection D: 01, 03, 05, 07
OUT0...OUT3

Digital outputs
(B_{H/L}, PWM, PWM-I, H)
Connection E: 01, 03, 05, 07
OUT4...OUT7

Free wheel diodes

Overload protection
(valid for all outputs)

Short-circuit strength
(valid for all inputs and outputs)

Total current per output supply VBB₁ or VBB₂

Technical data

- Semiconductor outputs, positive-switching (high side)
Short-circuit proof and overload protected
Diagnosis via current feedback (wire break / overload)
Diagnosis via voltage feedback, pullup resistance can be deactivated (wire break/ short circuit)

Switching voltage	5.5...32 V DC
Switching current	≤ 2.5 A
Load resistance	≥ 4.8 Ω (at 12 V DC) ≥ 9.6 Ω (at 24 V DC)

- PWM outputs

Output frequency	20...250 Hz
Pulse/pause ratio	1...1000 ‰
Switching current	≤ 2.5 A

- Current-controlled output

Output frequency	20...250 Hz
Control range	0.02...2.5 A
Setting resolution	1 mA
Control resolution	2 mA

Max. ambient temperature in PWM mode: ≤ 70 °C

Max. switch-on current	≤ 24 A
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- Semiconductor outputs, positive-switching (high side),
negative switching (low side), short-circuit and overload protection
Diagnosis via current feedback (wire break / overload)
Diagnosis via voltage feedback, pullup resistance can be deactivated (wire break/ short circuit)

Switching voltage	5.5...32 V DC
Switching current	≤ 4 A
Max. clamp energy	< 3 J (at 25°C)
Load resistance	≥ 3 Ω (at 12 V DC) ≥ 6 Ω (at 24 V DC)

- PWM outputs

Output frequency	20...250 Hz
Pulse/pause ratio	1...1000 ‰
Switching current	≤ 4 A

- current-controlled output

Output frequency	20...250 Hz
Control range	0.02...4 A
Setting resolution	1 mA
Control resolution	2 mA

Max. ambient temperature in PWM mode: ≤ 70 °C

Max. switch-on current	≤ 24 A (high side) ≤ 16 A (low side)
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Free wheel diodes for the deactivation of inductive loads are integrated

≤ 5 minutes (at 100% overload)

≤ 5 minutes (contacts +VBB/GND)

≤ 8 A

CR0411	Technical data	
Total summation current of the output supply VBB ₁ and VBB ₂ (continuous current load)	≤ 12 A	
Test standards and regulations		
CE marking	EN 61000-6-2	Electromagnetic compatibility (EMC) Noise immunity
	EN 61000-6-4	Electromagnetic compatibility (EMC) Emission standard
E1 marking	UN/ECE-R10	Emission standard Immunity with 100 V/m
Electrical tests	ISO 7637-2	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 B 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	Damp heat, cyclic Upper temperature 55°C, number of cycles: 6
	EN 60068-2-78	Damp heat, steady state Test temperature 40°C / 93% RH, Test duration: 21 days
	EN 60068-2-52	Salt spray test Severity level 3 (vehicle) Only with installed EC0401 or EC0402 cover
Mechanical tests	ISO 16750-3	Test VII; Vibration, random Mounting location: vehicle body
	EN 60068-2-6	Vibration, sinusoidal 10...500 Hz; 0.72 mm/10 g; 10 cycles/axis
	ISO 16750-3	Bumps 30 g/6 ms; 24,000 shocks
Tests for railway applications	EN 50121-3-2	Electromagnetic compatibility (EMC)
	EN 50155 clause 12.2	Electronic equipment used on rolling stock
Note	The EC declaration of conformity and approvals can be found at: www.ifm.com → Data sheet search → CR0411 → More information	

UK

CR0411**Technical data**

Wiring

A	B	C	D	E	F	N2	P/N1
8 poles						4 poles	6 poles
VBB _S	VBB _S		OUT0	OUT4		VBB _S	VBB _S
IN0	IN4		GND	GND		GND	VBB ₁
IN1	IN5		OUT1	OUT5		CAN2_H	VBB ₂
GND	GND		GND	GND		CAN2_L	GND
GND	GND		OUT2	OUT6			CAN1_H
IN2	IN6		GND	GND			CAN1_L
IN3	IN7		OUT3	OUT7			
VBB _S	VBB _S		GND	GND			

C/F = not used

Abbreviations

A	Analogue
B _H	Binary high side
B _L	Binary low side
FRQ	Frequency/pulse inputs
H	H-bridge function
PWM	Pulse width modulation
PWM-I	Pulse width modulation, current-controlled
R	Resistor input
VBB _S	Supply sensors/module
VBB ₁	Supply OUT 0...3
VBB ₂	Supply OUT 4...7


9 Maintenance, repair and disposal


9.1 Maintenance

The device does not contain any components that need to be maintained by the user.

9.2 Cleaning the housing surface

- ▶ Disconnect the device.
- ▶ Clean the device from dirt using a soft, chemically untreated and dry cloth.
- ▶ In case of heavy dirt, use a damp cloth.

 The following agents are not suited for cleaning the device:
chemicals dissolving plastics such as methylated spirit, benzine, thinner, alcohol, acetone or ammonia.

 Micro-fibre cloths without chemical additives are recommended.

9.3 Repair

- ▶ The device must only be repaired by the manufacturer.
Observe the safety instructions (→ 2.4 Tampering with the device)

9.4 Disposal

- ▶ Dispose of the device in accordance with the national environmental regulations.

10 Approvals/standards

Test standards and regulations (→ 8 Technical data)

The EC declaration of conformity and approvals can be found at:
www.ifm.com → Data sheet search → e.g. CR0401 → Approvals