

Installation instructions SmartController

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CR2500





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1 Preliminary note

This document applies to devices of the type "SmartController" (art. no.: CR2500). 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
- \rightarrow Cross-reference



Important note

Non-compliance can result in malfunction or interference.



Information Supplementary note

1.2 Warning signs used

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

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.

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" 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.

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

A 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 ±2 Nm

NOTE

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

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

UK

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 (\rightarrow 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.

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 (\rightarrow 4.1 Fastening)

5.3 Fuses

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

Description	Potential	Pin no.	Fuse
Supply voltage sensors/module	VBB s	23	≤ 2 A time-lag
Supply voltage outputs	VBB o	05	≤ 15 A

5.4 Laying the supply and signal cables

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.

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.

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 system manual (alternatively as online help)

The manuals can be downloaded from the internet: www.ifm.com \rightarrow Data sheet search \rightarrow CR2500 \rightarrow More information

CODESYS and SmartController online help: www.ifm.com \rightarrow Service \rightarrow Download \rightarrow Systems for mobile machines*

*) Download area with registration

7 Technical data

7.1 Mechanical and electric data

CR2500	$\begin{array}{c c} \mathbf{E} \\ 43 \\ 55 \\ \mathbf{E} \\ 106 \\ 5^{\pm 1} \\ \mathbf{E} \end{array}$
Mobile controller SmartController 2nd CAN interface for gateway function according to SAE J 1939 Programming to IEC 61131-3 Supply voltage 1032 V DC	
Technical data	can be used as CANopen master or intelligent I/O module 8 inputs (4 digital/4 analog) and 4 outputs (digital/PWM/current-controlled)
Housing	closed screened metal housing with flange fastening
Dimensions (H x W x D)	153 x 132 x 43 mm
Mounting	by means of 4 M5 xL screws to DIN 7500 or DIN 7984 mounting position horizontal or vertical to the mounting wall
Connection	55-pin connector, latched, protected against reverse polarity type AMP housing or Framatome AMP junior timer contacts, crimp connection 0.5/2.5 mm ²
Weight	0.95 kg
Inputs	8
can be configured as	4 digital; for positive sensor signals (Low Side); NAMUR; with diagnostic capability incl. 2 pulse inputs (max. 30 kHz) 4 analog; 010/32 V DC or 0/420 mA
Outputs	4
can be configured as Switching current per output	digital, positive switching (High Side) PWM (PWM frequency 20250 Hz) current-controlled (0.14 A) max. 4 A
	max. 12 A
Operating voltage UB Overvoltage Reset in case of undervoltage Auto save	$36 \text{ V for } t \le 10 \text{ s}$ $at U_B \le 9.5 \text{ V}$ $at U_B \le 9.0 \text{ V}$
Current consumption	≤ 160 mA (without external load)
Housing temperature	-4085 °C (depending on the load)
Storage temperature	−4085 °C
Protection	IP 67 (for inserted plug with individually sealed cores e.g. EC2084)
CAN interface 1 Baud rate Communication profile	CAN interface 2.0 B, ISO 11898 50 Kbits/s1 Mbits/s (default setting 125 kBits/s) CANopen, CiA DS 301 version 3.0, CiA DS 401 version 1.4
CAN interface 2 Baud rate Communication profile	CAN interface 2.0 A/B, ISO 11898 50 Kbits/s500 Kbits/s (default setting 125 kBits/s) SAE J 1939
Serial interface Baud rate Topology Protocol	RS 232 C 9.6 Kbits/s, 19.2 Kbits/s, 28.8 Kbits/s, 57.6 Kbits/s point-to-point (max. 2 participants); master/slave connection predefined ifm protocol (INTELHEX)
Node ID (default)	hex 20 (= dec. 32)
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CR2500

Processor

Device monitoring

Program memory	
Data memory	
Data memory	

(protected in case of power failure)

Memory allocation

Status LED

Operating status (status LED)

During the start-up or reset of the controller the green and red LEDs light simultaneously. This appears orange.

lechnical data	
CMOS microcontroller 16 bits C167C, pulse frequency 20 MH	Ηz

undervoltage monitoring watchdog function check sum test for program and system

monitoring of too high a temperature 192 Kbytes flash, can be used by the user

64 Kbytes SRAM, 32 Kbytes flash, 3 Kbytes EEPROM

256 bytes

(auto save memory)

see system manual www.ifm.com \rightarrow Data sheet search \rightarrow CR2500 \rightarrow More information

two-colour LED (red/green)

LED colour	Flashing frequency	Description
-	constantly off	no supply voltage
orange	for a short time on	initialisation or reset checks
green	5 Hz	no operating system loaded
green	2.0 Hz constantly on	Run Stop
red	2.0 Hz constantly on	Run with error Fatal error or stop with error

Electrical connection

To guarantee the electrical interference protection of the controller, the housing must be connected to the ground of the vehicle!

Designation	Pin no.	Potential
supply voltage	23	1032 V DC (VBB _s)
supply voltage outputs	05	1032 V DC (VBB ₀)
ground	01	GNDs
CAN interface 1	14 / 51 32 / 50 33 / 15	CAN_H CAN_L CAN_GND
CAn interface 2	42 / 43 44 / 45 26 / 31	CAN_H CAN_L CAN_GND
RS 232 interface (programming)	07 (TxD) 06 (RxD) 13 (GND)	pin 02, PC D-Sub (9 pins) pin 03, PC D-Sub (9 pins) pin 05, PC D-Sub (9 pins)
"TEST" input programming mode operating mode	24 24	1032 V DC (VBB _s) open

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7.2 Characteristics of the inputs/outputs

CR2500	Characteristics of the inputs/outputs
Digital inputs (%IX0.0 / 0.8 / 1.0 / 1.8) can be configured as	 Digital inputs for positive switching sensor signals switch-on level 0.7 U_B switch-off level 0.4 U_B input resistance 2.86 kΩ input frequency 50 Hz NAMUR inputs; digital inputs with diagnostic capability when used with ifm NAMUR sensors, supply voltage 525 V, e.g. NT5001NN5002 input resistance 2.86 kΩ input frequency 50 Hz Diagnostic inputs (analog evaluation), digital inputs with diagnostic capability when an external resistor connection is used, corresponds to the NAMUR input input reguency 50 Hz
	■ Frequency inputs; with diagnostic capability, evaluation with integrated comparator input frequency 1 100 Hz30 kHz (IN 0) input frequency 2 100 Hz30 kHz (IN 1) input resistance 2.86 kΩ
Analog inputs (%IW6%IW9) can be configured as	Voltage inputs input voltage 010/32 V resolution 10 bit input resistance 50 kΩ input frequency 50 Hz
	$\begin{tabular}{lllllllllllllllllllllllllllllllllll$
Outputs (%QX0.0 / 0.8 / 1.0 / 1.8) can be configured as	 Semi conductor outputs, positive switching (high side), short-circuit and overload protected switching voltage 1032 V DC switching current max. 4 A; total current max. 12 A
	PWM outputs; with diagnostic capabilityPWM frequencymax. 250 HzPWM pulse ratio199 %resolutiondepending on the PWM frequencyswitching currentmax. 4 A; total current max. 12 Aintegrated pull-down resistor (4.7 kΩ) to trigger Danfoss valves
	 Current-controlled outputs; with diagnostic capability switching current o.14 A; total current max. 12 A setting resolution 1 mA control resolution 5 mA accuracy ± 2% FS
Input "TEST"	During the test mode (e.g. programming) the "TEST" connection must be connected to U_B . For the "RUN" mode the input must not be connected. input resistance 12 k Ω

7.3 Test standards and regulations

CR2500	Test standards and regulations
Humidity test	to IEC 68-2-30 \leq 90 % rel. humidity, non-condensing
Mechanical resistance	vibration to IEC 68-2-6 shock to IEC 68-2-27 bump to IEC 68-2-29
Immunity to conducted interference	to ISO 7637: 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 / 24V function state A Pulse 5a, severity level III, function state A
EC declaration of conformity	according to directive RL 2004/108/EG to EN 61000-6-2: 2005 to EN 61000-6-3: 2007
E1 marking	according to UN/ECE-R10 (immunity with 100 V/m)
Railway specification	to BN 411 002 (DIN EN 50155 part 12.2: issue 03/2008)

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7.4 Wiring



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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 (\rightarrow 7 Technical data)

The EC declaration of conformity and approvals can be found at: www.ifm.com \rightarrow Data sheet search \rightarrow CR2500 \rightarrow Approvals