ECKELMANN
Industrieautomation

E•FBM

Analog Input Modules AIM04, AIM05, AIM08

Technical Manual

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

File name: AIM0x_TB_EN_V2.4.doc

Version: 2.4

Release:

Modification protocol

Chapter	Date	Person in charge	Modification	Release Date / Initial.
All	10/15/01	E. Baun	First edition	
All	10/26/04	W. Niebling	Complete editorial revision	
2.8	03/03/05	W. Niebling	Fault corrected power supply voltage	
2.14	03/14/05	WN	Fault corrected of Life-LED in diagram	
1.4, 9	12/05	WN	New chapter standards, CE declaration deleted	
2.15; 7.2	01/06	WN	New chapter 2.15 protection, chapter 7.2 extended	
2.2.1, 4.4, 6.2	06 /07	JP	New version of AIM04	
2.12, 3	10/07	JP	Changes in analog filter specifications	
	10/2011	WN	Changes for AIM0402	

Table of contents

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

1 Introduction

Together with the technical data, this documentation includes general information and instructions regarding the intended use of the analog input modules AIM04, AIM05, AIM08 of series E•FBM.

1.1 System manual E•FBM

The system manual includes general information about the field bus modules of series E•FBM.

Moreover, this manual includes the respective instructions regarding the intended use of the field bus modules.

1.2 Intended use

The components are supplied ex works with a fixed hardware and software configuration setting suited to meet the respective field of application. Modifications shall be permitted only within the framework of the options documented in the manuals. All other modifications to the hardware and software as well as the not intended use of the components shall exclude any liability of the ECKELMANN AG.

1.3 Use of the product and documentation

The use of the product described in this manual is intended to be made exclusively by technically qualified and especially trained staff with a training in PLC programming, by skilled persons or by persons trained by skilled persons who are in addition familiar with the valid standards.

Knowledge, correct interpretation and technically perfect implementation of the included provisions and instructions are the prerequisite for a safe installation, commissioning and operation of the described components. Reference to additional documentation is made, if necessary. This documentation is to be used within the same meaning.

ECKELMANN AG shall assume no liability for misaction and damage to Eckelmann products or products of third supplies caused by the non-observance of the information included in this manual.

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

1.4 Standards and approvals

The product complies with the following directives

89/336/EEC	Electromagnetic compatibility	EMC directive
73/23/EEC	Electrical Equipment designed for use within certain voltage limits	Low voltage directive LVD

The CE-conformation declaration is available from ECKELMANN AG.

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

2 Characteristic features of the modules

2.1 General

The analog input modules AIM04, AIM05 and AIM08 make available analog current or voltage inputs.

2.2 Module variants, options

This manual is valid for the following module variants.

2.2.1 Variants of the AIM04

	Order number	**4 analog inputs, 10 bit resolution Autobaud recognition at the CAN bus**
AIM04	FBMAIM0401	With screw-type terminal connection
AIM04	FBMAIM0402	With screw-type terminal connection, changed bridge setting, 24V supply voltage only
AIM04	FBMAIM0405	With COMBICON connection plug

2.2.2 Variants of the AIM05

	Order number	**5 analog inputs, 10 bit resolution Autobaud recognition at the CAN bus**
AIM05	FBMAIM0501	With screw-type terminal connection
AIM05	FBMAIM0505	With COMBICON connection plug

2.2.3 Variants of the AIM08

	Order number	**8 analog inputs, 10 bit resolution Autobaud recognition at the CAN bus**
AIM08	FBMAIM0801	With screw-type terminal connection
	FBMAIM0805	With COMBICON connection plug

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

2.2.4 Accessories

Order number	Accessories for	
FBMSTS404	FBMAIM0405	Set of matching plugs for COMBICON connection, 4 plugs screw-type terminal (Phoenix Contact MSTB 2.5/ 4-ST KMGY, no. 1946312)
FBMSTF404	FBMAIM0405	Set of matching plugs for COMBICON connection, 4 plugs spring-force terminal (Phoenix Contact FKCT 2.5/ 4-ST KMGY, no. 1921900)
FBMSTS405	FBMAIM0505	Set of matching plugs for COMBICON connection, 5 plugs screw-type terminal (Phoenix Contact MSTB 2.5/ 4-ST KMGY, no. 1946312)
FBMSTF405	FBMAIM0505	Set of matching plugs for COMBICON connection, 5 plugs spring-force terminal (Phoenix Contact FKCT 2.5/ 4-ST KMGY, no. 1921900)
FBMSTS408	FBMAIM0805	Set of matching plugs for COMBICON connection, 8 plugs screw-type terminal (Phoenix Contact MSTB 2.5/ 4-ST KMGY, no. 1946312)
FBMSTF408	FBMAIM0805	Set of matching plugs for COMBICON connection, 8 plugs spring-force terminal (Phoenix Contact FKCT 2.5/ 4-ST KMGY, no. 1921900)
KLZCP0001	FBMAIM0405 FBMAIM0505 FBMAIM0805	Coding section (Phoenix Contact CP-MSTB, no. 1734634) for COMBICON terminal (packing unit=100) Coding element (Phoenix Contact CR-MSTB, no. 1734401) for COMBICON housing (packing unit=100)

2.3 Characteristic features of the AIM04

- Analog input module for 4 analog signals (2 or 3 conductor wiring)
- 10 bit resolution (Multiplex)
- Optionally inputs of 0 - 20 mA or 0 - 10V, signal selectable for each input by means of jumper *)
- Range 0..20mA and 4..20 mA parameterizable in the software
- Parameterizable mean value generation
- Electrical isolation between the analog inputs and the system bus
- Module address settable on the front by means of rotary switch
- 16 modules per node that can be addressed at the CAN bus
- Autobaud recognition at the CAN bus
- Integrated sensor supply 10 V DC and 24 V DC **)
- Indicator LED for life check
- Screw-type terminal connection, variant with plugable terminals available
- Width of module housing 22.5 mm

*) FBMAIM0402 not configutrable

**) FBMAIM0402 24 V DC only

The electrical characteristics of the module with COMBICON connection are the same as those of the module with screw-type terminal connection.

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

2.4 Characteristic features of the AIM05

- Analog input module for 5 analog signals (2 or 3 conductor wiring)
- 10 bit resolution (Multiplex)
- Optionally inputs of 0 - 20 mA or 0 - 10V, signal selectable for each input by means of jumper
- Range 0..20mA and 4..20 mA parameterizable in the software
- Parameterizable mean value generation
- Electrical isolation between the analog inputs and the system bus
- Module address settable on the front by means of rotary switch
- 16 modules per node that can be addressed at the CAN bus
- Autobaud recognition at the CAN bus
- Integrated sensor supply 10 V DC and 24 V DC
- Indicator LED for life check
- Screw-type terminal connection, variant with plugable terminals available
- Width of module housing 45 mm

The electrical characteristics of the module with COMBICON connection are the same as those of the module with screw-type terminal connection.

2.5 Characteristic features of the AIM08

- Analog input module for 8 analog signals (2 or 3 conductor wiring)
- 10 bit resolution (Multiplex)
- Optionally inputs of 0 - 20 mA or 0 - 10V, signal selectable for each input by means of jumper
- Range 0..20mA and 4..20 mA parameterizable in the software
- Parameterizable mean value generation
- Electrical isolation between the analog inputs and the system bus
- Module address settable on the front by means of rotary switch
- 16 modules per node that can be addressed at the CAN bus
- Autobaud recognition at the CAN bus
- Integrated sensor supply 10 V DC and 24 V DC
- Indicator LED for life check
- Screw-type terminal connection, variant with plugable terminals available
- Width of module housing 45 mm

The electrical characteristics of the module with COMBICON connection are the same as those of the module with screw-type terminal connection.

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

2.6 Additional functions

Parameterizable mean value generation

The voltage made available by the hardware is sampled with approx. 1000 Hz. The digitalized values are corrected in the controller and are added for the mean value generation. The unconditioned input values read by the ADC are corrected as follows:

Measured value = unconditioned input value x slope + offset

Suppression of minor input changes

The transmission conditions of the event-controlled transmission of an analog input can be parameterized by means of a „minimum change amount“. The transmission of the respective TxPDO is again enabled when the absolute change of the analog input has exceeded the change amount after the last transmission.

2.7 Supply voltage field level

The module does not need an external voltage supply but is supplied exclusively by the internal ME bus.

2.8 Supply voltage for sensors (10 V DC and 24 V DC)

For the inputs, the module makes available the supply voltage for the sensors (10 V DC and 24 V DC). The supply voltages are connected as follows:

Module	**Supply voltage +10V is connected to terminal**	**Supply voltage +24V is connected to terminal**
AIM04	+V1, +V2	+V3, +V4
AIM05	+V1, +V2, +V5	+V3, +V4
AIM08	+V1, +V2, +V5, +V6	+V3, +V4, +V7, +V8

2.9 Life LED indicating the operating state of the module

The life LED (“life light”) is positioned in the upper part of the module and indicates the operating state of the module. Both the single operating states of the module and the life LED are described in the chapter Start-up. The function of the life LED can be parameterized via the CAN bus by means of object 2000H.

2.10 Analog inputs

The module can make available either current or voltage inputs. The measuring range for current inputs is 0 to 20 mA, the measuring range for voltage inputs is 0 to 10 V.

The analog inputs are balanced with input values in determined reference points that are measured and stored in a non-volatile storage.

The correction values slope and offset are calculated during each initialization of the system on the basis of the setpoints and actual values of the reference points. During this calculation, it is checked whether the reference points are in the correct range.

2.11 Electrical isolation

The electrical isolation is made between the microcontroller and the ME bus.

2.12 Adapting of the hardware to the analog inputs

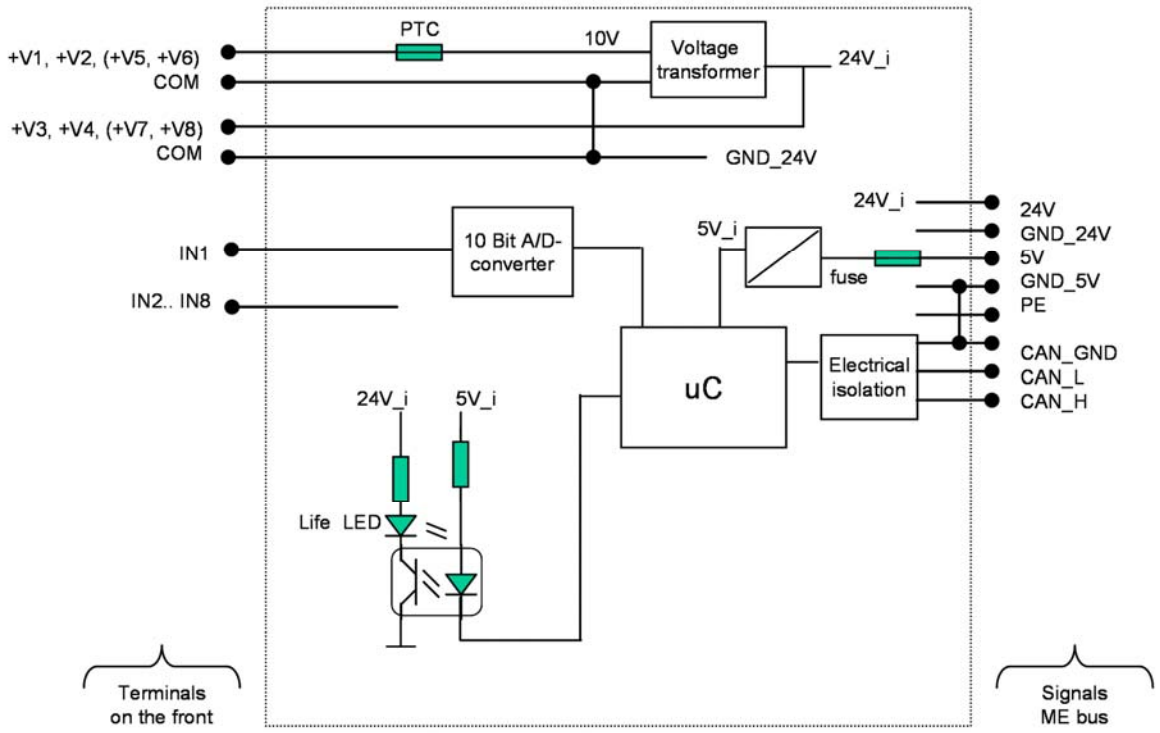
First the input voltage is carried over a protective circuit and is decoupled by operational amplifiers. Each input includes a jumper for the switch-over from voltage to current input and vice versa. Subsequently, the signals are filtered by a low pass filter with an attenuation of 20dB / octave and a cutt-off-frequency of 1,2 kHz. The decoupled and conditioned signal is then transmitted to the controller that includes an internal A/D converter with a resolution of 10 bit.

2.13 Serial EEPROM

The module is equipped with a serial EEPROM to make a non-volatile storage of the configuration parameters possible, such as balancing values, filter parameters etc. The storage of the configuration parameters is enabled by the write access to a determined CANopen object. The loading of the configuration parameters is made during each system initialization or also during the write access to the CANopen object made available for that.

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

2.14 Schematic diagram AIM04 (AIM05, AIM08)



FBMAIM0402: this module has no voltage transformer. Therefore the supply voltage 24V are output at terminal +V1, +V2, +V3, +V4.

2.15 Protection of the module

PTC resistor

The 10V outputs are protected by a PTC resistor. The PTC resistor is selected for a maximum load of a AIM08 module.

The PTC resistor has a reset time of the some seconds at 25°C und free convection. At higher temperatures and/or worser convection the time will be extended.

Fuse

The internal electronic is saved by a fuse. When the fuse has released the module will be defective and must be changed.

3 Technical data

General data	
Use: AIM04 AIM05 AIM08	Analog input module 0 to 10V, 0 to 20 mA 4 channels 5 channels 8 channels
Indication	LED indicating operating state
Module addressing	4 bit, freely selectable in the range 60h to 6Fh
Connection system	Direct screw-type terminals optionally COMBICON connector system with screw-type terminals or spring-force plugs
Weight: AIM04 AIM05 AIM08	 125 g 200 g 220 g
Installation height	min. 180mm
Dimensions (H x W x D): AIM04 AIM05 AIM08	 99 mm x 22.5 mm x 114.5 mm 99 mm x 45 mm x 114.5 mm 99 mm x 45 mm x 114.5 mm The dimensions are valid for the screw-type terminals and the COMBICON connection plugs without matching plugs

Supply	
Supply voltages Control voltage for sensor supply Logic voltage	 typ. 24V DC (18...32V DC) via ME bus typ. 5.0V DC (4.75...5.25V DC) via ME bus
Current input: AIM04 AIM05 AIM08	 max. 50 mA via 24 V system bus, max. 220 mA via 5 V system bus max. 60 mA via 24 V system bus, max. 230 mA via 5 V system bus max. 90 mA via 24 V system bus, max. 260 mA via 5 V system bus
Power loss: AIM04 AIM05 AIM08	 max. 2.8 W max. 3.1 W max. 4.1 W

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

Inputs	
Sensor supply:	
Admissible sensor types	Active and passive sensors
Sensor voltage	10V DC or 24V DC
At a sensor voltage of 10V: max. error of the supply voltage	± 1.5%
Sensor current	10 mA per input
Current input:	
Input impedance	499 Ohm
Measuring range	0 to 20 mA
Resolution	10 bit
Value of LSB	19.5 µA
Sample frequency	approx. 1000 Hz
Filter	Analog low pass 3rd order filter with a cut-off frequency of approx. 700 Hz
Max. error	± 1 %, corresponds to ± 0.2 mA
Admissible connection lines	Shielded lines
Voltage input (optional equipment):	
Input resistance	> 150 kOhm
Measuring range	0 to 10V
Max. voltage at the input	32.0 V
Resolution	10 bit
Value of LSB	9.8 mV
Inaccuracy	± 1 %, corresponds to ± 100 mV
Sample frequency	approx. 1000 Hz
Filter	analog low pass filter with an attenuation of 20dB / octave, Bessel characteristics and a cutt-off-frequency of 1,2 kHz
Admissible connection lines	Shielded lines

Fusing	
Fusing:	
Logic component	SMD fuse 500 mA slow
Electrical isolation:	
between logic component and 5V system voltage of the ME bus	500 V DC

Environment	Transportation and storage	Operation
Ambient temperature	-20°C to +70°C	0°C to +50°C In case of max. load, vertical mounting and sufficient convection
Temperature change Relative humidity (not condensing) Shock (10 ms) Vibration (10 to 100 Hz) Air pressure	max. 20 K/h 5% to 95% max. 15 G max. 2 G 660 hPa to 1060 hPa	max. 10 K/h 5% to 95% max. 5 G max. 0.5 G 860 hPa to 1060 hPa
Type of protection	IP20	

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

4 Mounting and installation

4.1 Module housing

All modules of series E•FBM have modular ME BUS housings. As a general rule, the housing is composed of a lower part and an upper part with the electronic system. For further details regarding the housing design please check the system manual.

4.2 Mounting

All modules of series E•FBM can be directly snapped on a mounting rail TS35 with a height dimension of 7.5 or 15mm as per European Standard EN 50022.

The mounting is easy and space-saving. The single modules are safely connected and positioned thanks to the 10-pole cross connection integrated in the housing bottom. Both the energy supply of the control electronics and the transmission of the bus signals are made via this cross connection.

The installation position must be vertical in order to ensure sufficient ventilation. On the top and on the bottom, a clearance of at least 80 mm should be kept for the module.

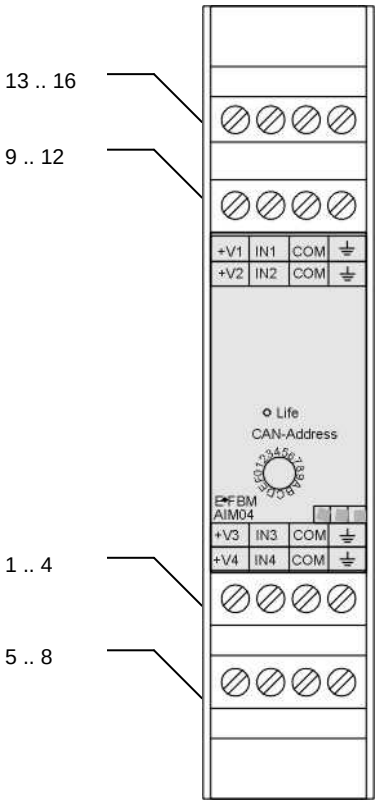
4.3 ESD protection

When handling the module, always take suited ESD protective measures, such as bracelets, conductive supports and suited packing material.

Make the following checks:

- Checking of the entire system for correct wiring
- Checking of the set CAN address
- Checking of the correct ME bus contacting
- Checking of the correct grounding

4.4 Terminal markings AIM04

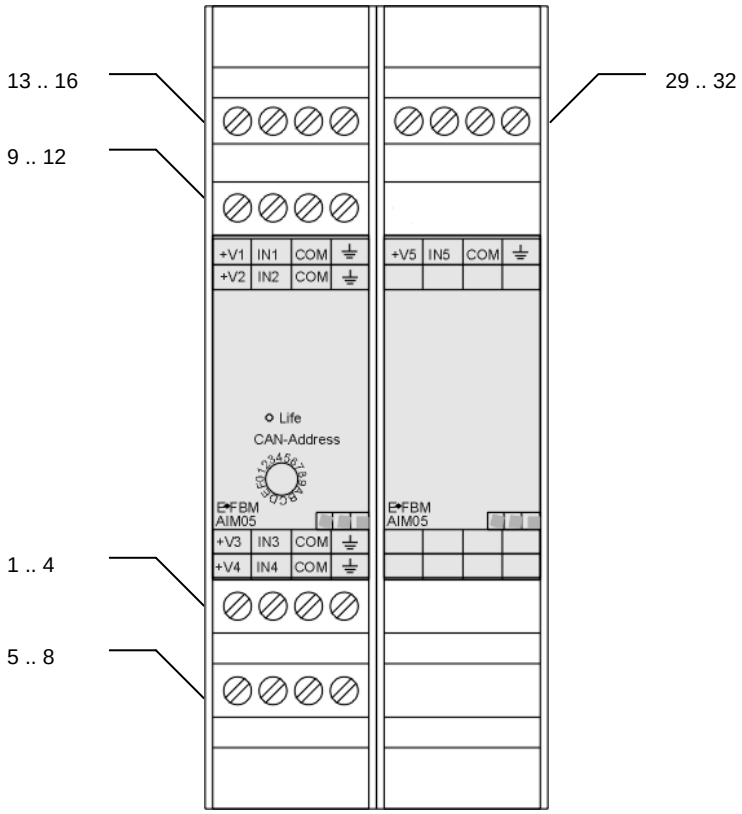


Terminal	Marking	Signal	Comment
14, 10, 2, 6	IN1.. IN4	4 analog inputs 0..10V or 0..20 mA	
13, 9	+V1, +V2	Sensor supply 10V	Terminals internally bridged
1, 5	+V3, +V4	Sensor supply 24V	Terminals internally bridged
15, 11, 3, 7	COM	Reference potential sensor	Terminals internally bridged
16, 12, 4, 8	⏚	Shield	Terminals internally bridged

FBMAIM0402 only (see chapter 6.2.1)

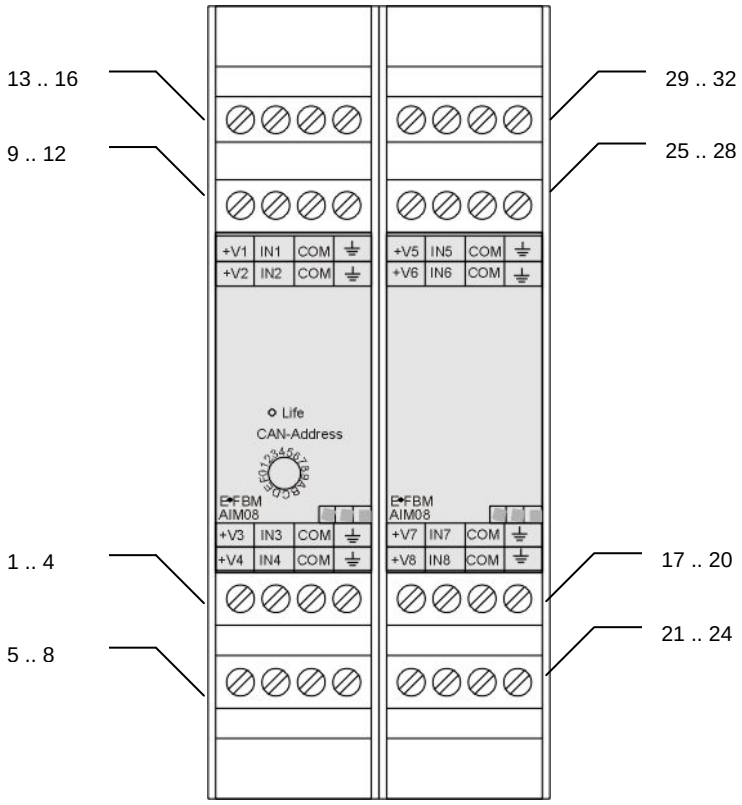
Terminal	Marking	Signal	Comment
14	IN1	analog input 0..20 mA	
10, 2, 6	In2.. IN4	analog inputs 0..10 V	
1, 5, 9, 13	+V1, +V2, +V3, +V4	Sensor supply 24 V	Terminals internally bridged
15, 11, 3, 7	COM	Reference potential sensor	Terminals internally bridged
16, 12, 4, 8	⏚	Shield	Terminals internally bridged

4.5 Terminal markings AIM05



Terminal	Marking	Signal	Comment
14, 10, 2, 6, 30	IN1.. IN5	5 analog inputs 0..10V or 0..20 mA	
13, 9, 29	+V1, +V2, +V5	Sensor supply 10V	Terminals internally bridged
1, 5	+V3, +V4	Sensor supply 24V	Terminals internally bridged
15, 11, 3, 7, 31	COM	Reference potential sensor	Terminals internally bridged
16, 12, 4, 8, 32	⏚	Shield	Terminals internally bridged

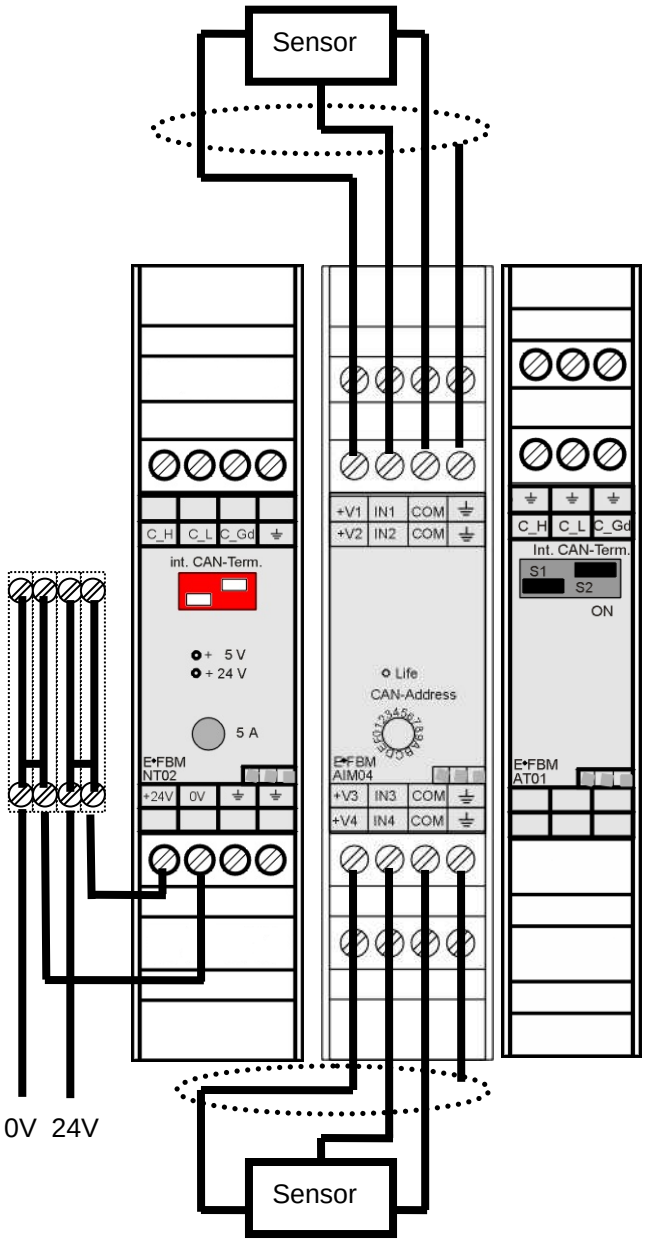
4.6 Terminal markings AIM08



Terminal	Marking	Signal	Comment
14, 10, 2, 6, 30, 26, 18, 22	IN1.. IN8	8 analog inputs 0..10V or 0..20 mA	
13, 9, 29, 25	+V1, +V2, +V5, +V6	Sensor supply 10V	Terminals internally bridged
1, 5, 17, 21	+V3, +V4, +V7, +V8	Sensor supply 24V	Terminals internally bridged
15, 11, 3, 7, 31, 27, 19, 23	COM	Reference potential sensor	Terminals internally bridged
16, 12, 4, 8, 32, 28, 20, 24	⏚	Shield	Terminals internally bridged

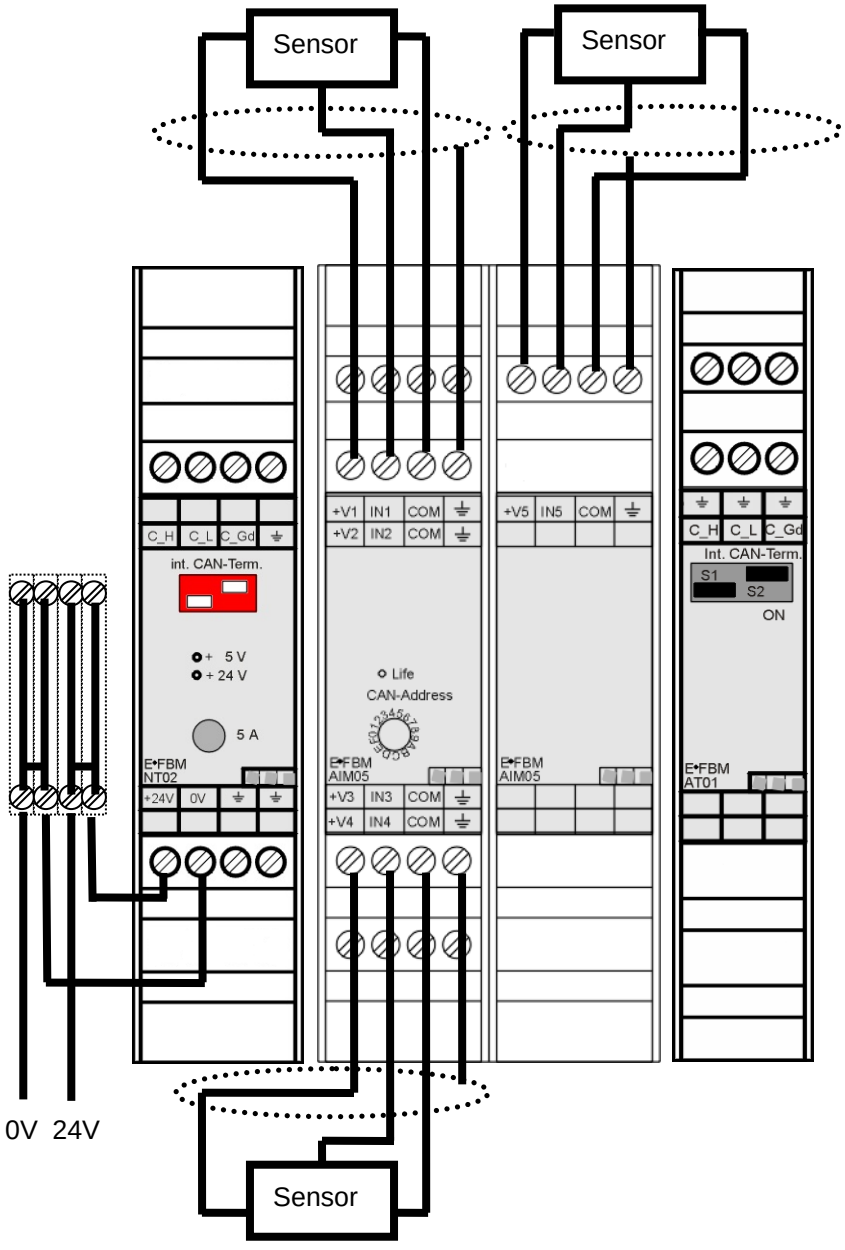
4.7 Example of connection AIM04

The voltage output V2 supplies a 10V sensor, the voltage output V3 supplies a 24V sensor. The sensors are connected at the second and the third analog input with shielded lines.



4.8 Example of connection AIM05

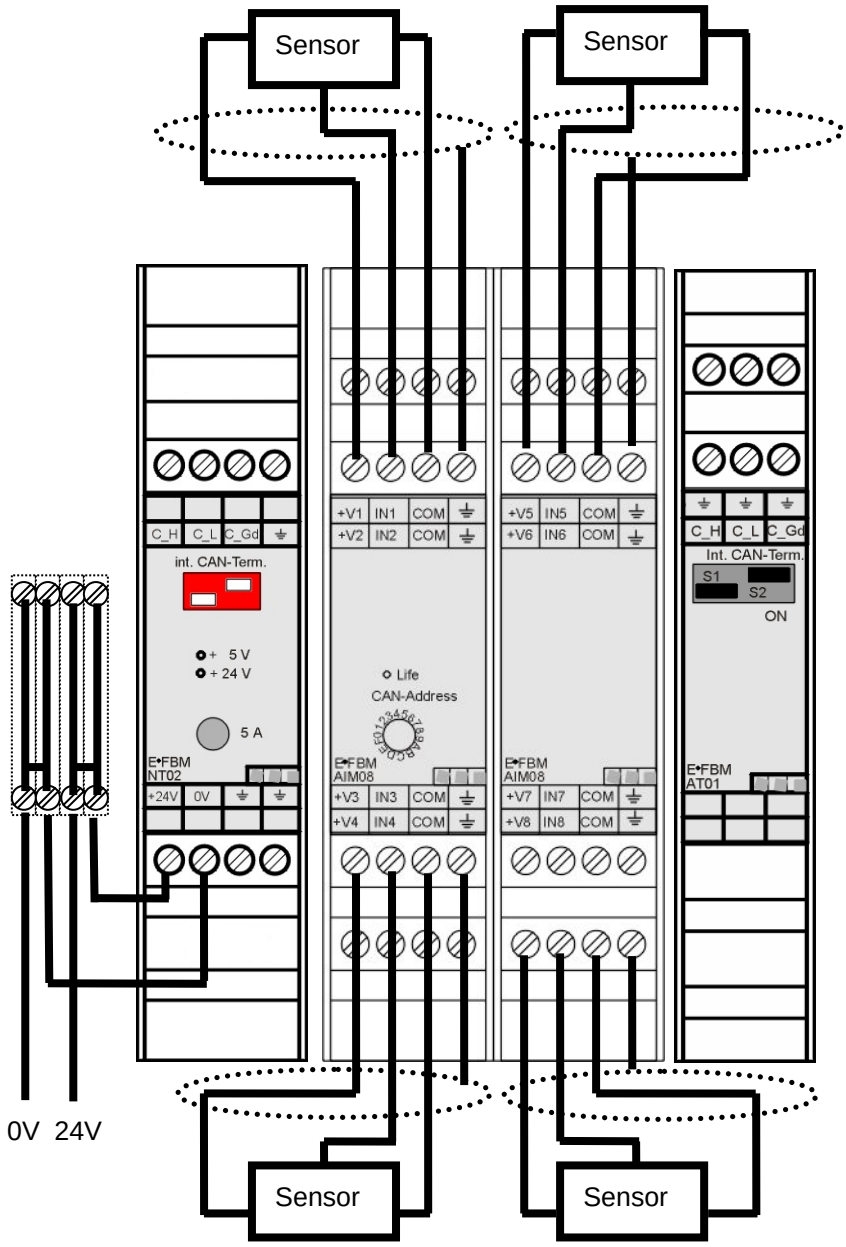
The voltage output V2, V5 supplies a 10V sensor, the voltage output V3 supplies a 24V sensor. The sensors are connected at the second, third and fifth analog input with shielded lines.



Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

4.9 Example of connection AIM08

The voltage output V2, V6 supplies a 10V sensor, the voltage output V3 and V8 supplies a 24V sensor. The sensors are connected at the second, third, sixth and eighth analog input with shielded lines.



5 Start-up

The start-up of the module can be made after the mechanical and the electrical installation of the field bus modules.

Supply voltage on: As soon as the supply voltage has been switched on, the module is in the state of automatic baud rate recognition. The life LED in the upper part of the module is flashing at 8 Hz. Upon recognition of the baud rate, an internal initialization of the module is made. Subsequently, the module is in the internal state „*Pre-operational*“. The module is now ready for operation and attends control signals via the CAN bus. The life LED is flashing at 0.25 Hz.

Initialization of the module: Upon successful initialization of the module via the CAN bus (e.g. by a controller) with the signal „Start-remote-node“, the module is in state „*Operational*“. The life LED is on (permanently).

All inputs are to be controlled and the specified voltage and current values are to be checked.

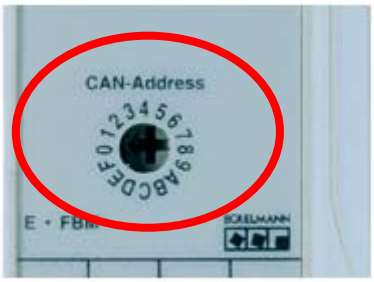
Module stopped: If the signal „Stop-remote-node“ is sent via the CAN bus, the module passes to the state „*Stopped*“. The module attends the respective signal to leave this state. In this state, the life LED is permanently off.

The life LED mode can be modified via the CAN bus (see chapter Parameterizing). Therefore, the statements made for the life LED are only valid for the default setting.

6 Programming and parameterizing

6.1 Setting of the node address

Each E•FBM module of a line is to be set with an unambiguous node address at the CAN bus.

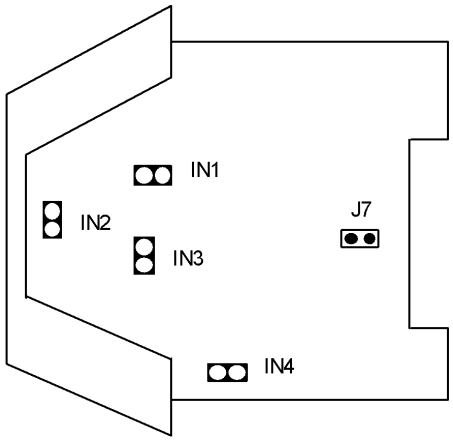


The setting of the node address is made via a hexagonal switch on the front (4 low-value address bits) and via hard-wired bridges inside the housing (3 higher-value address bits). Therefore, max. 16 modules are possible within one module type.

Module type	Higher-value address bits hard-wired	Low-value address bits, settable on the front via the hexagon switch	Set node address (hex)	Set node address (decimal)
AIMxx	60H	0…FH	60H…6FH	96..111

When setting the node address, make sure that no double assigning of modules to the same node address at the CAN bus occurs, i.e. several modules of the above table at the same CAN bus need to have differently set hexagon switches.

6.2 AIM04 bridges for the switch-over from current input to voltage input



For each input IN1 .. IN4, the respective input can be selected separately as voltage or current input via a bridge.

For the bridges IN1 .. IN4 the following is valid:

Bridges IN1 .. IN4	Corresponds to input 1..4 is a	Default setting
Open	Voltage input 0..10V	✓
Closed	Current input 0..20 mA or 4..20 mA	---

The additional bridge J7 is provided for an optional termination of the CAN bus. With closed bridge, a resistance of 120 Ohm is added on the ME bus between the lines CAN_L and CAN_H. In normal operation, the bridge must not be closed.

6.2.1 FBMAIM0402

For the FBMAIM0402 the following setting is valid

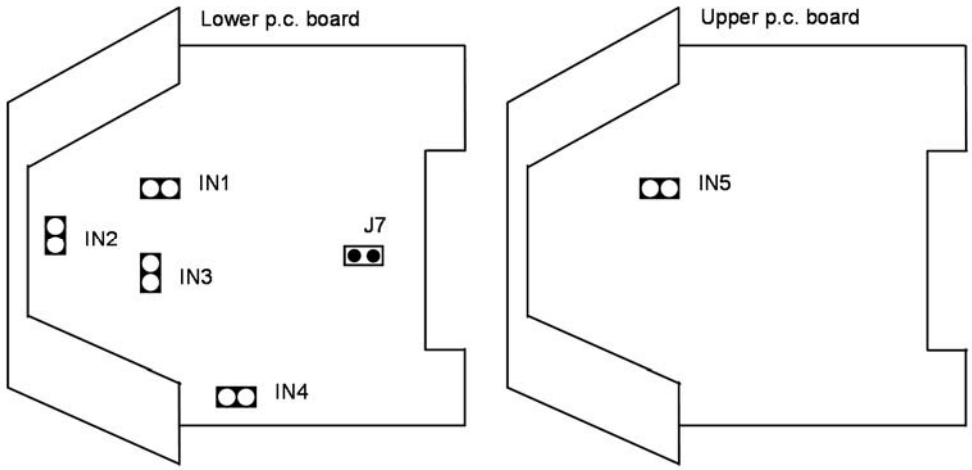
Input	Bridge		Corresponds to input is a
1	IN1	Closed	Current input 0..20 mA or 4..20 mA
2	IN2	Open	Voltage input 0..10V
3	IN3	Open	Voltage input 0..10V
4	IN4	Open	Voltage input 0..10V

6.3 AIM05 bridges for the switch-over from current input to voltage input

For each input IN1 .. IN5, the respective input can be selected separately as voltage or current input via a bridge.

For the bridges IN1 .. IN5 the following is valid:

Bridges IN1 .. IN5	Corresponds to input 1..5 is a	Default setting
Open	Voltage input 0..10V	✓
Closed	Current input 0..20 mA or 4..20 mA	---



In the module, the lower and the upper p.c. board are connected electrically and mechanically by means of a dual in-line connector. The two p.c. boards can be separated from each other by drawing them carefully. After a checking or setting of the bridges, the two p.c. boards are reconnected via the dual in-line connector.

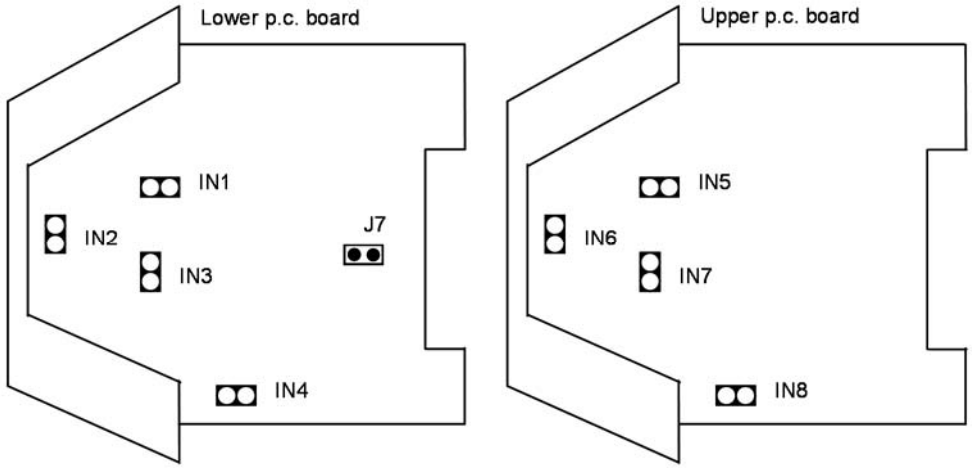
The additional bridge J7 is provided for an optional termination of the CAN bus. With closed bridge, a resistance of 120 Ohm is added on the ME bus between the lines CAN_L and CAN_H. In normal operation, the bridge must not be closed.

6.4 AIM08 bridges for the switch-over from current input to voltage input

For each input IN1 .. IN8, the respective input can be selected separately as voltage or current input via a bridge.

For the bridges IN1 .. IN8 the following is valid:

Bridges IN1 .. IN8	Corresponds to input 1..8 is a	Default setting
Open	Voltage input 0..10V	✓
Closed	Current input 0..20 mA or 4..20 mA	---

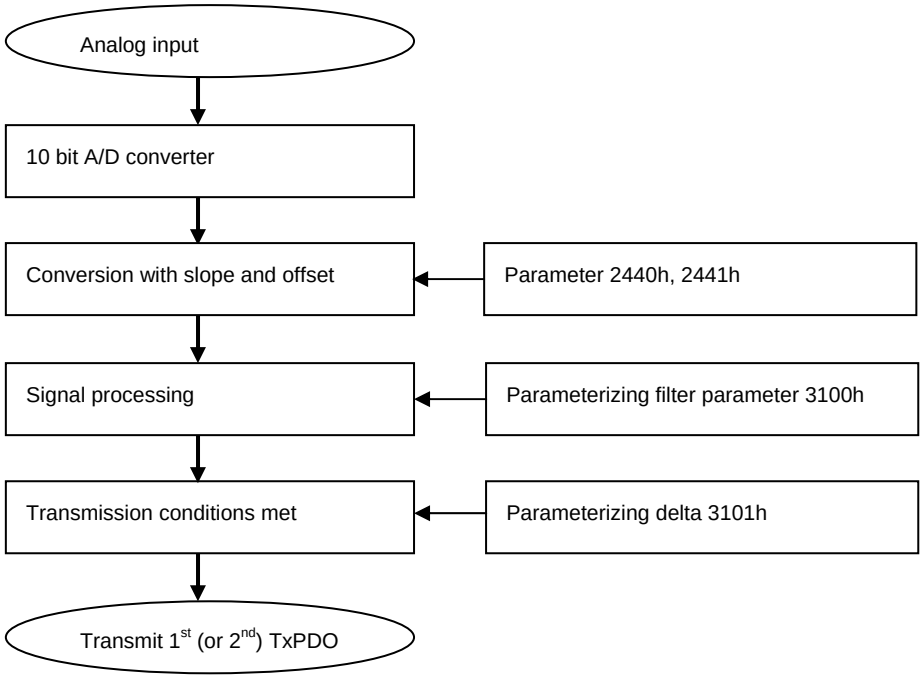


In the module, the lower and the upper p.c. board are connected electrically and mechanically by means of a dual in-line connector. The two p.c. boards can be separated from each other by drawing them carefully. After a checking or setting of the bridges, the two p.c. boards are reconnected via the dual in-line connector.

The additional bridge J7 is provided for an optional termination of the CAN bus. With closed bridge, a resistance of 120 Ohm is added on the ME bus between the lines CAN_L and CAN_H. In normal operation, the bridge must not be closed.

6.5 Signal and data flow

The configuration parameters and the data flow are displayed in the following diagram.



6.6 Parameterizing

After power-on and the subsequent internal initialization it is possible to parameterize the following objects by means of SDO transfer:

Communication profile area:

Parameter	Object (hex)	Sub-index	Type	Admissible input	Preset value
Guard time (ms)	100C	0	unsigned 16	0 .. 65535	0
Life time factor	100D	0	unsigned 8	0 .. 255	0
Heartbeat time (ms)	1017	0	unsigned 16	0 .. 65535	0
Inhibit time for 1. TxPDO (0.1 ms)	1800	3	unsigned 16	0 .. 2550	0

Standardized device profile area:

Parameter	Object (hex)	Sub-index	Type	Admissible input	Preset value
Switch-over of measuring range	6420	1..8	See the following chapter		
NMT behavior of the module in case of severe communication errors	67FE	1	unsigned 8	0: pre-operational 1: not modified 2: stopped	0

Manufacturer-specific profile area:

Parameter	Object (hex)	Sub-index	Type	Admissible input	Preset value
Mode of life LED	2000	1	See the following chapter		
Balancing of inputs: calculated correction slope of the analog input	2440	1..8	See the following chapter Balancing of inputs		
Balancing of inputs: calculated correction offset of the analog input	2441	1..8			
Balancing, minimum value of the input	3000	1..8			
Balancing, maximum value of the input	3010	1..8			
Mean value generation number, type	3100	1, 2	See the following chapter		
Minimum modification amount Delta	3101	1..8	See the following chapter		

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

6.6.1 Switch-over of measuring range

The measuring range to be used is set in object 6420h. This range is to correspond with the bridge circuit of the hardware.

Meaning	Object (hex)	Sub-index	Type	Admissible input	Preset value
Switch-over of measuring range	6420	1..8	unsigned 16	*See description*	1

Contents object 6420h Sub-index 1..8	Corresponds to setting of measuring range	Note
0001	0..10V	
0020	0..20 mA	
0040	4..20 mA	The measuring range differs from the range 0..20 mA by the fact that an error message is issued for the input flows in the range 0..3.999 mA

6.6.2 Mode of life LED

The operating states of the FBM are visually indicated by means of the life LED. The function of the life LED can be parameterized via the CAN bus by means of object 2000h.

Meaning	Object (hex)	Sub-index	Type	Admissible input	Preset value
Mode of the life LED	2000	1	unsigned 8	0, 1	0

Two possible indication patterns of operating states can be parameterized by means of object 2000h for FBM states.

	(Index 2000h, sub-index1) = 0	(Index 2000h , sub-index1) = 1
FBM state after voltage on (automatic baud rate recognition)	Flashing at 8 Hz, 1:1	
FBM state „Pre-operational“	Flashing at 0.25 Hz, 1:1	Flashing at 0.25 Hz, 1:1
FBM state „Operational“	„permanently on“	Flashing at 1 Hz, 1:1
FBM state „Stopped“	„permanently off“	Flashing at 0.25 Hz, 7:1 1 („long-time on“ and „short-time off“)

6.6.3 Mean value generation

Measured values can be smoothed by a mean value generation. The function requires the following parameters:

Meaning	Object (hex)	Sub-index	Type	Admissible input	Preset value
Mean value generation number	3100	1	unsigned 8	3..64	5
Mean value generation filter type		2	unsigned 8	0..4	1

Object 3100h defines the following filter parameters for all analog inputs for a non-floating mean value generation.

Sub-ID 1: Number of summations for mean value generation

Sub-ID 2: Type of filter

Contents Object 3100h, Sub-ID 2	Meaning
0	No mean value generation
1	Mean value generation via the number of summations
2	Mean value generation without maximum and minimum value, the two extreme values are cancelled and the mean value generation is made with the remaining values
3	Minimum value monitoring, the minimum value during mean value generation is stored
4	Maximum value monitoring, the maximum value during mean value generation is stored

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

6.6.4 Suppression of minor input modifications

Minor input modifications can be suppressed via a settable minimum value. The function requires the following parameters:

Meaning	Object (hex)	Sub-index	Type	Admissible input	Preset value
Minimum modification amount Delta	3101	1..8	unsigned 8	??	64

Object 3101h „Delta“ defines the transmission conditions of the event-controlled transmission of an analog input as „minimum modification amount“. The transmission of the respective TxPDO is again enabled if the absolute modification of the analog input has exceeded the modification amount since the last transmission.

The Delta value is referred to a 16 bit value (32767). A bit in object corresponds to a value of the maximum range (10V or 20mA) divided by 32767.

The table includes some examples for the parameterizing of Delta.

Entry in object 3101, Sub-ID 1..8 (hexadecimal)	Corresponds to the minimum required input modification for the range 0...10V of	Corresponds to the minimum required input modification for the range 0...20mA of
0020	9.8 mV	19.5 µA
0040 (default value)	19.5 mV	39.1 µA
00E0	68.4 mV	136.7 µA

6.7 Balancing of the inputs

By means of a balancing procedure, the inputs can be adapted in their characteristic curve. Balancing is made to compensate internal inaccuracies of the analog part of the input (operational amplifier etc.).

Prior to the supply, this function is carried out in the in-company system test. Normally, the user does not need to carry out this function again.

The function requires the following parameters:

Meaning	Object (hex)	Sub-index	Type	Admissible input	Preset value
Minimum value of the input 1..8	3000	1..8	unsigned 16	*See description*	
Maximum value of the input 1..8	3010	1..8	unsigned 16	*See description*	

During balancing, the input values are measured in the following two reference points and are stored. The admissible ranges for the min./max. values are shown in the table.

	Setpoint applied to the input	Admissible range at the output of the 10 bit A/D converter for the balancing	Balancing is made during overwriting of the object
Minimum value for 0..10V	0 mV	0...205 mV	3000
Maximum value for 0..10V	10 000 mV	9189...9589 mV	3010
Minimum value for 0..20mA	0 mA	0...0.41mA	3000
Minimum value for 4..20mA	4 mA	3.59..4.00 mA	3000
Maximum value for 0..20mA and 4..20mA	20 mA	18.380...19.180 mA	3010

The measuring is made during the overwriting of the objects with an optional value. The measured values can be checked at any time by means of read access.

Prior to the calculation, it is checked whether the reference points are in the admissible range. In case of error, an error message is sent to the superordinate controller.

Please check the system manual for further information about the emergency messages.

6.7.1 Calculation of slope and offset (range 0..10V, 0..20mA)

The correction values of slope (object 2440h) and offset (object 2441h) are calculated during each initialization of the system or during a balancing procedure on the basis of the reference points stored in object 3000h and 3010h. In case of error, an error message is sent to the superordinate controller.

After a conversion, the slope is stored as real number of a channel n on the basis of the following formula:

(Object 2440h, sub-index n) = 65536 * (setpoint_max - setpoint_min) /

[(Object 3010h, sub-index n) - (object 3000h, sub-index n)]

with the parameters in compliance with object 6420h.

Object 6420 (hexadecimal)	Corresponds to range	Setpoint_min used in the formula	Setpoint_max used in the formula
0001	0..10V	0	32767
0020	0..20 mA	0	32767
0040	4..20mA	6553	32767

The offset is stored as real number in a 16 bit value for a channel n on the basis of the following formula:

(Object 2441h, sub-index n) = setpoint_min -

(Object 3000h, sub-index n) * (setpoint_max - setpoint_min) /

[(Object 3010h, sub-index n) - (object 3000h, sub-index n)]

Balancing is completed with the storing of the parameters in the non-volatile storage.

6.7.1.1 Balancing state

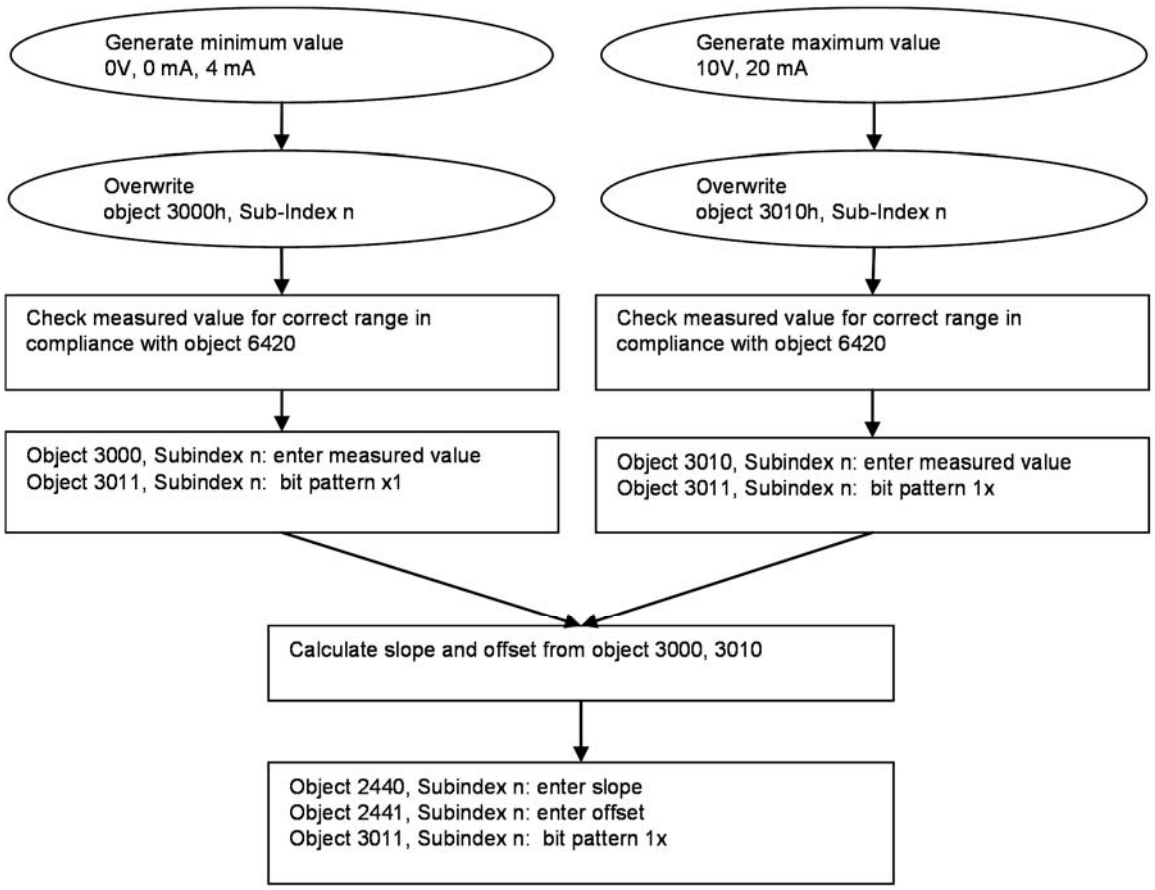
After a measurement, the bit pattern is entered in object 3011h.

On the basis of object 3011h, the balancing state can be checked. The state is codes with a bit mask.

Bit 0 (LSB): 1 = display of the faultless measurement of the minimum values

Bit 1: 1 = display of the faultless measurement of the maximum values

Balancing has been successful if both bits are set. The correction values (slope and offset) are calculated after the measurement of the 2nd reference point (object 3011h, sub-index n = 11).



6.7.2 Correction of the measured values with slope and offset

The signals applied to the other inputs are corrected as follows for a channel n:

Measured value (object 6401h, sub-index n) =

Unconditioned input value* slope (object 2440h, sub-index n) +

Offset (object 2441h, sub-index n)

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

6.8 Storing of parameters in the non-volatile storage

The described parameters are stored in the RAM and during initialization of the module they are automatically overwritten by the previously stored parameters of the non-volatile storage. The following two objects make the storing and loading of parameters in the non-volatile storage possible.

6.8.1 Store Parameter (object 1010)

The object Store Parameter (object 1010) makes the parameter storage in the non-volatile storage possible.

Parameter	Object (hex)	Sub-index	Type	Admissible input	Preset value
Store Parameter of the standardized and the manufacturer-specific profile area	1010	3	Unsigned 32	Read: 65766173h Write: 00000001	00000001

The storing of the parameters of the standardized and the manufacturer-specific profile area is enabled by the writing of a determined value on the corresponding sub-index 3 of the object. The parameters of the additional functions of the manufacturer-specific profile area are not stored.

An emergency message is transmitted to the superordinate controller in case of an error, i.e. the unsuccessful writing.

Please check the system manual for further information about the emergency messages.

6.8.2 Restore parameter (object 1011h)

The object Restore Parameter makes the loading of the parameters into the RAM possible from the non-volatile storage.

Parameter	Object (hex)	Sub-index	Type	Admissible input	Preset value
Restore parameter of the standardized and manufacturer-specific profile area	1011	3	Unsigned 32	Write: 64616F6Ch Read: 00000001	00000001

The loading of the parameters of the standardized and of the manufacturer-specific profile is enabled by the writing of a determined value to the sub-index 3 of the object.

Upon successful loading of the parameters, the module sends a „Bootup message“.

In the case of error, i.e. the unsuccessful loading, an emergency message is sent to the superordinate controller.

Please check the system manual for further information about the emergency messages.

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

6.9 PDO mapping

6.9.1 Mapped objects

The term PDO mapping stands for „Mapping of application objects in PDOs“. In objects TxPDO (1A00h-1A01h), this mapping of the objects is established for the transmission PDO TxPDO 1...2. This mapping is defined in the module and cannot be modified.

AIM04: Inputs 1..4 are transmitted with 2 bytes each (objects: 6401h, sub-ID 1...4) in the 1st transmission PDO.

AIM05: Inputs 1..4 are transmitted with 2 bytes each (objects: 6401h, sub-ID 1 ... 4) in the 1st transmission PDO. Input 5 is transmitted with 2 bytes (object: 6401h, sub-ID 5) in the 2nd transmission PDO.

AIM08: Inputs 1..4 are transmitted with 2 bytes each (objects: 6401h, sub-ID 1 ... 4) in the 1st transmission PDO. Inputs 5..8 are transmitted with 2 bytes each (object: 6401h, sub-ID 5 ... 8) in the 2nd transmission PDO.

Object	Byte	Mapped object	Parameter
1. TxPDO	0, 1	6401h, sub-ID 1	Input 1
	2, 3	6401h, sub-ID 2	Input 2
	4, 5	6401h, sub-ID 3	Input 3
	6, 7	6401h, sub-ID 4	Input 4
2. TxPDO	0, 1	6401h, sub-ID 5	Input 5 (AIM05, AIM08 only)
	2, 3	6401h, sub-ID 6	Input 6 (AIM08 only)
	4, 5	6401h, sub-ID 7	Input 7 (AIM08 only)
	6, 7	6401h, sub-ID 8	Input 8 (AIM08 only)

6.9.2 Data format of the analog inputs

The analog inputs are included in object 6401h. The input value read via the 10 bit A/D converter is stored with its value in a 16 bit word by multiplying its input value by 32 and by correcting the input value with the values of slope and offset of the parameters 2440h and 2441h with the respective sub-indices.

Input [mV]	Input [mA]	Output A/D converter [hex]	Contents object 6401 [decimal]
0.0000 V	0.000 mA	0000	0
0.0098 V	0.019 mA	0001	32
2.5000 V	5.000 mA	00FF	8160
5.0000 V	10.00 mA	01FF	16352
10.000 V	20.00 mA	03FF	32736

7 Maintenance and repair

General maintenance instructions are given in the system manual.

7.1 Replacement of the module

In case of a defect, the module electronics are replaced completely. Remove all connected lines and switch off the voltage.

Prior to be removed, the respective module is to be separated from modules probably plugged on the left and on the right, since the single modules are connected with the internal ME bus via a connector.

Subsequently remove the respective module from the rail by means of a suited tool, after using a lever at the bracket on bottom side of the module.

For further information please check the system manual.

7.2 Maintenance in case of an error

Problem	Possible cause	Action
Module does not operate	Contacting of the ME bus is not correct	Check the module
	24V current supply at the power unit is missing	Check the 24V supply
	Internal module error	Replace the module
Life LED is off	Life LED is programmed differently	Check the parameterizing
Current or voltage is not recognized correctly	Incorrect parameterizing	Check parameterizing and balancing
	Incorrect bridge circuit	Check bridge circuit
	Incorrect sensor supply, the module has pin-dependent supply voltages	Measure supply voltage of sensor, reconnect the sensor, if necessary
Short input signal is not recognized	Mean value generation active	Check parameterizing
10V at voltage outputs missing	PTC resistor has released	Check for external short circuit, wait the reset time of the PTC resistor

8 Technical annex: parameterizing via the CAN-Bus

8.1 CANopen

The description of the implemented structures and functions of the CANopen, such as the mapping of the process data objects (PDO), the service data objects (SDO), the network management (NMT) as well as of the emergency messages is made in the system manual

8.2 Emergency messages

Internal errors are written in a predefined error field and can be read in the object dictionary (index 1003H). The error field includes the single errors stated in a device, described in the form of error codes, as well as a device-specific additional information in the timely order of their occurring.

The presence of a device error and its type is displayed in a register that can be read by means of the object dictionary 1001H.

The transmission of the device-internal emergency objects is made by means of standardized high-priority messages.

An emergency message is sent once, at the occurring and after the elimination of the error.

Please check the system manual for further information about the error messages.

8.3 Configuration

The function and the configuration parameters are indicated as far as possible in the CANopen object dictionary of the device. The object dictionary is composed of 3 areas:

- Communication profile area as per CiA DS 301
- Standardized device profile area as per CiA DS 401
- Manufacturer-specific profile area

8.4 AIM04

8.4.1 Communication profile area (parameters corresponding to CiA DS 301)

The following table includes all general parameters that belong to the communication profile area of the CANopen object dictionary (CiA DS 301).

Index (hex)	Sub-index	Name	Type	Attr.	Meaning	Contents (hex)	De-fault (hex)
1000	0	Device type	Unsigned 32	R	Device type	00040191	
1001	0	Error register	Unsigned 8	R	Error register, bit-coded		00
1003		Error field					
	0	Number	Unsigned 8	RW	Number of errors occurred 0...16	0..10	00
	1	1. Error field	Unsigned 32	R	Error code + Manuf.specific error field		
	2	2. Error field	Unsigned 32	R	Error code + Manuf.specific error field		
	…	…					
	16	16. Error field	Unsigned 32	R	Error code + Manuf.specific error field		
1004		Number of PDOs			Number of PDO		
	0	Number	Unsigned 32	R	Total	00000001	
	1	Synchronous PDO	Unsigned 32	R	Synchronous PDO	00000000	
	2	Asynchronous PDO	Unsigned 32	R	Asynchronous PDO	00000001	
1008	0	Device name	Vis-String	R	Device name	"EST FBM-AIM04 "	
1009	0	Hardware version	Vis-String	R	Version HW	"Vxxh IDxx "	
100A	0	Software version	Vis-String	R	Version SW	"V1.05 "	
100B	0	Node-Id	Unsigned 32	R	CAN address	00000050	
100C	0	Guard time	Unsigned 16	RW	NMT guard time (ms) 0..65535	0000..FFFF	0000
100D	0	Life time factor	Unsigned 8	RW	NMT life time 0..255	00..FF	00
100E	0	Node guarding Id	Unsigned 32	R	CobId Nodeguard	00000700 + Node-Id	
1010		Store parameter			Storing of the configuration parameters in the non-volatile storage		
	0	Number	Unsigned 8	R	Number of elements	03	
	1	All parameters	Unsigned 32	R	Not implemented	00000000	
	2	Communication parameters	Unsigned 32	R	Not implemented	00000000	

	3	Application parameters	Unsigned 32	RW	Write: 65766173 (hex) Read: 1	00000001	
1011		Restore parameter			Loading of the configuration parameters from the non-volatile storage		
	0	Number	Unsigned 8	R	Number of elements	03	
	1	All parameters	Unsigned 32	R	Not implemented	00000000	
	2	Communication parameters	Unsigned 32	R	Not implemented	00000000	
	3	Application parameters	Unsigned 32	RW	Write: 64616F6C (hex) Read: 1	00000001	
1012	0	Time stamp Id	Unsigned 32	R	CobId Timestamp	80000100	
1014	0	Emergency Id	Unsigned 32	R	CobId Emergency	40000080 + Node-Id	
1017	0	Heartbeat time	Unsigned 16	RW	Heartbeat cycle time (ms) 0..65535	0000..FFFF	0000
1200		SDO parameters			SDO parameters		
	0	Number	Unsigned 8	R	Number of elements	02	
	1	Client->Server Id	Unsigned 32	R	CobId ReciveSDO	00000600+Node-Id	
	2	Server->Client Id	Unsigned 32	R	CobId TransmitSDO	00000580+Node-Id	
1800		1.TxPDO			Communication parameters 1.TxPDO		
	0	Number	Unsigned 8	R	Number of elements	04	
	1	ID Used By PDO	Unsigned 32	R	CobId 1.TxPDO	00000180+Node-Id	
	2	Transmission type	Unsigned 8	R		FF	
	3	Inhibit time	Unsigned 16	RW	Time in 0.1 ms (0..2550)	0000…09F6	0000
	4	CMSPriorityGroup	Unsigned 8	R		03	
1A00		TxPDO Mapping			Mapping parameters 1.TxPDO		
	0	Number	Unsigned 8	R	Number of elements	04	
	1	1. mapped object	Unsigned 32	R	Index+SubID+Size	60000108	
	2	2. mapped object	Unsigned 32	R	Index+SubID+Size	64010210	
	3	3. mapped object	Unsigned 32	R	Index+SubID+Size	64010310	
	4	4. mapped object	Unsigned 32	R	Index+SubID+Size	64010410	
1A01		2.TxPDOMapping			Mapping parameters 2.TxPDO		
	0	Number	Unsigned 8	R	Number of elements	0	

8.4.2 Standardized device profile area (parameters corresponding to CiA DS 401)

The table is a summary of the parameters that are part of the standardized device profile area of the CANopen object dictionary (CiA DS 401) and that describe the device function of the module.

The data formats, the admissible value areas as well as the default values of the objects are explained in detail in the next chapter.

Index (hex)	Sub-index	Name	Type	Attr.	Meaning	Contents (hex)	Default (hex)
6401		Analog inputs					
	0	Number	Unsigned 8	R	Number of elements	04	
	1	1. input	Integer 16	R	1. input 0..32767		0
	..	..					
	4	4. input	Integer 16	R	4. input 0..32767		0
6420		Analog Input range			Measuring range		
	0	Number	Unsigned 8	R	Number of elements	04	
	1	1. input	Unsigned 16	RW	0001: 0...10 V 0020: 0..20 mA 0040: 4..20 mA		0001
	..	..					
	4	4. input	Unsigned 16	RW	as 1. input		0001
67FE		Error behavior			NMT error behavior in case of communication errors		
	0	Number	Unsigned 8	R	Number of elements	01	
	1	NMT state in case of communication errors	Unsigned 8	RW	00: Pre-operational 01: Not modified 02: Stopped		00

8.4.3 Manufacturer-specific profile area

In the table, the additional parameters are summarized that describe the manufacturer-specific device functions and that are not mentioned in the standardized device profile area of the CANopen object dictionary.

The data formats, admissible value areas as well as default values of the objects are explained in detail in the next chapter.

Index (hex)	Sub-index	Name	Type	Attr.	Meaning	Contents (hex)	Default (hex)
2000		Life LED			Life LED		
	0	Number	Life-LED	R	Number of elements	01	
	1	Life LED	Life-LED	RW	00 or 01		00

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

2440		Slope			Calculated slope correction		
	0	Number	Unsigned 8	R	Number of elements	04	
	1	1. input	Unsigned 32	R	16 bit in front of decimal point and 16 bit after the decimal point		
	2	2. input	Unsigned 32	R	as 1. input		
	3	3. input	Unsigned 32	R	as 1. input		
	4	4. input	Unsigned 32	R	as 1. input		
2441		Offset			Calculated offset correction		
	0	Number	Unsigned 8	R	Number of elements	04	
	1	1. input	Integer 16	R	In LSB of ADC		
	..	..					
	4	4. input	Integer 16	R	as 1. input		
3000		Minimum values			Balancing reference point min. values		
	0	Number	Unsigned 8	R	Number of elements	04	
	1	1. input	Unsigned 16	RW	Left-aligned	0000	
	..	..					
	4	4. input	Unsigned 16	RW	as 1. Input	0000	
3010		Maximum values			Balancing reference point max. values		
	0	Number	Unsigned 8	R	Number of elements	05	
	1	1. input	Unsigned 16	RW	Left-aligned	0000	
	..	..					
	4	4. input	Unsigned 16	RW	as 1. input	0000	
3011		Balancing state			Balancing state		
	0	Number	Unsigned 8	R	Number of elements	04	
	1	1. input	Unsigned 8	RW	Bit mask balancing made 00: No measurement x1: Measurement min. value 1x: Measurement max. value 11: Balancing made		00
	..	..					
	4	4. input	Unsigned 8	RW	as 1. input		00
3100		Filter parameters			Filter parameters		
	1	Number	Unsigned 8	RW	Mean value generation versus number	3..40	05
	2	Filter types	Unsigned 8	RW	Filter types	0..4	01
3101		Delta			Transmission condition min modification amount		
	0	Number	Unsigned 8	R	Number of elements	04	
	1	1. input	Unsigned 16	RW	Left-aligned	0..FFFF	0040
	..	..					
	4	4. input	Unsigned 16	RW	as 1. input		0040

8.5 AIM05

8.5.1 Communication profile area (parameters corresponding to CiA DS 301)

The following table includes all general parameters that belong to the communication profile area of the CANopen object dictionary (CiA DS 301).

Index (hex)	Sub-index	Name	Type	Attr.	Meaning	Contents (hex)	Default (hex)
1000	0	Device type	Unsigned 32	R	Device type	00040191	
1001	0	Error register	Unsigned 8	R	Error register, bit-coded		00
1003		Error field					
	0	Number	Unsigned 8	RW	Number of errors occurred 0...16	0..10	00
	1	1. error field	Unsigned 32	R	Error code + Manuf.specific error field		
	2	2. error field	Unsigned 32	R	Error code + Manuf.specific error field		
	…	…					
	16	16. error field	Unsigned 32	R	Error code + Manuf.specific error field		
1004		Number of PDOs			Number of PDO		
	0	Number	Unsigned 32	R	Total	00000002	
	1	Synchronous PDO	Unsigned 32	R	Synchronous PDO	00000000	
	2	Asynchronous PDO	Unsigned 32	R	Asynchronous PDO	00000002	
1008	0	Device name	Vis-String	R	Device name	"EST FBM-AIM05 "	
1009	0	Hardware version	Vis-String	R	Version HW	"Vxxh IDxx "	
100A	0	Software version	Vis-String	R	Version SW	"V1.05 "	
100B	0	Node-Id	Unsigned 32	R	CAN address	00000050	
100C	0	Guard time	Unsigned 16	RW	NMT guard time (ms) 0..65535	0000..FFFF	0000
100D	0	Life time factor	Unsigned 8	RW	NMT life time 0..255	00..FF	00
100E	0	Node-guarding Id	Unsigned 32	R	CobId Nodeguard	00000700 + Node-Id	
1010		Store parameter			Storing of the configuration parameters in the non-volatile storage		
	0	Number	Unsigned 8	R	Number of elements	03	
	1	All parameters	Unsigned 32	R	Not implemented	00000000	
	2	Communication parameters	Unsigned 32	R	Not implemented	00000000	
	3	Application parameters	Unsigned 32	RW	Write: 65766173 (hex) Read: 1	00000001	

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

1011		Restore parameter			Loading of the configuration parameters from the non-volatile storage		
	0	Number	Unsigned 8	R	Number of elements	3	
	1	All parameters	Unsigned 32	R	Not implemented	00000000	
	2	Communication parameters	Unsigned 32	R	Not implemented	00000000	
	3	Application parameters	Unsigned 32	RW	Write: 64616F6C (hex) Read: 1	00000001	
1012	0	Time stamp Id	Unsigned 32	R	CobId Timestamp	80000100	
1014	0	Emergency Id	Unsigned 32	R	CobId Emergency	40000080 + Node-Id	
1017	0	Heartbeat time	Unsigned 16	RW	Heartbeat cycle time (ms) 0..65535	0000..FFFF	0000
1200		SDO parameters			SDO parameters		
	0	Number	Unsigned 8	R	Number of elements	02	
	1	Client->Server Id	Unsigned 32	R	CobId ReciveSDO	00000600+Node-Id	
	2	Server->Client Id	Unsigned 32	R	CobId TransmitSDO	00000580+Node-Id	
1800		1.TxPDO			Communication parameters 1.TxPDO		
	0	Number	Unsigned 8	R	Number of elements	04	
	1	ID Used By PDO	Unsigned 32	R	CobId 1.TxPDO	00000180+Node-Id	
	2	Transmission type	Unsigned 8	R		FF	
	3	Inhibit time	Unsigned 16	RW	Time in 0.1 ms (0..2550)	0000…09F6	0000
	4	CMSPriorityGroup	Unsigned 8	R		03	
1801		2.TxPDO			Communication parameters 2.TxPDO		
	0	Number	Unsigned 8	R	Number of elements	04	
	1	ID Used By PDO	Unsigned 32	R	CobId 1.TxPD	00000280+Node-Id	
	2	Transmission type	Unsigned 8	R		FF	
	3	Inhibit time	Unsigned 16	RW	Time in 0.1 ms (0..2550)	0000…09F6	0000
	4	CMSPriorityGroup	Unsigned 8	R		03	
1A00		1. TxPDO Mapping			Mapping parameters 1.TxPDO		
	0	Number	Unsigned 8	R	Number of elements	04	
	1	1. mapped object	Unsigned 32	R	Index+SubID+Size (in case of release by 4401h)	64010110	
	2	2. mapped object	Unsigned 32	R	Index+SubID+Size (in case of release by 4401h)	64010210	
	3	3. mapped object	Unsigned 32	R	Mapping parameters 2.TxPDO	64010310	
	4	4. mapped object	Unsigned 32	R	Number of elements	64010410	
1A01		2. TxPDOMapping			Mapping parameters 1.TxPDO		
	0	Number	Unsigned 8	R	Number of elements	01	
	1	1. mapped object	Unsigned 32	R	Index+SubID+Size	64010510	

8.5.2 Standardized device profile area (parameters corresponding to CiA DS 401)

The table is a summary of the parameters that are part of the standardized device profile area of the CANopen object dictionary (CiA DS 401) and that describe the device function of the module.

The data formats, the admissible value areas as well as the default values of the objects are explained in detail in the next chapter.

Index (hex)	Sub-index	Name	Type	Attr.	Meaning	Contents (hex)	Default (hex)
6401		Analog inputs					
	0	Number	Unsigned 8	R	Number of elements	05	
	1	1. input	Integer 16	R	1. input 0..32767		0
	..	..					
	5	5. input	Integer 16	R	5. input 0..32767		0
6420		Analog Input range			Measuring range		
	0	Number	Unsigned 8	R	Number of elements	05	
	1	1. input	Unsigned 16	RW	0001: 0...10 V 0020: 0..20 mA 0040: 4..20 mA		0001
	..	..					
	5	5. input	Unsigned 16	RW	as 1. input		0001
67FE		Error behavior			NMT error behavior in case of communication errors		
	0	Number	Unsigned 8	R	Number of elements	01	
	1	NMT state in case of communication errors	Unsigned 8	RW	00: Pre-operational 01: Not modified 02: Stopped		00

8.5.3 Manufacturer-specific profile area

In the table, the additional parameters are summarized that describe the manufacturer-specific device functions and that are not mentioned in the standardized device profile area of the CANopen object dictionary.

The data formats, admissible value areas as well as default values of the objects are explained in detail in the next chapter.

Index (hex)	Sub-Index	Name	Type	Attr.	Meaning	Contents (hex)	Default (hex)
2000		Life LED			Life LED		
	0	Number	Life-LED	R	Number of elements	01	
	1	Life LED	Life-LED	RW	00 or 01		00
2440		Slope			Calculated slope correction		

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

	0	Number	Unsigned 8	R	Number of elements	05	
	1	1. input	Unsigned 32	R	16 bit in front of decimal point and 16 bit after the decimal point		
	..	..					
	5	5. input	Unsigned 32	R	as 1. input		
2441		Offset			Calculated offset correction		
	0	Number	Unsigned 8	R	Number of elements	05	
	1	1. input	Integer 16	R	In LSB of ADC	0000	
	..	..					
	5	5. input	Integer 16	R	as 1. input	0000	
3000		Minimum values			Balancing reference point min. value		
	0	Number	Unsigned 8	R	Number of elements	05	
	1	1. input	Unsigned 16	RW	Left-aligned	0000	
	..	..					
	5	5. input	Unsigned 16	RW	as 1. input	0000	
3010		Maximum values			Balancing reference point max. values		
	0	Number	Unsigned 8	R	Number of elements	05	
	1	1. input	Unsigned 16	RW	Left-aligned	0000	
	..	..					
	5	5. input	Unsigned 16	RW	as 1. input	0000	
3011		Balancing state			Balancing state		
	0	Number	Unsigned 8	R	Number of elements	05	
	1	1. input	Unsigned 8	RW	Bit mask balancing made 00: No measurement x1: Measurement min. value 1x: Measurement max. value 11: Balancing made		00
	..	..					
	5	5. input	Unsigned 8	RW	as 1. input		00
3100		Filter parameters			Filter parameters		
	1	Number	Unsigned 8	RW	Mean value generation versus number	3..40	05
	2	Filter type	Unsigned 8	RW	Filter type	0..4	01
3101		Delta			Transmission conditions, min. modification amount		
	0	Number	Unsigned 8	R	Number of elements	05	
	1	1. input	Unsigned 16	RW	Left-aligned	0..FFFF	0040
	..	..					
	5	5. input	Unsigned 16	RW	as 1. input		

8.6 AIM08

8.6.1 Communication profile area (parameters corresponding to CiA DS 301)

The following table includes all general parameters that belong to the communication profile area of the CANopen object dictionary (CiA DS 301).

Index (hex)	Sub-Index	Name	Type	Attr.	Meaning	Contents (hex)	Default (hex)
1000	0	Device type	Unsigned 32	R	Device type	00040191	
1001	0	Error register	Unsigned 8	R	Error register, bit-coded		00
1003		Error field					
	0	Number	Unsigned 8	RW	Number of errors occurred 0...16	0..10	00
	1	1. error field	Unsigned 32	R	Error code + Manuf.specific error field		
	2	2. error field	Unsigned 32	R	Error code + Manuf.specific error field		
	…	…					
	16	16. error field	Unsigned 32	R	Error code + Manuf.specific error field		
1004		Number of PDOs			Number of PDO		
	0	Number	Unsigned 32	R	Total	00000002	
	1	Synchronous PDO	Unsigned 32	R	Synchronous PDO	00000000	
	2	Asynchronous PDO	Unsigned 32	R	Asynchronous PDO	00000002	
1008	0	Device name	Vis-String	R	Device name	"EST FBM-AIM08 "	
1009	0	Hardware version	Vis-String	R	Version HW	"Vxxh IDxx "	
100A	0	Software version	Vis-String	R	Version SW	"V1.05 "	
100B	0	Node-Id	Unsigned 32	R	CAN address	00000050	
100C	0	Guard time	Unsigned 16	RW	NMT guard time (ms) 0..65535	0000..FFFF	0000
100D	0	Life time factor	Unsigned 8	RW	NMT life time 0..255	00..FF	00
100E	0	Node-Guarding Id	Unsigned 32	R	CobId Nodeguard	00000700 + Node-Id	
1010		Store parameter			Storing of the configuration parameters in the non-volatile storage		
	0	Number	Unsigned 8	R	Number of elements	03	
	1	All parameters	Unsigned 32	R	Not implemented	00000000	
	2	Communication parameters	Unsigned 32	R	Not implemented	00000000	
	3	Application pa-rameters	Unsigned 32	RW	Write66173 (hex) Read	00000001	

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

1011		Restore parameter			Loading of the configuration parameters from the non-volatile storage		
	0	Number	Unsigned 8	R	Number of elements	3	
	1	All parameters	Unsigned 32	R	Not implemented	00000000	
	2	Communication parameters	Unsigned 32	R	Not implemented	00000000	
	3	Application parameters	Unsigned 32	RW	Write: 64616F6C (hex) Read: 1	00000001	
1014	0	Emergency Id	Unsigned 32	R	CobId Emergency	40000080 + Node-Id	
1017	0	Heartbeat time	Unsigned 16	RW	Heartbeat cycle time (ms) 0..65535	0000..FFFF	0000
1200		SDO parameters			SDO parameters		
	0	Number	Unsigned 8	R	Number of elements	02	
	1	Client->Server Id	Unsigned 32	R	CobId ReciveSDO	00000600+Node-Id	
	2	Server->Client Id	Unsigned 32	R	CobId TransmitSDO	00000580+Node-Id	
1800		1.TxPDO			Communication parameters 1.TxPDO		
	0	Number	Unsigned 8	R	Number of elements	04	
	1	ID Used By PDO	Unsigned 32	R	CobId 1.TxPDO	00000180+Node-Id	
	2	Transmission type	Unsigned 8	R		FF	
	3	Inhibit time	Unsigned 16	RW	Time in 0.1 ms (0..2550)	0000…09F6	0000
	4	CMSPriorityGroup	Unsigned 8	R		03	
1801		2.TxPDO			Communication parameters 2.TxPDO		
	0	Number	Unsigned 8	R	Number of elements	04	
	1	ID Used By PDO	Unsigned 32	R	CobId 1.TxPD	00000280+Node-Id	
	2	Transmission type	Unsigned 8	R		FF	
	3	InhibitTime	Unsigned 16	RW	Time in 0.1 ms (0..2550)	0000…09F6	0000
	4	CMSPriorityGroup	Unsigned 8	R		03	
1A00		1. TxPDO Mapping			Mapping parameters 1.TxPDO		
	0	Number	Unsigned 8	R	Number of elements	04	
	1	1. mapped object	Unsigned 32	R	Index+SubID+Size	64010110	
	2	2. mapped object	Unsigned 32	R	Index+SubID+Size	64010210	
	3	3. mapped object	Unsigned 32	R	Index+SubID+Size	64010310	
	4	4. mapped object	Unsigned 32	R	Index+SubID+Size	64010410	
1A01		2. TxPDO mapping			Mapping parameters 2.TxPDO		
	0	Number	Unsigned 8	R	Number of elements	04	
	1	1. mapped object	Unsigned 32	R	Index+SubID+Size	64010510	
	2	2. mapped object	Unsigned 32	R	Index+SubID+Size	64010610	
	3	3. mapped object	Unsigned 32	R	Index+SubID+Size	64010710	
	4	4. mapped object	Unsigned 32	R	Index+SubID+Size	64010810	

8.6.2 Standardized device profile area (parameters corresponding to CiA DS 401)

The table is a summary of the parameters that are part of the standardized device profile area of the CANopen object dictionary (CiA DS 401) and that describe the device function of the module.

The data formats, the admissible value areas as well as the default values of the objects are explained in detail in the next chapter.

Index (hex)	Sub-index	Name	Type	Attr.	Meaning	Contents (hex)	Default (hex)
6401		Analog inputs					
	0	Number	Unsigned 8	R	Number of elements	08	
	1	1. input	Integer 16	R	1. input 0..32767		0
	..	..					
	8	8. input	Integer 16	R	8. input 0..32767		0
6420		Analog Input range			Measuring range		
	0	Number	Unsigned 8	R	Number of elements	08	
	1	1. input	Unsigned 16	RW	0001: 0...10 V 0020: 0..20 mA 0040: 4..20 mA		0001
	..	..					
	8	8. input	Unsigned 16	RW	as 1. input		0001
67FE		Error behavior			NMT error behavior in case of communication errors		
	0	Number	Unsigned 8	R	Number of elements	01	
	1	NMT state in case of communication errors	Unsigned 8	RW	00: Pre-operational 01: Not modified 02: Stopped		00

8.6.3 Manufacturer-specific profile area

In the table, the additional parameters are summarized that describe the manufacturer-specific device functions and that are not mentioned in the standardized device profile area of the CANopen object dictionary.

The data formats, admissible value areas as well as default values of the objects are explained in detail in the next chapter.

Index (hex)	Sub-Index	Name	Type	Attr.	Meaning	Contents (hex)	Default (hex)
2000		Life LED			Life LED		
	0	Number	Life-LED	R	Number of elements	01	
	1	Life LED	Life-LED	RW	00 or 01		00

Phone:+49(0)611- 7103-0 • Fax:+49(0)611-7103-133 • www.eckelmann.de • info@eckelmann.de

2440		Slope			Calculated slope correction		
	0	Number	Unsigned 8	R	Number of elements	08	
	1	1. input	Unsigned 32	R	16 bit in front of decimal point and 16 bit after the decimal point		
	..	..					
	8	8. input	Unsigned 32	R	as 1. input		
2441		Offset			Calculated offset correction		
	0	Number	Unsigned 8	R	Number of elements	08	
	1	1. input	Integer 16	R	In LSB of ADC	0000	
	..	..					
	8	8. input	Integer 16	R	as 1. input	0000	
3000		Minimum values			Balancing reference point min. values		
	0	Number	Unsigned 8	R	Number of elements	08	
	1	1. input	Unsigned 16	RW	Left-aligned	0000	
	..	..					
	8	8. input	Unsigned 16	RW	as 1. input	0000	
3010		Maximum values			Balancing reference point max. values		
	0	Number	Unsigned 8	R	Number of elements	08	
	1	1. input	Unsigned 16	RW	Left-aligned	0000	
	..	..					
	8	8. input	Unsigned 16	RW	as 1. input	0000	
3011		Balancing state			Balancing state		
	0	Number	Unsigned 8	R	Number of elements	08	
	1	1. input	Unsigned 8	RW	Bit mask balancing made 00: No measurement x1: Measurement min. value 1x: Measurement max. value 11: Balancing made		00
	..	..					
	8	8. input	Unsigned 8	RW	as 1. input		00
3100		Filter parameters			Filter parameters		
	1	Number	Unsigned 8	RW	Mean value generation versus number	3..40	05
	2	Filter type	Unsigned 8	RW	Filter type	0..4	01
3101		Delta			Transmission conditions, min. modification amount		
	0	Number	Unsigned 8	R	Number of elements	08	
	1	1. input	Unsigned 16	RW	Left-aligned	0..FFFF	0040
	..	..					
	8	8. input	Unsigned 16	RW	as 1. input		