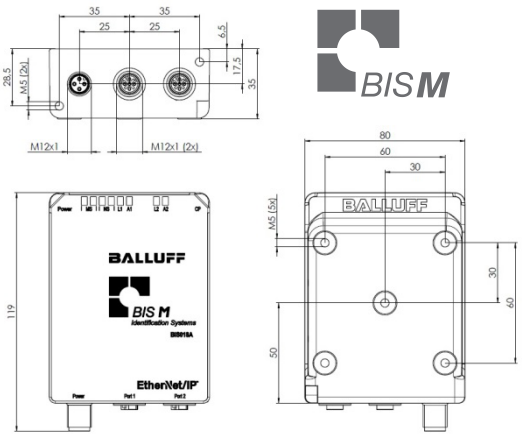
BALLUFF

BIS M-4006-034-00x-ST4
EtherNet/IP™

Technical Description, Operating Manual



english

www.balluff.com

1 User Instructions

1.1 About this Manual

This manual describes the BIS M-4006 compact processor for the identification system as well as its startup for immediate operation.

1.2 Typographical Conventions

The following conventions are used in this manual:

Enumerations

Enumerations are shown as a list with an en-dash.
– Entry 1
– Entry 2

Actions

Action instructions are indicated by a preceding triangle. The result of an action is indicated by an arrow.
► Action instruction 1
⇒ Action result
► Action instruction 2

Syntax

Numbers:
– Decimal numbers are shown without additional indicators (e.g. 123)
– Hexadecimal numbers are shown with the additional indicator $_{hex}$ (e.g. 00_{hex})

Parameters:
Parameters are shown in italics (e.g. CRC_*16*).

Directory paths:
References to paths where data is stored or to be saved are shown in small caps (e.g. Project:\Data Types\User-Defined).

Control characters:
Control characters for sending are set in angle brackets (e.g. <ACK>).

ASCII code:
Characters transmitted in ASCII code are set in apostrophes (e.g. 'L').

1.3 Symbols

Note, tip
This symbol indicates general notes.

1.4 Meaning of Warning Notes

NOTICE
The signal word NOTICE warns against possible property damage.
► Always observe the described measures for preventing this danger.

CAUTION
The pictogram used with the word "Caution" warns of a situation that could harm someone's health or damage equipment. Failure to observe these warning notes may result in injury or damage to equipment.
► Always observe the described measures for preventing this danger.

1 User Instructions

1.5 Abbreviations

BIS	Balluff Identification System
CIP	Common Industrial Protocol
CP	Code Present
CRC	Cyclic Redundancy Check
DHCP	Dynamic Host Configuration Protocol
I/O port	Digital input and output port
EDS	Electronic Data Sheet
EEPROM	Electrical Erasable and Programmable ROM
EMC	Electromagnetic Compatibility
EMC	Electromagnetic compatibility
FCC	Federal Communications Commission
FE	Function ground
HTML	Hypertext Markup Language
I/O	Digital Input/Output port
IP	Internet Protocol
LF CR	Line Feed with Carriage Return
LSB	Least Significant Byte
MAC	Media Access Control
MSB	Most Significant Byte
ODVA	Open DeviceNet Vendor Association
PC	Personal Computer
PLC	Programmable Logic Controller
Protocol DID	Device ID
PLC	Programmable Logic Controller
Tag	Data carrier
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
UID	Unique Identifier
URL	Uniform Resource Locator
VID	Vendor ID

2 Safety

2.1 Intended use

The BIS M-4006 compact processor is a component of the BIS M identification system and combines read head, processor unit and link to a higher level controller (PLC) in one device. It may be used only for this purpose in an industrial environment corresponding to Class A of the EMC Law.
This description applies to compact processor units of the following series:
– BIS M-4006-034-001-ST4
– BIS M-4006-034-002-ST4

Installation and Startup
Installation and startup are to be performed by trained technical personnel only. Any damage resulting from unauthorized manipulation or improper use voids warranty and liability claims against the manufacturer.
When connecting the processor unit to an external controller, observe proper selection and polarity of the connection as well as the power supply (see „Assembly“ on page 9).
The processor unit may only be used with an approved power supply (see „Technical Data“ on page 11).

NOTICE
This is a Class A device. It may cause RF noise in a residential area. In such cases the operator may be required to take appropriate measures.

Conformity

CE — This product was developed and manufactured in accordance with all applicable European Directives. CE conformity has been verified.

FC IC — FCC ID: 2AGZY-BFIDM01 / IC: 20739-BFIDM01
This device conforms to Part 15 of the FCC regulations. Operation of the device is subject to the following conditions:
– This device does not generate any harmful emissions
– The device and its function are not affected by radio frequency noise

2.2 General Safety Notes

All approvals and certifications are no longer valid if:
– Components are used that are not part of the identification system BIS M
– Components are used that have not been explicitly approved by Balluff

Operation and testing
The operator is responsible for ensuring that local safety regulations are observed.
If defects and persistent faults occur in the identification system, take it out of service and secure it to prevent unauthorized use.

3 Basic Knowledge

3.1 Function principle of identification systems

The BIS U identification system is classified as a non-contacting system with read and write function. This allows it to convey information programmed permanently in the data carrier, but also to collect and pass on current information.

Main components of the BIS M identification system include:
– Compact processor
– Data carrier

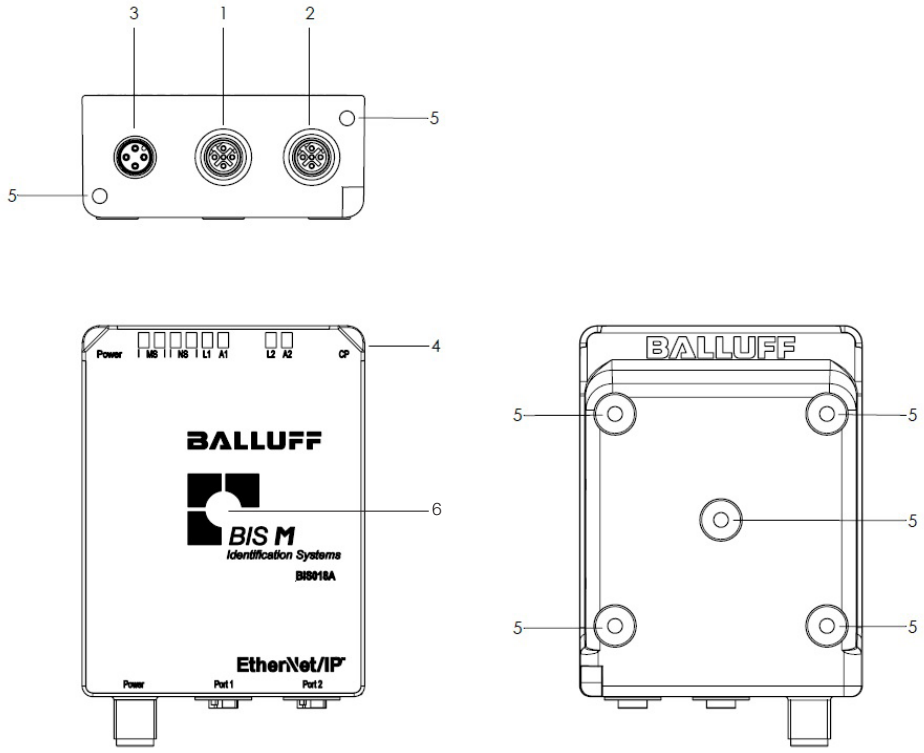


Figure 1: System overview

1 EtherNet/IP™ port 1
2 EtherNet/IP™ Port 2
3 Power IN
4 Status LEDs
5 Mounting hole
6 Sensing surface

The main areas of application are:
– In the production and control of material flow (e.g. in model-specific processes, workpiece transport in conveying systems, for acquiring production-related data)
– In transporting and conveyor technology

3.2 Product description

Compact processor BIS M-4006:
– Metal housing
– Round connector terminations
– Power for the data carrier provided by the compact processor via carrier signal
– 2 × EtherNet/IP™
– Control displays
– Webserver for diagnostics and service functions

3 Basic Knowledge

3.3 Control function

The compact processor unit is the link between data carrier and host system. It manages bi-directional data transfer (reading and writing) between the data carrier and host control system and serves as a data buffer.

The higher level control system can be:
– a PLC
– a soft PLC

Double bit string:
In order to ensure complete transmission of all data in the data buffer, the control bits in the data buffer's first and last byte (bit header) are transmitted and compared. If both bit headers are the same, then the data is updated completely and can be taken over. The data are only valid if both bit headers are the same. Thus, the host control system must also compare the bits in the bit headers.

3.4 Data consistency, data security

In order to increase data integrity, data transfer between the data carrier and compact processor as well as the storage device can be monitored using a check procedure.
A CRC_16 data check can be enabled for this via parameter configuration.
With the CRC_16 data check, a check code that allows the validity to be checked at any time is written to the data carrier.

A CRC_16 data check provides the following advantages:
– Data integrity even during the non-active phase (data carrier outside the R/W head)
– Shorter read time – page is read once

3.5 EtherNet/IP™

EtherNet/IP is an industrial networking standard. The IP in EtherNet/IP stands for "Industrial Protocol". EtherNet/IP uses the "Common Industrial Protocol" (CIP) open communication protocol on the application level (in accordance with ISO/OSI reference model). EtherNet/IP is supported by the "Open DeviceNet™ Vendor Association" (ODVA) network organization.

Ethernet/IP can operate in a ring topology (Device Level Ring). It is strongly recommended to configure the device speed with auto-negotiation for all devices within the ring:
CIP Ethernet Link object (0xF6) --> Instance 1 and 2 --> Attributes 1 and 6.

Attribute 1 shows the current status of the port and attribute 6 contains the configuration of the port (AutoNeg or 100MBit-FD etc.). It is important that attribute 6 is configured to AutoNegotiation on all ports.

4 Assembly

4.1 Compact processor, scope of delivery

Included in the scope of delivery:
- BIS M-4006
- Security notice
- 1 × closure cap
- Grounding set

Note
Visit www.balluff.com for more information on available software and accessories.

4.2 Compact processor installation

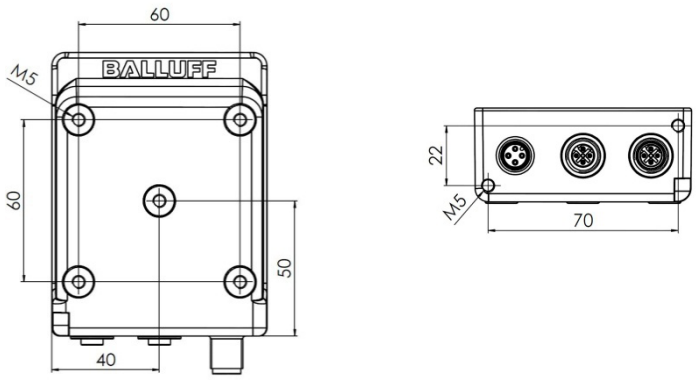


Figure 2: Mechanical connection (dimensions in mm)

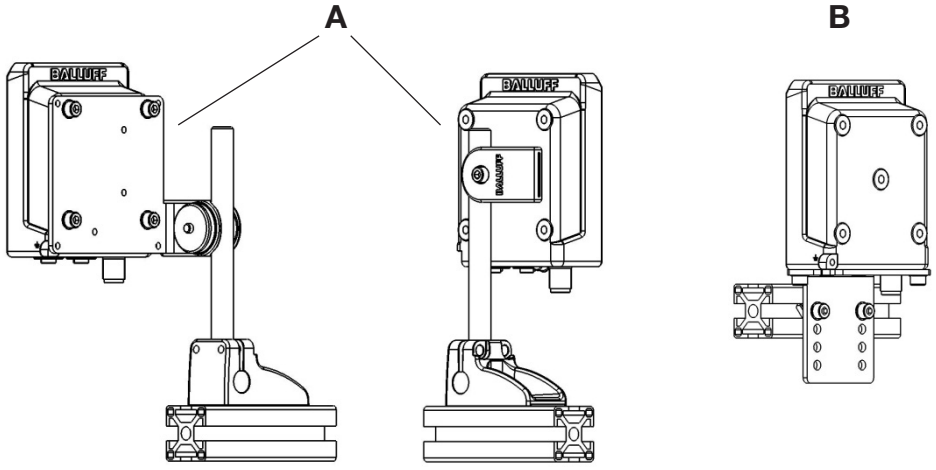


Figure 3: Mounting examples (**A**: Using Balluff Mounting System, **B**: Using mounting bracket on T-slot profile)

- ► Select a suitable installation position.
- ► Secure the processor unit using 4 or 2 M5 screws (strength category 8.8, lightly oiled, tightening torque M = 5.5 Nm).

4 Installation

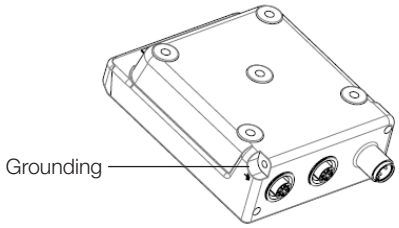


Figure 4: Grounding

Note
The function ground connection from the housing to the machine must have low-impedance and is made using the supplied ground strap.

4.3 Electrical connection

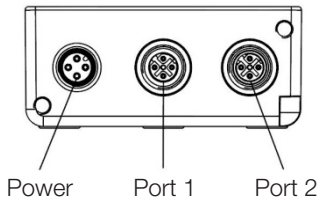
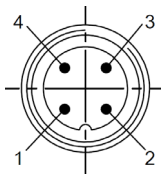


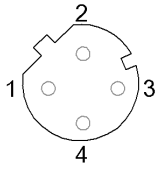
Figure 5: Electrical connection

Power
Male insert, 4-pin, A-coded



PIN	Function
1	+24 V DC
2	n. c.
3	0 V
4	n. c.

Ethernet/IP™-Port 1/2
Female M12, 4-pin, D-coded



PIN	Function
1	+Tx
2	+Rx
3	–Tx
4	–Rx

5 Technical Data

5.1 Dimensions

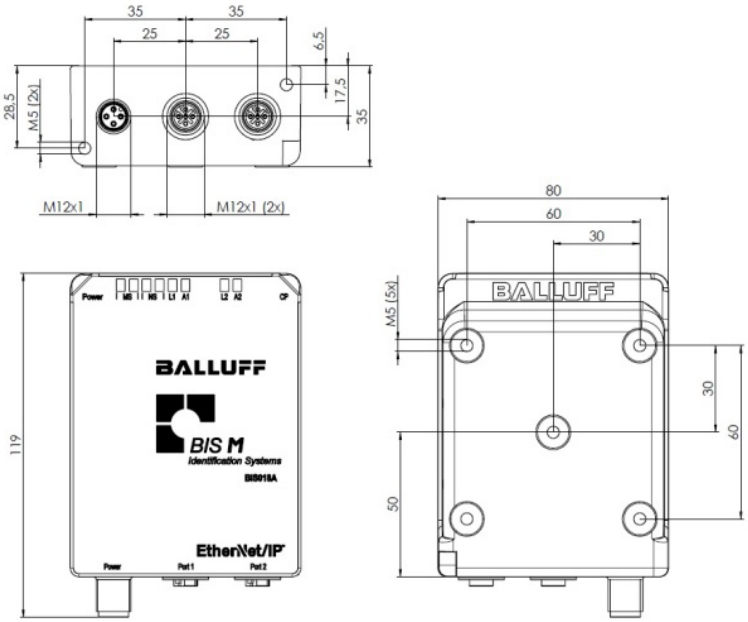


Figure 6: Dimensions in mm

Mechanical data

Housing material	Zinc die-cast housing
Power	4-pin M12 plug, A-coded
EtherNet/IP™ -PORT 1	Female M12, 4-pin, D-coded
EtherNet/IP™ -PORT 2	Female M12, 4-pin, D-coded
Degree of protection	IP67 (with connectors)
Weight	Approx. 490 g

Electrical data

Supply voltage V_S	24 V DC ±20% LPS Class 2
Residual ripple	≤ 10%
Current consumption	150 mA, 24 V DC
Application interfaces	EtherNet/IP™

Operating conditions

Ambient temperature	0 °C…+70 °C
Storage temperature	–20 °C…+85 °C
EMC – EN 61000-6-2/4/5/6 – EN61000-6-3 (80-1000MHz) – EN61000-6-3 (1400-2000MHz) – EN61000-6-3 (2000-2700MHz) – EN 301489-1/-3	R&TTE Directive 1999/5/EC – Severity level 2A/1A/1A/2A – Severity level 3A – Severity level 3A – Severity level 2A – EN 55022 (Cl.A)
Vibration/shock	EN 60068 Part 2-6/27/29

6 Commissioning

EtherNet/IP™

The BIS V-4006 processor unit and the controlling system communicate via Ethernet/IP™ protocol.
The Ethernet/IP™ system consists of the following components:
– EtherNet/IP™ -Scanner
– EtherNet/IP™ -Adapter (here the BIS M-4006 processor unit)

EDS file

All device perimeters for configuration are listed in the EDS file.

IP address

The processor unit and host control system communicate via Ethernet/IP. Assigning a unique IP address associates the processor unit with a network. A processor unit can be integrated into a network in different ways (DHCP, ARP). A MAC address provides the basis for integration into a network. This hardware address is unique and distinctly identifies network devices such as the processor unit.

DHCP

The „Dynamic Host Configuration Protocol“ (DHCP) allows for dynamic assignment of an IP address using a server. The hardware can be integrated into the network without requiring any further configuration. Only automatic assignment (MAC address) of the IP address needs to be configured.

6 Startup

Ethernet Device Configuration

"Ethernet Device Configuration“ is a software for scanning the network for Ethernet/IP components. The tool is used to determine the IP address of a device or enable access to the IP setting via the web server by assigning an IP address. IP setting using the web server is described under „Setup/Configurations“ on page 38 . With this tool a temporary IP address can also be assigned to the devices.

Note
For the application software "Ethernet Device Configuration“ see www.balluff.com.

► Start "Ethernet Device Configuration“.
⇒ The subnetwork is scanned for connected devices by clicking on the "Find devices". The result is displayed in the output window of the software.

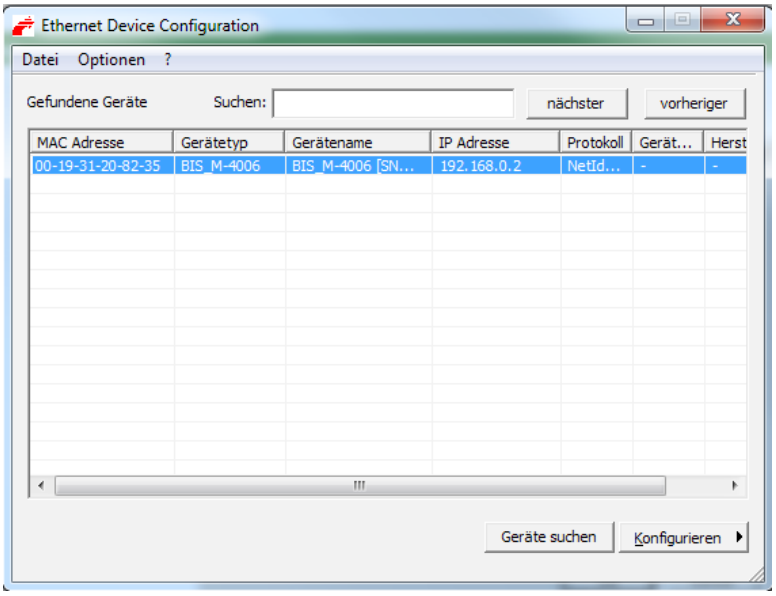


Figure 7: Finding Ethernet IP devices

To enter an IP address on the device the corresponding device must be selected in the window, then click on the "Configure" button.
► Use the dropdown menu to select the "Set IP address" function.

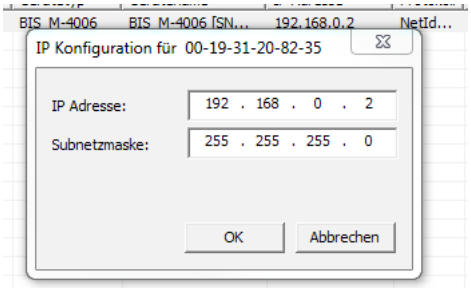


Figure 8: Setting the IP address

Note
This tool cannot be used to set the device to DHCP mode. For this, use of the web server is recommended (see „Setup/Configurations“ on page 38).

6 Startup

6.1 Data Configuration

Data Configuration	Instance ID	Data length
INPUT	100	128
OUTPUT	101	128
CONFIG	102	4

6.2 Configuration Data

Byte	Parameter	Description
00–04	RFID Head	Configuration of the read/write head

RFID port parameter

Byte	Meaning
02	CRC
03	Dynamic mode
04	Type serial number
05	Slow tag detection

CRC check

The CRC check is a procedure for determining a check value for data in order to be able to recognize transmission errors. If the CRC check is activated, an error message is sent when a CRC error is detected.

Checksum
The checksum is written to the data carrier as 2 bytes of information. 2 bytes per block are lost. This leaves 14 bytes per block available. The usable number of bytes can be found in the following table.

The number of usable bytes thus decreases when using the checksum.

Balluff data carrier type	Memory capacity	Usable bytes for CRC_16
BIS M-1_ _-**02**	2000 bytes	1750 bytes
BIS M-1_ _-**03**	112 bytes	98 bytes
BIS M-1_ _-**04**	256 bytes	224 bytes
BIS M-1_ _-**05**	224 bytes	196 bytes
BIS M-1_ _-06	288 bytes	252 bytes
BIS M-1_ _-**07**	992 bytes	868 bytes
BIS M-1_ _-**08**	160 bytes	140 bytes
BIS M-1_ _-**09**	32 bytes	28 bytes
BIS M-1_ _-**11**	8192 bytes	7168 bytes
BIS M-1_ _-**13**	32786 bytes	28672 bytes
BIS M-1_ _-**14**	65536 bytes	57344 bytes
BIS M-1_ _-**15**	131072 bytes	114688 bytes
BIS M-1_ _-17	208 bytes	182 bytes
BIS M-1_ _-**20**	8192 bytes	7168 bytes

6 Startup

6.2.1 Dynamic mode

As soon as the (*Dynamic mode*) function is enabled, the compact processor unit accepts the read/write job from the controlling system and stores it, regardless of whether a data carrier is in the active zone of the R/W head or not. If a data carrier enters the active range of the R/W head, the stored job is run.

6.2.2 Type serial number

If this function is enabled, the type of the read/write head as well as the data carrier type and serial number (UID = Unique Identifier) for the data carrier are output when CP occurs.

6.2.3 Slow tag detection

For this option, the antenna on the read/write head is switched on for data carrier detection only every 200 ms. The parameters for this function are configured in the respective read/write head module.

7 Device function

7.1 Function principle of the BIS M-4006

The exchange of data and commands between the processor unit and host control system takes place in the input and output buffer. The buffer contents are exchanged using cyclical polling. The buffer content depends on the cycle in which it is written (e.g. control commands at the beginning of a job).
When writing to the buffer, the transmitted data from the preceding cycle is overwritten. Unwritten bytes are not deleted and retain their data content.

Process data input (Assembly 100, T → 0)

Instance	100
Data length	128
Bytes 0…127	RFID head, 128 bytes

Process data output (Assembly 101, 0 → T)

Instance	101
Data length	128
Bytes 0…127	RFID head, 128 bytes

7.2 Process Data Buffer

Output buffer

The control commands for the identification system and the data to be written to the data carrier are transmitted via the output buffer.

Bit-No. / Subaddress	7	6	5	4	3	2	1	0
00_{hex} = bit string		TI	KA			GR		AV
01_{hex}	Command identifier					or	Data	
02_{hex}	Start address (Low Byte) or program No.					or	Data	
03_{hex}	Start address (high byte)					or	Data	
04_{hex}	Number of bytes (low byte)					or	Data	
05_{hex}	Number of bytes (high byte)					or	Data	
06_{hex}	Data							
…	Data							
Last byte = bit string		TI	KA			GR		AV

7 Device Functions

Assignment and explanation

Subaddress	Bit name	Meaning	Function description
00_{hex}/last byte	TI	Toggle bit in	Controller is ready to receive additional data (read job).
	KA	Head on/off	Shuts off the R/W head's antenna. Tag detection no longer takes place. CP and MT are 0.
	GR	Base state	Cancels the current job for this R/W head and puts the channel into a base state. The R/W head can then be used again once GR = 0 and the controller has acknowledged this with BB = 1. CP and MT are 0.
	AV	Job	A job is present.

Note
After a R/W error the GR bit does not need to be set in order to place the R/W in the base state. The read/write head is in the base state after each command is executed (whether successful or with error).

7 Device Functions

Command structure

Command designator 00_{hex}: No command present

Subaddress	Meaning	Function description
00_{hex}	1st bit string	
00_{hex}	Command identifier	00_{hex}: No command present.
…	None	No meaning
Last byte	2nd bit string	Valid data is present if the 1st and 2nd bit strings match.

Command designator 01_{hex}: Read from data carrier

Subaddress	Meaning	Function description
00_{hex}	1st bit string	
01_{hex}	Command identifier	01_{hex}: Read from data carrier.
02_{hex}	Start address (low byte)	Start address for reading.
03_{hex}	Start address (high byte)	Start address for reading.
04_{hex}	Number of bytes (low byte)	The number of bytes that are to be read starting from the start address (low byte).
05_{hex}	Number of bytes (high byte)	The number of bytes that are to be read starting from the start address (high byte).
…	None	No meaning
Last byte	2nd bit string	Valid data is present if the 1st and 2nd bit strings match.

Command designator 02_{hex}: Write to data carrier

Subaddress	Meaning	Function description
00_{hex}	1st bit string	
01_{hex}	Command identifier	02_{hex}: Write to data carrier.
02_{hex}	Start address (low byte)	Start address to be written from.
03_{hex}	Start address (high byte)	Start address to be written from.
04_{hex}	Number of bytes (low byte)	The number of bytes that are to be written starting from the start address (low byte).
05_{hex}	Number of bytes (high byte)	The number of bytes that are to be written starting from the start address (high byte).
…	None	No meaning
Last byte	2nd bit string	Valid data is present if the 1st and 2nd bit strings match.

7 Device Functions

Command structure

Data is accepted from the compact processor unit only after the command has been accepted by the processor unit and acknowledged.

00_{hex}	1st bit string	
01_{hex}	Data	Transmission of the data that is to be written to the data carrier.
…	Data	Transmission of the data that is to be written to the data carrier.
Last byte	2nd bit string	Valid data is present if the 1st and 2nd bit strings match.

Command designator 07_{hex}: Store the start address for the "Auto Read" function

Subaddress	Meaning	Function description
00_{hex}	1st bit string	
01_{hex}	Command identifier	07_{hex}: Store the start address for the "Auto Read" function in EEPROM.
02_{hex}	Start address (low byte)	Address for the "Auto Read" function starting from which the data carrier is read. The value is stored in the EEPROM.
03_{hex}	Start address (high byte)	Address for the "Auto Read" function starting from which the data carrier is read. The value is stored in the EEPROM.
…	None	No meaning
Last byte	2nd bit string	Valid data is present if the 1st and 2nd bit strings match.

Command designator 09_{hex}: Type and serial number

Subaddress	Meaning	Function description
00_{hex}	1st bit string	
01_{hex}	Command identifier	09_{hex}: Read the read/write head type, data carrier type and UID (unique identifier) of a data carrier in the field (for data format, see page14).
…	None	No meaning
Last byte	2nd bit string	Valid data is present if the 1st and 2nd bit strings match.

7 Device Functions

Command structure

Command designator 12_{hex}: Initialize CRC_16 data check

Subaddress	Meaning	Function description
00_{hex}	1st bit string	
01_{hex}	Command identifier	12_{hex}: Initialize data carrier.
02_{hex}	Start address (low byte)	Start address from which the CRC_16 data check is to be carried out.
03_{hex}	Start address (high byte)	Start address from which the CRC_16 data check is to be carried out.
04_{hex}	Number of bytes (low byte)	Number of bytes for which a CRC_16 data check is to be carried out from the start address (low byte).
05_{hex}	Number of bytes (high byte)	Number of bytes for which a CRC_16 data check is to be carried out from the start address (high byte).
…	None	No meaning
Last byte	2nd bit string	Valid data is present if the 1st and 2nd bit strings match.

Command designator 32_{hex}: Write constant value to data carrier

Subaddress	Meaning	Function description
00_{hex}	1st bit string	
01_{hex}	Command identifier	32_{hex}: Write a data carrier with a constant value.
02_{hex}	Start address (low byte)	Start address to be written from.
03_{hex}	Start address (high byte)	Start address to be written from.
04_{hex}	Number of bytes (low byte)	The number of bytes that are to be written starting from the start address (low byte).
05_{hex}	Number of bytes (high byte)	The number of bytes that are to be written starting from the start address (high byte).
…	None	No meaning
Last byte	2nd bit string	Valid data is present if the 1st and 2nd bit strings match.

Data is accepted from the compact processor unit only after the command has been accepted by the processor unit and acknowledged.

00_{hex}	1st bit string	
01_{hex}	Data	Value that is to be written to the data carrier.
…	None	No meaning
Last byte	2nd bit string	Valid data is present if the 1st and 2nd bit strings match.

7 Device Functions

Command structure

Command designator 0081_{hex}: Read data carrier with 24-bit address assignment

Subaddress	Meaning	Function description
0000_{hex}	Command identifier	0081_{hex}: Read from data carrier.
0001_{hex}	Start address (Low Word)	Start address for reading.
0002_{hex}	Start address (High Word)	Start address for reading.
0003_{hex}	Number of words (Low Word)	Number of words to be read starting from the start address.
0004_{hex}	Number of words (High Word)	Number of words to be read starting from the start address.

Command designator 0082_{hex}: Write data carrier with 24-bit address assignment

Subaddress	Meaning	Function description
0000_{hex}	Command identifier	0082_{hex}: Write to data carriers.
0001_{hex}	Start address (Low Word)	Start address to be written from.
0002_{hex}	Start address (High Word)	Start address to be written from.
0003_{hex}	Number of words (Low Word)	Number of words to be read starting from the start address.
0004_{hex}	Number of words (High Word)	Number of words to be read starting from the start address.

Command designator 0087_{hex}: Saving the start address for the Auto Read function with 24-bit address assignment

Subaddress	Meaning	Function description
0000_{hex}	Command identifier	0087_{hex}: Store the start address for the "Auto Read" function in EEPROM.
0001_{hex}	Start address (Low Word)	Address for the "Auto Read" function starting from which the data carrier is read. The value is stored in the EEPROM.
0002_{hex}	Start address (High Word)	Address for the "Auto Read" function starting from which the data carrier is read. The value is stored in the EEPROM.

7 Device Functions

Command structure

Command designator 0092_{hex} : Initialize CRC_16 data check with 24-bit address assignment

Subaddress	Meaning	Function description
0000_{hex}	Command identifier	0092_{hex}: Initialize CRC_16 data check.
0001_{hex}	Start address (Low Word)	Start address from which the CRC_16 data check is to be carried out.
0002_{hex}	Start address (High Word)	Start address from which the CRC_16 data check is to be carried out.
0003_{hex}	Number of words (Low Word)	Number of words for which a CRC_16 data check is to be carried out from the start address (low word).
0004_{hex}	Number of words (High Word)	Number of words for which a CRC_16 data check is to be carried out from the start address (low word).

Command designator $00B2_{hex}$: Write constant value to data carrier with 24-bit address assignment

Subaddress	Meaning	Function description
0000_{hex}	Command identifier	$00B2_{hex}$: Write to data carrier.
0001_{hex}	Start address (Low Word)	Start address to be written from.
0002_{hex}	Start address (High Word)	Start address to be written from.
0003_{hex}	Number of words (Low Word)	Number of words to be written.
0004_{hex}	Number of words (High Word)	Number of words to be written.

7 Device Functions

Input buffer

The input buffer is used to send the data read from the identification system, the designations, and the status codes to the host control system.

Bit-No. / Subaddress	7	6	5	4	3	2	1	0
00_{hex} = bit string	BB	HF	TO	MT	AF	AE	AA	CP
01_{hex}	Status code or Data							
02_{hex}	Data							
…	Data							
Last byte = bit string	BB	HF	TO	MT	AF	AE	AA	CP

Assignment and explanation

Subaddress	Bit name	Meaning	Function description
00_{hex}/last byte	BB	Ready	After powering up or after a reset via the GR bit, the BB bit indicates that the corresponding channel is ready.
	HF	Head error	Cable break to the R/W head.
	TO	Toggle bit out	**Read operation:** Additional data is being provided by the identification system. **Write operation:** Processor unit can accept additional data.
	MT	Multiple Tag	More than 1 data carrier is in the R/W head's field.
	AF	Job error	A job was processed incorrectly or was canceled.
	AE	Job end	A job was completed without errors.
	AA	Job start	A job was detected and started.
	CP	Code Present	A data carrier has been detected.

Structure of the input buffer

The structure of the process data buffer is identical for all commands.

Subaddress	Meaning	Function description
00_{hex}	1st bit string	
01_{hex}	Status code	Provides information on the status of a query.
02_{hex}	Data	Transmission of data that was read from the data carrier.
…	Data	Transmission of data that was read from the data carrier.
Last byte	2nd bit string	Valid data is present if the 1st and 2nd bit strings match.

7 Device Functions

Status codes

Note
Status codes are only valid in connection with the AF bit!

Status code	Function description
00_{hex}	Everything OK
02_{hex}	Not possible to read the data carrier.
04_{hex}	Cannot write to the data carrier.
05_{hex}	Data carrier was removed from the R/W head's range during writing.
07_{hex}	No or invalid command designator with set AV bit or the number of bytes is 00_{hex}.
09_{hex}	R/W head cable break or no R/W head connected
$0D_{hex}$	Communication to the R/W head disrupted.
$0E_{hex}$	CRC for the read data and CRC for the data carrier do not agree.
$0F_{hex}$	1st and 2nd bit string are unequal. The 2nd bit string must be used.
20_{hex}	Address assignment of the read/write job is outside the memory range of the data carrier.
21_{hex}	This function is not possible for this data carrier.

Description of the Code Present (CP) and Multiple Tag (MT) bits

CP	MT	Meaning
0	0	No tag in the field
1	0	Exactly one tag in the field. Automatic reading is OK (if configured).
0	1	More than one data carrier is in the field. They cannot be processed.
1	1	Does not occur.

7 Device Functions

Communication

The communication between the controlling system and processor unit is defined by a sequence protocol. Communication between the host control system and the processor unit is implemented using a control bit in the output and input buffers.

Basic sequence

1. The controller sends a command designator to the processor unit in the output buffer with the AV bit set.
   The AV bit tells the compact processor unit that a job is beginning and the transmitted data is valid.
2. The compact processor unit accepts the job and confirms the job by setting the AA bit in the input buffer.
3. If additional data needs to be exchanged for the job, readiness for additional data exchange is indicated by inverting the TI and TO toggle bits.
4. The compact processor unit has correctly executed the job and sets the AE bit in the input buffer.
5. The controller has accepted all data. The AV bit in the output buffer is reset.
6. The compact processor unit resets all control bits set in the input buffer during the job (AA bit, AE bit). The processor unit is ready for the next job.

Note
All specifications are typical values. Deviations are possible depending on the application and combination of R/W head and data carrier.
The specifications apply to static operation; no CRC_16 data checking.

Read/write times

ISO 15693:

Read times Data carrier with 16 bytes per block	
Data carrier detection	~ 20 ms
Read bytes 0 to 15	~ 25 ms
For each additional 16-byte block started	~ 10 ms

Write times Data carrier with 16 bytes per block		
	FRAM (BIS M-1_ _-02/20)	EEPROM (BIS M-1_ _-03/07/08)
Data carrier detection	~ 20 ms	~ 20 ms
Write bytes 0 to 15	~ 60 ms	~ 80 ms
For each additional 16-byte block started	~ 25 ms	~ 80 ms

High speed*:

Read times Data carrier with 64 bytes per block	
Data carrier detection	~ 20 ms
Read bytes 0 to 63	~ 14 ms
For each additional 64-byte block started	~ 6 ms

Write times Data carrier with 64 bytes per block	
Data carrier detection	~ 20 ms
Write bytes 0 to 63	~≤ 30 ms
For each additional 64-byte block started	~ 15 ms

*These times apply only to data carriers BIS M-1_ _-**11**/A, BIS M-1_ _-**13**/A, BIS M-1_ _-**14**/A and BIS M-1_ _-**15**/A.

7 Device Functions

Distance between the data carriers

Data carrier	Distance BIS M					
	106-… 107-… 108-… 110-… 111-… 115-… 128-…	112-… 134-… 135-… 137-…	140-… 142-… 143-… 144-…	150-… 151-… 152-… 154-… 155-… 156-…	153-…	191-…
BIS M-4006-…-001	> 20 cm	> 20 cm	> 20 cm			
BIS M-4006-…-002				> 25 cm	> 30 cm	> 25 cm

Distance between the compact processor units

Compact processor	Minimum distance
BIS M-4006-…-001	20 cm
BIS M-4006-…-002	20 cm

When installing two BIS M-4_ _-... on metal, there is normally no mutual interference. Unfavorable use of a metal frame can result in problems when reading a data carrier. In this case, the read distance is reduced to 80% of the maximum value.

7 Device Functions

7.3 Function indicator

The operating states of the identification system and the EtherNet/IP™ interface are indicated by LEDs.

Overview of display elements

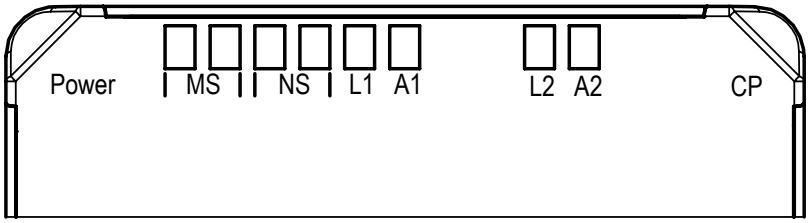


Figure 9: Function indicator

LED	Status	Function
POWER	Off	Device is not ready for operation.
	Green	Supply voltage OK.
	Green, flashing	Cable break
CP	Off	No data carrier detected.
	Yellow	Data carrier detected.
	Flashing yellow	Data carrier is being processed.
MS	Off	Device not turned on.
	Green	Device is ready for operation.
	Green, flashing	Stand-by: Device not configured.
	Red	Severe, fatal error
	Red, flashing	Simple, non-fatal error (e.g. an incorrect configuration)
	Red/green, flashing	Self test: Device is undergoing a self test after being switched on.
NS	Off	Device not turned on or there is no IP address.
	Green	Connected: Device has an existing connection to the master.
	Green, flashing	No connection: Device has no existing connection, IP address is not available.
	Red	Doubled IP address: Device identified that its IP address is already being used.
	Red, flashing	Connection timeout
	Red/green, flashing	Self test: Device is undergoing a self test after being switched on.
L1 / L2	Off	No connection
	Green	Connection
A1 / A2	Off	No data transfer
	Flashing yellow	Data transfer

7 Device Functions

7.4 Examples

As soon as sufficient data have been read, they are sent to the input buffer.
The AE bit is not set until the compact processor unit has finished the "Read" operation.
The reply "Job end" (AE bit) is reliably set no later than before the last data has been sent. This time point depends on the requested volume of data and the time response of the controller. In the example, the use of italics for „*Set AE bit*“ calls your attention to this fact.

7.4.1 Command: Read 30 bytes on read/write head, start address 10

Controller

1. Process output buffer (note sequence):

01_{hex}	Command designator 01_{hex}
02_{hex}	Start address $0A_{hex}$
03_{hex}	Start address 00_{hex}
04_{hex}	No. of bytes $1E_{hex}$
05_{hex}	No. of bytes 00_{hex}
$00_{hex}/0F_{hex}$	Set AV bit

3. Process input buffer:

$01…0E_{hex}$	Copy first 14 bytes

Process output buffer:

$00_{hex}/0F_{hex}$	Invert TI bit

5. Process input buffer:

$01…0E_{hex}$	Copy second 14 bytes

Process output buffer:

$00_{hex}/0F_{hex}$	Invert TI bit

7. Process input buffer:

$01…02_{hex}$	Copy last 2 bytes

Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

Identification system

2. Process input buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit
$01…0E_{hex}$	Enter first 14 bytes
$00_{hex}/0F_{hex}$	Invert TO bit
$00_{hex}/0F_{hex}$	*Set AE bit*

4. Process input buffer:

$01…0E_{hex}$	Enter second 14 bytes
$00_{hex}/0F_{hex}$	Invert TO bit
$00_{hex}/0F_{hex}$	*Set AE bit*

6. Process input buffer:

$01…02_{hex}$	Enter last 2 bytes
$00_{hex}/0F_{hex}$	Invert TO bit
$00_{hex}/0F_{hex}$	*Set AE bit*

8. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AE bits

7 Device Functions

7.4.2 Command: Read 30 bytes on read/write head, start address 10, problem with reading

Note
If a problem occurs, the AF bit is set with the corresponding status number instead of the AE bit. Setting the AF bit cancels the job and declares it as finished.

Controller

1. Process output buffer (note sequence):

01_{hex}	Command designator 01_{hex}
02_{hex}	Start address $0A_{hex}$
03_{hex}	Start address 00_{hex}
04_{hex}	No. of bytes $1E_{hex}$
05_{hex}	No. of bytes 00_{hex}
$00_{hex}/0F_{hex}$	Set AV bit

Identification system

2. Process input buffer (note sequence):
If problem occurs immediately!

$00_{hex}/0F_{hex}$	Set AA bit
01_{hex}	Enter status number
$00_{hex}/0F_{hex}$	Set AF bit

3. Process input buffer:

01_{hex}	Copy status number

Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

4. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AF bits

7 Device Functions

7.4.3 Command: Read 30 bytes on read/write head, start address 10, problem with reading

Note
If a problem occurs after transmission of the data has started, the AF bit is provided instead of the AE bit together with a corresponding status number. The AF status message is dominant. Which data is incorrect cannot be specified. Setting the AF bit cancels the job and declares it as finished.

Controller

1. Process output buffer (note sequence):

01_{hex}	Command designator 01_{hex}
02_{hex}	Start address $0A_{hex}$
03_{hex}	Start address 00_{hex}
04_{hex}	No. of bytes $1E_{hex}$
05_{hex}	No. of bytes 00_{hex}
$00_{hex}/0F_{hex}$	Set AV bit

3. Process input buffer:

$01…0E_{hex}$	Copy first 14 bytes

Process output buffer:

$00_{hex}/0F_{hex}$	Invert TI bit

5. Process input buffer:

$01…0E_{hex}$	Copy status number

Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

Identification system

2. Process input buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit
$01…0E_{hex}$	Enter first 14 bytes
$00_{hex}/0F_{hex}$	Invert TO bit

4. Process input buffer:
If a problem has occurred!

01_{hex}	Enter status number
$00_{hex}/0F_{hex}$	Set AF bit

6. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AF bits

7 Device Functions

7.4.4 Command: Write 30 bytes on read/write head, start address 20

Controller **Identification system**

1. Process output buffer (note sequence):

01_{hex}	Command designator 02_{hex}
02_{hex}	Start address 14_{hex}
03_{hex}	Start address 00_{hex}
04_{hex}	No. of bytes $1E_{hex}$
05_{hex}	No. of bytes 00_{hex}
$00_{hex}/0F_{hex}$	Set AV bit

2. Process input buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit, invert TO bit

3. Process output buffer:

$01…0E_{hex}$	Enter first 14 bytes
$00_{hex}/0F_{hex}$	Invert TI bit

4. Process output buffer:

$01…0E_{hex}$	Copy first 14 bytes

Process input buffer:

$00_{hex}/0F_{hex}$	Invert TO bit

5. Process output buffer:

$01…0E_{hex}$	Enter second 14 bytes
$00_{hex}/0F_{hex}$	Invert TI bit

6. Process output buffer:

$01…0E_{hex}$	Copy second 14 bytes

Process input buffer:

$00_{hex}/0F_{hex}$	Invert TO bit

7. Process output buffer:

$01…02_{hex}$	Enter last 2 bytes
$00_{hex}/0F_{hex}$	Invert TI bit

8. Process output buffer:

$01…02_{hex}$	Copy last 2 bytes

Process input buffer:

$00_{hex}/0F_{hex}$	Set AE bit

9. Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

10. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AE bits

7 Device Functions

7.4.5 Command: Write a constant value to the data carrier

A data carrier is to be written with 1000 bytes (constant value) starting from start address 80.

Controller **Identification system**

1. Process output buffer (note sequence):

01_{hex}	Command designator 32_{hex}
02_{hex}	Start address 50_{hex}
03_{hex}	Start address 00_{hex}
04_{hex}	Number of bytes $E8_{hex}$
05_{hex}	No. of bytes 03_{hex}
$00_{hex}/0F_{hex}$	Set AV bit

2. Process input buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit, invert TO bit

3. Process output buffer:

01	Enter constant value
$00_{hex}/0F_{hex}$	Invert TI bit

4. Process output buffer:

01	Copy constant value

Process input buffer:

$00_{hex}/0F_{hex}$	Set AE bit

5. Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

6. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AE bits

7 Device Functions

7.4.6 Command: Initialize data carrier for CRC

The sequence for CRC initialization is similar to a write command. The start address and number of bytes must correspond to the maximum volume of data used.
In the example the complete memory area of a data carrier (752 bytes) is used.
658 bytes on the data carrier are available as data bytes, since 94 bytes are required for the CRC.

Controller **Identification system**

1. Process output buffer (note sequence):

01_{hex}	Command designator 12_{hex}
02_{hex}	Start address 00_{hex}
03_{hex}	Start address 00_{hex}
04_{hex}	No. of bytes 92_{hex}
05_{hex}	No. of bytes 02_{hex}
$00_{hex}/0F_{hex}$	Set AV bit

2. Process input buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit, invert TO bit

3. Process output buffer:

$01…0E_{hex}$	Enter first 14 bytes
$00_{hex}/0F_{hex}$	Invert TI bit

4. Process output buffer:

$01…0E_{hex}$	Copy first 14 bytes

Process input buffer:

$00_{hex}/0F_{hex}$	Invert TO bit

5. Process output buffer:

$01…0E_{hex}$	Enter second 14 bytes
$00_{hex}/0F_{hex}$	Invert TI bit

6. Process output buffer:

$01…0E_{hex}$	Copy second 14 bytes

Process input buffer:

$00_{hex}/0F_{hex}$	Invert TO bit

95. Process output buffer:

$01…08_{hex}$	Enter last bytes
$00_{hex}/0F_{hex}$	Invert TI bit

96. Process output buffer:

$01…08_{hex}$	Copy last bytes

Process input buffer:

$00_{hex}/0F_{hex}$	Set AE bit

97. Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

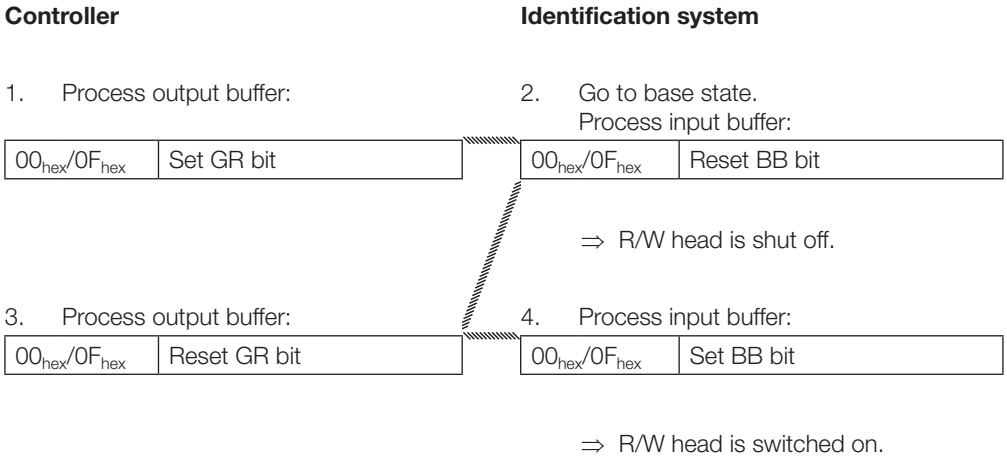
98. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AE bits

7 Device Functions

7.4.7 Command: Place R/W head in base state or turn off R/W head

The read/write head of the identification system can be set to the base state or turned off.



7.4.8 Command: Turn off R/W head antenna

In normal operation the read/write head antenna is turned on. Setting the KA bit turns the antenna off.

Controller

1. Process output buffer:

$00_{hex}/0F_{hex}$	Set KA bit

The antennas are switched back on by resetting the KA bit.

7 Device Functions

7.5 Webserver

The integrated web server of the BIS M-4006 compact processor is used for querying/displaying detailed information about the current status. Resetting the device settings to their original configuration (Factory Reset) is possible.
For connection setup with the web server, enter the IP address of the module in the address line of the browser. Please use Internet Explorer 10 or higher.

Navigation

Clicking on the icons in the navigation bar in the upper section of the web server allows the various pages of the web server to be opened.

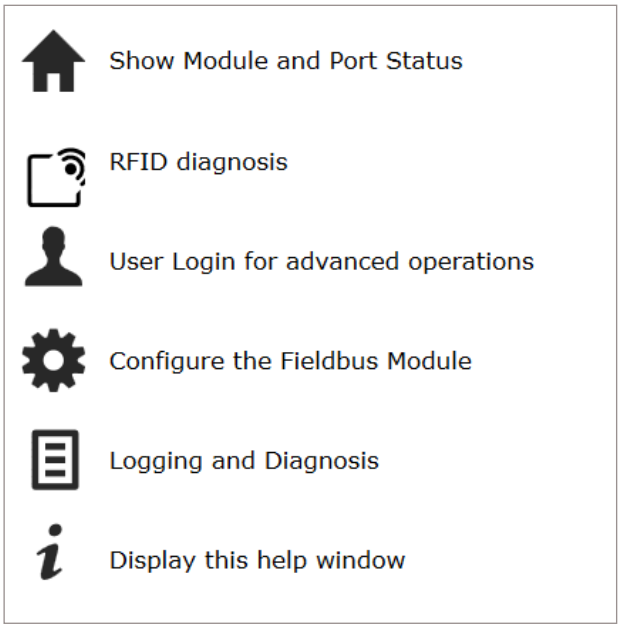


Figure 10: Navigation bar icons

Note
The active page is indicated by the highlighting of the icon and the icon text in the navigation bar.

7 Device Functions

Home

Here the information about the configuration and network activity of the compact processor are shown. The device image is dynamic. The animated LEDs correspond to the current device status. The "Get EDS" button allows you to download the needed EDS file and the associated icon as a ZIP file from the device.

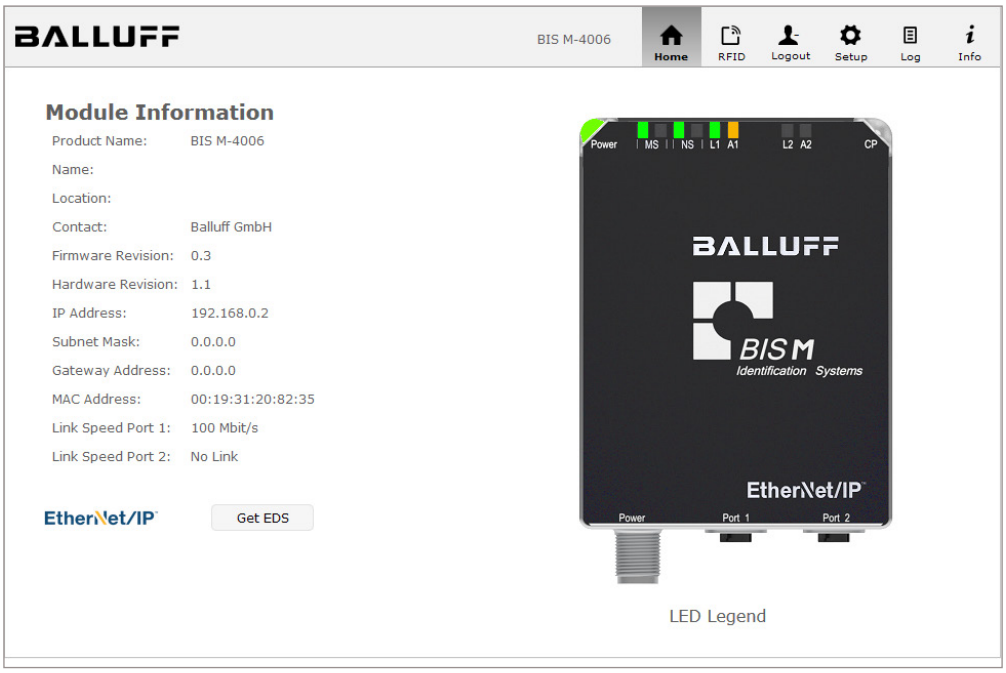


Figure 11: Webserver Home

LED Legend

Click on the "LED_Legend" link to see an explanation of the device status.

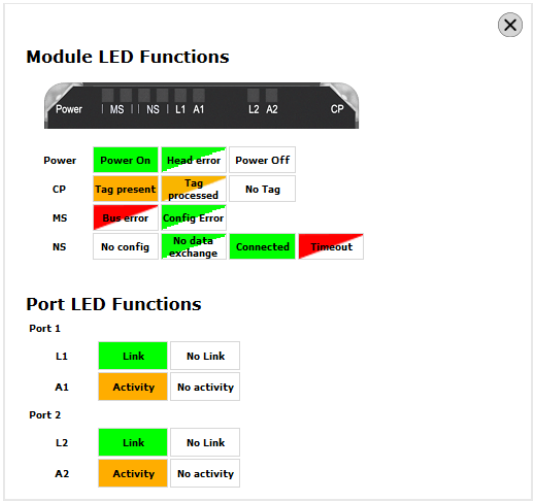


Figure 12: Webserver LED legend

7 Device Functions

RFID

This page shows information about the current process data and the parameter settings. These are the parameters set for the RFID unit during project planning. Use the checkbox to turn display of the process data exchange on and off. If there is no process data exchange with a master currently taking place, "No Data transfer with PLC" is shown.

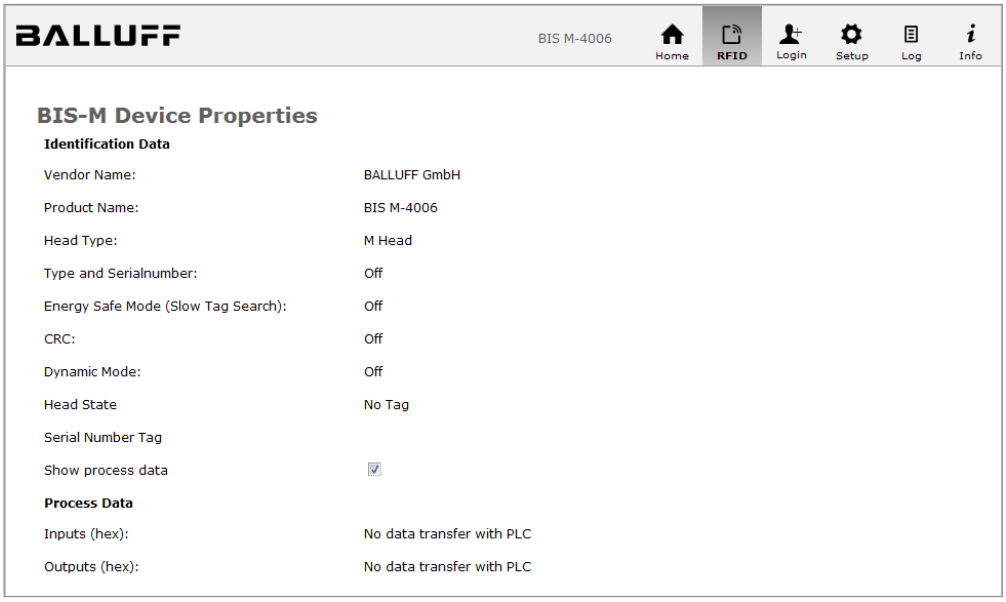


Figure 13: Webserver RFID read/write head

Note
The process data display is refreshed every second. The displayed process data may therefore differ from the actual process data for the controller.
Furthermore, the system is slowed down since the process data are obtained from the firmware. This function should therefore only be used for diagnostics purposes or for startup.

7 Device Functions

Setup/ Configurations

The Setup/Configurations page requires entry of a user name and password. This is done using the User Logins page.

Figure 14: Webserver user login

Password: BISMEIP

The module description and module position of the BIS M-4006 device can be edited on this page. The network parameters for the device can be set here.

Selecting the IP-Control assigns the network address via DHCP, as a static address and with the manufacturer's address 192.168.1.1.
Factory default for IP-Control is DHCP.

Clicking on "Save Configuration“ saves the setting in the device. This set configuration takes effect with the next restart.

► To restart the device, click on the "Restart" button.

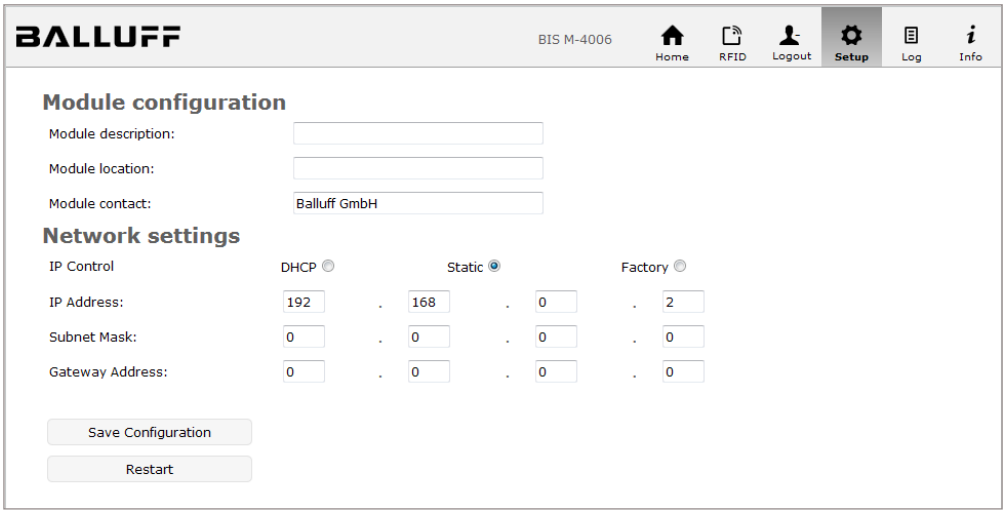


Figure 15: Webserver module configuration

7 Device Functions

Note
If the device is used in DHCP mode, it no longer has an IP address. A new address must be assigned using a DHCP server.
Any change to the IP setting may cause interruption of bus communication with the PLC.

Log

This page is used for device diagnostics. The diagnostics messages are summarized in a list. The messages are differentiated by meaning, origin, time stamp and error description. Some diagnostics messages are also stored in a file in flash memory. This file can be exported to the connected PC using the "Export Web Log“ button. The "Clear Log“ button clears the temporary Web log entries. This function has no effect on the entries stored in the file and can only be performed after a user login. The "Set Module Time“ button sends the current browser time to the device. The "Update Log“ button updates the page and the associated entries.

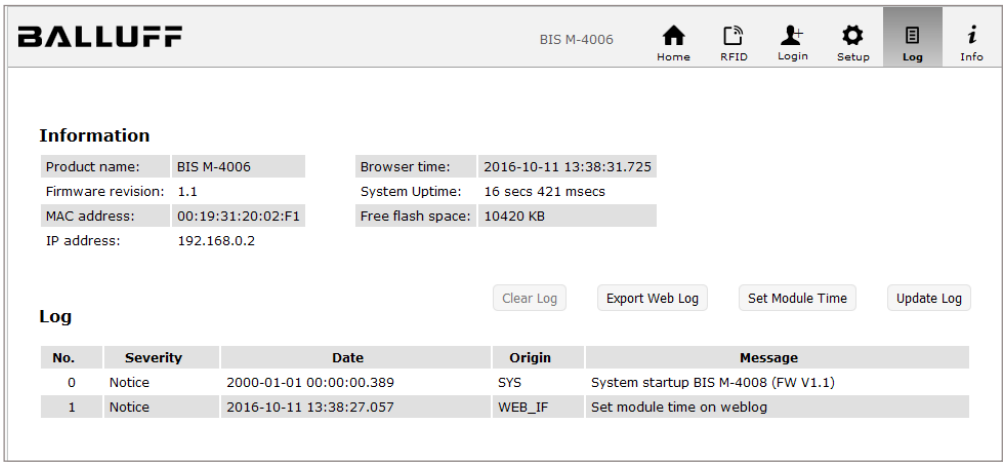


Figure 16: Webserver log page

Note
If a more precise time stamp is needed for the diagnostics, when restarting the device the time must be sent to the device using the "Set Module Time" button. This time indication is based on the "browser" time. Sending takes several seconds, so that a slight time offset results. If no time is sent to the device, the time is incremented starting at 2000 -01 -01…….

7 Device Functions

Logout

Exiting the expanded functions „Setup/Configurations“ is done by clicking on the „Logout“ button in the navigation line.

Figure 17: Webserver logout

Info

Display of the contact data for Balluff and legend for the navigation elements in the menu line.

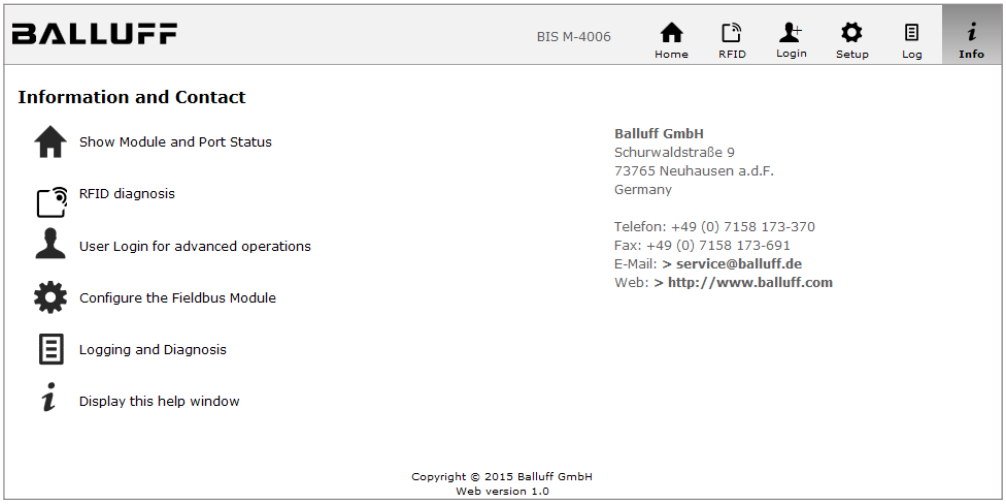
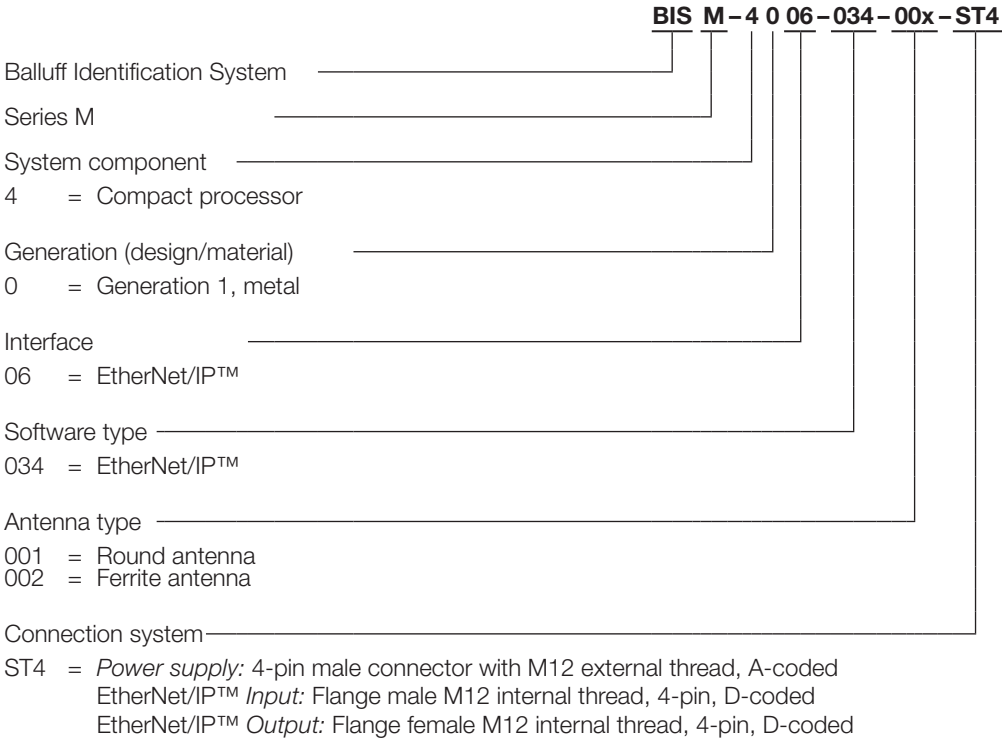


Figure 18: Webserver information and contact

Appendix

Type code



Accessories (optional, not included in the scope of delivery)

Note
For other BIS M-4006 accessories see www.balluff.com.

Appendix

ASCII table

Decimal	Hex	Control code	ASCII	Decimal	Hex	ASCII	Decimal	Hex	ASCII
0	00	Ctrl @	NUL	43	2B	+	86	56	V
1	01	Ctrl A	SOH	44	2C	,	87	57	W
2	02	Ctrl B	STX	45	2D	-	88	58	X
3	03	Ctrl C	ETX	46	2E	.	89	59	Y
4	04	Ctrl D	EOT	47	2F	/	90	5 A	Z
5	05	Ctrl E	ENQ	48	30	0	91	5B	[
6	06	Ctrl F	ACK	49	31	1	92	5C	\
7	07	Ctrl G	BEL	50	32	2	93	5D	[
8	08	Ctrl H	BS	51	33	3	94	5E	^
9	09	Ctrl I	HT	52	34	4	95	5F	_
10	0 A	Ctrl J	LF	53	35	5	96	60	`
11	0B	Ctrl K	VT	54	36	6	97	61	a
12	0C	Ctrl L	FF	55	37	7	98	62	b
13	0D	Ctrl M	CR	56	38	8	99	63	c
14	0E	Ctrl N	SO	57	39	9	100	64	d
15	0F	Ctrl O	SI	58	3 A	:	101	65	e
16	10	Ctrl P	DLE	59	3B	;	102	66	f
17	11	Ctrl Q	DC1	60	3C	<	103	67	g
18	12	Ctrl R	DC2	61	3D	=	104	68	h
19	13	Ctrl S	DC3	62	3E	>	105	69	i
20	14	Ctrl T	DC4	63	3F	?	106	6 A	j
21	15	Ctrl U	NAK	64	40	@	107	6B	k
22	16	Ctrl V	SYN	65	41	A	108	6C	L
23	17	Ctrl W	ETB	66	42	B	109	6D	m
24	18	Ctrl X	CAN	67	43	C	110	6E	n
25	19	Ctrl Y	EM	68	44	D	111	6F	o
26	1 A	Ctrl Z	SUB	69	45	E	112	70	p
27	1B	Ctrl [	ESC	70	46	F	113	71	q
28	1C	Ctrl \	FS	71	47	G	114	72	r
29	1D	Ctrl]	GS	72	48	H	115	73	s
30	1E	Ctrl ^	RS	73	49	I	116	74	t
31	1F	Ctrl _	US	74	4 A	J	117	75	u
32	20		SP	75	4B	K	118	76	v
33	21		!	76	4C	L	119	77	w
34	22		„	77	4D	M	120	78	x
35	23		#	78	4E	N	121	79	y
36	24		$	79	4F	O	122	7 A	z
37	25		%	80	50	P	123	7B	{
38	26		&	81	51	Q	124	7C	|
39	27		‘	82	52	R	125	7D	}
40	28		(	83	53	S	126	7E	~
41	29		)	84	54	T	127	7F	DEL
42	2 A		*	85	55	U			

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innovating automation

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