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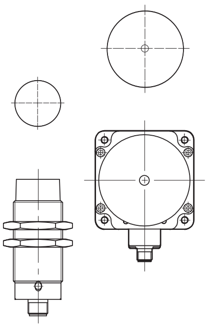
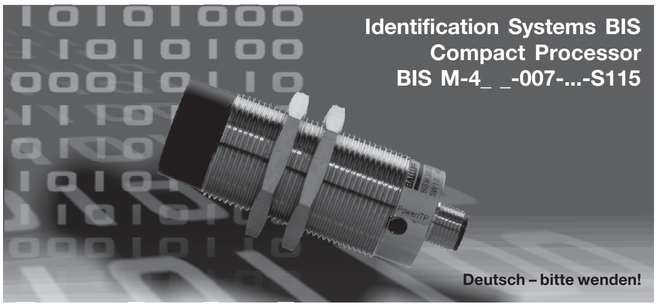


Manual



Identification Systems BIS
Compact Processor
BIS M-4_ _-007-...-S115

Deutsch – bitte wenden!

2

No. 854 304 D/E • Edition 0910
Subject to modification.
Replaces edition 0706.

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Contents

Safety Notes

Proper use and operation

BIS M-4_ _ processor together with the other BIS M system components comprise the Identification System and may only be used for this purpose in industrial applications corresponding to Class A of the EMC Directive.

Installation and operation

Installation and operation are permitted by trained specialists only. Unauthorized modifications and improper use will result in loss of the right to make warranty and liability claims.

When installing the processor, follow exactly the connection diagrams provided later in this document. Take special care when connecting the processor to external controllers, especially with respect to the selection and polarity of the connections including the power supply.

Only approved power supplies may be used. For specific information, see the Technical Data section.

Deployment and inspection

When deploying the identification system, all relevant safety regulations must be followed. In particular, measures must be taken to ensure that any defect in the identification system does not result in a hazard to persons or equipment.

This includes maintaining the permissible ambient conditions and regular inspection for proper function of the identification system and all the associated components.

Malfunction

At the first sign that the identification system is not working properly, it should be taken out of service and guarded against unauthorized use.

Scope

This document applies to the processor BIS M-40_-007-00_-0_-S115 (Software version V1.4, Hardware version V2.0 and higher).

Introduction
BIS M-4_ _ Identification System

This manual is intended to guide the user in installing and commissioning the components in the BIS M-4_ _ identification system, so that start-up time is reduced to an absolute minimum.

Principle

The BIS M-4_ _ identification system belongs to the category of

non-contacting systems,
which can both read and write.

This dual function permits uses where not only information permanently stored in the data carrier can be transported, but also current information can be collected and transported.

Applications

The main areas of application include

– in production for controlling material flow
(e.g., for part-specific processes),
in workpiece transport using conveying systems,
for obtaining safety-relevant data,

– in process materials organization.

System component function

The processor and the read head form a compact unit which is contained in a housing.

The data carrier represents an independent unit. It does not require line-fed power and receives its energy from the integrated read head in the BIS M-4_ _ identification system. The read head continuously sends a carrier signal which supplies the data carrier as soon as the latter has reached the required distance from the read head. The read/write process takes place during this phase. This may be static or dynamic. The data are output serially and made available to the host system. These host systems may be:

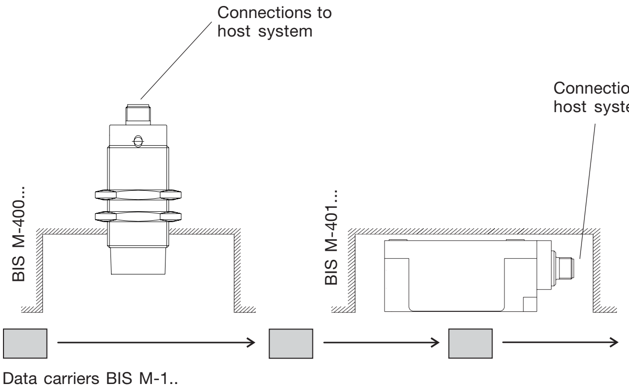
– a control computer (e.g., industrial PC) having a serial port, or
– a programmable logic controller (PLC).

Introduction
BIS M-4_ _ Identification System

System components

The main components of the BIS M-4_ _ identification system are

– the processor with integrated read head, and
– the data carrier(s).



Schematic representation of an identification system (example)

BIS M-4_ _ Processor
Basic knowledge for application

Data integrity with CRC_16

When sending data between the read/write head and the data carrier a procedure is required for recognizing whether the data were correctly read or written.

The processor is supplied with standard Balluff procedure of double reading and comparing. In addition to this procedure a second alternative is available: CRC_16 data checking.

Here a test code is written to the data carrier, allowing data to be checked for validity at any time or location.

Advantages of CRC_16	Advantages of double reading
Data checking even during the non-active phase (CT outside read/write head zone).	No bytes on the data carrier need to be reserved for storing a check code.
Shorter read times since each page is read only once.	Shorter write times since no CRC needs to be written.

Since both variations have their advantages depending on the application, the user is free to select which method of data checking he wishes to use (see Configuration 🕮 8-16).

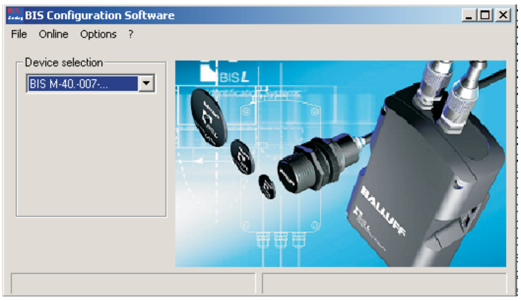
To use the CRC check method, the data carriers must be initialized. You use either data carriers with the data map factory configured (all data are 0), or you must use the processor to write the special initialization command 'Z' to the data carriers.

It is not permitted to operate the system using both check procedures!

Configuration

Before programming, the processor configuration must be carried out, in case the factory settings will not be used.

Configuration is done using a computer and the Balluff software *Configuration software BIS*, and it is stored in the processor. It may be overwritten at any time. The configuration can be stored in a file, making it accessible when required.

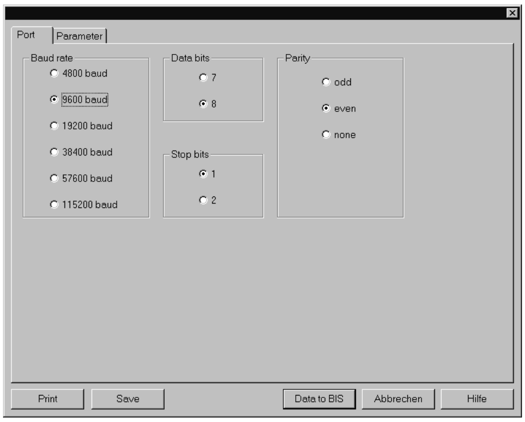


☞ No data carrier is allowed in front of the read head while configuring the processor.

Configuration

Interface
BIS M-40.-007-...

The first screen shows the parameters baud rate, number of data and stop bits, and parity type for the serial interface selected. The graphic shows the factory settings. The other settings are carried out in the corresponding masks which are illustrated in the following 🗐.



Baud rate
○ 4800 baud
● 9600 baud
○ 19200 baud
○ 38400 baud
○ 57600 baud
○ 115200 baud

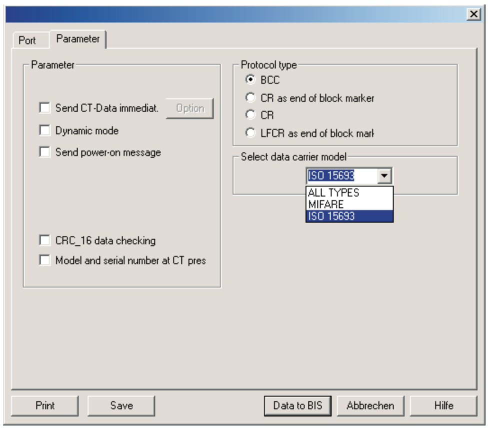
Data bits
○ 7
● 8

Stop bits
● 1
○ 2

Parity
○ odd
● even
○ none

Configuration

Parameters
BIS M-40.-007-...



Parameter
□ Send CT-Data immediat.
□ Dynamic mode
□ Send power-on message
□ CRC_16 data checking
□ Model and serial number at CT pres

Protocol type
● BCC
○ CR as end of block marker
○ CR
○ LFCR as end of block marl

Select data carrier model
ISO 15693
ALL TYPES
MIFARE
ISO 15693

Configuration

Protocol Type

Operation with blockcheck BCC is factory set. For host devices which require a terminator, the additional use of Carriage Return 'CR' or Line Feed with Carriage Return 'LF CR' is made available. The following page contains examples of the various possibilities.

Examples for terminating telegrams:

Protocol Variants	Telegram with command, Address and no. of bytes	End	Acknow-ledge	Terminator
with blockcheck BCC	'R 0000 0001'	BCC	<ACK> '0'	
with Carriage Return	'R 0000 0001'	'CR'	<ACK> '0'	
with Terminator Carriage Return	'R 0000 0001'	'CR'	<ACK> '0'	'CR'
with Terminator Carriage return and Line feed	'R 0000 0001'	'LF CR'	<ACK> '0'	'LF CR'

Configuration

Parameters

– **Immediately send CT data**
Each time another data carrier is detected, it is read according to the configuration and the data are output. This setting eliminates the read command in dialog mode.

– **Dynamic Mode**
This function switches off the error-message "No data carrier present", i.e.:
-> In dynamic mode, a read or write telegram is stored until a data carrier enters the working range of the corresponding read/write head.
-> Without dynamic mode, a read or write telegram is acknowledged with an error message (<NAK> '1') if there is no data carrier present in front of a read/write head; the processor goes into the ground state.

– **Send power-on message**
If this function is activated, the processor sends the device name and software version as soon as power is turned on.

– **Serial number when CT Pres.**
If the function "Type and serial number when CT pres." is parameterized, the number of the data carrier type followed by the 8-byte unique serial number (at Mifare 4 bytes + 4 bytes '0_{Hex}') is sent.

Configuration

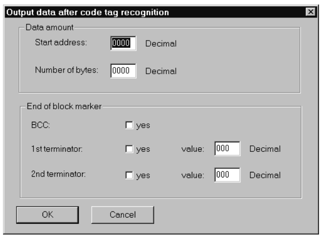
Parameters
(continued)

Read and send data carrier data without direct command:

The specified data amount (number of bytes beginning at start address) is read from the newly detected data carrier.

After reading, the data are automatically output.

If desired, a BCC and/or 1 or 2 freely definable terminators may be sent also.



Output data after code tag recognition

Data amount

Start address: 0000 Decimal

Number of bytes: 0000 Decimal

End of block marker

BCC: □ yes

1st terminator: □ yes value: 000 Decimal

2nd terminator: □ yes value: 000 Decimal

Configuration

Parameters
(continued)

– CRC_16 initialization

To be able to use the CRC_16 check, the data carrier must first be initialized with the command identifier Z (see 🗋 28). The CRC_16 initialization is used like a normal write job. The latter is rejected (with an error message) if the processor recognizes that the data carrier does not contain the correct CRC_16 checksum. Data carriers as shipped from the factory (all data are 0) can immediately be written with CRC-checked data.

If CRC_16 data checking is activated, a special error message is output to the interface whenever a CRC_16 error is detected.

If the error message is not caused by a failed write request, it may be assumed that one or more memory cells on the data carrier is defective. That data carrier must then be replaced.

If the CRC error is however due to a failed write request, you must reinitialize the data carrier in order to continue using it.

Configuration

CRC_16 and Codetag Present

If CRC_16 was parameterized and a data carrier is recognized whose CRC_16 checksum is incorrect, the read data are not output. The CT present LED comes on and the digital output is set - the data carrier can be processed using the initialization command (**Z**).

CRC_16

The checksum is written to the data carrier as a 2-byte datum for each CRC block (corresponds to 16 bytes). 2 bytes are used (lost) for each CRC block, i.e., the CRC block contains only 14 bytes of user data. This means that the actual usable number of bytes is reduced:

Supported data carriers and memory capacity

Mifare

Balluff data carrier type	Manufacture	Name	Memory capacity	Usable bytes using CRC	Memory type
BIS M-1_ _-**01**	Philips	Mifare Classic	752 Byte	658 Byte	EEPROM

ISO15693

Balluff data carrier type	Manufacture	Name	Memory capacity	Usable bytes using CRC	Memory type
BIS M-1_ _-**02**	Fujitsu	MB89R118	2000 Byte	1750 Byte	FRAM
BIS M-1_ _-**03**[1]	Philips	SL2ICS20	112 Byte	98 Byte	EEPROM
BIS M-1_ _-**04**[1]	Texas Inst.	TAG-IT Plus	256 Byte	224 Byte	EEPROM
BIS M-1_ _-**05**[1]	Infineon	SRF55V02P	224 Byte	196 Byte	EEPROM
BIS M-1_ _-**06**[1]	EM	EM4135	288 Byte	252 Byte	EEPROM
BIS M-1_ _-**07**[1]	Infineon	SRF55V10P	992 Byte	868 Byte	EEPROM

[1] on request

Configuration

Data carrier type

Select the data carrier type, you want to process:

- **ALL TYPES**
- **MIFARE**
- **ISO 15693**

ALL TYPES: All data carriers supported by Balluff can be processed.

MIFARE: All Mifare data carriers supported by Balluff can be processed.

ISO 15693: All ISO15693 data carriers supported by Balluff can be processed.

(See 🗋 15 "Supported data carriers and memory capacity".)

Programming Information

The preceding sections describe basic telegram sequence, and configuration and wiring of the interfaces. What now follows is information about the proper construction of the telegrams themselves.

Specific telegrams exist in the BIS M Identification System for particular tasks. They always begin with the command which is associated with the telegram type.

Telegram types with their associated commands (ASCII characters)

'L'	Read the data carrier with 2-byte reservation
'P'	Write to the data carrier with 2-byte reservation
'C'	Write a constant value to the data carrier with read/write select with 2-byte reservation
'R'	Read the data carrier
'W'	Write to the data carrier
'Q'	Restart the processor (acknowledge)
'Z'	Initialize CRC_16 data check
'U'	Read data carrier ID and output with status byte.

Please note:
– Continuous querying on the interface is not permitted!

Programming Information

Telegram Contents

Start address and no. of bytes	The start address (A3, A2, A1, A0) and the number of bytes to send (L3, L2, L1, L0) are sent in decimal as ASCII characters. For the start address, the range 0000 to "memory capacity -1" can be used, and for the number of bytes 0001 to "memory capacity". A3 ... L0 represent one ASCII character each. **Please note:** Start address + number of bytes may not exceed 1024 bytes.
Reserved	The commands 'L' (read data carrier with L-command), 'P' (write to data carrier with P-command), 'C' (write to the data carrier with C-command) and 'Z' (initialize CRC_16 data check) cause the 2 bytes given after the address and the number of 8 bytes to be read/written to be reserved with '1'.
Acknowledge	The acknowledgement <ACK> '0' is sent by the Identification System if the serially transmitted characters were recognized as correct and there is a data carrier in the active zone of a read/write head. In the 'R' command, the <ACK> '0' is only sent if the data is ready for transmission. <NAK> + Error No.' is sent if an error was recognized or if there is no data carrier in the active zone of a read/write head.
Start	<STX> starts the data transmission.
Transmitted Bytes	The data are transmitted code transparent (no data conversion).

Programming Information

BCC Block Check

The BCC block check is formed as an EXOR of the serially transmitted binary characters of the telegram block. Example: Read 128 bytes starting at address 13.
The command line without BCC is: 'L 0013 0128 11'. The BCC is formed:

	'L	=	0100 1100	EXOR	
	0	=	0011 0000	EXOR	
	0	=	0011 0000	EXOR	
	1	=	0011 0001	EXOR	
	3	=	0011 0011	EXOR	
	0	=	0011 0000	EXOR	
	1	=	0011 0001	EXOR	
	2	=	0011 0010	EXOR	
	8	=	0011 1000	EXOR	
	1	=	0011 0010	EXOR	
	1'	=	0011 0000	EXOR	
Block check result:	BCC	=	0100 0101	=	'E'

Variants for finish with BCC, Terminator

If necessary the finish using block check BCC can be replaced with a special ASCII character. This is:

– Carriage Return 'CR'

For hosts which always require a terminator character, this must always be included in the telegrams. Available are:

– Carriage Return 'CR' or
– Line Feed with Carriage Return 'LF CR'.

The various protocol variants are represented on the following 🗋.
See also: Configuration starting on 🗋 8.

Programming Information

Description of Various Protocol Variants

Reference is now made to the command string 'L 0013 0128 11 E' with 'E' as BCC (see preceding 🗋). This command string is here shown in its possible variants; also shown are the various forms of acknowledgement with and without terminator:

Command line from host system to BIS	Acknowledge from BIS for correct reception	Acknowledge from BIS for incorrect reception
with BCC but no terminator 'L 0013 0128 11 E'	No terminator <ACK> '0'	No terminator <NAK> '1'
with 'CR' instead of BCC, no terminator 'L 0013 0128 11 CR'	No terminator <ACK> '0'	No terminator <NAK> '1'
no BCC, with terminator 'CR' 'L 0013 0128 11 CR'	with terminator 'CR' <ACK> '0 CR'	with terminator 'CR' <NAK> '1 CR'
no BCC, with terminator 'LF CR' 'L 0013 0128 11 LF CR'	with terminator 'LF CR' <ACK> '0 LF CR'	with terminator 'LF CR' <NAK> '1 LF CR'

For <NAK> with error number a '1' was used here (no data carrier present) as an error example.

The respective positions for the additional terminator are shown in the tables in italics.

Programming Information

Read from data carrier with command L
Write to data carrier with command P

Task	Data Flow	Com-mand	Start address of first byte to be sent	Number of bytes to be sent	re-serv-ed		End 2)	Acknow-ledge 3)	*Termi-nator 4)*	Start trans-mission	*Termi-nator 4)*	Data (from start address to start address + no. of bytes)	End 2)	Acknow-ledge 3)	*Termi-nator 4)*
Read	from host system to BIS	**'L'**	A3 A2 A1 A0 '0 0 0 0' to memory capacity -1	L3 L2 L1 L0 '0 0 0 1' to memory capacity 5)	'1'	'1'	BCC or see 2)			<STX>	*'CR' or 'LF CR'*				
	from BIS to host system							<ACK>'0' or <NAK> + Error-No.	*'CR' or 'LF CR'*			D1 D2 D3 ... Dn	BCC or see 2)		
			1)								1)				
Write	from host system to BIS	**'P'**	A3 A2 A1 A0 '0 0 0 0' to memory capacity -1	L3 L3 L1 L0 '0 0 0 1' to 'memory capacity 5)	'1'	'1'	BCC or see 2)			<STX>		D1 D2 D3 ... Dn	BCC or see 2)		
	from BIS to host system							<ACK>'0' or <NAK> + Error-No.	*'CR' or 'LF CR'*					<ACK>'0' or <NAK> + Error-No.	*'CR' or 'LF CR'*
			1)									1)			

1) The command 'Quit' is not permitted at this point.
2) Instead of block check BCC, depending on protocol variant either Carriage Return 'CR' or LIne Feed with Carriage Return may be used.
3) <ACK> '0' is returned as acknowledgement if there is no error, or <NAK> + Error No. if an error occurs.
4) For protocol variants which always require a terminator, either 'CR' or 'LF CR' must be inserted here.
5) The number of bytes to send may **not** exceed 1024 bytes.

Values inside apostrophes represent the respective character(s) in ASCII code.

Programming Information

Telegram example for 🗋21:
Read from data carrier with command L
with block check (BCC)

-> Read 10 bytes starting at address 50 of the data carrier.

The host sends 'L 0050 0010 11 H' BCC (48_{Hex})

Address of first byte to read
Number of bytes to read
reserved

The BIS processor acknowledges with <ACK> '0'
The host system gives the start command <STX>
The BIS processor provides the data from the data carrier 1 2 3 4 5 6 7 8 9 0 '1' BCC (31_{Hex})

Telegram example for 🗋21:
Write to data carrier with command P
with block check (BCC)

-> Write 5 bytes starting at address 100 of the data carrier.

The host sends 'P 0100 0005 11 L' BCC (54_{Hex})

Address of first byte to write
Number of bytes to write
reserved

The BIS processor acknowledges with <ACK> '0'
The host system gives the start command and data <STX> 1 2 3 4 5 '3' BCC (33_{Hex})
The processor acknowledges with <ACK> '0'

Values inside apostrophes represent the respective character(s) in ASCII code.

Programming Information

Writing a constant value in the data carrier with command C

This command can be used to erase a data carrier data. One saves the time for the transmission of the write byte.

Task	Data Flow	Com-mand	Start address of first byte to be sent	Number of bytes to be sent	re-serv-ed		End 2)	Acknow-ledge 3)	*Termi-nator 4)*	Start trans-mission	*Termi-nator 4)*	Data (from start address to start address + no. of bytes)	End 2)	Acknow-ledge 3)	*Termi-nator 4)*
Write	from host system to BIS	**'C'**	A3 A2 A1 A0 '0 0 0 0' to memory capacity -1	L3 L3 L1 L0 '0 0 0 1' to memory capacitity 5)	'1'	'1'	BCC or see 2)			<STX>		D	BCC or see 2)		
	from BIS to host system							<ACK>'0' or <NAK> + Error-No.	*'CR' or 'LF CR'*					<ACK>'0' or <NAK> + Error-No.	*'CR' or 'LF CR'*
			1)									1)			

1) The command 'Quit' is not permitted at this point.
2) Instead of block check BCC, depending on protocol variant either Carriage Return 'CR' or LIne Feed with Carriage Return may be used.
3) <ACK> '0' is returned as acknowledgement if there is no error, or <NAK> + 'Error No.' if an error occurs.
4) For protocol variants which always require a terminator, either 'CR' or 'LF CR' must be inserted here.
5) The number of bytes to send may **not** exceed 1024 bytes.

Data within angle brackets are control characters.
Values inside apostrophes represent the respective character(s) in ASCII code.

Programming Information

Telegram example for 📄23:
Write to data carrier with command C
with block check (BCC)

-> Write 101 bytes of ASCII data value 0 (30_{Hex}) starting at address 20 of the data carrier.

The host sends 'C 0020 0101 11 A' BCC (41_{Hex})

Address of first byte to write
Number of bytes to write
reserved

The BIS processor acknowledges with <ACK> '0'
The host system gives the start command and data <STX> '0 2' BCC (32_{Hex})
The processor acknowledges with <ACK> '0'

Data within angle brackets are control characters.
Values inside apostrophes represent the respective character(s) in ASCII code.

Programming Information

Read from Data carrier, Write to Data carrier

Task	Data Flow	Com-mand	Start address of first byte to send	Number of bytes to send	End 2)	Acknow-ledge 3)	*Termi-nator 4)*	Start trans-mission	*Termi-nator 4)*	Data (from start address to start address + no. of bytes)	End 2)	Acknow-ledge 3)	*Termi-nator 4)*
Read	from host system to BIS	**'R'**	A3 A2 A1 A0 '0 0 0 0' to memory capacity -1	L3 L3 L1 L0 '0 0 0 1' to memory capacity 5)	BCC or see 2)			<STX>	*'CR' or 'LF CR'*				
	from BIS to host system					<ACK>'0' or <NAK> + Error-No.	*'CR' or 'LF CR'*			D1 D2 D3 ... Dn	BCC or see 2)		
			1)										
Write	from host system to BIS	**'W'**	A3 A2 A1 A0 '0 0 0 0' to memory capacity -1	L3 L3 L1 L0 '0 0 0 1' to memory capacity 5)	BCC or see 2)			<STX>		D1 D2 D3 ... Dn	BCC or see 2)		
	from BIS to host system					<ACK>'0' or <NAK> + Error-No.	*'CR' or 'LF CR'*					<ACK>'0' or <NAK> + Error-No.	*'CR' or 'LF CR'*
			1)							1)			

1) The command 'Quit' is not permitted at this point.
2) Instead of block check BCC, depending on protocol variant either Carriage Return 'CR' or LIne Feed with Carriage Return may be used.
3) <ACK> '0' is returned as acknowledgement if there is no error, or <NAK> + Error No. if an error occurs.
4) For protocol variants which always require a terminator, either 'CR' or 'LF CR' must be inserted here.
5) The number of bytes to send may **not** exceed 1024 bytes.

Values inside apostrophes represent the respective character(s) in ASCII code.

Programming Information

Telegram example for ⎘ 25:
Read from Data carrier
with block check (BCC)

Read from Data carrier: -> Read 10 bytes starting at address 50.

The host sends	'R 0050 0010 V' BCC (56_{Hex})
Address of first byte to read	0050
Number of bytes to read	0010
The BIS processor acknowledges with	<ACK> '0'
The host gives the start command	<STX>
The BIS processor provides the data from the data carrier	1 2 3 4 5 6 7 8 9 0 'SOH' BCC (01_{Hex})

Telegram example for ⎘ 25:
Write to Data carrier
with block check (BCC)

Write to Data carrier: -> Write 5 bytes starting at address 100.

The host system sends	'W 0100 0005 S' BCC (53_{Hex})
The BIS processor acknowledges with	<ACK> '0'
The host sends the data	<STX> 1 2 3 4 5 '3' BCC (33_{Hex})
The BIS processor acknowledges with	<ACK> '0'

The 'R' and 'W' commands represent a subtype of the 'L' and 'P' commands.

Values inside apostrophes represent the respective character(s) in ASCII code.

Programming Information

Restart the Processor (Quit)

Sending the Restart command causes a telegram in process to be aborted and puts the processor in the ground state. After this telegram is acknowledged, an approx. 500 ms pause should be allowed before starting a new telegram.

> Important! The Quit command is not permitted while the processor is waiting for a terminator (BCC, 'CR' or 'LF CR'). In this situation, the Quit would be incorrectly interpreted as a terminator or datum.

Task	Data Flow	Command	End 2)	Acknowledge	End 2)
Restart (Quit)	from host system to BIS	**'Q'**	BCC or see 2)		
	from BIS to host system			'Q'	BCC or see 2)
			1)		

1) The command 'Quit' is not permitted at this point.
2) Instead of block check BCC, depending on protocol variant either Carriage Return 'CR' or LIne Feed with Carriage Return may be used.

Telegram example:
Restart the Processor (Quit)
with block check (BCC)

Put the BIS system into the ground state.

The host sends 'Q Q' BCC (51Hex)

The BIS processor acknowledges with 'Q Q' BCC (51Hex)

> Values inside apostrophes represent the respective character(s) in ASCII code.

Programming Information

Initialize CRC_16 data check

This telegram initializes a data carrier located at the read/write head for use of CRC_16 data checking. This telegram must also be send again if a CRC error results from a failed write operation, i.e., the data carrier must be reinitialized in order to use it again.

> **Please note the table on 15!** The indicated number of usable bytes may not be exceeded, i.e., the sum of start address plus number of bytes must not exceed the data carrier memory capacity!

Task	Data Flow	Command	Start address of first byte to be sent	Number of bytes to be sent	reserved		End 2)	Acknowledge 3)	*Terminator 4)*	Start transmission	Data (from start address to start address + no. of bytes)	End 2)	Acknowledge 3)	*Terminator 4)*
Initialize CRC_16 range	from host system to BIS	**'Z'**	A3 A2 A1 A0 '0 0 0 0' to usable bytes at CRC -1	L3 L3 L1 L0 '0 0 0 1' to usable bytes at CRC -1	'1'	'1'	BCC or see 2)			<STX>	D1 D2 D3 .... Dn	BCC or see 2)		
	from BIS to host system							<ACK>'0' or <NAK> + Error-No.	*'CR' or 'LF CR'*				<ACK>'0' or <NAK> + Error-No.	*'CR' or 'LF CR'*
			1)								1)			

1) The command 'Quit' is not permitted at this point.
2) Instead of BCC block check, depending on the protocol variant either Carriage Return 'CR' or Line Feed with Carriage Return 'LF CR' may be used.
3) <ACK> '0" is sent as an acknowledgement if there was no error, or <NAK> + 'Error-No.' if there was an error.
4) For protocol variants which always need a terminator, either 'CR' or 'LF CR' must be inserted here.

> The characters between the apostrophes represent the respective ASCII character(s). '_' = Space = ASCII 20Hex.

Programming Information

Query status byte, data carrier type, data carrier ID

With the telegram the status byte (Tag Present), data carrier type and data carrier ID of data carriers are read and sent. In contrast to the standard command, here the reply is not an <ACK> or <NAK>, but rather a fixed data telegram.

Task	Data Flow	Command	End 2)	Status message	End 2)
Check Status Message	From host system to BIS	**'U'**	BCC or see 2)		
	From BIS to host system			S1 Type1 ID1	BCC or see 2)
			1)		

1) The Command 'Quit' is not permitted at this point.
2) Instead of BCC block check, depending on the protocol variant either Carriage Return 'CR' or Line Feed with Carriage Return 'LF CR' may be used.

S1 = Status byte ('1' no data carrier; '0' data carrier)
Typ1 = Number of the data carrier type (see 15 "Supported data carriers and memory capacity")
ID1 = ID of the data carrier type is 8 bytes long (at Mifare 4 Byte + 4 Byte '0_{Hex}')

Telegram example:
Query status byte, data carrier type and data carrier ID

The host sends	'U U' BCC (55_{Hex})	
The BIS processor acknowledges with	'0☺123400005' BCC (35_{Hex})	if a data carrier was recognized
The BIS processor acknowledges with	'1xxxxxxxxx1' BCC (31_{Hex})	if no data carrier was recognized (x = 'NUL')

Values inside apostrophes represent the respective character(s) in ASCII code.

Error Numbers

Error Numbers

The BIS M-4_ _ always outputs an error number. The meaning of these error numbers is indicated in the following table.

No.	Error Description	Effect	
1	No data carrier present	Telegram aborted, processor goes into ground state.	
2	Read error	Read telegram aborted, processor goes into ground state. Possible read error: - data carrier removed - Key false	
4	Write error	Write telegram aborted, processor goes into ground state. Possible write error: - data carrier removed - Key false	**CAUTION:** An aborted write could cause new data to be written to the data carrier which may be incomplete! *)
6	Interface error	Processor goes into ground state. (parity or stop bit error)	
7	Telegram format error	Processor goes into ground state. Possible format errors: - Command is not 'L', 'P', 'C', 'R', 'W', 'Z' or 'U'. - Start address or number of bytes exceed permissible range	

*) **Note:** If a CRC data check is used, error message “E” could result if error 4 was not cleared.

Error Numbers

Error Numbers
(continued)

No.	Error Description	Effect
8	BCC error, the transmitted BCC is wrong	Telegram is aborted, processor goes into ground state.
D	CT error	Bad CT signal, processor goes into ground state.
E	CRC error: the CRC on the data carrier is wrong. *)	Telegram aborted, processor goes into ground state.

*) **Note:** If a CRC data check is used, error message “E” could result if in the preceding command error 4 was reported.

Read/Write Times

Read times

Data carrier with each 16 bytes/block	BIS M-1_ _-01	BIS M-1_ _-02
Time for data carrier recognition/serial ID	≤ 20 ms	≤ 30 ms
Read bytes 0 to 15	≤ 20 ms	≤ 30 ms
For each additional 16 bytes add another	≤ 10 ms	≤ 15 ms

Write times

Data carrier with each 16 bytes/block	BIS M-1_ _-01	BIS M-1_ _-02
Time for data carrier recognition/serial ID	≤ 20 ms	≤ 30 ms
Write bytes 0 to 15	≤ 40 ms	≤ 65 ms
For each additional 16 bytes add another	≤ 30 ms	≤ 45 ms

☞ Variations in the ms range are possible.
Electrical interference may increase the read/write times.

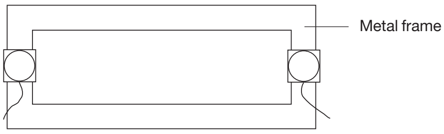
☞ All data are typical values. Deviations are possible depending on the application and combination of read/write head and data carrier!
The data apply to static operation, no CRC_16 data checking.

BIS M-4_ _ Installation

Installing the BIS M-4_ _, permissible distances

When installing two BIS M-400 on a metal base, there is normally no mutual interference. If a metal frame is located in an unfavorable location, problems may result when reading out the data carriers. In this case the read distance will be reduced to 80 % of the maximum value.

Testing is recommended in critical applications !



Distance from data carrier to data carrier

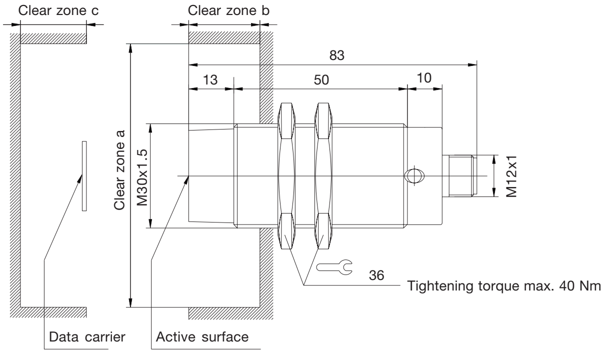
	BIS M-101-01/L BIS M-108-02/L BIS M-110-02/L BIS M-111-02/L	BIS M-102-01/L BIS M-112-02/L	BIS M-105-01/A BIS M-122-02/A	BIS M-120-01/L	BIS M-150-02/A BIS M-151-02/A
BIS M-400-007-00_-..	> 10 cm	> 15 cm	> 10 cm	-	-
BIS M-401-007-001-..	> 20 cm	> 20 cm	-	> 25 cm	-
BIS M-451-007-001-..	-	-	-	-	> 25 cm

Minimum distance from read head to read head:

BIS M-400-007-00_-... => min. 20 cm
BIS M-401-007-001-... => min. 60 cm
BIS M-451-007-001-... => min. 60 cm

BIS M-400-007-001-_ _-S115 Installation

Installation and permissible distances



BIS M-400-007-001-_ _-S115 Installation

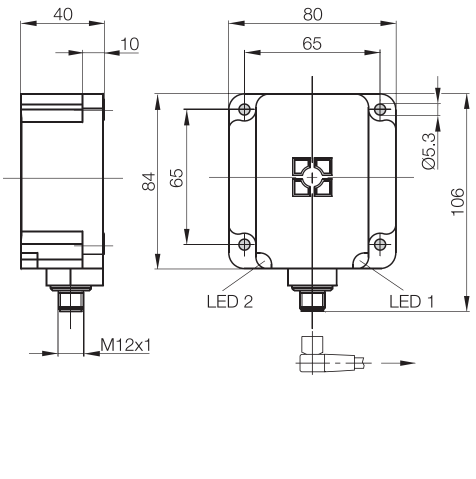
Characteristic data by data carrier

Characteristic data by data carrier (installed in clear zone)	at v = 0 (static condition)						Clear zone		
	Dis-tance (mm)	Center axis offset at a distance of: (mm)					a	b	c
		5	15	20	30	35			
BIS M-101-01/L	0-20	±14	±10	±5	-	-	100	30	50
BIS M-102-01/L	0-28	±20	±20	±15	-	-	150	30	50
BIS M-105-01/A	0-7	±7	-	-	-	-	100	20	20
BIS M-105-02/A	0-11	±8	-	-	-	-	100	20	20
BIS M-108-02/L	0-28	±16	±14	±14	-	-	100	30	25
BIS M-110-02/L	0-20	±12	±8	±5	-	-	100	30	25
BIS M-111-02/L	0-28	±16	±14	±14	-	-	100	30	25
BIS M-112-02/L	0-38	±22	±20	±20	±16	±10	150	30	50
(Data carrier is flush installed)									
BIS M-108-02/L	0-16	±10	±6	-	-	-	100	30	-

	Speed in m/s							
	read							
min. distance	9	10	3,5	3,5	9	8	9	14
DT BIS M-...	101-01/L	102-01/L	105-01/A	105-02/A	108-02/L	110-02/L	111-02/L	112-02/L
ID No.	2.4	3.3	1.25	0.93	1.6	1.33	1.6	2.4
No. of bytes 16	1.65	2.2	0.8	0.55	1	0.76	1	1.3
32	1.5	1.8	0.7	0.42	0.8	0.65	0.8	1
48	1.28	1.58	0.5	0.38	0.6	0.5	0.6	0.86
64	1.1	1.4	0.4	0.3	0.5	0.43	0.5	0.7
	write							
min. distance	9	10	3.5	3.5	9	8	9	14
No. of bytes 16	1.05	1.45	0.52	0.27	0.7	0.5	0.7	0.9
32	0.73	1.1	0.38	0.19	0.45	0.33	0.45	0.6
48	0.58	0.8	0.2	0.15	0.36	0.23	0.36	0.48
64	0.48	0.65	0.15	0.12	0.28	0.17	0.28	0.38

BIS M-401-007-001-_ _-S115 Installation

Installation and permissible distances



BIS M-401-007-001-_ _-S115 Installation

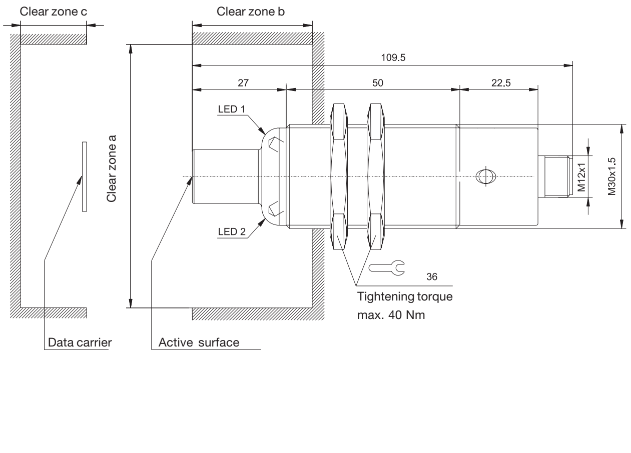
Characteristic data by data carrier

Characteristic data by data carrier (installed in clear zone)	at v = 0 (static condition)						Clear zone		
	Dis-tance (mm)	Center axis offset at a distance of: (mm)							
		20	30	40	50	60	a	b	c
BIS M-101-01/L	0-28	±15	-	-	-	-	200	70	50
BIS M-102-01/L	0-45	±30	±24	±15	-	-	200	70	50
BIS M-120-01/L	0 - 50	x ±40	±40	±28	±4	-	250	70	80
		y ±30	±28	±18	±4	-			
BIS M-108-02/L	0-40	±25	±20	±15	-	-	200	50	70
BIS M-110-02/L	0-30	±20	±10	-	-	-	200	50	70
BIS M-111-02/L	0-40	±25	±20	±15	-	-	200	50	70
BIS M-112-02/L	20-60	-	±35	±35	±25	±25	200	50	70

	Speed in m/s						
	read						
min. distance	9	14	15	10	9	12	20
DT BIS M-...	101-01/L	102-01/L	120-01/L	108-02/L	110-02/L	111-02/L	112-02/L
ID No.	4.1	4.5	4.8	3.2	2.6	3.2	4.3
No. of bytes 16	2.7	3.8	4.2	1.88	1.4	1.88	2.6
32	2.28	3	3.9	1.56	1.13	1.56	2.3
48	1.76	2.25	3.25	1.25	0.85	1.25	1.8
64	1.5	1.9	3	0.98	0.65	0.98	1.5
	write						
min. distance	9	14	15	10	9	12	20
No. of bytes 16	1.55	2.2	3.1	1.25	0.85	1.25	1.65
32	1.34	1.78	2.25	0.84	0.55	0.84	1.08
48	1	1.3	1.75	0.7	0.38	0.7	0.88
64	0.93	1	1.53	0.5	0.25	0.5	0.78

BIS M-400-007-002-_ _-S115 Installation

Installation and permissible distances



BIS M-400-007-002-_ _-S115 Installation

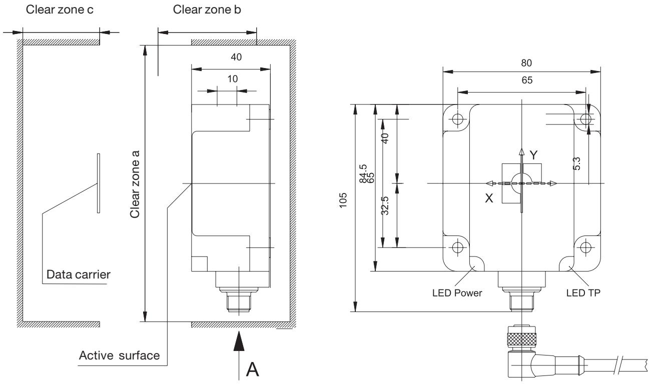
Characteristic data by data carrier

Characteristic data by data carrier (installed in clear zone)	at v = 0 (static condition)						Clear zone		
	Distance (mm) read/ write	Center axis offset at a distance of: (mm)					a	b	c
		5	10	15	20	25			
BIS M-101-01/L	0-15	±9	±6	±4	-	-	100	30	25
BIS M-102-01/L	0-18	±16	±12	±8	-	-	150	30	50
BIS M-105-01/A	0-6	±4	-	-	-	-	100	20	10
BIS M-105-02/A	0-9	±6	-	-	-	-	100	20	10
BIS M-108-02/L	0-20	±14	±12	±10	±7	-	100	30	25
BIS M-110-02/L	0-15	±8	±6	±4	-	-	100	30	25
BIS M-111-02/L	0-20	±12	±10	±10	-	-	100	30	25
BIS M-112-02/L	0-28	±20	±18	±18	±16	±12	150	30	50
(Data carrier is flush installed)									
BIS M-105-01/A	0-5	±2	-	-	-	-	100	20	-
BIS M-105-02/A	0-5	±2	-	-	-	-	100	20	-
BIS M-108-02/L	0-12	±8	±6	-	-	-	100	30	-

	Speed in m/s							
	read							
min. distance	6	7	3,5	3,5	6	5	6	8
DT BIS M-...	101-01/L	102-01/L	105-01/A	105-02/A	108-02/L	110-02/L	111-02/L	112-02/L
ID No.	2	2.6	0.85	0.6	1.3	1	1.3	1.8
No. of bytes 16	1.3	2	0.54	0.38	0.87	0.7	0.87	1.15
32	1	1.75	0.48	0.28	0.66	0.5	0.66	1
48	0.88	1.4	0.38	0.21	0.52	0.4	0.52	0.88
64	0.78	1.3	0.33	0.17	0.48	0.3	0.48	0.73
	write							
min. distance	6	7	3.5	3.5	6	5	6	8
No. of bytes 16	0.9	1.38	0.38	0.25	0.51	0.38	0.51	0.82
32	0.62	1.05	0.24	0.11	0.33	0.25	0.33	0.58
48	0.44	0.78	0.19	0.08	0.27	0.18	0.27	0.4
64	0.38	0.62	0.11	-	0.2	0.15	0.2	0.32

BIS M-451-007-001-_ _-S115 Installation

Installation and permissible distances



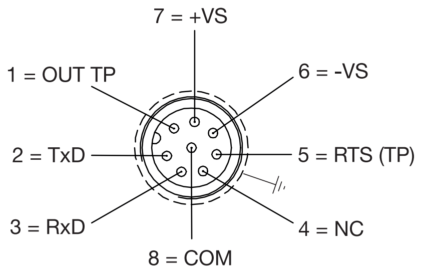
BIS M-451-007-001-_ _-S115 Installation

Characteristic data by data carrier

Characteristic data by data carrier (installed in clear zone)	at v = 0 (static condition)									Clear zone		
	Distance (mm) read/ write	X-axis offset at a distance of: (mm)				Y-axis offset at a distance of: (mm)				a	b	c
		0...10	25	40	50	0...10	25	40	50			
BIS M-150-02/A	0-60	±50	±40	±30	±10	±10	±10	±8	±5	200	70	0
BIS M-151-02/A	0-60	±50	±40	±30	±10	±10	±10	±8	±5	200	70	0
(in air)												
BIS M-150-02/A	0-40	±40	±30	±10	-	±10	±8	±5	-	200	70	-
BIS M-151-02/A	0-5	±40	±30	±10	-	±10	±8	±5	-	100	20	-

BIS M-4_ _-007-_ _ _-00-S115 Installation

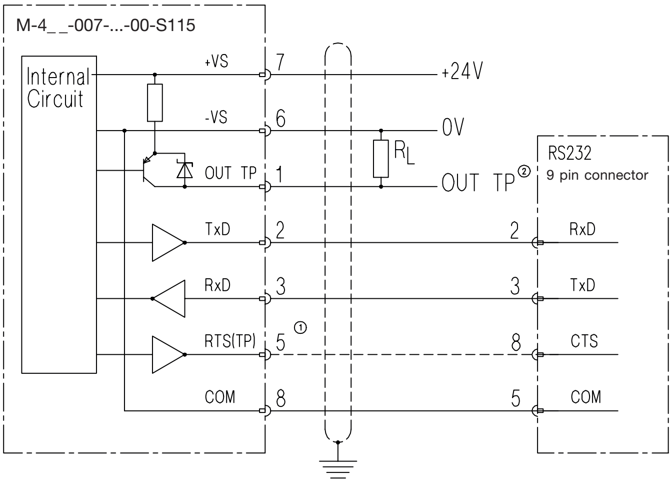
Pin assignments BIS M-4_ _-007-... -00-S115



	RS232 = 00	Color code using cables BKS-S116-PU / -S115-PU
1	OUT TP	yellow
2	TxD	gray
3	RxD	pink
4	NC	red
5	RTS (TP)	green
6	-VS	blue
7	+VS	brown
8	COM	white

BIS M-4_ _-007-_ _ _-00-S115
Interface Information

Interface V.24 / RS232



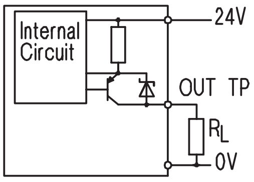
① RTS connection (TP) allows TP display in the BISCOMRW.EXE program.

② OUT TP switches to +24V when there is a data carrier in the capture zone.

BIS M-4_ _-007-_ _ _-00-S115
Connection Diagrams

Wiring the outputs OUT TP (only for RS232)

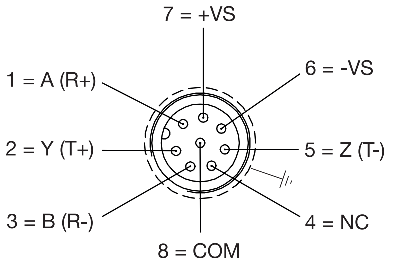
PNP



Supply voltage:	DC 24 V +10% / –20% (incl. ripple)
Output current:	max. 200 mA
Voltage drop at 50 mA:	≤ 1.5 V

BIS M-4_ _-007-_ _ _-02-S115
Installation

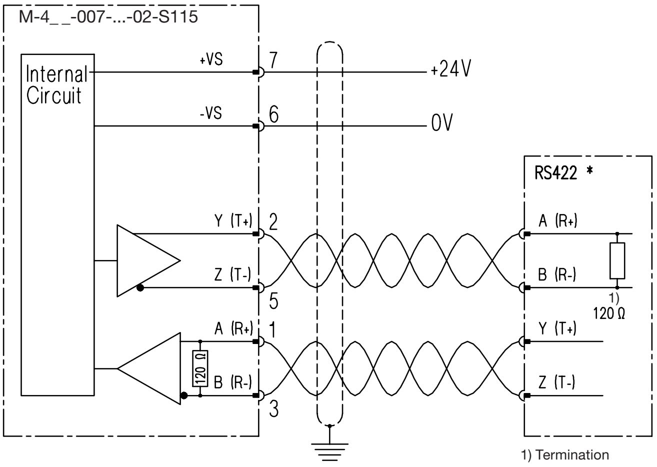
Pin assignments
BIS M-4_ _-007-...
-02-S115



	RS422 = 00	Color code using cables BKS-S116-PU / -S115-PU
1	OUT TP	yellow
2	TxD	gray
3	RxD	pink
4	NC	red
5	RTS (TP)	green
6	-VS	blue
7	+VS	brown
8	COM	white

BIS M-4_ _-007-_ _ _-02-S115
Interface Information

Interface
RS422
4-wires
point-to-point



* For the power supply and the RS422 interface a galvanic isolation is recommended! Twisted pair cable data links.

BIS M-4_ _
Technical Data

General data	Housing	M-400-... CuZn nickel-plated	M-401-... plastic (PBT)
Temperature range	Ambient temperature	0 °C to +70 °C	
Enclosure rating	Enclosure rating	IP 67	
Supply voltage	Supply voltage V_s	DC 24 V +10 % / –20 % (incl. ripple) LPS Class 2	
	Current consumption	≤ 50 mA with no load	
LED function indicator	Power	LED green	
	Tag Present (TP)	LED yellow	

C UL US LISTED

Process Control Equipment
Control No 3TLJ
File No E227256

CE Declaration of Conformity and user safety

CE *This product was developed and produced considering the claimed European standards and guidelines.*

☞ You can separately request a Declaration of Conformity.

Further safety measures you can find in chapter *Safety* (see 🗋 4).

BIS M-4_ _
Ordering Information

Part Numbers

BIS M-4_ _-007-00_-0_-S115

Balluff Identification System

Series M

Hardware type
4_ _ = Processor
400 = M30 housing
401 = Maxisensor
451 = Maxisensor for data carrier on metal

Software type
007 = Balluff-Protocol

Hardware version
001 = Coil
002 = M18 read/write head

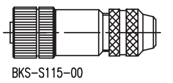
Interface
00 = RS232
02 = RS422 (4-wires, point-to-point)

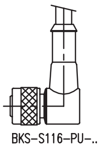
Module
S115 = M12 8-pole female

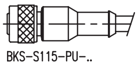
BIS M-4_ _ Ordering Information

Accessories (optional, not included in scope of delivery)

Type		**Part No.**
Mating connector	without cable	BKS-S115-00
Cable	(Pin assignments see 🗎 40)	BKS-S116-PU-..
Cable	(Pin assignments see 🗎 40)	BKS-S115-PU-..







Cable is available in various standard lengths:
2 m, 5 m, 10 m, 15 m, 20 m, 25 m

Example:	BKS-S115-PU-02	Part number for 2 m cable
	BKS-S116-PU-15	Part number for 15 m cable

☞ For BIS M-4_ _-007-00_-0_-S115 and a baud rate of 19.200 cable length max. 15 m
9.600 cable length max. 20 m

Symbols / Abbreviations

⎓ DC Current

LPS Limited Power Source Class 2

⏚ Function ground

ESD Symbol

Appendix, ASCII Table

Decimal	Hex	Control Code	ASCII	Decimal	Hex	Control Code	ASCII	Decimal	Hex	ASCII	Decimal	Hex	ASCII	Decimal	Hex	ASCII	Decimal	Hex	ASCII
0	00	Ctrl @	NUL	22	16	Ctrl V	SYN	44	2C	,	65	41	A	86	56	V	107	6B	k
1	01	Ctrl A	SOH	23	17	Ctrl W	ETB	45	2D	-	66	42	B	87	57	W	108	6C	l
2	02	Ctrl B	STX	24	18	Ctrl X	CAN	46	2E	.	67	43	C	88	58	X	109	6D	m
3	03	Ctrl C	ETX	25	19	Ctrl Y	EM	47	2F	/	68	44	D	89	59	Y	110	6E	n
4	04	Ctrl D	EOT	26	1A	Ctrl Z	SUB	48	30	0	69	45	E	90	5A	Z	111	6F	o
5	05	Ctrl E	ENQ	27	1B	Ctrl [	ESC	49	31	1	70	46	F	91	5B	[	112	70	p
6	06	Ctrl F	ACK	28	1C	Ctrl \	FS	50	32	2	71	47	G	92	5C	\	113	71	q
7	07	Ctrl G	BEL	29	1D	Ctrl]	GS	51	33	3	72	48	H	93	5D	]	114	72	r
8	08	Ctrl H	BS	30	1E	Ctrl ^	RS	52	34	4	73	49	I	94	5E	^	115	73	s
9	09	Ctrl I	HT	31	1F	Ctrl _	US	53	35	5	74	4A	J	95	5F	_	116	74	t
10	0A	Ctrl J	LF	32	20		SP	54	36	6	75	4B	K	96	60	`	117	75	u
11	0B	Ctrl K	VT	33	21		!	55	37	7	76	4C	L	97	61	a	118	76	v
12	0C	Ctrl L	FF	34	22		"	56	38	8	77	4D	M	98	62	b	119	77	w
13	0D	Ctrl M	CR	35	23		#	57	39	9	78	4E	N	99	63	c	120	78	x
14	0E	Ctrl N	SO	36	24		$	58	3A	:	79	4F	O	100	64	d	121	79	y
15	0F	Ctrl O	SI	37	25		%	59	3B	;	80	50	P	101	65	e	122	7A	z
16	10	Ctrl P	DLE	38	26		&	60	3C	<	81	51	Q	102	66	f	123	7B	{
17	11	Ctrl Q	DC1	39	27		'	61	3D	=	82	52	R	103	67	g	124	7C	|
18	12	Ctrl R	DC2	40	28		(	62	3E	>	83	53	S	104	68	h	125	7D	}
19	13	Ctrl S	DC3	41	29		)	63	3F	?	84	54	T	105	69	i	126	7E	~
20	14	Ctrl T	DC4	42	2A		*	64	40	@	85	55	U	106	6A	j	127	7F	DEL
21	15	Ctrl U	NAK	43	2B		+												