BALLUFF

sensors worldwide

BIS M-4_ _-045-_0_-07-S4
BIS M-4_ _-072-_0_-07-S4

Condensed guide

BIS M IO-Link

ECOLAB

english

BIS M-4 _ _ IO-Link Device
Read/Write Device

1 User Instructions

1.1 Conformity and User Safety

This product was developed and manufactured in accordance with applicable European standards and directives.

$C\epsilon$ **Declaration of Conformity**

This product was developed and manufactured in accordance with applicable European standards and directives.

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i **Note**
You can request a Declaration of Conformity separately.

UL listing
Control No. 3TLJ
File No. E227256

1.2 Scope of Delivery

Included in the scope of delivery:
– BIS M-4_ _ IO-Link device
– BIS software CD
– Condensed manual in printed form (DE, EN)

1.3 About This Manual

This manual describes the read/write device of the BIS M-4_ _ identification system with IO-Link interface and includes commissioning instructions for immediate operation.
This manual does not describe:
– The startup, function and safe operation of the host device (PC, PLC, IO-Link master).
– The installation and function of accessories and expansion devices.

1.4 Structure of the Manual

The manual is organized so that the sections build on each other.
Chapter 2: Basic Safety Information.
Chapter 3: The key steps for installing the identification system.
Chapter 4: Introduction to the material.

1.5 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.

1 User Instructions

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).

1.6 Symbols

⚠ **Note!**
This symbol indicates a safety instruction that absolutely must be followed.

ℹ **Note, tip**
This symbol indicates general notes.

1.7 Abbreviations

BIS	Balluff Identification System
CRC	Cyclic Redundancy Code
DPP	Direct Parameter Page
EMC	Electromagnetic Compatibility
LSB	Least Significant Bit
MSB	Most Significant Bit
PC	Personal Computer
SIO	Standard IO
SPDU	Service Protocol Data Unit
PLC	Programmable Logic Controller
TCP	Transmission Control Protocol

2 Safety

2.1 Intended use

The BIS M-4xx_ _ read/write device, together with other components of the BIS M, form the identification system.
They may only be used for this purpose in an industrial environment corresponding to Class A of the EMC law.
This description applies for the read/write devices of the BIS M-4_ _ series with IO-Link interface

2.2 General Safety Notes

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 the manufacturer's guarantee and warranty.
When connecting the read/write device to an external controller, pay attention to the choice and polarity of the connection as well as the power supply.
The read/write device must only be powered using approved power supplies.

⚠ **Note!**
This is a Class A device. This device may cause RF disturbances in residential areas; in such a case the operator may be required to take appropriate countermeasures.

Operation and testing
The operator is responsible for ensuring that locally applicable safety regulations are observed. In the event of defects and non-correctable faults in the identification system, take the system out of service and secure it to prevent unauthorized use.

2.3 Meaning of Warning Notes

⚠ **Note!**
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.

BIS M-4 _ _ IO-Link Device
Read/Write Device

3.1 Mechanical Connection
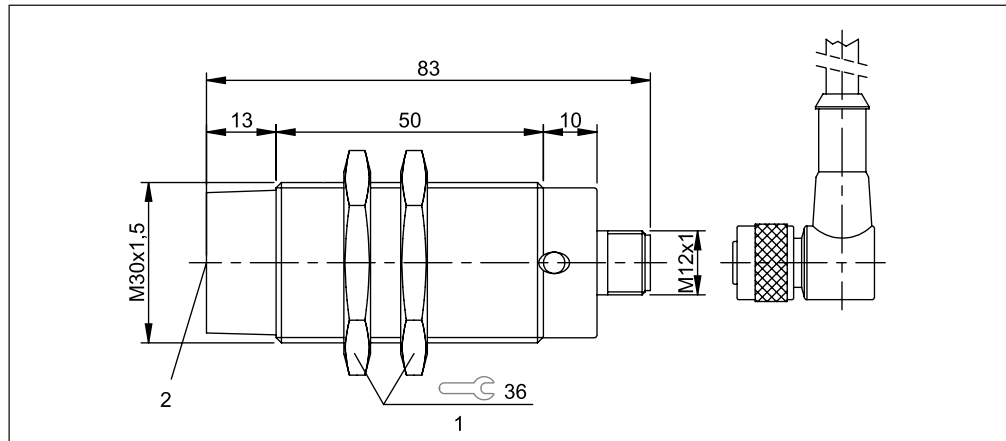
BIS M-400-...-001

Figure 1: BIS M-400-045-001-07-S4 / BIS M-400-072-001-07-S4 read/write device, values in mm

1 Maximum tightening torque 40 Nm   **2** Sensing surface
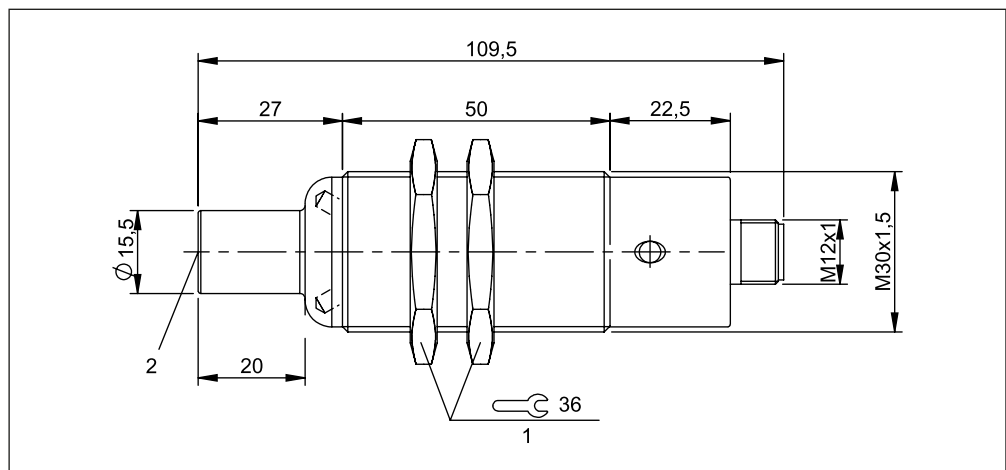
BIS M-400-...-002

Figure 2: BIS M-400-045-002-07-S4 / BIS M-400-072-002-07-S4 read/write device, values in mm

1 Maximum tightening torque 40 Nm   **2** Sensing surface

BIS M-4 _ _ IO-Link Device
Read/Write Device

BIS M-400-...-401
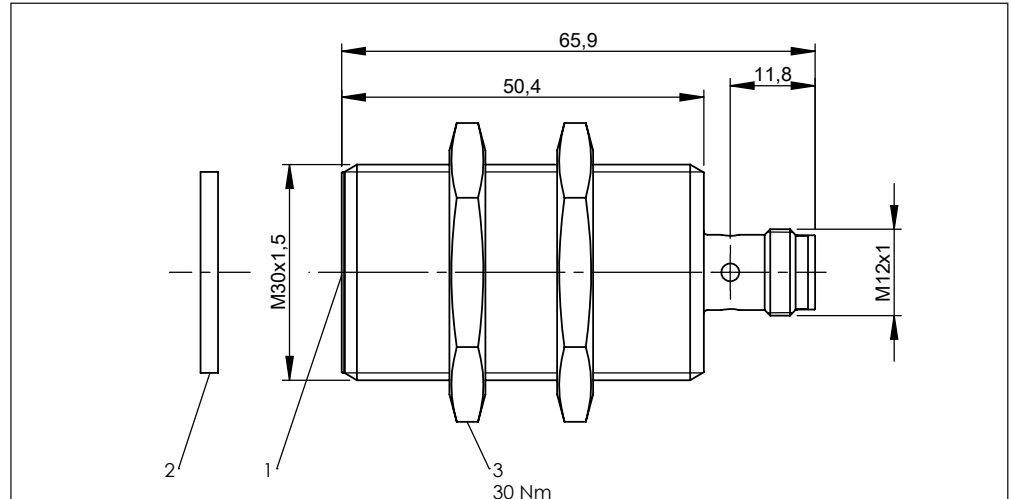

Figure 3: BIS M4000_ _¬-40107S4 read/write device, values in mm

1 Sensing surface   **2** Data carrier

3 Tightening torque
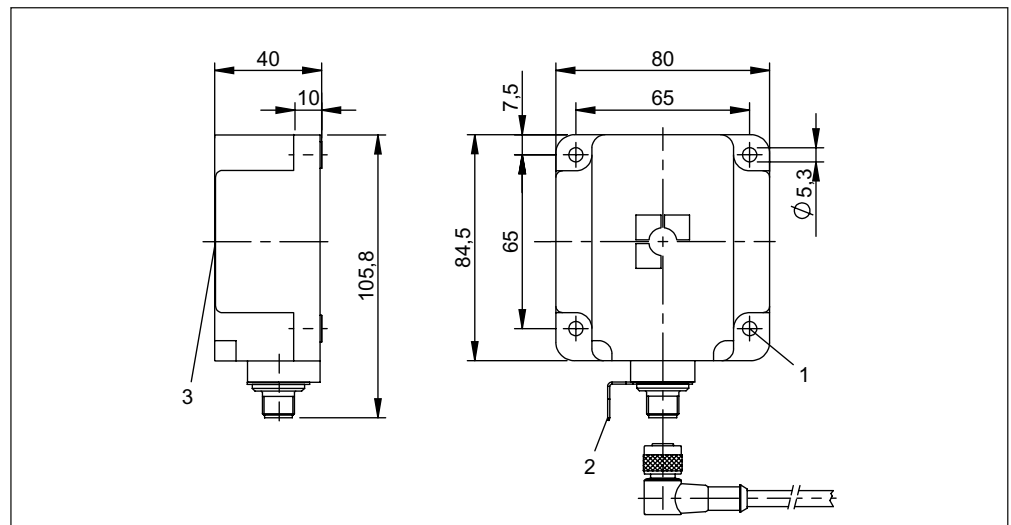
BIS M-401-...-001

Figure 4: BIS M-401-045-001-07-S4 / BIS M-401-072-001-07-S4 read/write device, values in mm

1 Maximum tightening torque 3 Nm   **2** Grounding strap

3 Sensing surface

BIS M-4 _ _ IO-Link Device
Read/Write Device
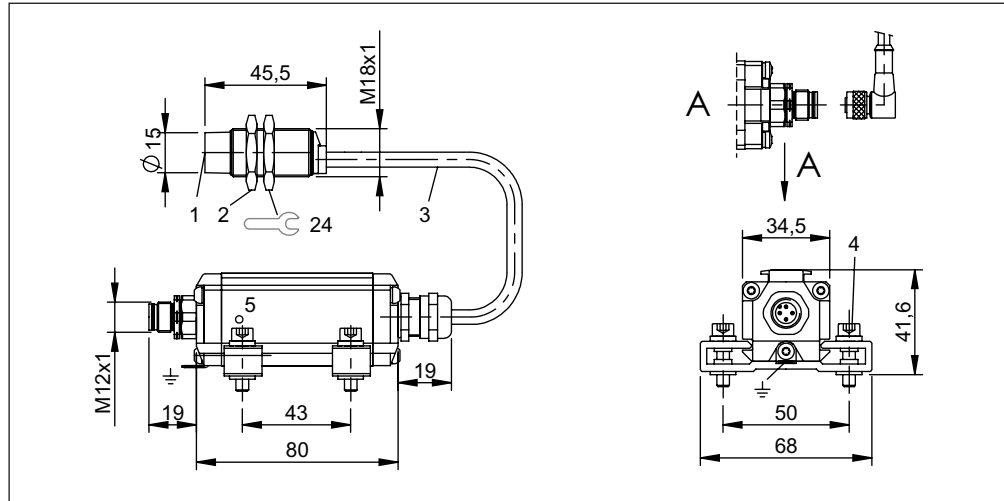
BIS M-402-...-002

Figure 5: BIS M-402-045-002-07-S4 / BIS M-402-072-002-07-S4 read/write device, values in mm

1 Sensing surface	**2** Maximum tightening torque 25 Nm
3 Cable length 0.5 m	**4** Maximum tightening torque 2 Nm

BIS M-402-...-004
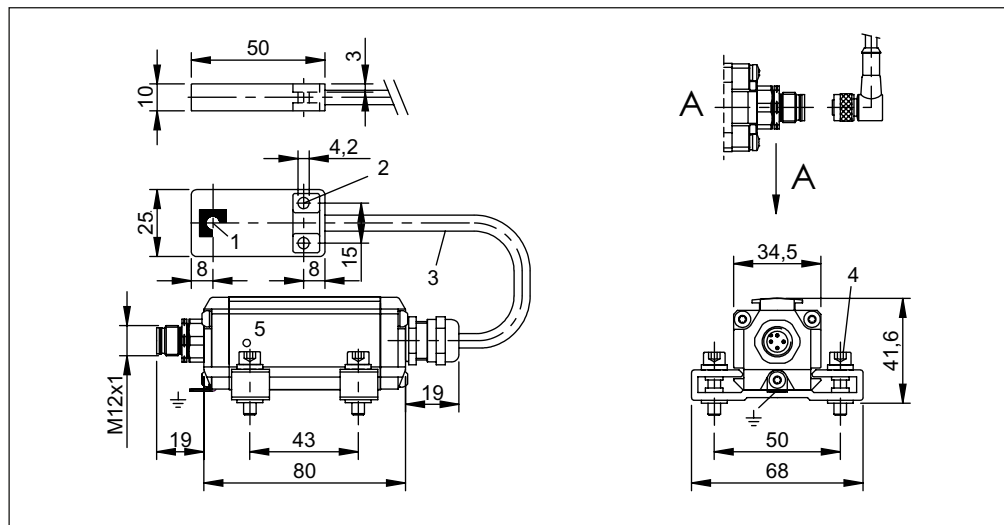
Figure 6: BIS M-402-045-004-07-S4 / BIS M-402-072-004-07-S4 read/write device, values in mm

1 Sensing surface	**2** Maximum tightening torque 1 Nm
3 Cable length 0.5 m	**4** Maximum tightening torque 2 Nm

BIS M-4 _ _ IO-Link Device
Read/Write Device

BIS M-404-...-401

Figure 7: BIS M-404-0_ _-401-07-S4 read/write device, values in mm

1 Sensing surface   **2** Data carrier

3 Tightening torque

BIS M-406-...-001
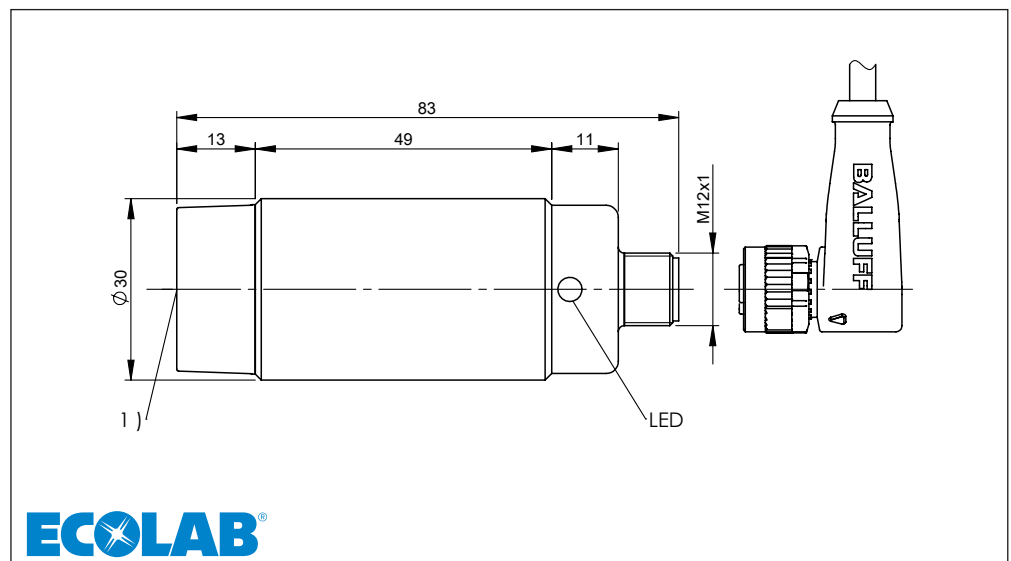
Figure 8: BIS M-406-045-001-07-S4 / BIS M-406-072-001-07-S4 read/write device, values in mm
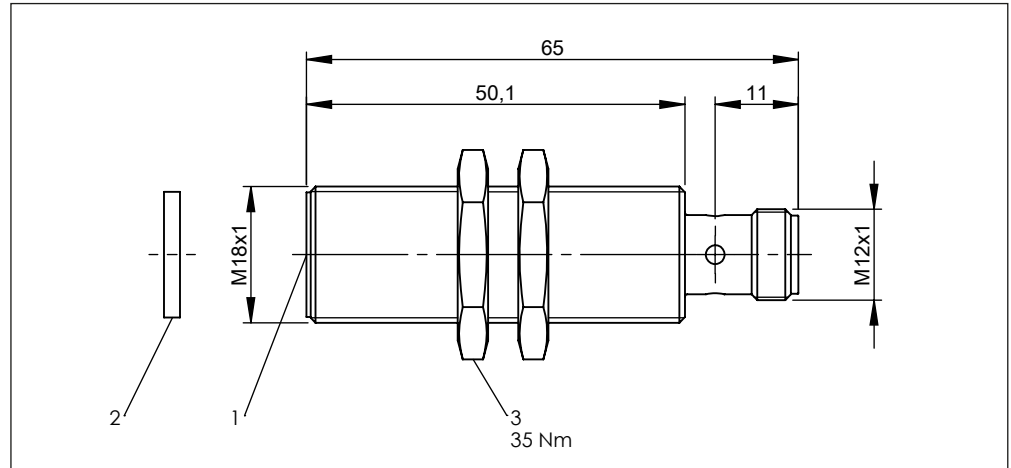
1 Sensing surface

3 Getting started

BIS M-408-...-001
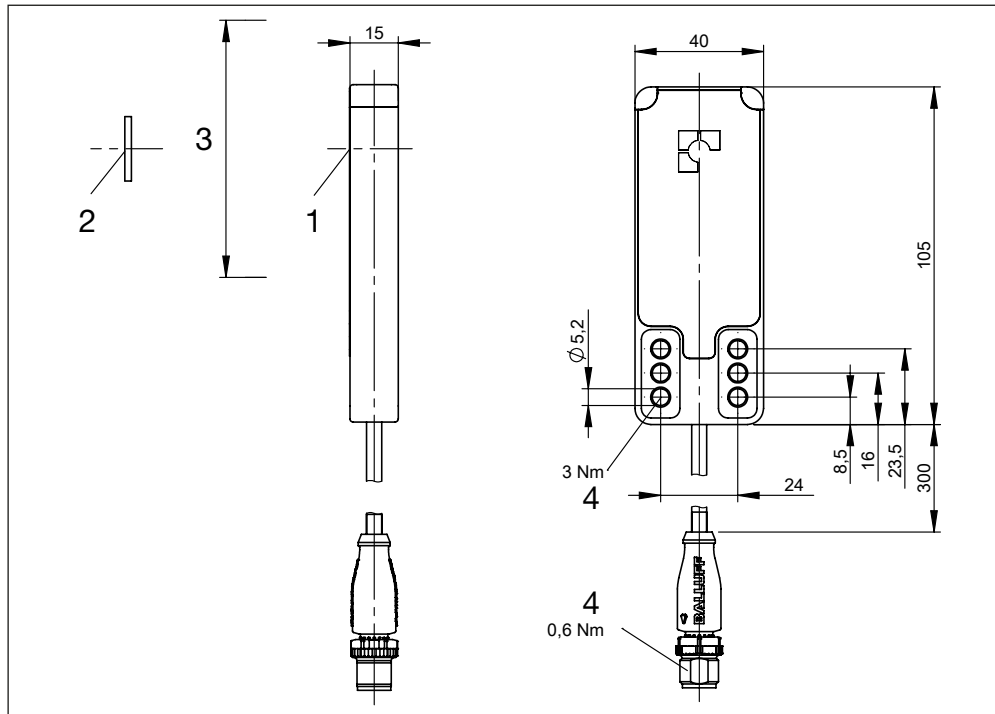
Figure 9: BIS M-408-045-004-07-S4 / BIS M-408-072-004-07-S4 read/write device, values in mm

1	Sensing surface	**2**	Data carrier
3	Clear zone (dependent on data carrier)	**4**	Tightening torque

BIS M-451-...-001
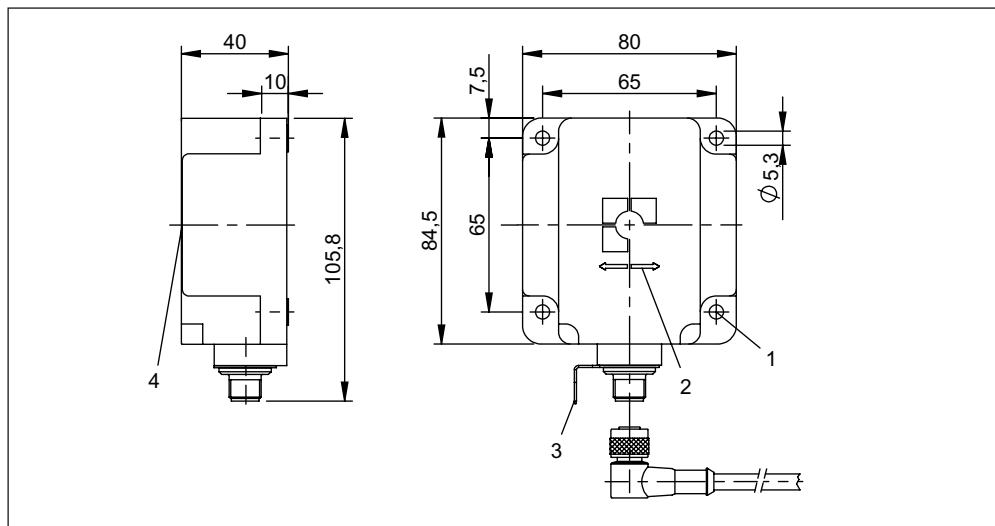
Figure 10: BIS M-451-045-001-07-S4 / BIS M-451-072-001-07-S4 read/write device, values in mm

1	Maximum tightening torque 3 Nm	**2**	Read/write axis
3	Grounding strap	**4**	Sensing surface

3 Getting started

BIS M-458-...-001
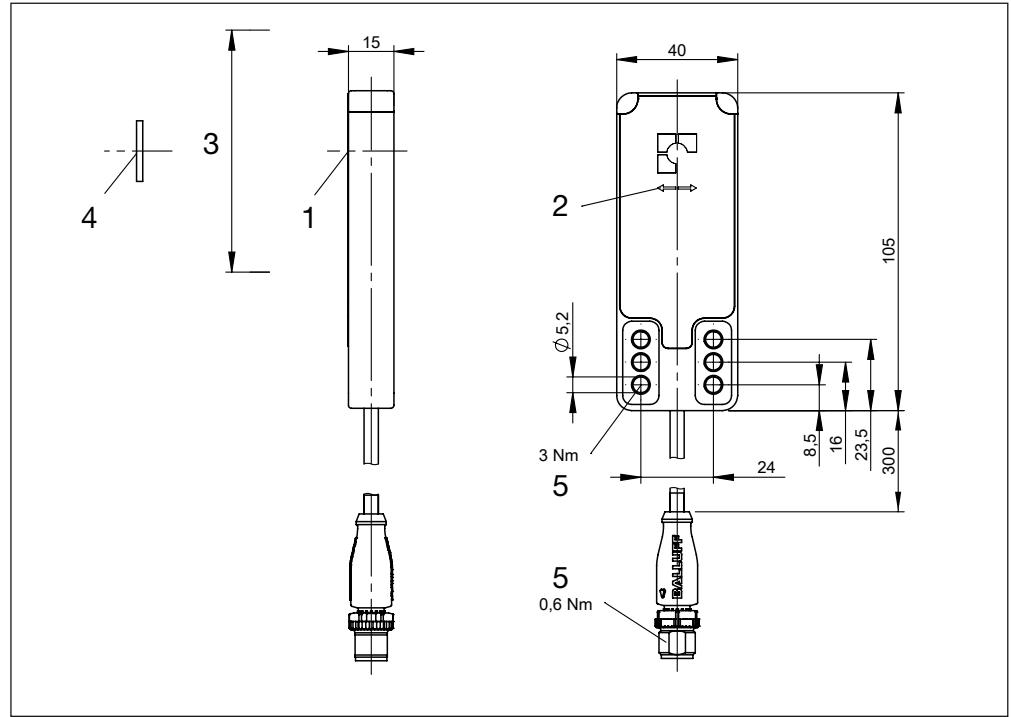
Figure 11: BIS M-458-045-001-07-S4 / BIS M-458-072-001-07-S4 read/write device, values in mm

1	Sensing surface	**2**	Read/write axis
3	Clear zone (dependent on data carrier)	**4**	Data carrier
5	Tightening torque		

Distance between the data carriers

Data carrier	Distance BIS M-...							
	101-... 106-... 107-... 108-... 110-... 111-... 115-... 128-...	102-... 112-... 134-... 135-...	105-... 122-...	120-...	140-... 142-... 143-... 144-...	150-... 151-... 152-... 154-...	153-...	191-...
BIS M-400-...	> 10 cm	> 15 cm	> 10 cm	–	> 10 cm	–	–	–
BIS M-401-...	> 20 cm	> 20 cm	–	> 25 cm	> 20 cm	–	–	–
BIS M-402-...	> 10 cm	–	> 10 cm	–	> 10 cm	–	–	–
BIS M-404-...	> 10 cm	–	> 10 cm	–	> 10 cm	–	–	–
BIS M-406-...	> 10 cm	> 15 cm	> 10 cm	–	> 10 cm	–	–	–
BIS M-408-...	> 10 cm	> 20 cm	> 10 cm	–	> 10 cm	–	–	–
BIS M-451-...	–	–	–	–	–	> 25 cm	> 30 cm	–
BIS M-458-...	–	–	–	–	–	> 20 cm	> 20 cm	> 10 cm

3 Getting started

Distance between the read/write devices
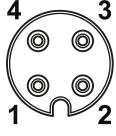
Read/Write Device	Minimum distance
BIS M-400-_ _ _-001-...	150 mm
BIS M-400-_ _ _-401-...	100 mm
BIS M-401-...	200 mm
BIS M-402-...	100 mm
BIS M-404-…	50 mm
BIS M-406-...	150 mm
BIS M-408-...	80 mm
BIS M-451-...	300 mm
BIS M-458-...	80 mm

i **Note**
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.
In critical applications, a pre-test is recommended.

3.2 Electrical Connection

IO-Link port (M12, A-coded, female)		
	PIN	Function
	1	+24 V
	2	NC
	3	GND
	4	C/Q

► Connect data line to IO-Link master.
 (See Balluff IO-Link catalog for connection cables and accessories)
 In areas with electromagnetic noise, shielded cables are recommended.

i **Note**
For all variants, the ground connection of the read/write device or of the function ground are, depending on the system, to be connected to ground either directly / with low impedance or via a suitable RC combination.

4 Basic Knowledge

4.1 Function Principle of Identification Systems

The BIS M identification system is a contactless read and write system. The read/write device consists of evaluation electronics with permanently connected read/write head. The system can be used to program and to read information on a data carrier. The data and current status messages are transmitted from the identification system to the host system via a defined protocol. This protocol can also be used to transmit additional commands to the device, such as switching off the read-head antenna.

The main components of the BIS M identification system are:
– Read/write device,
– Data carrier.

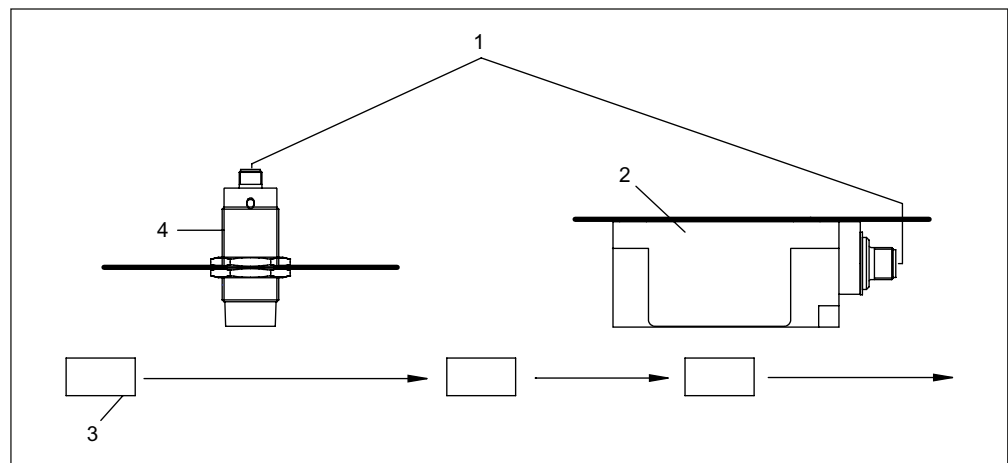Data is transmitted to the host system via an IO-Link master.

Figure 12: Schematic representation of an identification system

| **1** | Connection to the IO-Link master | **2** | Read/write device |
| **3** | Data carrier | **4** | Read/write device |

The data carrier is an autonomous unit that is supplied with power by the read/write head. The read/write head continuously sends a carrier signal that is picked up by the data carrier from within a certain distance. As soon as the data carrier is powered up by the carrier signal, a static read operation takes place.

The read/write device manages the data transfer between read/write head and data carrier, serves as a buffer storage device, and sends the data to the host controller.
The data is passed to the IO-Link master using IO-Link protocol, and the master then passes it to the host system.

Host systems may be the following:
– A control computer (e.g. industrial PC)
– A PLC

The main areas of application are:
– In production for controlling material flow (e.g. for model-specific processes, conveying systems that transport workpieces, acquisition of safety-relevant data)
– In warehousing for monitoring material movement
– transportation, and
– conveying technology.

4 Basic Knowledge

4.2 Example
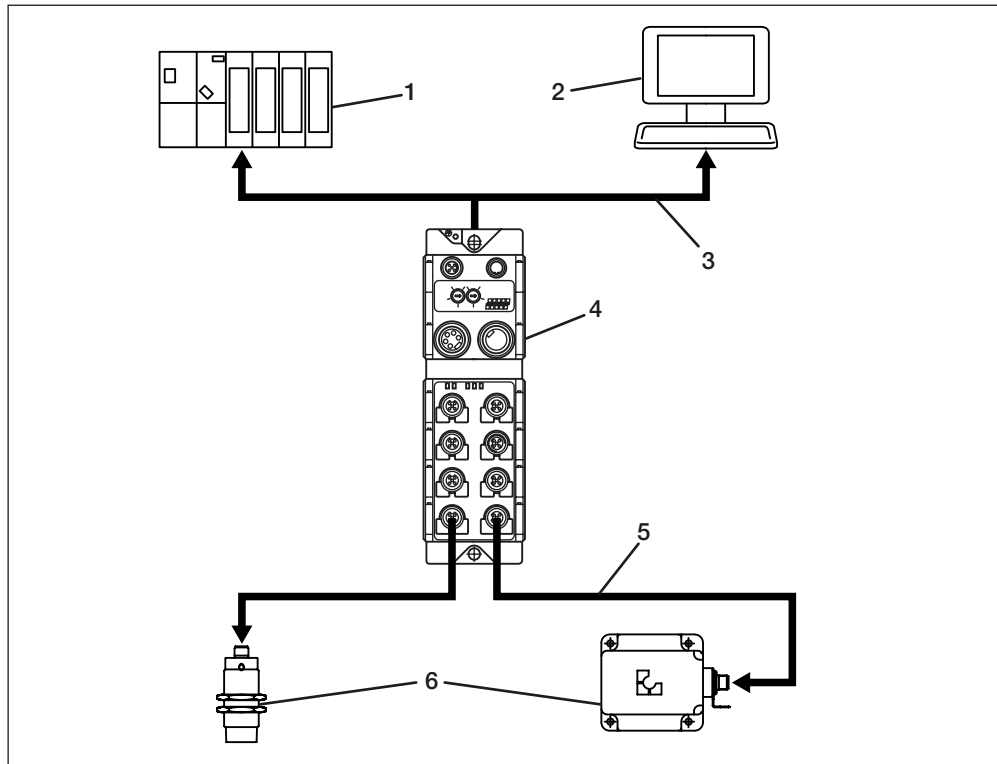
Figure 13: Topology of the BIS M IO-Link identification system

1	PLC	**2**	PC
3	Fieldbus	**4**	IO-Link master
5	Connection to the host system	**6**	BIS M read/write device, IO-Link device

4.3 Read Distance/ Offset

To ensure that data carriers are detected without error and the data can be reliably read, do not exceed a maximum distance and maximum offset between the data carriers and read heads.
The „distance" value refers to the maximum distance from the data carrier to the sensing surface of the read/write head.
The „offset" value indicates the maximum offset between the center axis of the data carrier and the center axis of the sensing surface.
Data carriers can only be reliably detected and the data reliably read within the permissible read distance and offset.
Data carrier detection is indicated by an LED on the device („TP – Tag Present"). At the same time, the CP bit is set in the input buffer („CP – Codetag Present").

4 | **Basic Knowledge**

4.4 Product Description

BIS M-400- … read/write device:
– M30 threaded tube,
– round connector terminations,
– integrated read/write head,
– the read/write head is suitable for dynamic or static operation,
– data carrier is powered by the read/write head using a carrier signal.

BIS M-4_1-045-0_ _-07-S4 / BIS M-4_1-072-0_ _-07-S4 read/write device:
– plastic housing,
– round connector terminations,
– integrated read/write head,
– the read/write head is suitable for dynamic or static operation,
– data carrier is powered by the read/write head using a carrier signal.

BIS M-402-045-0_ _-07-S4 / BIS M-402-072-0_ _-07-S4 read/write device:
– metal housing,
– round connector terminations,
– integrated read/write head,
– the read/write head is suitable for dynamic or static operation,
– data carrier is powered by the read/write head using a carrier signal.
– read/write head in plastic (...-004-...) or metal housing (...-002-...).

BIS M-404- … :
– M18 threaded tube,
– round connector terminations,
– integrated read/write head,
– the read/write head is suitable for dynamic or static operation,
– data carrier is powered by the read/write head using a carrier signal.

BIS M-406-045-0_ _-07-S4 / BIS M-406-072-0_ _-07-S4 read/write device:
– D30 tube,
– round connector terminations,
– integrated read/write head,
– the read/write head is suitable for dynamic or static operation,
– data carrier is powered by the read/write head using a carrier signal,
– Ecolab certification.

BIS M-4_8-0_ _-001-07-S4 read/write device:
– metal housing,
– round connector terminations over 30 cm cable,
– integrated read/write head,
– the read/write head is suitable for dynamic or static operation,
– data carrier is powered by the read/write head using a carrier signal.

4.5 Data integrity

To ensure data integrity, data transfer between the data carrier and read/write device can be monitored using a CRC_16 data check.
With the CRC_16 data check, a checksum is written to the data carrier which enables the data to be checked for validity at any time.

Advantages of the CRC_16 data check:
– Very high data integrity, even during the non-active phase (data carrier outside the read/write head)

Restrictions of the CRC_16 data check:
– Longer write times, as the CRC must also be written.
– User bytes are lost on the data carrier.

Use of CRC_16 can be configured by the user.

4 Basic Knowledge

4.6 Autoread

The Autoread function is used to immediately read out a specific memory area of the data carrier when the data carrier enters the vicinity of the read head. The data quantity here is 8 bytes (BIS M-4_ _-045-...) or 30 bytes (BIS M-4_ _-072-...), the start address can be configured in the parameters.

If a read error occurs during autoread or if the specified data area lies outside the capacity of the data carrier, no error is displayed. In this case, no data is output.

4.7 Supported Data Carrier Types

Mifare

Balluff data carrier type	Manufac- turer	Description	Memory capacity	Usable bytes with CRC	Memory type
BIS M-1_ _-01	NXP	Mifare Classic	752 bytes	658 bytes	EEPROM
BIS M-1_ _-10	NXP	Mifare Classic	736 bytes	644 bytes	EEPROM

> **ℹ Note**
> Data carriers cannot be used with BIS M-4_ _-0_ _-401-…, read/write devices.

ISO15693

Balluff data carrier type	Manufac- turer	Description	Memory capacity	Usable bytes with CRC	Memory type
BIS M-1_ _-02	Fujitsu	MB89R118	2000 bytes	1750 bytes	FRAM
BIS M-1_ _-03	NXP	SL2ICS20	112 bytes	98 bytes	EEPROM
BIS M-1_ _-04	Texas Inst.	TAG-IT Plus	256 bytes	224 bytes	EEPROM
BIS M-1_ _-05	Infineon	SRF55V02P	224 bytes	196 bytes	EEPROM
BIS M-1_ _-06	EM	EM4135	288 bytes	252 bytes	EEPROM
BIS M-1_ _-07	Infineon	SRF55V10P	992 bytes	868 bytes	EEPROM
BIS M-1_ _-08	NXP	SL2IC553	160 bytes	140 bytes	EEPROM
BIS M-1_ _-09	NXP	SL2ICS50	32 bytes	28 bytes	EEPROM
BIS M-1_ _-11*	Balluff	BIS M-1	8192 bytes	7168 bytes	FRAM
BIS M-1_ _-13*	Balluff	BIS M-1	32768 bytes	28672 bytes	FRAM
BIS M-1_ _-14*	Balluff	BIS M-1	65536 bytes	57344 bytes	FRAM
BIS M-1_ _-15*	Balluff	BIS M-1	131072 bytes	114688 bytes	FRAM
BIS M-1_ _-20	Fujitsu	MB89R112	8192 bytes	7680 bytes	FRAM

* Can only be used in conjunction with BIS M-4_ _-0_ _-401-…read/write device

4 **Basic Knowledge**

4.8 IO-Link Basic Knowledge	**Advantages of IO-Link:**

Advantages of IO-Link:
– Uniform, simple wiring of different devices
– The host system can be used to change the device parameters
– Remote querying of diagnostic information is possible
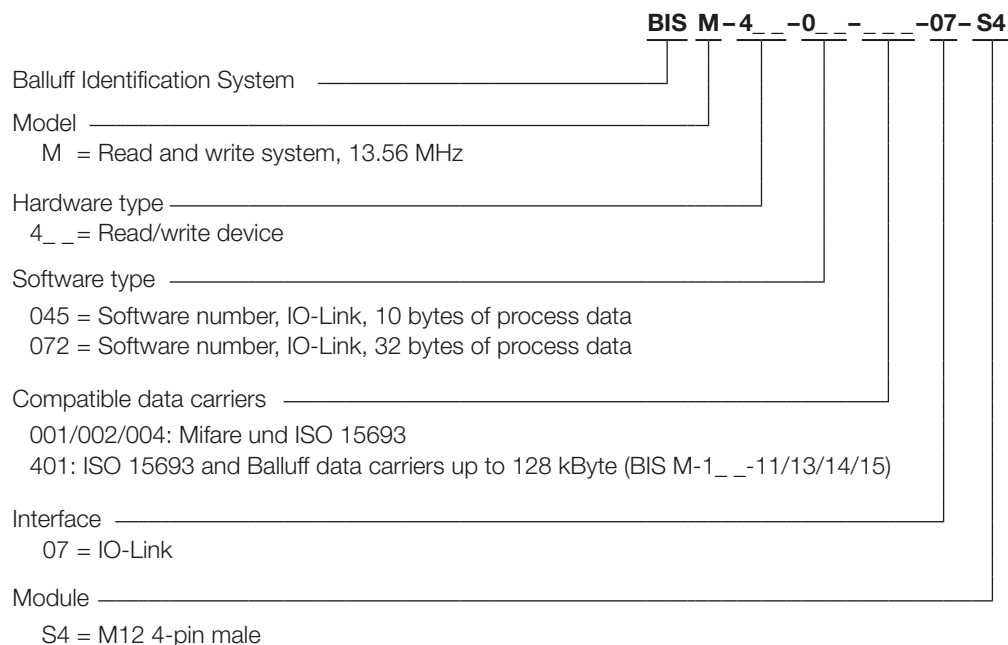– Centralized data retention of the device parameters is possible

The manufacturer-specific standard IO-Link sends not only the actual process signal, but also all relevant parameter and diagnostic data on the process level over a single standard cable. Communication is based on a standard UART protocol with 24V pulse modulation; no separate power supply is required.

The BIS M IO-Link uses three-conductor technology (physics 2) and operates with a transfer rate of 38400 (COM2). The data quantity of the process data is 10 bytes (BIS M-4 _ _-045-00 _-07-S4) or 32 bytes (BIS M-4 _ _-072-00 _-07-S4) in each direction.

BIS M-4 _ _ IO-Link Device
Read/Write Device

Type code

BIS M – 4 _ _ –0 _ _ – _ _ _ –07 – S4

Balluff Identification System ─────────────

Model ─────────────
  M = Read and write system, 13.56 MHz

Hardware type ─────────────
  4 _ _ = Read/write device

Software type ─────────────
  045 = Software number, IO-Link, 10 bytes of process data
  072 = Software number, IO-Link, 32 bytes of process data

Compatible data carriers ─────────────
  001/002/004: Mifare und ISO 15693
  401: ISO 15693 and Balluff data carriers up to 128 kByte (BIS M-1 _ _-11/13/14/15)

Interface ─────────────
  07 = IO-Link

Module ─────────────
  S4 = M12 4-pin male

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

Accessories for the BIS M-4 _ _-... can be found in the Balluff IO-Link catalog.

The catalog can be downloaded on the Internet at "www.balluff.de".