**BALLUFF**

*sensors worldwide*

# BIC IO-Link unidirectional
# 500 mA, IP67
## User´s Guide

**IO**-Link

INDUCTIVECOUPLER

BALLUFF

**English**

# Balluff Inductive Coupler
# Base BIC 1I0-I2A50-M30MI3-SM4A4A and
# Remote BIC 2I0-I2A50-M30MI3-SM4A5A

## Contents

**Balluff Inductive Coupler**
**Base BIC 1I0-I2A50-M30MI3-SM4A4A and**
**Remote BIC 2I0-I2A50-M30MI3-SM4A5A**

## 1    User instructions

| | |
|---|---|
| **1.1  Validity of the Guide** | This manual describes the structure, function and installation of the Balluff Uni-Standard inductive coupler. It is valid for types:<br>Base BIC 1I0-I2A50-M30MI3-SM4A4A and<br>Remote BIC 2I0-I2A50-M30MI3-SM4A5A (see type code)<br><br>The guide is intended for qualified technical personnel. Read the guide before you install and operate the devices. |
| **1.2  Typographical Conventions** | The following typographical conventions are used in this guide. |
| **Enumerations** | Enumerations are shown as a list with an en-dash.<br>– Entry 1<br>– Entry 2 |
| **Syntax** | Numbers<br>– Decimal numbers are shown without additional indicators (e.g. 123),<br>– Hexadecimal numbers are shown with the additional indicator hex (e.g. 00hex). |
| **Cross-references** | Cross-references indicate where additional information on the topic can be found:<br>(see Chap. 5, Section "Technical data"). |

**1.3  Symbols**

| | | |
|---|---|---|
| | **i** | **Note, tip**<br>This symbol indicates general notes. |
| | ⚠ | **Caution!**<br>This symbol indicates a safety instruction that must be followed without exception. |
| | ◉ | **IO-Link**<br>This device is IO-Link-capable |

**1.4  Abbreviations**

| | |
|---|---|
| BIC | Balluff Inductive Coupler |
| EMC | Electromagnetic Compatibility |
| FE | Function Ground |

# Balluff Inductive Coupler
# Base BIC 1I0-I2A50-M30MI3-SM4A4A and
# Remote BIC 2I0-I2A50-M30MI3-SM4A5A

⚠ **Important!**
Before commissioning, carefully read the operating manual.

## 2.1 Proper use

The device is designed to replace a plug connection in order to ensure contact-free data transmission.
The system must not be used in applications in which the safety of persons is dependent on the function of the device.
Warranty and liability claims against the manufacturer are rendered void by:
– Unauthorized tampering
– Improper use
– Use, installation or handling contrary to the instructions provided in this operating manual

## 2.2 Authorized Personnel

Installation and commissioning may only be performed by trained specialist personnel.

## 2.3 Obligations of the Operating Company

The operating company must ensure that the locally applicable safety regulations are observed.
The device corresponds to EMC Class A and can cause radio interference. The operating company must take appropriate precautions to prevent radio interference.
The device may only be used with an approved power supply. (see "Technical Data"). Only approved cables may be used.

## 2.4 Malfunctions

In the event of defects and device malfunctions that cannot be rectified, the device must be taken out of operation and protected against unauthorized use.

## 2.5 Meaning of the warning notes

The warning notices in this guide and the measures described for avoiding dangers must be observed.
The warning notices contain the following signal words that indicate the severity of the danger:
– **Danger:**
 Indicates an immediate danger that will result in a severe injury or death of persons if not observed.
– **Warning:**
 Indicates a potential danger that may result in a severe injury or death of persons if not observed.
– **Caution:**
 Indicates a potential danger that may result in light injury to persons or damage to property if not avoided.
– **Caution:**
 Indicates a situation that may result in property damage if not avoided.

When working with this product, the following warning notices apply:

⚠ **Caution!**
Risk of burning on hot surfaces! The active surface heats up even under normal operating conditions. Keep away hands and objects from the active surface.
Avoid contact of metal objects on the active surface. Fire hazard!

## 2.6 Certification

With the CE marking, we confirm that our products meet the requirements of EC directives 2004/108/EC (EMC) and the EMC law.
In our EMC laboratory, which is accredited by DATech for testing electromagnetic compatibility, evidence has been provided that the Balluff products satisfy the EMC requirements of the generic standards:
EN 61000-6-4 (interference emission) and EN 61000-6-2 (interference immunity)

$C\epsilon$

**Balluff Inductive Coupler
Base BIC 1I0-I2A50-M30MI3-SM4A4A and
Remote BIC 2I0-I2A50-M30MI3-SM4A5A**

## 3    Construction and Function

### 3.1  Construction

The BIC components are designed for applications in an IO-Link system. They are connected to the host master module via the IO-Link protocol. The system consists of the following two components:

– Base (master side)
– Remote (device)

The components are enclosed in a brass housing protected acc. to IP 67
**Master**
The master is connected to the base.
**Devices**
The remote is connected to the device.
When IO-Link devices are connected, observe the following:
– Make certain that the total power consumption is not greater than that of the base.
– Use only devices with inputs

### 3.2  Function

This set transfers power from the base to the remote via an air bridge; the base then receives IO-Link data back from the remote. The base and remote must match one another with respect to size.

The IO-Link device is wired to the remote. The remote is only inductively coupled to the base, however. The base transmits the energy for the IO-Link device to the remote. The IO-Link communication of the IO-Link device is transmitted from the remote to the base. The energy available for the IO-Link device is dependent on the distance and on the offset between base and remote and is, therefore, limited. For this reason, the total current consumption of the connected IO-Link device must not exceed the maximum power output of the remote.

### 3.3  Features, Advantages

– The cable length between the remote and IO-Link device can be a maximum of 20 meters.
– LED indicator on the remote and base for operational readiness and operating voltage
– An angular offset is possible between base and remote
– Simple wiring of e.g. rotary tables, replaceable punch heads etc.
– M12 plug connection on the systems
– Control of capacitive loads
– More power in the same structural shape
– Large operating voltage range

### 3.4  Indicators

If the supply voltage is applied correctly, the green LEDs on the base and remote illuminate. If the IO-Link communication is active, the green LED on the base flashes inversely. The base's red LED illuminates as soon as an error has been detected in the system. As soon as the remote moves out of the secured working range, the red LEDs on the base begin to flash. If the red LED illuminates and stays on, there is an error in the IO-Link communication. If no device is connected to the remote but the remote is within range of the base, the green LEDs flash.

## 4     Function indicator and diagnosis

### 4.1   Base indicators

Green LED status indicator "IO-Link
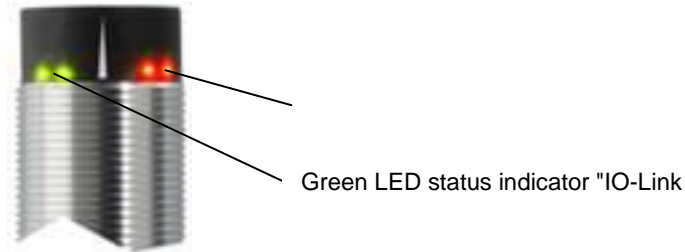
| Signaling | Function |
|---|---|
| Green, static | Supply voltage OK<br>No IO-Link communication |
| Green, flashing inversely | IO-Link communication between master and base is OK |
| Red, flashing | No remote detected |
| Red off | Remote present, IO-Link communication OK |
| Red, static | Remote present, no IO-Link communication<br>to connected device |

### 4.2   Remote indicators

Green LED status indicator
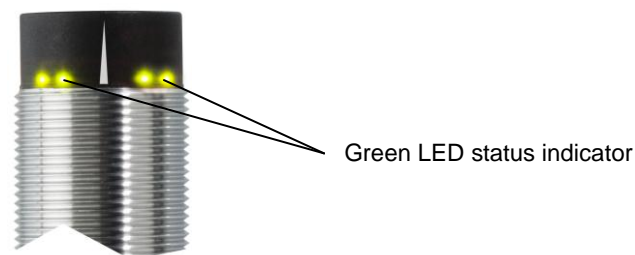
| Signaling | Function |
|---|---|
| Green – static | The remote is located within the working range of a base, communication between the remote and IO-Link device is OK |
| Green, flashing | No IO-Link device present |

| 5 | Installation and Connection |
|---|---|

**5.1 Mutual Interference**

⚠️ **Caution!**
Improper mounting may affect the function of the system and lead to damage.
The spacings specified for installation must be adhered to.

To prevent mutual interference with adjacent bases or remotes, the specified minimum distances must be adhered to:
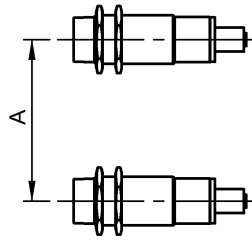
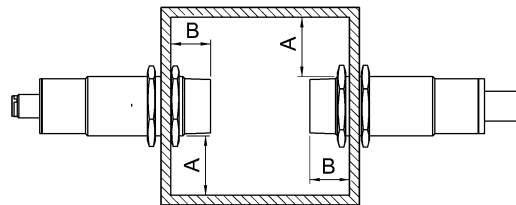| Type | A (mm) |
|------|--------|
| BIC 1I0-I2A50-M30MI3-SM4A4A | 100 |
| BIC 2I0-I2A50-M30MI3-SM4A5A | 100 |

**5.2 Installation in metal**

⚠️ **Caution!**
Device damage due to induction effects
Metallic objects on the coil cap cause the objects to be heated.
Install the components so that no metallic objects can collect on the coil cap.
There is a fire hazard!

When installing in metal, the specified minimum distances to the surrounding sides of the metallic object must be maintained. Otherwise, the transmission distance between transmitter and receiver changes.
The transmission distance can also be influenced by the type of metal.

| Type | A (mm) | B (mm) |
|------|--------|--------|
| BIC 1I0-I2A50-M30MI3-SM4A4A | 30 | 20 |
| BIC 2I0-I2A50-M30MI3-SM4A5A | 30 | 20 |

## 5 Installation and Connection

### 5.3 Angular offset

The permissible angular offset ensures proper function, even in difficult installation conditions:
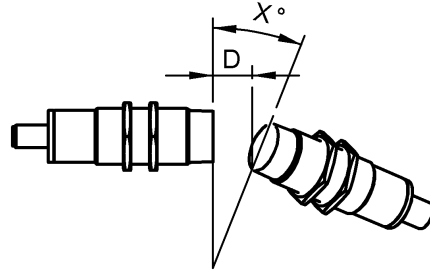


| Distance D (mm) | Angle X |
|:---:|:---:|
| 1 | 18° |
| 2 | 12° |
| 3 | 10° |
| 4 | 5° |
| 5 | 0° |

### 5.4 Connection

**Caution!**
Device damage due to incorrect voltage supply!
Malfunctions may occur if the ripple is too high or if the output voltage is not regulated.
   Use only approved, regulated voltage supplies

**Caution!**
The remote (receiver) may be damaged by voltage spikes if cables that are too long are used! To satisfy the EMC requirements, the cables must not be longer than 20 meters.

### 5.5 Series connection

Two BIC systems can be connected in series.

**Caution!**
This cuts the power in half from 500 mA to 250 mA. The cable length between the individual components in each case must not be larger than 20 m. An angular offset can no longer be guaranteed. For that reason, the systems should be positioned accurately. It is not possible to have an air gap larger than 5mm.
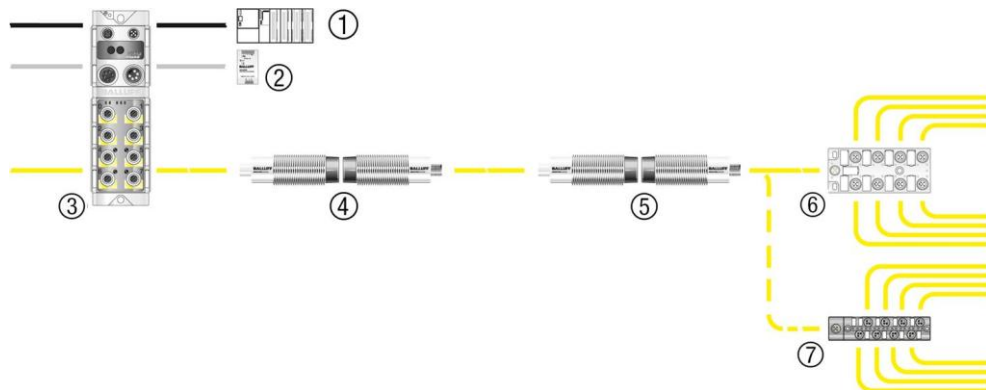


| No. | Legend for graphic: | Balluff components |
|---|---|---|
| 1 | Profibus controller | - |
| 2 | Balluff power supply | BAE PS-XA-1W-24-050-003 |
| 3 | Balluff IO-Link master | BNI PBS-502-001-Z001 |
| 4+5 | BIC IO-Link system | BIC 1I0-I2A50-M30MI3-SM4A4A BIC 2I0-I2A50-M30MI3-SM4A5A |
| 6 | Balluff sensor hub | BNI IOL-104-000-K006 |
| 7 | Balluff sensor hub alternative to 6 | BNI IOL-104-000-K021 |

## 6    Technical data for "Base"

### 6.1    Dimension
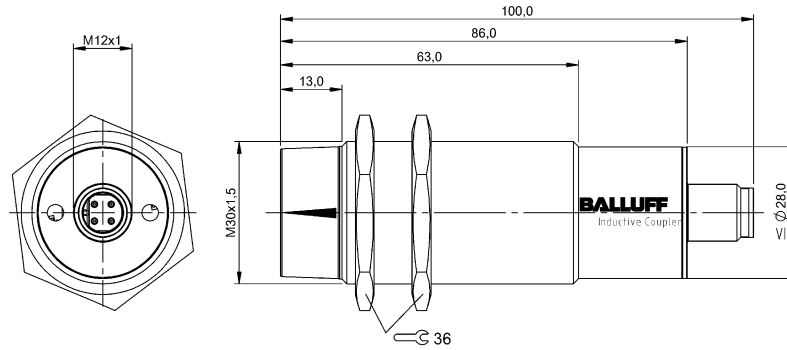


### 6.2    Mechanical data

| | |
|---|---|
| Housing material | Brass |
| Degree of protection as per IEC 60529 | IP 67 (only in plugged-in and screwed-down state) |
| Connection type | M12, A-coded |
| Dimensions (D x L in mm) | M30 X 100 |
| Weight | Approx. 160 g |
| Tightening torque | 70 Nm |

### 6.3    Operating conditions

| | |
|---|---|
| Transmission distance | 1 to 5 mm |
| Operating temperature $T_a$ | 0 °C to 55 °C |
| Storage temperature range | -25 °C to 75 °C |
| EMC EN 61000-4-2/3/4/5/6 EN 55011 | Severity 4ª/3ª/4B/2ª/3ª Size 1, Cl. A |
| Vibration | EN 60068-2-6, EN 60068-2-27 |
| Shock | EN 60068-2-29, EN 60068-2-64 |

### 6.4    Electrical data

| | |
|---|---|
| Supply voltage | 24 V DC +-10% , acc. to EN 61131-2 |
| Operating current at 24 V | Max. 1 A |
| Standby current | Max. 100 mA |
| Overload protection | Yes |

### 6.5    Electrical connection
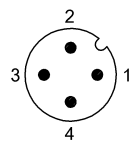
**M12, 4-pin, connector**

| Pin | Signal | Meaning |
|---|---|---|
| 1 | +24 V | Input voltage |
| 2 | nc | NC |
| 3 | 0V | GND, |
| 4 | C/Q, IO Link | C/Q, IO Link |

## Balluff Inductive Coupler
## Base BIC 1I0-I2A50-M30MI3-SM4A4A and
## Remote BIC 2I0-I2A50-M30MI3-SM4A5A

**7.1    Dimension**

Connector
SM4A5A
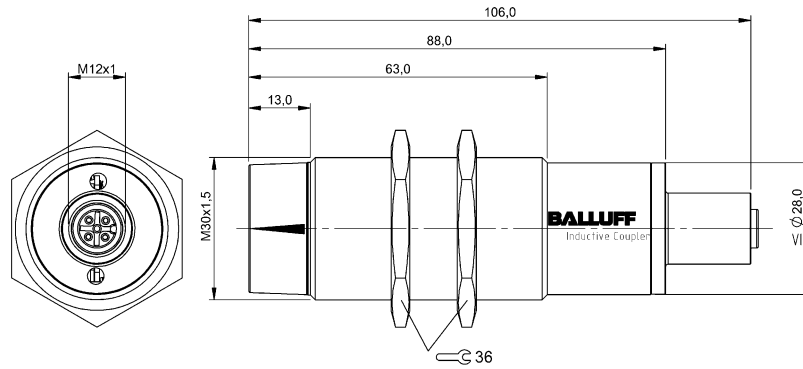
**7.2    Mechanical data**

| | |
|---|---|
| Housing material | Brass |
| Degree of protection as per | IP 67 (only in plugged-in and screwed-down state) |
| Connection type | M12, A-coded / Cable PUR |
| Dimensions (D x L in mm) | M30 X 106 |
| Weight | Approx. 160 g |
| Tightening torque | 70 Nm |

**7.3    Operating conditions**

| | |
|---|---|
| Transmission distance | 1 to 5 mm |
| Operating temperature Ta | 0 °C to 55 °C |
| Storage temperature range | -25 °C to 75 °C |
| EMC | |
| Vibration | EN 60068-2-6, EN 60068-2-27 |
| Shock | EN 60068-2-29, EN 60068-2-64 |

**7.4    Electrical data**

| | |
|---|---|
| Supply voltage | 24 V DC +-5 % |
| Output current | 500 mA |
| Short-circuit protected | Yes |
| Output peak current | Max. 800 mA |
| Operational readiness | < 100 ms |

**7.5    Electrical connections**
**M12, 5-pin, socket**
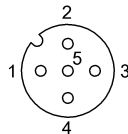
| Pin | Signal | Meaning |
|---|---|---|
| 1 | +24 V | Output voltage |
| 2 | - | NC |
| 3 | 0V | GND |
| 4 | C/Q, IO Link | C/Q, IO Link |
| 5 | nc | NC |

## 8    IO-Link communication

**8.1    Process data**

The "Base" transmits 4 bytes of input via the IO-Link. The first ten represent the data of the IO-Link device connected to the "Remote", while the 4th byte contains status information. If an IO-Link device that outputs less than 4 bytes of input data is connected to the "Remote", the remaining, unused bytes are transmitted with "0".

| Byte 0 | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PD Byte 0 Bit 7 | PD Byte 0 Bit 6 | PD Byte 0 Bit 5 | PD Byte 0 Bit 4 | PD Byte 0 Bit 3 | PD Byte 0 Bit 2 | PD Byte 0 Bit 1 | PD Byte 0 Bit 0 |

| Byte 1* | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PD Byte 1 Bit 7 | PD Byte 1 Bit 6 | PD Byte 1 Bit 5 | PD Byte 1 Bit 4 | PD Byte 1 Bit 3 | PD Byte 1 Bit 2 | PD Byte 1 Bit 1 | PD Byte 1 Bit 0 |

| Byte 2* | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PD Byte 2 Bit 7 | PD Byte 2 Bit 6 | PD Byte 2 Bit 5 | PD Byte 2 Bit 4 | PD Byte 2 Bit 3 | PD Byte 2 Bit 2 | PD Byte 2 Bit 1 | PD Byte 2 Bit 0 |

| Byte 3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| not used | not used | not used | not used | Status „Supply Remote" | Status „Short Remote" | Status "nzone" | Status "Com" |

\* All unused bits and bytes are output with "0".

**Explanation of the status bits**

| Status | Meaning |
|---|---|
| "Supply remote" | Voltage at the remote is less than 18V |
| "Short remote" | Short-circuit at the IO-Link interface of the remote |
| "Inzone" | No remote detected |
| "Com" | No IO-Link device detected |

**i**    **Note, tip**
Process data update time is max. 50ms

**8.2  Parameters**

Various base parameters can be accessed via IO-Link. All parameters are read-only, so they involve information, not configuration options. The "Identification data" can contain texts and information about the base. The Direct Parameter page of the IO-Link device connected to the remote is displayed in the "Parameter data".

| | DPP | SPDU | | Description | Length | Default value |
|---|---|---|---|---|---|---|
| | Index | Index | Sub Index | | | |
| **Identification data** | 0 x 07 | | | Vendor ID | 2 bytes | 0 x 0378 |
| | 0 x 08 | | | | | |
| | 0 x 09 | | | Device ID | 3 bytes | 0 x 050601 |
| | 0 x 0A | | | | | |
| | 0 x 0B | | | | | |
| | | 0 x 10 | 0 | Vendor name | 7 bytes | BALLUFF |
| | | 0 x 11 | 0 | Vendor text | 15 bytes | www.balluff.com |
| | | 0 x 12 | 0 | Product name | 37 bytes | BIC 1I0-I2A50-M30MI3-SM4A4A |
| | | 0 x 13 | 0 | Product ID | 7 bytes | BIC000C |
| | | 0 x 14 | 0 | Product text | 34 bytes | BIC IOL Base |
| | | 0 x 16 | 0 | Hardware revision | 3 bytes | |
| | | 0 x 17 | 0 | Firmware revision | 3 bytes | |
| **Parameterization data** | 0 x 40 64 | 0 x 40 64 | 0 1 – 16 | Direct Parameter page of the IO-Link device on the remote | 16 bytes | |

**8.3  Events**

| Event classification | | | Detailed information | | | |
|---|---|---|---|---|---|---|
| **Mode** | **Type** | **Instance** | | | | |
| **Event 1** | | | | | | |
| 0 x F3 | | | 0 x 5112 | | | |
| 0 x C0 | 0 x 30 | 0 x 03 | 0 x 5000 | 0 x 0100 | 0 x 0010 | 0 x 0002 |
| coming | Error | Application | Hardware | Supply | Supply low voltage | U2 = supply + 24 V |
| Supply voltage is too low | | | | | | |
| **Event 2** | | | | | | |
| 0 x B3 | | | 0 x 5112 | | | |
| 0 x 80 | 0 x 30 | 0 x 03 | 0 x 5000 | 0 x 0100 | 0 x 0010 | 0 x 0002 |
| going | Error | Application | Hardware | Supply | Supply low voltage | U2 = supply + 24 V |
| Supply voltage is OK again | | | | | | |

## 9    Accessories

### 9.1  Connectors

| Description | Description | Remarks |
|---|---|---|
| PUR for base, open cable end | BCC M415-0000-1A-003-PX0434-xxx | XXX -> cable length |
| PUR for base and remote as jumper | BCC M415-M414-3A-304-PX0434-xxx | XXX -> cable length |
| PUR for remote, open cable end | BCC M415-0000-1A-003-PX0434-xxx | XXX -> cable length |

### 9.2  Installation accessories

| Description | Description | Fig. |
|---|---|---|
|  | BES 30.0-BS-1 |  |
|  | BES 30-HW-1 |  |

### 9.3  Active components

| Description | Description | Fig. |
|---|---|---|
| Profibus connection for base | BNI PBS-507-001-Z011 |  |
| Profibus connection for base | BNI PBS-502-001-Z001 |  |
| Profibus connection for base | BNI PBS-504-001-K008 |  |
| Profinet connection for base | BNI PNT-502-105-Z015 |  |

## 10   Type code

**10.1 Type Code**

BIC 1I0-I2A50-M30MI3-XXXXXX_002-M45A

Balluff Inductive Coupler

Base (1) Remote (2)

Technology (PNP), variant (24 V),
power class (500 mA)
I2= 4 bytes

Housing shape (M30x1,5)

Housing material (M = brass) and length

SM4A5A:
Connector M12, axial
Number of pins and coding
BPX04:
Cable PUR, Number of wire

Cable lenght

Pig Tail
Number of wire
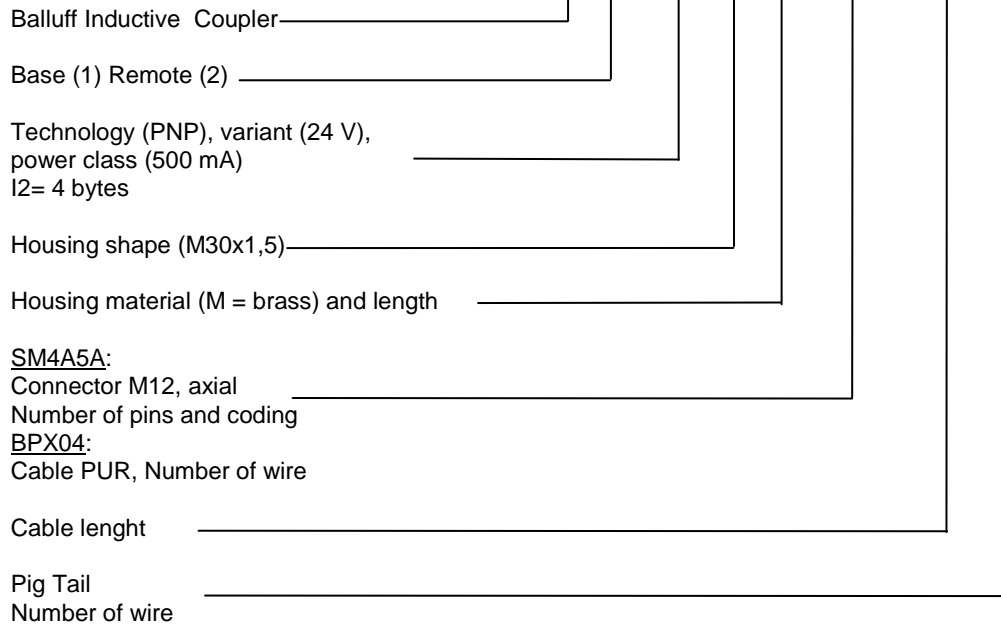
**10.2 Order code**

| Description | Order code |
|---|---|
| BIC 1I0-I2A50-M30MI3-SM4A4A | BIC000C |
| BIC 2I0-I2A50-M30MI3-SM4A5A | BIC000E |

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