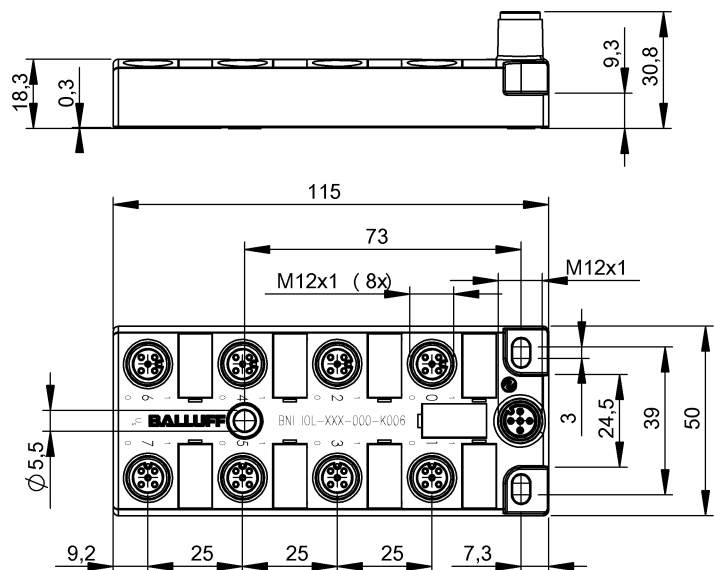


## BNI IOL-106-000-K006 BNI IOL-106-S01-K006 BNI IOL-106-S01-K006-C01



### User's Guide



## Content

<b>1</b>	<b>Notes to the user</b>	<b>2</b>
1.1	About this guide	2
1.2	Structure of the guide	2
1.3	Typographical conventions	2
	Enumerations	2
	Actions	2
	Syntax	2
	Cross-references	2
1.4	Symbols	2
1.5	Abbreviations	2
<b>2</b>	<b>Safety</b>	<b>3</b>
2.1	Intended use	3
2.2	General safety notes	3
2.3	Meaning of the warnings	3
<b>3</b>	<b>Getting Started</b>	<b>4</b>
3.1	Connection overview	4
3.2	Mechanical connection	5
3.3	Electrical connection	5
3.4	IO-Link connection	5
	Sensor Hub connection	6
	Module versions	6
3.5	Digital Sensors	6
<b>4</b>	<b>IO-Link Interface</b>	<b>7</b>
4.1	IO-Link Data	7
4.2	Process data inputs	7
4.3	Parameter data/ On-request data	10
	Inversion 40hex	11
	Voltage Monitoring 44hex	11
	Identification 60hex	11
4.4	Errors	12
4.5	Events	12
4.6	IO-Link Functions	12
	Parameter Server / Data Storage	12
	Block Parameter in a consistent way	12
<b>5</b>	<b>Technical Data</b>	<b>13</b>
5.1	Dimensions	13
5.2	Mechanical data	13
5.3	Electrical data	13
5.4	Operating conditions	13
5.5	Function indicators	14
	Module LEDs	14
	Digital Input LEDs	14
<b>6</b>	<b>Appendix</b>	<b>15</b>
6.1	Type designation code	15
6.2	Order information	15

**1 Notes to the user**

- 1.1 About this guide** This guide describes the Balluff IO-Link sensor collector module, also called the Sensor Hub. Connection to the host interface master is made through the IO-Link protocol. Functionally this compact, cost-effective module is comparable with a passive splitter box: It takes digital and analog sensor signals and passes them over the IO-Link interface.
- 1.2 Structure of the guide** The Guide is organized so that the sections build on one another.  
 Section 2 : Basic safety information.  
 Section 3 : The main steps for installing the device.  
 Section 4: IO-Link, parameter and process data for the device.  
 Section 5: Technical data for the device..
- 1.3 Typographical conventions** The following typographical conventions are used in this Guide.
- Enumerations** Enumerations are shown in list form with bullet points.
- 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 <sub>hex</sub> (e.g. 00<sub>hex</sub>).
- Cross-references** Cross-references indicate where additional information on the topic can be found (see Section 5 -"Technical Data").
- 
- 1.4 Symbols**
-  **Note!**  
 This symbol indicates a security notice which must be observed.
- 
-  **Note tip**  
 This symbol indicates general notes.
- 
- 1.5 Abbreviations**
- |        |                               |
|--------|-------------------------------|
| BNI    | Balluff Network Interface     |
| DPP    | Direct Parameter Page         |
| I-Port | Digital input port            |
| EMC    | Electromagnetic Compatibility |
| IOL    | IO-Link                       |
| LSB    | Least Significant Bit         |
| MSB    | Most Significant Bit          |
| SPDU   | Service Protocol Data Unit    |

## 2 Safety

**2.1 Intended use** The BNI IOL-... is a decentralized sensor input module which is connected to a host IO-Link master over an IO-Link interface.

**2.2 General safety notes**

**Installation and startup**

Installation and startup are to be performed only by trained specialists. Any damage resulting from unauthorized manipulation or improper use voids the manufacturer's guarantee and warranty.

The device is an equipment in accordance with EMC Class A. Such equipment may generate RF noise. The operator must take precautionary measures accordingly. The device must be powered only using an approved power supply (see Section 5 „Technical Data“). Only approved cables may be used.

**Operation and testing**

The operator is responsible for observing local prevailing safety regulations. When defects and non-clearable faults in the device occur, take it out of service and secure against unauthorized use.

Approved use is ensured only when the housing is fully installed.

**2.3 Meaning of the warnings**

---

**Note!**



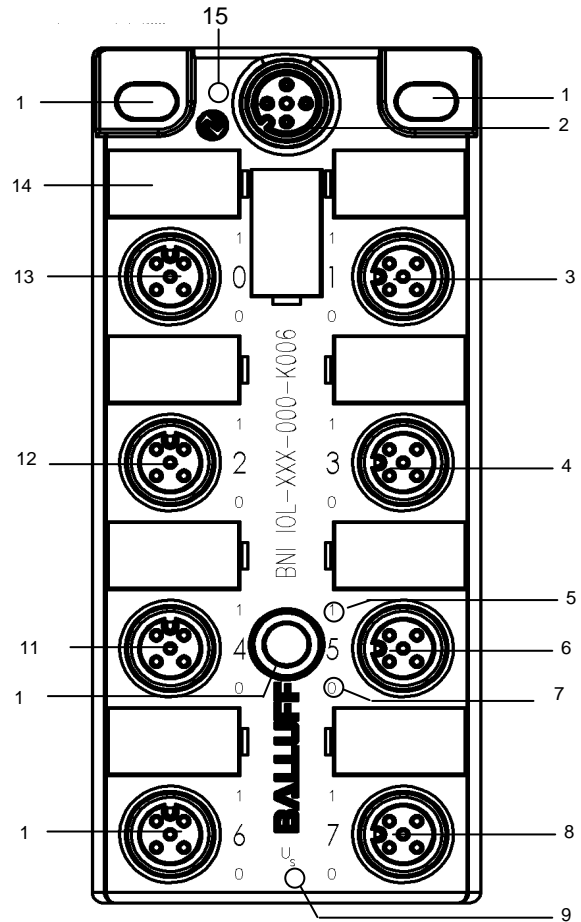
The pictogram used with the word "Caution" warns of a possible hazardous situation affecting the health of persons or equipment damage. Ignoring these warnings can result in injury or equipment damage.

➤ Always observe the described measures for preventing this danger.

---

3 Getting Started

3.1 Connection overview



- |  |                             |
|--|-----------------------------|
| 1 Mounting hole                        | 9 Status LED "Power Supply" |
| 2 IO-Link interface                    | 10 Digital I Port 6         |
| 3 Digital I Port 1                     | 11 Digital I Port 4         |
| 4 Digital I Port 3                     | 12 Digital I Port 2         |
| 5 Status-LED: Digital I Port 5 (pin 2) | 13 Digital I Port 0         |
| 6 Digital I Port 5                     | 14 Label                    |
| 7 Status-LED: Digital I Port 5 (pin 4) | 15 Status-LED IO-Link       |
| 8 Digital I Port 7                     |                             |

### 3 Getting Started

#### 3.2 Mechanical connection

The BNI IOL modules are attached using 3 M4 screws.

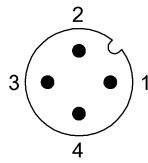
#### 3.3 Electrical connection

The BNI IOL-106-xxx-K006 modules require no separate supply voltage connection. Power is provided through the IO-Link interface by the host IO-Link Master.

#### 3.4 IO-Link connection

The IO-Link connection is made using an M12 connector (A-coded, male).

IO-Link (M12, A-coded, male)



Pin	Function
1	Supply voltage $U_s$ , +24 V, max. 1.6 A
2	-
3	GND, reference potential
4	C/Q, IO-Link data transmission channel

### 3 Getting Started

#### Sensor Hub connection

➤ Connect the incoming IO-Link line to the Sensor Hub.



**Note!**

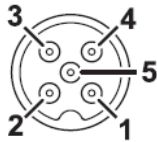
A standard sensor cable is used for connecting to the host IO-Link Master.

#### Module versions

Sensor Hub Version	Digital Port
BNI IOL-106-000-K006	16 Inputs
BNI IOL-106-S01-K006	16 Inputs, with single channel monitoring
BNI IOL-106-S01-K006-C01	16 Inputs, with single channel monitoring and identification

#### 3.5 Digital Sensors

Digital Input port (M12, A-coded, female)



Pin	Function
1	+24 V, 100 mA
2	Sinking (NPN) Input 2
3	0 V, GND
4	Sinking (NPN) Input 1
5	-



**Note!**

For the digital sensor inputs follow the input guideline per EN 61131-2, Type 2.



**Note!**

Unused I/O port sockets must be fitted with cover caps to ensure IP67 protection rating.

## 4 IO-Link Interface

### 4.1 IO-Link Data

<b>BNI IOL-106-000-K006</b>		
Data transmission rate	COM2 (38,4 kBaud)	
Minimal cycle time	3 ms	
Process data length	2 Byte input	
<b>IO-Link Revision</b>	<b>1.1</b>	<b>1.0</b>
Frame typ	2.V	1
Process data cycle time*	3 ms	3 ms

\* by min. cycle time

<b>BNI IOL-106-S01-K006</b>		
Data transmission rate	COM2 (38,4 kBaud)	
Minimal cycle time	3,5 ms	
Process data length	4 Byte input	
<b>IO-Link Revision</b>	<b>1.1</b>	<b>1.0</b>
Frame typ	2.V	1
Process data cycle time*	3,5 ms	14 ms

\* by min. cycle time

<b>BNI IOL-106-S01-K006-C01</b>		
Data transmission rate	COM2 (38,4 kBaud)	
Minimal cycle time	4 ms	
Process data length	6 Byte input	
<b>IO-Link Revision</b>	<b>1.1</b>	<b>1.0</b>
Frame typ	2.V	1
Process data cycle time*	4 ms	24 ms

\*by min. cycle time

### 4.2 Process data inputs

#### **BNI IOL-106-000-K006**

Process data length 2 Byte:

Byte	0								1							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
<b>Description</b>	Input Port 7 Pin 4	Input Port 6 Pin 4	Input Port 5 Pin 4	Input Port 4 Pin 4	Input Port 3 Pin 4	Input Port 2 Pin 4	Input Port 1 Pin 4	Input Port 0 Pin 4	Input Port 7 Pin 2	Input Port 6 Pin 2	Input Port 5 Pin 2	Input Port 4 Pin 2	Input Port 3 Pin 2	Input Port 2 Pin 2	Input Port 1 Pin 2	Input Port 0 Pin 2



4 IO-Link Interface

**BNI IOL-106-S01-K006**

Process data length 4 Byte:

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Description	Input Port 7 Pin 4	Input Port 6 Pin 4	Input Port 5 Pin 4	Input Port 4 Pin 4	Input Port 3 Pin 4	Input Port 2 Pin 4	Input Port 1 Pin 4	Input Port 0 Pin 4	Input Port 7 Pin 2	Input Port 6 Pin 2	Input Port 5 Pin 2	Input Port 4 Pin 2	Input Port 3 Pin 2	Input Port 2 Pin 2	Input Port 1 Pin 2	Input Port 0 Pin 2

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Description	Short Circuit Port 7	Short Circuit Port 6	Short Circuit Port 5	Short Circuit Port 4	Short Circuit Port 3	Short Circuit Port 2	Short Circuit Port 1	Short Circuit Port 0	-	-	-	-	-	-	-	Undervoltage Us

## 4 IO-Link Interface

### BNI IOL-106-S01-K006-C01

Process data length 6 Byte:

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Description	Input Port 7 Pin 4	Input Port 6 Pin 4	Input Port 5 Pin 4	Input Port 4 Pin 4	Input Port 3 Pin 4	Input Port 2 Pin 4	Input Port 1 Pin 4	Input Port 0 Pin 4	Input Port 7 Pin 2	Input Port 6 Pin 2	Input Port 5 Pin 2	Input Port 4 Pin 2	Input Port 3 Pin 2	Input Port 2 Pin 2	Input Port 1 Pin 2	Input Port 0 Pin 2

Byte	2								3							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Description	Short Circuit Port 7	Short Circuit Port 6	Short Circuit Port 5	Short Circuit Port 4	Short Circuit Port 3	Short Circuit Port 2	Short Circuit Port 1	Short Circuit Port 0	.	.	.	.	.	.	.	Undervoltage Us

Byte	4								5							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Description	Identification byte 0								Identification byte 1							

4 IO-Link Interface

4.3 Parameter data/ On-request data

	DPP	SPDU		Parameter	Data length	Access right	Default value
	Index	Index	Sub-index				
Identification Data	07hex			Vendor ID	2 Byte	Read only	0378hex
	08hex						
	09hex			Device ID	3 Byte		05010Fhex(106-000-K006) 050110hex(106-S01-K006) 050111hex(106-S01-K006-C01)
	0Ahex						
	0Bhex						
		10hex	0	Vendor Name	8 Byte		BALLUFF
		11hex	0	Vendor text	16 Byte		www.balluff.com
		12hex	0	Product Name	20/24 Byte		BNI IOL-106-000-K006 BNI IOL-106-S01-K006 BNI IOL-106-S01-C01
		13hex	0	Product ID	7 Byte		BNI0074 (106-000-K006) BNI0075 (106-S01-K006) BNI0076 (106-S01-K006-C01)
		14hex	0	Product text	22 Byte		Sensor hub plastic NPN
	16hex		Hardware Revision	< 4 Byte			
	17hex	0	Firmware Revision	< 64 Byte			
	18hex	0	Application tag*	32 Byte	Read / Write		

\* 32 Byte string adjustable by the user

	DPP	SPDU		Parameter	Data length	Range	Default value
	Index	Index	Sub-index				
Parameter Data		40hex 64	0 1-16	Inversion	2 Byte	0hex...FFFFhex	0hex
		44hex 68	0 1-16	Supply Monitoring	2 Byte	0hex ... FF01hex	-
		60hex 96	0	Identification *	2 Byte	0hex ... FFFFhex	-

\* Only at BNI IOL-106-S01-K006-C01

**Note!**

The Index 60, which includes the identification bytes, is not part of the parameter server list for the data storage.



If the parameter server of the IO-Link master port is activated, this Index will not be assigned during data storage, neither from the IO-Link Device to the master port, nor from the master port to the IO-Link device.

## 4 IO-Link Interface

### Inversion 40hex

Inversion of the input signals:

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub Index	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9
Description	Inversion Port 7 Pin 4	Inversion Port 6 Pin 4	Inversion Port 5 Pin 4	Inversion Port 4 Pin 4	Inversion Port 3 Pin 4	Inversion Port 2 Pin 4	Inversion Port 1 Pin 4	Inversion Port 0 Pin 4	Inversion Port 7 Pin 2	Inversion Port 6 Pin 2	Inversion Port 5 Pin 2	Inversion Port 4 Pin 2	Inversion Port 3 Pin 2	Inversion Port 2 Pin 2	Inversion Port 1 Pin 2	Inversion Port 0 Pin 2

**Inversion Port (x):**

0 – Normal  
1 - Inverted

### Voltage Monitoring 44hex

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Sub Index	8	7	6	5	4	3	2	1								9
Description	Short Circuit Port 7 Pin 1	Short Circuit Port 6 Pin 1	Short Circuit Port 5 Pin 1	Short Circuit Port 4 Pin 1	Short Circuit Port 3 Pin 1	Short Circuit Port 2 Pin 1	Short Circuit Port 1 Pin 1	Short Circuit Port 0 Pin 1	.	.	.	.	.	.	.	Undervoltage Us

Short Circuit port x = 1  
Short Circuit on port x between Pin 1 and Pin 3  
Port x = 0....7

### Identification 60hex

Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Description	Identificaton Byte 0								Identificaton Byte 1							

This parameter data will not be saved in data storage.

**4 IO-Link Interface**

**4.4 Errors**

Error Code	Description
0x8011	Index not available
0x8012	Subindex not available
0x8023	Access Denied
0x8030	Parameter Value out of Range
0x8033	Parameter length overrun
0x8034	Parameter length underrun

**4.5 Events**

IO-Link Revision 1.0	
Event Code	Description
0x5112	Low sensor voltage (US)
0x5410	Short circuit
IO-Link Revision 1.1	
Event Code	Description
0x5111	Low sensor voltage (US)
0x7710	Short circuit

**4.6 IO-Link**

**Functions**

With IO-Link Version 1.1 the Devices are supporting new functionalities. However these new functionalities are only available, when the IO-Link-Master-Port where the Device is connected to, is also supporting IO-Link Version 1.1.

**Parameter Server / Data Storage**

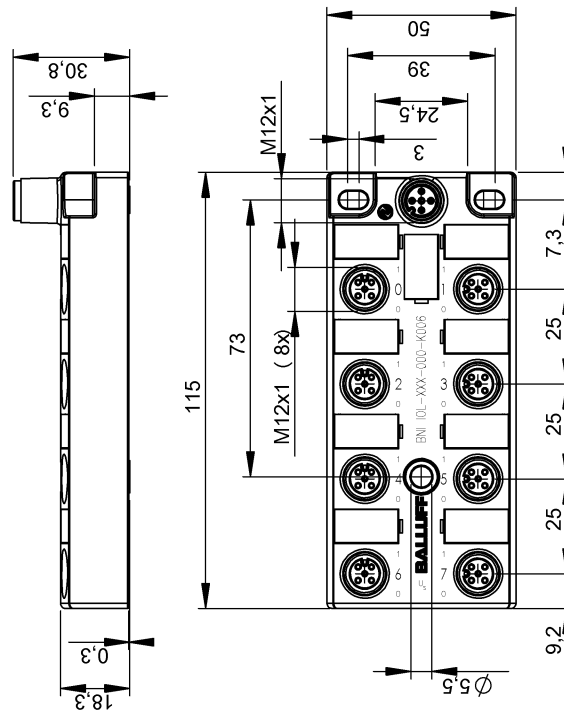
An IO-Link Master of Version 1.1 provides minimum 2kByte storage capacity for the Device configuration of the connected Device.  
 With an Upload- / Download-Function the parameter data can be transferred from Device to the Master-Port or from the Master-Port into the Device.  
 It has to be configured in the IO-Link-Master-Module if the upload- or the download-function should be activated.

**Block Parameter in a consistent way**

Data blocks (Parameter blocks) can be downloaded from a controller or a configuration tool.

## 5 Technical Data

### 5.1 Dimensions



### 5.2 Mechanical data

Housing Material	Plastic, transparent
IO-Link-Port	M12, A-coded, male
Input-Ports	8x M12x1, A-coded, female
Enclosure rating	IP67 (only when plugged-in and threaded-in)
Weight	90 g
Dimensions (L x W x H, excluding connector)	115 x 50 x 30,8 mm

### 5.3 Electrical data

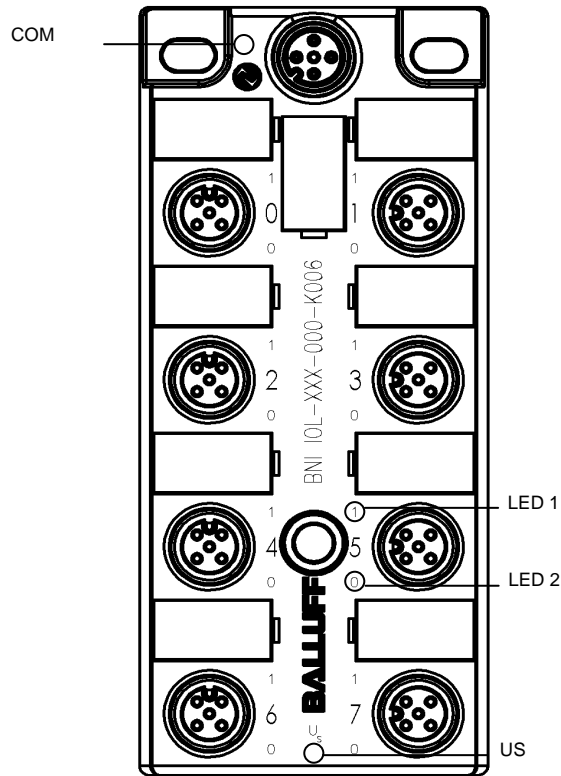
Operating voltage	18 ... 30,2 V DC, per EN 61131-2
Ripple	< 1 %
Current draw without load	≤ 55 mA

### 5.4 Operating conditions

Operating temperature	-5 °C ... +55 °C
Storage temperature	-25 °C ... +70 °C
EMC – EN 61000-4-2/3/4/5/6	EMC-directive 2004/108/EEC EN 61000-6-2:2005 AC:2005 EN 61000-6-4:2007 A1:2011
Enclosure rating	IP67 (only when plugged-in and threaded-in)
Vibration/shock	EN 60068-2-6, EN 60068-2-27, EN 60068-2-29, EN 60068-2-64

5 Technical Data

5.5 Function indicators



Module LEDs

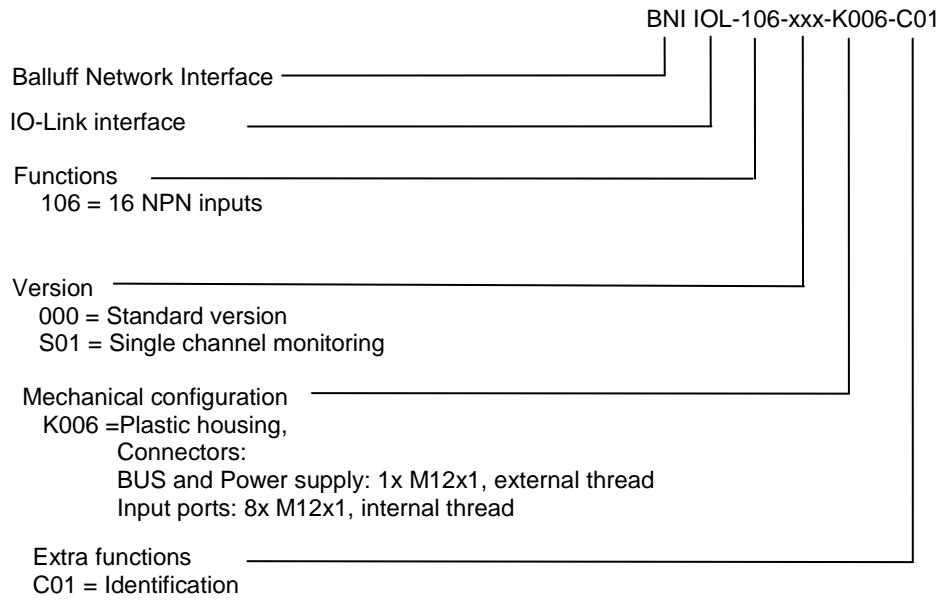
	Status	Function
<b>IO-Link Communication</b>	Green	No Communication
	Green negative pulsed	Communication OK
	Red	Communication line overload
	Off	Module unpowered
<b>Us LED</b>	Green	Module power is OK
	Green slowly flashing	Short Circuit Sensor supply
	Green rapidly flashing	Module power supply < 18 V
	Off	Module unpowered

Digital Input LEDs LED 2, Input Pin 4 and LED 1, Input Pin 2

Status	Function
Yellow	Input signal = 1
Red	Sensor power supply short circuit,
Off	Input signal = 0

## 6 Appendix

### 6.1 Type designation code



### 6.2 Order information

Type	Order Code
BNI IOL-106-000-K006	BNI0074
BNI IOL-106-S01-K006	BNI0075
BNI IOL-106-S01-K006-C01	BNI0076



Notes

 [www.balluff.com](http://www.balluff.com)

Balluff GmbH  
Schurwaldstrasse 9  
73765 Neuhausen a.d.F.  
Germany  
Tel. +49 7158 173-0  
Fax +49 7158 5010  
[balluff@balluff.de](mailto:balluff@balluff.de)

**BALLUFF**

No. 895400 E • Edition 114 • Replaces Edition D13 • Subject to modification