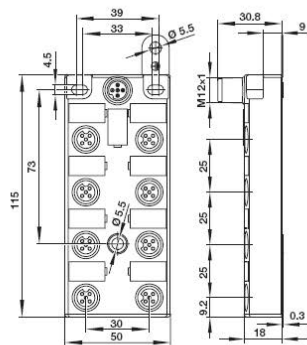




## BNI IOL-709-000-K006 BNI IOL-710-000-K006 IO-Link Sensor-Hub analog User's Guide



<b>1</b>	<b>Notes to the user</b>	<b>2</b>
1.1	Structure of the guide	2
1.2	Typographical conventions	2
	Enumerations	2
	Actions	2
	Syntax	2
	Cross-references	2
1.3	Symbols	2
1.4	Abbreviations	2
1.5	Divergent views	2
<b>2</b>	<b>Safety</b>	<b>3</b>
2.1	Intended use	3
2.2	Installation and startup	3
2.3	General safety Notes	3
2.4	Resistance to Aggressive Substances	3
	Hazardous voltage	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	Function ground	5
3.5	IO-Link connection	5
3.6	Digital Sensors	6
3.7	Analogue 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	Process data outputs	8
4.4	Parameter data/ On-request data	8
	Identification data	8
	Inversion	9
	Switch point enable	9
	Switch point	9
4.5	Errors	10
4.6	Events	10
<b>5</b>	<b>Technical Data</b>	<b>11</b>
5.1	Dimensions	11
5.2	Mechanical data	11
5.3	Electrical data	11
5.4	Operating conditions	11
5.5	Function indicators	12
	Module LEDs	12
	Digital Input LEDs	12
	Analogue Input LEDs	12
<b>6</b>	<b>Appendix</b>	<b>13</b>
6.1	Type designation code	13
6.2	Order information	13

**1 Notes to the user**

<b>1.1 Structure of the guide</b>	The Guide is organized so that the sections build on one another. Section 2 : Basic safety information. .....																										
<b>1.2 Typographical conventions</b>	The following typographical conventions are used in this Guide.																										
<b>Enumerations</b>	Enumerations are shown in list form with bullet points. <ul style="list-style-type: none"> <li>• Entry 1,</li> <li>• Entry 2.</li> </ul>																										
<b>Actions</b>	Action instructions are indicated by a preceding triangle. The result of an action is indicated by an arrow. <ul style="list-style-type: none"> <li>➤ Action instruction 1.</li> <li>➤ ↪ Action result.</li> <li>➤ Action instruction 2.</li> </ul>																										
<b>Syntax</b>	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> ).																										
<b>Cross-references</b>	Cross-references indicate where additional information on the topic can be found.																										
<b>1.3 Symbols</b>	<hr/> <div style="display: flex; align-items: center;">  <div> <p><b>Attention!</b>              This symbol indicates a security notice which must be observed.</p> </div> </div> <hr/> <div style="display: flex; align-items: center;">  <div> <p><b>Note</b>              This symbol indicates general notes.</p> </div> </div> <hr/>																										
<b>1.4 Abbreviations</b>	<table border="0" style="width: 100%;"> <tr> <td style="width: 30%;">BCD</td> <td>Binary coded switch</td> </tr> <tr> <td>BNI</td> <td>Balluff Network Interface</td> </tr> <tr> <td>CV</td> <td>Current Version: BNI IOL 709...</td> </tr> <tr> <td>DPP</td> <td>Direct Parameter Page</td> </tr> <tr> <td>I-Port</td> <td>Digital input port</td> </tr> <tr> <td>EMC</td> <td>Electromagnetic Compatibility</td> </tr> <tr> <td>FE</td> <td>Function ground</td> </tr> <tr> <td>IOL</td> <td>IO-Link</td> </tr> <tr> <td>LSB</td> <td>Least Significant Bit</td> </tr> <tr> <td>MSB</td> <td>Most Significant Bit</td> </tr> <tr> <td>SP</td> <td>Switch Point</td> </tr> <tr> <td>SPDU</td> <td>Service Protocol Data Unit</td> </tr> <tr> <td>VV</td> <td>Voltage version: BNI IOL 710...</td> </tr> </table>	BCD	Binary coded switch	BNI	Balluff Network Interface	CV	Current Version: BNI IOL 709...	DPP	Direct Parameter Page	I-Port	Digital input port	EMC	Electromagnetic Compatibility	FE	Function ground	IOL	IO-Link	LSB	Least Significant Bit	MSB	Most Significant Bit	SP	Switch Point	SPDU	Service Protocol Data Unit	VV	Voltage version: BNI IOL 710...
BCD	Binary coded switch																										
BNI	Balluff Network Interface																										
CV	Current Version: BNI IOL 709...																										
DPP	Direct Parameter Page																										
I-Port	Digital input port																										
EMC	Electromagnetic Compatibility																										
FE	Function ground																										
IOL	IO-Link																										
LSB	Least Significant Bit																										
MSB	Most Significant Bit																										
SP	Switch Point																										
SPDU	Service Protocol Data Unit																										
VV	Voltage version: BNI IOL 710...																										
<b>1.5 Divergent views</b>	Product views and images can differ from the specified product in this manual. They serve only as an illustration.																										

## 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 Installation and startup**



**Attention!**

Installation and startup are to be performed by trained technical personnel only. Skilled specialists are people who are familiar with the work such as installation and the operation of the product and have the necessary qualifications for these tasks. Any damage resulting from unauthorized tampering or improper use shall void warranty and liability claims against the manufacturer. The operator is responsible for ensuring that the valid safety and accident prevention regulations are observed in specific individual cases.

**2.3 General safety Notes**

**Commissioning and inspection**

Before commissioning, carefully read the User's Guide.

The system must not be used in applications in which the safety of persons depends on the function of the device.

**Intended use**

Warranty and liability claims against the manufacturer shall be rendered void by damage from:

- Unauthorized tampering
- Improper use
- Use, installation or handling contrary to the instructions provided in this User's Guide.

**Obligations of the owner/operator!**

The device is a piece of equipment in accordance with EMC Class A. This device can produce RF noise. The owner/operator must take appropriate precautionary measures against this for its use. The device may be used only with a power supply approved for this. Only approved cables may be connected.

**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.

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

**2.4 Resistance to Aggressive Substances**



**Attention!**

The BNI modules always have good chemical and oil resistance. When used in aggressive media (such as chemicals, oils, lubricants and coolants, each in a high concentration (i.e. too little water content)), the material must first be checked for resistance in the particular application. No defect claims may be asserted in the event of a failure or damage to the BNI modules caused by such aggressive media..

**Hazardous voltage**



**Attention!**

Disconnect all power before servicing equipment.

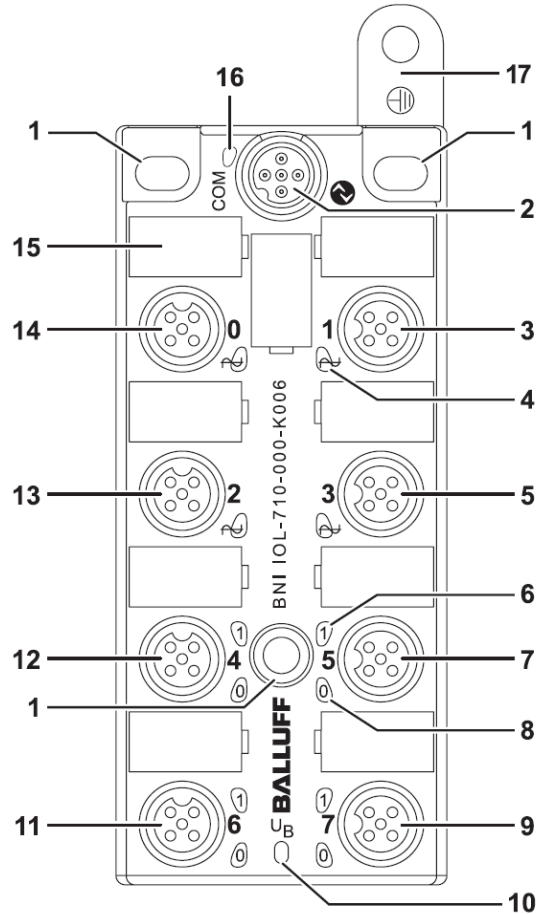


**Note**

In the interest of continuous improvement of the product, Balluff GmbH reserves the right to change the technical data of the product and the content of these instructions at any time without notice.

3 Getting Started

3.1 Connection overview



- |   |                                 |    |                            |
|---|---------------------------------|----|----------------------------|
| 1 | Mounting hole                   | 10 | Status LED "Power Supply"  |
| 2 | IO-Link interface               | 11 | Digital input port 2       |
| 3 | Analogue input-Port 1           | 12 | Digital input port 0       |
| 4 | Status-LED: Analogue port       | 13 | Analogue input port 2      |
| 5 | Analogue input port 3           | 14 | Analogue input port 0      |
| 6 | Status-LED: digital input Pin 2 | 15 | Label                      |
| 7 | Digital input port 1            | 16 | Status-LED „COM“           |
| 8 | Status-LED: Digital port Pin 4  | 17 | Function ground connection |
| 9 | Digital input port 3            |    |                            |

### 3 Getting Started

#### 3.2 Mechanical connection

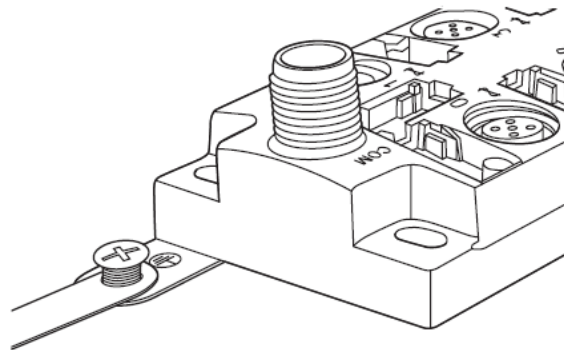
The BNI IOL modules are attached using 3 M4 screws (Item 1, Fig. 3-1/3-2).

#### 3.3 Electrical connection

The Sensor Hub modules require no separate supply voltage connection. Power is provided through the IO-Link interface by the host IO-Link Master.

#### 3.4 Function ground

The modules are provided with a ground terminal.



- Connect Sensor Hub module to the ground terminal.



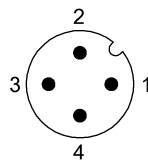
#### Note

The FE connection from the housing to the machine must be low-impedance and as short as possible.

#### 3.5 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, +24 V, max. 1.6 A
2	-
3	GND, reference potential
4	C/Q, IO-Link data transmission channel

- Connection protection ground to FE terminal, if present.
- Connect the incoming IO-Link line to the Sensor Hub.



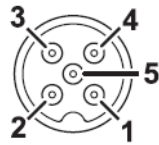
#### Note

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

### 3 Getting Started

#### 3.6 Digital Sensors

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



Pin	Function
1	+24 V, 100 mA
2	Standard Input
3	0 V, GND
4	Standard Input
5	-

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

#### 3.7 Analogue Sensors

Analogue input port (M12, A-coded, female)



Pin	Function
1	+24 V, 100 mA
2	BNI IOL-709...: 4 - 20 mA BNI IOL-710...:n.c.
3	0 V, GND
4	BNI IOL-710...: 0 - 10 V BNI IOL-709...:n.c.
5	FE, function ground

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

**Note**  
 Overcurrent (> 25mA) on the BNI IOL-709 Module's inputs can distort the measurement results of the other channels and it may leads to malfunction..

## 4 IO-Link Interface

### 4.1 IO-Link Data

Baudrate	COM2 (38,4 kBaud)
Frame type	1
Minimum cycle time	3 ms
Process data cycle	30 ms with minimum cycle time

### 4.2 Process data inputs

#### BNI IOL-710-.../BNI IOL-709-...(Sensor-Hub digital/analog)

Process data length 10Byte:

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Input Port 7.Pin 4	Input Port 6.Pin 4	Input Port 5.Pin 4	Input Port 4.Pin 4	Switch Point 1 Port 3	Switch Point 1 Port 2	Switch Point 1 Port 1	Switch Point 1 Port 0	Input Port 7.Pin 2	Input Port 6.Pin 2	Input Port 5.Pin 2	Input Port 4.Pin 2	Switch Point 2 Port 3	Switch Point 2 Port 2	Switch Point 2 Port 1	Switch Point 2 Port 0

Byte 2				Byte 3												
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	
Error 1	Error 2	Error 3	0	MSB		Analogue value										LSB
Port 0																

Byte 4				Byte 5												
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	
Error 1	Error 2	Error 3	0	MSB		Analogue value										LSB
Port 1																

Byte 6				Byte 7												
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	
Error 1	Error 2	Error 3	0	MSB		Analogue value										LSB
Port 2																

Byte 8				Byte 9												
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	
Error 1	Error 2	Error 3	0	MSB		Analogue value										LSB
Port 3																



4 IO-Link Interface

<b>Input:</b>	Input-Signal at Port and Pin
<b>Switch Point:</b>	The switch point bits show a switch point overrun. The switch point can be configured by parameter ( see 0.0 - "Switch point enable" and 0.0 - "Switch point")
<b>Analogue value:</b>	VV: actual voltage value between 0 and 1056 (1Bit = 0.01V) CV: actual current value between 0 and 2150 (1Bit = 0.01mA)
<b>Error:</b>	Overcurrent/short circuit on sensor supply Measurement range overflow Measurement range undercut (only CV)

4.3 Process data outputs

There are no outputs at BNI IOL-710-... and BNI IOL-709-... modules.

4.4 Parameter data/ On-request data

	DPP	SPDU		Parameter	Data width	Access
	Index	Index	Sub-index			
Identification Data	07hex			Vendor ID	2 Byte	Read only
	08hex					
	09hex			Device ID	3 Byte	
	0Ahex					
	0Bhex					
		10hex	0	Vendor Name	8 Byte	
		11hex	0	Vendor text	16 Byte	
		12hex	0	Product Name	34 Byte	
		13hex	0	Product ID	21 Byte	
		14hex	0	Product text	34 Byte	
	16hex		Hardware Revision	3 Byte		
	17hex	0	Firmware Revision	3 Byte		

Identification data

Type	Device ID	Version
BNI IOL-710-000-K006	050201hex	Voltage version
BNI IOL-709-000-K006	050202hex	Current version

	DPP	SPDU		Parameter	Data width	Value range	Default-value
	Index	Index	Sub-index				
Parameter Data	10hex 11hex	40hex 64	0 1-16	Inversion	2 Byte	0000hex...FFFFhex	0000hex
	12hex	41hex 65	0 1-8	Switch point enable	1 Byte	00hex...FFhex	00hex
		42hex 66	0	Switch point 1 Port 0	2 Byte	0000hex ... 03E8hex	0000hex
		43hex 67	0	Switch point 1 Port 1	2 Byte	0000hex ... 03E8hex	0000hex
		44hex 68	0	Switch point 1 Port 2	2 Byte	0000hex ... 03E8hex	0000hex
		45hex 69	0	Switch point 1 Port 3	2 Byte	0000hex ... 03E8hex	0000hex
		46hex 70	0	Switch point 2 Port 0	2 Byte	0000hex ... 03E8hex	0000hex
		47hex 71	0	Switch point 2 Port 1	2 Byte	0000hex ... 03E8hex	0000hex
		48hex 72	0	Switch point 2 Port 2	2 Byte	0000hex ... 03E8hex	0000hex
		49hex 73	0	Switch point 2 Port 3	2 Byte	0000hex ... 03E8hex	0000hex

**Inversion**

Inversion of the input signals:

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Inversion Port 7 Pin 4	Inversion Port 6 Pin 4	Inversion Port 5 Pin 4	Inversion Port 4 Pin 4	Inversion SP1 Port 3	Inversion SP1 Port 2	Inversion SP1 Port 1	Inversion SP1 Port 0	Inversion Port 7 Pin 2	Inversion Port 6 Pin 2	Inversion Port 5 Pin 2	Inversion Port 4 Pin 2	Inversion SP2 Port 3	Inversion SP2 Port 2	Inversion SP2 Port 1	Inversion SP2 Port 0

**Switch point enable**

Enable the switch points by setting the enable bits

Byte 0							
7	6	5	4	3	2	1	0
Enable switch point 2 Part 3	Enable switch point 2 Part 2	Enable switch point 2 Part 1	Enable switch point 2 Part 0	Enable switch point 1 Part 3	Enable switch point 1 Part 2	Enable switch point 1 Part 1	Enable switch point 1 Part 0

**Switch point**

Byte 0								Byte 1							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
0	0	0	0	Switch point											

**Value range (dec)**

CV= 400...2000

VV= 0...1000

4 IO-Link Interface

4.5 Errors

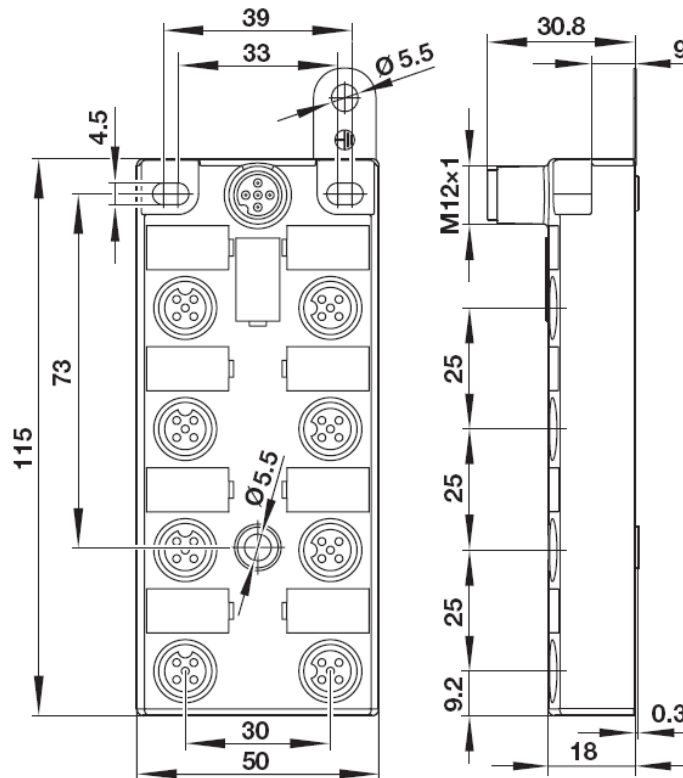
Byte 0	Byte 1
Device application error: 80 <sub>hex</sub>	11 <sub>hex</sub> Index not available
	12 <sub>hex</sub> Subindex not available
	30 <sub>hex</sub> Value out of range

4.6 Events

	Class/Qualifier			Code (high + low)			
	Mode	Type	Instance				
Parameter Data	appears	Error	AL	Device Hardware	supply	Supply low voltage	U2 = supply + 24V
	C0 <sub>hex</sub>	30 <sub>hex</sub>	03 <sub>hex</sub>	5000 <sub>hex</sub>	0100 <sub>hex</sub>	0010 <sub>hex</sub>	0002 <sub>hex</sub>
	F3 <sub>hex</sub>			5112 <sub>hex</sub>			
	disappears	Error	AL	Device Hardware	supply	Supply low voltage	U2 = supply + 24V
	80 <sub>hex</sub>	30 <sub>hex</sub>	03 <sub>hex</sub>	5000 <sub>hex</sub>	0100 <sub>hex</sub>	0010 <sub>hex</sub>	0002 <sub>hex</sub>
	B3 <sub>hex</sub>			5112 <sub>hex</sub>			
	appears	Error	AL	Device Hardware	supply	supply periphery	
	C0 <sub>hex</sub>	30 <sub>hex</sub>	03 <sub>hex</sub>	5000 <sub>hex</sub>	0100 <sub>hex</sub>	0060 <sub>hex</sub>	
	F3 <sub>hex</sub>			5160 <sub>hex</sub>			
	disappears	Error	AL	Device Hardware	supply	supply periphery	
	80 <sub>hex</sub>	30 <sub>hex</sub>	03 <sub>hex</sub>	5000 <sub>hex</sub>	0100 <sub>hex</sub>	0060 <sub>hex</sub>	
	B3 <sub>hex</sub>			5160 <sub>hex</sub>			

## 5 Technical Data

### 5.1 Dimensions



### 5.2 Mechanical data

Housing Material	Plastic, transparent
IO-Link-Port	M12, A-coded, male
Input-Ports	8x M12, 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

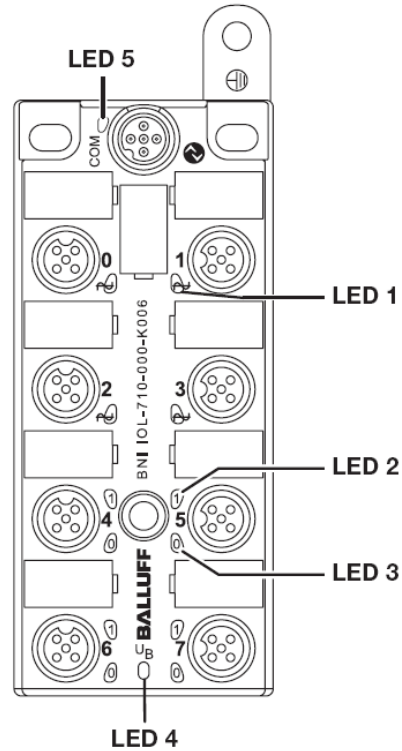
Operating voltage	18 ... 30,2 V DC, per EN 61131-2
Ripple	< 1 %
Current draw without load	≤ 40 mA

### 5.4 Operating conditions

Operating temperature	-5 °C ... +55 °C
Storage temperature	-25 °C ... +70 °C

5 Technical Data

5.5 Function indicators



Module LEDs

LED 5, IO-Link Communication

Status	Function
Green	No Communication
Green negative pulsed	Communication OK
Red	Communication line overload
Off	Module unpowered

LED 4, Power supply status

Status	Function
Green	Module power is OK
Green slowly flashing	Short circuit
Green rapidly flashing	Module power supply < 18 V
Off	Module unpowered

Digital Input LEDs

LED 3, Input Pin 4 and LED 2, Input Pin 2

Status	Function
Yellow	Input signal = 1
Off	Input signal = 0

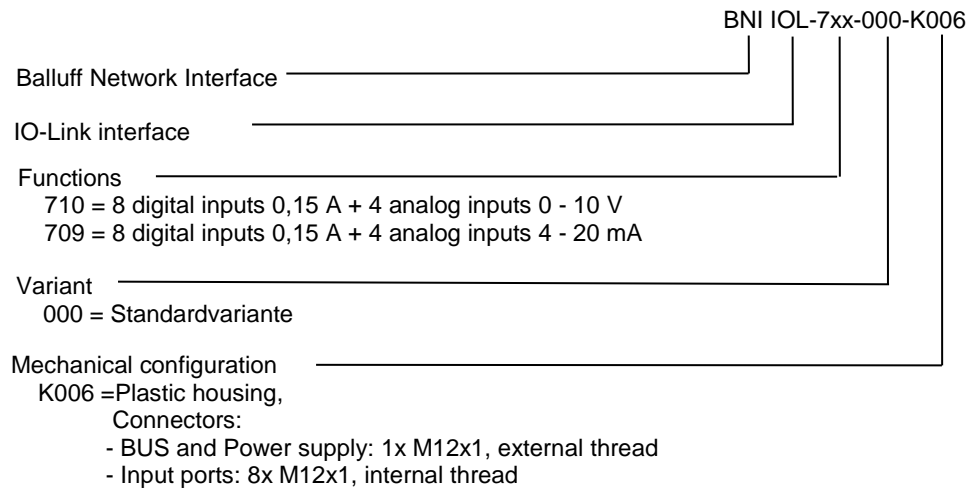
Analogue Input LEDs

LED 1, Analogue input port

Status	Signal 709 (4-20 mA)	Signal 710 (0-10 V)
Green	$\geq 4 \text{ mA} - \leq 20 \text{ mA}$	$> 0,05 \text{ V}$
Red	$< 4 \text{ mA} - > 20 \text{ mA}$	$> 10,05 \text{ V}$

## 6 Appendix

### 6.1 Type designation code



### 6.2 Order information

Type	Order Code
BNI IOL-709-000-K006	BNI0007
BNI IOL-710-000-K006	BNI0008

**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)