DeviceNet
SDNL-0404D-xxxx

IO Data Mapping
DeviceNet Objects
Indicators and Switches

Version: 1.1
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Please note the following

Target group

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards.

Safety requirements

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

The documentation has been prepared with care. The products described are, however, constantly under development. For that reason the documentation is not in every case checked for consistency with performance data, standards or other characteristics, and does not represent an assurance of characteristics in the sense of § 459, Para. 2 of the German Civil Code. In the event that it contains technical or editorial errors, we retain the right to make alterations at any time and without warning. No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

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1 Introduction

SDNL-0404D-xxxx

The purpose of this document is to provide DeviceNet Specific Information needed to run TURCK SDNL-0404D-xxxx fieldbus coupler boxes in a DeviceNet Network.

DeviceNet Characteristics

Characteristic	Description
DeviceNet Functionality	Group Two Only Slave for DeviceNet Master / Scanner
DeviceType	Communications Adapter
IO – Modes	Polling, Bit Strobe, Change of State / Cyclic
IO – Data Length	The IO Data length for the IO-Modes Polling and COS/Cyclic is limited to 512 Bytes in each direction
Configuration	Switches (node address) , Configuration Objects, Electronic Data Sheet (EDS)
LEDs	Module / Network Status LED, Vendor Specific IO LEDs
Electronic Data Sheet	Electronic Data Sheet for each type of SDNL-0404D-xxxx (www.turck.de)
Connector	Sealed Micro Style Connector
Baud Rates	125 Kbaud, 250 Kbaud, 500 Kbaud, Auto Baud Detection

2 IO Data Mapping

IO Data Mapping

The IO Data Mapping describes the contents of the IO Data of the SDNL-0404D-xxxx in Receive and Transmit direction. The description is done by DeviceNet Assembly Objects. Each of the SDNL-0404D-xxxx supports Assembly Objects in each data direction. The input data/status or output data is mapped to a byte stream exchanged with the DeviceNet Master / Scanner by IO-Data transfer.

2.1 IO Data Assignment of SDNL-0404D-xxxx and Extension Boxes

Digital Signals (bit-oriented)

The digital Signals are bit-oriented. This means that one bit in the process image is assigned to each channel. The SDNL-0404D-xxxx creates a memory area containing the current input bits and ensures that the bits in a second memory area dedicated to the output channels are written out immediately

Analog Signals (byte-oriented)

The processing of analog signals is always byte-oriented. Analog input and output values are represented in memory by two bytes each. Values are represented in unsigned/signed integer or two's complement format (see SNNE-xxxx-xxxx manual). The number "0" stands for the input/output value "0 V", "0 mA" or "4 mA". Per default, Control and Status Bytes for each analog channel are **not** mapped to the IO-data image. An analog channel is represented in the process image by two bytes

Special Signals and interfaces (byte-oriented)

The SDNL-0404D-xxxx supports extension boxes with other interfaces such as RS232, RS485 incremental encoder, SSI Sensor interface. These signals can considered similarly to the analog signals named above. For some special signals the width of 16 Bit is not sufficient. The SDNL-0404D-xxxx can Support any byte width.

Assignment of inputs/ outputs to the process image (Default Assignment / Assembly Object)

Once it has been switched on, the SDNL-0404D-xxxx finds out how many Extension Boxes are connected and creates an assignment list. The analog and digital channels, divided into inputs and outputs, are assembled into different parts of the list. The assignment starts on the first extension box next to the SDNL-0404D-xxxx. The software in the SDNL-0404D-xxxx collects the individual entries for each of the channels in order to create the assignment list.

IO Data from Master / Scanner to SDNL-0404D-xxxx (Default Assignment / Assembly Object)

IO-Data which is transferred from the DeviceNet Master / Scanner to the SDNL-0404D-xxxx begins with byte-oriented values which is the data for the analog output and special signal extension boxes. The bit-oriented data for the digital outputs of the SDNL-0404D-xxxx and the digital output extension boxes is transmitted after the byte-oriented data. If the total number of digital inputs is not a multiple of 8, there will be a number of bits left over in the last data byte. These will be discarded.

IO Data from SDNL-0404D-xxxx to Master / Scanner to (Default Assignment / Assembly Object)

IO-Data which is transferred from the SDNL-0404D-xxxx to the DeviceNet Master / Scanner begins with byte-oriented values which is the data from the analog input and special signal extension boxes. The bit-oriented data for the digital inputs of the SDNL-0404D-xxxx and the digital input extension boxes is transmitted after the byte-oriented data. If the total number of digital outputs is not a multiple of 8, there will be a number of bits left over in the last data byte. These will be discarded.

Status Byte at the end of the input data

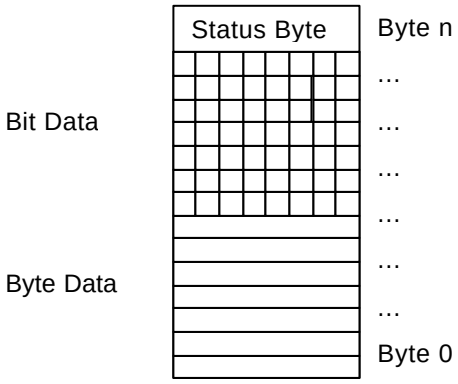
An extra status byte is transferred at the end of the Input Data and returns the status of the SDNL-0404D-xxxx with the following meaning:

Bit0: Coupling_Module_Error : IO Error, internal Data exchange SDNL-0404D-xxxx has failed
Bit1: Coupling_Module-Cfg : SDNL-0404D-xxxx Configuration Error
Bit2: reserved
Bit3: Diag : Diagnosis of analog Channel
Bit4: reserved
Bit5: reserved
Bit6: reserved
Bit7: FB_Error : Fieldbus Error / Idle Mode

The status byte corresponds to the Attribute “Coupling Module-Status” of the Coupling Module-Config Object.

IO Data from Master / Scanner to SDNL-0404D-xxxx

IO Data from SDNL-0404D-xxxx to Master / Scanner



2.1.1 SDNL-0404D-xxxx

Description	**4 x Digital Input + 4 x Digital Output, 24 V DC**
IO Data Type	Digital Signal, bit-oriented
Input Data	4 Bit
Output Data	4 Bit

2.1.2 SNNE-0800D-xxxx

Description	**8 Channel Digital Input, 24 V DC**
IO Data Type	Digital Signal, bit-oriented
Input Data	8 Bit
Output Data	none

2.1.3 SNNE-0202D-0003

Description	**2 Channel Up/Down Counter, 24 V DC, 100 kHz**
IO Data Type	Analog Signal, byte-oriented
Input Data	10 Byte Byte 0: Status, Channel 1 Byte 1: LowByte DataIn[0], Channel 1 Byte 2: HighByte DataIn[0], Channel 1 Byte 3: LowByte DataIn[1], Channel 1 Byte 4: HighByte DataIn[1], Channel 1 Byte 5: Status, Channel 2 Byte 6: LowByte DataIn[0], Channel 2 Byte 7: HighByte DataIn[0], Channel 2 Byte 8: LowByte DataIn[1], Channel 2 Byte 9: HighByte DataIn[1], Channel 2
Output Data	10 Byte Byte 0: Control, Channel 1 Byte 1: LowByte DataOut[0], Channel 1 Byte 2: HighByte DataOut [0], Channel 1 Byte 3: LowByte DataOut [1], Channel 1 Byte 4: HighByte DataOut [1], Channel 1 Byte 5: Control, Channel 2 Byte 6: LowByte DataOut [0], Channel 2 Byte 7: HighByte DataOut [0], Channel 2 Byte 8: LowByte DataOut [1], Channel 2 Byte 9: HighByte DataOut [1], Channel 2 (detailed description, see SNNE-0202D-0003 manual)

2.1.4 SNNE-0008D-xxxx

Description	**8 Channel Digital Output, 24 V DC**
IO Data Type	Digital Signal, bit-oriented
Input Data	none
Output Data	8 Bit

2.1.5 SNNE-0404D-xxxx

Description	**4 x Digital Input + 4 x Digital Output, 24 V DC**
IO Data Type	Digital Signal, bit-oriented
Input Data	4 Bit
Output Data	4 Bit

2.1.6 SNNE-0808D-xxxx

Description	**8 Channel Digital Combi Input / Output, 24 V DC**
IO Data Type	Digital Signal, bit-oriented
Input Data	8 Bit
Output Data	8 Bit

2.1.7 SNNE-40A-0005

Description	**4 Channel Analog Input, ± 10 V**
IO Data Type	Analog Signal, byte-oriented
Input Data	8 Byte Byte 0: LowByte Channel 1 Byte 1: HighByte Channel 1 Byte 2: LowByte Channel 2 Byte 3: HighByte Channel 2 Byte 4: LowByte Channel 3 Byte 5: HighByte Channel 3 Byte 6: LowByte Channel 4 Byte 7: HighByte Channel 4
Output Data	none (detailed description, see SNNE-40A-0005 manual)

2.1.8 SNNE-40A-0007

Description	**4 Channel Analog Input 0-20mA**
IO Data Type	Analog Signal, byte-oriented
Input Data	8 Byte Byte 0: LowByte Channel 1 Byte 1: HighByte Channel 1 Byte 2: LowByte Channel 2 Byte 3: HighByte Channel 2 Byte 4: LowByte Channel 3 Byte 5: HighByte Channel 3 Byte 6: LowByte Channel 4 Byte 7: HighByte Channel 4
Output Data	none (detailed description, see SNNE-40A-0007manual)

2.1.9 SNNE-40A-0009

Description	**4 Channel Analog Input PT100 (RTD)**
IO Data Type	Analog Signal, byte-oriented
Input Data	8 Byte Byte 0: LowByte Channel 1 Byte 1: HighByte Channel 1 Byte 2: LowByte Channel 2 Byte 3: HighByte Channel 2 Byte 4: LowByte Channel 3 Byte 5: HighByte Channel 3 Byte 6: LowByte Channel 4 Byte 7: HighByte Channel 4
Output Data	none (detailed description, see SNNE-40A-0009 manual)

2.1.10 SNNE-40A-0004

Description	**4 Channel Analog Input Thermoelement**
IO Data Type	Analog Signal, byte-oriented
Input Data	8 Byte Byte 0: LowByte Channel 1 Byte 1: HighByte Channel 1 Byte 2: LowByte Channel 2 Byte 3: HighByte Channel 2 Byte 4: LowByte Channel 3 Byte 5: HighByte Channel 3 Byte 6: LowByte Channel 4 Byte 7: HighByte Channel 4
Output Data	none (detailed description, see SNNE-40A-0004manual)

2.1.11 SNNE-04A-0009

Description	**4 Channel Analog Output, 0... 20 mA**
IO Data Type	Analog Signal, byte-oriented
Input Data	none
Output Data	8 Byte Byte 0: LowByte Channel 1 Byte 1: HighByte Channel 1 Byte 2: LowByte Channel 2 Byte 3: HighByte Channel 2 Byte 4: LowByte Channel 3 Byte 5: HighByte Channel 3 Byte 6: LowByte Channel 4 Byte 7: HighByte Channel 4 (detailed description, see SNNE-04A-0009 manual)

2.1.12 SNNE-04A-0007

Description	**4 Channel Analog Output, -10 V / 0-10 V**
IO Data Type	Analog Signal, byte-oriented
Input Data	none
Output Data	8 Byte Byte 0: LowByte Channel 1 Byte 1: HighByte Channel 1 Byte 2: LowByte Channel 2 Byte 3: HighByte Channel 2 Byte 4: LowByte Channel 3 Byte 5: HighByte Channel 3 Byte 6: LowByte Channel 4 Byte 7: HighByte Channel 4 (detailed description, see SNNE-04A-0007 manual)

2.1.13 SNNE-10S-0005

Description	**1 Channel SSI Sensor Interface**
IO Data Type	Analog Signal, byte-oriented
Input Data	4 Byte Byte 0: LowByte PCDL Byte 1: HighByte PCDL Byte 2: LowByte PCDH Byte 3: HighByte PCDH
Output Data	none (detailed description, see SNNE-10S-0005 manual)

2.1.14 SNNE-10S-0001

Description	**1 Channel Incremental Encoder Interface, 1 MHz**
IO Data Type	Analog Signal, byte-oriented
Input Data	6 Byte Byte 0: Status Byte 1: Low Byte Counter Byte 2: High Byte Counter Byte 3: Latch Byte 4: LowByte Period Byte 5: HighByte Period
Output Data	3 Byte Byte 0: Control Byte 1: Low Byte RegData Byte 2: High Byte RegData (detailed description, see SNNE-10S-0001 manual)

2.1.15 SNNE-10S-0002

Description	**1 Channel Serial Interface, RS232 C**
IO Data Type	Serial Signal, byte-oriented
Input Data	6 Byte Byte 0: Status Byte 1: Data In 0 Byte 2: Data In 1 Byte 3: Data In 2 Byte 4: Data In 3 Byte 5: Data In 4
Output Data	6 Byte Byte 0: Control Byte 1: Data In 0 Byte 2: Data In 1 Byte 3: Data In 2 Byte 4: Data In 3 Byte 5: Data In 4 (detailed description, see SNNE-10S-0002 manual)

2.1.16 SNNE-10S-0003

Description	**1 Channel Serial Interface, 0...20mA (TTY)**
IO Data Type	Serial Signal, byte-oriented
Input Data	6 Byte Byte 0: Status Byte 1: Data In 0 Byte 2: Data In 1 Byte 3: Data In 2 Byte 4: Data In 3 Byte 5: Data In 4
Output Data	6 Byte Byte 0: Control Byte 1: Data In 0 Byte 2: Data In 1 Byte 3: Data In 2 Byte 4: Data In 3 Byte 5: Data In 4 (detailed description, see SNNE-10S-0003 manual)

2.1.17 SNNE-10S-0004

Description	**1 Channel Serial Interface, RS422 / RS485**
IO Data Type	Serial Signal, byte-oriented
Input Data	6 Byte Byte 0: Status Byte 1: Data In 0 Byte 2: Data In 1 Byte 3: Data In 2 Byte 4: Data In 3 Byte 5: Data In 4
Output Data	6 Byte Byte 0: Control Byte 1: Data In 0 Byte 2: Data In 1 Byte 3: Data In 2 Byte 4: Data In 3 Byte 5: Data In 4 (detailed description, see SNNE-10S-0004 manual)

2.2 IO Mapping Example

The example below shows the IO-Data mapping with default IO-Assignment:

Configuration

SDNL-0404D-0003 +
SNNE-0800D-0007 +
SNNE-0008D-0006 +
SNNE-0808D-0001 +
SNNE-40A-0005 +
SNNE-04A-0009

Input Data

12 Byte

Byte 0 :SNNE-40A-0005, Low Byte Channel 1
Byte 1 :SNNE-40A-0005, High Byte Channel 1
Byte 2 :SNNE-40A-0005, Low Byte Channel 2
Byte 3 :SNNE-40A-0005, High Byte Channel 2
Byte 4 :SNNE-40A-0005, Low Byte Channel 3
Byte 5 :SNNE-40A-0005, High Byte Channel 3
Byte 6 :SNNE-40A-0005, Low Byte Channel 4
Byte 7 :SNNE-40A-0005, High Byte Channel 4
Byte 8 :
Bit 0: SDNL-0404D-0003, Bit0
Bit 1: SDNL-0404D-0003, Bit1
Bit 2: SDNL-0404D-0003, Bit2
Bit 3: SDNL-0404D-0003, Bit3
Bit 4: SNNE-0800D-0007, Bit0
Bit 5: SNNE-0800D-0007, Bit1
Bit 6: SNNE-0800D-0007, Bit2
Bit 7: SNNE-0800D-0007, Bit3
Byte 9 :
Bit 0: SNNE-0800D-0007, Bit0
Bit 1: SNNE-0800D-0007, Bit1
Bit 2: SNNE-0800D-0007, Bit2
Bit 3: SNNE-0800D-0007, Bit3
Bit 4: SNNE-0808D-0001, Bit0
Bit 5: SNNE-0808D-0001, Bit1
Bit 6: SNNE-0808D-0001, Bit2
Bit 7: SNNE-0808D-0001, Bit3
Byte 10 :
Bit 0: SNNE-0808D-0001, Bit4
Bit 1: SNNE-0808D-0001, Bit5
Bit 2: SNNE-0808D-0001, Bit6
Bit 3: SNNE-0808D-0001, Bit7
Bit 4: not used
Bit 5: not used
Bit 6: not used
Bit 7: not used
Byte 11 :Coupling Module StatusByte
Bit0: Coupling Module _Error
Bit1: Coupling Module -Cfg
Bit2: reserved

Bit3: Diag
Bit4: reserved
Bit5: reserved
Bit6: reserved
Bit7:FB_Error

Output Data 11 Byte

Byte 0 :SNNE-04A-0009, Low Byte Channel 1
Byte 1 :SNNE-04A-0009, High Byte Channel 1
Byte 2 :SNNE-04A-0009, Low Byte Channel 2
Byte 3 :SNNE-04A-0009, High Byte Channel 2
Byte 4 :SNNE-04A-0009, Low Byte Channel 3
Byte 5 :SNNE-04A-0009, High Byte Channel 3
Byte 6 :SNNE-04A-0009, Low Byte Channel 4
Byte 7 :SNNE-04A-0009, High Byte Channel 4
Byte 8 :
Bit 0: SDNL-0404D-0003, Bit0
Bit 1: SDNL-0404D-0003, Bit1
Bit 2: SDNL-0404D-0003, Bit2
Bit 3: SDNL-0404D-0003, Bit3
Bit 4: SNNE-0008D-0006, Bit0
Bit 5: SNNE-0008D-0006, Bit1
Bit 6: SNNE-0008D-0006, Bit2
Bit 7: SNNE-0008D-0006, Bit3
Byte 9 :
Bit 0: SNNE-0008D-0006, Bit4
Bit 1: SNNE-0008D-0006, Bit5
Bit 2: SNNE-0008D-0006, Bit6
Bit 3: SNNE-0008D-0006, Bit7
Bit 4: SNNE-0808D-0001, Bit0
Bit 5: SNNE-0808D-0001, Bit1
Bit 6: SNNE-0808D-0001, Bit2
Bit 7: SNNE-0808D-0001, Bit3
Byte 10 :
Bit 0: SNNE-0808D-0001, Bit4
Bit 1: SNNE-0808D-0001, Bit5
Bit 2: SNNE-0808D-0001, Bit6
Bit 3: SNNE-0808D-0001, Bit7
Bit 4: not used
Bit 5: not used
Bit 6: not used
Bit 7: not used

2.3 Assembly Objects

The Assembly Object binds attributes of multiple objects, which allows data to or from each object to be sent or received over a single connection (IO or Explicit). Assembly objects are used to bind input data and output data.

Class Code: **4** (04_{hex})

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description	Semantics of Value
1	Get	Revision	UINT	Revision of implementation	2

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description	Semantics of Value
3 (03hex)	Get/set	Value	Array of Byte	Input or Output Data of the SDNL-0404D-xxxx.	

Common Services

Service Code	Service Name	Description
14 (0Ehex)	Get_Attribute_Single	Returns the contents of the specified attribute
16 (10hex)	Set_Attribute_Single	Modifies an attribute Value

IO Assembly Instances

Number	Type	Name
101	Output	Analog and Digital Outputs
102	Output	Digital Outputs
103	Output	Analog Outputs
111	Input	Analog and Digital Inputs and Status Byte
112	Input	Digital Inputs and Status Byte
113	Input	Analog Inputs and Status Byte

2.3.1 Input Assembly

Default Instance

Number	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
111	0 to (n-1)	Analog Inputs							
	n to (m-1)	Digital Inputs							
	m	Coupling Module StatusByte							

Number	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
112	0 to (n-1)	Digital Inputs							
	n	Coupling Module StatusByte							

Number	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
113	0 to (n-1)	Analog Inputs							
	n	Coupling Module StatusByte							

2.3.2 Output Assembly

Default Instance

Number	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
101	0 to (n-1)	Analog Outputs							
	n to m	Digital Outputs							

Number	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
102	n	Digital Outputs							

Number	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
103	n	Analog Outputs							

2.3.3 Mapping IO Assembly Data to DeviceNet Objects

Data Component Name	Class		Instance	Attribute	
	Name	Number		Name	Number
Discrete Input n	Digital Input Channel	101	n	Value	1
Discrete Output n	Digital Output Channel	102	n	Value	1
Analog Input n	Analog Input Channel	103	n	Value	1
Analog Output n	Analog Output Channel	104	n	Value	1
Coupling Module Status-Byte	Coupling Module Config Object	100	1	Coupling Module - Status	5

3 Coupling Module Config Object

Coupling Module Config Object

The SDNL-0404D-xxxx provides the vendor specific object class to access its status, diagnostic and configuration data. Within the Coupling Module Config Object the full range of Registers and Status-Information of the SDNL-0404D-xxxx and the connected extension boxes is available.
The Coupling Module Config Object Class is Vendor specific and within in the Range of the Vendor specific Class Codes.

Class Code: **100** (64_{hex})

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description	Semantics of Value
1	Get	Revision	UINT	Revision of implementation	1
2	Get	Max. Instance	UINT	Max. number of instances	1

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description	Semantics of Value
1	Get/Set	Terminal Number	USINT	Number of terminal	0: Coupler >0: Channels
2	Get/Set	Table Number	USINT	Number of table	See SDNL-0404D-xxxx /Channel Description
3	Get/Set	Register Number	USINT	Number of Register	See SDNL-0404D-xxxx /Channel Description
4	Get/Set	Register Data	DWORD	Register Value	see semantics
5	Get	Coupling Module-Status	BYTE	Status of the SDNL-0404D-xxxx	see semantics
6	Get	Extension Box-Diagnosis	WORD	Diagnosis of the extension boxes	see semantics
10	Get/Set	IO Error Action	BYTE	Action to be performed if a fieldbus error occurs	see semantics
11	Get/Set	Poll produced data type	BYTE	Type of IO data produced via the Poll mode	see semantics
12	Get/Set	COS/ Cyclic produced data type	BYTE	Type of IO data produced via the Change of State / Cyclic mode	see semantics
13	Get/Set	Bit Strobe produced data type	BYTE	Type of IO data produced via the Bit Strobe / Cyclic mode	see semantics

14	Get/Set	Poll / COS/ Cyclic consumed data type	BYTE	Type of IO data consumed via the Poll / Change of State / Cyclic mode	see semantics

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description	Semantics of Value
15	Get	Input Size Poll Mode	BYTE	Number of Bytes produced via the Poll mode	
16	Get	Input Size Bit Strobe Mode	BYTE	Number of Bytes produced via the Bit Strobe mode	
17	Get	Input Size COS / Cyclic Mode	BYTE	Number of Bytes produced via the Change of State / Cyclic mode	
18	Get	Output Size Poll / COS/ Cyclic Mode	BYTE	Number of Bytes consumed via the Poll / Change of State /Cyclic mode	
19	Get/Set	Device Diagnostics	BYTE	Enables Diagnosis of complex (analog/special-function) extension boxes	see semantics
20	Get	Analog Out Length	BYTE	Size of analog output data in bits	
21	Get	Analog In Length	BYTE	Size of analog input data in bits	
22	Get	Digital In Length	BYTE	Size of digital output data in bits	
23	Get	Digital Out Length	BYTE	Size of digital input data in Bits	
25	Get/Set	Bus Off Behavior	BYTE	Behavior of SDNL-0404D-xxxx after detection of a Bus-Off event	see semantics

Semantics

Register Data

Within the response of a Get_Attribute_Single Service to the „Register Data“ Attribute the status of the internal reading and the registers data is returned by the SDNL-0404D-xxxx. The meaning of the registers data is described in the SDNL-0404D-xxxx manual.
Within the request of a Set_Attribute_Single Service to the „Register Data“ Attribute the Low-Word of the attribute „RegisterData“ is used to send the Register data to the SDNL-0404D-xxxx. The meaning of the registers data is described in the SDNL-0404D-xxxx manual.

Response Data of Get_Attribute_Single

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status (Low Byte)							
1	Status (High Byte) : 0 = OK, >0 = Error							
2	Register data (Low Byte)							
3	Register data (High Byte)							

Request Data of Set_Attribute_Single

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Register data (Low Byte)							
1	Register data (High Byte)							
2	Not used							
3	Not used							

Response Data of Set_Attribute_Single

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status (Low Byte)							
1	Status (High Byte) : 0 = OK, >0 = Error							

Coupling Module _Status The „Coupling Module Status " attribute shows the actual status of the SDNL-0404D-xxxx.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte	FB_Error	res.	res.	res.	Diag	res.	Coupling Module _Cfg	Coupling Module _Error

Coupling Module _Error: IO Error, internal Data exchange SDNL-0404D-xxxx has failed
Coupling Module _Cfg : SDNL-0404D-xxxx Configuration Error (EEPROM check failed)
Diag : Diagnosis of analog Channel
FB_Error : Fieldbus Error / Idle Mode

Extension Box Diagnosis The „Extension Box Status" attribute describes which of the extension boxes has encountered a diagnosis event. **After reading the extension box Status, the attribute is cleared until the next diagnosis appears. Reading of the attribute also clears the "Diag-Bit" within the attribute "Coupling Module Status ". The function of this attribute is only active if the diagnosis of analog extension boxes is enabled.**

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Extension Box Number							
1	Status	Error Code					Channel Number	

Extension Box Number : Number of failed extension box
Channel Number : Number of failed channel of the extension box
Error Code : Extension box specific Error Code (see extension box manual)
Status : 0 = Error is reseted
1 = Error occurred

IO Error Action

Action to be performed if a fieldbus error occurred.

Note

To activate a new IO error Action setting a device reset has to be performed either by executing a power cycle to the SDNL-0404D-xxxx or by executing a Reset Service (Service Code 5) to the SDNL-0404D-xxxx Identity Object (Class Id 1, Instance 1)

Value	Description
0	Leave local IO Cycle
1	Leave local IO Cycle and reset outputs (default)
2	freeze outputs

- Poll produced data type
- COS / Cyclic produced data type
- Poll / COS / Cylic consumed data type

Type of IO data produced/consumed via the Poll mode and Change of State / Cyclic mode

Value	Description
0	Analog and digital IO Data with Status Byte (default)
1	Digital IO Data with Status Byte
2	Analog IO Data with Status Byte

- Bit Strobe produced data type

Type of IO data produced via the Bit Strobe mode

Value	Description
0	Diagnostic Data (see Attribute extension box diagnosis)
1	Digital Inputs with Status Byte (default)

Device Diagnostics

Enables Diagnostics of complex (analog/special function) extension boxes. Setting this attribute enables the diagnosis of complex channels which is needed to read the extension box diagnosis.

Note

To activate the diagnosis functions a device reset has to be performed either by executing a power cycle to the SDNL-0404D-xxxx or executing a Reset Service (Service Code 5)to the Identity Object (Class Id 1, Instance 1)

Value	Description
0	Device Diagnostic OFF (default)
1	Device Diagnostic ON

Bus Off Behavior

Defines the Behavior of the SDNL-0404D-xxxx after detection of a Bus-Off event.

Note

This attribute is available from Firmware Revision 1.2 upwards

Value	Description
0	Hold the SDNL-0404D-xxxx in Bus-Off State (default)
1	Reset SDNL-0404D-xxxx and restart communication. After detection of 255 Bus-Off events the SDNL-0404D-xxxx keeps in the reset state.

4 Digital Input Channel Object

Digital Input Channels

The SDNL-0404D-xxxx provides Digital Input Channel Objects to access the digital input channels data of the SDNL-0404D-xxxx and the connected extension boxes. For each digital input channel exits one instance of the Digital Input Channel Object Class.
The Digital Input Channel Object Class is Vendor specific and within in the range of the Vendor specific Class Codes.

Class Code: **101** (65_{hex})

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description	Semantics of Value
1	Get	Revision	UINT	Revision of implementation	1
2	Get	Max. Instance	UINT	Max. number of instances	

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description	Semantics of Value
1 (01hex)	Get	Value	BOOL	Input Channel Value	0: OFF 1: ON

Common Services

Service Code	Service Name	Description
14 (0Ehex)	Get_Attribute_Single	Returns the contents of the specified attribute

5 Digital Output Channel Object

Digital Output Channels

The SDNL-0404D-xxxx provides Digital Output Channel Objects to access the digital output channels data of the SDNL-0404D-xxxx and the connected extension boxes. For each digital output channel exits one instance of the Digital Output Channel Object Class.

The Digital Output Channel Object Class is Vendor specific and within in the range of the Vendor specific Class Codes.

Class Code: **102** (66_{hex})

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description	Semantics of Value
1	get	Revision	UINT	Revision of implementation	1
2	get	Max. Instance	UINT	Max. number of instances	

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description	Semantics of Value
1 (01hex)	Get/Set	Value	BOOL	Output Channel Value	0: OFF 1: ON

Common Services

Service Code	Service Name	Description
14 (0Ehex)	Get_Attribute_Single	Returns the contents of the specified attribute
16 (10hex)	Set_Attribute_Single	Modifies an attribute Value

6 Analog Input Channel Object

Analog Input Channel

The Analog Input Channel Class allows the access to the IO-Data and the Register Data of each analog channel of the SDNL-0404D-xxxx and the connected extension boxes. At Boot Up the SDNL-0404D-xxxx determines the number of analog input channels and creates one instance of the object class for each channel.
The Analog Input Channel Object Class is Vendor specific and within in the range of the Vendor specific Class Codes.

Class Code: **103** (67_{hex})

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description	Semantics of Value
1	get	Revision	UINT	Revision of implementation	1
2	get	Max. Instance	UINT	Max. number of instances	

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description	Semantics of Value
1 (01hex)	get	Value	Array of BYTE	Value of analog input channel	Number of Bytes differs between analog and special signal extension boxes
2 (02hex)	get	Value Length	USINT	Value length in Bytes	
100 (64hex)	get/set[1]	Register 0	DWORD	Value of Register 0 of the analog input channel	see semantics
:	:	:	:	:	:
106 (6Ahex)	get	Register 6	DWORD	Diagnosis Register	see semantics
:	:	:	:	:	:
163 (A3hex)	get/set[1]	Register 63	DWORD	Value of Register 63 of the analog input channel	see semantics

1: before writing the registers the write protection of the registers has to be disabled.

Semantics

Register 0 – 63

Within the response of a Get_Attribute_Single Service to the „Register Data“ Attribute the status of the internal reading and the registers data is returned by the SDNL-0404D-xxxx. The meaning of the registers data is described in the SDNL-0404D-xxxx manual.
Within the response of a Set_Attribute_Single Service to the „Register Data“ Attribute the status of the internal reading is returned by the SDNL-0404D-xxxx.

Get_Attribute Response

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status (Low Byte)							
1	Status (High Byte) : 0 = OK, >0 = Error							
2	Register data (Low Byte)							
3	Register data (High Byte)							

Set_Attribute Request

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Register data (Low Byte)							
1	Register data (High Byte)							
2	Not used							
3	Not used							

Set_Attribute Response

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status (Low Byte)							
1	Status (High Byte) : 0 = OK, >0 = Error							

Common Services

Service Code	Service Name	Description
14 (0Ehex)	Get_Attribute_Single	Returns the contents of the specified attribute
16 (10hex)	Set_Attribute_Single	Modifies an attribute Value

7 Analog Output Channel Object

Analog Output Channels

The Analog Output Channel Class allows the access to the IO-Data and the Register Data of each analog output channel of the SDNL-0404D-xxxx and the connected extension boxes. At Boot Up the SDNL-0404D-xxxx determines the number of analog output channels and creates one instance of the object class for each channel.
The Analog Output Channel Object Class is Vendor specific and within in the range of the Vendor specific Class Codes.

Class Code: **104** (68_{hex})

Class Attributes

Attribute ID	Access Rule	Name	Data Type	Description	Semantics of Value
1	get	Revision	UINT	Revision of implementation	1
2	get	Max. Instance	UINT	Max. number of instances	

Instance Attributes

Attribute ID	Access Rule	Name	Data Type	Description	Semantics of Value
1 (01hex)	Get/set	Value	Array of BYTE	Value of analog output channel	Number of Bytes differs between analog and special signal extension boxes
2 (02hex)	get	Value Length	USINT	Value length in Bytes	
100 (64hex)	get/set[1]	Register 0	DWORD	Value of Register 0 of the analog output channel	see semantics
:	:	:	:	:	:
106 (6Ahex)	get	Register 6	DWORD	Diagnosis Register	see semantics
:	:	:	:	:	:
163 (A3hex)	get/set[1]	Register 63	DWORD	Value of Register 63 of the analog output channel	see semantics

1: before writing the registers the write protection of the registers has to be disabled.

Semantics

Register 0 – 63

Within the response of a Get_Attribute_Single Service to the „Register Data“ Attribute the status of the internal reading and the registers data is returned by the SDNL-0404D-xxxx. The meaning of the registers data is described in the SDNL-0404D-xxxx manual.
Within the response of a Set_Attribute_Single Service to the „Register Data“ Attribute the status of the internal reading is returned by the coupler.

Get_Attribute Response

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status (Low Byte)							
1	Status (High Byte) : 0 = OK, >0 = Error							
2	Register data (Low Byte)							
3	Register data (High Byte)							

Set_Attribute Request

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Register data (Low Byte)							
1	Register data (High Byte)							
2	Not used							
3	Not used							

Set_Attribute Response

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status (Low Byte)							
1	Status (High Byte) : 0 = OK, >0 = Error							

Common Services

Service Code	Service Name	Description
14 (0Ehex)	Get_Attribute_Single	Returns the contents of the specified attribute
16 (10hex)	Set_Attribute_Single	Modifies an attribute Value

8 Indicators and Switches

8.1 Start-up procedure and Diagnostics LEDs

Start-up procedure and Diagnostic

After switching on, the SDNL-0404D-xxxx immediately checks the connected configuration. Error-free start-up is signalled by the red "I/O ERR“ LED being extinguished. If the “I/O ERR” LED blinks, an error in the area of the extension boxes is indicated. The error code can be determined from the frequency and number of blinks. This permits rapid rectification of the error. There is a detailed description in the section on "The diagnostic LEDs".

The diagnostic LEDs

The SDNL-0404D-xxxx has two groups of LEDs for the display of status. The upper group with two LEDs indicates the status of the respective fieldbus. The significance of the “fieldbus status“ LED is explained in the relevant sections of this manual - it conforms to conventional fieldbus displays.

On the bottom of the SDNL-0404D-xxxx are two more green LEDs that indicate the supply voltage. The left hand LED indicates the presence of the 24 V supply for the SDNL-0404D-xxxx. The right hand LED indicates the presence of the supply to the power contacts.

Local errors

Two LEDs, the “I/O LEDs”, in the area below the field bus status LEDs referred to above, serve to indicate the operating status of the SDNL-0404D-xxxx and the connected extension boxes. The green LED lights up in order to indicate fault-free operation. The red LED blinks with two different frequencies in order to indicate an error. The error is encoded in the blinks as follows:

Blink code

Fast blinking	Start of the error code
First slow sequence	Error code
Second slow sequence	Error code argument

Error location

Error code	Error code argument	Description
1 pulse	0 1 2	EEPROM checksum error Inline code buffer overflow Unknown data type
2 pulses	 0 n (n > 0)	Programmed configuration Incorrect table entry / SDNL-0404D-xxxx Incorrect table comparison (extension box n)
3 pulses	0 n	Interruption of IP-Link bus Break behind extension box (0: SDNL-0404D-xxxx)
4 pulses	0 n	IP-Link bus data error (incorrect telegram) Extension box n (0: SDNL-0404D-xxxx)
5 pulses	n	IP-Link bus error in register communication with extension box n
6 pulses	0 n (n > 0)	Special fieldbus error
11 pulses	n	IR Error, no communication, extension box n is not processing the IR commands
12 pulses	n	More than 120 extension boxes n extension boxes too much
13 pulses	n	unknown box type, extension box n

The number of pulses in the first sequence indicates the error type, while the second sequence indicates the position of the last extension box before the fault.
In the case of some errors, rectification does not cause the SDNL-0404D-xxxx to leave the blink sequence. The SDNL-0404D-xxxx stays in the "Stop" state. The SDNL-0404D-xxxx can only be re-started either by switching the power supply off and on again, or by a scanner reset.

8.2 Fieldbus / DeviceNet LEDs

DeviceNet Status LED

The red/green LED pair provides information about the device and communication status of the SDNL-0404D-xxxx. The LEDs acts as the bi-color combined Module/Network Status LED defined in the DeviceNet Specification.
The LED pair is located next to the configuration interface for adjustment of the DeviceNet address (MacId)

States of Module / Status LED

LED State	Description
Green Flashing	Boot Up OK, Device has executed Duplicate MacId Check and is ON-Line. The SDNL-0404D-xxxx is not allocated by a Master / Scanner, no Data Exchange with a Master / Scanner
Green ON	No Error, SDNL-0404D-xxxx is allocated by a Master / Scanner, Data Exchange (Explicit or IO) with Master / Scanner is OK
Green OFF	- Bus Sense Error (24V DeviceNet Voltage in not available) (all LEDs off, including IO-Run, IO-Error LEDs) - No BaudRate, SDNL-0404D-xxxx is not able to detect BaudRate (IO-Run, IO-Error LEDs On)
Red Flashing	Time Out, IO-Connection has timed out
Red ON	- Duplicate MacId Fault, check for same Address in Network - Bus-Off, check cabling, check bus termination, check bus length - Receive/Transmit Overrun, reduce IO-Cycle Time / Interscan delay at Master / Scanner
Red OFF	- Bus Sense Error (24V DeviceNet Voltage in not available) (all LEDs off, including IO-Run, IO-Error LEDs) - No BaudRate, SDNL-0404D-xxxx is not able to detect BaudRate (IO-Run, IO-Error LEDs On)

8.3 DeviceNet Node Address Switches

Node Address Switches

The Node Address Switches consist of two, ten position rotary switches within the Configuration Interface of the SDNL-0404D-xxxx

Node Address Switch

Node Address	Description
0 - 63	Node Address from Switches is valid, not programmable
> 63	Node Address is programmable by Master / Scanner

For further information please contact your local TURCK representative.