



User Manual
KUNBUS-IC PROFINET

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1 General information

1.1 Disclaimer

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1.2 Notes regarding this user manual

This user manual provides important, technical information that can enable you, as a user, efficient, safe and convenient integration of the KUNBUS-IC into your applications and systems. It is intended for trained, qualified personnel, whose sound knowledge in the field of electronic circuits and expertise of PROFINET is assumed.

As an integral part of the module, the information provided here should be kept and made available to the user.

1.3 Validity

This document describes the application of the KUNBUS IC-Moduls with the product number:

- PR100048, Release 03
- PR100104, Release 02

1.4 Limitation of Liability

Warranty and liability claims will lapse if:

- the product has been used incorrectly,
- damage is due to non-observance of the operating manual,
- damage is caused by inadequately qualified personnel,
- damage is caused by technical modification to the product (e.g. soldering).

1.5 Customer Service

If you have any questions or suggestions concerning this product, please do not hesitate to contact us:

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2 Safety Guidelines

2.1 User

The Modul may only be assembled, installed and put into operation by trained, qualified personnel. Before assembly, it is absolutely essential that this documentation has been read carefully and understood. Expertise in the following fields is assumed:

- Electronic circuits,
- Basic knowledge of PROFINET,
- work in electrostatic protected areas,
- Locally applicable rules and regulations for occupational safety.

2.2 Symbols

The symbols used have the following meaning:

DANGER

Hazard

Observe this information without fail!

There is a safety hazard that can lead to serious injuries and death.

CAUTION

Caution

There is a safety hazard that can result in minor injuries and material damage.

NOTICE

Note

Here you will find important information without a safety hazard.

2.3 General Safety Guidelines

DANGER

Danger of electric shock

If unsuitable power supply is used, this can cause an electric shock.

- This can cause death, serious injuries and material damage to your systems and modules.
- ➔ Only use a power supply that complies with the regulations for safety extra-low voltage (SELV) or protective extra-low voltage (PELV).

CAUTION

Fault due to mechanical load

A continuous mechanical load of over 5 G or shock loads of over 15 G can cause faults on your modules.

- ➔ Comply with these load limits and avoid any unnecessary loads.

CAUTION

Damage due to subsequent processing

Avoid subsequent processing of the KUNBUS-IC.

- Soldering can cause components to become detached and thus damage or destroy the module.
- Please note that the warranty shall become invalid if the products are changed technically.
- ➔ Speak to your contact person at the KUNBUS GmbH about customised solutions.

2.4 Environmental Conditions

Operate the KUNBUS-IC only in an environment that complies with the operating conditions in order to prevent any damage.

Suitable Environmental Conditions:

Operating temperature	0 to +60°C
Humidity	0% not 95%, non-condensing

3 Overview

3.1 Introduction

With the KUNBUS-IC you can make a sensor or actuator fieldbus-capable. To do this, simply insert the module into your application and connect it to the fieldbus.

The KUNBUS-IC thereby saves you time-consuming in-house developments.

3.2 Application Interface

The main board is connected to the device controller via a 32-pin connector strip. Thus, you have the option to plug the module directly into your DIL socket.

NOTICE

If the module is plugged in and unplugged frequently, mechanical stresses may damage the module.

Use a zero insertion force socket to prevent damage.

You can find detailed information on this topic in section "Installation [▶ 39]".

3.3 Status LEDs

LEDs on the Module

There are 6 status LEDs on the module.

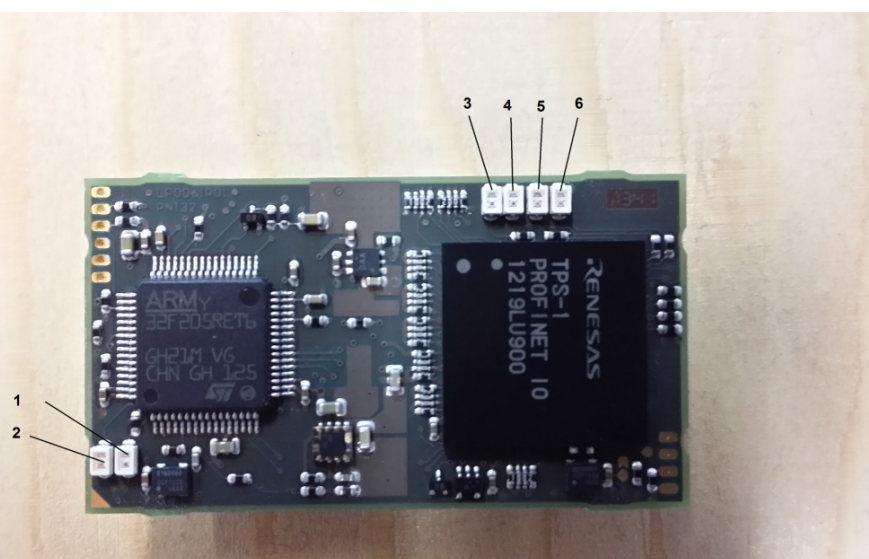


Illustration 1: On-Board LEDs

The signals have the following meaning:

LED	Name	Colour	State	Meaning
1	Modul Error (corresponds to Bit 1, SSC)	Red	Off	No Error
			On	General Error
2	Module Run (corresponds to Bit 0, SSC)	Green	Off	Module not running, Voltage missing
			On	Module in Run Operation
3	TPS-1 System Fail	Red	Off	No PROFINET Diagnosis present
			On	PROFINET diagnosis
4	TPS-1 Bus Communication	Red	On	No Link-Status available
			Flashes	No Link-Status is ok. There is no Communication Link to the PROFINET Controller
			Off	The connection between the module and the PROFINET Controller is present.
5	TPS-1 Maintenance Required	Green	On	Maintenance Required (Diagnosis Item must be set)
6	TPS-1 Device Ready	Green	Off	The module was not started correctly
			Flashes	The module is waiting for synchronisation with the CPU (Firmware completely started)
			On	The module was started correctly

Connection of additional LEDs via the shift register

You have the option to integrate LEDs into your application. The LEDs can be activated using the shift register.

- ✓ To do this, configure the first output shift register
 - In register 0x25 or
 - in CDI menu "2.3 SSC Communication"

The signals have the following meaning:

Bit	Signal	Meaning
0	Green	Module in Run Mode
1	Red	Error in module
2	Green	Script in Run mode
3	Red	Error in Script
4	Green	PROFINET Status
5	Red	PROFINET Status (not used)
6	Green	PROFINET Diagnosis/ Problem DCP Signaling
7	Red	PROFINET Diagnosis/ Problem

LED's on the Baseboard

You have the option to integrate additional LED's into your application.

Please note that the maximum capacity of the outputs is 25 mA.

PIN	Signal	Meaning
9	green	PROFINET Status Prerequisite: Bit 4 or 5 of the shift register has been set.
10		Port1 Link/Activity
23		Port2 Link/Activity
24		PROFINET diagnosis
25	green	Module Status

4 Components

4.1 Module Components

The module is divided into independent components to ensure a high level of flexibility in the application.

The following pages describe the individual components:

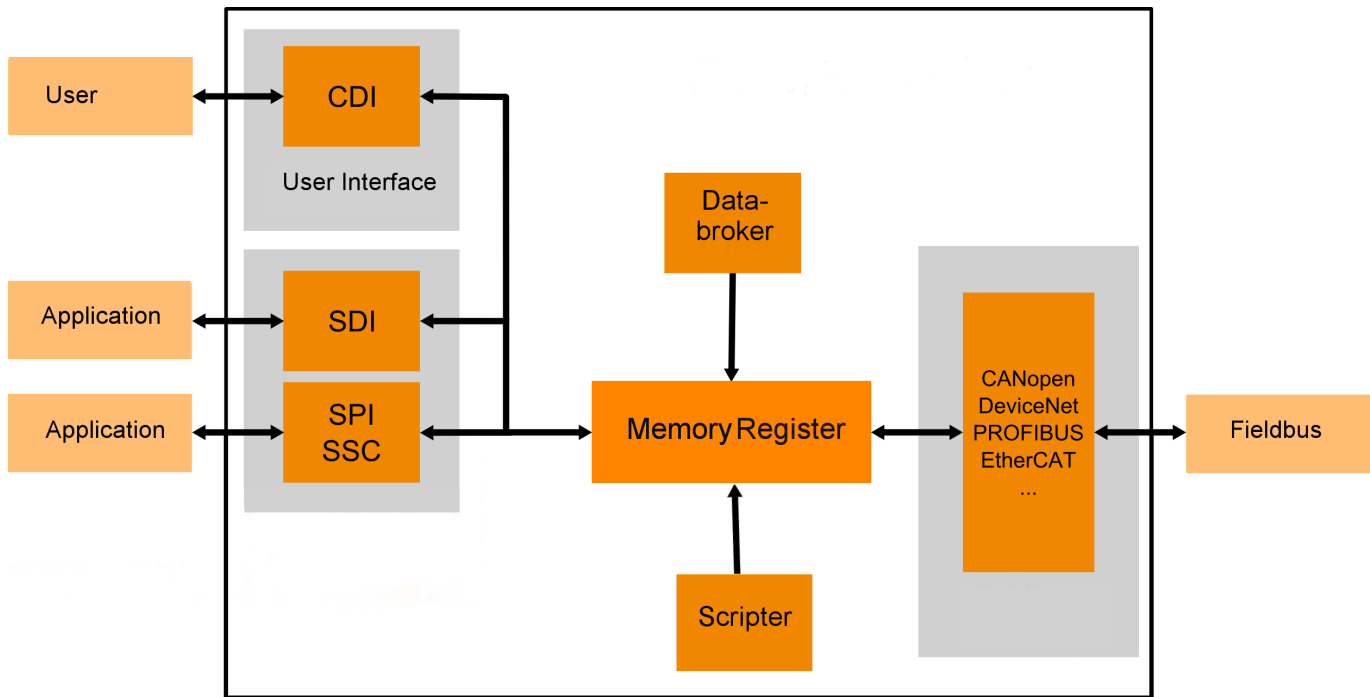


Illustration 2: Components

4.2 Storage Unit

The storage unit is the central component for all functions of the IC-Module. It is subdivided into individual Memory Register with a width of 16 bits each. In these Memory registers the following information is stored:

- Input and output data
- Configuration settings
- Module Status
- Error states

The functionality of the addressing was incorporated from Modbus. The register assignment depends on the application and is not specified by the Modbus specification. A Memory Register according to this specification has a register number between 1 (0x0001) and a maximum of 65536 (0x10000), of which the module only uses a small part, however.

With 8-bit values, 1 byte remains unused. 32-bit values are stored in 2 registers.

The 16-bit values are stored internally in the memory in Little Endian order. This must be taken into account when you access data via the fieldbus interface, SDI or SSC.

NOTICE! In the description of the individual memory registers and CDI, the memory registers are also referred to as Modbus registers.

In section "Overview of the Memory Register [► 60]" we have compiled a detailed overview of registers for you.

4.3 Data Broker

The Data Broker decouples individual components from each other and distributes the data streams between the interfaces. The targeted forwarding of the data ensures a high level of functionality between the data sources and data sinks of the module.

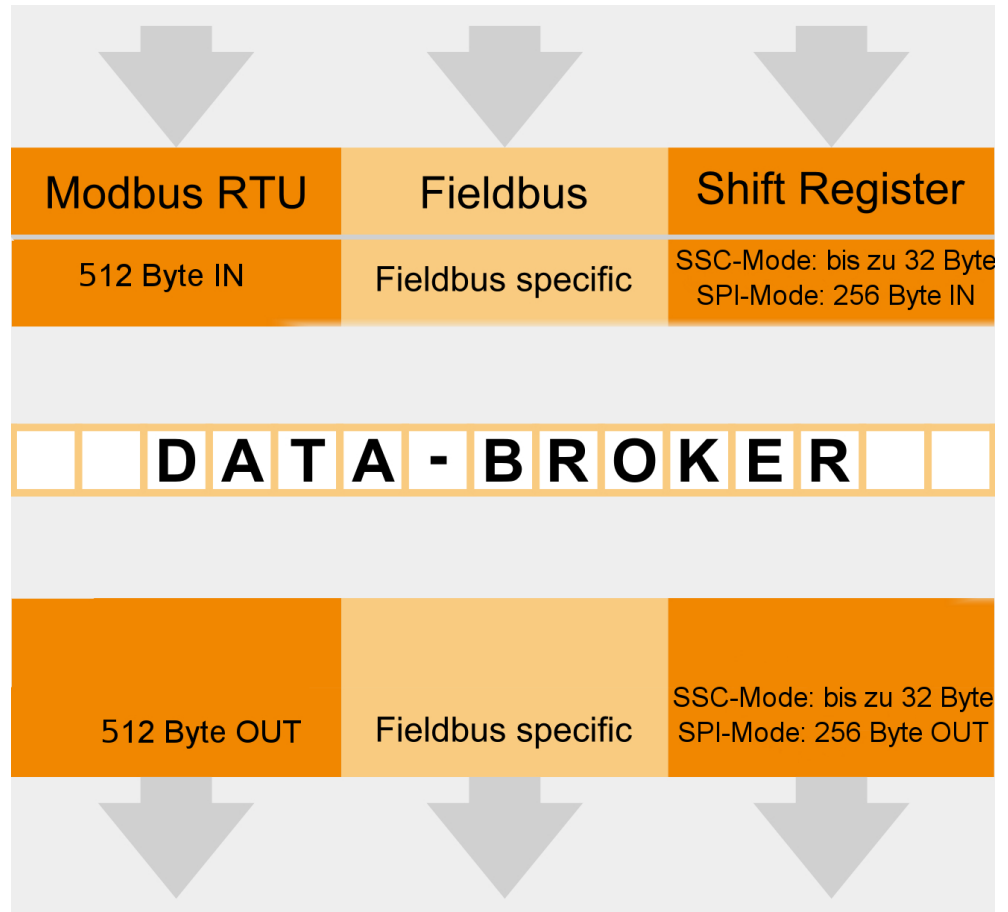


Illustration 3: Internal mapping by the Data Broker

Mapping

You have the option to define the allocation (mapping) yourself. This allows you to define which input register the Data Broker should accept data from and which output register it should transfer data to. You can define up to 8 register areas with freely definable lengths in the respective output register area for each of the interfaces. Any register area of the same length is assigned to the output register areas from one of the input register areas of all interfaces. Here, the 8 target areas are always on consecutive output register positions, starting with the lowest register address for the respective interface.

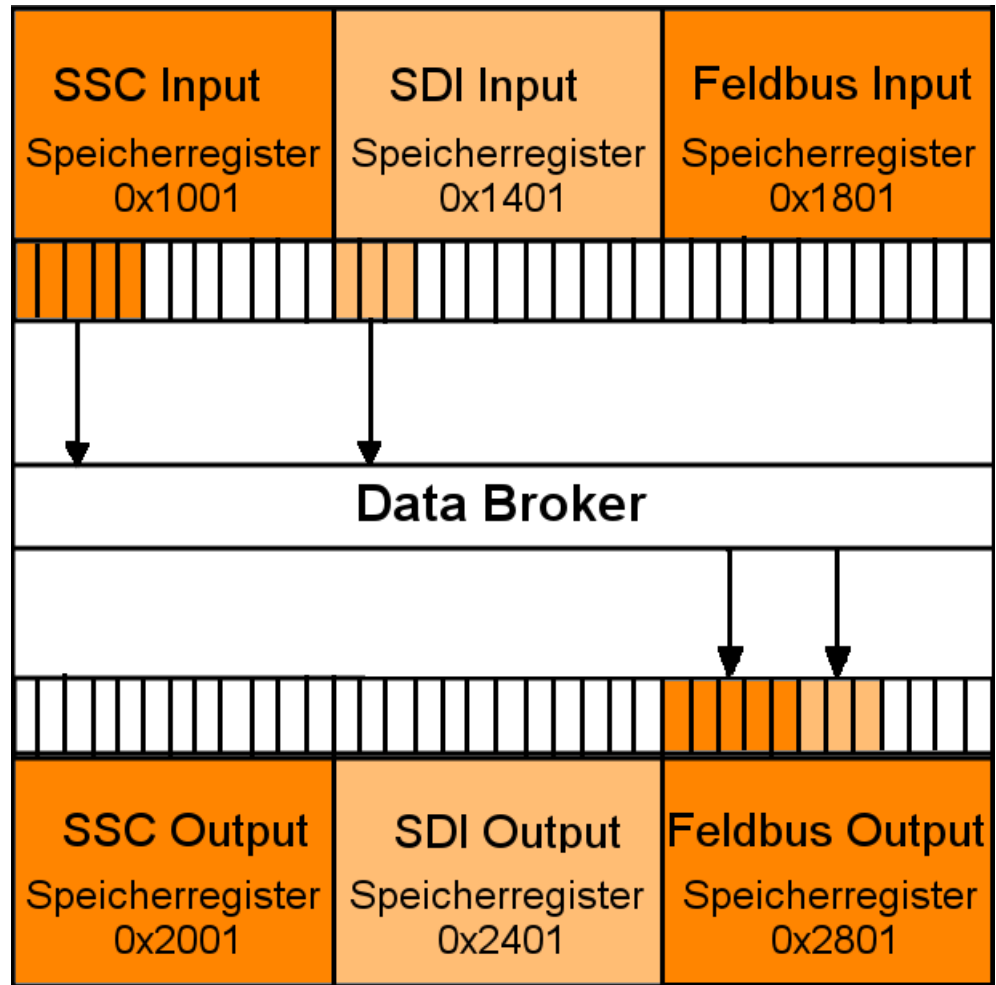


Illustration 4: Mapping

NOTICE

Viewpoint

Please note that the description of the input and output values is written from the perspective of the module and not from the perspective of the overall system or controller.

- Output: Values that the module sends to the fieldbus or application.
- Input: Values that the module receives from the fieldbus or application.

You can configure standard values that the Data Broker writes in the relevant output register instead of an input register in the event of a failure of a data provider. That has the advantage that the data processing cannot abort uncontrollably.

The module uses the Little Endian byte order for the internal processing. You can also configure the Data Broker so that it exchanges the high and low byte when copying if necessary. To do this, add the value 0x8000 or 32768 for the required mapping area (see details below).

Extended Mapping

Some applications work with data that is viewed bitwise. To make the mapping for such applications even more flexible, an "Extended Mapping" is provided. This mapping basically works in the same way as the mapping described above:

Individual areas of the output Memory Register are assigned from areas of the input Memory registers. In Extended Mapping you define such assignments for up to 16 areas. When doing so, enter a number of consecutive bits for each of these areas.

The limit of a register must not be exceeded: The area may be up to 1024 bits long. Unlike the simple mapping described above, however, the 16 target areas do not necessarily have to be at consecutive addresses. You are totally free to define the position of the first bit of the target area by entering an output register address and the corresponding bit position (0 bis 15). The source area is also defined by entering the input register and a start bit position.

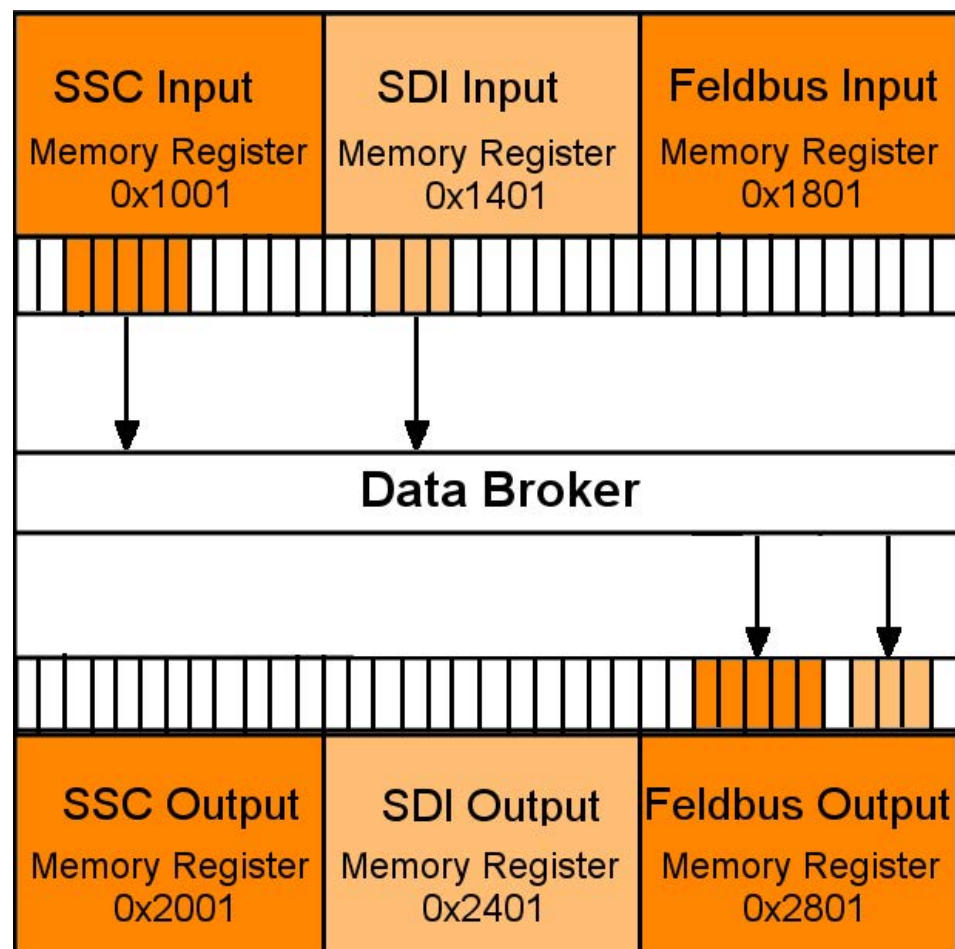


Illustration 5: Extended Mapping

All mapping areas are processed sequentially. The Data Broker first copies all simple mapping areas cyclically. After that, it executes the Extended Mapping. In the course of this, it is quite possible to intentionally overwrite a target area by several sources of data.

NOTICE

It is possible that bits are overwritten unintentionally by various input sources.

Make sure that the target areas do not overlap unintentionally.

Validity period of the process data

Data sources that write data to the input area of the central memory are called producers because they produce process data. The Data Broker collects this data and copies it into the output area of the central memory. From there, the data is sent to its target, the so-called consumer, via the corresponding interfaces.

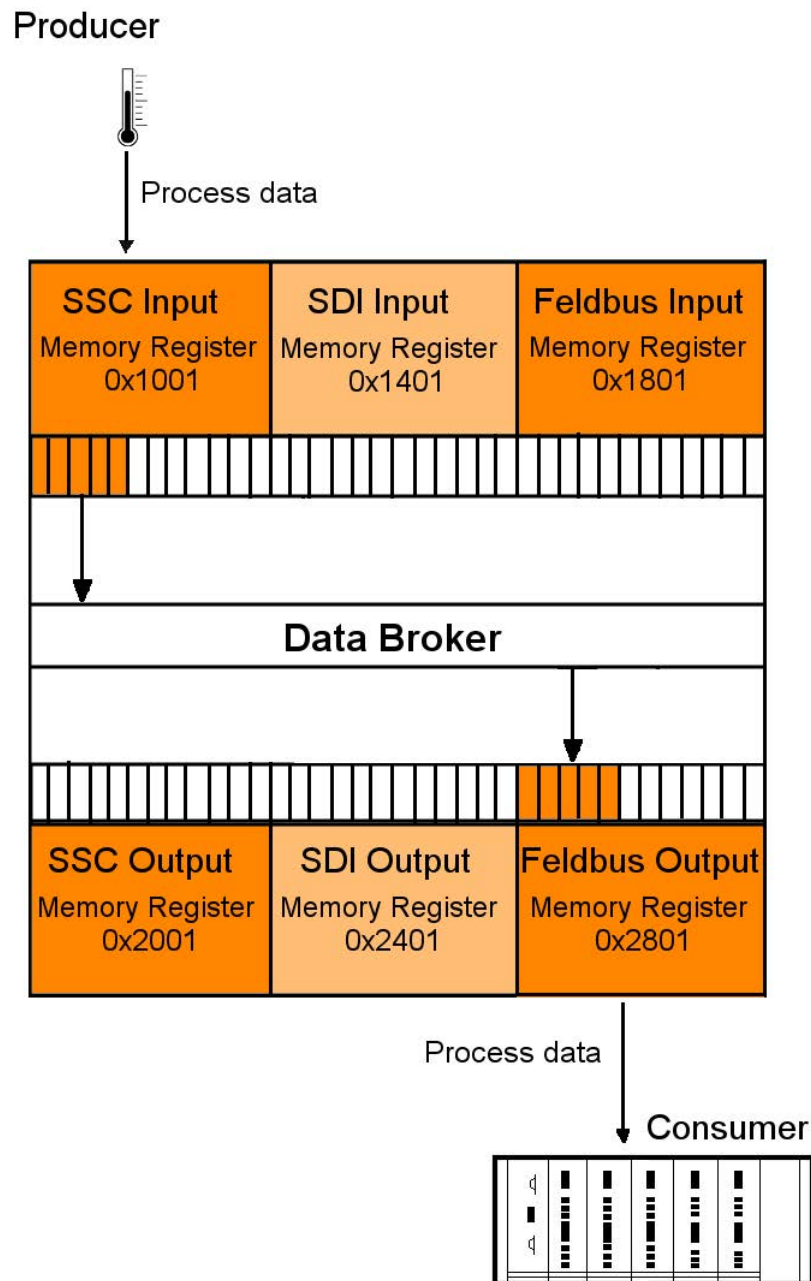


Illustration 6: Distribution to producers/consumers

Process data is normally exchanged cyclically between producers and consumers. If a producer fails (e.g. a connector is removed or a cable is broken), the consumer must be able to deal with this situation appropriately. For this reason, you can define in advance which values the producer will receive in exchange for the failed process data.

The IC-Module allow a separate validity period to be defined for each producer (SDI, SSC, PROFINET). When a producer supplies new process data, a stopwatch is started. If the producer does not supply any new process data before the predefined validity period expires, then the old data is invalid after this time.

Each consumer predefines which data he is to receive from the Data Broker in such a case:

- All bytes at 0
- All bytes at 1
- retain the last valid data

The set validity periods from KUNBUS-IC are saved permanently in the Memory registers. They are also available after a restart.

Likewise, the rule defined for a consumer, as to how to proceed if the validity period is exceeded. The respective time values of the validity period must be adapted, of course, to the cycle time of the interface concerned.

- For PROFINET this cycle time is determined by parameters of the master.
- For SSC interface the time is determined from the shift register chain length, the cycle frequency, and for short or fast register chains, it is determined by the cycle time of the COMS module.
- During SPI slave mode and SDI transfer, the master determines the cycle time of the respective interface.

Example of a Mapping

The following example explains, step-by-step, how to map the first three SDI input registers and the first five SSC input registers to the field output register.

If you would like to participate in this example, you will need a functional CDI connection. Section "Setting up a Serial Connection [▶ 121]" explains how this works.

Input options in the CDI menu:

You can enter hexadecimal (with prefixedm 0x or with attached letter h) or decimal numbers in the CDI menu.

[Esc]	Go back one level
[Enter]	Confirm input/selection
[b]	Value is displayed in binary code
[h]	Value is displayed in hexadecimal code
[d]	Value is displayed in decimal code

- Open the main menu of the CDI as described in the Appendix "Setting up a serial connection using PuTTY".

Main Menu

The main menu is your access point for operating the module using the CDI. After a reset, the module transmits this main menu to the terminal.

```

-----
KUNBUS-IC - Main Menu
-----
1 - Module Information
2 - Interface Configuration
3 - Monitor Communication
4 - Module Status
-----
>
    
```

Configuration menu

- In the main menu enter [2]+[Return].
- ⇒ You will be taken to the configuration menu "Interface Configuration"

In this menu you have the option to set the mapping for the data broker and the operational parameters for the different interfaces.

- Select "Fieldbus Output Mapping" to define the data source for the fieldbus output register.
To do this, enter [8] + [Return].

```

-----
KUNBUS-IC - Interface Configuration
-----
1 - SDI Communication
2 - CDI Communication
3 - SSC Communication
4 - SDI Output mapping
5 - SSC Output mapping
6 - Fieldbus Output mapping
7 - Fieldbus Specific
8 - Set Arbitrary Register
9 - Reset Module
10 - Extended Databroker
11 - Script Interpreter
12 - Reset to Factory Settings
-----
>

```

- Enter [1] + [Return].
 - Specify the first 3 registers of the SDI input register as data source (start address 0x1401).
 - Confirm your entry with [Return]
- ⇒ After confirming, you will return automatically to the "Fieldbus Output Mapping" menu

You can find an overview of the start addresses in the section "Overview of the Memory Register [▶ 60]".

```

-----
KUNBUS-IC - Edit one map entry
-----
Source Register: 0x1401
Number of Registers: 3

```

- Create another mapping at the next free position
- Select the first 5 registers of the SSC input register as data source (start address 0x1001)

```

-----
KUNBUS-IC - Edit one map entry
-----
Source Register: 0x1001
Number of Registers: 5

```

In the menu for fieldbus outputmapping, you can see the finished mapping.

```
-----
KUNBUS-IC - Fieldbus Outputmapping
-----
```

```
Src Register Number
1 - 1521 (0x1401) | 3
2 - 4097 (0x1001) | 5
3 - 1 (0x0001) | 0
4 - 1 (0x0001) | 0

5 - Default Data: all zero
6 - Valid Time: disabled
-----
```

```
>
```

The new mapping becomes active after a restart of the module. To perform a restart, you have the following options:

1. Switch the module off and on again.
2. [Esc] takes you to the CDI menu [2] "Interface Configuration". Here, enter [14] + [Return].

In CDI menu [2] "Interface Configuration" under menu item "Set Arbitrary Register" you now have the option to write the values in the SDI-In data area. The registers 0x1401 - 0x1500 are available to you for this purpose.

In menu [3] "Monitor Communication", under menu item "Arbitrary Register" you can view the fieldbus output register from address 0x2801.

NOTICE

Fault due to fine settings

Some settings lead to malfunctioning of the module.

If you already want to test some settings now, read section CDI Menus CDI Menus [▶ 124].

Also see about this

- 📖 Register for the Mapping [▶ 88]
- 📖 Setting up a Serial Connection [▶ 121]

4.4 Fieldbus Interface

The fieldbus interface connects the Modul to PROFINET. This also enables access to the fieldbus data areas FBS IN/Out.

Also see about this

 [Overview of the Memory Register \[▶ 60\]](#)

4.5 CDI - Configuration and Debug Interface

At the application interface, serial cables are available (UART interface with 3.3 V logic levels). You can connect these cables to a terminal or PC with terminal simulation (e.g. PuTTY) using an interface IC on the main board (see the application sample circuit diagram, Appendix 2). You can read and change parameters using structured menus. The CDI is also used for downloading scripts and firmware updates.

The CDI is suitable for configuration during the development and for diagnostic purposes. To configure several modules automatically, we recommend performing the settings with "Modpoll". "Modpoll" is freely-available software. You can find an introduction and example of this in the Appendix "Configuration via Modpoll [[▶ 165](#)]".

To connect the cables, you have the following options:

- Connect the cables directly with the UART inputs of the microprocessor on the main board
- Convert the cables to standardised levels using level converters or interface ICs. Afterwards, place the converted levels onto connectors for connecting a PC or terminal.

We deliver the Modul to you with the following default settings to enable access via the CDI :

- 115200 bit/s
- 8 data bits
- 1 stop bit
- Even parity (Even)

In section CDI Menus, we have compiled a detailed description of the menus for you.

4.6 SDI - Serial Data Interface

The serial data interface allows the application to access the individual Memory Register via the Modbus-RTU protocol. This allows you to configure the KUNBUS-IC automatically and to write process data in the input registers or to read it from the output registers.

The serial data interface is located at the application interface. The respective cables are provided there with 3.3 V logic levels. To connect these cables, you have the following options:

- Connect the cables directly with the UART inputs of the microprocessor on the main board
- Convert the cables to standardised levels using level converters or interface ICs. Afterwards, place the converted levels onto connectors for connecting a PC or terminal.

We deliver the Modul to you with the following default settings to enable access via the SDI :

- automatic baudrate detection
- 8 data bits
- 1 stop bit
- Even parity (Even)

Automatic bitrate detection means that the module tests the following bitrates until it has received a correct Modbus-RTU telegram:

- 2400 bit/s
- 4800 bit/s
- 9600 bit/s
- 19200 bit/s
- 38400 bit/s
- 57600 bit/s
- 115200 bit/s

NOTICE! During automatic bitrate detection the module does not send a reply to the master until the correct bitrate has been detected. This procedure can require up to 40 polls of the master.

TIP: Set a fixed bitrate if the automatic bitrate detection lasts too long for you.

You can make the settings optionally using the CDI or in the memory register 0x0005 [► 68].

4.7 Synchronous serial interface

A synchronous serial interface is available to you on the application interface. The synchronous serial interface can be used in 2 operating modes. You can select the operating mode in the CDI menu or in the memory registers:

- CDI Menu 2.3 [▶ 128]
- Memory Register 0x0017 [▶ 74]

Output data from the Data Broker is written to the SSC output register area and input data is read from the SSC input register area in both operating modes. The SPI Slave operating mode also allows an SPI Master write and read access to all other Memory Register that are enabled for this. This section describes how this functions in detail.

Operating mode as SPI Slave

In SPI Slave mode, the transmission of the process data between an SPI Master and the SSC Input or Output registers takes place in data blocks, which, in addition to the actual process data, also contain metadata (e.g. for indicating the register addresses for source and target areas). Such data blocks are transmitted with a hardware handshake. The actual data transmission lines MOSI, MISO and Clock are used with 3.3 V logic in the usual manner, as described below in the document S12SPIV4 "SPI Block Guide" from Motorola / Freescale®. Here, you can freely select the normally alterable parameters CPOL (Clock polarity) and CPHA (Clock Phase) in KUNBUS-IC and define these permanently via the CDI Menu [▶ 130] or memory register [▶ 75]. The bit sequence (MSB first or MSB last) is fixed for IC modules, the module always starts the transmission with the MSB (bit of highest value) of a byte. All bytes belonging to a block are transmitted in a continuous sequence.

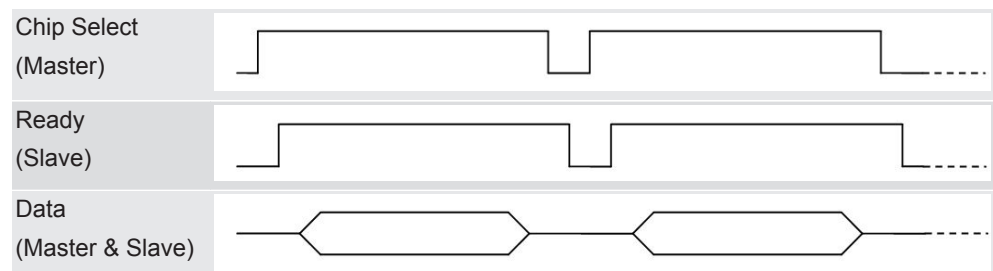
The clock signal required is input externally from the Master.

The KUNBUS-IC can process maximum clock frequencies of 20 MHz.

Handshaking

The handshaking lines ensure that a Master first sends the subsequent transmission block after the module has processed the block that was received previously.

The module indicates by the "low" level on the SPI ready line that a transmission cycle has been completed, the status of the last transmission is waiting to be retrieved and the Master can trigger the next cycle. The Master starts this cycle by setting the SSC Chip Select line to "high" to indicate to the module that data is ready for transmission and the following data block is meant for the module (theoretically, a master can address several modules). Once the module is ready for this data transmission, it sets the SPI ready line to "high" and the Master can start transmission of the block immediately. A maximum delay between setting the CS signal and releasing by the ready signal of the module is 10 ms. All bytes of a data block are now transmitted directly in succession at the rate preset by the Master. After the last bit of the data block has been transmitted, the Master indicates the end of the transmission by resetting the SPI Chip Select line to "low". The module responds to this by resetting the SPI Ready line to "low". This happens at the earliest, however (maximum 10 ms after resetting CS), when the data has been processed insofar as the status was determined and is ready in the SPI output buffer so that the next transmission can start. This must first be requested, however, by the Master (as described above) by setting the SPI Chip Select line to "high".



Protocol

KUNBUS has defined a separate protocol for the data exchange via the synchronous serial interface. This protocol allows you to perform various read and write access operations. Here, the Master first always sends a transmission block with at least 5 bytes. The first 3 bis 5 bytes of this transmission block consist of meta data (target address, etc.). Depending on the access type, another transmission block of variable data length follows the first block. Write and read access to the memory register of the module is performed. Only memory registers that have been enabled can be written or read, of course. The following areas cannot be written:

Input data areas:

- Fieldbus
- SDI

Output data areas:

- Fieldbus
- SSC
- SDI

When writing to the SSC input data area, the time monitoring is reset for this area (see Valid Time, Section "Data Broker [► 13]").

The various access types are explained below.

Writing 1 byte

This access type is used if 1 byte is written to a memory register of the module by the Master.

The Master first sends a transmission block with a fixed length of 5 bytes, which have the following content:

Transmission block with fixed length				
Command code (1 byte)	Address area (2 bytes)	Data area (1 byte)	Mask area (1 byte)	Description
0x01	0x0000-0xFFFF	0x00-0xFF	0x00-0xFF	WRITE_LOW_BYTE
0x02	0x0000-0xFFFF	0x00-0xFF	0x00-0xFF	WRITE_HIGH_BYTE
0x00	0XXXXX	0XX	0XX	NO_OPERATION*

Theoretically, you could use all memory register addresses between 0 and 0xFFFF. In practice, however, the write access is limited to registers that are enabled for this purpose. The byte can be written to the high or low byte position of the 16-bit wide register by selecting the associated command code. The mask byte only makes it possible to write single bits to the target register. Thereby, only bits that are set to "1" in the mask are transferred from the data byte (i.e. these bits are set to the value as found in the data byte). All other bits are left unchanged in the register.

During transmission of this first block, the module sends the status of the previous data transmission. The module first returns the status for the previous access when sending the next transmission block. If, however, no further write or read operation should follow the write access, then the Master must send another transmission block with the command code 0 ("NO_OPERATION") for retrieving the status, in which the module returns the status for the last write access operation.

The status response from the module is structured as follows for all write access types:

Transmission block with fixed length			
Status code (1 byte)	Error code (2 bytes)	Not used (2 bytes)	Description
0x00	0xXXXX	0xXXXX	NO_PREVIOUS_OPERATION
0x01	0x0000	0xXXXX	WRITE_SUCCESS
0x02	ERROR_CODE ¹	0xXXXX	WRITE_FAILURE

¹ See Table "ErrorCode"

The first byte returns the status. If it is set to "0", the Master then indicates that it cannot return any current status information since there was no previous operation (this is usually the response to the very first block transmission). A "1" indicates the successful completion of the previous transmission. In the case of a 2, the module sends the error code of an error in the subsequent byte, which occurred during the previous block transmission. The possible error codes are listed at the end of this subsection.

Writing 2 bytes (Word)

This access type basically proceeds as when writing 1 byte. It differs in the following points:

- Instead of a mask byte, the second byte of the 16-bit wide user data is transmitted with the data block. Access to individual bits in the target register is not possible with this access type.
- The 16-bit wide register content to be written must be prepared by the Master in such a way that the higher-value byte is transmitted as the s 4th byte and the lower-value byte is transmitted as the s 5th byte ("Big-Endian" or "Motorola format").

Transmission block with fixed length			
Command code (1 byte)	Address area (2 bytes)	Data area (2 byte)	Description
0x04	0x0000-0xFFFF	0x0000-0xFFFF	WRITE_WORD
0x00	0xXXXX	0xXXXX	NO_OPERATION*

The status response has the same structure and meaning as write access with 1 byte

Writing more than 2 bytes with one access (bulk-write)

This access type is suitable for larger volumes of data. The number of target registers to be written and start address are transmitted with the first transmission block. As with the previous access types, the first transmission block also has a fixed length of 5 bytes here. After this block with metadata, the user data follows in a separate transmission block with variable length. The maximum permitted number of target registers to be written depends on the target area: A maximum of 128 registers (each 16-bit = 1 word) are permitted for writing to the SSC input register area. A maximum of 16 registers per block is to be written for all other target areas.

All 16-bit wide register contents to be written must be prepared by the Master in such a way that the higher-value byte is transmitted as the first byte and the lower-value byte is transmitted as the second byte ("Big-Endian" or "Motorola format"). The register contents must be sent in ascending address order, i.e. the start address first.

Transmission block with fixed length			
Command code (1 byte)	Address area (2 bytes)	Data length (2 bytes)	Description
0x08	0x0000-0xFFFF	1-16/128	WRITE_BULK
0x00	0XXXXX	0XXXXX	NO_OPERATION*

NOTICE

The maximum data length for writing in the SSC input data area is 128 registers (256 bytes).

If this value is exceeded, errors in the data communication will result.

In the case of a transmission block of variable length, the module sends bytes with the value 0 to the master.

The status response has almost the same structure and meaning as write access with 1 byte. In the event of an error, a 16-bit wide register address is at position 4 and 5 for this transmission type, at which the first error occurred. The status is transmitted in the first transmission block that follows the data block with variable length.

Transmission block with fixed length			
Status code (1 byte)	Error code (2 bytes)	Address area** (2 bytes)	Description
0x00	0xFFFF	0xFFFF	NO_PREVIOUS_OPERATION
0x01	0x0000	0xFFFF	WRITE_SUCCESS
0x02	ERROR_CODE ¹	0x0000-0xFFFF	WRITE_FAILURE

¹ See Table "ErrorCode"

** Address where an error occurs

Reading 2 bytes (Word)

This access type is used if just 1 register is to be read from a memory register of the module by the Master. The Master first sends a data block with a fixed length of 5 bytes, which have the following content:

Transmission block with fixed length			
Command code (1 byte)	Address area (2 bytes)	Not used (2 bytes)	Description
0x10	0x0000-0xFFFF	0xFFFF	READ_WORD
0x00	0xFFFF	0xFFFF	NO_OPERATION*

* This command allows the master to request the status of a read request without an additional read or write request having to be executed.

Theoretically, you could use all memory register addresses between 0 and 0xFFFF. In practice, however, the read access is limited to registers that are enabled for this purpose.

During transmission of the first data block, the module sends the status of the previous data transmission. The module first returns the data to be read when sending the next data block. If, however, no further write or read operation should follow the read access, then the Master must send another data block with the command code 0 ("NO_OPERATION") for retrieving the data to be read, in which the module returns the status for the last access operation.

The response from the module is structured as follows for all read access operations:

Transmission block with fixed length			
Status code (1 byte)	Error code (2 bytes)	Data area (2 byte)	Description
0x00	0xFFFF	0xFFFF	NO_PREVIOUS_OPERATION
0x01	0x0000	0x0000-0xFFFF	READ_SUCCESS
0x02	ERROR_CODE ¹	0xFFFF	READ_FAILURE

¹ See Table "ErrorCode"

The first byte returns the status. If it is set to "0", the Master then indicates that it cannot return any current status information since there was no previous operation (this is usually the response to the very first block transmission). A "1" indicates the successful completion of the previous transmission. In the case of a 2, the module sends the error code of an error in the subsequent byte, which occurred during the previous block transmission.

If the status is "1", the 2 bytes after that at position 4 and 5 contain the content of the memory register to be read at the address that was transmitted at the last block with the read command. The 16-bit wide register content read is prepared by the module in such a way that the higher-value byte is transmitted as the 4th and the lower-value byte is transmitted as the 5th byte ("Big-Endian" or "Motorola format").

In the case of status "0" or "2", both data bytes at position 4 and 5 are invalid and must be discarded by the Master.

Reading more than 2 bytes
(Bulk-Read)

In this access type, the number of source registers to be read as well as the start address are transmitted with the first transmission block that has a fixed length of 5 bytes. After this block with metadata, the transmission of the read data follows in a separate transmission block with variable length. Therefore, this access type is suitable primarily for larger volumes of data. The maximum permitted number of source registers to be read depends on the source area: A maximum of 128 registers (each 16-bit = 1 word) are permitted for reading from the SSC output register area. A maximum of 16 registers per block is to be read for all other source areas. Byte order:

All 16-bit wide register contents read are prepared by the module in such a way that the higher-value byte is transmitted as the first byte and the lower-value byte is transmitted as the second byte ("Big-Endian" or "Motorola format"). The register contents are sent in ascending address order, i.e. the start address first.

Transmission block with fixed length			
Command code (1 byte)	Address area (2 bytes)	Data length (2 bytes)	Description
0x20	0x0000-0xFFFF	1-16/128/256	READ_BULK
0x00	0XXXX	0XXXX	NO_OPERATION*

The Master sends a block of variable length with 0 bytes to the module.

The status response has almost the same structure and meaning as read access with 1 byte. In the event of an error, a 16-bit wide register address is at position 4 and 5 for this transmission type, at which the first error occurred. The status is transmitted in the first transmission block that follows the data block with variable length.

In the event of an error during bulk access (status "2"), the data transmitted by the module from the data block with variable length is invalid and must be discarded by the Master.

Transmission block with fixed length			
Status code (1 byte)	Error code (2 bytes)	Address area** (2 bytes)	Description
0x00	0XXXX	0XXXX	NO_PREVIOUS_OPERATION
0x01	0x0000	0XXXX	READ_SUCCESS
0x02	ERROR_CODE ¹	0x0000-0xFFFF	READ_FAILURE

¹See Table "Error code"

** Address where an error occurs

Transmission block with variable length (1-16/128 words)
Data area
0x0000-0xFFFF"

Simultaneous reading and writing of more than 2 bytes with one access (bulk read/write)

In this access type, the number of source registers to be read or target registers to be written are transmitted with the first transmission block that has a fixed length of 5 bytes. After this block with metadata, the transmission of the read data follows in a separate transmission block with variable length. Unlike with Bulk-Read or Bulk-Write, no random start address can be defined for this access type. The start address for the block to be read is preset with 0x2001 (SSC input register) and with 0x1001 (SSC output register) for the block to be written. Byte order:

All 16-bit wide register contents to be read or written are prepared by the module in such a way that the higher-value byte is transmitted as the first byte and the lower-value byte is transmitted as the second byte ("Big-Endian" or "Motorola format"). The register contents are sent in ascending address order, i.e. the start address first.

Transmission block with fixed length			
Command code (1 byte)	Not used (2 bytes)	Data length (2 bytes)	Description
0x40	0xFFFF	1-128	READ_WRITE_BULK
0x00	0xFFFF	0xFFFF	NO_OPERATION*

Transmission block with variable length (1-16/128 words)
Data area
0x0000-0xFFFF"

The status response has almost the same structure and meaning as read access with 1 byte. In the event of an error, a 16-bit wide register address is at position 4 and 5 for this transmission type, at which the first error occurred when reading or writing. The status is transmitted in the first transmission block that follows the data block with variable length.

Transmission block with fixed length			
Status code (1 byte)	Error code (2 bytes)	Not used (2 bytes)	Description
0x00	0xFFFF	0xFFFF	NO_PREVIOUS_OPERATION
0x10	0x0000	0xFFFF	READ_WRITE_SUCCESS
0x20	ERROR_CODE ¹	0xFFFF	READ_WRITE_FAILURE

In the event of an error during bulk access (status "2"), the data transmitted by the module from the data block with variable length is invalid and must be discarded by the Master.

Error Codes

Error code	Designation	Description
0x01	INVALID_DATA_ADDRESS	Invalid data address The master tries to access an invalid address. The slave ignores the instruction.
0x02	INVALID_DATA_LENGTH	Invalid data length The data length predefined by the master is too great. The slave ignores the instruction.
0x04	INVALID_DATA	Invalid data The master tries to write data containing values outside a valid range. The slave ignores the instruction.
0x08	INVALID_ACCESS	Invalid access The master tries to access an invalid area or a valid address. The slave ignores the instruction.
0x10	INVALID_RANGE	Invalid range The master tries to write beyond the limits of an SSC input data area or to write beyond the limits of an SSC, SDI or FBS output data area. The slave ignores the instruction.
0x20	UNDEFINED_ERROR	Undefined error An undefined error has occurred. The slave ignores the instruction.

Table 1: Error Code

SSC Master Operating Mode

In this operating mode, output data is read from the SSC output register area via the serial synchronous interface and input data is written to the SSC input register area. This takes place via a hardware shift register chain.

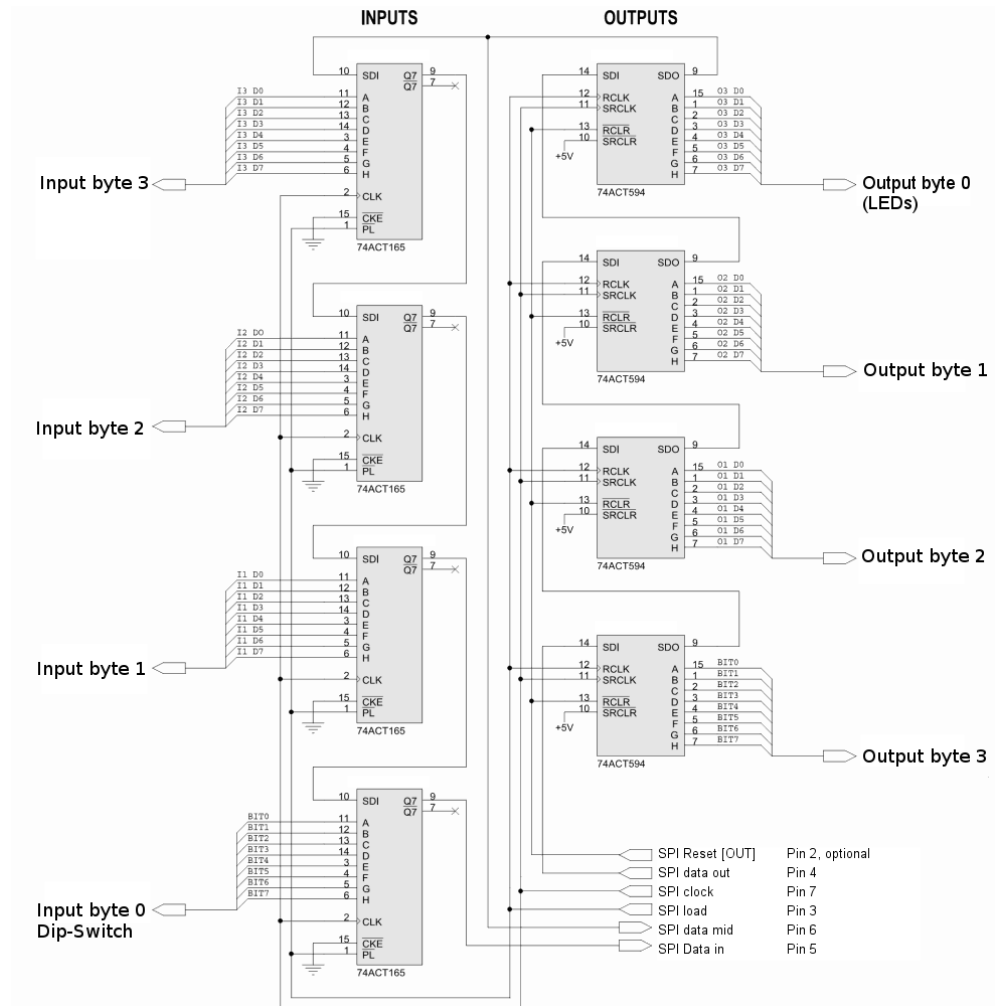


Illustration 7: Hardware shift register chain, example with 4 inputs and outputs

The advantage of such an interface is the possibility of forwarding input and output signals to the fieldbus without the need of microprocessor controlled application circuitry. Switches, contacts, relay coils or solenoid valves, for example, can therefore be connected directly via PROFINET without using a microprocessor.

The KUNBUS-IC with its clock clocks the output data into the input register of the chain via the MOSI line, where it is shifted bit by bit until the end. At the same time, the input data is shifted bit by bit via the MISO line into the KUNBUS-IC with the same clock pulse. Prior to each such shift procedure, the module sets the LOAD line to high. In this way, the parallel outputs of all shift register modules receive the data from the input buffers in the previous cycle. The input shift registers, on the other hand, utilise the positive edges from the LOAD

signal to copy all parallel input values simultaneously to their output buffers. From there, they are shifted bit by bit to the SSC input register area of the KUNBUS-IC during the current cycle.

The clock rates of the IC-Moduls can be adapted manually or automatically in 3 levels and are about 300, 1200 or 4800 Kbit/s. The load impulse is between 5 and 15 μs long (active low). The delay between the load edge (positive edge of the load impulse) and the first clock edge (from high to low) is between 1 and 2 μs . These values are completely uncritical when using the shift register modules 74HC165 (Input) and 74HC594 (Output).

An optional SSC RESET line initialises the shift register modules during the starting process of the IC-Moduls (i.e. also during each reset of the module).

With an arrangement of the output and input shift register as shown in this example, all registers are switched in series so that the KUNBUS-IC has its own output data shifted back into the input register again for checking purposes. A test sample shifted through the complete chain without a LOAD signal allows the KUNBUS-IC to detect how long the entire chain is by means of the necessary clock signals for such a shifting procedure.

A centre pickoff between the output and input modules allows the KUNBUS-IC to also detect the corresponding number of inputs and outputs of the shift register modules during this run of a test sample.

If bit errors occur, the clock rate is reduced in automatic mode by one level. Hence, with such a structure the KUNBUS-IC can find the right setting for the chain lengths and maximum possible transmission rate independently. It is also possible, however, to assign the lengths and clock rates manually via the CDI menu. In this case, the centre pickoff can also be omitted (it is only needed for determining the allocation between inputs and outputs of the shift register modules). The entire chain length is monitored constantly during ongoing operation and must match the configured length. If the module detects a difference, then it shuts down the SSC communication and reports an error status via its status register.

The KUNBUS-IC can operate a maximum of 32 shift registers. You can use these freely as input and/or output shift registers.

Note on cycle time: The cycle time of the shift register interface is normally independent of its chain length since the KUNBUS-IC in its work cycle only starts the transmission of a shift procedure. The shift procedure itself then takes place independently of the work cycle of

the IC-Moduls. Its length is determined by the number of cycles and the clock rate. After completion of a shift procedure, the next shift cycle starts with the next work cycle of the module. The maximum delay between the completion and start of a shift cycle is 10 ms.

Note ! If the shift procedure is longer than a work cycle of the module, the cycle time is determined by the length and speed of the shift register chain.

4.8 Scriptor

The KUNBUS-IC includes a software component that allows you to set up customer-specific data exchange protocols for SDI or CDI serial interfaces. If, for example, the module is to communicate in an application with a serial-controlled servomotor, this servomotor expects a preset protocol to be processed in order to receive the actuator values or to return sensor values. With the aid of the Scriptor you can load small executable program sequences into the module that are then executed there cyclically. With the appropriate data exchange protocol the module can receive such actuator values e.g. via PROFINET and transmit these via the serial interface of the module (SDI or CDI) to the servomotor. The program sequences required are loaded once into the module in the form of a script via the CDI interface of the module and then always executed there cyclically. KUNBUS provides you with a PC tool for creating and testing such scripts. You can read all the necessary details in the separate manual on the Scriptor.

NOTICE! Please note that when using the Scriptor and activating a script the interface (CDI or SDI) selected for its communication is always assigned for the Scriptor. If you choose the CDI interface, you can then no longer use this interface to check and enter module parameters ("CDI menus" are then no longer available). If you choose the SDI interface as a serial communication channel for the Scriptor, you can then no longer process any Modbus protocol with access to the memory register via this interface.

5 Commissioning

5.1 Installation

The main board is connected to the device controller via a 32-pin connector strip. Thus, you have the option to plug the module directly into your DIL socket.

NOTICE

If the module is plugged in and unplugged frequently, mechanical stresses may damage the module.

Use a zero insertion force socket to prevent damage.

Pin assignment on the application interface

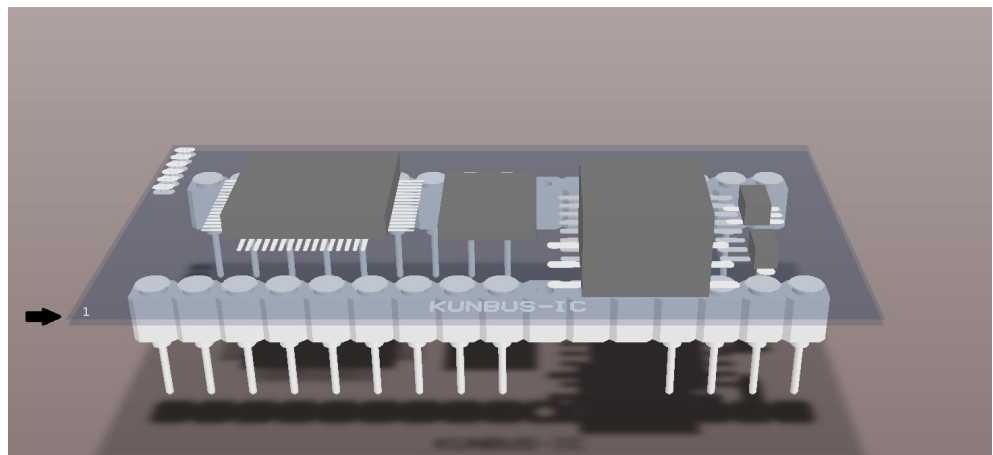


Illustration 8: Start point view

When you view your module from above, you will find a printed triangle in one corner.

The counting of the pins starts with the underlying pin which is then continued U-shaped and ends with the allocation 32 at the opposite pin.

1	32
2	31
3	30
4	29
5	28
6	27
7	26
8	25
9	24
10	23
11	22
12	21
13	20
14	19
15	18
16	17

Illustration 9: Pin Assignment

In the table below, we have compiled the pin assignment on the application interface for you.

SPI Master Mode

PIN	Application side	Direction	Electrical specifications			Temperature range (-40 C to 85 C)
			Min.	Typical	Max.	Tolerance:
1	VCC 3.3 V	[IN]	3.1 V	3.3 V	3.5 V	I _{max} = 400 mA
2	SPI Reset	[OUT]	-	-	3.3 V, 4 mA	-
3	SPI Load	[OUT]	-	-	3.3 V, 4 mA	-
4	SPI data out	[OUT]	-	-	3.3 V, 4 mA	-
5	SPI data in	[IN]	-0.1 V	2 V ⁽¹⁾	5 V	±10 %
6	SPI data mid	[IN]	-0.1 V	2.0 V ⁽¹⁾	5 V	±10 %
7	SPI clock	[OUT]	-	-	3.3 V, 4 mA	-
8	Module Reset	[IN]	-0.1 V	-	5 V	±10 %
9	LED PROFINET Run (high active)	[OUT]	*	*	*	*
10	LED Port 1 Link/Activity (low active)	[OUT]	*	*	*	*
11	Supply for center tap of magnetics	[OUT]	*	*	*	*
12	Supply for center tap of magnetics	[OUT]	*	*	*	*
13	Port 1, RX-	[IN]	*	*	*	*
14	Port 1, RX+	[IN]	*	*	*	*
15	Port 1, TX-	[OUT]	*	*	*	*
16	Port 1, TX+	[OUT]	*	*	*	*
17	Port 2, RX+	[IN]	*	*	*	*
18	Port 2, RX-	[IN]	*	*	*	*
19	Port 2, TX+	[OUT]	*	*	*	*
20	Port 2, TX-	[OUT]	*	*	*	*
21	Supply for center tap of magnetics	[OUT]	*	*	*	*
22	Supply for center tap of magnetics	[OUT]	*	*	*	*
23	LED Port 2 Link/Activity (low active)	[OUT]	*	*	*	*
24	LED PROFINET Error (high active)	[OUT]	*	*	*	*
25	LED Module Status	[OUT]	*	*	*	*
26	Config. Mode	[IN]	*	*	*	*
27	CDI (UART) TX	[OUT]	-	-	3.3 V, 4 mA	-
28	CDI (UART) RX	[IN]	-0.1 V	2 V ⁽¹⁾	5 V	-
29	SDI (UART) RX	[IN]	-0.1 V	2 V ⁽¹⁾	5 V	-
30	SDI (UART) TX	[OUT]	-	-	3.3 V, 4 mA	-
31	SDI TX enable	[OUT]	-	-	3.3 V, 4 mA	-
32	GND	[IN]	-	-	-	-

(1) A logical High is detected from 2 Volts. * Specified according to IEEE 1802.3

SPI Slave Mode (Activation via Modbus Register)

PIN	Application side	Direction	Electrical specifications			Temperature range (-40 C to 85 C)
			Min.	Typical	Max.	Tolerance:
1	VCC 3.3 V	[IN]	3.1 V	3.3 V	3.5 V	I _{max} = 400 mA
2	Reserved	Do not connect!				
3	SPI Slave Ready	[OUT]	-	-	3.3 V, 4 mA	-
4	SPI MOSI	[IN]	-0.1 V	2.0 V ⁽¹⁾	5 V	±10 %
5	SPI MISO	[OUT]	-	-	3.3 V, 4 mA	-
6	SPI Slave CS	[IN]	-0.1 V	2 V ⁽¹⁾	5 V	±10 %
7	SPI CLK	[IN]	-	-	3.3 V, 4 mA	-
8	Module Reset	[IN]	-0.1 V	-	5 V	± 10 %
9	LED PROFINET Run (high active)	[OUT]	*	*	*	*
10	LED Port 1 Link/Activ- ity (low active)	[OUT]	*	*	*	*
11	Supply for center tap of magnetics	[OUT]	*	*	*	*
12	Supply for center tap of magnetics	[OUT]	*	*	*	*
13	Port 1, RX-	[IN]	*	*	*	*
14	Port 1, RX+	[IN]	*	*	*	*
15	Port 1, TX-	[OUT]	*	*	*	*
16	Port 1, TX+	[OUT]	*	*	*	*
17	Port 2, RX+	[IN]	*	*	*	*
18	Port 2, RX-	[IN]	*	*	*	*
19	Port 2, TX+	[OUT]	*	*	*	*
20	Port 2, TX-	[OUT]	*	*	*	*
21	Supply for center tap of magnetics	[OUT]	*	*	*	*
22	Supply for center tap of magnetics	[OUT]	*	*	*	*
23	LED Port 2 Link/Activ- ity (low active)	[OUT]	*	*	*	*
24	LED PROFINET Error (high active)	[OUT]	*	*	*	*
25	LED Module Status	[OUT]	*	*	*	*
26	Config. Mode	[IN]	*	*	*	*
27	CDI (UART) TX	[OUT]	-	-	3.3 V, 4 mA	-
28	CDI (UART) RX	[IN]	-0.1 V	2 V ⁽¹⁾	5 V	-
29	SDI (UART) RX	[IN]	-0.1 V	2 V ⁽¹⁾	5 V	-
30	SDI (UART) TX	[OUT]	-	-	3.3 V, 4 mA	-
31	SDI TX enable	[OUT]	-	-	3.3 V, 4 mA	-
32	GND	[IN]	-	-	-	-

(1) A logical High is detected from 2 Volts. * Specified according to IEEE 1802.3

Function

The individual PINs establish the contact to the following functions:

- PIN 1 and 9: Power supply.
- PIN 2 – 7: SPI Slave interface.

- PIN 8: Module reset
- PIN 9-26: Fieldbus
- PIN 27 – 31: Serial communication (SDI/CDI)

NOTICE

An example of the connection options can be found in Appendix 2.

Connection options to the SDI interface

You can establish the connection to the SDI in RS232 or RS485 mode:

You need an RS232 level converter for operating in RS232 mode.

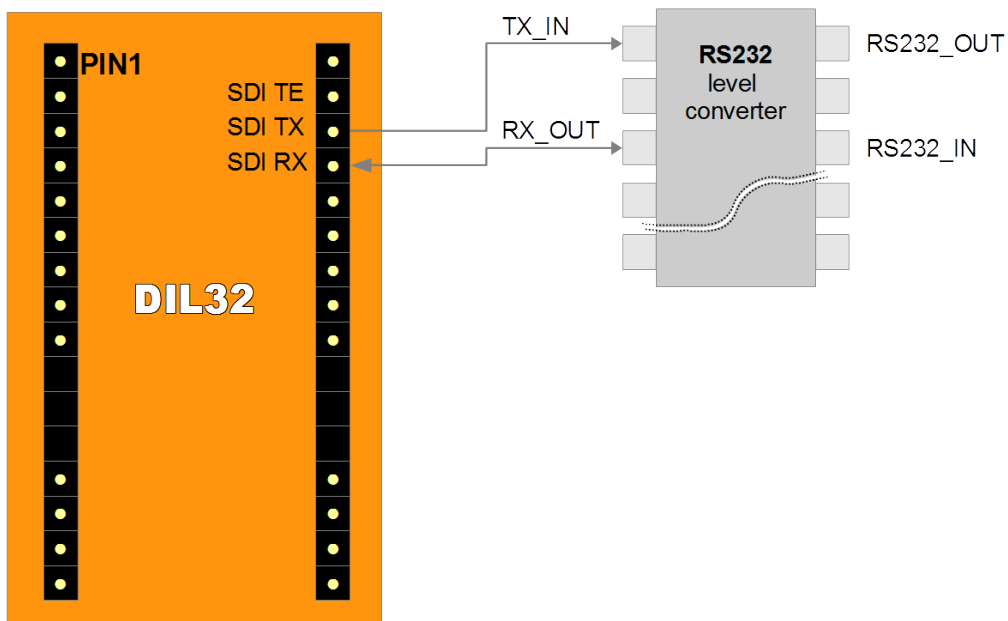


Illustration 10: Connection for the SDI via RS 232

The TX PIN is not used with this connection.

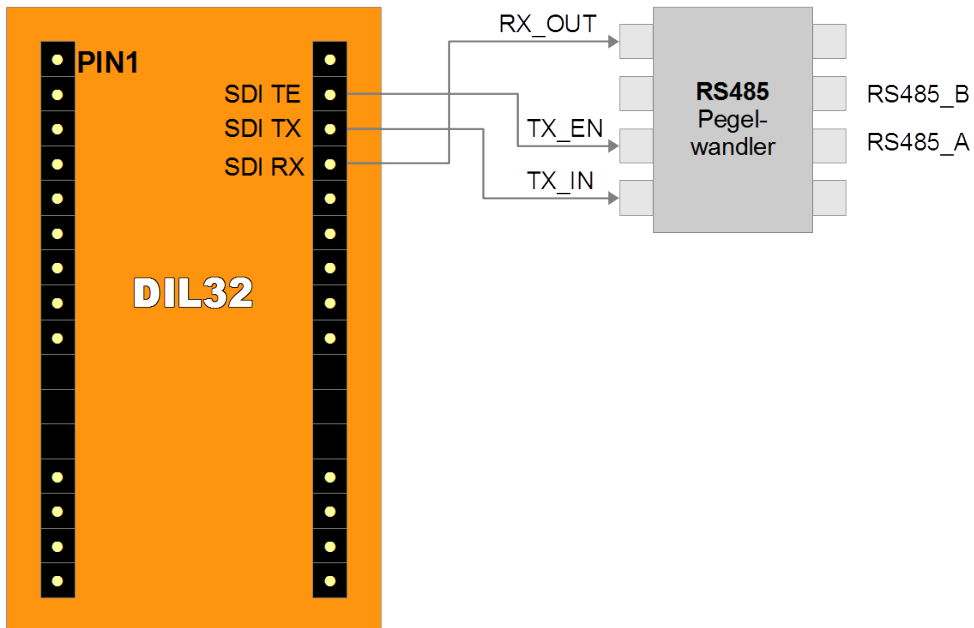


Illustration 11: Connection option for the SDI using RS485

You need an RS485 level converter for operating in RS485 mode.

Connection options to the CDI interface

You can establish the connection to the CDI in RS232 mode:

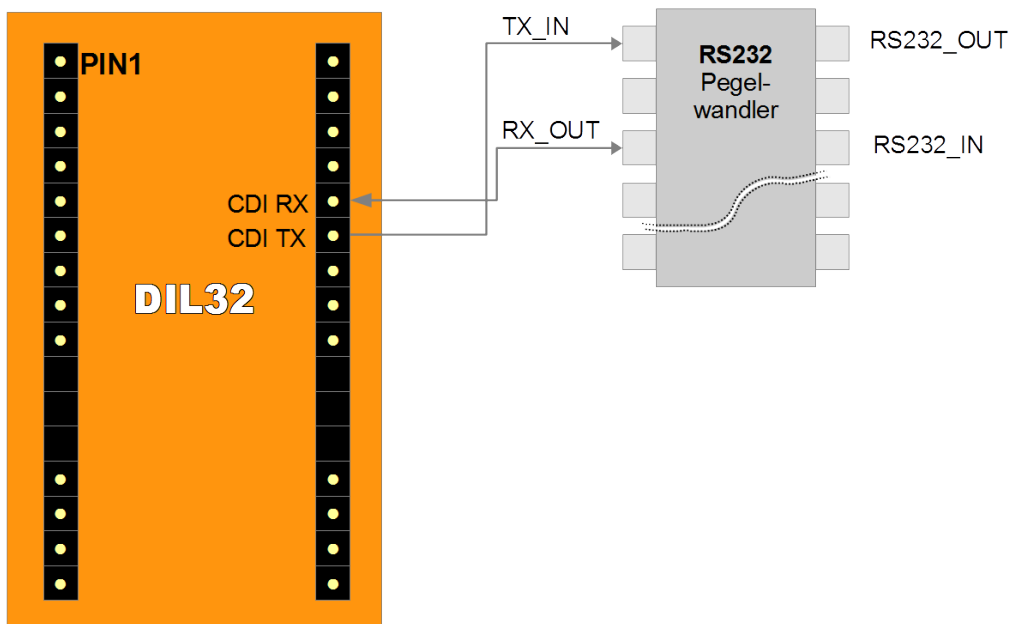


Illustration 12: Connection option for the CDI

5.2 Configuration

This section describes how to configure the module and associated components and applications.

NOTICE

- The module has no undo function.
- ➔ Changes are applied after a reset or start of the operating mode without any further confirmation.
- ⇒ If you want to reset all values, use the function "Reset to factory settings". [▶ 149] Please note that all previous settings made will be lost.

Configuration using the CDI

To configure the Modul and put it into operation using the CDI, you need a PC or notebook with a serial interface (RS-232) or USB/serial adapter. Make sure that the adapter drivers are installed.

Communication with the CDI (Configuration and Debug Interface) of the module takes place using a terminal program (e.g. PuTTY for Microsoft Windows®).

TIPPI!: Das CDI is suitable for configuration during the development and for diagnostic purposes. To configure several modules automatically, we recommend performing the settings with Modpoll. You can find an introduction and example of this in the Appendix Configuration via Modpoll [▶ 165].

Configuration using the SDI

The KUNBUS-IC has a UART interface with 3.3 V logic levels. Your main board must convert these lines to standardised RS-485 signals so that Modbus/RTU devices can access these. Conversion to standardised RS-232 signals is generally necessary for communication with a PC. The base board of the evaluation board has both interfaces that can each be selected via jumpers.

Configuration using the SDI requires a Modbus master device.

One of the following devices is suitable for this:

- Master computer,
- Control panel,
- Programming device,
- SPS with the possibility of Modbus-RTU communication.

To communicate with the SDI of the module using a PC, you need Modbus software (e.g. Modpoll).

5.3 Firmware Update

If a firmware update is required, please contact our support (support@kunbus.de). We will be delighted to provide you with all the information you need for your product.

6 Communication parameters

The communication parameters are used for identification of the module in your application. The unique assignment of these communication parameters is the precondition for communicability of the module within your application.

The following adjustments can be made for PROFINET:

- Station Name
- IP Address
- Subnet Mask
- Gateway Address

You have 2 options for configuring the communication parameters:

- In the CDI menu 2.9.3 "Communication Parameters"
- In the memory registers:
 - The station name occupies the memory register 0x4201 - 0x42f0
 - The IP address occupies the memory register 0x4044 - 0x4045
 - The subnet mask occupies the memory 0x4046 - 0x4047
 - The gateway address occupies the memory register 0x4048 - 0x4049

You can find a detailed overview of registers in section Fieldbus specific Registers.

Rules for assigning the Station Name

Since names are easier to handle than complex IP addresses in most cases, a station name can be assigned to PROFINET modules.

According to the definition RFC 5890, attention must be paid to the name assignment rules in this regard:

- Data should be specified in the Octet string type
- Restriction to a total of 240 characters (letters "a" to "z", numbers "0" to "9", hyphen or dot)
- A name element of the device name must be separated with a dot and can have a maximum of 63 characters.
- No special characters such as umlauts, brackets, underscore, blank etc.
- The hyphen is the only special character allowed.
- The device name must not begin or end with a dot.
- The device name must not begin with numbers.
- The device name must not have the form n.n.n.n (n = 0...999).
- The device name must not begin with the character string "port-xyz-" (x,y,z = 0...9).
- The device name may only begin with "xn-" if the original character string contains values other than "0" to "9" and "a" to "z".

- The field "NameOfStationValue" must not end with 0.

Examples of valid names:

“device -1.machine- 1.plant- 1.vendor”

“mühle1.ölmühle1.plant.com“ is coded as “ xn–mhle1-kva.xn–lmhle1-vxa4c.plant.com“

If devices have several Ethernet interfaces, the station name is assigned to the interface. In this case, you have to assign a station name to each Ethernet interface.

Please note that there are various possibilities for setting the station name:

- By the PROFINET Master (DCP)
- Via the memory register
- Via the CDI menu

The KUNBUS-IC uses the station name last set by one of these sources.

7 Functions for PROFINET

7.1 Identification & Maintenance

The Identification & Maintenance data has the function of describing the module. This allows you to adapt the manufacturer number, order number, serial number, device description and installation location of the module to your application.

The KUNBUS-IC supports I&M 0 - 4 data. These are available exclusively for Slot0, Subslot1.

I&M 0 data

I&M 0 data can be read from the master with Api0, Slot0, Subslot1, Index 0xaff0 via Record Read. This is managed as follows:

Field	Meaning
Vendor ID	The vendor ID is taken from the Modbus register 0x4004. It can be written permanently by the user. The default value is 0x01e (vendor ID KUNBUS)
Order ID	The order ID is transferred from the Modbus registers 0x4014 (High Word) and 0x4015 (Low Word) as a 32 bit unsigned number and saved as an ASCII string. It can be written permanently by the user. The default value is the KUNBUS order number of the module.
Serial Number	The serial number is transferred from the Modbus registers 0x400a (High Word) and 0x400b (Low Word) as a 32 bit unsigned number and saved as an ASCII string. It can be written by the user permanently. The default value is the serial number of the module assigned by the KUNBUS.
Hardware Revision	The Hardware Revision is specified as a constant when creating the firmware. It cannot be changed by the user.
Software Revision	The Software Revision is specified as a constant when creating the firmware. It cannot be changed by the user.
Revision Counter	The Revision Counter is specified as a constant when creating the firmware. It cannot be changed by the user.
Profile ID	Fix set to 0x0000 (non profile device)
Profile specific type	Fix set to 0x0003 (IO Device)
I&M Version	Fix set to 0x0101 (required by specification)

I&M Data 1 to 4

The I&M data 1-4 is saved permanently in the module and can only be read and written from the master.

7.2 Alarm Acknowledge

PROFINET provides the option of transmitting non-cyclical alarms. As a result, system and user-defined events can be transported and reported faster. There are 16 registers available for an alarm.

7.3 Module Types

The KUNBUS-IC has 9 virtual input/output modules. Slot 0 always contains the DAP module (Device Access Point) and cannot be changed.

In slot 1-8, input modules, output modules or input and output modules in the value range between 2 and 128 byte can be selected. Dummy modules serve as placeholders.

The COMS device supports a total of 384 input and 384 output bytes. The equipment state is valid if the total number of input and output bytes does not exceed this length.

NOTICE

Please note that this section considers the inputs and outputs from the point of view of the field level. Hence, input signifies the data transmitted from the module to the fieldbus master and output data signifies data transmitted from the fieldbus master to the module.

DAP (Device Access Point)

Description:	DAP
Module ID	0xa0000000
Usable in Slot	0
Total Number of Input Bytes	0
Total Number of Output Bytes	0
Number of Submodules	3

Submodule for Record Access

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	0
Number of Output Bytes	0

Submodule for Representation of the entire Profinet Device

Submodule ID	0x0000000a
Subslot	0x8000
Number of Input Bytes	0
Number of Output Bytes	0

Submodule for Representation of Port 1

Submodule ID	0x0000000b
Subslot	0x8001
Number of Input Bytes	0
Number of Output Bytes	0

Submodule for Representation of Port 2

Submodule ID	0x0000000c
Subslot	0x8002
Number of Input Bytes	0
Number of Output Bytes	0

Dummy Module

Description:	Dummy
Module ID	0xb0000000
Usable in Slot	1-8
Total Number of Input Bytes	0
Total Number of Output Bytes	0
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	0
Number of Output Bytes	0

Input 2 Byte

Description:	Input 2 Byte
Module ID	0x00000002
Usable in Slot	1-8
Total Number of Input Bytes	2
Total Number of Output Bytes	0
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	2
Number of Output Bytes	0

Input 4 Byte

Description:	Input 4 Byte
Module ID	0x00000003
Usable in Slot	1-8
Total Number of Input Bytes	4
Total Number of Output Bytes	0
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	4
Number of Output Bytes	0

Input 8 Byte

Description:	Input 8 Byte
Module ID	0x00000004
Usable in Slot	1-8
Total Number of Input Bytes	8
Total Number of Output Bytes	0
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	8
Number of Output Bytes	0

Input 16 Byte

Description:	Input 16 Byte
Module ID	0x00000005
Usable in Slot	1-8
Total Number of Input Bytes	16
Total Number of Output Bytes	0
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	16
Number of Output Bytes	0

Input 32 Byte

Description:	Input 32 Byte
Module ID	0x00000006
Usable in Slot	1-8
Total Number of Input Bytes	32
Total Number of Output Bytes	0
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	32
Number of Output Bytes	0

Input 64 Byte

Description:	Input 64 Byte
Module ID	0x00000007
Usable in Slot	1-8
Total Number of Input Bytes	64
Total Number of Output Bytes	0
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	64
Number of Output Bytes	0

Input 128 Byte

Description:	Input 128 Byte
Module ID	0x00000008
Usable in Slot	1-8
Total Number of Input Bytes	128
Total Number of Output Bytes	0
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	128
Number of Output Bytes	0

Output 2 Byte

Description:	Output 2 Byte
Module ID	0x00000020
Usable in Slot	1-8
Total Number of Input Bytes	0
Total Number of Output Bytes	2
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	0
Number of Output Bytes	2

Output 4 Byte

Description:	Output 4 Byte
Module ID	0x00000030
Usable in Slot	1-8
Total Number of Input Bytes	0
Total Number of Output Bytes	4
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	0
Number of Output Bytes	4

Output 8 Byte

Description:	Output 8 Byte
Module ID	0x00000040
Usable in Slot	1-8
Total Number of Input Bytes	0
Total Number of Output Bytes	8
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	0
Number of Output Bytes	8

Output 16 Byte

Description:	Output 16 Byte
Module ID	0x00000050
Usable in Slot	1-8
Total Number of Input Bytes	0
Total Number of Output Bytes	16
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	0
Number of Output Bytes	16

Output 32 Byte

Description:	Output 32 Byte
Module ID	0x00000060
Usable in Slot	1-8
Total Number of Input Bytes	0
Total Number of Output Bytes	32
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	0
Number of Output Bytes	32

Output 64 Byte

Description:	Output 64 Byte
Module ID	0x00000070
Usable in Slot	1-8
Total Number of Input Bytes	0
Total Number of Output Bytes	64
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	0
Number of Output Bytes	64

Output 128 Byte

Description:	Output 128 Byte
Module ID	0x00000080
Usable in Slot	1-8
Total Number of Input Bytes	0
Total Number of Output Bytes	128
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	0
Number of Output Bytes	128

In-/Output 2 Byte

Description:	In-/Output 2 Byte
Module ID	0x00000200
Usable in Slot	1-8
Total Number of Input Bytes	2
Total Number of Output Bytes	2
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	2
Number of Output Bytes	2

In-/Output 4 Byte

Description:	In-/Output 4 Byte
Module ID	0x00000300
Usable in Slot	1-8
Total Number of Input Bytes	4
Total Number of Output Bytes	4
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	4
Number of Output Bytes	4

In-/Output 8 Byte

Description:	In-/Output 8 Byte
Module ID	0x00000400
Usable in Slot	1-8
Total Number of Input Bytes	8
Total Number of Output Bytes	8
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	8
Number of Output Bytes	8

In-/Output 16 Byte

Description:	In-/Output 16 Byte
Module ID	0x00000500
Usable in Slot	1-8
Total Number of Input Bytes	16
Total Number of Output Bytes	16
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	16
Number of Output Bytes	16

In-/Output 32 Byte

Description:	In-/Output 32 Byte
Module ID	0x00000600
Usable in Slot	1-8
Total Number of Input Bytes	32
Total Number of Output Bytes	32
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	32
Number of Output Bytes	32

In-/Output 64 Byte

Description:	In-/Output 64 Byte
Module ID	0x00000700
Usable in Slot	1-8
Total Number of Input Bytes	64
Total Number of Output Bytes	64
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	64
Number of Output Bytes	64

In-/Output 128 Byte

Description:	In-/Output 64 Byte
Module ID	0x00000800
Usable in Slot	1-8
Total Number of Input Bytes	128
Total Number of Output Bytes	128
Number of Submodules	1

Submodule ID	0x00000001
Subslot	0x0001
Number of Input Bytes	128
Number of Output Bytes	128

8 Memory Register

8.1 Overview of the Memory Register

The storage unit is the central component for all functions of the IC-Module. It is subdivided into individual Memory Register with a width of 16 bits each. In these Memory registers the following information is stored:

- Input and output data
- Configuration settings
- Module Status
- Error states

The functionality of the addressing was incorporated from Modbus. The register assignment depends on the application and is not specified by the Modbus specification. A Memory Register according to this specification has a register number between 1 (0x0001) and a maximum of 65536 (0x10000), of which the module only uses a small part, however.

With 8-bit values, 1 byte remains unused. 32-bit values are stored in 2 registers.

The 16-bit values are stored internally in the memory in Little Endian order. This must be taken into account when you access data via the fieldbus interface, SDI or SSC.

NOTICE! In the description of the individual memory registers and CDI, the memory registers are also referred to as Modbus registers.

Bitwise access to input and output data

Optionally, you can address input and output data areas bitwise. The functions 01 Read Coil Status, 02 Read Input Status and 05 Force Single Coil are defined in Modbus for this purpose. Since each bit has a separate address, they are assigned to the bits in the registers as follows: coil 0x0001 corresponds to the lowest value bit 0 of register 0x0001, coil 0x0002 corresponds to bit 1, etc. coil 0x11 is the bit 0 from register 0x0002 etc.

The table below shows the start and end addresses of the data areas:

Area	Memory Register	Coil/Input Address
Input SSC	0x1001 - 0x1080	0x0001 – 0x0800
Input SDI	0x1401 – 0x1500	0x2001 – 0x3000
Input FBS	0x1801 - 0x1900	0x4001 – 0x6001
Output SSC	0x2001 – 0x2080	0x8001 – 0x8800
Output SDI	0x2401 – 0x2500	0xa001 – 0xb000
Output FBS	0x2801 - 0x2900	0xc001 – 0xe001

Register assignment of the memory area

The following table contains a brief overview of the register assignment of the general memory area. You can find a detailed overview of the individual registers on the following pages.

Register number	Assignment	Description
0x0001 – 0x0100 [65]	General Device Parameters	e.g. Setting of the bitrates, mailbox sizes etc.
0x0101 – 0x0e00	Reserved	-
0x0e01 – 0x0ea0	Register for mapping the output data	Each channel occupies 2 x 8 registers
0x0f01 – 0x0f40 [89]	Register for mapping of the extended Data Broker	16 mappings occupy 4 registers each
0x1001 – 0x2000 [90]	Input memory of the communication channels	Each communication channel has a preallocated memory area of 128 - 256 registers.
0x2001 – 0x3000 [91]	Output memory of the communication channels	Each communication channel has a preallocated memory area of 128 - 256 registers.
0x3001 – 0x4000	Reserved	-
0x4001 – 0x5000	Fieldbus-specific	s. following table
0x5001 – 0x10000	Reserved	-

The following table contains a brief overview of the register assignment of the memory area for PROFINET. You can find a detailed overview of the individual registers on the following pages.

Register assignment of the memory area for specifications from PROFINET

Register	Description
0x1801-0x1900	Data Broker; Fieldbus Input
0x1901-0x1980	Data Broker; Fieldbus Input Parameter
0 x 1981	Alarm Status Register
0x1982-0x1983	Alarm Response Code
0x1991-0x1b00	Diagnose Item Acknowledge
X + 0	Diagnose Item Status Register
X + 1-X + 2	Diagnosis Item Response Code
X + 3	Reserved
0x2801-0x2900	Data Broker; Fieldbus Output
0x2901-0x2980	Data Broker; Fieldbus Output Parameter
0 x 2981	Alarm Output Control Register
0 x 2982	Alarm Output Data Length Register
0x2983-0x2990	Alarm Output Data
0x29c1 -0x2a00	Diagnosis Items
0 x 4001	Fieldbus Status
0 x 4002	Module Status
0 x 4003	Reserved
0 x 4004	Fieldbus Vendor ID
0x4005-0x4006	Reserved
0x4007-0x4008	Reserved
0 x 4009	Firmware Version
0 x 4012	Fieldbus Configuration Bits
0 x 4013	Reserved
0x4014-0x4015	Product Code
0x4016-0x4035	Product Name
0 x 4036	Size of input image
0 x 4037	Size of output image
0x4041-0x4043	Configure MAC address
0x4044-0x4045	Configure IP Address
0x4046-0x4047	Configure Network Mask
0x4048 -0x4049	Configure Gateway Address
0x4101-0x4102	Module ID to Slot 0
0x4103-0x4104	Module ID to Slot 1
0x4105-0x4106	Module ID to Slot 2
0x4107-0x4108	Module ID to Slot 3
0x4109-0x410a	Module ID to Slot 4
0x410b-0x410c	Module ID to Slot 5
0x410d-0x410e	Module ID to Slot 6
0x410f-0x4110	Module ID to Slot 7

Register	Description
0x4111-0x4112	Module ID to Slot 8
0x4113-0x4180	Reserved
0x4181-0x4189	Slot Equipment Status
0x4201-0x42f0	Station Name

8.2 General Device Parameters

0x0001 Set operating mode

In this memory register you have the option, the operating mode to set

Modbus Register	0x0001
Value Range	0x0000-0x0003
Default Value	0x0000
Number of bytes available	2
Permanently stored	No
Access	Read/Write
Meaning	
0x0000 or 0x0001	Operation Cyclical data exchange takes place.
0x0002	Restoring default settings (Factory Reset) Resetting of all permanent parameters to their original respective settings. A module reset takes place automatically and does not have to be done manually here.
0x0003	Reset Implementing a reset. Your settings can first be applied after a reset.

0x0002-0x0003 Current module status

In these memory registers you will find information for the current module status.

Bit 5 indicates whether there is an error in the configuration of the SSC Master mode. It is only set, however, during the initialisation of the module. If an error occurs during ongoing operation, this is not displayed here.

Memory Register 0x0002 (bit 0-15) contains the Low Word, Memory Register 0x0003 (bit 16-31) contains the High Word.

Modbus Register	0x0002-0x0003
Value Range	-
Initial value	-
Number of available bytes	2
Permanently stored	No
Access	Read Only
Meaning	
Bit 0	Fieldbus Run State 1: The field bus is in cyclical data exchange 0: The cyclical data connection is interrupted
Bit 1	SSC SSR Master Run State 1: The synchronous serial interface is in SSC mode and is exchanging data cyclically 0: No cyclical data exchange takes place.
Bit 2	SSC Mapping Configuration Error State 1: Configuration error in the mapping of the SSC interface. 0: Configuration is ok.
Bit 3	SDI Mapping Configuration Error 1: Configuration error in the mapping for the SDI. 0: Configuration is ok.
Bit 4	Fieldbus Communication Mapping Configuration Error 1: Configuration Error in the Mapping for the Fieldbus Interface. 0: Configuration is ok.
Bit 5	SSC SSR Master Configuration Error State 1: General Configuration Error in the SSC SSR Master Mode 0: Configuration is ok.

Bit 6	SDI Configuration Error 1: General Configuration Error of the SDI Interface. 0: Configuration is ok.
Bit 7	Fieldbus Communication Configuration Error 1: General configuration error of the FBS interface 0: Configuration is ok.
Bit 8-13	Reserved
Bit 14	Extended Mapping Error 1: Configuration error in the mapping 0: Configuration is ok
Bit 15	Script Run Status 1: Script was loaded successfully and is running cyclically. 0: Script is stopped
Bit 16	Script Error State 1: An error has occurred during execution of the script 0: Script runs without errors

0x0004 Set device address for the SDI interface

In this memory register you have the option, to set a unique device address for communication via the SDI interface (Modbus)

A Modbus network (RS485) can consist of several modules. Therefore, the Modbus protocol provides the unique addressing via device addresses. If you want to access the KUNBUS-IC with a Modbus Master (e.g. PC with Modpoll), the Master must use the device address set in this register as the first byte in the send telegram.

The new settings are applied after a reset (Power Off/On or write Memory Register 0x0001 with value 0x0003).

Modbus Register	0x0004
Value Range	0x01-0xF7
Default Value	0x01
Number of available bytes	1
Permanently stored	Yes
Access	Read/Write

0x0005 Set bitrate for the SDI interface

In this memory register you have the option, to define with which bitrate the SDI interface should communicate.

Automatic bitrate detection means that the module tests the following bitrates until it has received a correct Modbus-RTU telegram:

- 2400 bit/s
- 4800 bit/s
- 9600 bit/s
- 19200 bit/s
- 38400 bit/s
- 57600 bit/s
- 115200 bit/s

NOTICE! During automatic bitrate detection the module does not send a reply to the master until the correct bitrate has been detected. This procedure can require up to 40 polls of the master.

TIP: Set a fixed bitrate if the automatic bitrate detection lasts too long for you.

The new settings are applied after a reset (Power Off/On or write Memory Register 0x0001 with value 0x0003).

Modbus Register	0x0005
Value Range	0x00-0x07
Default Value	0x00
Number of available bytes	1
Permanently stored	Yes
Access	Read/Write
Meaning	
0x00	Automatic bitrate detection
0x01	2400 bit/s
0x02	4800 bit/s
0x03	9600 bit/s
0x04	19200 bit/s
0x05	38400 bit/s
0x06	57600 bit/s
0x07	115200 bit/s

0x0006 Set parity bits for the SDI interface

In this memory register you have the option, to set the parity bit for the data transmission of the SDI interface.

The number of stop bits is adjusted automatically to the parity to ensure that a transmission always contains the same number of bits.

The new settings are applied after a reset (Power Off/On or write Memory Register 0x0001 with value 0x0003).

Modbus Register	0x0006
Value Range	0x00-0x02
Default Value	0x00 (Even Parity)
Number of available bytes	1
Permanently stored	Yes
Access	Read/Write
Meaning	
0x0000	Even Parity, 1 Stop-Bit
0x0001	Odd Parity, 1 Stop-Bit
0x0002	No Parity, (2 Stop-Bits)

0x0007 Current bitrate of the SDI interface

In this memory register you will find information about the currently used bitrate of the SDI interface.

Modbus Register	0x0007
Value Range	0x0000-0x0007
Initial value	-
Number of bytes available	1
Permanently stored	No
Access	Read Only
Meaning	
0x0000	The bitrate is unknown or has not yet been determined by the automatic bitrate detection.
0x0001	2400 bit/s
0x0002	4800 bit/s
0x0003	9600 bit/s
0x0004	19200 bit/s
0x0005	38400 bit/s
0x0006	57600 bit/s
0x0007	115200 bit/s

0x0012 Set bitrate for the CDI interface

In this memory register you have the option, to set the Bitrate for the CDI

The new settings are applied after a reset (Power Off/On or write Memory Register 0x0001 with value 0x0003).

Modbus Register	0x0012
Value Range	0x01-0x07
Default Value	0x07 (115200 bit/s)
Number of bytes available	1
Permanently stored	Yes
Access	Read/Write
Meaning	
0x01	2400 bit/s
0x02	4800 bit/s
0x03	9600 bit/s
0x04	19200 bit/s
0x05	38400 bit/s
0x06	56700 bit/s
0x07	115200 bit/s

NOTICE

Automatic bitrate detection with the CDI is not possible.

- If the configuration that was entered is invalid, the corresponding registers use the following settings in order not to block the interface by incorrect data:
- ➔ 115200 bit/s, 1 stop bit, even parity

0x0013 Set transmission format for the CDI interface

In this memory register you have the option, to set the format of the data transmission for the CDI interface

Modbus Register	0x0013
Value Range	0x00-0x07
Default Value	1
Number of bytes available	1
Permanently stored	Yes
Access	Read/Write
Meaning	
Bit 0	Parity Enable (PEN) 1: Activate parity check 0: Do not activate parity check
Bit 1	Even or Odd (EOP) Only relevant if parity check is activated. 1: Odd Parity 0: Even Parity
Bit 2	Stop Bit (STB) 1: Use synchronisation with 2 stop bits 0: Use synchronisation with 1 stop bit.

Example: The value "0x05" ("00000_101b") means:

- Bit 0: (1) Activate parity check.
- Bit 1: (0) Set Even Parity.
- Bit 2: (1) Use synchronisation with 2 stop bits.

Bit order:

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
													SBT	EOP	PEN

0x0014 Current bitrate of the CDI

In this memory register you will find information about the currently used bitrate for the CDI interface.

The new settings are applied after a reset (Power Off/On or write Memory Register 0x0001 with value 0x0003).

Modbus Register	0x0014
Value Range	0x01-0x07
Number of bytes available	1
Permanently stored	No
Access	Read Only
Meaning	
0x01	2400 bit/s
0x02	4800 bit/s
0x03	9600 bit/s
0x04	19200 bit/s
0x05	38400 bit/s
0x06	57600 bit/s
0x07	115200 bit/s

0x0015 Current data transmission format of the CDI interface

In this memory register you will find information about the current format of a data byte for the CDI .

Modbus Register	0x0015
Value Range	0x00-0x07
Number of bytes available	1
Permanently stored	No
Access	Read Only
Meaning	
Bit 0	Parity Enable (PEN) 1: Activate parity control 0: Do not activate parity control
Bit 1	Even or Odd (EOP) Only relevant if parity control is activated. 1: Odd Parity 0: Even Parity
Bit 2	Stop Bit (STB) 1: Use synchronisation with 2 stop bits 0: Use synchronisation with 1 stop bit.

Example: The value "0x05" ("00000_101b") means:

- Bit 0: (1) Parity control activated.
- Bit 1: (0) Even Parity Control set.
- Bit 2: (1) Synchronisation with 2 stop bits used.

Bit order:

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
														SBT	EOP PEN

0x0016 Configure SSC mode In this memory register you have the option, to set the SSC mode of the module

You can operate the module in slave mode or master mode.

Modbus Register	0x0016
Value Range	0x0000-0x0003
Default Value	0x01
Number of bytes available	1
Permanently stored	Yes
Access	Read/Write
Meaning	
0x00	SSC SSR Master Mode deactivated
0x01	SSC SSR Master Mode (shift register, automatic detection)
0x02	SSC SSR Mode (slide register, manual configuration)
0x03	SSC SPI Slave Mode

0x0017 Current SSC Mode In this memory register you will find information on the current SPI/SSC mode of the module.

You can find further information on this topic in section "Synchronous serial interface [▶ 25]".

Modbus Register	0x0017
Value Range	0x0000-0x0003
Initial value	0x01
Number of bytes available	1
Permanently stored	No
Access	Read Only
Meaning	
0x00	SSC SSR Master Mode deactivated
0x01	SSC SSR Master Mode (shift register, automatic detection)
0x02	SSC SSR Mode (shift register, manual configuration)
0x03	SSC SPI Slave Mode
0x04	SSC SSR Master Mode Error Status

0x0018 Configure SPI mode

In this memory register you have the option, Clock and data level for the SPI interface to set

This setting is only used in the SPI slave mode. In SSC Master Mode the SPI Controller always uses setting 4: "lagging edge, CLK high, MSB first" (see also Synchronous serial interface [▶ 25])

Modbus Register	0x0018
Value Range	0x0001-0x0004
Default Value	4
Number of bytes available	1
Permanently stored	Yes
Access	Read/Write
Meaning	
0x0001	Leading edge (CPHA=0, CLK low (CPOL=0), MSB first)
0x0002	Leading edge (CPHA=0, CLK high (CPOL=1), MSB first)
0x0003	Lagging edge (CPHA=1, CLK low (CPOL=0), MSB first)
0x0004	Lagging edge (CPHA=1, CLK high (CPOL=1), MSB first)

0x0019 Current configuration of the SPI controller

In this memory register you will find information about the current configuration of the clock and data level of the SPI controller.

Modbus Register	0x0019
Value Range	0x0000-0x0004
Number of bytes available	2
Permanently stored	No
Access	Read Only
Meaning	
0x0000	SSC/SPI deactivated
0x0001	Leading edge (CPHA=0, CLK low (CPOL=0), MSB first)
0x0002	Leading edge (CPHA=0, CLK high (CPOL=1), MSB first)
0x0003	Lagging edge (CPHA=1, CLK low (CPOL=0), MSB first)
0x0004	Lagging edge (CPHA=1, CLK high (CPOL=1), MSB first)

0x001a Set bitrate on the SSC interface

In this memory register you have the option, to set the bitrate on the SPI controller

Modbus Register	0x001a
Value Range	0x00-0x03
Default Value	0x01
Number of bytes available	1
Permanently stored	Yes
Access	Read/Write
Meaning	
0x00	Deactivated
0x01	~300kbit
0x02	~1200 Kbit/s
0x03	~4800 Kbit/s

0x001b Current bitrate on the SSC interface

In this memory register you will find information about the current bitrate of the SSC interface.

Modbus Register	0x001b
Value Range	0x00-0x03
Default Value	-
Number of bytes available	2
Permanently stored	No
Access	Read Only
Meaning	
0x00	Bitrate not set or invalid
0x01	~300kbit
0x02	~1200 kbit/s
0x03	~4800 kbit/s

0x001c Configure number of SSC Outputs

Prerequisite: You have activated the Master Mode

In this memory register you have the option, to set the number of output shift register modules for the cyclical data exchange. The size of each shift register module is 8 bits.

When you carry out a manual configuration here, you must make sure that the automatic register detection is not set, since these values are given priority. If the number of connected shift register modules does not match this register, the SSC interface switches to error state.

Modbus Register	0x001c
Value Range	0-32
Default Value	0
Number of bytes available	1
Permanently stored	Yes
Access	Read/Write
Meaning	
0x00	0 Shift registers
0x01	1 Shift registers
0x02 – 0x1F
0x20	32 Shift registers

0x001d Current number of output shift register modules

Prerequisite: You have activated the Master Mode.

In this memory register you will find information about the current number of output shift register modules for the cyclical data exchange on the SSC interface.

Modbus Register	0x001d
Value Range	0-32
Number of bytes available	2
Permanently stored	No
Access	Read Only
Meaning	
0x00	0 Shift registers
0x01	1 Shift registers
0x02 – 0x0F	...
0x20	32 Shift registers

0x001e Configure number of input shift register modules

Prerequisite: You have activated the Master Mode

In this memory register you have the option, to set the number of input shift register modules for the cyclical data exchange. The size of each shift register module is 8 bits.

When you carry out a manual configuration here, you must make sure that the automatic register detection is not set, since these values are given priority. If the number of connected shift register modules does not match this register, the SSC interface switches to error state.

Modbus Register	0x001e
Value Range	0-32
Default Value	0
Number of bytes available	1
Permanently stored	Yes
Access	Read/Write
Meaning	
0x00	0 Shift registers
0x01	1 Shift registers
0x02-0x1F	...
0x20	32 Shift registers

0x001f Current number of input shift register modules

Prerequisite: You have activated the Master Mode.

In this memory register you will find information about the current number of output shift register modules for the cyclical data exchange on the SSC interface.

Modbus Register	0x001f
Value Range	0-32
Default Value	-
Number of bytes available	2
Permanently stored	No
Access	Read Only
Meaning	
0x00	0 Shift registers
0x01	1 Shift registers
0x02-0x1F	...
0x20	32 Shift registers

0x0020 Module type

This register contains the unique identification number for the module type of the KUNBUS-COMS modules. This module type provides information regarding which product type it is and which fieldbus the module is used for.

Modbus Register	0x0020
Value Range	0x00-0xff
Initial value	58
Number of bytes available	1
Permanently stored	Yes
Access	Read Only
Meaning	
58	KUNBUS-IC for PROFINET

0x0021 Default values in the data communication configure

In this memory register you have the option, to specify the behaviour of the memory register in case no data from outside is received anymore on the SSC Modbus RTU or fieldbus interface.

Modbus Register	0 x 0021
Valid value range	0x00-0x3f
Default Value	0 x 00
Number of available bytes	1
Permanently stored	Yes
Access	Read/Write
Meaning	
Bit 1, Bit 0:	SS1 and SS0 (SSC interface) 00: Output data is set to 0 (default value) 01: Output data is set to 1 10: The data last written is retained
Bit 3, Bit 2:	FB1 and FB0 (fieldbus interface) 00: Output data is set to 0 (default value) 01: Output data is set to 1 10: The data last written is retained
Bit 5, Bit 4:	SD1 and SD0 (SDI interface, Modbus RTU) 00: Output data is set to 0 (default value) 01: Output data is set to 1 10: The data last written is retained

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
										SD	SD	FB	FB	SS	SS

0x0022 Validity period of the process data on the SSC interface

In this memory register you have the option, to set the validity period of the process data on the SSC interface

The next production must take place within the specified period, otherwise the input data is marked as invalid. Output registers that are supplied with process data via the Data Broker from this input area then adjust themselves to the preselected safe values. You set these values in the Memory Register 0x0021.

You can find detailed information on this topic in section "Data Broker [► 13]".

Modbus Register	0x0022
Value Range	0-255
Default Value	0x00
Number of bytes available	1
Permanently stored	Yes
Access	Read/Write
Meaning	
0	The data is valid indefinitely in acyclic operation.
1-255	Validity period in milliseconds (ms) The next production must follow within this time

0x0023 Validity period of the process data on the SDI interface

In this memory register you have the option, to define the validity period of the process data on the SDI interface.

The next production must take place within the specified period, otherwise the input data is marked as invalid. Output registers that are supplied with process data via the Data Broker from this input area then adjust themselves to the preselected safe values.

You set these values in the Memory Register 0x0021.

You can find detailed information on this topic in section "Data Broker [► 13]".

Modbus Register	0x0023
Value Range	0-255
Default Value	0x00
Number of bytes available	1
Permanently stored	Yes
Access	Read/Write
Meaning	
0	The data is valid indefinitely in acyclic operation.
1-255	Validity period in milliseconds (ms) The next production must follow within this time

0x0024 Validity period of the process data on the PROFINET interface

In this memory register you have the option, to define the validity period of the process data on the PROFINET interface.

The next production must take place within the specified period, otherwise the input data is marked as invalid. Output registers that are supplied with process data via the Data Broker from this input area then adjust themselves to the preselected safe values. You set these values in the Memory Register 0x0021.

You can find detailed information on this topic in section "Data Broker [► 13]".

Modbus Register	0x0024
Value Range	0-255
Default Value	0x00
Number of bytes available	1
Permanently stored	Yes
Access	Read/Write
Meaning	
0	The data is valid indefinitely in acyclic operation.
1-255	Validity period in milliseconds (ms) The next production must follow within this time

0x0025 Configure shift chain

In this memory register you have the option, to use the first input and output register of the shift chain for connecting additional components (e.g. Status LEDs, Switches). If you do not want to use any further components, all registers can be used for the data transmission.

Modbus Register	0x0025
Value Range	0x00 – 0x07
Default Value	0x03
Number of bytes available	1
Permanently stored	Yes
Access	Read/Write
Meaning	
Bit 2, Bit 1	Input register of the shift chain 00: all registers are used for the data transmission. 01: Input register 0 is used for fieldbus switches. 10: Input register 0 and 1 are used for fieldbus switches.
Bit 0	Output register of the shift chain 0: all output registers are used for the data transmission. 1: Output register 0 is used for the status LEDs.

0x0026 Current assignment of the shift chain

In this memory register you will find information about using the first input and output register of the shift chain. You can detect whether additional components (e. g. status LEDs, switches) are used or whether all registers are used for the data transmission.

Modbus Register	0 x 0026
Value Range	0x00 – 0x07
Number of available bytes	1
Permanently stored	Yes
Access	Read Only
Meaning	
Bit 0	Output register of the shift chain 0: all output registers are used for the data transmission. 1: Output register 0 is used for the status LEDs.
Bit 1, Bit 2	Input register of the shift chain 00: all registers are used for the data transmission. 01: Input register 0 is used for fieldbus switches. 10: Input register 0 and 1 are used for fieldbus switches.

0x0032 Script Enable Register

In this register you have the option to activate or to deactivate the execution of a script.

You will find information about creating a script in the "KUNBUS-Scripter" documentation supplied.

Modbus Register	0x0032
Value Range	0x00 - 0xff
Default Value	0x00
Number of bytes available	1
Permanently stored	Yes
Access	Read/Write
Meaning	
0	Deactivated
1	Activated

0x0033 Script Port Register

In this register you have the option to select the interface by which the script should communicate.

NOTICE

Please note that activation of a script influences the individual port.

E.g.: If the CDI port is used by the script, the CDI menu can no longer be used until you have deactivated the script.

If the CDI port is used by the script, you can only deactivate the script by writing the value 0 in the memory register 0x0032. You must restart the module to apply the deactivation.

Modbus Register	0x0033
Value Range	0x00-0x01
Default Value	0x01
Number of bytes available	1
Permanently stored	Yes
Access	Read/Write
Meaning	
0	CDI Interface
1	SDI Interface

0x0034 Script Status Register

In this register you will find information about the current status of the scripts.

Modbus Register	0x0034
Value Range	0x00-0xff
Default Value	0x00
Number of bytes available	1
Permanently stored	No
Access	Read Only
Meaning	
0	The running script is in the initialisation phase
1	The script is running cyclically
2	The running script is waiting for data input or for a waiting period to elapse
3	The script was stopped or no script for running is loaded or running script is deactivated
4	Script cannot run due to a serious error

0x0035 Script Loop Register

In this register you have the option to monitor whether your script is running. During each run of the script, the value in the register is incremented.

Modbus Register	0x0035
Value Range	0x0000- 0xffff
Initial value	0
Number of bytes available	2
Permanently stored	No
Access	Read Only

0x0036 SSC Error Register

In this memory register you will find information about possible errors that have occurred when connecting the module to an external shift register chain.

Modbus Register	0x0036
Value Range	0x00-0x05
Default Value	-
Number of bytes available	1
Permanently stored	No
Access	Read Only
Meaning	
0	No Error
1	Centre tap is not receiving any data, line defective
2	Data In is not receiving any data
3	Number of input registers is not as expected
4	Number of output registers is not as expected
5	General error, e.g. electrical faults

8.3 Register for the Mapping

In the following Memory registers you have the option to define the data mapping of the Data Broker for the input and output areas of the interfaces.

For each consumer (target register) there is a register area, in which all sources ("producers") are listed from which it obtains data. The data of the source areas is stored in the target area continuously in succession ("consumer") as well as the entries for this consumer. A maximum of 8 entries per consumer are possible. Each entry occupies 2 Memory Register. In the first memory register you can specify the base number of the register area from which the data is copied. This number must be specified in the internal representation, i.e. um 1 reduced. (For example, s 0x1800 must be specified for the base number of the fieldbus input area. If you configure this mapping via the CDI Menu [▶ 132], you have to enter 0x1801.)

In the second Memory Register you determine the number of values you want to copy. Here, you can also exchange the High Byte and Low Byte (swap).

In the event of an invalid mapping, an error message flag is set in the status register 0x0002.

In section "Data Broker [▶ 13]" we will explain how a mapping works. You will also find an example of a mapping.

0x0e01-0x0e08 Output Data Mapping SSC

Modbus Register	0x0e01 – 0x0e08
Value Range	-
Default Value	0x00
Number of bytes available	16
Permanently stored	Yes
Access	Read/Write

0x0e21-0x0e28 Output Data Mapping SDI

Modbus Register	0x0e21 – 0x0e28
Value Range	-
Default Value	0x00
Number of bytes available	16
Permanently stored	Yes
Access	Read/Write

0x0e41-0x0e48 Output Data Mapping Fieldbus

Modbus Register	0x0e41 – 0x0e48
Value Range	-
Default Value	0x00

0x0f01-0xf40 Extended Output Mapping

Number of bytes available	16
Permanently stored	Yes
Access	Read/Write

In these memory registers have the option, to define a bit-accurate mapping. Individual bits can be mapped from any input data area to the output data area of your choice.

You can create a total of 16 different mappings.

Please note that a bit-accurate mapping requires very much run-time performance. Only use this function if you really need it.

To define a bit-accurate mapping, s 4 registers must be defined in each case:

- In memory register 0xf01 enter the input register area from which your data should originate. Bear in mind that this is the internal Modbus base number here. You must therefore reduce the value um 1.
- In memory register 0xf02 enter the output register area in which you require the data. This is also the Modbus base number here. Therefore, reduce the value um 1.
- In memory register 0xf03 enter the source and target position of the first bit that you want to map.
 - Define the source position via bit 0-3.
 - Define the target position via bit 4-7.
- In the memory register 0xf04 define the number of bits that you want to copy.

Modbus Register	0x0f01 – 0xf40
Value Range	-
Default Value	0x00
Number of available bytes	128
Permanently stored	Yes
Access	Read/Write
Meaning	
Register 0x0f01, 0x0f05, 0x0f09 ,..., 0x0f3d	Source base register number
Register 0x0f02, 0x0f06, 0x0f0a, ..., 0x0f3e	Target base register number
Register 0x0f03, 0x0f07, 0x0f0b, ..., 0x0f3f	Bit 0-3: Source bit position Bit 4-7: Target bit position
Register 0x0f04, 0x0f08, 0x0f0c,..., 0x0f40	Bit 0-14: Number of bits to be copied.

8.4 Memory of the Communication Channels

The following memory registers contain the input and output data of the communication channels. Cyclical process data is written there or read from there.

The Data Broker distributes this data cyclically according to the Mapping entries. At the same time, the input data of the producers is assigned to the output data of the consumers.

The data can be read from the input registers at any time via the Modbus protocol. It is only possible to write to input registers via the respective communication channels (only in the case of SDI is this the Modbus communication itself, of course). The initial value in the input registers is 0 until a register is written with process data.

Output registers that are not written by the Data Broker also contain the initial value 0 regardless of the setting for the drop-off value in the event of validity periods of the source data being exceeded. Output registers can solely be written by the Data Broker. Read access is not possible via Modbus, however.

0x1001 Input SSC

Modbus Register	0x1001-0x1080
Coil Address	0x0001 – 0x0800
Value Range	-
Initial value	0x00
Number of bytes available	256
Permanently stored	No
Access	Read Only

0x1401 Input SDI

Modbus Register	0x1401-0x1480
Coil Address	0x2001 – 0x4000
Value Range	0x00-0xff
Initial value	0x00
Number of bytes available	256
Permanently stored	No
Access	Read/Write

0x1801 Input Fieldbus

The Memory Register stores all cyclical data transmitted from the master.

Modbus Register	0x1801-0x1900
Coil Address	0x4001 – 0x6001
Value Range	0-0xffff
Initial value	0
Number of available bytes	2
Permanently stored	No
Access	Read Only

0x2001 Output SSC

Modbus Register	0x2001-0x2080
Value Range	-
Coil Address	0x8001 – 0x8800
Initial value	0x00
Number of bytes available	256
Permanently stored	No
Access	Read Only

0x2401 Output SDI

Modbus Register	0x2401-0x2480
Coil Address	0xa001 – 0xb000
Value Range	-
Default Value	0x00
Number of bytes available	256
Permanently stored	No
Access	Read Only

0x2801 Output Fieldbus

Modbus Register	0x2801-0x2900
Coil Address	0xb001 – 0xe001
Value Range	0-0xffff
Initial value	0
Number of bytes available	2
Permanently stored	No
Access	Read Only

8.5 Fieldbus specific Registers

0x1801 – 0x1900 Data Broker; Fieldbus Input

In these memory registers you will find information about all cyclical data transmitted from the master.

Modbus Register	0x1801 – 0x1900
Value Range	0-0xffff
Default Value	0
Number of bytes available	2
Permanently stored	No
Access	Read Only
Meaning	-

0x1901 – 0x1980 Data
Broker; Fieldbus Input

In these memory registers you will find information about all parameters written from the master. Here, from the master page from records at slot 0, subslot 1.

The index addresses the individual memory register in the following area:

- Index 0x0000 = memory register 0x1901
- Index 0x007f = memory register 0x1980

The controller outputs the data in Little Endian format.

Consecutively ascending registers can be written at once.

Example: Index 0x0005, 10 byte data: Writes memory register 0x1906 – 0x190a

This data is written from the master using Record Write and read using Record Read.

Modbus Register	0x1901 – 0x1980
Value Range	0-0xffff
Default Value	0
Number of bytes available	2
Permanently stored	No
Access	Read Only
Meaning	-

0x1981 Alarm Status Register In this register you will find information as to whether or not an alarm response was received from the master.

You can reset the status bit using the Alarm Control Register (0x2981).

Modbus Register	0x1981
Value Range	0-0xffff
Default Value	0
Number of bytes available	2
Permanently stored	No
Access	Read Only
Meaning	
0	= 1: Alarm response received from the master

0x1982 – 0x1983 Alarm Response Code

In this register the response-code from the master is stored. In register 0x1982 is the Low Word, in register 0x1983 is the High Word of the response code.

Modbus Register	0x1982 – 0x1983
Value Range	0-0xffff
Default Value	0
Number of bytes available	2
Permanently stored	No
Access	Read Only
Meaning	-

0x1991 – 0x19b0 Diagnosis Item Acknowledge

In this register you will find information as to whether or not a response of the controller to the status change of a diagnosis item has occurred.

These registers store the response code of the controller.

Diagnosis Item	Basis Register
0:	0x1991
1:	0x1995
2:	0x1999
3:	0x199d
4:	0x19a1
5:	0x19a5
6:	0x19a9
7:	0x19ad

x + 0 Diagnosis Item Status Register

In this register the receipt of a diagnosis alarm response from the master is signalled.

You can reset the status bit using the Diagnosis Item Control Register (x + 1).

Modbus Register	X + 0
Value Range	0-0xffff
Default Value	0
Number of bytes available	2
Permanently stored	No
Access	Read Only
Meaning	
Bit 0	= 1: Alarm response received from the master
Bit 1	= 1: Invalid slot set in diag item data

x + 1, x + 2 Diagnosis Item Response Code

In register x + 1 is the Low Word, in register x + 2 is the High Word of the response code.

Modbus Register	x + 1, x + 2
Value Range	0-0xffff
Default Value	0
Number of bytes available	2
Permanently stored	No
Access	Read Only
Meaning	-

x + 3 Diagnosis Item
Reserved

Modbus Register	X +3
Value Range	0-0xffff
Default Value	0
Number of bytes available	2
Permanently stored	No
Access	Read Only
Meaning	-

0x2801 – 0x2900 Data
Broker; Fieldbus Output

This register transmits cyclical data from the module to the master

Modbus Register	0x2801 – 0x2900
Value Range	0-0xffff
Default Value	0
Number of bytes available	2
Permanently stored	No
Access	Read Only
Meaning	-

0x2901 – 0x2980 Data
Broker; Fieldbus Output
Parameter

In these memory registers have the option, to set parameters that the master can read.

The index addresses the individual memory register in this area:

Index 0x1000 = memory register 0x2901, Index 0x107f = memory register 0x2980

The data is transferred to the controller in Little Endian format. Thus, consecutively ascending registers can be read at once:

Example: Index 0x1005, 10 byte data; reads memory register 0x2906 – 0x290a

Modbus Register	0x2901 – 0x2980
Value Range	0-0xffff
Default Value	0
Number of bytes available	2
Permanently stored	No
Access	Read / Write
Meaning	-

0x2981 Alarm Output Control Register

In this memory register you have the option, to trigger outgoing alarms.

Modbus Register	0x2981
Value Range	0-0xffff
Default Value	0
Number of bytes available	2
Permanently stored	No
Access	Read / Write
Bit 0	1: Send Alarm to the Master
Bit 1	1: Reset Alarm Acknowledge Bit in Alarm Status Register

0x2982 Alarm Output Data Length Register

In this memory register you have the option, to define the amount of alarm data in bytes for which an alarm should be transmitted.

Modbus Register	0x2982
Value Range	0-28
Default Value	0
Number of bytes available	2
Permanently stored	No
Access	Read / Write

Alarm Output Data (0x2983 – 0x2990)

In this memory register you have the option, to define the data area of the alarm data for which an alarm should be transmitted to the master.

A maximum of 28 bytes can be transmitted per alarm.

Modbus Register	0x2983 – 0x2990
Value Range	0-0xffff
Default Value	0
Number of bytes available	2
Permanently stored	No
Access	Read / Write
Meaning	-

The diagnosis items are used to monitor your application. If a defined value is exceeded, the module will transmit an alarm to the controller with up to 28 bytes.

All diagnosis messages are transmitted as Extended Channel Diagnosis to the controller and have the following fields:

- Slot
- Channel Properties
- Channel Error Type
- Extended Channel Error Type
- Extended Channel Additional Value

There are 8 diagnosis items that occupy 8 registers respectively.

Control Register x + 0

The diagnosis items are controlled via the control register. To change the error code, for example, the corresponding diagnosis item must be written in the control register with a corresponding trigger value.

Bit	Meaning
0 - 1	=0 "Good", diagnosis item is not active, lowest level
	=1 "Maintenance required"
	=2 "Maintenance demanded"
	=3 "Diagnosis", highest level
2	=1 Deletion of the status register

This is the slot that the diagnostic item is assigned to.

Slot (x + 1)

Value: 0-8

NOTICE

The subslot does not have to be configured because it is predefined with the value 1. It is not possible to change this value

Channel Error Type (x + 2)

This field should be coded according to data type Unsight 18 in accordance with the table:

Value (Hexadecimal)	Meaning	Display text
0x0000	Reserved	Unknown error
0x0001	Short circuit	Short circuit
0x0002	Undervoltage	Undervoltage
0x0003	Overvoltage	Overvoltage
0x0004	Overload	Overload
0x0005	Overtemperature	Overtemperature
0x0006	Line break	Line break
0x0007	Upper limit value exceeded	Upper limit value exceeded
0x0008	Lower limit value exceeded	Lower limit value exceeded
0x0009	Error	Error
0x000A	Simulation active	Simulation active
0x000B	Unknown error	Unknown error
0x000C	Unknown error	Unknown error
0x000D	Unknown error	Unknown error
0x000E	Unknown error	Unknown error
0x000F	Default for "missing parameters"	The channel needs (additional) parameters. No parameters or too few parameters are written
0x0010	Default for "Parameterization fault "	Parameterization fault. Wrong parameters or too many parameters are written
0x0011	Default for "Power supply fault"	Power supply fault
0x0012	Default for "fuse blown / open"	Fuse blown / open
0x0013	Default for communication fault	Communication fault. Sequence number wrong / sequence wrong
0x0014	Default for "ground fault"	Ground fault
0x0015	Default for "reference point lost"	Reference point lost
0x0016	Default for "process event lost / sampling error"	Process event lost / sampling error
0x0017	Default for "threshold warning"	Threshold warning
0x0018	Default for "safety event"	Output disabled
0x0019	Default or "safety event"	Safety event

Value (Hexadecimal)	Meaning	Display text
0x001A	Default for "external	External fault
0x001B	Manufacturer specific	Manufacturer specific
0x001C	Manufacturer specific	Manufacturer specific
0x001D	Manufacturer specific	Manufacturer specific
0x001E	Manufacturer specific	Manufacturer specific
0x001F	Default for "temporary fault"	Temporary fault
0x0020 – 0x00FF	Reserved for common profiles	Reserved for common profiles ^a
0x0100 – 0x7FFF	Manufacturer specific	Manufacturer specific
0x8000	Data transmission impossible	Data transmission impossible
0x8001	Remote mismatch	Remote mismatch

Table 2: *

Value (Hexadecimal)	Meaning	Display text
0x0000	Reserved	Unknown error
0x0001	Short circuit	Short circuit
0x0002	Undervoltage	Undervoltage
0x0003	Overvoltage	Overvoltage
0x0004	Overload	Overload
0x0005	Overtemperature	Overtemperature
0x0006	Line break	Line break
0x0007	Upper limit value exceeded	Upper limit value exceeded
0x0008	Lower limit value exceeded	Lower limit value exceeded
0x0009	Error	Error
0x000A	Simulation active	Simulation active
0x000B	Unknown error	Unknown error
0x000C	Unknown error	Unknown error
0x000D	Unknown error	Unknown error
0x000E	Unknown error	Unknown error
0x000F	Default for "missing parameters"	The channel needs (additional) parameters. No parameters or too few parameters are written
0x0010	Default for "Parameterization fault "	Parameterization fault. Wrong parameters or too many parameters are written
0x0011	Default for "Power supply fault"	Power supply fault
0x0012	Default for "fuse blown / open"	Fuse blown / open
0x0013	Default for communication fault	Communication fault. Sequence number wrong / sequence wrong
0x0014	Default for "ground fault"	Ground fault
0x0015	Default for "reference point lost"	Reference point lost
0x0016	Default for "process event lost / sampling error"	Process event lost / sampling error
0x0017	Default for "threshold warning"	Threshold warning
0x0018	Default for "safety event"	Output disabled
0x0019	Default or "safety event"	Safety event
0x001A	Default for "external"	External fault
0x001B	Manufacturer specific	Manufacturer specific
0x001C	Manufacturer specific	Manufacturer specific

Value (Hexadecimal)	Meaning	Display text
0x001D	Manufacturer specific	Manufacturer specific
0x001E	Manufacturer specific	Manufacturer specific
0x001F	Default for "temporary fault"	Temporary fault
0x0020 – 0x00FF	Reserved (common profile)	Reserved for common profiles ^a
0x0100 – 0x7FFF	Manufacturer specific	Manufacturer specific
0x8000	Data transmission impossible	Data transmission impossible
0x8001	Remote mismatch	Remote mismatch
0x8002	Media redundancy mismatch	Media redundancy mismatch
0x8003	Sync mismatch	Sync mismatch
0x8004	Isochronous mode mismatch	Isochronous mode mismatch
0x8005	Multicast CR mismatch	Multicast CR mismatch
0x8006	Reserved	Reserved
0x8007	Network component function mismatch	Network functionality problems occur
0x8008	Time mismatch	Time master not existent or precision problems
0x8009	Dynamic frame packing function mismatch	DFP problems occur
0x800A	Media redundancy with planned duplication mismatch	MRPD problems occur
0x800B	System Redundancy Mismatch	System Redundancy Mismatch
0x800C	Multiple interface mismatch	Information about multiple interface problems
0x800E	Nested diagnosis indication	Controller to controller communication Used for propagation of diagnosis in hierarchical structures
0x800F	Reserved	Unknown error
0x8010 – 0x8FFF	Reserved	Unknown error
0x9000 – 0x9FFF	Reserved (Profile)	Profile specific
0xA000 – 0xFFFF	Reserved	Unknown error

Table 3: *

Extended Channel Error Type
(x + 3)

The Extended Channel Error Type is dependent on the Channel Error Type and can be encoded in the value range 0x0000 - 0xFFFF according to the following table

Value (hexadecimal)	Meaning	Use
ChannelErrorType 0 - 0xF		
0x0000	Reserved	—
0x0001 – 0x7FFF	Manufacturer specific	Alarm/diagnosis
0x8000	Accumulative Info	Alarm/diagnosis
0x8001 – 0x8FFF	Reserved	—
0x9000 – 0x9FFF	Reserved (Profile)	Alarm/diagnosis
0xA000 – 0xFFFF	Reserved	—

Table 4: *

ChannelErrorType 0x0100 – 0x7FFF		
0x0000	Reserved	—
0x0001 – 0x7FFF	Manufacturer specific	Alarm/diagnosis
0x8000	Accumulative Info	Alarm/diagnosis
0x8001 – 0x8FFF	Reserved	—
0x9000 – 0x9FFF	Reserved (Profile)	Alarm/diagnosis
0xA000 – 0xFFFF	Reserved	—

Table 5: *

ChannelErrorType "Data transmission impossible"		
0x0000	Reserved	—
0x0001 – 0x7FFF	Manufacturer specific	Alarm/diagnosis
0x8000	Link not accessible.	Alarm/diagnosis
0x8001	MAUType mismatch	Alarm/diagnosis
0x8002	Line Delay mismatch	Alarm/diagnosis
0x8003 – 0x8FFF	Reserved	—
0x9000 – 0x9FFF	Reserved (Profile)	Alarm/diagnosis
0xA000 – 0xFFFF	Reserved	—

Table 6: *

ChannelErrorType "Remote mismatch"		
0x0000	Reserved	—
0x0001 – 0x7FFF	Manufacturer specific	Alarm/diagnosis
0x8000	Peer name of station mismatch	Alarm/diagnosis
0x8001	Peer name of port mismatch	Alarm/diagnosis
0x8002	Peer RT_CLASS_3 mismatch	Alarm/diagnosis
0x8003	Peer MAUType mismatch	Alarm/diagnosis
0x8004	Peer MRP Domain mismatch	Alarm/diagnosis
0x8005	No peer detected	Alarm/diagnosis
0x8006	Reserved	—
0x8007	Peer Line Delay mismatch	Alarm/diagnosis
0x8008	Peer PTCP mismatch	Alarm/diagnosis
0x8009	Peer Preamble Length mismatch	Alarm/diagnosis
0x800A	Peer Fragmentation mismatch	
0x800B – 0x8FFF	Reserved	Alarm/diagnosis
0x9000 – 0x9FFF	Reserved (Profile)	
0xA000 – 0xFFFF	Reserved	—

Table 7: *

ChannelErrorType "Media redundancy mismatch"		
0x0000	Reserved	—
0x0001 – 0x7FFF	Manufacturer specific	Alarm/diagnosis
0x8000	Manager role fail	Alarm/diagnosis
0x8001	MRP ring open	Alarm/diagnosis
0x8002	Reserved	—
0x8003	Multiple manager	Alarm/diagnosis
0x8004 – 0x8FFF	Reserved	—
0x9000 – 0x9FFF	Reserved (Profile)	Alarm/diagnosis
0xA000 – 0xFFFF	Reserved	—

Table 8: *

ChannelErrorType "Sync mismatch"/ ChannelErrorType "Time mismatch"		
0x0000	Reserved	—
0x0001 – 0x7FFF	Manufacturer specific	Alarm/diagnosis
0x8000	No sync message received	Alarm/diagnosis
0x8001- 0x8002	Reserved	—
0x8003	Jitter out of boundary	Alarm/diagnosis
0x8004 – 0x8FFF	Reserved	—
0x9000 – 0x9FFF	Reserved (Profile)	Alarm/diagnosis
0xA000 – 0xFFFF	Reserved	—

Table 9: *

ChannelErrorType "Isochronous mode mismatch"		
0x0000	Reserved	—
0x0001 – 0x7FFF	Manufacturer specific	Alarm/diagnosis
0x8000	Output Time Failure – Output update missing or of order.	Alarm/diagnosis
0x8001	Input Time Error	Alarm/diagnosis
0x8002	Master Life Sign Failure – Error in MLS update detected	Alarm/diagnosis
0x8003 – 0x8FFF	Reserved	—
0x9000 – 0x9FFF	Reserved (Profile)	Alarm/diagnosis
0xA000 – 0xFFFF	Reserved	—

Table 10: *

ChannelErrorType "Multicast CR mismatch"		
0x0000	Reserved	—
0x0001 – 0x7FFF	Manufacturer specific	Alarm/diagnosis
0x8000	Multicast Consumer CR timed out	Alarm/diagnosis
0x8001	Address resolution failed	Alarm/diagnosis
0x8002 – 0x8FFF	Reserved	—
0x9000 – 0x9FFF	Reserved (Profile)	Alarm/diagnosis
0xA000 – 0xFFFF	Reserved	—

Table 11: *

ChannelErrorType "Fiber optic mismatch"		
0x0000	Reserved	—
0x0001 – 0x7FFF	Manufacturer specific	Alarm/diagnosis
0x8000	Power Budget	Alarm/diagnosis
0x8001 – 0x8FFF	Reserved	—
0x9000 – 0x9FFF	Reserved (Profile)	Alarm/diagnosis
0xA000 – 0xFFFF	Reserved	—

Table 12: *

ChannelErrorType "Network component function mismatch"		
0x0000	Reserved	—
0x0001 – 0x7FFF	Manufacturer specific	Alarm/diagnosis
0x8000	Frame dropped – no resource	Alarm/diagnosis
0x8001 – 0x8FFF	Reserved	—
0x9000 – 0x9FFF	Reserved (Profile)	Alarm/diagnosis
0xA000 – 0xFFFF	Reserved	—

Table 13: *

ChannelErrorType "Dynamic Frame Packing function mismatch"		
0x0000	Reserved	—
0x0001 – 0x7FFF	Manufacturer specific	Alarm/diagnosis
0x8000 – 0x80FF	Reserved	—
0x8100	Delayed error of the FrameID "0x0100"	Alarm/diagnosis
0x8101 + 0x8FFE	According to the formula: ExtChannelErrorType = 0x8000 + FrameID	Alarm/diagnosis
0x8FFF	Delayed error of the FrameID "0x0FFF"	Alarm/diagnosis
0x8001 – 0x8FFF	Reserved	—
0x9000 – 0x9FFF	Reserved (Profile)	Alarm/diagnosis
0xA000 – 0xFFFF	Reserved	—

Table 14: *

ChannelErrorType "Multiple interface mismatch"		
0x0000	Reserved	
0x0001 – 0x7FFF	Manufacturer specific	
0x8000	Network redundancy	
0x8001 – 0x8FFF	Reserved	—
0x9000 – 0x9FFF	Reserved (Profile)	Alarm/diagnosis
0xA000 – 0xFFFF	Reserved	—

Table 15: *

ChannelErrorType "Multiple interface mismatch"		
0x0000	Reserved	—
0x0001 – 0x7FFF	Manufacturer specific	Alarm/diagnosis
0x8000	Standard Gateway Mismatch	Alarm/diagnosis
0x8001	NameOfStation of the interface is not unique.	Alarm/diagnosis
0x8002	IP Address area of the interface is not unique.	Alarm/diagnosis
0x8003	Conflict between the MultipleInterface mode and NameOfDevice mode	Alarm/diagnosis
0x0000	Reserved	—
0x8004 – 0x8FFF	Reserved	—
0x9000 – 0x9FFF	Reserved (Profile)	Alarm/diagnosis
0xA000 – 0xFFFF	Reserved	—

Table 16: *

ChannelErrorType "Nested diagnosis indication"		
0x0000	Reserved	—
0x0001 – 0x7FFF	Manufacturer specific	Alarm/diagnosis
0x8000	Information about subordinate objects	Alarm/diagnosis
0x8001 – 0x8FFF	Reserved	—
0x9000 – 0x9FFF	Reserved (Profile)	Alarm/diagnosis
0xA000 – 0xFFFF	Reserved	—

Table 17: *

*Extract from "Technical Specification, for PROFINET IO"

Extended Channel Additional Value ($x + 4$, $x + 5$)

In register $x + 4$ is the Low Word and in register $x + 5$ is the High Word.

This field should be encoded according to data type Unsint 18 in the value range between 0 – 0xffffffff.

Value (Hexadecimal)	Meaning
0x00000000	No additional information exists
0x00000001 – 0xFFFFFFFF	Definition is dependent on the ChannelError and ExtChannelErrorType.

You can find the corresponding coding in the following tables:

Coding of the field ExtChannelAddValue for ChannelErrorType 0-0x7FFF

If the field ExtChannelErrorType contains the value 0x8000 and the field ChannelErrorType contains values between 0 – 0x7FFF, the field ExtendedChannelAddValue must be coded according to the following table.

Bit position	Value (hexadecimal)	Meaning
Bit 0	0x00	ChannelNumber is not effected
	0x01	ChannelNumber is effected
Bit 1	0x00	ChannelNumber +1 is not effected
	0x01	ChannelNumber +1 is effected
Bit 2	0x00	ChannelNumber +2 is not effected
	0x01	ChannelNumber +2 is effected
...
Bit 30	0x00	ChannelNumber +30 is not effected
	0x01	ChannelNumber +30 is effected
Bit 31	0x00	ChannelNumber +31 is not effected
	0x01	ChannelNumber +31 is effected

Coding of the field ExtChannelAddValue for ChannelErrorType "Fiber optic mismatch" – "Power Budget"

If the field ExtChannelErrorType contains the value 0x8000 and the field ChannelErrorType contains the value 0x8007, the field ExtendedChannelAddValue must be coded according to the following table.

Value (hexadecimal)	Meaning
0x00 – 0x3E7	PowerBudget in 0, 1 dB steps [0..99, 9 dB]
0x03E8 – 0xFFFFFFFFE	Reserved
0xFFFFFFFFF	Unknown

Coding of the field ExtChannelAddValue for ChannelErrorType “Network component function mismatch” – “Frame dropped”

If the field ExtChannelErrorType contains the value 0x8000 and the field ChannelErrorType contains the value 0x8008, the field ExtendedChannelAddValue must be coded according to the following table.

Value (hexadecimal)	Meaning
0x00000000 – 0x00FFFFFFF	Number of dropped frames in case of no resource
0x01000000 – 0xFFFFFFFFF	Reserved

Coding of the field ExtChannelAddValue for ChannelErrorType “Remote mismatch” – “Peer Cable Delay mismatch”

If the field ExtChannelErrorType contains the value 0x8007 and the field ChannelErrorType contains the value 0x8001, the field ExtendedChannelAddValue must be coded according to the following table.

Value (hexadecimal)	Meaning	Use
0x00 – 0x32	Error of measurement	No message
0x33 – 0x3B9ACA00	Cable Delay difference between peers	Signal deviation
0x3B9ACA01 – 0xFFFFFFFFF	Reserved	—

Coding of the field ExtChannelAddValue for ChannelErrorType
 “Multiple interface mismatch” – “Conflicting
 MultipleInterfaceMode.NameOfDevice mode”

If the field ExtChannelErrorType contains the value 0x8003 and the
 field ChannelErrorType contains the value 0x800D, the field
 ExtendedChannelAddValue must be coded according to the following
 table.

Value (hexadecimal)	Meaning	Use
0x00	Reserved	-
0x01	MultipleInterfaceMode.NameOfDevice for this interface is set to zero but one other interface is set to one.	Inconstancy
0x02	MultipleInterfaceMode.NameOfDevice for this interface is set to one but one other interface is set to zero	Inconstancy
Others	Reserved	-

Reserved (x + 6, x+ 7)

These registers are currently ignored.

0x4001 Fieldbus Status

In this register you will find information about the current fieldbus communication status

Modbus Register	0x4001
Value Range	0-1
Default Value	0
Number of bytes available	2
Permanently stored	No
Access	Read Only
Meaning	
0	Bus stopped
1	running

0x4002 Module Status

In this register you will find information about the status regarding the PROFINET state of the module.

Modbus Register	0x4002
Value Range	0-4
Default Value	0
Number of bytes available	2
Permanently stored	no
Access	Read Only
0	Initialisation
1	Error State
2	Run
3	Undefined

0x4004 Fieldbus Vendor ID

In this register you have the option to change the manufacturer number for your application.

Modbus Register	0x4004
Value Range	
Default Value	
Number of bytes available	2
Permanently stored	Yes
Access	Read / Write

0x4007-0x4008 Fieldbus Version

In this memory register you will find information about the fieldbus version.

The Memory Register 0x4007 contains the High Word, Memory Register 0x4008 contains the Low Word of the fieldbus version.

Modbus Register	0x4007 - 0x4008
Value Range	0x00000000 - 0xffffffff
Default Value	0
Number of bytes available	4
Permanently stored	Yes
Access	Read Only

0x4009 Firmware Version

In this register you will find information about the firmware version.

Modbus Register	0x4009
Value Range	0x0000 – 0xffff
Default Value	-
Number of bytes available	2
Permanently stored	Constant
Access	Read Only

0x400a - 0x400b Serial Number

In this register you have the option to change the serial number for your application.

The default value is the general serial number of the module.

Modbus Register	0x400a - 0x400b
Value Range	0x00000000 - 0xffffffff
Default Value	-
Number of bytes available	4
Permanently stored	yes
Access	Read / Write

0x4012 Fieldbus
Configuration Bits

In this memory register you will find information about how the communication parameters Station Name and IP Address are obtained.

Modbus Register	0x4012
Value Range	-
Default Value	0x0000
Number of bytes available	2
Permanently stored	Yes
Access	Read / Write
Meaning	
0	= 1: IP address is set by the module during the Stack Start.
1	Station Name is set by the module during the Stack Start

0x4014 - 0x4015 Product
Code

In this register you have the option to assign a numerical product code for your application.

You will also find this data in the I&M data as an order ID.

Modbus Register	0x4014 - 0x4015
Value Range	
Default Value	
Number of bytes available	4
Permanently stored	Yes
Access	Read / Write

0x4016 - 0x4035 Product
name

In this register you have the option to assign a product name.

You have 32 bytes available for a meaningful product description.

You will also find this data in the I&M data as a tag function.

Modbus Register	0x4016 - 0x4035
Value Range	35 Byte String
Default Value	"KUNBUS-IC TPS-1"
Number of bytes available	32
Permanently stored	Yes
Access	Read / Write

0x4036 Input Image Size

In this register you will find information about the number of bytes for the process mapping of the inputs.

Modbus Register	0x4036
Value Range	256
Default Value	256
Number of bytes available	2
Permanently stored	No
Access	Read / Only

0x4037 Output Image Size

In this register you will find information about the number of bytes for the process mapping of the outputs.

Modbus Register	0x4037
Value Range	256
Default Value	256
Number of bytes available	2
Permanently stored	No
Access	Read / Only

0x4041-0x4043 MAC Address

In these memory registers you can find the MAC address.

We provide you the module with a MAC address that was reserved by KUNBUS.

Modbus Register	0x4041 – 0x4043
Value Range	6 bytes
Default Value	c8:3e:a7:xx:xx:xx
Number of available bytes	6
Permanently stored	Yes
Access	Read Only

Example of distributing the MAC address to individual memory registers:

The MAC address c8:3e:a7:01:02:03 is saved in the following order:

[0x4041]: 0x0203

[0x4042]: 0xa701

[0x4043]: 0xc83e

0x4044 Configured IP Address High Word

In this memory register you have the option, the High-Word of the IP Address to set

Please note that there are various possibilities for setting the IP address:

- By the PROFINET Master (DCP)
- Via the memory register
- Via the CDI menu

The KUNBUS-IC uses the IP address last set by one of these sources.

Modbus Register	0 x 4044
Value Range	0 – 0xffff
Default Value	0
Number of available bytes	2
Permanently stored	Yes
Access	Read / Write

0x4045 Configured IP Address Low Word

In this memory register you have the option, the Low Word of the IP address to set

Modbus Register	0x4045
Value Range	0 – 0xffff
Default Value	0
Number of bytes available	2
Permanently stored	Yes
Access	Read / Write

0x4046 Configured IP
Network Mask High Word

In this memory register you have the option, the High-Word of the Network Mask to set

Modbus Register	0x4046
Value Range	0 – 0xffff
Default Value	0
Number of bytes available	2
Permanently stored	Yes
Access	Read / Write

0x4047 Configured IP
Network Mask Low Word

In this memory register you have the option, Low-Word of the Network Mask to set

Modbus Register	0x4047
Value Range	0 – 0xffff
Default Value	0
Number of bytes available	2
Permanently stored	Yes
Access	Read / Write

0x4048 Configured IP
Gateway Address High Word

In this memory register you have the option, the High-Word of the Gateway Address to set

Modbus Register	0x4048
Value Range	0 – 0xffff
Default Value	0
Number of bytes available	2
Permanently stored	Yes
Access	Read / Write

0x4049 Configured IP
Gateway Address Low Word

In this memory register you have the option, Low-Word of the Gateway Address to set

Modbus Register	0x4049
Value Range	0 – 0xffff
Default Value	0
Number of bytes available	2
Permanently stored	Yes
Access	Read / Write

0x4101 – 0x4102 Slot 0
Module ID

This storage register contains the module ID for the DAP module.
In the DAP module no content can be changed.

Storage register 0x4101 contains the High-Word, storage register 0x4102 contains the Low Word.

Modbus Register	0x4101 - 0x4102
Value Range	0xa0000000
Default Value	0xa0000000 (DAP)
Number of bytes available	4
Permanently stored	Yes
Access	Read Only

0x4103 – 0x4104 Slot 1
Module ID

This storage register contains the module ID for slot 1.

Since the module ID is 32 bits long and can therefore occupy 2 storage registers, it is not possible to determine whether the entire ID is valid when writing to a storage register. This is first checked during the module start.

Storage register 0x4103 contains the High-Word, storage register 0x4104 contains the Low Word.

Modbus Register	0x4103 - 0x4104
Value Range	0 - 0xffffffff
Default Value	0x00000006 (32 Byte Input)
Number of bytes available	4
Permanently stored	Yes
Access	Read / Write

0x4105 – 0x4106 Slot 2
Module ID

This storage register contains the module ID for slot 2.

Storage register 0x4105 contains the High-Word, storage register 0x4106 contains the Low Word.

Modbus Register	0x4105 - 0x4106
Value Range	0 - 0xffffffff
Default Value	0xb0000000 (Dummy Module)
Number of bytes available	4
Permanently stored	Yes
Access	Read / Write

0x4107 – 0x4108 Slot 3
Module ID

This storage register contains the module ID for slot 3.

Storage register 0x4107 contains the High-Word, storage register 0x4108 contains the Low Word.

Modbus Register	0x4107 - 0x4108
Value Range	0 - 0xffffffff
Default Value	0xb0000000 (Dummy Module)
Number of bytes available	4
Permanently stored	Yes
Access	Read / Write

0x4109 – 0x410a Slot 4
Module ID

This storage register contains the module ID for slot 4.

Storage register 0x4109 contains the High-Word, storage register 0x410a contains the Low Word.

Modbus Register	0x4109 - 0x410a
Value Range	0 - 0xffffffff
Default Value	0xb0000000 (Dummy Module)
Number of bytes available	4
Permanently stored	Yes
Access	Read / Write

0x410b – 0x410c Slot 5
Module ID

This storage register contains the module ID for slot 5.

Storage register 0x410b contains the High-Word, storage register 0x410c contains the Low Word.

Modbus Register	0x410b - 0x410c
Value Range	0 - 0xffffffff
Default Value	0xb0000000 (Dummy Module)
Number of bytes available	4
Permanently stored	Yes
Access	Read / Write

0x410d – 0x410e Slot 6
Module ID

This storage register contains the module ID for slot 6.

Storage register 0x410d contains the High-Word, storage register 0x410e contains the Low Word.

Modbus Register	0x410d - 0x410e
Value Range	0 - 0xffffffff
Default Value	0xb0000000 (Dummy Module)
Number of bytes available	4
Permanently stored	Yes
Access	Read / Write

0x410f – 0x4110 Slot 7
Module ID

This storage register contains the module ID for slot 7.

Storage register 0x410f contains the High-Word, storage register 0x4110 contains the Low Word.

Modbus Register	0x410f - 0x4110
Value Range	0 - 0xffffffff
Default Value	0xb0000000 (Dummy Module)
Number of bytes available	4
Permanently stored	Yes
Access	Read / Write

0x4111 – 0x4112 Slot 8
Module ID

This storage register contains the module ID for slot 8.

Storage register 0x4111 contains the High-Word, storage register 0x4112 contains the Low Word.

Modbus Register	0x4111 - 0x4112
Value Range	0 - 0xffffffff
Default Value	0xb0000000 (Dummy Module)
Number of bytes available	4
Permanently stored	Yes
Access	Read / Write

In this storage register you can get an overview of the connected modules.

Slot 0 occupies the storage register 0x4181, slot 1 occupies the storage register 0x4182 etc.

Modbus Register	0x4181 - 0x4189
Value Range	0 - 0xffffffff
Default Value	0x00000000
Number of bytes available	2 per storage register
Permanently stored	No
Access	Read Only
Meaning	
0	= 1: Module has input data
1	= 1: Provider State Input ok = 0: Provider State Input not ok
2	= 1: Consumer State Input ok = 0: Consumer State Input not ok
3	reserved
4	= 1: Module has Output Data
5	= 1: Provider State Output ok = 0: Provider State Output not ok
6	= 1: Consumer State Output ok = 0: Consumer State Output not ok
7	reserved
8 – 15	reserved

0x4201 – 0x42f0 Station Name

In this storage address you have the option to configure the station name.

You can also delete the complete station name here. To do this, write 0x0000 in the memory address 0x4201. Restart KUNBUS-IC or access the station name in the CDI menu so that the KUNBUS-IC applies this change.

Please note that there are various possibilities for setting the station name:

- By the PROFINET Master (DCP)
- Via the memory register
- Via the CDI menu

The KUNBUS-IC uses the station name last set by one of these sources.

Modbus Register	0x4201 - 0x42f0
Value Range	0 - 0xff
Default Value	0
Number of available bytes	240, 1 byte per register
Permanently stored	Yes
Access	Read / Write

9 CDI

9.1 Setting up a Serial Connection

The CDI interface of the COMS-Module is a UART interface (asynchronous serial interface) with 3.3V CMOS signal level.

If you connect a switch with level converter (e.g. "EXAR - SP3232EUEY") to the application connector via the RX and TX connections of this interface, an RS232 interface is available to you for connecting a terminal (you can find details from our sample circuit diagram under "RS232 Interface for CDI" in the PDF "Appendix 2").

You can connect the serial COMx interface of a PC to such a terminal interface (or a serial USB converter) and then access the CDI menus using a terminal emulation. We provide you with PuTTY as a terminal emulation on our support webpage.

How to start PuTTY:

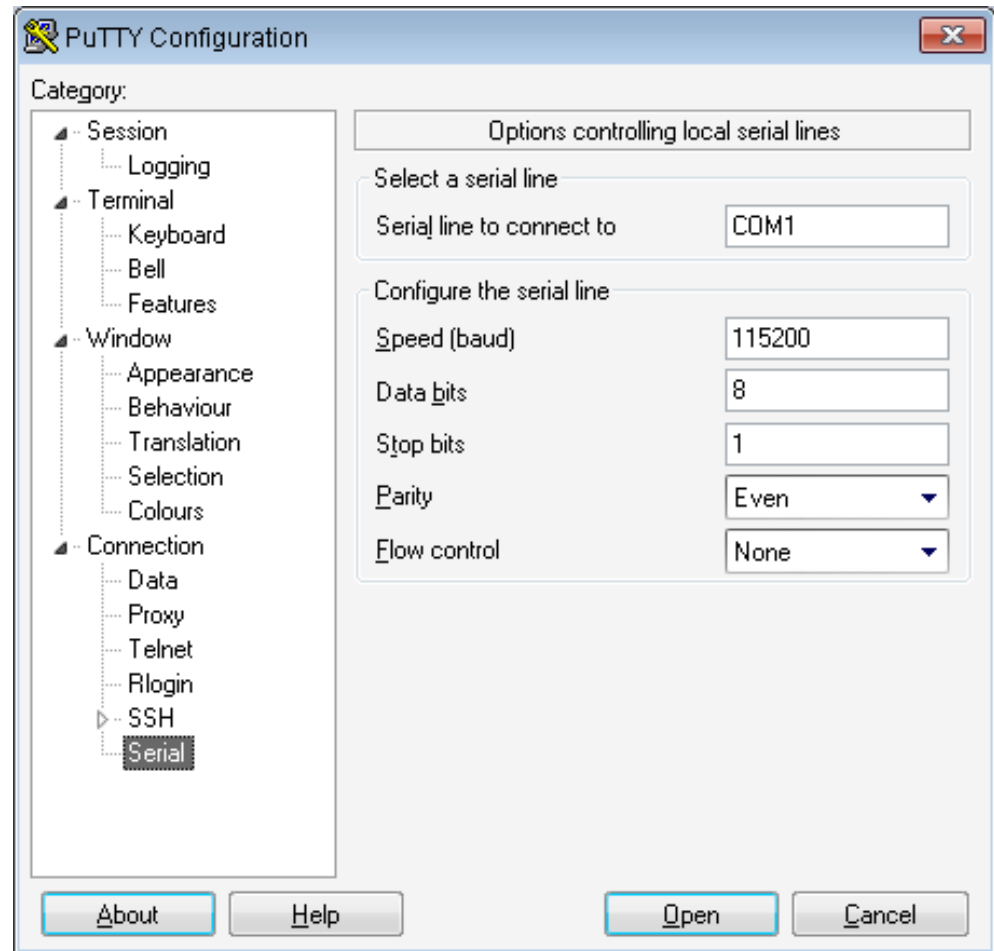


Illustration 13: Putty Serial

- Change to the "Connection > Serial" view
 - Select the serial interface that you want to access the CDI with (here: COM1)
 - Configure the interface with the default settings of the CDI interface (for values see Fig above). Deactivate the dataflow control as well.
 - Change to the "Session" view.
 - Activate "Serial" as connection type. The "Serial line" and "Speed" fields are already preallocated with the settings you specified beforehand.
 - Assign a name under "Saved Sessions" to save these settings.
 - Click on "Save".
 - Click on "Open".
- ⇒ The main menu will open in the terminal window.

NOTICE! If the terminal window remains black, click on the [ESC] key to start the data transmission via the CDI.

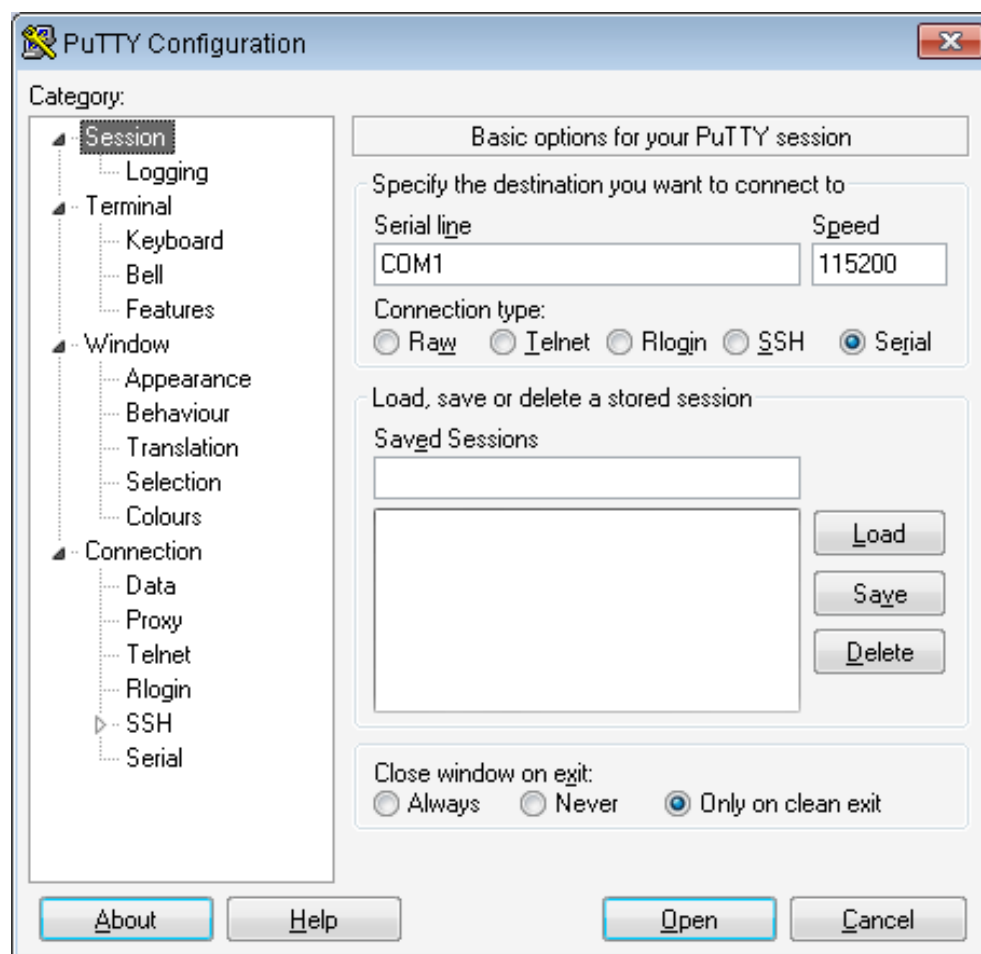


Illustration 14: Putty Session

9.2 CDI Menus

Main Menu

The main menu is your access point for operating the module using the CDI. After a reset, the module transmits this main menu to the terminal.

```
-----  
KUNBUS-IC - Main Menu  
-----  
1 - Module Information  
2 - Interface Configuration  
3 - Monitor Communication  
4 - Module Status  
-----  
>
```

1.Module Information

Menu 1 – "Module Information"

In this menu you will find general information about the module:

- Software revision
- Checksum of the firmware
- Serial number of the module
- Module type (unique throughout KUNBUS)

```
-----  
KUNBUS-IC- Module Information  
-----  
Revision: 2.1.4094  
Firmware CRC: 0xdebd4edc  
Serial Number: 4294967295  
Module Type: ( 61) Profinet  
-----  
>
```

Menu 2 – "Interface Configuration"

2. Interface Configuration

In this menu you have the option to define the operational parameters for the different interfaces.

Here, you can set the mapping for the data broker.

Changes that you make in these menus are first activated after a restart.

The selection "8 - Set Arbitrary Register" allows you write access to all writeable Modbus registers of the module.

```

-----
KUNBUS-IC - Interface Configuration
-----
1  - SDI Communication
2  - CDI Communication
3  - SSC Communication
4  - SDI Output mapping
5  - SSC Output mapping
6  - Fieldbus Output mapping
7  - Fieldbus Specific
8  - Set Arbitrary Register
9  - Reset Module
10 - Extended Databroker
11 - Script Interpreter
12 - Reset to Factory Settings
-----

```

2.1 SDI Communication

In this menu you will find information about the settings for the Modbus RTU communication. You can configure the values in the submenus.

```

-----
KUNBUS-IC - SDI Communication
-----
1 - Bitrate: Automatic Bitrate detection
2 - Parity: Even Parity, 1 Stopbit
-----
>

```

2.1.1 SDI Communication Bitrate

In this menu you have the option, to select the appropriate Bitrate for your application.

The default value is "Automatic Bitrate detection".

```
-----
KUNBUS-IC - SDI Communication: Set Bitrate
-----
1 - Automatic Bitrate detection
2 - 2400   Bit/s
3 - 4800   Bit/s
4 - 9600   Bit/s
5 - 19200  Bit/s
6 - 38400  Bit/s
7 - 57600  Bit/s
8 - 115200 Bit/s
-----
>
```

2.1.2 SDI Communication- Set Parity

In this menu you have the option to select the appropriate parity for your application from the displayed values.

The default value is "Even Parity (1 stop-bit)".

```
-----
KUNBUS-IC - SDI Communication: Set Parity
-----
1 - Even Parity (1 Stopbit)
2 - Odd Parity (1 Stopbit)
3 - No Parity (2 Stopbits)
-----
>
```

2.1.3 Set Modbus Node Address

In this menu you have the option, to enter the Modbus Node Address.

Permitted input values: 1-247

```
-----
KUNBUS-IC - SDI Communication: Set Modbus Node Address
-----
Enter a Modbus Node Address between 1 and 247:
-----
>
```

2.2 CDI Communication

In this menu you will find information about the currently set values of bitrate and parity. In the submenus you can configure the values.

```
-----
KUNBUS-IC - CDI Communication
-----
1 - Bitrate: 115200 Bit/s
2 - Parity: Even Parity, 1 Stopbit
-----
>
```

2.2.1 CDI Communication - Set Bitrate

In this menu you have the option, to select the appropriate Bitrate for your application.

The default value is 115200 bit/s.

Automatic bitrate detection via the CDI is not possible.

```
-----
KUNBUS-IC - CDI Communication: Set Bitrate
-----
1 - 2400 Bit/s
2 - 4800 Bit/s
3 - 9600 Bit/s
4 - 19200 Bit/s
5 - 38400 Bit/s
6 - 57600 Bit/s
7 - 115200 Bit/s
-----
>
```

2.2.2 CDI Communication - Set Parity

In this menu you have the option to select the appropriate parity for your application from the displayed values.

The default value is "Even Parity (1 stop-bit)".

```
-----
KUNBUS-IC - CDI Communication: Set Bitrate
-----
1 - Even Parity, 1 Stopbit
2 - Even Parity, 2 Stopbit
3 - Odd Parity, 1 Stopbit
4 - Odd Parity, 2 Stopbit
5 - No Parity, 1 Stopbit
6 - No Parity, 2 Stopbit
-----
>
```

SSC Mode

In this menu you have the option, to configure the shift register chain.

2.3 Select SSC SSR Master Mode

In this menu you have the following options:

- SSC SSR Master Mode, disabled: With this option, you switch off the SSC.
- SSC SSR Master Mode, auto detect shift registers: With this option, the number of input/output shift registers and the bitrate is determined automatically.
- SSC SSR Master Mode, configured shift registers: With this option, you can define the number of input/output shift registers and the bitrate yourself.
 - Enter [3] + [Enter] to select this mode as the configuration source.
 - With the option [9] you open the configuration menu.
- SSC SPI Slave Mode: With this selection you can make the settings for the SPI Slave Mode
 - Enter [4] + [Enter] to select this mode as the configuration source.
 - With the option [9] you open the configuration menu.

```

-----
KUNBUS-IC- Select SSC SSR Master Mode
-----
Mode: SSC SSR Master Mode, configured shift registers

1 - SSC SSR Master Mode, disabled
2 - SSC SSR Master Mode, auto detect shift registers
3 - SSC SSR Master Mode, configured shift registers
4 - SSC SPI Slave Mode

9 - Configure actual selection
-----
>
    
```

2.3.2 SSC SSR Master Mode, Auto detect shift registers

In this menu, you can define how many shift registers are available for the integration of configuration switches and status LEDs.

```

-----
KUNBUS-IC - SSC SSR Master Mode, auto detect shift registers
-----
1 - No. of Fieldbus Switch Registers: 0
2 - No. of Fieldbus Status-LED Registers: 0
-----
>
    
```

2.3.2.1 Number of Fieldbus Switch Registers

In this menu, you can define how many input shift registers are available for configuration switches.

Permissible input values: 0-2


```
-----
KUNBUS-IC - SSC No. of Fieldbus Switch registers
-----
>
```

2.3.2.2 Number of Status LED Registers

In this menu, you can define how many output shift registers are available for status LEDs.

Permissible input values: 0-1

```
-----
KUNBUS-IC - SSC No. of Fieldbus Status-LED registers
-----
>
```

2.3.3 SSC SSR Master Mode, configure shift registers

Prerequisite: In menu "2.3 - Select SSC SSR Master Mode" you have selected the configuration source "SSC SSR Master Mode, configure shift registers".

In this menu you have the following options:

- Number of input shift registers for configuration switches
- Number of output shift registers for status LEDs
- Number of input shift registers
- Number of output shift registers
- Bitrate

```
-----
KUNBUS-IC- SSC SSR Master Mode, configure shift registers
-----
3 - No of Fieldbus Switch Registers: 0
4 - No of Fieldbus Status-LED Registers: 0
3 - Number of overall Input Registers: 0
4 - Number of overall Output Registers: 0
5 - Configured Bitrate: 300 kBit/s
-----
>
```

2.3.3.1 Number of Fieldbus Switch Registers

In this menu, you can define how many input shift registers are available for configuration switches.

Permissible input values: 0-2

```
-----
KUNBUS-IC - SSC No. of Fieldbus Switch registers
-----
>
```

2.3.3.2 Number of Fieldbus Status LED Registers

In this register, you can define how many output shift registers are available for status LEDs.

Permissible input values: 0-1

```
-----
KUNBUS-IC - SSC No. of Fieldbus Status-LED registers
-----
>
```

2.3.3.3 Number of overall Input Registers

In this menu you have the option to define the number of input shift registers. Valid input values are between 0 and 32.

```
-----
KUNBUS-IC - SSC SSR Number of input shift registers
-----
>
```

2.3.3.4 Number of overall Output Registers

In this menu you have the option to define the number of output shift registers. Valid input values are between 0 and 32.

```
-----
KUNBUS-IC - SSC SSR Number of output shift registers
-----
>
```

2.3.3.5 SSC SSR Bitrate

In this menu you have the option for setting the bitrate. With option [1] "Auto detect Bitrate" the bitrate is determined automatically. The values specified are to be regarded as reference values for "fast", "medium" and "slow". In SSC master mode these values are fallen short of by approx. 10%.

```
-----
KUNBUS-IC - SSC SSR Bitrate
-----
1 - Auto detect Bitrate
2 - 300 kBit/s
3 - 1200 kBit/s
4 - 4800 kBit/s
-----
>
```

2.3.4 SSC SPI Slave Mode

In this menu you have the option to make settings for the SSC SPI Slave Mode.

In the first line you will see the current settings.

Using the option [1] "Configure settings" you can configure the settings.

```
-----
KUNBUS-IC - SSC SPI Slave Settings
-----
Settings: Polarity Normal, Falling Edge, CLK High, MSB first
1 - Configure settings
-----
>
```

2.3.4.1 SSC SPI Slave Settings

In this menu you have the option to select the following combination of clock and data level.

You can find further information on this topic in section "Synchronous serial interface [▶ 25]".

```
-----  
KUNBUS-IC - SSC SPI Slave Settings  
-----  
1 - Polarity Normal, Rising Edge, CLK Low, MSB first  
2 - Polarity Normal, Rising Edge, CLK High, MSB first  
3 - Polarity Normal, Falling Edge, CLK Low, MSB first  
4 - Polarity Normal, Falling Edge, CLK High, MSB first  
-----  
>
```

Note! Unfortunately, the representation in this CDI menu is not completely correct. In the memory register 0x0018 [▶ 75] you can see the correct representation.

2.4 SDI Output Mapping

In this menu you have the option, to configure the Data-Broker-Mapping for the SDI.

Here you can specify up to four different register areas (start address and number of successive registers) as data sources.

Optionally, you can activate a timeout and specify default data that should be valid in the event of a timeout.

```
-----
KUNBUS-IC - SDI Outputmapping
-----
```

```
Src Register Number
1 - 1 (0x0001) | 0
2 - 1 (0x0001) | 0
3 - 1 (0x0001) | 0
4 - 1 (0x0001) | 0

5 - Default Data: all zero
6 - Valid Time: disabled
-----
>
```

Configuring Output Mapping

```
-----
KUNBUS-IC - Edit one map entry
-----
```

```
Source Register:
```

- ✓ First determine the start address of the source register. You can get an overview of the start addresses in the chapter Register for the Mapping [▶ 88].
 - To do this, select a register from the input data area of the communication channels and then enter the number of registers to be used.
 - ⇒ After entering the number of registers, you will return automatically to the mapping overview.
 - Restart the module.
- ⇒ Your mapping is now configured and will be applied in the operating mode.

```
-----
KUNBUS-IC- Edit one map entry
-----
```

```
Source Register: 0x1001
Number of Registers:
```

NOTICE! In the event of an invalid mapping (e.g. due to a register address outside the permitted input range or a register number that is too high) an error message appears.

Default data in Data Broker

In this menu you have the option, to define the default data for consumers used in the event of invalid production data.

If the data in the input registers should be invalid e.g. because no data has arrived anymore from outside, the Data Broker uses the following values:

- All bits are 1
- All bits are 0
- All bits remain unchanged

```
-----  
KUNBUS-IC - Default data in data broker  
-----  
1 - all data bit are zero  
2 - all data bit are one  
3 - old production values are used  
-----  
>
```

Production valid time

In this menu you have the option, to determine the validity period of the register contents to be read out.

The value range of the validity periods can be defined between 0 and 255 ms.

If no new data from the producer should arrive in the input registers within the predefined period, the Data Broker uses the data set among the default values.

```
-----  
KUNBUS-IC - Production valid time (0 = disabled)  
-----  
>
```

2.5 SSC Output Mapping

In this menu you have the option, to configure the Data-Broker-Mapping for the SSC.

Here you can specify up to four different register areas (start address and number of successive registers) as data sources.

Optionally, you can activate a timeout and specify default data that should be valid in the event of a timeout.

```
-----
KUNBUS-IC - SSC Outputmapping
-----
```

```
Src Register Number
1 - 1 (0x0001) | 0
2 - 1 (0x0001) | 0
3 - 1 (0x0001) | 0
4 - 1 (0x0001) | 0

5 - Default Data: all zero
6 - Valid Time: disabled
-----
>
```

Configuring Output Mapping

```
-----
KUNBUS-IC - Edit one map entry
-----
```

```
Source Register:
```

- ✓ First determine the start address of the source register. You can get an overview of the start addresses in the chapter Register for the Mapping [▶ 88].
 - To do this, select a register from the input data area of the communication channels and then enter the number of registers to be used.
 - ⇒ After entering the number of registers, you will return automatically to the mapping overview.
 - Restart the module.
- ⇒ Your mapping is now configured and will be applied in the operating mode.

```
-----
KUNBUS-IC- Edit one map entry
-----
```

```
Source Register: 0x1001
Number of Registers:
```

NOTICE! In the event of an invalid mapping (e.g. due to a register address outside the permitted input range or a register number that is too high) an error message appears.

Default data in Data Broker

In this menu you have the option, to define the default data for consumers used in the event of invalid production data.

If the data in the input registers should be invalid e.g. because no data has arrived anymore from outside, the Data Broker uses the following values:

- All bits are 1
- All bits are 0
- All bits remain unchanged

```
-----  
KUNBUS-IC - Default data in data broker  
-----
```

```
1 - all data bit are zero  
2 - all data bit are one  
3 - old production values are used  
-----
```

```
>
```

Production valid time

In this menu you have the option, to determine the validity period of the register contents to be read out.

The value range of the validity periods can be defined between 0 and 255 ms.

If no new data from the producer should arrive in the input registers within the predefined period, the Data Broker uses the data set among the default values.

```
-----  
KUNBUS-IC - Production valid time (0 = disabled)  
-----
```

```
>
```

2.6 Fieldbus Output Mapping

In this menu you have the option, to configure the Data-Broker-Mapping for the fieldbus interface.

Here you can specify up to four different register areas (start address and number of successive registers) as data sources.

Optionally, you can activate a timeout and specify default data that should be valid in the event of a timeout.

```

KUNBUS-IC - Fieldbus Outputmapping
-----
Src Register Number
1 - 1 (0x0001) | 0
2 - 1 (0x0001) | 0
3 - 1 (0x0001) | 0
4 - 1 (0x0001) | 0

5 - Default Data: all zero
6 - Valid Time: disabled
-----
>
    
```

Configuring Output Mapping

```

-----
KUNBUS-IC - Edit one map entry
-----
Source Register:
    
```

- ✓ First determine the start address of the source register.
You can get an overview of the start addresses in the chapter Register for the Mapping [▶ 88].
 - To do this, select a register from the input data area of the communication channels and then enter the number of registers to be used.
 - ⇒ After entering the number of registers, you will return automatically to the mapping overview.
 - Restart the module.
- ⇒ Your mapping is now configured and will be applied in the operating mode.

```

-----
KUNBUS-IC- Edit one map entry
-----
Source Register: 0x1001
Number of Registers:
    
```

NOTICE! In the event of an invalid mapping (e.g. due to a register address outside the permitted input range or a register number that is too high) an error message appears.

Default data in Data Broker

In this menu you have the option, to define the default data for consumers used in the event of invalid production data.

If the data in the input registers should be invalid e.g. because no data has arrived anymore from outside, the Data Broker uses the following values:

- All bits are 1
- All bits are 0
- All bits remain unchanged

```
-----
KUNBUS-IC - Default data in data broker
-----
1 - all data bit are zero
2 - all data bit are one
3 - old production values are used
-----
>
```

Production valid time

In this menu you have the option, to determine the validity period of the register contents to be read out.

The value range of the validity periods can be defined between 0 and 255 ms.

If no new data from the producer should arrive in the input registers within the predefined period, the Data Broker uses the data set among the default values.

```
-----
KUNBUS-IC - Production valid time (0 = disabled)
-----
>
```

2.7 Profinet TPS-1 Configuration

In this menu you will get an overview of the PROFINET-specific configuration options.

```
-----
KUNBUS-IC - Profinet TPS-1 Configuration
-----
1 - Equipped Modules
2 - Identification & Maintenance
3 - Communication Parameter
-----
>
```

2.7.1 Equipped Modules

In this menu you can view all available modules for the PROFINET device. Select the menu item of the corresponding slot for configuration.

```

-----
KUNBUS-COMS - Equipped Modules
-----
Equipment State: valid configuration

1 - Slot 0: DAP
2 - Slot 1: Input 32 Byte
3 - Slot 2: Output 32 Byte
4 - Slot 3: Dummy Module
5 - Slot 4: Dummy Module
6 - Slot 5: Dummy Module
7 - Slot 6: Dummy Module
8 - Slot 7: Dummy Module
9 - Slot 8: Dummy Module

-----
>

```

2.7.1.1 Slot Info at Slot 0

In this menu you can view slot 0. This always contains the DAP module (Device Access Point) and cannot be changed.

```

-----
KUNBUS-IC - Slot info / select module
-----
Slot: 0
Module Description: DAP
Module ID: 0xa0000000
Input Length (to Master): 0 Byte
Input Modbus Base Register: -----
Output Length (from Master): 0 Byte
Output Modbus Base Register: -----

-----
>

```

2.7.1.2 Slot Info at Slot 1-8

In menu items 2-9 you will find the following information about slots 1-8:

- Module information
- Length of cyclical data
- Mapping on the Modbus area

```
-----
KUNBUS-COMS - Slot info / select module
-----
Slot: 1
Module Description: Input 32 Byte
Module ID: 0x00000006
Input Length (to Master): 32 Byte
Input Modbus Base Register: 0x2801
Output Length (from Master): 0 Byte
Output Modbus Base Register: -----

9 - Select Module
-----
>
```

By entering [9]+[Enter] you will be taken to a further menu where you can select another module for this slot.

2.7.2.1 Available Module Categories

To display the vast number of modules more clearly, you can select the module class here.

```
-----
KUNBUS-COMS - Available Module Categories
-----
1 - Input only Modules
2 - Output only Modules
3 - Input and Output Modules
4 - Dummy Module
-----
>
```

2.7.2.1.1 Available Input Modules

In this menu you will find information about the available input modules, their width and module ID.

```
-----
KUNBUS-COMS - Available Input Modules
-----
```

```
1 - Input 2 Byte (0x00000002)
2 - Input 4 Byte (0x00000003)
3 - Input 8 Byte (0x00000004)
4 - Input 16 Byte (0x00000005)
5 - Input 32 Byte (0x00000006)
6 - Input 64 Byte (0x00000007)
7 - Input 128 Byte (0x00000008)
-----
```

```
>
```

2.7.2.1.2 Available Output Modules

In this menu you will find information about the available output modules, their width and module ID.

```
-----
KUNBUS-COMS - Available Output Modules
-----
```

```
1 - Output 2 Byte (0x00000020)
2 - Output 4 Byte (0x00000030)
3 - Output 8 Byte (0x00000040)
4 - Output 16 Byte (0x00000050)
5 - Output 32 Byte (0x00000060)
6 - Output 64 Byte (0x00000070)
7 - Output 128 Byte (0x00000080)
-----
```

```
>
```

2.7.2.1.3 Available In-/Output Modules

In this menu you will find information about the available input and output modules, their width and module ID.

```
-----
KUNBUS-COMS - Available In/Output Modules
-----
```

```
1 - In/Out 2/ 2 Byte (0x00000200)
2 - In/Out 4/ 4 Byte (0x00000300)
3 - In/Out 8/ 8 Byte (0x00000400)
4 - In/Out 16/ 16 Byte (0x00000500)
5 - In/Out 32/ 32 Byte (0x00000600)
6 - In/Out 64/ 64 Byte (0x00000700)
7 - In/Out 128/128 Byte (0x00000800)
-----
```

```
>
```

2.7.2 Config Identification & Maintenance

In this menu you will find information about the I&M data as well as the option to configure rewritable values.

You can recognise rewritable values by the numbering with which you also access the further menu.

Non-rewritable values are for information and are not numbered.

```

-----
KUNBUS-IC - Config Identification & Maintenance
-----
1 - Vendor ID: 0x01e0
2 - Order ID: 100000
3 - Serial number: 4294967295
Hardware Revision: 0x0100
Software Revision: V1.0.0
Revision Counter: 0
Profile ID: 0
Profile specific type: 3
Version : 1.1
4 - Tag Function : ,KUNBUS-IC Profinet TPS-1`
5 - Tag Location : , ,
-----
    
```

2.7.2.1 I&M Vendor ID

In this menu you have the option to assign your own manufacturer number. The vendor ID of the KUNBUS GmbH is stored as the default value.

```

-----
KUNBUS-COMS - I&M Set Vendor ID
-----
Range: 0 - 65536 (0xffff)
    
```

2.7.2.2 Set Order ID

In this menu you have the option to assign your own order number. The KUNBUS order ID of the module is stored as the default value.

```

-----
KUNBUS-COMS - I&M Set Order ID
-----
Range: 0 - 4294967295 (0xffffffff)
>
    
```

2.7.2.3 I&M Serial Number

In this menu you have the option to assign the module its own serial number.

The default value is the KUNBUS serial number.

```

-----
KUNBUS-COMS - I&M Set Serial Number
-----
Range: 0 - 4294967295 (0xffffffff)
>
    
```

2.7.3 Configure Communication Parameter

In this register you get an overview of the current settings of the communication parameters as well as the option to configure these:

```
-----
KUNBUS-IC - Configure Communication Parameter
-----
1 - Set IP-Address at Startup : no
2 - Set Station Name at Startup : yes

3 - IP Address : 192.168.0.23
4 - Subnet Mask : 255.255.255.0
5 - Gateway Address : 192.168.0.1

6 - Clear Station Name
7 - Station Name : kb-comtest-1
-----
>
```

Please note that there are various possibilities for setting the station name and IP address:

- By the PROFINET Master (DCP)
- Via the memory register
- Via the CDI menu

The KUNBUS-IC uses the station name or IP address last set by one of these sources.

2.11.3.1 Set IP Address at Startup

In this menu you have the option to assign an IP address.

```
-----
KUNBUS-IC - Set IP Address at Startup
-----
1 - yes
2 - no
-----
>
```

NOTICE

Make sure that the IP address has not already been assigned to another network device in order to prevent any problems in the data communication.

2.7.3.2 Set Station Name at Startup

In this menu you can select whether the station name should be set automatically when starting.

```
-----
KUNBUS-IC - Set Station Name at Startup
-----
1 - yes
2 - no
-----
>
```

2.7.3.4 Configure Subnet Mask

In this menu you have the option to configure the subnet mask.

```
-----
KUNBUS-IC - Configure IP Subnet Mask
-----
>
```

2.7.3.5 Configure IP Gateway Address

In this menu you have the option to configure the gateway address for your application.

```
-----
KUNBUS-IC - Configure IP Gateway Address
-----
>
```

2.7.3.6 Configure Station Name

In this menu you have the option to assign a station name. Please also pay attention to the name assignment rules.

```
-----
KUNBUS-IC - Configure Station Name
-----
>
```

2.8 Set Arbitrary Register

In this menu you have the option, to make adjustments to the writeable registers that do not have their own menu item.

First enter the register number:

```
-----
KUNBUS-IC - Set Arbitray Register
-----
Register Number:
```

If the register number does not exist or is write-protected, you will receive a corresponding error message.

```
-----
KUNBUS-IC - Set Arbitray Register
-----
Register Number: 0x5001 <<Register doesn't exist or no write access
.Register Number:
```

If the register number is valid, the dialog first shows you the set value in decimal, hexadecimal and binary notation.

```
-----
KUNBUS-IC - Set Arbitray Register
-----
Register Number: 0x0013
Current Value : 1 0x0001 0000_0000_0000_0001b
Enter New Value:
```

Now specify a new value for the register and press [Return] to confirm your entry.

```

-----
KUNBUS-IC - Set Arbitray Register
-----
Register Number: 0x0013
Current Value : 1 0x0001 0000_0000_0000_0001b
Enter New Value: 2
New Value Set : 2 0x0002 0000_0000_0000_0010b

Register Number:

```

The configuration interface detects whether it is a decimal, hexadecimal or binary value based on the notation and displays the saved value once again for confirmation.

CAUTION

Please note that some settings could lead to functional incapacity of the CDI interface.

You can only remedy such an inaccurate setting with a functional SDI interface.

- When correcting the error, all settings made previously are reset.
- ➔ Write the value 0x0002 in the register 0x0001
- ⇒ You have set the module to the original settings. The CDI interface is now available again.

2.9 Reset Module

With this option you can restart the module. The module hereby interrupts the fieldbus communication temporarily.

A restart is necessary for the module to apply changes of the parameters.

2.10 Extended (Bit)Mapping

In this menu you will find information about the current settings of the extended Data Broker. You can configure the individual values in the corresponding submenus.

The Extended Mapping is executed after the general Mapping. You can combine both mapping functions by copying the larger areas with the standard mapping and change individual bits with the extended mapping afterwards.

You can define a total of 16 mappings. A mapping can be up to 1024 bits long.

You must store the following information for each mapping:

- Address of the source register
- Bit position within the source register
- Address of the target register
- Bit position within the target register
- Number of bits to be copied

Info!:

- Bitwise copying requires performance.
 The module works cyclically. During each cycle, the different interfaces are operated in series and the data from the Data Broker is distributed between the input and output data areas. Since all interfaces process the data traffic independently of each other (asynchronous) and store the data produced or used in a buffer, they are independent of the module's cycle. In the case of very fast interfaces and a long cycle time, it is possible, however, that the Data Broker does not distribute all incoming data completely if several data packets arrive at the interface within a cycle. Conversely, it may happen in the case of slow interfaces that the 2nd cycle will already proceed and the output values of an interface will be changed by the Data Broker before the values from the first cycle have been transmitted via the interface.
 For this reason, the cycle times of the module can be relevant. These are normally less than 1 ms. Individual cycles, however, can also last more than 5 ms. If you use the Extended Mapping very extensively, the cycle times can increase considerably.
 - Therefore, only use it if necessary.
 - Only use it for small areas.
- Bear in mind:
 - Mappings are processed sequentially. If target areas overlap, this can cause problems.
 - In the extended data broker no default data can be set, which should be used in the case of a failure of a data source.

```

-----
KUNBUS-IC - Extended (Bit)Mapping
-----
Source | Bitp | Dest. | Bitp | Length
-----
1 - 0x0001 | 0 | 0x0001 | 0 | 0
2 - 0x0001 | 0 | 0x0001 | 0 | 0
3 - 0x0001 | 0 | 0x0001 | 0 | 0
4 - 0x0001 | 0 | 0x0001 | 0 | 0
5 - 0x0001 | 0 | 0x0001 | 0 | 0
6 - 0x0001 | 0 | 0x0001 | 0 | 0
7 - 0x0001 | 0 | 0x0001 | 0 | 0
8 - 0x0001 | 0 | 0x0001 | 0 | 0
9 - 0x0001 | 0 | 0x0001 | 0 | 0
10 - 0x0001 | 0 | 0x0001 | 0 | 0
11 - 0x0001 | 0 | 0x0001 | 0 | 0
12 - 0x0001 | 0 | 0x0001 | 0 | 0
13 - 0x0001 | 0 | 0x0001 | 0 | 0
14 - 0x0001 | 0 | 0x0001 | 0 | 0
15 - 0x0001 | 0 | 0x0001 | 0 | 0
16 - 0x0001 | 0 | 0x0001 | 0 | 0
-----
>
  
```

The submenu for entering the mapping is displayed by entering a number from 1 to 16:

```
-----
KUNBUS-IC - Extended Mapping, 1 Entry
-----
```

```
Entry : 1
Source : 0x1001, Bitpos: 2
Destination: 0x2001, Bitpos: 0
(Bit)Length: 8
```

```
1 - change mapping
2 - clear mapping
-----
```

```
>
```

Any mapping that might exist is deleted by entering [2]+[Enter].

After entering [1]+[Enter], the Source Address, Bitpos, Destination Address, Bitpos and Bit length are polled sequentially:

Source

- Specify here which register the data should originate from.

```
-----
KUNBUS-IC - Extended Mapping, 1 Entry
-----
```

```
Entry : 1
Source : 0x1401, Bitpos: 14
Destination: 0x2401, Bitpos: 2
(Bit)Length: 0x2400, Bitpos: 2
```

```
1 - change mapping
-----
```

```
>1
Source Register >
```

Source Bit Position

- Specify here the exact position of the bit that you want to map.

```
-----
KUNBUS-IC - Extended Mapping, 1 Entry
-----
```

```
Entry : 1
Source : 0x1401, Bitpos: 14
Destination: 0x2401, Bitpos: 2
(Bit)Length: 0x2400, Bitpos: 2
```

```
1 - change mapping
-----
```

```
>1
Source Register >0x1810
Source Bit Position >
```

Destination Register

- Specify here the register where you want to output the data.

```
-----
KUNBUS-IC - Extended Mapping, 1 Entry
-----
```

```
Entry : 1
Source : 0x1401, Bitpos: 14
Destination: 0x2401, Bitpos: 2
(Bit)Length: 0x2400, Bitpos: 2
```

```
1 - change mapping
-----
```

```
>1
Source Register >0x1810
Source bit position >5
Destination Register >
```

Destination Bit Position

- Specify the exact position of the bit that you want to map the data on.

```
-----
KUNBUS-IC - Extended Mapping, 1 Entry
-----
```

```
Entry : 1
Source : 0x1401, Bitpos: 14
Destination: 0x2401, Bitpos: 2
(Bit)Length: 0x2400, Bitpos: 2
```

```
1 - change mapping
-----
```

```
>1
Source Register >0x1810
Source bit position >5
Destination Register >0x2405
Destination Bit Position >
```

Bit Length

- Specify here the number of bits you want to map.

```
-----
KUNBUS-IC - Extended Mapping, 1 Entry
-----
```

```
Entry : 1
Source : 0x1401, Bitpos: 14
Destination: 0x2401, Bitpos: 2
(Bit)Length: 0x2400, Bitpos: 2
```

```
1 - change mapping
-----
```

```
>1
Source Register >0x1810
Source bit position >5
Destination Register >0x2405
Destination bit position >3
Number of bits to map >
```

Main menu with mapping entry

After confirming the number of bits with the enter key, you will return automatically to the main menu.

Here, you will now see the mapping you created in the previous steps:

```

-----
KUNBUS-IC - Extended (Bit)Mapping
-----
Source | Bitp | Dest. | Bitp | Length
-----
1 - 0x1810 | 5 | 0x2405 | 3 | 27
2 - 0x0001 | 0 | 0x0001 | 0 | 0
3 - 0x0001 | 0 | 0x0001 | 0 | 0
4 - 0x0001 | 0 | 0x0001 | 0 | 0
5 - 0x0001 | 0 | 0x0001 | 0 | 0
6 - 0x0001 | 0 | 0x0001 | 0 | 0
7 - 0x0001 | 0 | 0x0001 | 0 | 0
8 - 0x0001 | 0 | 0x0001 | 0 | 0
9 - 0x0001 | 0 | 0x0001 | 0 | 0
10 - 0x0001 | 0 | 0x0001 | 0 | 0
11 - 0x0001 | 0 | 0x0001 | 0 | 0
12 - 0x0001 | 0 | 0x0001 | 0 | 0
13 - 0x0001 | 0 | 0x0001 | 0 | 0
14 - 0x0001 | 0 | 0x0001 | 0 | 0
15 - 0x0001 | 0 | 0x0001 | 0 | 0
16 - 0x0001 | 0 | 0x0001 | 0 | 0
-----
>

```

The extended mapping is stored permanently in the module, but is first executed after a restart.

2.11 Script Interpreter

In this menu you have the option, to activate or deactivate a script and to select the desired port.

NOTICE

Please note that activation of a script influences the individual port.

Never activate a script with the setting "Port used by script: CDI" if you do not have a fully functional SDI interface for accessing the parameter memory registers! In such a case, your module is no longer configurable! You can switch the status between disabled and enabled by entering [1]+[Return].

- You can define the SDI or CDI as port. You switch between both options by entering [2]+[Return].

```

-----
KUNBUS-IC - Script Interpreter
-----
1 - State: disabled
2 - Port used by script: SDI
-----
>
    
```

2.12 Reset to Factory Settings

With this option, you reset all parameters of the IC module to the default values.

You have to confirm the selection by entering the number "36" for reasons of security. Afterwards, the module restarts.

NOTICE

Loss of all settings

Bear in mind that with this function you will delete all settings that you have previously made.

3 Monitor Communication

Menu 3 – "Monitor Communication"

In this menu you have the option to view the current values of the Memory Register.

```

-----
KUNBUS-IC - Modbus Register Monitor
-----
1 - SSC In
2 - SDI In
3 - Fieldbus In (from Master)
4 - SSC Out
5 - SDI Out
6 - Fieldbus Out (to Master)
7 - Arbitrary Register
-----
>

```

3.1 Monitor SSC Input Registers

In this menu you will get an overview of the current values of the input areas of the shift register chain.

In the first row you see the setting values for the display. Here, you can select a binary [b], hexadecimal [h] or decimal [d] format.

```

-----
KUNBUS-IC - Monitor SSC Input Registers
-----
b=binary, h=hex, d=decimal, n=next, p=previous <cr>=refresh

0x1001: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1009: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1011: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1019: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1021: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1029: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1031: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1039: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
>

```

3.2 Monitor SDI Input Registers

In this menu you will get an overview of the input area's current values of the SDI interface.

In the first row you see the setting values for the display. Here, you can select a binary [b], hexadecimal [h] or decimal [d] format.

```
-----
KUNBUS-IC - Monitor SDI Input Registers
-----

b=binary, h=hex, d=decimal, n=next, p=previous <cr>=refresh

0x1401: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1409: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1411: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1419: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1421: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1429: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1421: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1439: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
```

3.3 Monitor Fieldbus Input (from Master)

In this menu you will get an overview of the input area's current values of the PROFINET interface.

In the first row you see the setting values for the display. Here, you can select a binary [b], hexadecimal [h] or decimal [d] format.

```
-----
KUNBUS-IC - Monitor Fieldbus Input (from Master)
-----

b=binary, h=hex, d=decimal, n=next, p=previous <cr>=refresh

0x1801: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1809: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1811: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1819: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1821: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1829: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1831: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x1839: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
>
```

3.4 Monitor SSC Output Registers

In this menu you will get an overview of the output area's current values of the shift register chain.

In the first row you see the setting values for the display. Here, you can select a binary [b], hexadecimal [h] or decimal [d] format.

```
-----
KUNBUS-IC - Monitor SSC Output Registers
-----

b=binary, h=hex, d=decimal, n=next, p=previous <cr>=refresh

0x2001: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2009: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2011: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2019: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2021: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2029: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2031: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2039: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
>
```

3.5 Monitor SDI Output Registers

In this menu you will get an overview of the output area's current values of the SDI interface.

In the first row you see the setting values for the display. Here, you can select a binary [b], hexadecimal [h] or decimal [d] format.

```
-----
KUNBUS-IC - Monitor SDI Output Registers
-----

b=binary, h=hex, d=decimal, n=next, p=previous <cr>=refresh

0x2401: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2409: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2411: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2419: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2421: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2429: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2431: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2439: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
>
```


3.6 Monitor Fieldbus Output (to Master)

In this menu you will get an overview of the output area's current values of the PROFINET interface.

In the first row you see the setting values for the display. Here, you can select a binary [b], hexadecimal [h] or decimal [d] format.

```

-----
KUNBUS-IC - Monitor Fieldbus Output (to Master)
-----

b=binary, h=hex, d=decimal, n=next, p=previous <cr>=refresh

0x2801: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2809: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2811: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2819: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2821: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2829: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2831: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
0x2839: 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
>
    
```

3.7 Arbitrary Register

In this menu you will get an overview of all registers. Use this function to view registers that do not have their own menu item.

First enter the register number (e.g. "0x4001"):

```

-----
KUNBUS-IC - Monitor Arbitray Register
-----

Register Number: 0x4001
    
```

The CDI then displays 64 registers from the specified register value.

In the first row you see the setting values for the display. Here, you can select a binary [b], hexadecimal [h] or decimal [d] format.

```

-----
KUNBUS-IC - Monitor Arbitray Register
-----

b=binary, h=hex, d=decimal, n=next, p=previous <cr>=refresh

0x4001: ..... 0x0490 ..... 0x002b ..... 0x0102
0x4009: 0x0ef5 0x0001 0xe240 ..... 0x0000 .....
0x4011: ..... 0x0001 ..... 0x0004 0x0055 0x004e
0x4019: 0x0042 0x0055 0x0053 0x002d 0x0043 0x004f 0x004d
0x4021: 0x0020 0x0045 0x0074 0x0068 0x0065 0x0072 0x004e
0x4029: 0x0074 0x002f 0x0049 0x0050 0x0000 0x0017 0x0000
0x4031: 0x0000 0x0008 0x00e1 0x0000 0x0020 .....
0x4039: .....
>
    
```

The CDI represents registers that do not exist by dots.

Menu 4 – "Module Status"

4 Module Status

In the following submenu you will get an overview of the current operating state of the module and of all interfaces.

```

-----
KUNBUS-COM - Module Status
-----
1 - Common Status
2 - SDI Status
3 - SSC Status
4 - CDI Status
5 - Fieldbus Status
7 - Error Stack
8 - Script Status
-----
>

```

4.1 Common Status

In this menu you will find information about the current operating state of all communication channels.

The CDI displays the states of the interfaces, connection mode for the main board, configuration errors as well as errors in the Data Broker Mapping.

```

-----
KUNBUS-IC - Common Status
-----
<cr> = refresh; <Esc> = return

Fieldbus State: is stopped
Fieldbus Configuration: is ok
Fieldbus Mapping: is ok

Synchron serial communication: is stopped
Sync. serial comm. Configuration: is ok
Sync. serial comm. Mapping: is ok

Modbus RTU (SDI) Mapping: is ok
Modbus RTU (SDI) Configuration: is ok
-----
>

```

4.2 SDI Status

In this menu you will find information about the current interface parameters and node ID.

If the interface is running in "Automatic Bitrate detection" mode and no bitrate has been detected yet, the message "Actual Bitrate: undefined" will be displayed instead of the interface parameters.

```
-----
KUNBUS IC - SDI Status
-----
<cr> = refresh; <Esc> = return

Modbus Node Address: 1
Actual Bitrate: 38400 Bit/s
Actual Parity: even
Actual Stopbits: 1 Stopbit
-----
>
```

4.3 SSC Status

In this menu you will find information about the status of the SSC interface. The representation is dependent on the selected mode and configurations:

SSC SSR Master Mode, auto detect shift registers

- You have selected "auto detect shift registers" as the configuration source for the SSC.

In this menu you will find the following information:

- Number of shift registers used fieldbus specifically
- Number of status LEDs used
- Number of shift registers
- Bitrate

If the shift register chain is not working, the text "Shift Register chain not working" will be displayed instead of the interface parameters.

```
-----
KUNBUS-IC - SSC Status
-----
<cr> = refresh; <Esc> = return

SSC SSR Master Mode, auto detect shift registers

Act. No. of Fieldbus Switch regs: 0
Act. No. of Fbus Status-LED regs: 0
Actual Number of Input registers: 4
Actual Number of Output registers: 4
Actual Bitrate: 4800 kBit/s
-----
>
```

SSC SSR Master Mode, configured registers

- You have selected "configured shift registers" as the configuration source for the SSC.

In this menu you will find the following information:

- Number of shift registers used fieldbus specifically
- Number of status LEDs used
- Number of shift registers
- Bitrate

If the number of configured registers does not match the number of connected registers or the shift register chain is not working, you will see the message "Shift Register Chain not working".

```
-----
KUNBUS-IC- SSC Status
-----
<cr> = refresh; <Esc> = return

SSC SSR Master Mode, configured shift registers

Act. No. of Fieldbus Switch regs: 0
Act. No. of Fbus Status-LED regs: 0
Actual Number of Input registers: 4
Actual Number of Output registers: 2
Actual Bitrate: 4800 kBit/s
-----
>
```

SSC SSR Master Mode, disabled

You will find this representation in one of the following cases:

- SSC SSR Master is switched off via the menu
- Invalid configuration of the number of input or output registers
- Transmission error due to unsuitable bitrate
- Other transmission errors (e.g. line interruption)

```
-----
KUNBUS-IC - SSC Status
-----
<cr> = refresh; <Esc> = return

SSC SSR Master Mode, disabled
-----
>
```

SSC SPI Slave Mode

– You have selected "SSC SPI Slave Mode" as the configuration source.
 In this menu you will find information about clock and data level.

```

-----
KUNBUS-IC - SSC Status
-----
<cr> = refresh; <Esc> = return

SSC SPI Slave Mode

Actual SPI Settings: Polarity Normal, Falling Edge, CLK High, MSB
first
-----
>
    
```

4.4 CDI Status

In this menu you will find information about the current parameters of the CDI.

```

-----
KUNBUS-KUNBUS-IC - CDI Status
-----
<cr> = refresh; <Esc> = return

Actual Bitrate: 115200 Bit/s
Actual Parity: even
Actual Stopbits: 1 Stopbit
-----
>
    
```

4.5 PROFINET Status

From this starting point you are taken to menus where you will find information about the status of the connected modules, alarm acknowledge, diagnosis items and communication parameters in the PROFINET.

```

-----
KUNBUS-COMS - Profinet TPS-1 Status
-----
1 - Equipped Modules State
2 - Alarm Acknowledge State
3 - Diagnosis Item State
4 - Communication Parameter
-----
    
```

4.5.1 Equipped Module State **In this menu you will find information about all available slots.**

```

-----
KUNBUS-COMS - Equipment Status
-----

1 - Slot 0 State
2 - Slot 1 State
3 - Slot 2 State
4 - Slot 3 State
5 - Slot 4 State
6 - Slot 5 State
7 - Slot 6 State
8 - Slot 7 State
9 - Slot 8 State
-----
>
    
```

4.5.1.1 Slot Status **Select the required slot using the corresponding number to view its status information.**

```

-----
KUNBUS-COMS - Slot Status
-----

Slot: 1

Input Data: present
Input Data Provider State: good
Input Data Consumer State: bad

Output Data: not available
Output Data Provider State: ----
Output Data Consumer State: ----

-----
>
    
```

Designation	Value	Meaning
Slot	1-9 (0-8)	Slot number
Input Data	present	Input data available
	not available	No input data available
	Data is being transmitted from the module to the Profinet master.	
Input Data Provider State	good	Valid data is being read out from the data broker
	bad	No data or invalid data is being read out from the data broker
Input Data Consumer State	good	Data is being received from the master and processed
	bad	Data is not being received from the master and processed
Output Data	present	Output data available
	not available	No input data available

Designation	Value	Meaning
Output Data Provider State	good	There is a connection to the master and this is receiving valid data from its application (e.g. SPS)
	bad	There is no connection to the master or this is receiving invalid/no data from its application.
Output Data Consumer State	good	The module is processing the data from the Profinet master
	bad	The module is not processing the data from the Profinet master

NOTICE

If no data is available, the provider and consumer state are not relevant.

4.5.2 Alarm Acknowledge

In this menu you will find information as to whether or not an alarm message was transmitted to the controller from the module.

```

-----
KUNBUS-COMS - Alarm Acknowledge Status
-----
Status: 0x0000
Response code: 0x00000000
-----
>

```

Meaning:

Status Bit 0 = 1 Acknowledge

Response Code: returned as from TPS-1. Does not correspond to PNIO status. No definition is contained in the TPS-1 stacker description.

4.5.3 Diagnosis Item Data

In this CDI menu you can select which diagnosis item the current data should be displayed for.

```
-----
KUNBUS-COMS - Diagnosis Item Data
-----
```

```
1 - Diagnosis Item 0
2 - Diagnosis Item 1
3 - Diagnosis Item 2
4 - Diagnosis Item 3
5 - Diagnosis Item 4
6 - Diagnosis Item 5
7 - Diagnosis Item 6
8 - Diagnosis Item 7
-----
```

```
>
```

Enter the list number of the diagnosis item required and press the Enter button to confirm your entry.

You will now be taken to the following menu where you can see a thematically subdivided overview of the selected diagnosis items.

```
-----
KUNBUS-COMS - Diagnosis Item Data
-----
```

```
Diagnosis Item number : 0
```

```
Control Register : 0x0000
```

```
Slot : 0x0000
```

```
Channel Error Type : 0x0000
```

```
Extended Channel Error Type : 0x0000
```

```
Extended Channel Additional Value :0x00000000
```

```
Alarm Response State : 0x0000
```

```
Alarm Response Code :0x00000000
-----
```

```
>
```

In the first block, the item number is displayed.

In the second block, the transmitted data is displayed:

- Control Register,
- Slot that the item belongs to,
- Error Codes.

In the third block, the response state of the controller on the diagnosis alarm is displayed.

4.5.4 Communication Parameter Status

In this menu you will find information about the currently used communication parameters.

NOTICE! The parameters may vary from the configured values if they were set by the PROFINET controller.

```
-----
KUNBUS-COMS - Communication Parameter (Stack)
-----
IP Address : 192.168.16.12
IP Subnet Mask : 0.0.0.0
IP Gateway Address : 0.0.0.0

MAC Address Interface : 00:a0:45:00:00:01
MAC Address Port 1 : 00:a0:45:00:00:02
MAC Address Port 2 : 00:a0:45:00:00:03

Station Name : kb-comstest-1
-----
>
```

4.6 Error Stack

In this menu you will find information about the errors that last occurred. Please have these entries ready at hand when you contact our support. We can help you faster by evaluating the entries.

If the value is 0x00000000, no error has occurred.

The Error Stack occupies the register 0x000a to 0x0011 and provides space for 4 entries at a length of 32 bits each.

The register x+0 (0x...0000) contains the High-Word of the error.

The register x+1 (0x...0000) contains the Low-Word of the error.

If all four entries are occupied and another error occurs, this error will replace the oldest error in the Error Stack. The latest error is always displayed first.

```
-----
KUNBUS-IC - Error Stack
-----
<cr> = refresh; <Esc> = return

Entry 0: = 0x00000000
Entry 1: = 0x00000000
Entry 2: = 0x00000000
Entry 3: = 0x00000000
-----
>
```

4.7 Script Interpreter Status

In this menu you will find information about the current Script-Status.

```

-----
KUNBUS-IC - Script Interpreter Status
-----
<cr> = refresh; <Esc> = return

Port used by script: CDI
Execution status: Stopped
Loop counter: 0
-----
>

```

4.8 Emergency Menu

In the unlikely event of a serious error, you can open this menu.

- You can try to start the module by entering "R".
- You can reset the EEPROM to the factory settings with the "F" key. This can be useful, for example, if a permanently stored value triggers a serious software error after a firmware update.

If the error cannot be remedied, please contact our support. Have the number of the error entry ready for this purpose.



```

-----
KUNBUS-IC - Fatal Error Handler
-----
A severe error occurred. Error Stack:

Entry 0: = 0x34030000
Entry 1: = 0x00000000
Entry 2: = 0x00000000
Entry 3: = 0x00000000
-----
press 'R' for Reset or
press 'F' for Reset with Factory Defaults
-----
>

```

Also see about this

-  Synchronous serial interface [▶ 25]
-  General Device Parameters [▶ 75]

10 Disposal

10.1 Dismantling and Disposal

This section contains important information explaining how to safely dismantle, replace and dispose of the KUNBUS-IC correctly.

Dismantling

DANGER

Danger of electric shock

Before dismantling, make sure that the device in which your module is installed is no longer connected to the power supply.

- Remove the mains plug of the device from the power supply.
- Proceed in accordance with the device manufacturer's documentation to ensure that the device is disconnected from the power supply and no damage will result when dismantling.

WARNING

Fault due to electrostatic discharge

Observe all regulations necessary for working in electrostatically protected areas in order to avoid any faults on the module.

- Make sure that you yourself and the module are earthed.

- ✓ The device, in which your module is installed, has been disconnected from the power supply.
- ✓ You have removed the cover of the housing, if applicable, in accordance with the manufacturer's instructions.
 - Release the safety lever, if applicable, and remove your module carefully out of the socket.
 - If you want to insert a new module, proceed as described in section Installation [▶ 39].

Disposal

Dispose of any defective module at a collection point for waste electronic equipment in accordance with EU Directive 2002/96/EC. Do not dispose of the module in your household waste.

Dispose of any defective module in accordance with the local regulations for waste electronic equipment.

11 Technical data

11.1 Technical data

Dimensions

Length	25.2 mm
Width	45.4 mm
Height	14.2 mm
Weight	8 g

Environmental Conditions

Operating temperature	0 to +60°C
Humidity	0% not 95%, non-condensing
Mechanical shock load	15G
Permanent mechanical stress	5G
Condensing	not allowed
Storage temperature	-30 °C to +85 °C

12 Appendix

12.1 Configuration via Modpoll

Prerequisite: You have made the SDI interface on the application connector suitable for a PC by your application hardware (e.g. a level converter).

Tip! With the KUNBUS-IC Evaluation Board you have a Sub-D connector at your disposal with RS-232 levels that can be connected to a serial COM interface of the PC or to a serial USB converter.

To configure the module conveniently for application, we recommend that you make the setting adjustments with the aid of the Modpoll program supplied.

- ✓ To do this, open the command line prompt in the first step and then change to the directory where Modpoll is located. Drag and drop the modpoll.exe file into the input panel.
 - Always begin new commands with the input "Modpoll".
- ⇒ Define your application by specifying the protocol type, register address, baudrate etc. We have compiled the relevant Modpoll commands for you in the following table.

Complete Application Configuration

Example for the Configuration of the SSC Output Register

```
modpoll -m rtu -r 0x1401 -t 4:hex -b 19200 COM1 0x1234
```

```
modpoll -m rtu -r 0x2401 -t 4:hex -b 19200 COM1
```

Overview of the Modpoll Commands

Start	modpoll.exe
Help	-h
Protocol selection	
Modbus ASCII Protocol	-m ascii
Modbus RTU Protocol	-m rtu
Modbus TCP Protocol	-m tcp
Nested Modbus RTU via TCP	-m enc
Addresses	
Slave address	-a #
Register address	-r #
Number of registers	-c #
I/O	
Discrete output (coil)	-t 0
Discrete input	-t 1
16-bit input register	-t 3
16-bit input register with hexadecimal display	-t 3:hex
32-bit integer data type in the input register table	-t 3:int
32-bit module 1000 data type in the input register table	-t 3:mod
32-bit float data type in the input register table	-t 3:float

16-bit output register (holding) with default value	-t 4
16-bit output register (holding) with hexadecimal display	-t 4:hex
32-bit integer data type in the output register (holding) table	-t 4:int
32-bit module 1000 data type in the output register (holding) table	-t 4:mod
32-bit float data type in the output register table	-t 4:float
Slave works onBig-Endian 32-Bit integers	-i
Slave works onBig-Endian 32-Bit floats	-f
Only poll once (instead of every second)	-1
Use Daniel/Enron single register 32-bit mode	-e
First reference is 0 instead of 1 (PDU addressing)	-0
Options for Modbus TCP	
TCP Port number (default value: 502)	-p #
Options for ASCII and Modbus RTU	
Baudrate (9600, 19200,... Default value: 9600)	-b #
Databits (7 or 8 for ASCII, 8 for RTU)	-d #
Stop bits (1 or 2, default value:1)	-s #
Parity: None	-p none
Parity: Even	-p even
Parity: Odd	-p odd
RS-485 Mode	-4 #
Timeout in seconds (0.01-10.0 default value: 0)	-o #