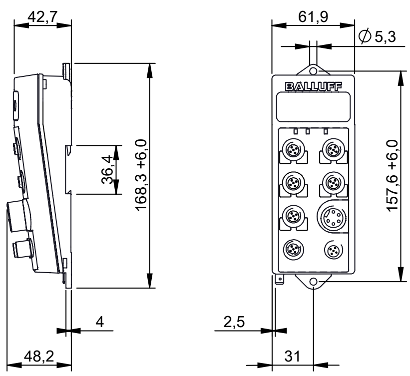
BIS V-6102 PROFIBUS

Technical Reference, Operating Manual



english

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1 User Instructions

1.1 About This Manual

This manual describes the processor unit for BIS V-6102 Identification Systems and startup instructions for immediate operation.

1.2 Typographical Conventions

The following conventions are used in this manual:

Actions

Action instructions are indicated by a preceding triangle. The result of an action is indicated by an arrow.

► Action instruction 1.
  ⇒ Action result.
► Action instruction 2.

Syntax

Numbers:
– Decimal numerals are shown without an additional indicator (e.g. 123).
– Hexadecimal numerals are shown with the additional indicator $_{hex}$ (e.g. 00_{hex}).

Parameters:
Parameters are shown in italics (e.g. CRC_*16*).

Directory paths:
References to paths where data is stored or is to be saved are shown in small caps (e.g. PROJECT:\DATA TYPES\USER-DEFINED).

Control characters:
Control characters for sending are set in angle brackets (e.g. <ACK>).

ASCII code:
Characters transmitted in ASCII code are set in apostrophes (e.g. 'L').

1.3 Symbols

Note, tip
This symbol indicates general notes.

1.4 Meaning of Warnings

Warning notes are especially safety-relevant and are used for accident avoidance. This information must be read thoroughly and followed exactly. The warning notes are constructed as follows:

SIGNAL WORD
Type and source of the hazard
Consequences of non-observance
► Measures for hazard avoidance

The signal words used have the following meaning:

NOTICE
The warning word NOTICE indicates a risk which can result in **damage to or destruction of the product**.

CAUTION
The general warning symbol combined with the signal word CAUTION indicates a risk which can result in **slight or moderate injuries**.

WARNING
The general warning symbol combined with the signal word WARNING indicates a risk which can result in **serious injury or death**.

DANGER
The general warning symbol combined with the signal word DANGER indicates a risk which can result **directly in serious injury or death**.

1 User Instructions

1.5 Abbreviations

BIS	Balluff Identification System
CP	Code Present
CRC	Cyclic Redundancy Check
DID	Device ID
DP	Decentralized peripherals
EEPROM	Electrical Erasable and Programmable ROM
EIRP	Equivalent Isotropically Radiated Power
EMC	Electromagnetic Compatibility
EPC	Electronic Product Code
ERP	Effective Radiated Power
FCC	Federal Communications Commission
FE	Functional ground
LF CR	Line Feed with Carriage Return
MAC	Media Access Control
n. c.	not connected
PC	Personal Computer
PROFIBUS	Process Field Bus
RSSI	Receive Signal Strength Indicator
PLC	Programmable Logic Controller
Tag	Data carrier
TID	Tag identifier
UID	Unique Identifier
UHF	Ultra high frequency
VID	Vendor ID

2 Safety

2.1 Intended Use

The BIS V-6102 processor unit is a component of the BIS V identification system. It is used for linking to a host computer (PLC, PC) within the identification system. It may be used only for this purpose in an industrial environment corresponding to Class A of the EMC Law.
This reference manual applies to processor units in the following series:
- BIS V-6102-019-C001
- BIS V-6102-019-C101

2.2 General Safety Notes

Installation and Startup
Installation and startup are to be performed by trained technical personnel only. Any damage resulting from unauthorized manipulation or improper use voids the warranty and any liability claims against the manufacturer.
When connecting the processor unit to an external controller, observe proper selection and polarity for the connection as well as the power supply (see "Installation" on page 11).
The processor unit may only be used with an approved power supply (see "Technical Data" on page 14).

Conformity

CE	This product was developed and manufactured in accordance with the applicable European directives. CE conformity has been verified.

All approvals and certifications are no longer valid if:
- Components are used that are not part of the BIS V Identification System,
- Components are used that have not been explicitly approved by Balluff.

Operation and testing
The operator is responsible for ensuring that local safety regulations are observed.
In the event of defects and non-correctable faults in the identification system, take the system out of service and secure it to prevent unauthorized use.

3 Basic Knowledge

3.1 Operating Principle of Identification Systems

The BIS V Identification System is classified as a non-contact system with read and write capabilities. This makes it possible to not only convey information that is programmed permanently in the data carrier, but also to collect and pass on current information.

The main components of the BIS V Identification System are:
- Processor unit,
- Read/write heads,
- Data carrier.

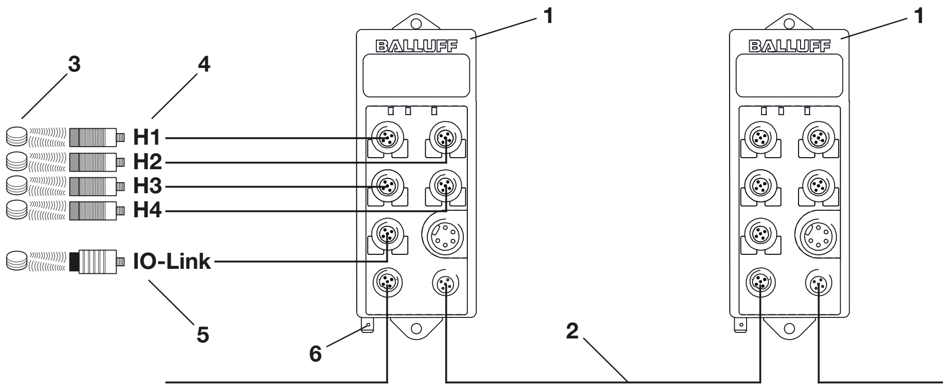


Figure 1: System Overview

1	BIS V	**4**	Read/Write Heads H1…H4
2	PROFIBUS DP	**5**	Service/IO-Link
3	Data carriers (max. 1 per R/W head)	**6**	Functional ground

The main areas of use are:
- In manufacturing for controlling material flow (e.g. for model-specific processes, for workpiece transport using conveying systems, for acquiring safety-related data,
- In warehouse areas for monitoring inventory movement,
- In the transportation sector and in materials handling.

3.2 Product Description

Processor Unit BIS V-6102:
- Metal housing
- Round connector terminations
- Four read/write heads can be connected
- 1 × IO-Link module or standard input port can be connected
- Power for the system components provided by the processor unit
- Power for the data carrier provided by the read/write heads via carrier signal
- USB Port
- PROFIBUS DP input and output
- Display with keys for startup and configuration
- Control displays

3 Basic Knowledge

3.3 Control Function

The processor unit is the link between data carrier and host control system. It manages two-way data transfer between data carrier and R/W head and provides buffer storage.
The processor unit uses the R/W head to write data from the host control system to the data carrier or reads the data from the carrier and makes it available to the host control system.

Host control systems could include:
- A control computer (e.g. industrial PC)
- A PLC.

Double Bit Header:
In order to ensure complete transmission of all data in the data buffer, the control bits in the data buffer's first and last byte (bit header) are transmitted and compared for each R/W head. If both bit headers are the same, then the data has been fully updated and can be transmitted. This means that the data for each R/W head is only valid if both bit headers are the same. Thus, the host control system must also compare the bits in the bit headers.

3.4 Data Integrity

In order to increase data integrity, data transfer between the data carrier and processor unit and the storage device must be monitored using a check procedure.
A CRC_16 data check can be enabled for this via parameter configuration.
With the CRC_16 data check, a check code that allows the validity to be checked at any time is written to the data carrier.

A CRC_16 data check provides the following advantages:
- Data integrity even during the non-active phase (data carrier outside the R/W head).
- Shorter read time – page is read once.

3 Basic Knowledge

3.5 Read/Write Heads H1…H4

For BIS V-6102-019-C001, read/write heads in the BIS VM-3_ _, BIS VL-3_ _, and BIS VU-3_ _ series can be connected to terminals H1…H4.
BIS V-6102-019-C101 also supports read/write heads in the BIS C-3_ _ series (Adapter required).

> **Note**
> Read/write heads in the BIS VU-3_ _ series are only supported with a device software version of 3.0 or higher. Should the occasion arise, an update will be required.

> **Note**
> Device software as well as manuals with detailed information about the read/write heads used are available at www.balluff.com.

BIS V processor units are available in different variants with respect to the supported read/write heads. The following table shows the differences.

Processor Unit	Available Connections	Compatible Read/Write Heads			
	H1…H4	VM-3_ _	VL-3_ _	VU-3_ _	C-3_ _
BIS V-6102-019-C001	H1…H4	YES	YES	YES	NO
BIS V-6102-019-C101	H1…H4	YES	YES	YES	YES

> **Note**
> Only shielded cables are to be used for connecting read/write heads!
>
> An adapter cable is required for connecting read/write heads in the BIS C-3_ _ series.
>
> The maximum cable length for read/write heads in the BIS VM-3_ _, BIS VL-3_ _, and BIS VU-3_ _ series is 50 m. For the BIS C-3_ _ series, the cable length is set at 1 m, 5 m, or 10 m plus the adapter depending on the design of the system.

> **Note**
> Visit www.balluff.com for more information on available software and accessories.

3.6 PROFIBUS

Open bus system for process and field communication in cell networks with few nodes and for data communication in accordance with IEC 61158/EN 50170. Automation devices, such as PLCs, PCs, operating and observation devices, sensors or actuators, can communicate using this bus system. PROFIBUS DP is used in the BIS V-6102.

3 Basic Knowledge

3.7 IO-Link

IO-Link is defined as a standardized point-to-point connection between sensors/actuators and an I/O module. An IO-Link sensor/actuator can send additional communication data (e.g. diagnostics signals) in addition to the binary process signals over the IO-Link interface.

Compatibility with standard I/O:
- IO-Link sensors/actuators can be connected to existing I/O modules.
- Sensors/actuators that are not IO-Link-capable can be connected to an IO-Link module.
- Standard sensor/actuator cables can be used

Key technical data:
- Serial point-to-point connection
- Communication as an add-on to the standard I/O
- Standard I/O connection technology, unshielded, 20 m cable length
- Communication using 24 V pulse modulation, standard UART protocol

3.8 Communication Mode

Process data (cyclical):
The GSD file provides different data modules for representing the sensor map:
- Inputs: 1 byte – 32 bytes
- Outputs: 1 byte – 32 bytes
- Or combined input/output modules

Deterministic time behavior:
- Typically 2 ms cycle time for 16 bits of process data and 38.4 kbaud transmission rate.

Service data (diagnostics, parameters):
- Parallel and non-reactive to process data

Standard I/O mode

- Startup parameters can be configured using communication, then
- Binary switching signal

3.9 USB Port

The device can be connected to a computer's USB port using the "Service/IO-Link" jack and then behaves like a USB stick. This allows access to the internal memory, where the manual, the GSD file and a communications driver for service functions are saved. In addition, the BIS V has to be connected to a voltage source. The communication driver can be installed as needed, but is not required for the USB port and BIS V to function.

Note
Visit www.balluff.com for more information on available software and accessories.

4 Installation

4.1 Processor Unit Scope of Delivery

Included in the scope of delivery:
- BIS V-6102
- 5 × closure cap
- Safety Precautions

Note
Visit www.balluff.com for more information on available software and accessories.

4.2 Processor Unit Installation

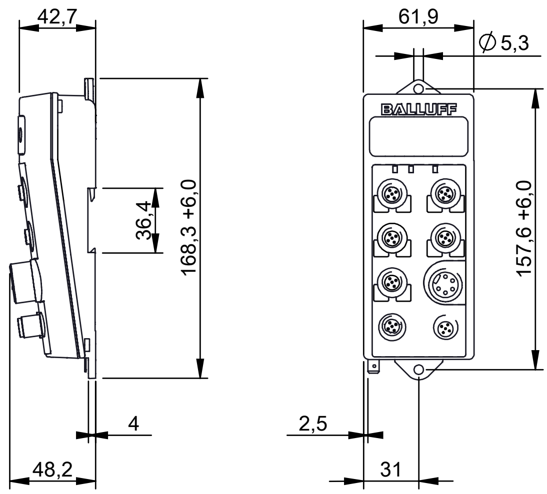


Figure 2: Mechanical connection (dimensions in mm)

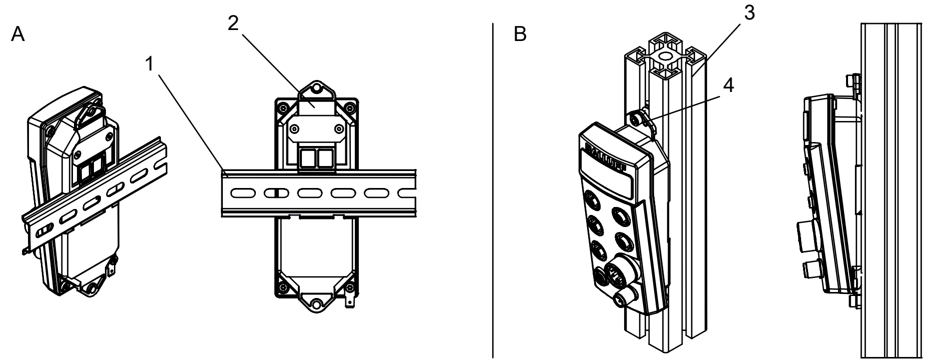


Figure 3: Installation examples (A: attachment to DIN rails, B: attachment to T-slotted framing)

1 DIN rail
2 Fastening
3 T-slotted framing
4 Holder for screw mounting

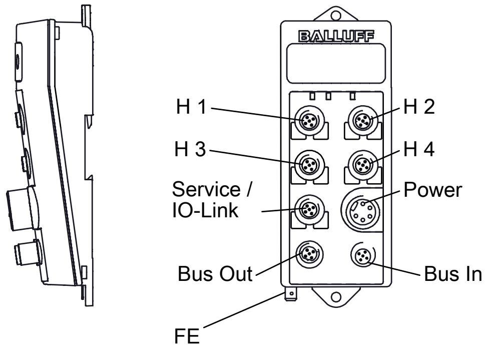
► Select a suitable installation position.
► Secure the processor unit using two M5 screws (strength category 8.8, lightly oiled, tightening torque M = 5.5 Nm).

4 Installation

4.3 Electrical Connections

> **Note**
> Make the ground connection either directly or using an RC combination to ground.

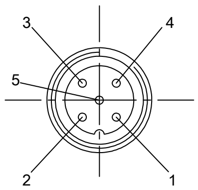
Connections



H1…H4	Read/Write Heads
Service/IO-Link	USB function Service/IO-Link (master function)
Bus in	PROFIBUS DP input
Bus out	PROFIBUS DP output
FE	Functional ground

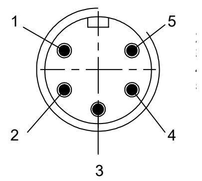
Figure 4: Electrical Connections

H1…H4
M12 female, 5-pin, A-coded



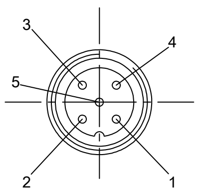
PIN	Function
1	+24 V DC
2	A
3	0 V
4	B
5	n.c.

Power
7/8" male, 5-pin



PIN	Function
1	0 V
2	0 V
3	FE
4	+24 V DC
5	Reserved, not connected

IO-Link / Service
M12 female, 5-pin, A-coded



IO-Link

PIN	Function
1	VP (+24 V DC)
2	n. c.
3	0 V
4	Q/C (IO-Link) or digital input
5	n. c.

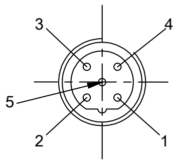
Service

PIN	Function
1	n. c.
2	USB–
3	0 V
4	n. c.
5	USB+

> **NOTICE**
> **Damage to the USB interface**
> **Standard USB cables can damage the USB interface on the PC.**
> ► Use the cable BCC0CR2 for the use of the Balluff Software BIS Cockpit or UHF Manager on the Port IO-Link / Service.

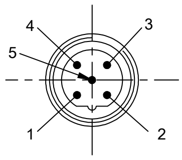
4 Installation

Bus out
M12 female, 5-pin, B-coded



PIN	Function
1	VP
2	A
3	DGND
4	B
5	n.c.

Bus in
M12 male, 5-pin, B-coded



PIN	Function
1	VP
2	A
3	DGND
4	B
5	n.c.

5 Technical Data

Dimensions

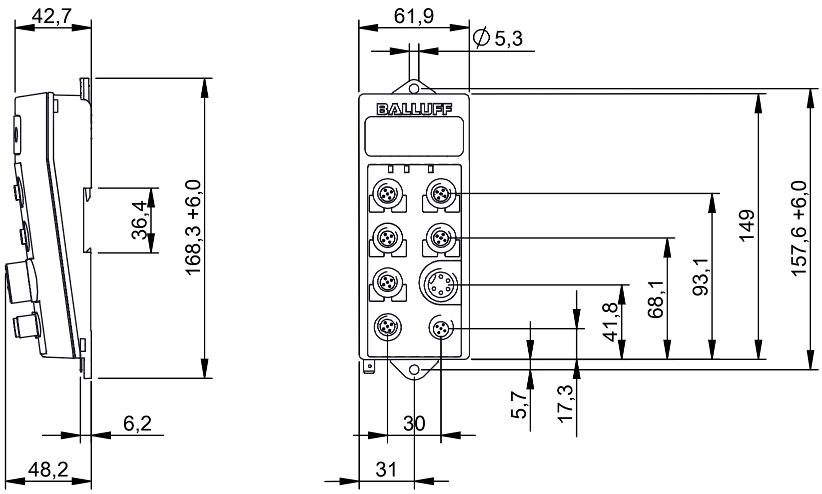


Figure 5: Dimensions in mm

Mechanical Data

Housing material	Zinc die-cast housing
H1…H4	V_S 24 V DC - M12 female, 5-pin, A-coded
Service/IO-Link (master function)	M12 female, 5-pin, A-coded
Power	7/8" male, 5-pin
Bus out	M12 female, 5-pin, B-coded
Bus in	M12 male, 5-pin, B-coded
Protection Class	IP65 (with connectors)
Weight	800 g

Electrical Data

Operating Voltage V_S	24 V DC ±20% LPS Class 2
Ripple	≤ 10 %
Power Consumption	≤ 2 A
Application interfaces	PROFIBUS DP, IO-Link

Application interfaces

IO-Link port M12, A-coded, female

Pin 1	+24 V DC, 1 A
Pin 2	USB+
Pin 3	0 V
Pin 4	IO-Link / input max. 500 mA
Pin 5	USB–

5 Technical Data

Operating conditions

Ambient Temperature	0 °C…+60 °C
Storage Temperature	0 °C…+60 °C
EMC (BIS V-6102-019-C001) – EN 61000-6-2 – EN 61000-4-2/4/5/6 – EN 61000-4-3 80 MHz – 1000 MHz 1400 MHz – 2000 MHz 2000 MHz – 2700 MHz – Emission as per EN 55016-2-3 EMC (BIS V-6102-019-C101) – EN 300330-2 – EN 61000-4-2/4/6 – EN 61000-4-3 80 MHz – 1000 MHz 1400 MHz – 2000 MHz 2000 MHz – 2700 MHz – Emission as per EN 301489-1/-3	 – Severity level 2B/3B/2B/3A – Severity level 3A – Severity level 3A – Severity level 2A – EN61000-6-4 – Severity level 2B/2B/2A – Severity level 3A – Severity level 3A – Severity level 2A – EN 55022 (class A)
Vibration/shock	EN 60068 Part 2-6/27

6 Startup

PROFIBUS DP

The processor unit BIS V-6102 and the host system communicate via PROFIBUS DP.
The PROFIBUS DP system consists of the following components:
– Bus master
– Bus modules/slaves (here, the processor unit BIS V-6102)

> **Important note for implementation using PLCs**
> There are controllers where the PROFIBUS DP data range is not transmitted synchronously with the update of the input/output map. If more than 2 bytes of data are transferred, a mechanism must be used that guarantees that the data in the PLC and the data in the BIS V are always the same!
>
> **1st option: Synchronous data transmission as a setting on the master**
> In this method, the bus master ensures that all of the data necessary for the respective slave is transmitted together. Usually a special software function must be used in the PLC that also controls the access between the PLC and bus master so that all data is always transmitted together.
>
> **2nd option: Configuring a 2nd bit header (always active)**
> The data exchange between PLCs and BIS is controlled via what is known as a bit header. This is always the first byte of the respective R/W head in the data buffer. This bit header is present in both the input zone (data from BIS to the PLC) and the output zone (data from the PLC to the BIS). If this bit header is also transmitted as the last byte, the consistency of the transmitted data can be guaranteed by comparing these two bytes.
> This method affects neither the PLC cycle time nor the bus access time. Only one byte in the data buffer is required for the byte of the 2nd bit header instead of using it for data.

Device master data

In order to configure the parameters for the bus master correctly based on type, the device master data for the BIS V-6102 evaluation data are included in the form of a GSD file. The data can be found in the processor unit's internal memory and can be retrieved from there via the USB port.

Station address

Each processor unit BIS V-6102 is shipped with a station address of 126. Before being used on the bus, this has to be configured individually first (see page 17).

Input/output buffer

The data exchange takes place with the host control system in the input and output buffers buffer. The size of these buffers must be configured by the master.

> **Note**
> The possible buffer sizes for each read/write head are stored in the GSD file. A minimum size of 4 and a maximum size of 128 bytes can be configured; the value must always be an even number. The maximum total buffer size of 244 bytes must not be exceeded.

User parameter bytes
User parameter bytes

There are up to 47 bytes (user parameter bytes) in the processor unit BIS V-6102 that have to be transmitted during parameter configuration. The significance of the 47 bytes for parameter configuration is described on page 21.

> **Note**
> The preset is stored in the GSD file.

6 Startup

6.1 Configuring the Station Address

The station address used to trigger the device on the bus can be assigned using the display. Each address may be used only once.

Address Assignment

- Permitted working range: 0 to 125
- Each PROFIBUS node has to be assigned a unique address.
- The address is read once after power is turned on.
- If the address is changed, this change becomes effective after a power reset on the module.

A DP master is generally assigned addresses 0 to 2. We recommend setting addresses using values of 3 and higher.

Display setting/ menu navigation

Details for configuring the station address and for menu navigation on the display are described in the chapter “Display” on page 89.

6 Startup

6.2 Configuration

In project planning for PROFIBUS devices, a device is mapped as a modular system that consists of a "BIS V-6102" header module and multiple data modules.

GSD file

The device data required for project planning is stored in GSD files (General Station Description). The data modules of each read/write head, each IO-Link port, and any additional modules are illustrated in the project planning software relative to their slot. The GSD file makes the possible data modules (inputs/outputs for the read/write heads and the IO-Link port for various data widths) available. Appropriate data modules are assigned to a specific slot for configuring the BIS V-6102.

A module always has to be plugged in at slots 1 to 6 (see table, at bottom). If optional additional modules are plugged in for the IO-Link port, these have to be plugged in from slot 7 onward without a slot left empty in between.

The "BIS V-6102" header module always has to be plugged in at slot 1.
The data modules for the 4 read/write heads can be plugged in at slots 2 to 5. If a head is not going to be used, a "R/W head not used" module is to be plugged into that slot.
Depending on use, an IO-Link port, a standard I/O, an IO-Link data module or an SIO module can be plugged in at slot 6. If the IO-Link port is not going to be used, Slot 6 is to be equipped with a "Standard I/O" module.

Slot	Module	Function
1	BIS V-6102 header module	Parameter configuration, no process data
2	Read/write head	Parameter configuration and process data
3	Read/write head	
4	Read/write head	
5	Read/write head	
6	IO-Link port pin 4	IO-Link data modules of various data width or configurable as a standard input port
7		Slots for optional additional modules – Input pin 4 – Communication status – IO-Link diagnostics enable – Station diagnostics – Peripheral error – Sensor short circuit
8		
9		
10		
11		
12		
13		

6 Startup

Coding IO-Link Data Modules

Data modules for standard input ports:

Data module	Data width
Standard I/O	see “Auxiliary Modules” on page 20

Data modules for IO-Link_inputs

Data module	Data width
IOL_I_1byte	1 byte
IOL_I_2byte	2 bytes
IOL_I_4byte	4 Byte
IOL_I_6byte	6 Byte
IOL_I_8byte	8 Byte
IOL_I_10byte	10 Byte
IOL_I_16byte	16 Byte
IOL_I_24byte	24 Byte
IOL_I_32byte	32 Byte

Data modules for IO-Link_outputs

Data module	Data width
IOL_O_1byte	1 byte
IOL_O_2byte	2 bytes
IOL_O_4byte	4 Byte
IOL_O_6byte	6 Byte
IOL_O_8byte	8 Byte
IOL_O_10byte	10 Byte
IOL_O_16byte	16 Byte
IOL_O_24byte	24 Byte
IOL_O_32byte	32 Byte

6 Startup

Coding IO-Link Data Modules

Data modules for IO-Link_inputs_outputs

Data module	Data width	
	Input	Output
IOL_I/O_1/_1byte	1 byte	1 byte
IOL_I/O_2/_2byte	2 bytes	2 bytes
IOL_I/O_2/_4byte	2 bytes	4 Byte
IOL_I/O_4/_4byte	4 Byte	4 Byte
IOL_I/O_4/_2byte	4 Byte	2 bytes
IOL_I/O_2/_8byte	2 bytes	8 Byte
IOL_I/O_4/_8byte	4 Byte	8 Byte
IOL_I/O_8/_2byte	8 Byte	2 bytes
IOL_I/O_8/_4byte	8 Byte	4 Byte
IOL_I/O_8/_8byte	8 Byte	8 Byte
IOL_I/O_10/_10byte	10 Byte	10 Byte
IOL_I/O_4/_32byte	4 Byte	32 Byte
IOL_I/O_32/_4byte	32 Byte	4 Byte
IOL_I/O_16/_16byte	16 Byte	16 Byte
IOL_I/O_24/_24byte	24 Byte	24 Byte
IOL_I/O_32/_32byte	32 Byte	32 Byte

Note
Project planning software of various providers mostly offers graphical assistance during configuration; the configuration string is automatically created.

Auxiliary Modules

Additional module	Data width	
	Input	Output
Communication status	1 byte	
IO-Link diagnostics enable		1 byte
Station diagnostics	1 byte	
Peripheral error	1 byte	
Sensor short circuit	1 byte	
Input pin 4		1 byte

6.3 Parameter Configuration

User parameter bytes

Byte	Bit	Meaning
1–3		Reserved for DPV1
4	0	Global diagnostic
	1	Channel related diagnostic
	2	Low voltage bus/sensor supply
	3	Low voltage actuator supply
	4–7	Reserved
5	0–2	IO-Link port function
	3–7	Reserved
6	0–1	IO-Link port safe state
	2–7	Reserved
7	0	Keyboard/LCD: read only
	1	Device LEDs off
	2–7	Reserved
8		Reserved
9 Parameter for R/W head 1	0	CRC
	1	Dynamic mode*
	2	Type serial number
	3	"Slow tag detection" energy saving function *
	4	"Low antenna power" energy saving function *
	5	"Head LEDs off" energy saving function
	6–7	Reserved
10 Tag type (parameter for R/W head 1)	0–7	0: All data carriers in the series used (e.g. BIS VM) are recognized*
		10: Mifare
		11: ISO 15693
		20: EM4x02
		21: Hitag1
		22: HitagS
		30: BIS C 32 Byte
		31: BIS C 64 Byte
11 (parameter for R/W head 1)	0–3	UID compare count
	4–7	Reserved
12–14		Parameters for R/W head 2; structured like bytes 9–11
15–17		Parameters for R/W head 3; structured like bytes 9–11
18–20		Parameters for R/W head 4; structured like bytes 9–11
21–47		Parameters for IO-Link module

* Not for read/write heads BIS VU-_ _

6 Startup

Description of individual parameters

Global diagnostic
This function can be used to permit / suppress all of the module's diagnostics messages (optical diagnostics signals are not affected).

Channel related diagnostic
This function permits/denies channel-related diagnostic messages.

Low voltage bus/ sensor supply
This function can be used to permit / suppress the diagnostics message Sensor supply undervoltage (optical diagnostics signals are not affected).

Low voltage actuator supply
This function can be used to permit / suppress the diagnostics message Actuator supply undervoltage (optical diagnostics signals are not affected).

IO-Link port function
Here, the function of the IO-Link port can be defined:

N/O Contact	=	Input as normally open contact
N/C Contact	=	Input as normally closed contact
IO-Link	=	IO-Link function
N/O Contact after Parameter Configuration	=	SIO mode; an IO-Link device can be configured via IO-Link and afterward switched over to an SIO mode in which the IO-Link port pin functions as a simple switch input
N/C Contact after Parameter Configuration	=	SIO mode, as with normally open after configuration, but as normally closed input

IO-Link port safe state
This function is an extension of the IO-Link port starting configuration. A safe state that the port is to take on in the case of a loss of bus communication can be predefined for the port.

Keyboard/LCD: read only
If this function is enabled, the PROFIBUS address can no longer be changed via the display.

Device LEDs off
If this function is enabled, the read/write head LEDs on the BIS V-6102 processor unit are shut off after 30 min. The parameters for this function are configured in the header module.

CRC check

The CRC check is a procedure for determining a check value for data in order to be able to recognize transmission errors. If the CRC check is enabled, a status message will be sent when a CRC error is detected.

Note
The CRC check function is only supported by read/write heads in the BIS C, BIS VL, and BIS VM series.

Checksum
M and L system:
The checksum is written to the data carrier as 2 bytes of information. 2 bytes per block are lost. This leaves 14 bytes per block available. The usable number of bytes can be found in the following table.

C system:
The checksum is written to the data carrier as 2 bytes of information per page. 2 bytes per page are lost, i.e. the page size is 30 bytes or 62 bytes depending on the data carrier type.

The number of usable bytes thus decreases when using the checksum.

Balluff data carrier type	Memory capacity	Usable bytes for CRC_16
BIS M-1_ _-**01**	752 Byte	658 Byte
BIS M-1_ _-**02**	2000 Byte	1750 Byte
BIS M-1_ _-**03**	112 Byte	98 Byte
BIS M-1_ _-**04**	256 Byte	224 Byte
BIS M-1_ _-**05**	224 Byte	196 Byte
BIS M-1_ _-**06**	288 Byte	252 Byte
BIS M-1_ _-**07**	992 Byte	868 Byte
BIS M-1_ _-**08**	160 Byte	140 Byte
BIS M-1_ _-**09**	32 Byte	28 Byte
BIS M-1_ _-**10**	736 Byte	644 Byte
BIS M-1_ _-**11**	8192 Byte	7168 Byte
BIS M-1_ _-**13**	32786 Byte	28672 Byte
BIS M-1_ _-**14**	65536 Byte	57344 Byte
BIS M-1_ _-**15**	131072 Byte	114688 Byte
BIS M-1_ _-**20**	8192 Byte	7168 Byte
BIS L-1_ _-**01**	192 bytes	168 bytes
BIS L-2_ _-**03**	5 bytes (read-only)	—
BIS L-1_ _-**05**	192 bytes	168 bytes
BIS C-1_ _-**04**	511 Byte	450 Byte
BIS C-1_ _-**05**	1023 Byte	930 Byte
BIS C-1_ _-**11**	2047 Byte	1922 Byte
BIS C-1_ _-**32**	8192 Byte	7936 Byte

Dynamic mode

As soon as the *Dynamic Mode* function is enabled, the processor unit accepts the read/write job from the host control system and stores it, regardless of whether a data carrier is in the active zone of the R/W head or not. If a data carrier enters the active range of the R/W head, the stored job is run.

> **Note**
> To achieve the read times during dynamic operation that are specified on page 71, the *Tag Type* parameter must be set to "BIS C 32 Byte" or "BIS C 64 Byte" on the respective head.

Type serial number

If this function is enabled, the type of the read/write head as well as the data carrier type and the serial number (UID = Unique Identifier) for the data carrier are output with the Auto Read function instead of data. The data is output as soon as the data carrier is in the active zone of the read/write head. The CP bit is set in the input buffer.

The length of the outputted data is reduced to the configured buffer size as appropriate.

The length of the serial number can vary depending on the type of data carrier. To be able to determine the length, the data is preceded by a length field.

> **Note about BIS C**
> BIS C data carriers do not have serial numbers.

> **Note about BIS VM and BIS VL**
> BIS M and BIS L data carriers transfer a UID with a length of 4 bytes (e.g. Mifare and Hitag1) or a UID with a length of 8 bytes (ISO 15693) into the Serial Number field. Because of this, the data sheet for the data carrier used is to be followed.

> **Note about BIS VU**
> BIS U data carriers transfer EPC or TID into the Serial Number field, depending on the most recently executed command. For BIS VU, 00_{hex} is transferred by default into the data carrier type field.

Data Format	**1 byte**	**1 byte**	**1 byte**	**Variable**
Meaning	Length (number of bytes including length)	Read/write head type	Data Carrier Type	Serial Number

BIS VU-3_ _	**BIS VM-3_ _-001-S4**	**BIS VL-3_ _-001-S4**	**BIS C-3_ _**
04	03	02	01

Slow tag detection

For this option, the antenna on the read/write head is switched on for data carrier detection only every 200 ms. This function is configured in the respective read/write head module (only BIS VM).

Low antenna power

Transmitting power is reduced when using this parameter. The parameters for this function are configured in the respective read/write head module and is reserved for future read/write heads.

> **Note**
> Information about configuring the transmission power for BIS VU read/write heads can be found in the manual for the BIS L read/write head.
> Manuals are available at www.balluff.com.

6 Startup

Head LEDs off

This parameter switches off the LEDs on the respective read/write head. This function is configured in the respective read/write head module (only BIS VM and BIS VU).

UID Compare Count

This parameter indicates how often the 5-byte ID of a BIS L-1_ _-03 data carrier is imported and compared before the data carrier is shown as identified. The value default setting is 2. For highly dynamic applications, this value can be set to 1 (only BIS VL).

Tag type

The following data carriers are available for the processor unit BIS V-6102.

> **Note**
> The data carriers contain additional memory ranges for configuration and protected data. These ranges cannot be processed using the BIS V-6102 processor unit.

Mifare data carriers (for read/write heads BIS VM):

Balluff data carrier type	Manufacturer	Description	Memory capacity	Memory type
BIS M-1_ _-**01**	NXP	Mifare Classic	752 Byte	EEPROM
BIS M-1_ _-**10**	NXP	Mifare Classic	736 Byte	EEPROM

ISO 15693 data carriers (for read/write heads BIS VM):

Balluff data carrier type	Manufacturer	Description	Memory capacity	Memory type
BIS M-1_ _-**02**	Fujitsu	MB89R118	2000 Byte	FRAM
BIS M-1_ _-**03**	NXP	SL2ICS20	112 Byte	EEPROM
BIS M-1_ _-**04***	Texas Instruments	TAG-IT Plus	256 Byte	EEPROM
BIS M-1_ _-**05***	Infineon	SRF55V02P	224 Byte	EEPROM
BIS M-1_ _-**06***	EM	EM4135	288 Byte	EEPROM
BIS M-1_ _-**07**	Infineon	SRF55V10P	992 Byte	EEPROM
BIS M-1_ _-**08***	NXP	SL2ICS530	160 Byte	EEPROM
BIS M-1_ _-**09***	NXP	SL2ICS500	32 Byte	EEPROM
BIS M-1_ _-**11**	Balluff	BIS M-1	8192 Byte	FRAM
BIS M-1_ _-**13**	Balluff	BIS M-1	32768 Byte	FRAM
BIS M-1_ _-**14**	Balluff	BIS M-1	65536 Byte	FRAM
BIS M-1_ _-**15**	Balluff	BIS M-1	161072 Byte	FRAM
BIS M-1_ _-**20**	Fujitsu	MB89R112	8192 Byte	FRAM

* On request

For read/write heads BIS VL:

Balluff data carrier type	Manufacturer	Description	Memory capacity	Memory type
BIS L-1_ _-**01**	NXP	Hitag1	192 bytes	EEPROM
BIS L-2_ _-**03**	EM	EM4x02	5 bytes (read-only)	–
BIS L-1_ _-**05**	NXP	HitagS	192 bytes	EEPROM

6 Startup

Tag type

For read/write heads BIS C (with adapter):

Balluff data carrier type	Manufacturer	Memory capacity	Memory type	Memory organization
BIS C-1_ _-**04**	Balluff	511 Byte	EEPROM	32-byte blocks
BIS C-1_ _-**05**	Balluff	1023 Byte	EEPROM	32-byte blocks
BIS C-1_ _-**11**	Balluff	2047 Byte	EEPROM	64-byte blocks
BIS C-1_ _-**32**	Balluff	8192 Byte	FRAM	64-byte blocks

> **Note**
> To achieve the read times during dynamic operation that are specified on page 71, the *Tag Type* parameter must be set to "BIS C 32 Byte" or "BIS C 64 Byte" on the respective head.

For read/write heads BIS VU:

Balluff data carrier type	Manufacturer	Memory capacity
BIS U-1_ _	Balluff and others	See Data Sheet

> **Note**
> The read/write head BIS VU generally supports data carriers regardless of manufacturer, that meet the standards set by EPCglobal™ Class 1 Generation 2 or ISO IEC 18000-63.

IO-Link port

The configuration of the IO-Link port always consists of 27 bytes.

IO-Link port configuration (optional)

It is configured via project planning using the GSD file (IO-Link module, slot 6).

Byte \ Bit No.	7	6	5	4	3	2	1	0	Description
21	Module identifier								10_{hex}
22	Basis		Cycle time						Cycle time with multiplier (cycle time formula multiplier)
23	Offset data window								0…31 bytes
24	Length data window								0…16 bytes
25	Validation type								Validation type 0 – No validation 1 – Compatible (VID + DID) 2 – Identical (VID + DID + SerNum)
26	IOL Vendor ID 1								Vendor ID
27	IOL Vendor ID 2								
28	IOL Device ID 1								Device ID
29	IOL Device ID 2								
30	IOL Device ID 3								
31	IOL Serial number 1								Serial number optional
…	…								
46	IOL Serial number 16								
47	Parameter server								Optional

6 Startup

Cycle time

The cycle time controls the timing for triggering the IO-Link device. The factory default setting is 0 (Auto). It is recommended that this value be retained.
The cycle time is stored in the IO-Link device (slave) and is detected automatically. Only times that are slower than the automatically selected times can be set manually.

Offset data window and Length data window

The offset (offset data window) can be used by the start byte with length (length data window) to define the end byte of the process data. This setting is only for the input data, has no influence on the actual process data length and is for visual purposes only.

Validation type

Whether a connected IO-Link device receives access to the IO-Link master can be controlled using validation.

Configuration options:
- 0
  No validation
- 1 Compatible
  Only allows communication to the IO-Link master for devices whose vendor ID (VID) and device ID (DID) correspond to the configured values.
- 2 Identical
  See "1 Compatible"; in addition, the serial number of the IO-Link device is checked

IOL Vendor ID (VID)

Vendor ID for the IO-Link device (refer to the manual for the device)

IOL Device ID (DID)

Device ID for the IO-Link device (refer to the manual for the device)

IOL Serial number, optional

Serial number for the IO-Link device (if available; refer to the IO-Link device's type plate)

Parameter server, optional

Automatic upload (IO-Link slave → IO-Link master) or download (IO-Link master → IO-Link slave) can be switched on using this parameter.
For automatic upload, the parameter configuration is read when an IO-Link device is plugged in.
For automatic download, the parameter configuration is transmitted to the device when an IO-Link device is plugged in.

Background:
The automatic upload makes it possible to read in the parameter configuration of a *correctly* configured device when plugging one in. If an IO-Link device has to be replaced, the previously read in parameter configuration from the *old* device is transferred to the *new* device when it is plugged in.

The "Upload" option can be disabled by having a valid parameter set read.
Configuration options:
- $8X_{hex}$: Switch on
- $X1_{hex}$: Switch on upload
- $X2_{hex}$: Switch on download

6 Startup

6.4 Integration into Project Planning Software

The connection of a BIS V-6102 to a Siemens S7 controller using "SIMATIC Manager" is shown as an example. The exact procedure depends on the project planning software used.

Installing the GSD file

To perform project planning on the PC, the GSD file for the module must be installed:

- ▶ Open a new project.
- ▶ Open the hardware configurator.
- ▶ Select the "Tools | Install new GSD" menu command.
  - ⇒ An "Install new GSD file" dialog will appear.
- ▶ Select directory and GSD file.
  - ⇒ The [Install] button only becomes active if a GSD file is selected.
- ▶ Click on [Install].
  - ⇒ The GSD file is installed.
  - ⇒ A message appears once the process has finished.
- ▶ Confirm the message and close the window.
- ▶ Select the menu command "Tools | Update catalog".
  - ⇒ The devices are displayed in the product tree.

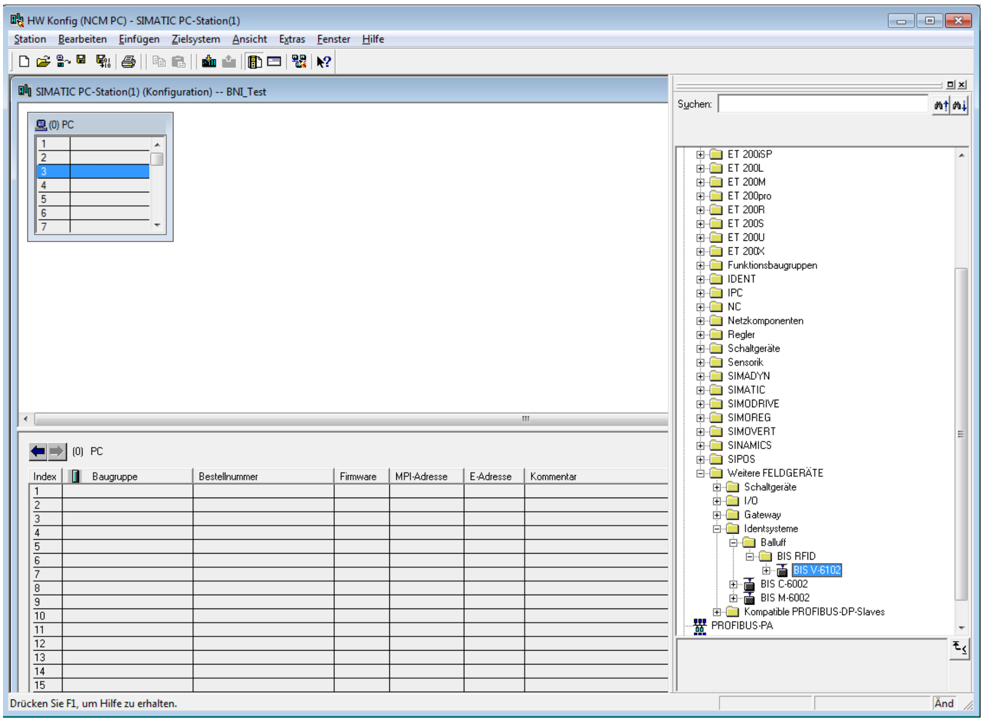


Figure 6: Parameter configuration with a GSD file

6 Startup

Adding a DP slave

The devices are located in the hardware catalog under "Other field devices", "Ident systems", "Balluff", "RFID". The module is added as a DP slave.

► Select the PROFIBUS rail.
► Double-clicking adds the device as a DP slave.
   ⇒ The slots are assigned the default settings.

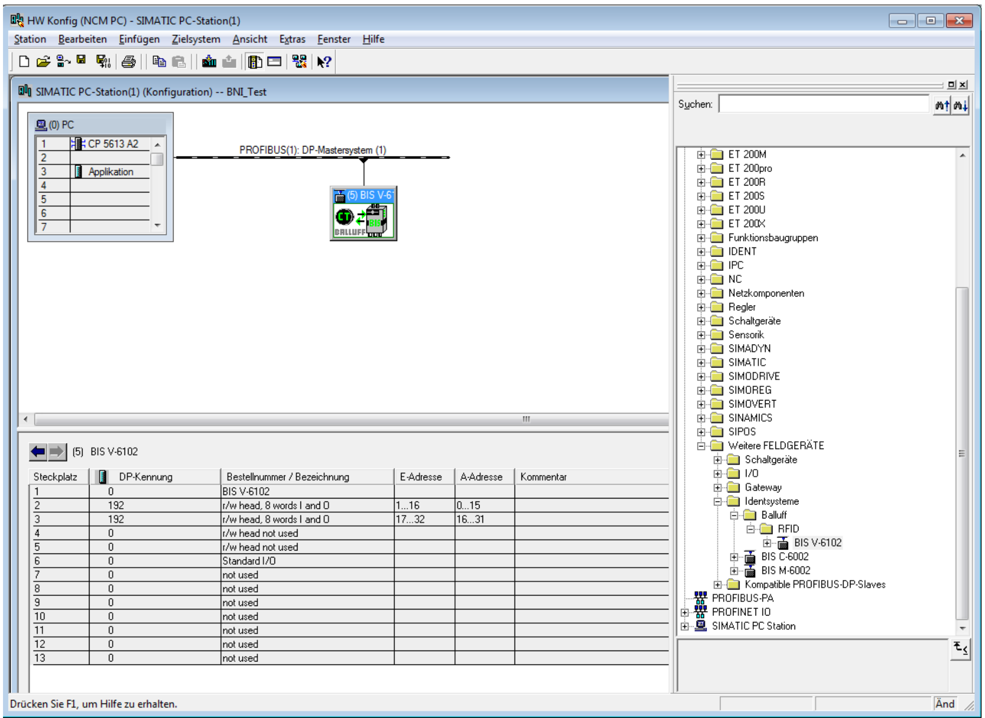


Figure 7: Adding the BIS V-6102 as a slave

Determining the slave address

► Determine the PROFIBUS address of the slave.

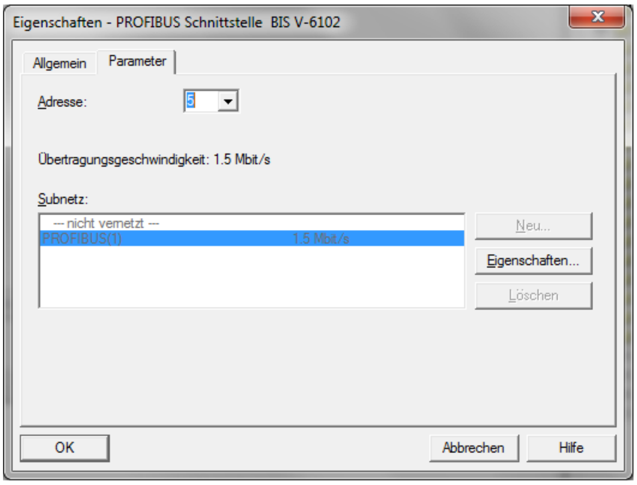


Figure 8: Determining the slave address

6 Startup

Configuring read/ write heads

Two read/write head modules are plugged in by default. The quantity of process data (buffer size) for a read/write head can be selected by deleting and plugging in a corresponding "head" module. "R/W head not used" modules have to be plugged in for unused read/write heads.

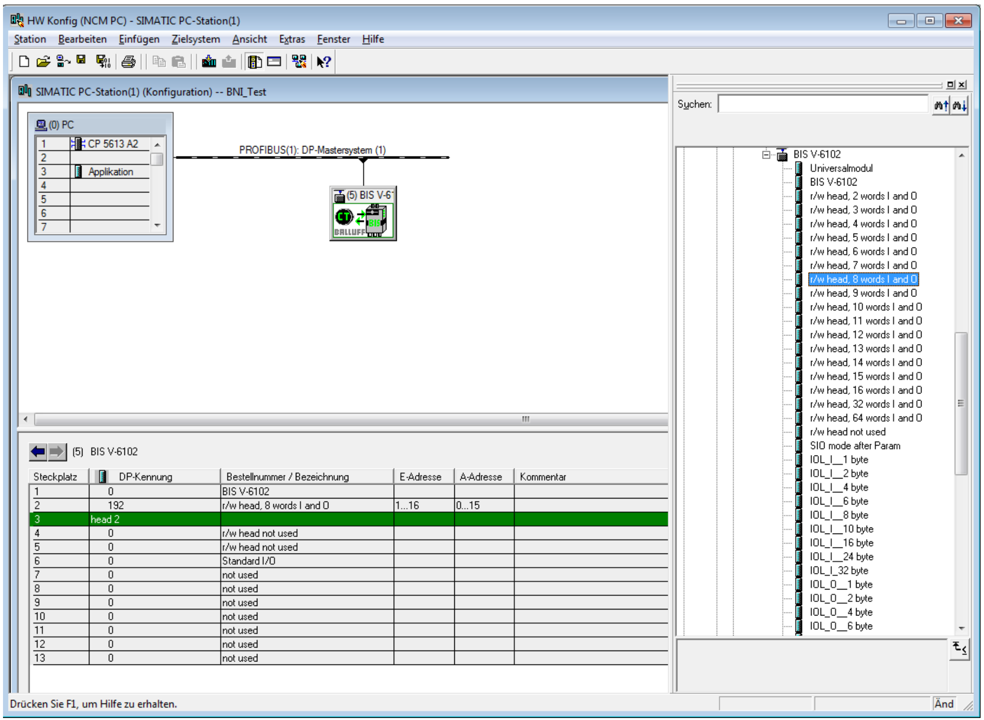


Figure 9: Selecting modules for read/write heads

6 Startup

Configuring the IO-Link module

If a IO-Link module is to be installed, the standard I/O module has to be deleted first.

► Select the corresponding IO-Link module after the deletion.

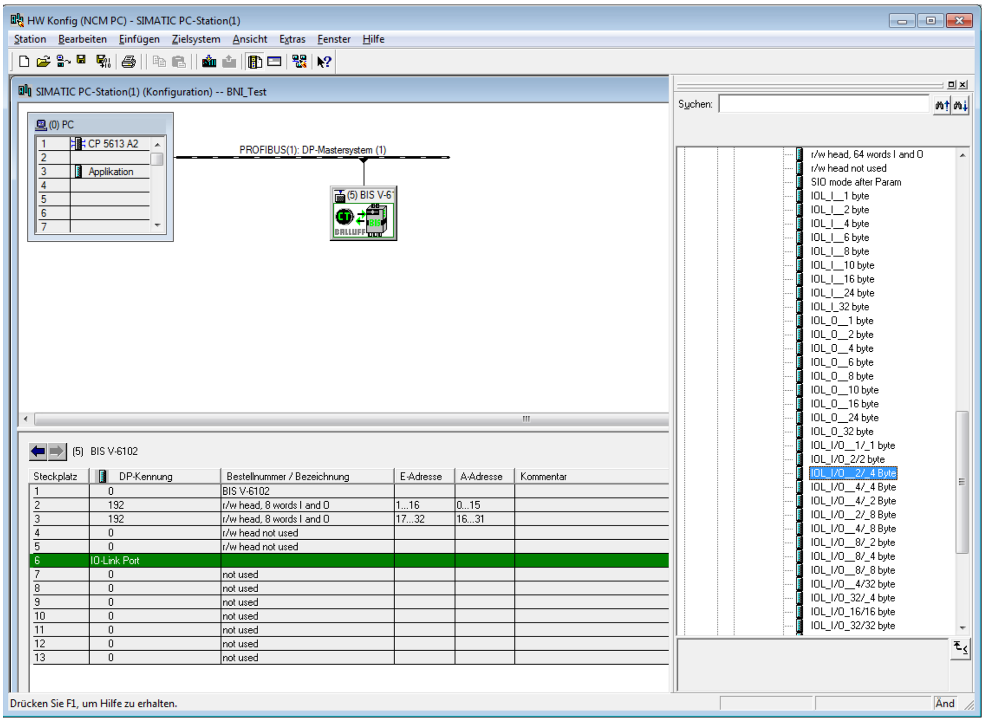


Figure 10: Selecting the IO-Link module

► Drag the selected module to slot 6 (slots 7–13 are reserved for optional additional modules for IO-Link).

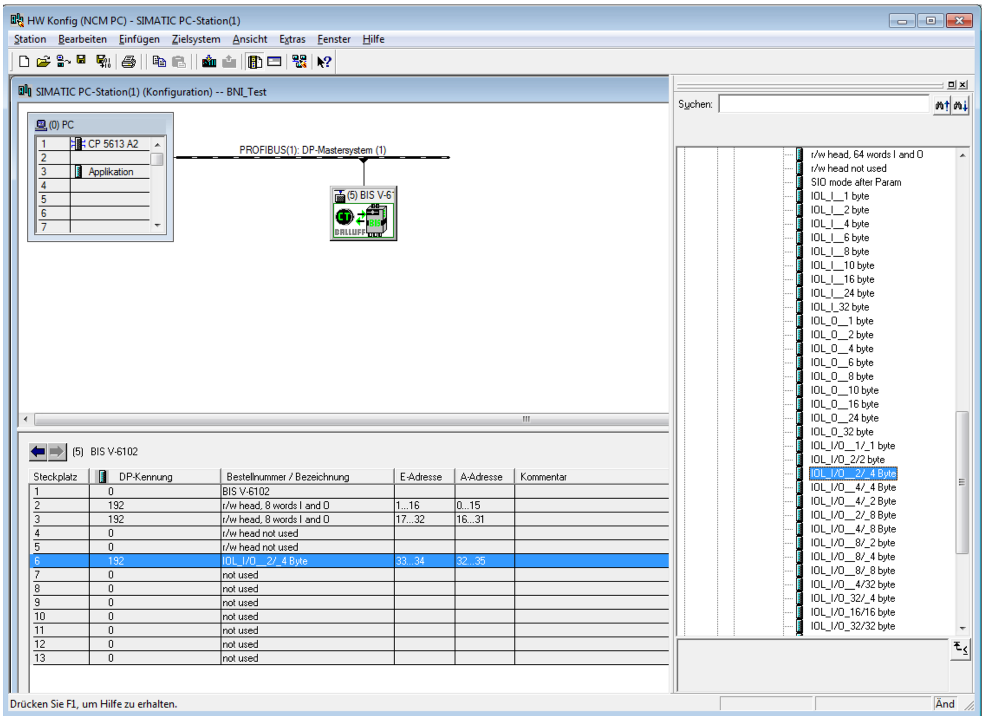


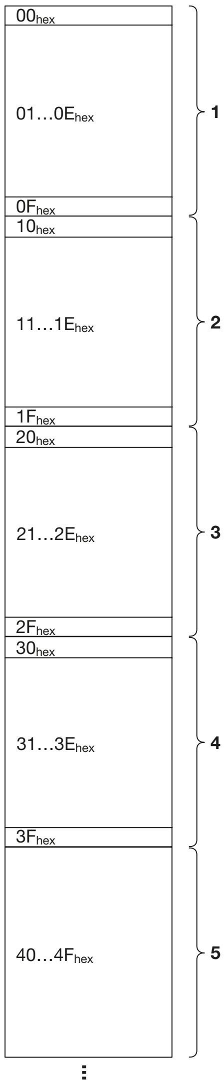
Figure 11: Plugging in the IO-Link module

7 Device Functions

7.1 Function Principle of the BIS V-6102

Two buffers are needed to exchange data and commands between the processor unit and the host control system (input buffer and output buffer). The buffer contents are exchanged using cyclical polling. The buffer content depends on the cycle in which it is written (for example, control commands at the beginning of a job).
When writing to the buffer, the transmitted data from the previous cycle is overwritten. Unwritten bytes are not deleted and retain their data content.

Example:
Total buffer size 80 bytes (4 × 16 bytes: heads H1 to H4, 16 bytes: IO-Link)



The total buffer size is derived from the sum of all buffers (ranges 1–5 + X) and is not allowed to exceed 244 bytes.

The process data buffer is divided into multiple ranges:
- Zone 1…4 = read/write heads 1…4 (H1…H4)
- Range 5 = IO-Link
- Potential additional ranges for IO-Link

The size of these ranges can be configured using the GSD file.

Figure 12: Example for a total buffer size of 80 bytes (4 × 16 bytes: heads H1 to H4, 16 bytes: IO-Link)

1	R/W head 1	**4**	R/W head 4
2	R/W head 2	**5**	IO-Link
3	R/W head 3		Subsequently, potential additional ranges for IO-Link.

IO-Link

IO-Link data is transmitted unchanged to the IO-Link Slaves via the IO-Link Master.
IO-Link buffer: 0…32 bytes (max.)

7.2 Process Data Buffer

Output buffer

The control commands for the identification system and the data to be written to the data carrier are sent via the output buffer.

Subaddress \ Bit No.	7	6	5	4	3	2	1	0
00_{hex} = Bit Header		TI	KA			GR		AV
01_{hex}	Command Identifier					or	Data	
02_{hex}	Start address (Low Byte) or program No.					or	Data	
03_{hex}	Start address (high byte)					or	Data	
04_{hex}	Number of bytes (low byte)					or	Data	
05_{hex}	Number of bytes (high byte)					or	Data	
06_{hex}	Data							
…	Data							
Last Byte = Bit Header		TI	KA			GR		AV

Assignment and explanation

Subaddress	Bit name	Meaning	Description of Function
00_{hex}/last byte	TI	Toggle Bit In	Controller is ready to receive additional data (read job).
	KA	Head shutoff	Shuts off the R/W head's antenna. Tag detection no longer takes place. CP and MT are 0.
	GR	Default state	Cancels the current job for this R/W head and puts the channel into a basic state. The R/W head can then be used again once GR = 0 and the controller has acknowledged this with BB = 1. CP and MT are 0.
	AV	Job	A job is present.

7 Device Functions

Input buffer

The input buffer is used to send the data read from the identification system, the designations, and the status codes to the host control system.

Subaddress \ Bit No.	7	6	5	4	3	2	1	0
00_{hex} = Bit Header	BB	HF	TO	MT	AF	AE	AA	CP
01_{hex}	Status code			or			Data	
02_{hex}	Data							
…	Data							
Last Byte = Bit Header	BB	HF	TO	MT	AF	AE	AA	CP

Assignment and explanation

Subaddress	Bit name	Meaning	Description of Function
00_{hex}/last byte	BB	Ready for Operation	After powering up or after a reset via the GR bit, the BB bit indicates that the corresponding channel is ready.
	HF	Head error	Cable break to the R/W head.
	TO	Toggle Bit Out	**Read:** Additional data is being provided by the identification system. **Write operation:** Identification system can accept additional data.
	MT	Multiple Tag	More than 1 data carrier is in the R/W head's field.
	AF	Job Error	A job was processed incorrectly or was canceled.
	AE	Job End	A job was completed without errors.
	AA	Job Start	A job was detected and started.
	CP	Code Present	A data carrier has been detected.

Structure of the input buffer
The structure of the process data buffer is identical for all commands.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
02_{hex}	Data	Transmission of data that was read from the data carrier.
…	Data	Transmission of data that was read from the data carrier.
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Note
Displaying the "multiple tag function" (MT) is not possible with BIS C read/write heads.

Input buffer

Status codes

Status code	Description of Function
00_{hex}	Everything OK.
01_{hex}	Job cannot be run because there is no data carrier in range of the read/write head.
02_{hex}	Cannot read the data carrier.
03_{hex}	Data carrier was removed from the R/W head's range during reading.
04_{hex}	Cannot write to the data carrier.
05_{hex}	Data carrier was removed from the R/W head's range during writing.
07_{hex}	No or invalid command identifier for set AV bit or the number of bytes is 00_{hex}.
09_{hex}	R/W head cable break or no R/W head connected.
$0D_{hex}$	Communication to the R/W head disrupted.
$0E_{hex}$	CRC for the read data and CRC for the data carrier do not agree.
$0F_{hex}$	1st and 2nd bit header are not the same. The 2nd bit header must be used.
20_{hex}	Address assignment of the read/write job is outside the memory range of the data carrier.
21_{hex}	This function is not possible for this data carrier.
30_{hex}	License key incorrect.
31_{hex}	Invalid parameter set.
32_{hex}	Password required.
33_{hex}	Password invalid.
34_{hex}	Memory area is locked.
35_{hex}	Value range of the parameter incorrect.

Description of the Code Present (CP) and Multiple Tag (MT) bits

CP	MT	Meaning
0	0	No tag in the field
1	0	Exactly one tag in the field. Automatic reading is OK (if configured).
0	1	More than one data carrier is in the field. They cannot be processed.
1	1	Does not occur.

Structure of the commands for read/write heads

Command Identifier 00_{hex}: No Command Present

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	00_{hex}: No command present.
Last byte	2nd Bit Header	

Structure of the commands for read/write heads

Command designator 01_{hex}: Read from data carrier

Reads USER data from the specified start address. The data length is equal to the number of bytes.

When using a data carrier with expanded memory, the *Read Data Carrier* command can also be executed as a command with 24-bit addresses.
Refer to: Command Identifier 81_{hex}, Read Data Carrier with 24-bit Addresses.

Note
UHF data carriers, depending on the type, provide different memory banks. The read/write head BIS VU can be configured with respect to the memory bank in order to handle these memory banks.
The memory bank is preset at the factory to USER data. Please refer to the manual for the UHF read/write head as well as the data sheet for the data carrier.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	01_{hex}: Read from data carrier.
02_{hex}	Start address (low byte)	Start address for reading.
03_{hex}	Start address (high byte)	Start address for reading.
04_{hex}	Number of bytes (low byte)	Number of bytes to be read starting from the start address.
05_{hex}	Number of bytes (high byte)	Number of bytes to be read starting from the start address.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

If execution is successful, the response is passed to the input buffer in the following format:

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Data	Transmission of the data that is to be written to the data carrier.
…	Data	Transmission of the data that is to be written to the data carrier.
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Depending on the number of bytes to read and the configured buffer size, multiple bus cycles may be necessary to transfer the data.

Structure of the commands for read/write heads

Command Identifier 81_{hex}: Read Data Carrier with 24-bit Addresses

When assigning addresses to data carriers with expanded memory, the start address and number of bytes can be specified as 24-bit values. Information about executing the command as well as about return values are drawn from the 01_{hex} command (see “Command Identifier 00hex : No Command Present”).

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	01_{hex}: Read from data carrier.
02_{hex}	Start address (low byte)	Start address for reading.
03_{hex}	Start address (middle byte)	Start address for reading.
04_{hex}	Start address (high byte)	Start address for reading.
05_{hex}	Number of bytes (low byte)	Number of bytes to be read starting from the start address.
06_{hex}	Number of bytes (middle byte)	Number of bytes to be read starting from the start address.
07_{hex}	Number of bytes (high byte)	Number of bytes to be read starting from the start address.
…	None	No meaning
Last byte	2nd Bit Header	Valid data is present if the 1st and 2nd bit strings match.

Structure of the commands for read/write heads

Command Identifier 02hex: Write to Data Carrier

Writes USER data at the specified start address. The data length is equal to the number of bytes. When using a data carrier with expanded memory, the *Write to Data Carrier* command can also be executed as a command with 24-bit addresses.
Refer to: Command Identifier 81hex, Read Data Carrier with 24-bit Addresses.

Note
A password is required to write to read-only data carriers.
Write commands that are attempted with an invalid password will be acknowledged with the status message *Password Required* or *Password Invalid* (see “Status codes” on page 35).
Details about access passwords can be found in the manual of the UHF read/write head used.

Subaddress	Meaning	Description of Function
00hex	1st Bit Header	
01hex	Command Identifier	02hex: Write to data carrier.
02hex	Start address (low byte)	Start address to be written from.
03hex	Start address (high byte)	Start address to be written from.
04hex	Number of bytes (low byte)	Number of bytes to be written starting from the start address.
05hex	Number of bytes (high byte)	Number of bytes to be written starting from the start address.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Data is accepted from the processor unit only after the command has been accepted by the processor unit and acknowledged.

Subaddress	Meaning	Description of Function
00hex	1st Bit Header	
01hex	Data	Transmission of the data that is to be written to the data carrier.
…	Data	Transmission of the data that is to be written to the data carrier.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00hex	1st Bit Header	
01hex	Data	Provides information on the status of a query.
…	Data	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Structure of the commands for read/write heads

Command designator 82_{hex} : Write to data carrier with 24-bit addresses

When assigning addresses to data carriers with expanded memory, the start address and number of bytes can be specified as 24-bit values. Information about executing the command as well as about return values are drawn from the 02_{hex} command (see "Command Identifier 02_{hex}: Write to Data Carrier").

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	02_{hex}: Write to data carriers.
02_{hex}	Start address (low byte)	Start address to be written from.
03_{hex}	Start address (middle byte)	Start address to be written from.
04_{hex}	Start address (high byte)	Start address to be written from.
05_{hex}	Number of bytes (low byte)	Number of bytes to be written starting from the start address.
06_{hex}	Number of bytes (middle byte)	Number of bytes to be written starting from the start address.
07_{hex}	Number of bytes (high byte)	Number of bytes to be written starting from the start address.
…	None	No meaning
Last byte	2nd Bit Header	Valid data is present if the 1st and 2nd bit strings match.

Command designator 03_{hex}: Display output

Output of a predetermined character string on the display.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	03_{hex}: Display output.
02_{hex}	Data	Characters for display output.
…	Data	Characters for display output.
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Structure of the commands for read/write heads

Command designator 07_{hex}: Store the start address for the "Auto Read" function

Configuring the start address after the data is read with the Auto Read function. For more details, see the "Description of individual parameters" chapter on page 22.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	07_{hex}: Save the start address for the Auto Read function.
02_{hex}	Start address (low byte)	Address for the "Auto Read" function starting from which the data carrier is read. The value is stored in the EEPROM.
03_{hex}	Start address (high byte)	Address for the "Auto Read" function starting from which the data carrier is read. The value is stored in the EEPROM.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Structure of the commands for read/write heads

Command Identifier 87_{hex} : Save the Start Address for the Auto Read Function with 24-bit addresses

When assigning addresses to data carriers with expanded memory, the start address and number of bytes can be specified as 24-bit values. Information about executing the command as well as about return values are drawn from the 07_{hex} command (see "Command designator 07_{hex}: Store the start address for the „Auto Read" function").

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	07_{hex}: Save the start address for the Auto Read function.
02_{hex}	Start address (low byte)	Address for the "Auto Read" function starting from which the data carrier is read. The value is stored in the EEPROM.
03_{hex}	Start address (middle byte)	Address for the "Auto Read" function starting from which the data carrier is read. The value is stored in the EEPROM (optional, 24-bit command).
04_{hex}	Start address (high byte)	Address for the "Auto Read" function starting from which the data carrier is read. The value is stored in the EEPROM.
…	None	No meaning
Last byte	2nd Bit Header	Valid data is present if the 1st and 2nd bit strings match.

Structure of the commands for read/write heads

Command designator 09_{hex}: Type and serial number

If a data carrier is recognized in the active read/write zone of the read/write head, this command will return the read-write head type as well as the data carrier type and serial number of the detected data carrier.

Note
For details about read/write head types and data carrier types, see the "Description of individual parameters" chapter on page 22.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	09_{hex}: Read out type and serial number.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

If execution is successful, the response is passed to the input buffer in the following format:

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Length	Length (number of bytes including length)
02_{hex}	Read/write head type	C = 01/VL = 02/VM = 03/VU = 04
03_{hex}	Data Carrier Type	Data Carrier Type
04_{hex}	Serial Number / UID	UID data that was transmitted from the data carrier.
05_{hex}	Serial Number / UID	UID data that was transmitted from the data carrier.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Structure of the commands for read/write heads

Command designator 11_{hex}: Copy data between data carriers

Copy data from one data carrier to another. The specified number of bytes will be copied from the source start address in the source data carrier to the target start address in the target data carrier. Care must be taken to ensure that the memory areas of the source and target data carriers are compatible.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	11_{hex}: Copy data carrier.
02_{hex}	Source start address (low byte)	Copy the start address of the source data carrier for the function from which copying is to start.
03_{hex}	Source start address (high byte)	Copy the start address of the source data carrier for the function from which copying is to start.
04_{hex}	Target start address (low byte)	Copy the start address of the target data carrier for the function from which copying is to start.
05_{hex}	Target start address (high byte)	Copy the start address of the target data carrier for the function from which copying is to start.
06_{hex}	Number of bytes (low byte)	Number of bytes to be copied starting from the source start address.
07_{hex}	Number of bytes (high byte)	Number of bytes to be copied starting from the source start address.
08_{hex}	Target R/W head number	Number of the read/write head that the target data carrier is in front of.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Structure of the commands for read/write heads

Command Identifier 91_{hex}: Copy Data Between Data Carriers with 24-bit Addresses

When assigning addresses to data carriers with expanded memory, the start address and number of bytes can be specified as 24-bit values. Information about executing the command as well as about return values are drawn from the 11_{hex} command (see "Command designator 11_{hex}: Copy data between data carriers").

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	11_{hex}: Copy data.
02_{hex}	Source start address (low byte)	Copy the start address of the source data carrier for the function from which copying is to start.
03_{hex}	Source Start Address (Middle Byte)	Copy the start address of the source data carrier for the function from which copying is to start.
04_{hex}	Source start address (high byte)	Copy the start address of the source data carrier for the function from which copying is to start.
05_{hex}	Target start address (low byte)	Copy the start address of the target data carrier for the function from which copying is to start.
06_{hex}	Target Start Address (Middle Byte)	Copy the start address of the target data carrier for the function from which copying is to start.
07_{hex}	Target start address (high byte)	Copy the start address of the target data carrier for the function from which copying is to start.
08_{hex}	Number of bytes (low byte)	Number of bytes to be copied starting from the source start address.
09_{hex}	Number of bytes (middle byte)	Number of bytes to be copied starting from the source start address.
$0A_{hex}$	Number of bytes (high byte)	Number of bytes to be copied starting from the source start address.
$0B_{hex}$	Target R/W head number	Number of the read/write head that the target data carrier is in front of.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

7 Device Functions

Structure of the commands for read/write heads

Command designator 12_{hex}: Initialize CRC_16 data check

The memory area of the data carrier used is prepared for use with a CRC data check. It is initialized by writing USER data with a checksum.

If the CRC data check is enabled in the processor unit, then read and write commands on a memory area that is not initialized leads to a CRC error.

Note
CRC data checks reduce the usable storage area in the data carrier, but it increases the integrity of the data (see the "Description of individual parameters" chapter on page 22).

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	12_{hex}: Initialize data carrier.
02_{hex}	Start address (low byte)	Start address from which the CRC_16 data check is to be carried out.
03_{hex}	Start address (high byte)	Start address from which the CRC_16 data check is to be carried out.
04_{hex}	Number of bytes (low byte)	Start address from which the CRC_16 data check is to be carried out.
05_{hex}	Number of bytes (high byte)	Start address from which the CRC_16 data check is to be carried out.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Data is accepted from the processor unit only after the command has been accepted by the processor unit and acknowledged.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Data	Transmission of the data that is to be written to the data carrier.
…	Data	Transmission of the data that is to be written to the data carrier.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Structure of the commands for read/write heads

Command Identifier 92_{hex}: Initialize CRC_16 Data Check with 24-bit Addresses

When assigning addresses to data carriers with expanded memory, the start address and number of bytes can be specified as 24-bit values. Information about executing the command as well as about return values are drawn from the 12_{hex} command (see "Command designator 12_{hex}: Initialize CRC_16 data check").

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	12_{hex}: Initialize data carrier.
02_{hex}	Start address (low byte)	Start address from which the CRC_16 data check is to be carried out.
03_{hex}	Start address (middle byte)	Start address from which the CRC_16 data check is to be carried out.
04_{hex}	Start address (high byte)	Start address from which the CRC_16 data check is to be carried out.
05_{hex}	Number of bytes (low byte)	Start address from which the CRC_16 data check is to be carried out.
06_{hex}	Number of bytes (middle byte)	Start address from which the CRC_16 data check is to be carried out.
07_{hex}	Number of bytes (high byte)	Start address from which the CRC_16 data check is to be carried out.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

7 Device Functions

Structure of the commands for read/write heads

Command designator 32_{hex}: Write constant value to data carrier

Writes a constant value to the memory area, which is indicated with a start address and number of bytes.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	32_{hex}: Write a constant value to the data carrier.
02_{hex}	Start address (low byte)	Start address to be written from.
03_{hex}	Start address (high byte)	Start address to be written from.
04_{hex}	Number of bytes (low byte)	Number of bytes to be written starting from the start address.
05_{hex}	Number of bytes (high byte)	Number of bytes to be written starting from the start address.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Data is accepted from the processor unit only after the command has been accepted by the processor unit and acknowledged.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Data	Value that is to be written to the data carrier.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Data	Value that is to be written to the data carrier.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Structure of the commands for read/write heads

Command Identifier B2$_{hex}$: Write Constant Value to Data Carrier with 24-bit Addresses

When assigning addresses to data carriers with expanded memory, the start address and number of bytes can be specified as 24-bit values. Information about executing the command as well as about return values are drawn from the 12$_{hex}$ command (see "Command designator 12$_{hex}$: Initialize CRC_16 data check").

Subaddress	Meaning	Description of Function
00$_{hex}$	1st Bit Header	
01$_{hex}$	Command Identifier	32$_{hex}$: Write a constant value to the data carrier.
02$_{hex}$	Start address (low byte)	Start address to be written from.
03$_{hex}$	Start address (middle byte)	Start address to be written from.
04$_{hex}$	Start address (high byte)	Start address to be written from.
05$_{hex}$	Number of bytes (low byte)	Number of bytes to be written starting from the start address.
06$_{hex}$	Number of bytes (middle byte)	Number of bytes to be written starting from the start address.
07$_{hex}$	Number of bytes (high byte)	Number of bytes to be written starting from the start address.
...	None	No meaning
Last byte	2nd Bit Header	Valid data is present if the 1st and 2nd bit strings match.

7 Device Functions

Specific commands for BIS VU read/write heads

> **Note**
> Details and more information about the available parameters as well as BIS VU-specific commands can be found in the manual of the BIS VU read/write head used (Available at www.balluff.com).

Command Identifier 40_{hex}: Select (Select Data Carrier in Multi-tag Mode)

In the Multi-tag Mode, the Select command selects a single data carrier from within a data carrier population. A data carrier that is located in the active read/write zone of the antenna is accessed and selected directly based on its EPC or its TID and is then available for further processing.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	40_{hex}: Select Tag (Selecting the data carrier).
02_{hex}	Type EPC/TID	EPC = 0 TID = 1
03_{hex}	No. of bytes	Number of bytes for the data carrier identifier (EPC or TID) that is transmitted in subsequent cycles.
04_{hex}	Reserved	Set to 0.
05_{hex}	Reserved	Set to 0.
06_{hex}	Reserved	Set to 0.
…	None	No meaning
Last byte	2nd Bit Header	Valid data is present if the 1st and 2nd bit strings match.

Data is accepted from the processor unit only after the command has been accepted by the processor unit and acknowledged.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Data	1st byte of the data carrier identifier (EPC or TID)
…	Data	Other bytes of the data carrier identifier (EPC or TID)
…	None	No meaning
Last byte	2nd Bit Header	Valid data is present if the 1st and 2nd bit strings match.

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Specific commands for BIS VU read/write heads

Command Identifier 41_{hex}: Unselect (Undo a Data Carrier Selection)

The Unselect command undoes one data carrier selection that was carried out with the Select command. If a selection is not active, the status will remain unchanged.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	41_{hex}: Unselect (Undo the data carrier selection).
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Specific commands for BIS VU read/write heads

Command Identifier 42$_{hex}$: Read from EPC

Reads the EPC memory area of a data carrier that was previously selected with the Select command.

In Single-Tag mode, that is, if only one data carrier is located in front of the active read/write zone antenna, then the Select command can be disregarded. The *Read from EPC* command will be automatically executed on the data carrier that is located in front of the antenna.

Note
If the order is executed without the preceding Select when more than one data carrier is located in front of the antenna, the command will be acknowledged with the Multiple-Tags status code.

Subaddress	Meaning	Description of Function
00$_{hex}$	1st Bit Header	
01$_{hex}$	Command Identifier	42$_{hex}$: Read from EPC.
…	None	No meaning
Last byte	2nd Bit Header	Valid data is present if the 1st and 2nd bit strings match.

If execution is successful, the response is passed to the input buffer in the following format:

Subaddress	Meaning	Description of Function
00$_{hex}$	1st Bit Header	
01$_{hex}$	No. of bytes	Number of bytes in the read EPC.
02$_{hex}$	EPC Data	Transmission of EPC data that was read from the data carrier.
…	EPC Data	Transmission of EPC data that was read from the data carrier.
…	None	No meaning
Last byte	2nd Bit Header	Valid data is present if the 1st and 2nd bit strings match.

or

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00$_{hex}$	1st Bit Header	
01$_{hex}$	Status code	Provides information about the status of a query:
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Specific commands for BIS VU read/write heads

Command Identifier 43$_{hex}$: Write to EPC

Writes to the EPC memory area of a data carrier that was previously selected with the Select command.

In Single-Tag mode, that is, if only one data carrier is located in front of the active read/write zone antenna, then the Select command can be disregarded. The *Write to EPC* command will be automatically executed on the data carrier that is located in front of the antenna.

Note
If the order is executed without the preceding Select and more than one data carrier is located in front of the antenna, the command will then be acknowledged with the Multiple-Tags status code.
The EPC can have a length of 2...62 bytes; the number of bytes must be even.

Subaddress	Meaning	Description of Function
00$_{hex}$	1st Bit Header	
01$_{hex}$	Command Identifier	43$_{hex}$: Write to EPC.
02$_{hex}$	No. of bytes	Number of bytes for the EPC to be written.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Data is accepted from the processor unit only after the command has been accepted by the processor unit and acknowledged.

Subaddress	Meaning	Description of Function
00$_{hex}$	1st Bit Header	
01$_{hex}$	EPC Data	Transmission of the EPC data that is to be written to the data carrier.
02$_{hex}$	EPC Data	Transmission of the EPC data that is to be written to the data carrier.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00$_{hex}$	1st Bit Header	
01$_{hex}$	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Specific commands for BIS VU read/write heads

Command Identifier 44_{hex}: Read from TID

Reads the TID memory area of a data carrier that was previously selected with the Select command.

In Single-Tag mode, that is, if only one data carrier is located in front of the active read/write zone antenna, then the Select command can be disregarded. The *Read from EPC* command will be automatically executed on the data carrier that is located in front of the antenna.

Note
If the order is executed without the preceding Select and more than one data carrier is located in front of the antenna, the command will then be acknowledged with the Multiple-Tags status code.
The length of the TID data field is defined by a parameter setting.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	44_{hex}: Read from TID.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

If execution is successful, the response is passed to the input buffer in the following format:

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	TID Data	Transmission of TID data that was read from the data carrier.
…	TID Data	Transmission of TID data that was read from the data carrier.
…	None	No meaning
Last byte	2nd Bit Header	Valid data is present if the 1st and 2nd bit strings match.

or

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Specific commands for BIS VU read/write heads

Command Identifier 45_{hex}: Configure the Transmission Power

The transmission power for the antenna (ERP or EIRP), which is specified as a value in quarter dBm increments, affects the maximum range of the read/write range of the antenna.

The maximum transmission power depends on the read/write head used.

Example:
Configuring a transmission power of 21 dBm (125 mW): 21 * 4 = 84 => (54_{hex})

Note
The entered value is not saved permanently and will be restored to the default value when the Reader is rebooted.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	45_{hex}: Set antenna power.
02_{hex}	Antenna power	Antenna power (ERP/EIRP) in increments of n * 0.25 dBm. A value of 0 turns off the antenna. Example: An antenna power of 20 dBm corresponds to a value of 80_{hex} The entered value is not saved permanently and will be reset to the default value when the Reader is rebooted.
…	None	No meaning
Last byte	2nd Bit Header	Valid data is present if the 1st and 2nd bit strings match.

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Specific commands for BIS VU read/write heads

Command Identifier 46_{hex}: Read out Transmission Power

Reads out the current transmission power (ERP). The transmission power is returned as a value in the form of quarter dBm.

Example:
Reading out the transmission power returns the value of 54_{hex} (= 84).
This corresponds to a transmission power of 21 dBm: 84/4 = 21

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	46_{hex}: Read out antenna power.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

If execution is successful, the response is passed to the input buffer in the following format:

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Antenna power	Antenna power in increments of n * 0.25 dBm or 0 for disconnected antennae. Example: An antenna power of 20 dBm corresponds to a value of 80_{hex}.
…	None	No meaning
Last byte	2nd Bit Header	Valid data is present if the 1st and 2nd bit strings match.

or

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Specific commands for BIS VU read/write heads

Command Identifier 47_{hex}: Read from Multiple Data Carriers

The *Read from Multiple Data Carriers* reads, depending on the configured type, the EPC or the TID of all data carriers that are located in the active read/write area of the antenna.

Note
The length of the TID or EPC field parameters are configured on the BIS VU read/write head.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	47_{hex}: Read from multiple data carriers.
02_{hex}	Type	EPC (0) or TID (1)
03_{hex}	Max. number of data carriers	Maximum number of data carriers to be output 1…255, (0 = no limit). If the specification is greater than the maximum specification of the connected heads, the lower value applies.
04_{hex}	Data carrier selection	All = 0 / Selected = 1
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

If the EPCs transfer with the length of 12 bytes, the response in the input buffer is as follows:

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	No. of tags	
02_{hex}	Number of bytes per EPC	12 This corresponds to the length of the longest transmitted EPC configured in the device. EPCs shorter than this length are output right-justified and filled with zeros on the left. In the following, the (number of data carriers read) × (number of bytes per EPC) are transmitted. For 64 bytes per EPC, the actual EPC length in ASCII is specified in the 1st and 2nd byte of the EPC.
03_{hex}	EPC 1	EPC data uppermost address
…	…	…
…	EPC 1	EPC data lowermost address
…	EPC 2	EPC data uppermost address
…	…	…
	EPC 2	EPC data lowermost address
…	…	…
…	EPC n	EPC data uppermost address
…	…	…
	EPC n	EPC data lowermost address
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Specific commands for BIS VU read/write heads

Note
As circumstances require, the data must be transmitted over multiple BUS cycles.

Example of a received data frame with 2 EPCs and 12 bytes per EPC
(Illustration without bit headers).:

EPC 1: E2 FF 00 00 E2 11 90 22 E2 03 01 27

EPC 2: E2 00 90 51 32 05 01 74 07 80 C5 BE

```
000000: 02 0c 27 01 03 e2 22 90 11 e2 00 00 ff e2 be c5
000010: 80 07 74 01 05 32 51 90 00 e2
```

If the EPCs transfer with the length of 64 bytes, the response in the input buffer is as follows:

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	No. of tags	
02_{hex}	Number of bytes per EPC	64 This corresponds to the length of the longest transmitted EPC configured in the device. EPCs shorter than this length are output right-justified and filled with zeros on the left. In the following, the (number of data carriers read) × (number of bytes per EPC) are transmitted. For 64 bytes per EPC, the actual EPC length in ASCII is specified in the 1st and 2nd byte of the EPC.
03_{hex}	EPC 1 Length	MSB Length (ASCII)
04_{hex}	EPC 1 Length	LSB Length (ASCII)
05_{hex}	EPC 1	EPC data uppermost address
…	…	…
…	EPC 1	EPC data lowermost address
	EPC 2 Length	MSB Length (ASCII)
	EPC 2 Length	LSB Length (ASCII)
…	EPC 2	EPC data uppermost address
…	…	…
	EPC 2	EPC data lowermost address
	EPC n Length	MSB Length (ASCII)
	EPC n Length	LSB Length (ASCII)
…	…	…
…	EPC n	EPC data uppermost address
…	…	…
	EPC n	EPC data lowermost address
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Note
As circumstances require, the data must be transmitted over multiple BUS cycles.

Specific commands for BIS VU read/write heads

Example of a received data frame with 2 EPCs and 64 bytes per EPC (Illustration without bit headers):

EPC 1

Length: 48 bytes (34_{hex} 38_{hex})

EPC: E2 FF 00 00 E2 11 90 22 E2 03 01 27 33 44 55 66
77 88 99 AC 01 02 03 04 05 06 07 08 09 0A 0B 0C
00 00 00 00 00 00 00 00 00 00 00 00 00 00 AA BB

EPC 2

Length: 12 bytes (31_{hex} 32_{hex})

EPC: E2 00 90 51 32 05 01 74 07 80 C5 BE

Data:

```
000000: 02 40 34 38 00 00 00 00 00 00 00 00 00 00 00 00
000010: 00 00 bb aa 00 00 00 00 00 00 00 00 00 00 00 00
000020: 00 00 0c 0b 0a 09 08 07 06 05 04 03 02 01 ac 99
000030: 88 77 66 55 44 33 27 01 03 e2 22 90 11 e2 00 00
000040: ff e2 31 32 00 00 00 00 00 00 00 00 00 00 00 00
000050: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
000060: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
000070: 00 00 00 00 00 00 be c5 80 07 74 01 05 32 51 90
000080: 00 e2
```

Specific commands for BIS VU read/write heads

Command Identifier 48_{hex}: Write Parameters

The *Write Parameters* command transfers parameters to the BIS VU read/write that affect its behavior.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	48_{hex}: Write parameters.
02_{hex}	Parameter (Low Byte)	Parameter number
03_{hex}	Parameter (High Byte)	Parameter number
04_{hex}	Length	Length of the parameter in bytes
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Data is accepted from the processor unit only after the command has been accepted by the processor unit and acknowledged.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Data	Parameter data
…	Data	Parameter data
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Numerical parameters, consisting of more than 8 bits (1 byte), are transmitted with the LSB first. Example: The 32-bit value 00000602_{hex} is transmitted as a byte sequence 02 06 00 00.

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

7 Device Functions

Specific commands for BIS VU read/write heads

Command Identifier 49_{hex}: Read Parameters

Reads out the parameter values that are currently set in the read/write head.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	49_{hex}: Read parameters.
02_{hex}	Parameter (Low Byte)	Parameter number
03_{hex}	Parameter (High Byte)	Parameter number
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

If execution is successful, the response is passed to the input buffer in the following format:

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	No. of bytes	Number of bytes of the parameter that is transmitted in the subsequent cycles.
02_{hex}	Data	Parameter data
…	Data	Parameter data
…	Data	Parameter data
…	Data	Parameter data
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Numerical parameters, consisting of more than 8 bits (1 byte), are transmitted with the LSB first. Example: The 32-bit value 00000602_{hex} is transmitted as a byte sequence 02 06 00 00.

or

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Specific commands for BIS VU read/write heads

Command Identifier 50_{hex}: Kill

The *Kill* command deactivates a data carrier previously selected with the Select command.

> **Note**
> **Executing the Kill command permanently deactivates the selected data carrier.**
> **The deactivation cannot be undone.**

> **Note**
> In order to execute the Kill command, a Kill password must first be set and written to the data carrier.
> Information about password protection and about locking and unlocking ("Lock") of UHF RFID data carriers can be found in the UHF RFID standards EPCglobal™ Radio Frequency Identity Protocols Class-1 Generation-2 UHF RFID and ISO IEC 18000-63.
> The EPCglobal™ standard is available online at www.gs1.org/standards.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	50_{hex} : Kill
02_{hex}	Password 1	1st byte password
03_{hex}	Password 2	2nd byte password
04_{hex}	Password 3	3rd byte password
	Password 4 (High Byte)	4th byte password
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

or

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Specific commands for BIS VU read/write heads

Command Identifier 53_{hex}: Bulk Read

The *Bulk Read* command reads the data from a data carrier population. Optionally from all of the data carriers that are found in the active read/write zone of the antenna or from a subset that was previously selected with the Select command.

The Bulk Read command first reports only the number of data carriers that were detected in the active field of the antenna. The data in the data carriers is then read out and transmitted to the controller.
If the data carriers are removed from the active field of the antenna in between the detection and read out stages or if they cannot be successfully read out for other reasons, erroneous data may occur. In which case, the data will be marked as invalid via a check byte at the end of the data block and transmitted to the controller.

Data blocks marked as valid in their check bytes can be used without restrictions.

A maximum of 255 bytes from 255 data carriers can be read at a time.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	53_{hex} : Bulk Read.
02_{hex}	Start address (Low Byte)	Start address for reading.
03_{hex}	Start address (High Byte)	Start address for reading.
04_{hex}	No. of bytes (Low Byte)	Number of bytes to be read starting from the start address.
05_{hex}	No. of bytes (High Byte)	Number of bytes to be read starting from the start address.
06_{hex}	Data carrier selection	All = 0 / Selected = 1
07_{hex}	Max. Tags	Maximum number of tags.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

7 Device Functions

Specific commands for BIS VU read/write heads

If execution is successful, the response is passed to the input buffer in the following format:

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	No. of tags	Number of detected tags
02_{hex}	Number of Bytes per Tag	Bytes to be transmitted per tag.
03_{hex}	Data 1 [0]	Transmission of the 1st byte that was read from the 1st data carrier.
…	Data 1 [1]	Transmission of the 2nd byte that was read from the 1st data carrier.
…	Data 1 […]	Additional data from the 1st data carrier.
…	Check Byte 1	A check byte is transmitted in the last byte from the first data carrier, which indicates whether the data read is valid: 00_{hex}: Data valid FF_{hex}: Data invalid
…	Data 2 [0]	Transmission of the 1st byte that was read from the 2nd data carrier.
…	Data 2 [1]	Transmission of the 2nd byte that was read from the 2nd data carrier.
…	Data 2 […]	Additional data from the 2nd data carrier.
…	Check Byte 2	A check byte is transmitted in the last byte from the second data carrier, which indicates whether the data read is valid: 00_{hex}: Data valid FF_{hex}: Data invalid
…	…	…
…	Data n [0]	Transmission of the 1st byte that was read from the n-th data carrier.
…	Data n [1]	Transmission of the 2nd byte that was read from the n-th data carrier.
…	Data n […]	Additional data from the n-th data carrier.
…	Check Byte n	A check byte is transmitted in the last byte from the n-th data carrier, which indicates whether the data read is valid: 00_{hex}: Data valid FF_{hex}: Data invalid
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Specific commands for BIS VU read/write heads

Command Identifier 54_{hex}: Bulk Write

The *Bulk Write* command writes data to a data carrier population. Optionally to all of the data carriers that are found in the active read/write zone of the antenna or from a subset that was previously selected with the Select command.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	54_{hex} : Bulk Write.
02_{hex}	Start address (Low Byte)	Start address to be written from.
03_{hex}	Start address (High Byte)	Start address to be written from.
04_{hex}	Number of bytes (low byte)	Number of bytes to be written from the start address.
05_{hex}	No. of bytes (High Byte)	Number of bytes to be written from the start address.
06_{hex}	Data carrier selection	All = 0 / Selected = 1
07_{hex}	Max. Tags	Maximum number of tags.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Data is accepted from the processor unit only after the command has been accepted by the processor unit and acknowledged.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Data	Transmission of the data that is to be written from the data carriers.
…	Data	Transmission of the data that is to be written from the data carriers.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

While the command is running (AA = 1, AE = 0, AF = 0), the current status is output in the input buffer.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	AA = 1, A E = 0, AF = 0: Command is running.
01_{hex}	No. of tags	Number of detected tags
02_{hex}	Number of the Tag being Processed	0…255
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

7 Device Functions

Specific commands for BIS VU read/write heads

Upon successful execution (AE = 1, AF = 0), the number of written data carriers is transmitted into the input buffer in the following format:

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	AE = 1, AF = 0: Command finished.
01_{hex}	No. of tags	Number of detected tags.
02_{hex}	Number of Successfully Written Data Carriers	0…255
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

or

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	AF = 1: Status message
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Specific commands for BIS VU read/write heads

Command Identifier 55_{hex}: Return Number of Tags

This command returns the number of data carriers that were found in the active read/write zone of the antenna. Optionally, the total number of data carriers or the number of data carriers selected with the Select command.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	55_{hex}: Return Number of Tags.
02_{hex}	Data carrier selection	All = 0 / Selected = 1
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

If execution is successful, the response is passed to the input buffer in the following format:

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Number of data carriers read	0…255
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

If no tag is identified, this command returns the number "0" and no error message.

or

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Specific commands for BIS VU read/write heads

Command Identifier 56_{hex}: Get RSSI (Receive Signal Strength Indicator)

This command returns the RSSI of a data carrier previously selected with the Select command. The RSSI is a value which is proportional to the signal strength of the received response signal from the data carrier.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	56_{hex}: Get RSSI
02_{hex}	RSSI Type	0: Real-time RSSI 1: Pilot Tone RSSI 2: Data RSSI
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

The RSSI value is returned in the form of an I component and a Q-component as a power level measured in dBm.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	I-value	
02_{hex}	Q-value	
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

or

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Specific commands for BIS VU read/write heads

57_{hex}: Lock

The Lock command can block read or write access, as well as access of any kind, to memory areas (RES, EPC, TID, USER) of a UHF data carrier. Depending on the level of security, the memory areas can be password protected or completely blocked. The Mask and Action fields specify which memory areas receive a new Lock Status and how these should appear. Using Bit Masks allows the Lock Status of multiple memory areas to be changed at the same time.

Note
In order to successfully execute the Lock command, it is necessary to first provide the correct Access Password for the data carrier via a Write Parameter command. Passwords (Access and Kill) are stored in the *Reserved* memory area.

Mask: Bit Mask (16-Bit), used to determine which memory area of the selected data carrier should be processed with respect to its Lock Status.

0: Memory area is not affected by the *Action* field
1: Memory area is affected by the *Action* field

Action: Bit Mask (16-Bit), used to determine how the Lock Status of the respective memory areas should be changed.
The Lock Status can be set for individual memory areas by setting or resetting the *Lock* and *Permalock* bits.

Bit No.	7	6	5	4	3	2	1	0
Memory area	Access PW	Access PW	EPC	EPC	TID	TID	USER	USER
Mask[0]	Mask	Mask	Mask	Mask	Mask	Mask	Mask	Mask
Action[0]	Lock	Perma-lock	Lock	Perma-lock	Lock	Perma-lock	Lock	Perma-lock

Bit No.	15	14	13	12	11	10	9	8
Memory area	Not used						Kill PW	Kill PW
Mask[1]							Mask	Mask
Action[1]							Lock	Perma-lock

Lock Status of the *EPC, TID* and *USER* memory areas:

Lock	Permalock	Lock Status	
0	0	Read and Write:	No Password
0	1	Read and Write: (State can no longer be changed)	No Password
1	0	Read: Write:	No Password Access Password
1	1	Read: Write: (State can no longer be changed)	No Password Access Password

Specific commands for BIS VU read/write heads

> **Note**
> The *TID* memory area is inherently read-only regardless of the Lock Status and can only be read.

Lock Status of the *Reserved* memory area (*Access* Password and *Kill* Password)

Lock	Permalock	Lock Status	
0	0	Read and Write:	No Password
0	1	Read and Write: (State can no longer be changed)	No Password
1	0	Read and Write:	Access Password
1	1	Read and Write: (State can no longer be changed)	Not Possible

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	57_{hex}: Lock.
02_{hex}	Mask[0]	
03_{hex}	Mask[1]	
04_{hex}	Action[0]	
05_{hex}	Action[1]	
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

or

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

BIS M-41_ compatibility mode

Command Identifier 58_{hex}: Activate Custom Parameters

Places the BIS V processor unit into the BIS M-41_ compatibility mode for use of custom read/write commands in connection with BIS M - 1_ _ - 07 type data carriers.

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Command Identifier	58_{hex}: Set Custom Parameters
02_{hex}	Custom Parameter	Read/Write with Custom Option 0: deactivated 1: activated
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

or

Input Buffer: Status Message

Subaddress	Meaning	Description of Function
00_{hex}	1st Bit Header	
01_{hex}	Status code	Provides information on the status of a query.
…	None	No meaning
Last byte	2nd Bit Header	If the 1st and 2nd bit headers match, the data is valid.

Communication

Communication between the controlling system and processor unit is defined by a trace. Communication between the host control system and the processor unit is implemented using a control bit in the output and input buffers.

Basic sequence
1. The controller sends a command identifier to the processor unit in the output buffer with the AV bit set.
   The AV bit tells the processor unit that a job is starting and that the transmitted data is valid.
2. The processor unit accepts the job and confirms the job by setting the AA bit in the input buffer.
3. If additional data needs to be exchanged for the job, readiness for additional data exchange is indicated by inverting the TI and TO toggle bits.
4. The processor unit has correctly executed the job and sets the AE bit into the input buffer.
5. The controller has accepted all of the data. The AV bit in the output buffer is reset.
6. The processor unit resets all of the control bits set in the input buffer during the job (AA bit, AE bit). The processor unit is ready for the next job.

Read/write times

> **Note**
> All specifications are typical values. Deviations are possible depending on the application and combination of R/W head and data carrier.
> The specifications apply to static operation; no CRC_16 data checking.
> All specified read/write times are based on the communication between the data carrier and the read/write head. The times for the data communication between the processor unit and the host control system are not included.

7 Device Functions

For read/write heads BIS VM

Mifare:

Read times Data carrier with 16 bytes per block	
Data carrier detection	~ 20 ms
Read bytes 0 to 15	~ 25 ms
For each additional 16-byte block started	~ 10 ms

Write times Data carrier with 16 bytes per block	
Data carrier detection	~ 20 ms
Write bytes 0 to 15	~ 60 ms
For each additional 16-byte block started	~ 30 ms

ISO 15693:

Read times Data carrier with 16 bytes per block	
Data carrier detection	~ 20 ms
Read bytes 0 to 15	~ 25 ms
For each additional 16-byte block started	~ 10 ms

Write times Data carrier with 16 bytes per block		
	FRAM (BIS M-1_ _-02/20)	EEPROM (BIS M-1_ _-03/07/08)
Data carrier detection	~ 20 ms	~ 20 ms
Write bytes 0 to 15	~ 60 ms	~ 80 ms
For each additional 16-byte block started	~ 25 ms	~ 80 ms

High speed*:

Read times Data carrier with 64 bytes per block	
Data carrier detection	~ 20 ms
Read bytes 0 to 63	~ 14 ms
For each additional 64-byte block started	~ 6 ms

Write times Data carrier with 64 bytes per block	
Data carrier detection	~ 20 ms
Write bytes 0 to 63	~ 30 ms
For each additional 64-byte block started	~ 15 ms

*These times apply only for the combination of BIS VM-3_ _-**4**01-S4 read/write head with BIS M-1_ _-**11**/A, BIS M-1_ _-**13**/A, BIS M-1_ _-**14**/A, or BIS M-1_ _-**15**/A data carriers.

7 Device Functions

For read/write heads BIS VL

Read times:

Data carrier with 16 bytes per block	BIS L-1_ _
Data carrier detection	~ 110 ms
Read bytes 0 to 15	~ 175 ms
For each additional 16-byte block started	~ 40 ms

Data carrier BIS L-2_ _
Data carrier detection + Read data carrier ≤ 140 ms

Write times:

Data carrier with 16 bytes per block	BIS L-1_ _
Data carrier detection	~ 110 ms
Write bytes 0 to 15	~ 285 ms
For each additional 16-byte block started	~ 100 ms

Data carrier BIS L-2_ _
Writing not possible

For read/write heads BIS C

Read times in static mode

Data carrier with 32 bytes per block	
No. of bytes	**Read time [ms]**
0 to 31	110
For each additional 32-byte block started	120

Data carrier with 64 bytes per block	
No. of bytes	**Read time [ms]**
0 to 63	220
For each additional 64-byte block started	230

Write times in static mode

Data carrier with 32 bytes per block	
No. of bytes	**Read time [ms]**
0 to 31	110 + n * 10
≥ 32 bytes	y * 120 + n * 10

Data carrier with 64 bytes per block	
No. of bytes	**Read time [ms]**
0 to 63	220 + n * 10
≥ 64 bytes	Y * 230 + n * 10

n = Number of contiguous bytes to write
y = Number of blocks to be processed

7 Device Functions

For read/write heads BIS C

Example: 17 bytes should be written starting at address 187. Data carrier = 32 bytes per block. Blocks 5 and 6 are processed, since the start address 187 is in block 5 and end address 203 is in block 6.
t = 2 * 120 + 17 * 10 = 410

Read times within the first block in dynamic mode

Data carrier with 32 bytes per block	
No. of bytes	**Read time [ms]**
0 to 3	14
For each additional byte	3,5
0 to 31	112

Data carrier with 64 bytes per block	
No. of bytes	**Read time [ms]**
0 to 3	14
For each additional byte	3,5
0 to 63	224

m = Highest address to read
Formula: t = (m + 1) * 3.5 ms

Example: Read 11 bytes starting at address 9. This means that the largest address to be read is 19. This yields 70 ms.

Note
Dynamic operation with BIS C: The times indicated apply after the data carrier has been detected. Otherwise 45 ms must be added for powering up until the data carrier is recognized. To achieve the read times specified in dynamic operation, the Tag Type parameter has to be set to "BIS C 32 Byte" or "BIS C 64 Byte" on the respective head.

7 Device Functions

7.3 Function Indicator

The operating states of the identification system, the PROFIBUS DP interface and the IO-Link master are displayed using LEDs.

Overview of display elements

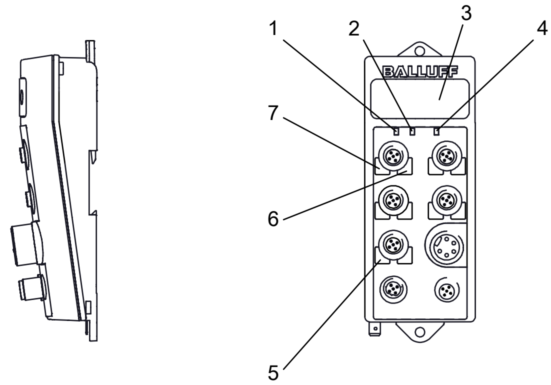


Figure 13: Function Indicators

1 Ready device (RD)
2 Bus ready (BR) PROFIBUS
3 Display
4 Bus failure (BF) PROFIBUS
5 Service/IO-Link
6 COM R/W head
7 RD R/W head

Device LEDs

Indicator	Function		
	Ready device (RD) (Green)	Bus ready (BR) (green)	Bus Failure (BF) (Red)
Off	Device is not ready for operation	No voltage or no PROFIBUS	No voltage or no PROFIBUS
LED lights up	Device is ready for operation	Device in cyclical data exchange	Bus error

R/W head LEDs

Indicator	Function	
	RD R/W head (Green)	COM R/W head (Yellow)
Off	Not ready	No data carrier detected
LED lights up	Ready for Operation	Data carrier detected (CP)
LED flashes	Cable break or R/W head not connected	Data carrier is being processed

7 Device Functions

IO-Link port LED The IO port is assigned an LED for displaying the operational status.

Indicator	Function	
	IO-Link	**Input**
Off	PROFIBUS not yet started	Signal = 0
Yellow	–	Signal = 1
Red	Error	SC*
Green	IO-Link communication active	–
Flashing green	No IO-Link communication	–

* Short-circuit at PIN 1. In this case, the LED lights up in red.

7.4 Examples

1. Reading 30 bytes at R/W head 1, start address 10

Once enough data has been read during the execution of the read job to fill the input buffer for R/W Head 1, the data will be transmitted to the input buffer. The AE bit is not set until the processor unit has finished the "Read" operation.
The "Job End" (AE bit) response is reliably set no later than before the last data has been sent. This timing depends on the requested volume of data and the time response of the controller. In the example, the use of italics for "*Set AE Bit*" calls your attention to this fact.

Control

1. Process output buffer (note sequence):

01_{hex}	Command designator 01_{hex}
02_{hex}	Start address $0A_{hex}$
03_{hex}	Start address 00_{hex}
04_{hex}	No. of bytes $1E_{hex}$
05_{hex}	No. of bytes 00_{hex}
$00_{hex}/0F_{hex}$	Set AV Bit

Identification System

2. Process Input Buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit
$01...0E_{hex}$	Enter first 14 bytes
$00_{hex}/0F_{hex}$	Invert TO bit
$00_{hex}/0F_{hex}$	*Set AE bit*

3. Process input buffer:

$01...0E_{hex}$	Copy first 14 bytes

Process output buffer:

$00_{hex}/0F_{hex}$	Invert TI bit

4. Process input buffer:

$01...0E_{hex}$	Enter second 14 bytes
$00_{hex}/0F_{hex}$	Invert TO bit
$00_{hex}/0F_{hex}$	*Set AE bit*

5. Process input buffer:

$01...0E_{hex}$	Copy second 14 bytes

Process output buffer:

$00_{hex}/0F_{hex}$	Invert TI bit

6. Process input buffer:

$01...02_{hex}$	Enter last bytes
$00_{hex}/0F_{hex}$	Invert TO bit
$00_{hex}/0F_{hex}$	*Set AE bit*

7. Process input buffer:

$01...02_{hex}$	Copy last bytes

Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

8. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AE bits

Examples

2. Reading 30 bytes at R/W head 1, start address 10, problem during reading

Note
If a problem occurs, the AF bit is set with the corresponding status number instead of the AE bit. Setting the AF bit cancels the job and declares it as finished.

Control

1. Process output buffer (note sequence):

01_{hex}	Command designator 01_{hex}
02_{hex}	Start address $0A_{hex}$
03_{hex}	Start address 00_{hex}
04_{hex}	No. of bytes $1E_{hex}$
05_{hex}	No. of bytes 00_{hex}
$00_{hex}/0F_{hex}$	Set AV Bit

Identification System

2. Process Input Buffer (note sequence):
If problem occurs immediately!

$00_{hex}/0F_{hex}$	Set AA bit
01_{hex}	Enter status number
$00_{hex}/0F_{hex}$	Set AF bit

3. Process input buffer:

01_{hex}	Copy status number

Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

4. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AF bits

7 Device Functions

Examples

3. Reading 30 bytes at R/W head 1, start address 10, problem during reading

> **Note**
> If a problem occurs after transmission of the data has started, the AF bit is provided instead of the AE bit together with a corresponding status number. The AF status message is dominant. Which data is incorrect cannot be specified. Setting the AF bit cancels the job and declares it as finished.

Control

1. Process output buffer (note sequence):

01_{hex}	Command designator 01_{hex}
02_{hex}	Start address $0A_{hex}$
03_{hex}	Start address 00_{hex}
04_{hex}	No. of bytes $1E_{hex}$
05_{hex}	No. of bytes 00_{hex}
$00_{hex}/0F_{hex}$	Set AV Bit

Identification System

2. Process Input Buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit
$01…0E_{hex}$	Enter first 14 bytes
$00_{hex}/0F_{hex}$	Invert TO bit

3. Process input buffer:

$01…0E_{hex}$	Copy first 14 bytes

Process output buffer:

$00_{hex}/0F_{hex}$	Invert TI bit

4. Process input buffer:
If a problem has occurred!

01_{hex}	Enter status number
$00_{hex}/0F_{hex}$	Set AF bit

5. Process input buffer:

$01…0E_{hex}$	Copy status number

Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

6. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AF bits

Examples

4. Writing 30 bytes at R/W head 1, start address 20

Control

1. Process output buffer (note sequence):

01_{hex}	Command designator 02_{hex}
02_{hex}	Start address 14_{hex}
03_{hex}	Start address 00_{hex}
04_{hex}	No. of bytes $1E_{hex}$
05_{hex}	No. of bytes 00_{hex}
$00_{hex}/0F_{hex}$	Set AV Bit

Identification System

2. Process Input Buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit, invert TO bit

3. Process output buffer:

$01...0E_{hex}$	Enter first 14 bytes
$00_{hex}/0F_{hex}$	Invert TI bit

4. Process output buffer:

$01...0E_{hex}$	Copy first 14 bytes

Process input buffer:

$00_{hex}/0F_{hex}$	Invert TO bit

5. Process output buffer:

$01...0E_{hex}$	Enter second 14 bytes
$00_{hex}/0F_{hex}$	Invert TI bit

6. Process output buffer:

$01...0E_{hex}$	Copy second 14 bytes

Process input buffer:

$00_{hex}/0F_{hex}$	Invert TO bit

7. Process output buffer:

$01...02_{hex}$	Enter last 2 bytes
$00_{hex}/0F_{hex}$	Invert TI bit

8. Process output buffer:

$01...02_{hex}$	Copy last 2 bytes

Process input buffer:

$00_{hex}/0F_{hex}$	Set AE bit

9. Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

10. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AE bits

Examples

5. Copying data from one data carrier to another

The data from one data carrier at a read/write head (source) is copied to a data carrier in front of another read/write head (target). The data carriers have to be in front of the read/write heads (even if dynamic mode has been configured) and must have the specified address range. The command is processed in the buffer of the source head.

In the example, 17 bytes starting from address 10 of the data carrier are to be copied to the data carrier in front of read/write head 3 starting from address 35.

Control

1. Process output buffer (note sequence):

01_{hex}	Command designator 11_{hex}
02_{hex}	Source start address $0A_{hex}$
03_{hex}	Source start address 00_{hex}
04_{hex}	Target start address 23_{hex}
05_{hex}	Target start address 00_{hex}
06_{hex}	No. of bytes 11_{hex}
07_{hex}	No. of bytes 00_{hex}
08_{hex}	Target head number 03_{hex}
$00_{hex}/0F_{hex}$	Set AV Bit

3. Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

Identification System

2. Process Input Buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit, Set AE bit

4. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AE bits

Examples

6. Writing to a data carrier with a constant value

A data carrier is to be written with 1000 bytes (constant value) starting from start address 80.

Control

1. Process output buffer (note sequence):

01_{hex}	Command designator 32_{hex}
02_{hex}	Start address 50_{hex}
03_{hex}	Start address 00_{hex}
04_{hex}	Number of bytes $E8_{hex}$
05_{hex}	No. of bytes 03_{hex}
$00_{hex}/0F_{hex}$	Set AV Bit

Identification System

2. Process Input Buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit, invert TO bit

3. Process output buffer:

01	Enter constant value
$00_{hex}/0F_{hex}$	Invert TI bit

4. Process output buffer:

01	Copy constant value

Process input buffer:

$00_{hex}/0F_{hex}$	Set AE bit

5. Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

6. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AE bits

Examples

7. Initializing a data carrier for CRC

The sequence for CRC initialization is similar to a write command. The start address and the number of bytes must correspond to the maximum amount of data used.
In the example the complete memory area of a data carrier (752 bytes) is used. 658 bytes on the data carrier are available as data bytes, since 94 bytes are required for the CRC.

Control

1. Process output buffer (note sequence):

01_{hex}	Command designator 12_{hex}
02_{hex}	Start address 00_{hex}
03_{hex}	Start address 00_{hex}
04_{hex}	No. of bytes 92_{hex}
05_{hex}	No. of bytes 02_{hex}
$00_{hex}/0F_{hex}$	Set AV Bit

Identification System

2. Process Input Buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit, invert TO bit

3. Process output buffer:

$01…0E_{hex}$	Enter first 14 bytes
$00_{hex}/0F_{hex}$	Invert TI bit

4. Process output buffer:

$01…0E_{hex}$	Copy first 14 bytes

Process input buffer:

$00_{hex}/0F_{hex}$	Invert TO bit

5. Process output buffer:

$01…0E_{hex}$	Enter second 14 bytes
$00_{hex}/0F_{hex}$	Invert TI bit

6. Process output buffer:

$01…0E_{hex}$	Copy second 14 bytes

Process input buffer:

$00_{hex}/0F_{hex}$	Invert TO bit

95. Process output buffer:

$01…08_{hex}$	Enter last bytes
$00_{hex}/0F_{hex}$	Invert TI bit

96. Process output buffer:

$01…08_{hex}$	Copy last bytes

Process input buffer:

$00_{hex}/0F_{hex}$	Set AE bit

97. Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

98. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AE bits

Examples

8. Creating a basic state for a R/W head or switching off a R/W head

The read/write heads for the identification system can be put into a basic state independently of each other and the respective read/write head can be shut off.

Control

1. Process output buffer:

$00_{hex}/0F_{hex}$	Set GR bit

Identification System

2. Go to the default state.
Process input buffer:

$00_{hex}/0F_{hex}$	Reset BB bit

⇒ R/W head is shut off

Control

3. Process output buffer:

$00_{hex}/0F_{hex}$	Reset GR bit

Identification System

4. Process input buffer:

$00_{hex}/0F_{hex}$	Set BB bit

⇒ R/W head is switched on

9. Switching off a read/write head antenna

During normal operation, all read/write head antennas are switched on. The antenna of a respective R/W head can be switched off by setting the KA bit.

Control

1. Process output buffer:

$00_{hex}/0F_{hex}$	Set KA bit

The R/W head's antenna is switched back on by resetting the KA bit.

Examples

10 Reading the EPCs of multiple data carriers in front of the antenna (only BIS VU)

For configuration with 16-byte buffer size!

With a maximum number of 5, EPC size of 12 bytes configured, 3 data carriers identified

Control / **Identification System**

1. Process output buffer (note sequence):

01_{hex}	Command designator 47_{hex}
02_{hex}	Type EPC 00_{hex}
03_{hex}	Max. number 05_{hex}
00_{hex}/$0F_{hex}$	Set AV Bit

2. Process Input Buffer (note sequence):

00_{hex}/$0F_{hex}$	Set AA bit
01_{hex}	Number of data carriers 03_{hex}
02_{hex}	Number of bytes per EPC $0C_{hex}$
03_{hex}…$0E_{hex}$	First EPC 12 bytes
00_{hex}/$0F_{hex}$	Set AE bit

3a. Process input buffer:

01_{hex}	Note number of data carriers
02_{hex}	Save number of bytes
03_{hex} /$0E_{hex}$	Copy first EPC 12 bytes

3b. Process output buffer:

00_{hex}/$0F_{hex}$	Invert TI bit

4. Process input buffer:

01…$0C_{hex}$	Enter second EPC 12 bytes
$0D_{hex}$ /$0E_{hex}$	Enter third EPC 2 bytes
00_{hex}/$0F_{hex}$	Invert TO bit

5a. Process input buffer:

01_{hex}…$0C_{hex}$	Copy second EPC 12 bytes
$0D_{hex}$ /$0E_{hex}$	Copy third EPC 2 bytes

5b. Process output buffer:

00_{hex}/$0F_{hex}$	Invert TI bit

6. Process input buffer:

01_{hex}…$0A_{hex}$	Enter third EPC 10 bytes
00_{hex}/$0F_{hex}$	Invert TO bit

7a. Process input buffer:

01_{hex} /$0A_{hex}$	Copy third EPC 10 bytes

7b. Process output buffer:

00_{hex}/$0F_{hex}$	Reset AV bit

8. Process input buffer:

00_{hex}/$0F_{hex}$	Reset AA and AE bits

7 Device Functions

Examples

11. Selecting a data carrier for further processing (only BIS VU)

For configuration with 16-byte buffer size!

For configuration with EPC size of 12 bytes

Control

1. Process output buffer (note sequence):

01_{hex}	Command designator 40_{hex}
02_{hex}	Type EPC 00_{hex}
03_{hex}	Length of the EPC $0C_{hex}$
04_{hex}	Reserved 00_{hex}
05_{hex}	Reserved 00_{hex}
06_{hex}	Reserved 00_{hex}
$00_{hex}/0F_{hex}$	Set AV Bit

Identification System

2. Process Input Buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit, Invert TO bit

3. Process output buffer:

$01_{hex}...0C_{hex}$	Enter 12 bytes EPC
$00_{hex}/0F_{hex}$	Invert TI bit

4a. Process output buffer:

$01_{hex}...0C_{hex}$	Save EPC

4b. Process input buffer:

$00_{hex}/0F_{hex}$	Set AE bit

5. Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

6. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AE bits

Examples

12. Bulk Write (only BIS VU)

Write to all data carriers that are located in front of the antenna. Write 16 bytes starting at data carrier address 3.

Control / **Identification System**

1. Process output buffer (note sequence):

01_{hex}	Command designator 54_{hex}
02_{hex}	Start address 03_{hex}
03_{hex}	Start address 00_{hex}
04_{hex}	No. of bytes 10_{hex}
05_{hex}	No. of bytes 00_{hex}
06_{hex}	Subset Type 00_{hex}
07_{hex}	Max Tags FF_{hex}
$00_{hex}/0F_{hex}$	Set AV Bit

2. Process Input Buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit, invert TO bit

3. Process output buffer:

$01...0E_{hex}$	Enter first 14 bytes
$00_{hex}/0F_{hex}$	Invert TI bit

4a. Process output buffer:

$01...0E_{hex}$	Copy first 14 bytes

4b. Process input buffer:

$00_{hex}/0F_{hex}$	Invert TO bit

5. Process output buffer:

$01...02_{hex}$	Enter the last 2 bytes
$00_{hex}/0F_{hex}$	Invert TI bit

6a. Process output buffer:

$01...02_{hex}$	Copy last 2 bytes

6b. Process input buffer:

01_{hex}	Enter the number of tags found
02_{hex}	Enter the number of successfully written tags
$00_{hex}/0F_{hex}$	Set AE bit

7. Process input buffer:

01_{hex}	Copy the number of tags found
02_{hex}	Copy the number of successfully written tags

Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

8. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AE bits

Examples

13. Bulk Read (only BIS VU)

Read from all data carriers that are located in front of the antenna. Read 4 bytes starting at data carrier address 3.

Control / **Identification System**

1. Process output buffer (note sequence):

01_{hex}	Command designator 53_{hex}
02_{hex}	Start address 03_{hex}
03_{hex}	Start address 00_{hex}
04_{hex}	No. of bytes 04_{hex}
05_{hex}	No. of bytes 00_{hex}
06_{hex}	Subset Type 00_{hex}
07_{hex}	Max Tags FF_{hex}
$00_{hex}/0F_{hex}$	Set AV Bit

2. Process Input Buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit
01_{hex}	Enter the number of tags
02_{hex}	Enter the number of bytes per tag
03_{hex} ... $0E_{hex}$	Enter 12 bytes of data and the check byte
$00_{hex}/0F_{hex}$	Invert TO bit
$00_{hex}/0F_{hex}$	Set AE bit

3a. Process input buffer:

01_{hex}	Copy the number of tags
02_{hex}	Copy the number of bytes per tag
03_{hex}...06_{hex}	Copy the 4th byte of data for the 1st tag
07_{hex}	Read the check byte
08_{hex}...$0b_{hex}$	Copy the 4th byte of data for the 2nd tag
$0C_{hex}$	Read the check byte
$0D_{hex}$ /$0E_{hex}$	Copy the 2nd byte of data for the 3rd tag

3b. Process output buffer:

$00_{hex}/0F_{hex}$	Invert TI bit

4. Process input buffer:

01_{hex}...08_{hex}	Enter l8 bytes of data and the check byte
$00_{hex}/0F_{hex}$	Invert TO bit
$00_{hex}/0F_{hex}$	Set AE bit

5a. Process input buffer:

01_{hex}...02_{hex}	Copy the 2nd byte of data for the 3rd tag
03_{hex}	Read the check byte
04_{hex}...07_{hex}	Copy the 4th byte of data for the 4th tag
08_{hex}	Read the check byte

5b. Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

6a. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AE bits

Examples

14. Reading the read/write head parameters (only BIS VU)

Reading the parameter max EPC length (Parameter 0003_{hex}) from one BIS VU read/write head.

Control

1. Process output buffer (note sequence):

01_{hex}	Command designator 49_{hex}
02_{hex}	Parameter 03_{hex}
03_{hex}	Parameter 00_{hex}
$00_{hex}/0F_{hex}$	Set AV Bit

Identification System

2. Process Input Buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit
01_{hex}	Enter the number of parameters
02_{hex}	Enter parameter data
$00_{hex}/0F_{hex}$	Set AE bit

3a. Process input buffer:

01_{hex}	Read parameter length
02_{hex}	Copy parameter data

3b. Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

4. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AE bits

15. Unselect (only BIS VU)

Undoing a data carrier selection that was made with the Select command.

Control

1. Process output buffer (note sequence):

01_{hex}	Command designator 41_{hex}
$00_{hex}/0F_{hex}$	Set AV Bit

Identification System

2. Process Input Buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit
$00_{hex}/0F_{hex}$	Set AE bit

3. Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

4. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AE bits

7 Device Functions

Examples

16. Setting the read/write head parameters (only BIS VU)

Setting an access password (Parameter 1002_{hex}) for accessing a password-protected data carrier.

Password: 12345678_{hex}

Control

1. Process output buffer (note sequence):

01_{hex}	Command designator 48_{hex}
02_{hex}	Parameter 02_{hex}
03_{hex}	Parameter 10_{hex}
04_{hex}	Parameter Length 04_{hex}
$00_{hex}/0F_{hex}$	Set AV Bit

Identification System

2. Process Input Buffer (note sequence):

$00_{hex}/0F_{hex}$	Set AA bit, Invert TO bit

3. Process output buffer:

01_{hex}	Parameter Data 78_{hex}
02_{hex}	Parameter Data 56_{hex}
03_{hex}	Parameter Data 34_{hex}
04_{hex}	Parameter Data 12_{hex}
$00_{hex}/0F_{hex}$	Invert TI bit

4a. Process output buffer:

$01…04_{hex}$	Copy parameter data

4b. Process input buffer:

$00_{hex}/0F_{hex}$	Set AE bit

5. Process output buffer:

$00_{hex}/0F_{hex}$	Reset AV bit

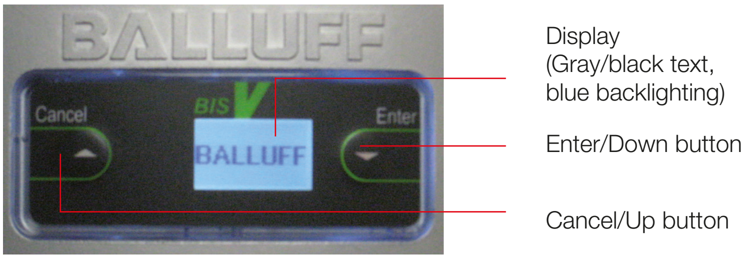
6a. Process input buffer:

$00_{hex}/0F_{hex}$	Reset AA and AE bits

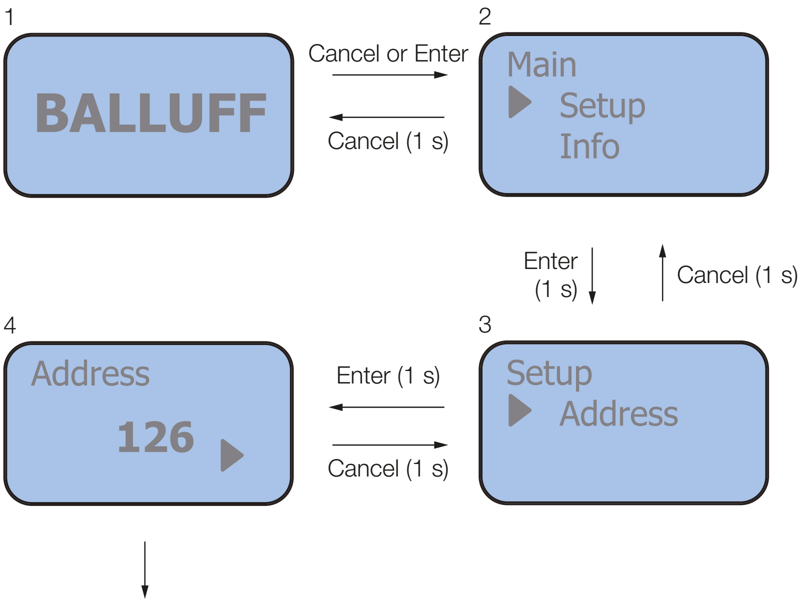
7 Device Functions

7.5 Display

The display provides functions for starting up the BIS V. These can be used to configure the PROFIBUS station address and to output tag data for diagnostic purposes. It is controlled using a 2-button controller.
You can navigate within a menu level by holding the Enter/Down and Cancel/Up buttons for a short time. You can switch between menu levels or confirm or cancel an action by pressing the buttons longer.



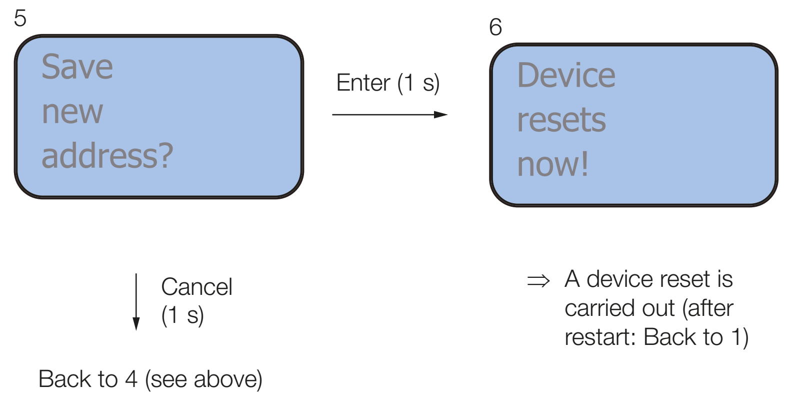
Setting the station address



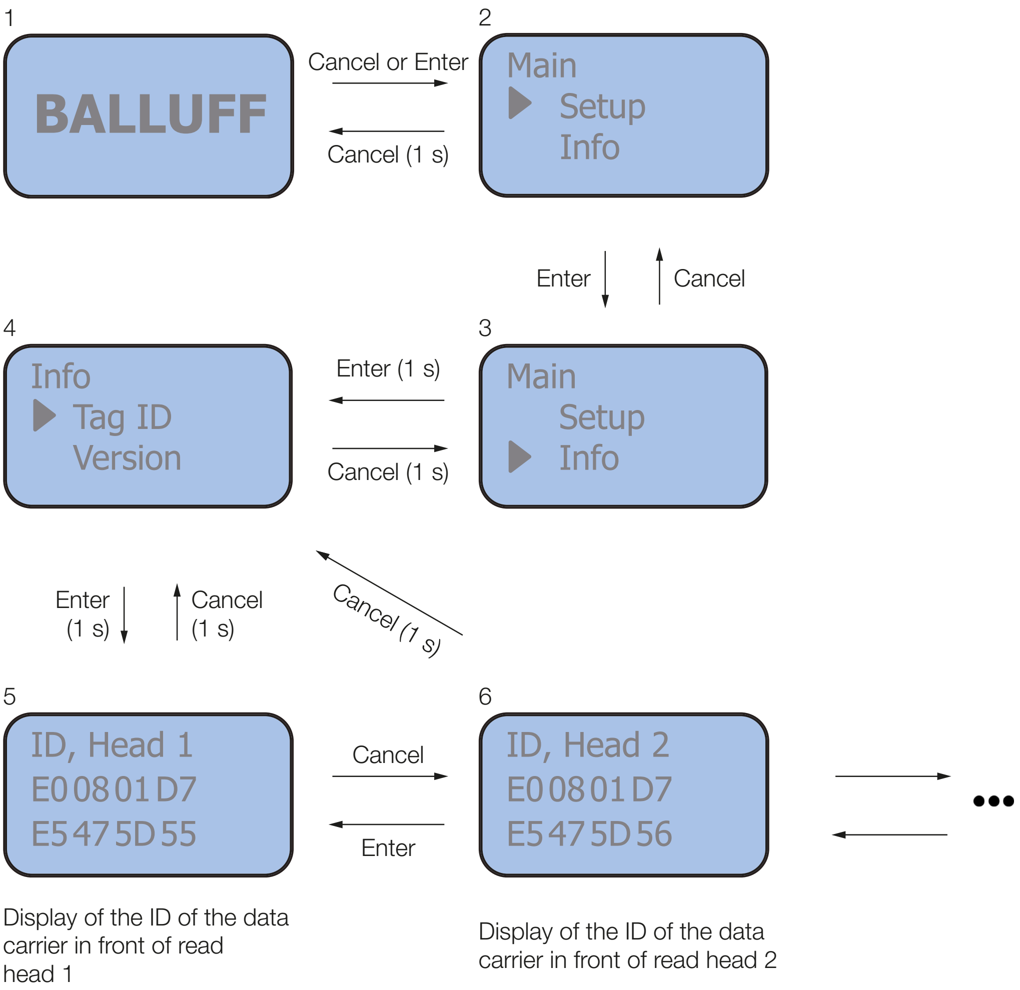
- ► You switch through the positions (1st, 2nd, 3rd) using Enter/Down.
  ⇒ The current position starts flashing.
- ► Press Cancel/Up to increase the number at the currently selected position.
- ► Pressing Cancel (1 s) cancels the configuration.
  ⇒ Back to 4; the currently configured station address is shown.
- ► Press Enter (1 s) to confirm the configured address.

7 Device Functions

Setting the station address



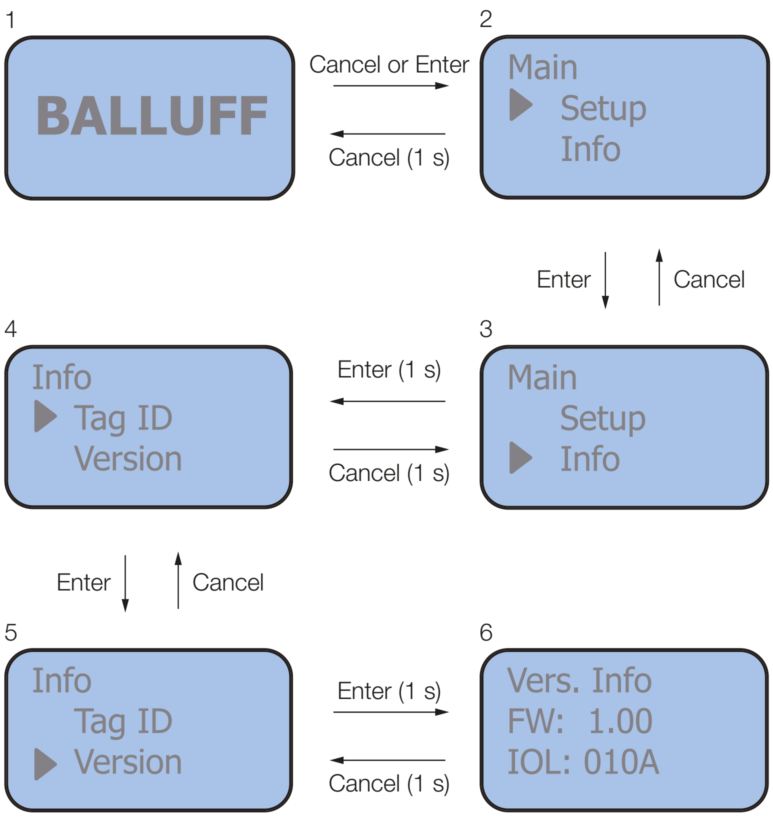
Displaying tag data



When selecting Head_IDs 1…4 (5, 6, etc.), you can hold down Cancel for 1 second to jump back to 4.

7 Device Functions

Version display



Two versions are displayed:
- The firmware version of the device (here 1.00)
- The software version of the IO-Link firmware (010A)

8 Diagnostics

8.1 Diagnostics Telegram

The diagnostics telegram is made up of various blocks. The first 6 bytes (standard diagnostics) are defined by PROFIBUS standard EN 50170. If a problem occurs, expanded diagnostics follow. 2 bytes of ID-specific diagnostics, 6 bytes of device-specific diagnostics and then 3 bytes for each group of channel-related diagnostics.
A diagnostics telegram consists of at least 6 bytes and at most 244 bytes.

Normal diagnostics

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Status 1							
1	Status 2							
2	Status 3							
3	Master address							
4	Ident_Number_High_Byte $0D_{hex}$							
5	Ident_Number_Low_Byte $A9_{hex}$							

Note
For coding standard-specific diagnostics: 1 = enabled, 0 = disabled.

Coding of the Standard Diagnostics

The following describes coding for standard diagnostic bytes 0...3. Byte 4 and Byte 5 (ID number) are fixed.

Status 1

Byte 0, status 1:

Bit	Meaning
0	**Station_non_existent** The DP Slave always sets the bit to 0. The DP Master sets it to 1 if the DP Slave cannot be reached.
1	**Station_not_ready** The DP Slave sets the bit to 1 if it is not yet ready for the data exchange.
2	**Cfg fault** The DP Slave sets the bit to 1 if the configuration data last received from the Master does not agree with that which the DP Slave detected.
3	**Ext_diag** If the bit is set to 1, there is a diagnostics entry in the slave-specific diagnostics area (Ext_Diag_Data). A further diagnostic follows in the telegram.
4	**Not supported** The DP slave sets the bit to 1 if an unsupported function was requested.
5	**Invalid_Slave-Response** The DP slave always sets the bit to 0. The master sets it to 1 if it receives an implausible response from the DP slave.
6	**Prm_fault** The slave sets the bit to 1 if the last parameter telegram was defective (e.g. wrong length, wrong ID number, invalid parameters).
7	**Master_lock** The DP Slave always sets the bit to 0. The DP Master sets it to 1 if the parameters for the DP Slave were configured by a different Master (Lock from another Master; In this case: Address in Byte 3 not equal to FF_{hex} and not equal to its own address).

8 Diagnostics

Status 2

Byte 1, status 2:

Bit	Meaning
0	**Prm_req** The DP slave always sets the bit to 1 if it needs to be reconfigured and parameterized. The bit remains set until the parameters have been configured.
1	**Stat_Diag** (Statistical Diagnostics) The Slave sets the bit to 1 if, for example, it cannot send valid data. In this case, the DP master fetches diagnostic data until the bit is reset to 0.
2	**Fixed at 1**
3	**WD_On** Response monitoring enabled/disabled (watchdog on).
4	**Freeze_Mode** The Slave sets the bit to 1 if it has received the Freeze command.
5	**Sync_Mode** The Slave sets the bit to 1 if it has received the Sync command.
6	**Not_Present** The DP slave always sets the bit to 0. The DP master sets it to 1 for DP slaves not contained in the master parameter set.
7	**Deactivated** The DP Slave always sets the bit to 0. The DP Master sets it to 1 if the DP Slave is removed from the Master parameter set.

Status 3

Byte 2, status 3:

Bit	Meaning
0…6	Reserved
7	**Ext_Diag_Overflow** If this bit is set, there is more diagnostic information than is indicated in **Ext_Diag_Data**. For example, the DP slave sets the bit to 1 if there is more channel-related diagnostic information than the DP slave can enter in its send buffer. A DP Master sets the bit to 1 if the DP Slave sends more diagnostic information than the Master can hold in its diagnostics buffer.

Address

Byte 3, address of the master:

Bit	Meaning
0…7	**Master_Add** After configuring the parameters, the address is entered for the DP Master that configured the parameters for the DP Slave. If a DP slave's parameters were not configured by a master, it uses the FF_{hex} address.

**Ident_Number_
High_Byte**

Byte 4, ident high:

Bit	Meaning
0…7	$0D_{hex}$

**Ident_Number_
Low_Byte**

Byte 4, ident high:

Bit	Meaning
0…7	$A9_{hex}$

8 Diagnostics

Device-specific diagnostics IO-Link module

Invalid data, defect in module:

Slot		Header + number of bytes in the diagnos-tics	Alarm or status type	Slot number	Status or alarm specifier	Status messages	
S7 Descrip-tion		**1st byte**	**2nd byte**	**3rd byte**	**4th byte**	**5th byte**	**6th byte**
Slot 6	IO-Link pin 4	06_{hex}	82_{hex}	00_{hex}	00_{hex}	00_{hex}	04_{hex}

Invalid data, wrong module:

Slot		Header + number of bytes in the diagnos-tics	Alarm or status type	Slot number	Status or alarm specifier	Status messages	
S7 Descrip-tion		**1st byte**	**2nd byte**	**3rd byte**	**4th byte**	**5th byte**	**6th byte**
Slot 6	IO-Link pin 4	06_{hex}	82_{hex}	00_{hex}	00_{hex}	00_{hex}	08_{hex}

Invalid data, missing module:

Slot		Header + number of bytes in the diagnos-tics	Alarm or status type	Slot number	Status or alarm specifier	Status messages	
S7 Descrip-tion		**1st byte**	**2nd byte**	**3rd byte**	**4th byte**	**5th byte**	**6th byte**
Slot 6	IO-Link pin 4	06_{hex}	82_{hex}	00_{hex}	00_{hex}	00_{hex}	$0C_{hex}$

ID-specific diagnostics IO-Link module

Slot		Header + number of bytes in the diagnostics	Module No. 5 has a diagnostic
S7 Description		**1st byte**	**2nd byte**
Slot 6	IO-Link pin 4	42_{hex}	20_{hex}

8 Diagnostics

Channel-specific Diagnostics

Byte	Bit							
	7	6	5	4	3	2	1	0
0	Header							
1	Channel							
2	Error							

Coding of Channel-specific Diagnostics

Header

Byte 0, header

Bit	Meaning
7…6	Header 2: Channel-specific Diagnostics
5…0	Affected module 5: IO-Link port

Channel

Byte 1, channel

Bit	Meaning
7…6	Type 1: Input 2: Output 3: Input and output
5…0	Number of affected channels in the module 0: IO-Link port 1: IO-Link module

Error

Byte 2, error

Bit	Meaning	
7…5	Format 1: Bit 2: 2 bits 3: 4 bits	 4: Byte 5: Word 6: 2 words
4…0	Error code 1: Short-circuit 2: Undervoltage 3: Overvoltage 4: Overload 5: Overtemperature 6: Cable break 7: Upper limit exceeded 8: Lower limit not reached 9: Error	 10–15: Reserved 16–22: Manufacturer-specific 23: Actuator warning 24: Actuator short circuit 25: Low voltage bus/sensor supply 26: External diagnostic 27: Sensor has wrong configuration 28: Low voltage actuator supply 29–31: Manufacturer-specific

Example

An IO-Link module attached to the IO-Link port with inputs and outputs was removed:

Slot		Header and affected module	Channel	Error
S7 Description		**1st byte**	**2nd byte**	**3rd byte**
Slot 6	IO-Link pin 4	85_{hex}	$C0_{hex}$	06_{hex}

Appendix

Type Code

BIS V – 6 1 02 – 019 – C001

Balluff Identification System

Series V (V = variable)

System component
6 = Processor Unit

Generation (design/material)
1 = Generation 1, 2011 housing design, metal

Interface
02 = PROFIBUS DP
06 = Ethernet/IP
08 = PROFINET
10 = EtherCAT
11 = CC-Link

Software type
019 = PROFIBUS DP

Connection system
C001 = *Power supply:* 5-pin flanged male connector with 7/8" external thread
IO-Link Master and USB: Flanged female connector M12 internal thread, 5-pin, A-coded
PROFIBUS DP Input: Flanged male connector M12 external thread, 5-pin, B-coded
PROFIBUS DP Output: Flanged female connector M12 internal thread, 5-pin, B-coded
4 heads VL/VM and future systems: Flanged female connector M12 internal thread, 5-pin, A-coded
C101 = Similar to C001, also supports BIS C-3_ _ read/write heads (Adapter required)

Accessories (Optional, not included with delivery)

Note
More accessories for the BIS V-6102-_ _ can be found in the Balluff BIS catalog and at www.balluff.com.

Appendix

ASCII Table

Decimal	Hex	Control Code	ASCII
0	00	Ctrl @	NUL
1	01	Ctrl A	SOH
2	02	Ctrl B	STX
3	03	Ctrl C	ETX
4	04	Ctrl D	EOT
5	05	Ctrl E	ENQ
6	06	Ctrl F	ACK
7	07	Ctrl G	BEL
8	08	Ctrl H	BS
9	09	Ctrl I	HT
10	0 A	Ctrl J	LF
11	0B	Ctrl K	VT
12	0C	Ctrl L	FF
13	0D	Ctrl M	CR
14	0E	Ctrl N	SO
15	0F	Ctrl O	SI
16	10	Ctrl P	DLE
17	11	Ctrl Q	DC1
18	12	Ctrl R	DC2
19	13	Ctrl S	DC3
20	14	Ctrl T	DC4
21	15	Ctrl U	NAK
22	16	Ctrl V	SYN
23	17	Ctrl W	ETB
24	18	Ctrl X	CAN
25	19	Ctrl Y	EM
26	1 A	Ctrl Z	SUB
27	1B	Ctrl [	ESC
28	1C	Ctrl \	FS
29	1D	Ctrl]	GS
30	1E	Ctrl ^	RS
31	1F	Ctrl _	US
32	20		SP
33	21		!
34	22		„
35	23		#
36	24		$
37	25		%
38	26		&
39	27		‘
40	28		(
41	29		)
42	2 A		*

Decimal	Hex	ASCII
43	2B	+
44	2C	,
45	2D	-
46	2E	.
47	2F	/
48	30	0
49	31	1
50	32	2
51	33	3
52	34	4
53	35	5
54	36	6
55	37	7
56	38	8
57	39	9
58	3 A	:
59	3B	;
60	3C	<
61	3D	=
62	3E	>
63	3F	?
64	40	@
65	41	A
66	42	B
67	43	C
68	44	D
69	45	E
70	46	F
71	47	G
72	48	H
73	49	I
74	4 A	J
75	4B	K
76	4C	L
77	4D	M
78	4E	N
79	4F	O
80	50	P
81	51	Q
82	52	R
83	53	S
84	54	T
85	55	U

Decimal	Hex	ASCII
86	56	V
87	57	W
88	58	X
89	59	Y
90	5 A	Z
91	5B	[
92	5C	\
93	5D	[
94	5E	^
95	5F	_
96	60	`
97	61	a
98	62	b
99	63	c
100	64	d
101	65	e
102	66	f
103	67	g
104	68	h
105	69	i
106	6 A	j
107	6B	k
108	6C	l
109	6D	m
110	6E	n
111	6F	o
112	70	p
113	71	q
114	72	r
115	73	s
116	74	t
117	75	u
118	76	v
119	77	w
120	78	x
121	79	y
122	7 A	z
123	7B	{
124	7C	|
125	7D	}
126	7E	~
127	7F	DEL

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No. 887556-726 EN · 05.127612 · L18; Subject to modification. Replaces K17.