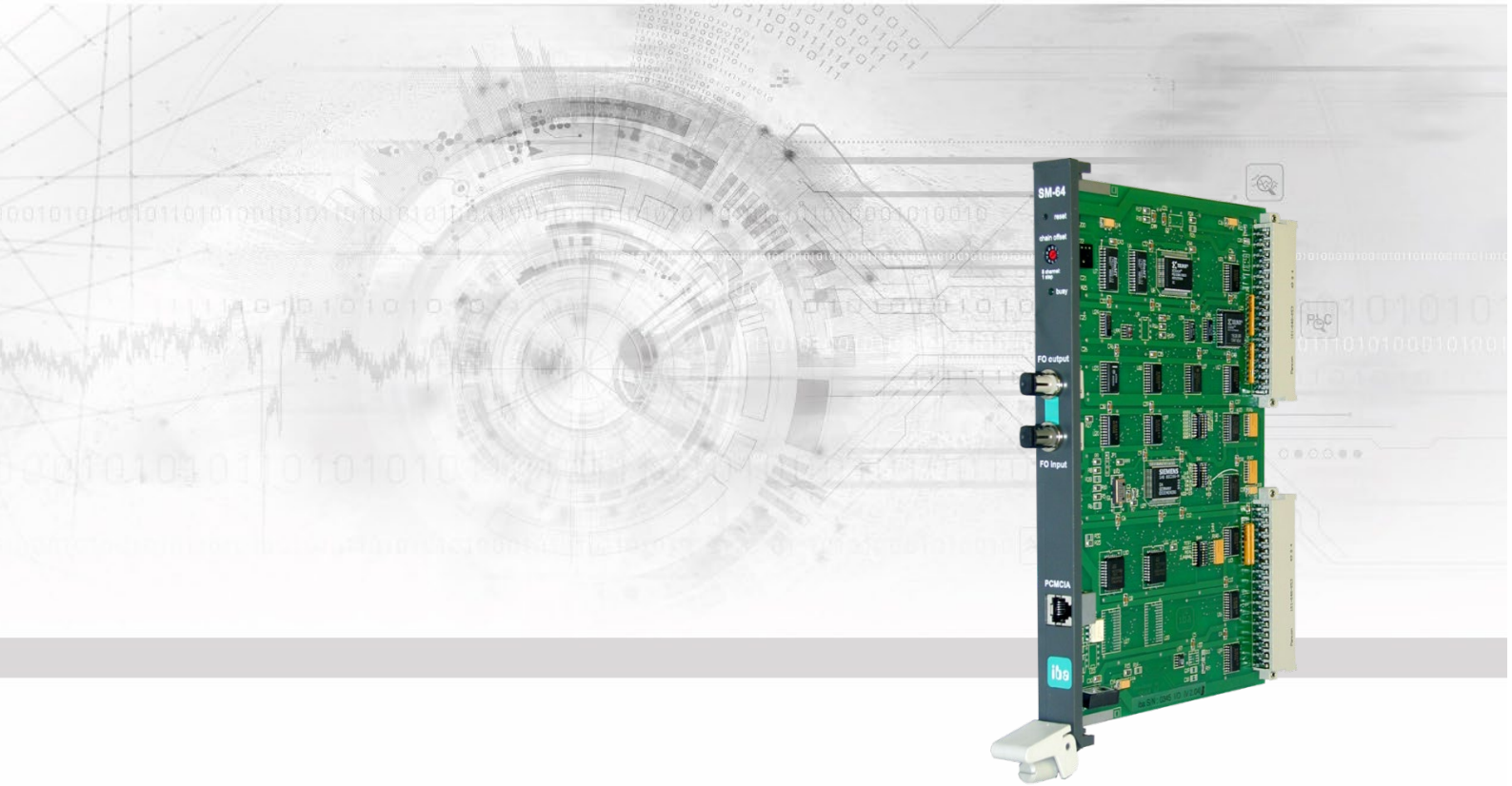

ibaLink-SM-64-io

System Interface for SIMATIC S5 and MMC

Manual

Issue 3.8

Measurement Systems for Industry and Energy

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The content of this publication has been checked for compliance with the described hardware and software. Nevertheless, deviations cannot be excluded completely so that the full compliance is not guaranteed. However, the information in this publication is updated regularly. Required corrections are contained in the following regulations or can be downloaded on the Internet.

The current version is available for download on our web site http://www.iba-ag.com.

Certification

The device is certified according to the European standards and directives. This device corresponds to the general safety and health requirements. Further international customary standards and directives have been observed.

CE

Issue	Date	Revision	Chapter	Author	Version HW / FW
3.8	09-2023	Scope of delivery			

Table of contents

1 About this manual

This manual describes the construction, the use and the operation of the device ibaLink-SM-64-io.

1.1 Target group

This manual addresses in particular the qualified professionals who are familiar with handling electrical and electronic modules as well as communication and measurement technology. A person is regarded to as professional if he/she is capable of assessing safety and recognizing possible consequences and risks on the basis of his/her specialist training, knowledge and experience and knowledge of the standard regulations.

1.2 Notations

The following designations are used in this manual:

Action	Notations
Menu command	Menu *Logic diagram*
Call of menu command	*Step 1 – Step 2 – Step 3 – Step x* Example: Select menu *Logic diagram – Add – New logic diagram*
Keys	<Key name> Example: <Alt>; <F1>
Press keys simultaneously	<Key name> + <Key name> Example: <Alt> + <Ctrl>
Buttons	<Button name> Example: <OK>; <Cancel>
File names, Paths	„File name“, „Path” Example: „Test.doc“

1.3 Used symbols

If safety instructions or other notes are used in this manual, they mean:

⚠ DANGER

The non-observance of this safety information may result in an imminent risk of death or severe injury:

- By an electric shock!
- Due to the improper handling of software products which are coupled to input and output procedures with control function!

If you do not observe the safety instructions regarding the process and the system or machine to be controlled, there is a risk of death or severe injury!

⚠ WARNING

The non-observance of this safety information may result in a potential risk of death or severe injury!

⚠ CAUTION

The non-observance of this safety information may result in a potential risk of injury or material damage!

Note

A note specifies special requirements or actions to be observed.

Tip

Tip or example as a helpful note or insider tip to make the work a little bit easier.

Other documentation

Reference to additional documentation or further reading.

2 Introduction

The card ibaLink-SM-64-io is an interface board in double European size, with modified design for SIMATIC S5 (8 bit and 16 bit) and SIMICRO MMC 216.

It is used for transmission of measured data from a SIMATIC S5 or SIMICRO MMC 216-system to an ibaPDA or ibaLogic system or for realization of a so called frame connection.

The card provides a fiber optical (FO) transmitter and receiver on the front panel.

Up to 64 analog (Integer / Float) and 64 digital signals can be transmitted over these connections.

The ibaLink-SM-64-io-card uses a dedicated memory range on the backplane bus of the S5 or MMC system. The data to be measured are written into this memory range by the system where the card is plugged in and are transmitted over an iba standard fiber optical interface with 3.3 Mbit/s to the iba system.

The fiber optical receiver is used for data being sent from an ibaLogic system to the S5 or MMC system and for input of measured data from other iba systems or devices (ibaPADU, ibaLink-MBII, ibaLink-SM-128V-i-2o etc.) to the S5 or MMC system.

By means of a crossed over point-to-point connection between two ibaLink-SM-64-io cards or an ibaLink-SM-64-io card and another iba component with FO transmitter and receiver in another PLC system, data can be exchanged even without an iba software application.

Warning!

This is a Class A device. This equipment may cause radio interference in residential areas. In this case, the operator will be required to take appropriate measures.

3 Scope of delivery

- ibaLink-SM-64-io board
- S5- function blocks (on the data medium “iba Software & Manuals”)
  - P23-k1st.s5d for S5-115U (941-944) Cache Mode
  - P23-k2st.s5d for S5-115U (945) Cache Mode
  - P23-k3st.s5d for S5-135U (928) Cache Mode
  - P23-k4st.s5d for S5-150U (924-927) Cache Mode
  - P23-k5st.s5d for S5-155U (948) Cache Mode
  - P23-m5st.s5d for S5-155U (948) linear addressing for multi-processor mode

4 System requirements

4.1 Hardware

Control system

- ❑ SIMATIC S5-155U/CPU 948, S5-150U/CPU 924-927, S5-135U/CPU 928B, S5-115U/CPU 941B, 942B, 943B, 944B
- ❑ SIMICRO MMC 216 system with at least one free slot

Accessories

For measurement or analysis of the received data beside the board:

- ❑ PC with one of the following fiber optical interface boards:
  - ibaFOB-io-S or ibaFOB-io-X, resp.
  - ibaFOB-4i-S + ibaFOB-4o or
  - ibaFOB-4i-X + ibaFOB-4o-X as well as
  - ibaFOB-D + ibaFOB-io-ExpressCard
  - also older FOB-F ISA-cards can be used
- ❑ For measuring on a notebook computer an ibaCom-PCMCIA-F card (type 2) and the corresponding spiral cable are required.

In order to realize a frame-to-frame connection a second ibaLink-SM-64-io card or another iba component such as ibaLink-MBII-2io or ibaLink-SM-128V-i-2o (VMEbus) is required.

4.2 Software

Accessories

For further data processing on a connected PC, the following components are required:

- ❑ Online software
  - ibaPDA
  - ibaQDR
  - Signal manager (Soft-PLC) ibaLogic, V3.60 or higher
  - ibaScope, version 3.0.01 or higher
- ❑ Analysis software
  - ibaAnalyzer (V2.50 or higher)

5 Installation / Deinstallation

Each ibaLink-SM-64-io board occupies a single slot in the S5 and/or MMC rack.

⚠ CAUTION

The EGB standards for handling electrostatic sensitive devices must be followed.

Use a ground line or discharge any electrostatic charge from yourself before touching the card.

Avoid direct contact with the connectors.

5.1 Installing the Card

1. Unpack the card carefully. Use a ground line or discharge any electrostatic charge from yourself before touching the card.
2. Put the card with the welded side down on an even, clean and dry surface and make the required settings of the DIL switches.
3. Switch off the S5 and/or MMC rack.
4. Take hold of the card by the two grips between thumb and index finger each.
5. Slide the card into the appropriate slot of the S5 and/or MMC system carefully.
6. Before sliding in the card to the end make sure that the two screws on the rear side of the front panel can slide into the dedicated holes in the rack.
7. Push the card firmly until the end by pressing your thumbs on the front panel.
8. Fix the card to the rack with the two screws on the upper and lower end of the front panel.

5.2 Removing the Card

In order to remove the card from the S5 and/or MMC rack please follow these steps:

1. Switch off the power supply of the S5 and/or MMC rack.
2. Release the screws in the front panel.
3. Press the two grips apart from each other. This will release the card from the back-plane connectors.
4. Pull the card out of the slot.

6 Product Characteristics

6.1 Connectors and Operational Elements on Front Panel

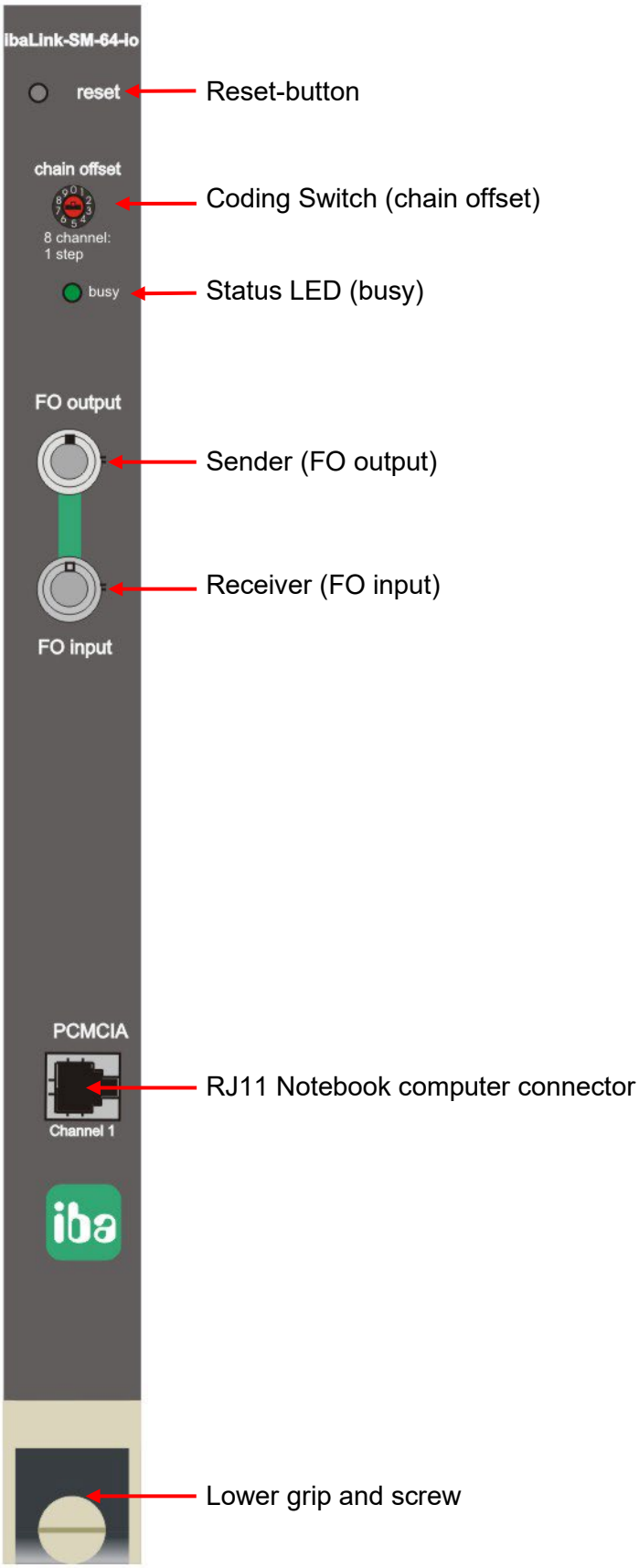


Figure 1: Front panel

6.1.1 Reset Button

Depressing this switch resets the board. When the button is depressed the board can not be accessed by the system. Please note, that in certain instances, this may cause disturbances within a host system, when the ibaLink-SM-64-io card refuses bus access requests during reset.

6.1.2 Coding Switch

The coding switch determines how much data is to be extracted from the local DPR (Dual Port RAM) and how much is to be accepted from the subordinate (cascaded) boards. Linking receive data is only possible with new telegrams.

The cascading setup only recognizes groups of 8 measurement values for both real and integer values. Due to the differing data lengths (4 bytes and 2 bytes), double data words are transmitted for real values and single data words are transmitted for integers. The allocation of the cascade data occurs in the function blocks with offset start and offset end. (see also 6.3)

Reals

Front Switch	Cascaded Data		Local Data	
	Double Word Variable	Bit Variable	Double Word Variable	Bit Variable
Position 0	DD 0 - 126	Bit 0 - 63	-	:
Position 1	DD 16 - 126	Bit 8 - 63	DD 0 - 14	Bit 0 - 7
Position 2	DD 32 - 126	Bit 16 - 63	DD 0 - 30	Bit 0 - 15
Position 3	DD 48 - 126	Bit 24 - 63	DD 0 - 46	Bit 0 - 23
Position 4	DD 64 - 126	Bit 32 - 63	DD 0 - 62	Bit 0 - 31
Position 5	DD 80 - 126	Bit 40 - 63	DD 0 - 78	Bit 0 - 39
Position 6	DD 96 - 126	Bit 48 - 63	DD 0 - 94	Bit 0 - 47
Position 7	DD 112 - 126	Bit 56 - 63	DD 0 - 110	Bit 0 - 55
Position 8	----------	----------	DD 0 - 126	Bit 0 - 63

Default position: 8 (no cascade, all local variables are copied)

Integer

Front Switch	Cascaded Data		Local Data	
	Double Word Variable	Bit Variable	Double Word Variable	Bit Variable
Position 0	DW 0 - 63	Bit 0 - 63	-	:
Position 1	DW 8 - 63	Bit 8 - 63	DW 0 - 7	Bit 0 - 7
Position 2	DW 16 - 63	Bit 16 - 63	DW 0 - 15	Bit 0 - 15
Position 3	DW 24 - 63	Bit 24 - 63	DW 0 - 23	Bit 0 - 23
Position 4	DW 32 - 63	Bit 32 - 63	DW 0 - 31	Bit 0 - 31
Position 5	DW 40 - 63	Bit 40- 63	DW 0 - 39	Bit 0 - 39
Position 6	DW 48 - 63	Bit 48 - 63	DW 0 - 47	Bit 0 - 47
Position 7	DW 56 - 63	Bit 56 - 63	DW 0 - 55	Bit 0 - 55
Position 8	----------	----------	DW 0 - 63	Bit 0 - 63
Position 9	none	none	Reception DW 0 - 63	Reception DW 0 - 63

The switch setting 9 of the rotary switch at the front panel activates the additional receiver mode of the ibaLink-SM-64-io. In this transmission mode it is possible to receive and send 64 analog plus 64 binary signals in both directions. No cascading is possible in this mode of operation

If the rotary switch is turned during operation, incorrect telegrams are generated.

6.1.3 Status LED

LED	Status	Description
busy	blinking	valid 3Mbit telegram
	off	no valid 3Mbit telegram

6.1.4 Fiber Optic Connectors

Connector: ST-Lean for fiber optical cable with 62,5 / 125 µm

Transmitter (FO output): light grey color

Receiver (FO input): dark grey color

6.1.5 RJ11 Socket

Here a notebook can be attached for the parallel measurement of the fiber optic output signals. The measurement of the input signal is not possible at this socket.

6.2 Connectors and Switches on Board

On the assembly side of the board there are three DIL-switches which are used to set the format of the data to be transmitted and received on the fiber optical channels.

Position of the elements

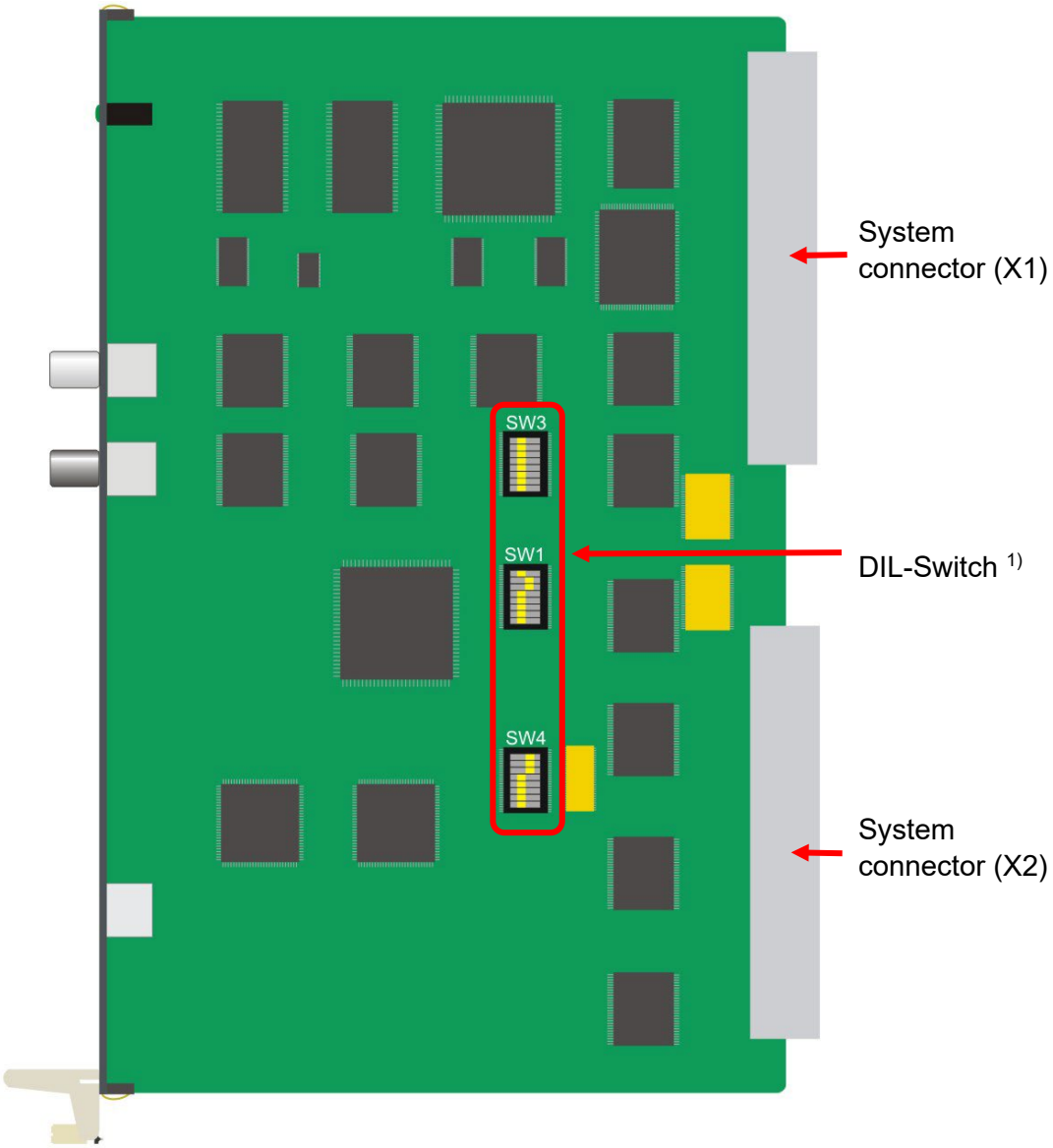


Figure 2: View on assembly side

1) Factory setting of the DIL

6.2.1 S5 Applications: Switch Settings on the Board

The sequence of the switches corresponds to the layout on the board.

Addressing:

SW3	S5-Linear Mode: Address Settings		S5-Cache Mode: 8-bit Cache Number Settings	
	OFF (=0)	ON (=1)	OFF (=0)	ON (=1)
1	A10 = 0	A10 = 1	Bit 0 = 0	Bit 0 = 1
2	A11 = 0	A11 = 1	Bit 1 = 0	Bit 1 = 1
3	A12 = 0	A12 = 1	Bit 2 = 0	Bit 2 = 1
4	A13 = 0	A13 = 1	Bit 3 = 0	Bit 3 = 1
5	A14 = 0	A14 = 1	Bit 4 = 0	Bit 4 = 1
6	A15 = 0	A15 = 1	Bit 5 = 0	Bit 5 = 1
7	irrelevant		Bit 6 = 0	Bit 6 = 1
8	irrelevant		Bit 7 = 0	Bit 7 = 1

Default Setup:

SW1	OFF (=0)	ON (=1)
1	Cache mode (S5)	Linear mode (S5/MMC)
2	MMC - mode	S5 mode
3	8-bit data bus	16-bit data bus
4	new telegram (128DW)	old telegram (32W)
5	irrelevant	
6	irrelevant	
7	irrelevant	
8	irrelevant	

Supplementary Setup:

SW4	OFF (=0)	ON (=1)
1	Transmit test pattern (simulation)	Normal mode
2	irrelevant	3.3Mbit data rate: 1 ms for 64 reals
3	S5 REAL (ibaFOB converted to Intel format)	INTEGER
4	irrelevant	
5	irrelevant	
6	irrelevant	
7	irrelevant	
8	irrelevant	

Default setup: S5-135U/155U
16-bit mode
Cache mode (No. 0)
Integer data (KF)

6.2.2 MMC Applications: Switch Settings on the Board

The sequence of the switches corresponds to the layout on the board

Addressing Section 2:

SW3	OFF (=0)	ON (=1)
1	Addr. 11 = 0	Addr. 11 = 1
2	Addr. 12 = 0	Addr. 12 = 1
3	Addr. 13 = 0	Addr. 13 = 1
4	Addr. 14 = 0	Addr. 14 = 1
5	Addr. 15 = 0	Addr. 15 = 1
6	Addr. 16 = 0	Addr. 16 = 1
7	irrelevant	
8	irrelevant	

Default Setup:

SW1	OFF (=0)	ON (=1)
1	Cache mode (S5)	Linear mode (S5/MMC)
2	MMC - mode	S5 mode
3	8-bit data bus	16-bit data bus
4	new telegram (128DW)	old telegram (32W)

Addressing Section 1:

	OFF (=0)	ON (=1)
5	Addr. 17 = 0	Addr. 17 = 1
6	Addr. 18 = 0	Addr. 18 = 1
7	Addr. 19 = 0	Addr. 19 = 1
8	Addr. 20 - 23 = 0	Addr. 20 - 23 = 1

Attention:

For the BGT 0, BGT01, BGT03 and BGT05 the addresses A22 (X2 Pin d22) and A23 (X2 Pin d26) on the backplane must be re-wired
i.e. to achive log 0 :to X2 Pin f24).

Supplementary Setup:

SW4	OFF (=0)	ON (=1)
1	Transmit test pattern (simulation)	Normal mode
2	irrelevant	3.3Mbit data rate: 1 ms for 64 reals
3	REAL	INTEGER
4	irrelevant	
5	irrelevant	
6	irrelevant	
7	irrelevant	
8	irrelevant	

Setup Example: CE800

Switch settings: ---SW3--- ---SW1--- ---SW4---
1011 1000 1011 0110 1100 0000

Address 19 18 17 16 15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00

X=on/0=off X X 0 0 X X X 0 X 0 0 0 0 0 0 0 0 0 0 0 0

MMC-mode / 16 bit / new telegram (64 real + 64 bin.) / Addr. CE800 / real

6.2.3 Backplane Connector

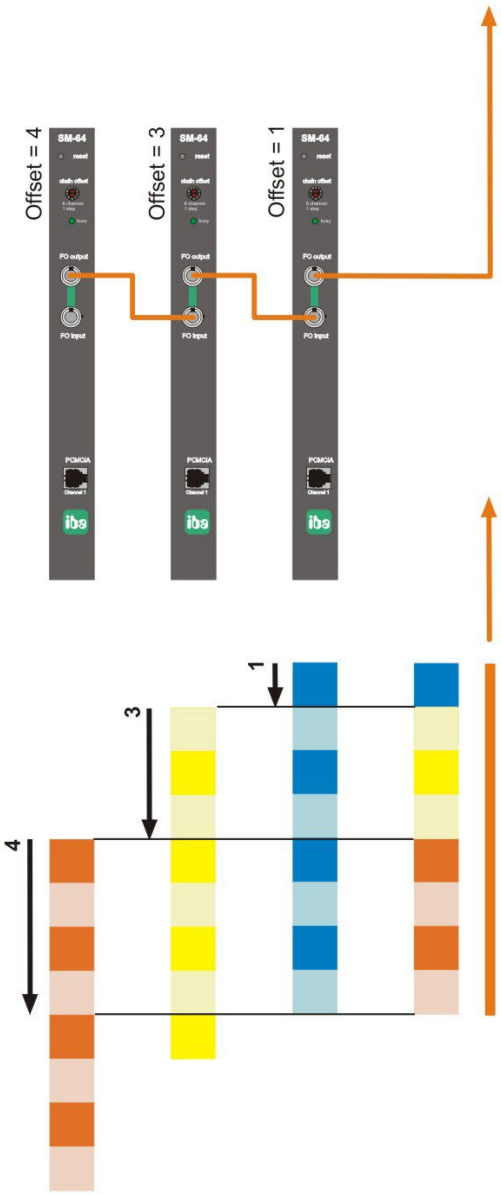
X1 (upper connector)				X2 (lower connector)			
PIN no	**Row d**	**Row b**	**Row z**	**PIN no**	**Row d**	**Row b**	**Row z**
2	NC	GND	VCC	2	NC	GND	VCC
4	UBAT	PESP	CLK	4	NC	D8	D12 BHE/
6	A12	A0	RESET	6	NC	D9	D13 ADB0
8	A13	A1	MRD/	8	NC	D10	D14 ADB17
10	A14	A2	MWR/	10	ADB20	D11	D15 ADB18
12	A15	A3	RDY/	12	NC	NC	ADB19
14	IRA/	A4	DB0	14	ADB21	NC	NAU / DB8
16	IRB/	A5	DB1	16	NC	NC	DB9
18	IRC/	A6	DB2	18	NC	NC	DB10
20	IRD/	A7	DB3	20	NC	NC	DB11
22	IRE/	A8	DB4	22	ADB22	NC	DB12
24	IRF/	A9	DB5	24	NC	NC	DB13
26	IRG	A10	DB6	26	ADB23	NC	DB14
28	DS/	A11	DB7	28	NC	NC	DB15
30	NC	BASP	NC	30	NC	NC	NC
32	NC	GND	NC	32	NC	GND	-15 V

6.3 Cascading Boards (Loop Mode):

The ibaLink-SM-64-io can be cascaded in steps of 8 channels each (8 integer or real and 8 binary values).

The cascade setup is implemented via the front panel rotary switch.

An example is illustrated on the right.



Right Hand Board Output (Offset = 1):

1 x 8	Local Value
7 x 8	Values linked in via Cascading Input

Middle Board Output (Offset = 3)

3 x 8	Local Values
5 x 8	Values linked in via Cascading Input

Left Hand Board Output (Offset = 4):

4 x 8	Local Values
4 x 8	Values from unused Cascade Input

It is possible to change the fiber optic connection during operation.

6.4 Compatibility

32-Bit-Mode:

The 32-bit mode of the new S5/MMC interface board (ibaLink-SM-64-io) now transmits 4 telegrams in the sequence EE, EB, E8 and E5.

6.5 Memory Organization

The board supports three memory access modes:

- ❑ S5 Bus Linear mode
- ❑ S5 Bus Cache mode
- ❑ MMC Linear - Bus mode.

The board contains 2KB of dual-port RAM interfaced to 16-bit data bus. The bus can be set to operate in 8-bit mode when the cache or linear access mode is used.

The board provides both a fiber optic transmitter and receiver on the front panel. In addition, the data can also be simultaneously transmitted to a notebook PC via a galvanically isolated RS485 interface (RJ11).

Data memory is reset to a default value of 00 by an initialization function as soon as the board is connected to the power supply. Transmission to both outputs is automatic. The transmit mode is indicated by a flashing diode on the front panel.

Attention! The first byte of the dualport ram contains the status of the card when read via the bus backplane.

S5 Mode

The board utilizes the addresses A0 through A15 in this mode. Differentiation between the 8-bit and 16-bit data bus is made via a switch (SW1/3) on the board. The signal PESP is not used.

⚠ CAUTION

The reset switch on the front panel will cause S5 to revert to the STOP state due to a time out!

Consistency Checks

A consistency check has been implemented for the writing of data words. Integer mode always requires 2 bytes (1 word) to be written. Real mode always requires 4 bytes (2 words) to be written. This occurs in the S5 in a descending sequence and an ascending sequence in the MMC. The time period between accessing is not limited.
No consistency checking is carried out in the digital range.

6.6 Transmit Telegrams via the Fiber Optic Connections

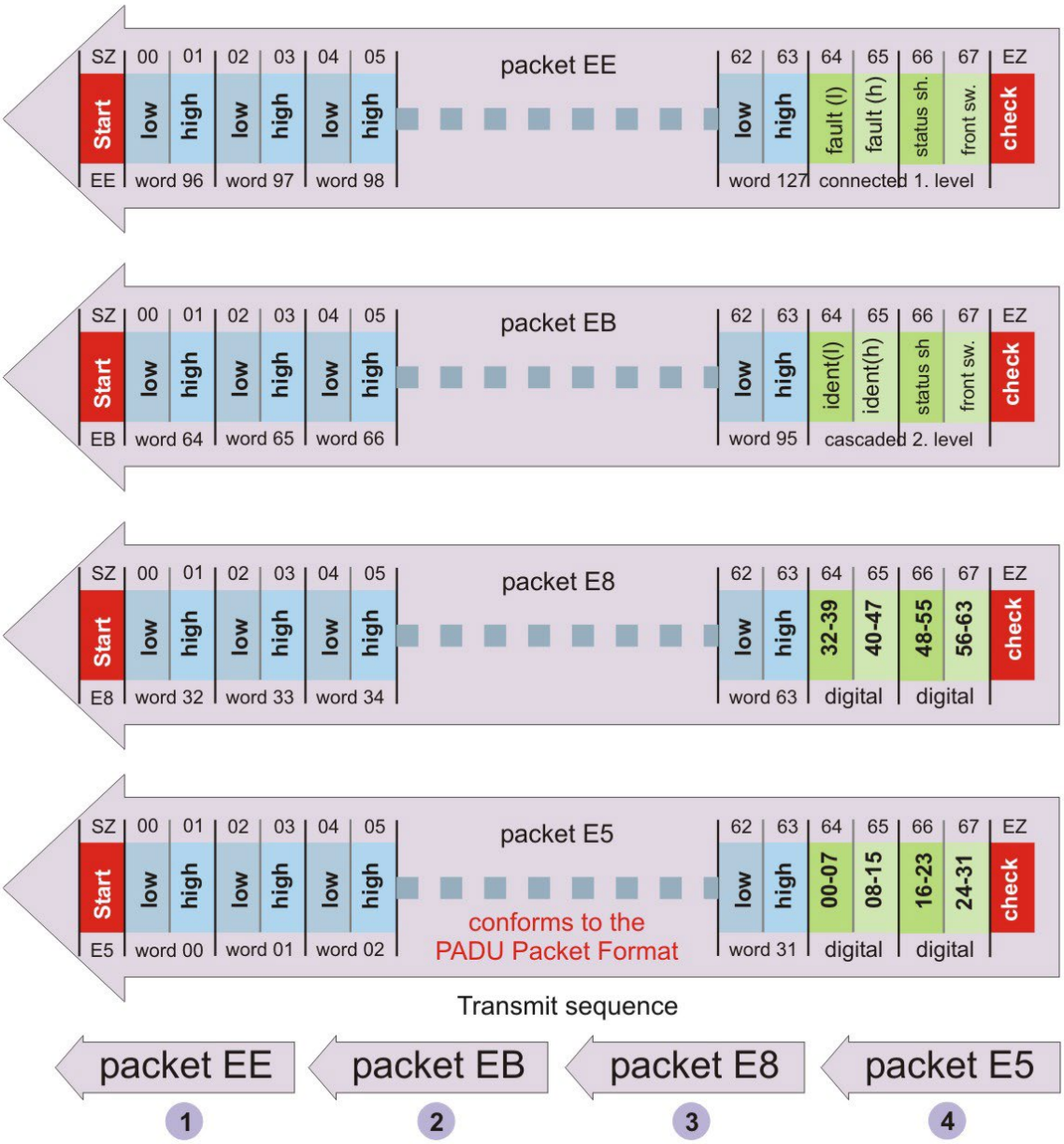


Figure 3: Telegrams over fiber optics

Packet EE (EB)

Byte 64,65: Module Identification of Acquisition Units
Level 1/2 (ibaLink-SM-64-io or ibaPADU-K)

Byte 66: Status of the Acquisition Units
Bit0 = 1: Test Operation (Real -Transfer)
Bit1 = 1: Reception of S5-Reals
Bit2 = 1: Reception Error from ibaLink-SM-64-io
Bit3 = 1: Operating in Real-Mode (0 = Integer)

Byte 67: Rotary Switch Setting of the ibaLink-SM-64-io

7 System Topologies and Application

Multiple system topologies are possible with the ibaLink-SM-64-io without the request for special settings. The operating mode of the ibaLink-SM-64-io is a consequence of the desired topology.

7.1 Peer-to-Peer Operation (frame-to-frame connection)

If the device shall run in loopback mode (output coupled to own input) or two ibaLink-SM-64-io cards shall run directly coupled the mode switch of both cards must be set to position 9. In this setting cascading of multiple devices is NOT supported.

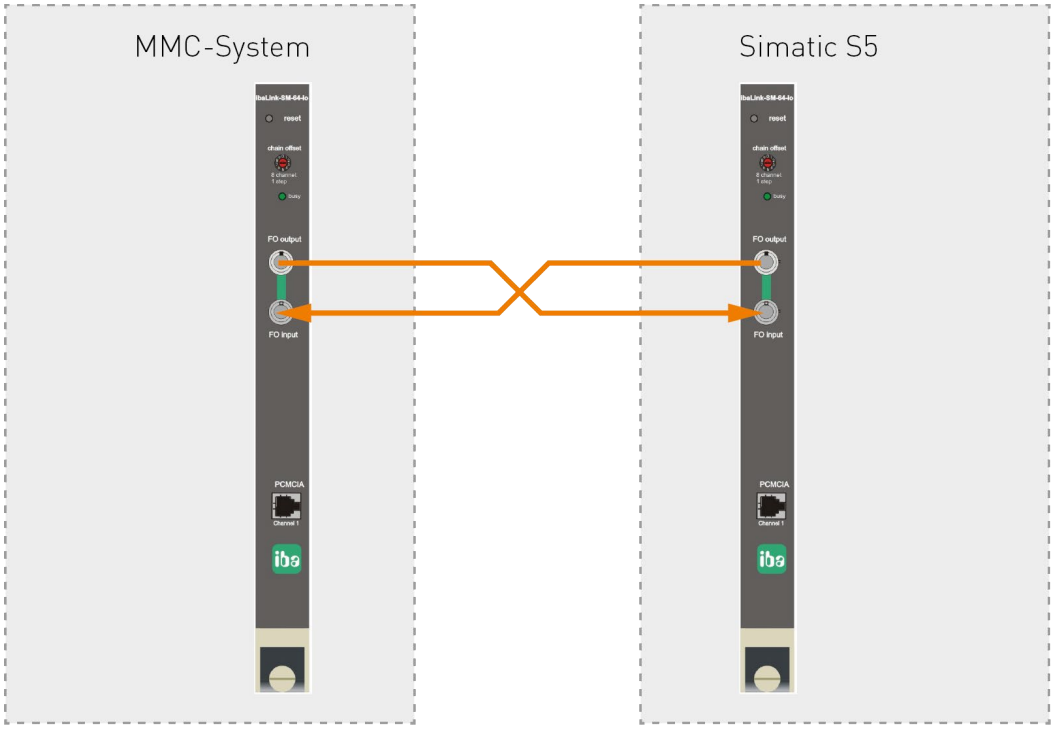


Figure 4: Peer-to-Peer-operation (frame-to-frame connection)

This operation mode is used to connect two S5 or MMC-systems in order to exchange data (64 analog and 64 digital signals in both directions) periodically in 1 ms. Only integer format is supported for sending and receiving analog values.

No further accessories, such as additional power supply or software, are needed. In this mode of operation the two backplane memory ranges are transmitted from one card to the other. The outputs of one card are the inputs for the other card and vice versa.

Such a so called frame connection can also be established between different cards, e. g. ibaLink-SM-64-io and ibaLink-MBII-2io (Multibus II).

7.2 ibaPDA Application

In classic combination of ibaLink-SM-64-io and ibaPDA the fiber optic output link is connected to an input link on an ibaFOB-io, ibaFOB-4i-S, ibaFOB-2io-X or ibaFOB-4i-X card. The link transmits 64 analog and 64 digital signals.

Only the output (FO output) of the ibaLink-SM-64-io card can be used.

Note

For version 6.02 and higher of ibaPDA it is possible to generate digital output signals (alarms). Beginning with version 6.15, analog signals can also be sent to the S5.

In both cases, an ibaFOB output module must be available in the PC, whose FO output must be connected to the input on the card (FO input). In the ibaPDA configuration, a "FOB alarm" module must be added at the corresponding output link.

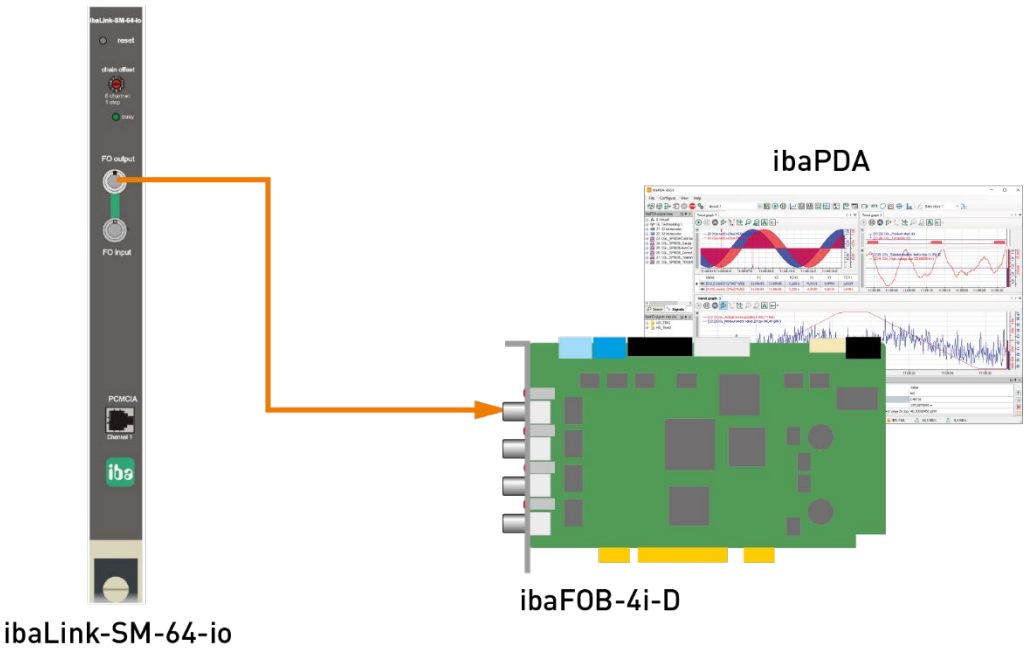


Figure 5: ibaLink-SM-64-io with ibaPDA

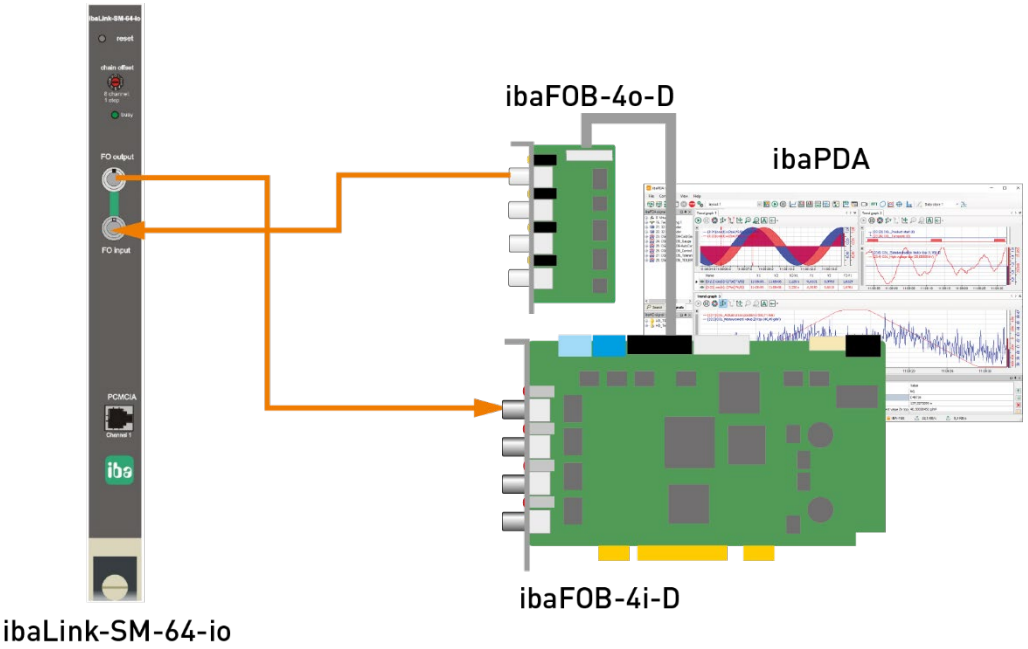


Figure 6: ibaLink-SM-64-io with ibaPDA and ibaFOB output module

Engineering Notice

In ibaPDA (V 5.x) two modules of type “Sm64” are required to measure all signals of the card. In ibaPDA-V6 one module “SM64” is sufficient because it covers 64 analog and 64 digital signals.

7.3 ibaLogic Application

A typical combination of ibaLink-SM-64-io and ibaLogic requires connection of the fiber optic output link to an ibaFOB-io or ibaFOB-4i-S input link. The link transmits 64 analog and 64 digital signals.

In order to use the outputs of the ibaLogic application the fiber optic input link (FO input) of the ibaLink-SM-64-io card must be connected to the output link of an ibaFOB-io- or ibaFOB-4o card in the ibaLogic-PC. This link as well receives 64 analog and 64 digital signals.

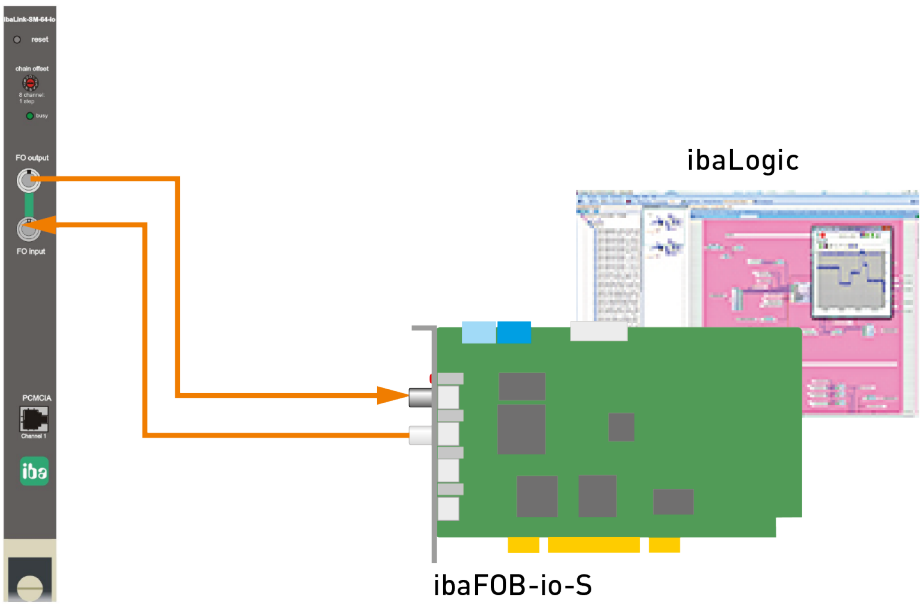


Figure 7 ibaLink-SM-64-io with ibaLogic

Engineering Notice

In ibaLogic, use the input resources FOB-F/FOB-IO for data coming from an ibaLink-SM-64-io card.

The ibaLogic output resources FOB-F OUT / FOB-IO OUT should be used for outputs from ibaLogic to the ibaLink-SM-64-io card.

7.4 I/O Mode of Operation

The ibaLink-SM-64-io can serve as a process i/o bus extender for PLC systems.

In order to transmit output data from the S5 or MMC system via the ibaLink-SM-64-io card the ibaPADU-8-O device can be used. For the input direction ibaPADU-8 devices may be used. Up to 8 ibaPADU-8 devices can be connected to the fiber optic output or input.

The devices of the ibaNet-750 family may be used as well for inputs and outputs.

ibaPDA or ibaLogic systems can be connected too.

Only daisy-chain structures are supported.

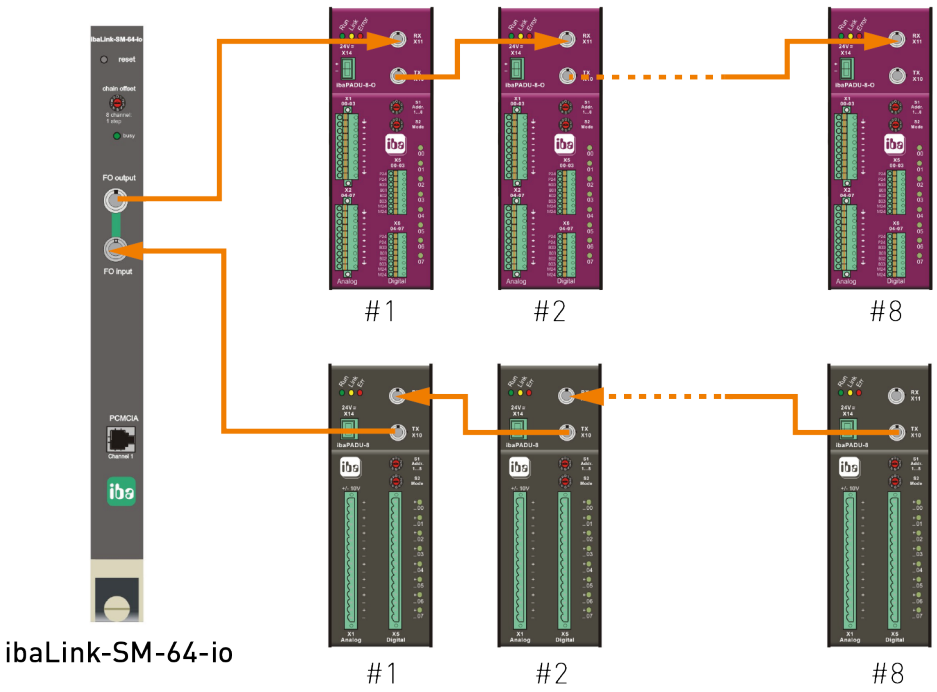


Figure 8: ibaLink-SM-64-io in I/O mode operation with ibaPADU-8 and ibaPADU-8-O

Note

Here, the ibaLink-SM-64-io card is not running in daisy-chain operation.

In the figure above, the daisy chain is realized outside of the card with the result, that the ibaLink-SM-64-io card can send and receive complete telegrams on the fiber optic links. The card is working in pure I/O mode.

8 S5 – Function Blocks and Modes of operation

8.1 S5 - Function Blocks

The function blocks are stored in the following files:

P23-k1st.s5d	for S5-115U (941-944) cache mode
P23-k2st.s5d	for S5-115U (945) cache mode
P23-k3st.s5d	for S5-135U (928) cache mode
P23-k4st.s5d	for S5-150U (924-927) cache mode
P23-k5st.s5d	for S5-155U (948) cache mode
P23-m5st.s5d	for S5-155U (948) linear addressing for multi-processor operation

8.2 Cache Mode 115U/135U/155U

(Files P23-k1st.s5d, P23-k2st.s5d, P23-k3st.s5d; P23-k5st.s5d)

These function blocks facilitate the transfer of existing data from the S5 to the ibaLink-SM-64-io interface board. The interface board is accessed via cache addressing.

The analog and digital data should be transferred to a data block in a predefined format by the user.

Integer: 115U / 135U / 155U Function Blocks FB32 and FB33	
	DW 0 ..... DW 63 64 analog values in KF/integer
The left-hand sections (DL) are not utilized. The DB must be at least 79 DWs long. The range DW72-DW78 must not be overwritten.	DR64 - Binary value 0 - 7 DR65 - Digital channel 8 - 15 DR66 - Digital channel 16 - 23 DR67 - Digital channel 24 - 31 DR68 - Digital channel 32 - 39 DR69 - Digital channel 40 - 47 DR70 - Digital channel 48 - 55 DR71 - Digital channel 56 - 63

Real: 135U / 155U Function blocks FB30 and FB31	
	DD 0 ..... DD 126 64 analog values in KG/real
The left-hand sections (DL) are not utilized. The DB must be at least 144 DWs long. The range DW136-DW143 must not be overwritten.	DR128 - Digital channel 0 - 7 DR129 - Digital channel 8 - 15 DR130 - Digital channel 16 - 23 DR131 - Digital channel 24 - 31 DR132 - Digital channel 32 - 39 DR133 - Digital channel 40 - 47 DR134 - Digital channel 48 - 55 DR135 - Digital channel 56 - 63

8.3 Function Blocks

FB30 - Real - Default

FB31 - Real - Cyclic Data Transfer

FB32 - Integer - Default

FB33 - Integer - Cyclic Data Transfer

All FBs utilize one data block. This data block contains saved analog and digital data (as described above) as well as internal auxiliary data for the function block. This block must be created by the user. Its length must be equal to or higher than 144 DWs for reals and 79 DWs for integers.

The FB30/FB32 can be invoked, for example, during the start-up OBs: OB20, OB21, or OB22. The FB31/FB33 must be cyclically invoked in OB1 or in the timer OBs. The frequency of these starts defines the scanning rate for the measurement recording.

FB30 / FB32 Parameter

DB - B	Data Block
OFFS - D/KY	Block size (Offset-start / Offset-end)

Offset-start and offset-end defines the range (real / integer or binary) from the total number of 64 measurement channels.

KACH - D/KY	cache number 0-255 / unused
PAFE - A/BI	Configuring error

FB31 / FB33 Parameter

DB - B	Data block (same as in FB30 / FB32)

Examples:

Definition of the **OFFS** parameter	**S5135U/155U (Real)**
OFFS (KY) = 1,1	8 Real from DD 0
Definition of the **OFFS** parameter	**S5135U/155U (Real)**
OFFS (KY) = 1,8	64 Real from DD 0
Definition of the **OFFS** parameter	**S5115U/135U/155U (Integer)**
OFFS (KY) = 1,6	48 Integer from DW 0
Definition of the **OFFS** parameter	**S5115U/135U/155U (Integer)**
OFFS (KY) = 1,3	24 Integer from DW 0

Note

An OFFSET will access 16 or 8 data words, due to the differing format lengths between real and integer and the fact that the cascading reference is the number of measurement channels

Flags are not used by any FB.

These function blocks do not suppress interrupts. If this is necessary, then the user must disable them and write custom code (either outside or within the FB).

8.3.1 Data blocks and Offset Assignment

8.3.1.1 Data Block for Real Transfers

```
0     KG 0                    ;Analog.Value 00 / Offset-1
2     KG 0                    ;Analog.Value 01
4     KG 0                    ;Analog.Value 02
6     KG 0                    ;Analog.Value 03
8     KG 0                    ;Analog.Value 04
10    KG 0                    ;Analog.Value 05
12    KG 0                    ;Analog.Value 06
14    KG 0                    ;Analog.Value 07
16    KG 0                    ;Analog.Value 08 / Offset-2
18    KG 0                    ;Analog.Value 09
20    KG 0                    ;Analog.Value 10
22    KG 0                    ;Analog.Value 11
24    KG 0                    ;Analog.Value 12
26    KG 0                    ;Analog.Value 13
28    KG 0                    ;Analog.Value 14
30    KG 0                    ;Analog.Value 15
32    KG 0                    ;Analog.Value 16 / Offset-3
34    KG 0                    ;Analog.Value 17
36    KG 0                    ;Analog.Value 18
38    KG 0                    ;Analog.Value 19
40    KG 0                    ;Analog.Value 20
42    KG 0                    ;Analog.Value 21
44    KG 0                    ;Analog.Value 22
46    KG 0                    ;Analog.Value 23
48    KG 0                    ;Analog.Value 24 / Offset-4
50    KG 0                    ;Analog.Value 25
52    KG 0                    ;Analog.Value 26
54    KG 0                    ;Analog.Value 27
56    KG 0                    ;Analog.Value 28
58    KG 0                    ;Analog.Value 29
60    KG 0                    ;Analog.Value 30
62    KG 0                    ;Analog.Value 31
64    KG 0                    ;Analog.Value 32 / Offset-5
66    KG 0                    ;Analog.Value 33
68    KG 0                    ;Analog.Value 34
70    KG 0                    ;Analog.Value 35
72    KG 0                    ;Analog.Value 36
74    KG 0                    ;Analog.Value 37
76    KG 0                    ;Analog.Value 38
78    KG 0                    ;Analog.Value 39
80    KG 0                    ;Analog.Value 40 / Offset-6
82    KG 0                    ;Analog.Value 41
84    KG 0                    ;Analog.Value 42
86    KG 0                    ;Analog.Value 43
88    KG 0                    ;Analog.Value 44
90    KG 0                    ;Analog.Value 45
92    KG 0                    ;Analog.Value 46
94    KG 0                    ;Analog.Value 47
96    KG 0                    ;Analog.Value 48 / Offset-7
98    KG 0                    ;Analog.Value 49
100   KG 0                    ;Analog.Value 50
102   KG 0                    ;Analog.Value 51
104   KG 0                    ;Analog.Value 52
106   KG 0                    ;Analog.Value 53
108   KG 0                    ;Analog.Value 54
110   KG 0                    ;Analog.Value 55
112   KG 0                    ;Analog.Value 56 / Offset-8
114   KG 0                    ;Analog.Value 57
116   KG 0                    ;Analog.Value 58
118   KG 0                    ;Analog.Value 59
120   KG 0                    ;Analog.Value 60
122   KG 0                    ;Analog.Value 61
124   KG 0                    ;Analog.Value 62
126   KG 0                    ;Analog.Value 63
128   KM 11111111 00000000    ;DL-free/DR-Dig.Val. 0-7   Offs-1
129   KM 11111111 00000000    ;DL-free/DR-Dig.Val. 8-15  Offs-2
130   KM 11111111 00000000    ;DL-free/DR-Dig.Val. 16-23 Offs-3
131   KM 11111111 00000000    ;DL-free/DR-Dig.Val. 24-31 Offs-4
132   KM 11111111 00000000    ;DL-free/DR-Dig.Val. 32-39 Offs-5
133   KM 11111111 00000000    ;DL-free/DR-Dig.Val. 40-47 Offs-6
134   KM 11111111 00000000    ;DL-free/DR-Dig.Val. 48-55 Offs-7
135   KM 11111111 00000000    ;DL-free/DR-Dig.Val. 56-63 Offs-8
```

Figure 9: Data blocks for real transfers

8.3.1.2 Data Block for Integer Transfers

```
0     KF +0                    ;Analog.Value 0 / Offset-1
1     KF +0                    ;Analog.Value 1 /
2     KF +0                    ;Analog.Value 2 /
3     KF +0                    ;Analog.Value 3 /
4     KF +0                    ;Analog.Value 4 /
5     KF +0                    ;Analog.Value 5 /
6     KF +0                    ;Analog.Value 6 /
7     KF +0                    ;Analog.Value 7 /
8     KF +0                    ;Analog.Value 8 / Offset-2
9     KF +0                    ;Analog.Value 9 /
10    KF +0                    ;Analog.Value 10 /
11    KF +0                    ;Analog.Value 11 /
12    KF +0                    ;Analog.Value 12 /
13    KF +0                    ;Analog.Value 13 /
14    KF +0                    ;Analog.Value 14 /
15    KF +0                    ;Analog.Value 15 /
16    KF +0                    ;Analog.Value 16 / Offset-3
17    KF +0                    ;Analog.Value 17 /
18    KF +0                    ;Analog.Value 18 /
19    KF +0                    ;Analog.Value 19 /
20    KF +0                    ;Analog.Value 20 /
21    KF +0                    ;Analog.Value 21 /
22    KF +0                    ;Analog.Value 22 /
23    KF +0                    ;Analog.Value 23 / Offset-4
24    KF +0                    ;Analog.Value 24 /
25    KF +0                    ;Analog.Value 25 /
26    KF +0                    ;Analog.Value 26 /
27    KF +0                    ;Analog.Value 27 /
28    KF +0                    ;Analog.Value 28 /
29    KF +0                    ;Analog.Value 29 /
30    KF +0                    ;Analog.Value 30 /
31    KF +0                    ;Analog.Value 31 /
32    KF +0                    ;Analog.Value 32 / Offset-5
33    KF +0                    ;Analog.Value 33 /
34    KF +0                    ;Analog.Value 34 /
35    KF +0                    ;Analog.Value 35 /
36    KF +0                    ;Analog.Value 36 /
37    KF +0                    ;Analog.Value 37 /
38    KF +0                    ;Analog.Value 38 /
39    KF +0                    ;Analog.Value 39 /
40    KF +0                    ;Analog.Value 40 / Offset-6
41    KF +0                    ;Analog.Value 41 /
42    KF +0                    ;Analog.Value 42 /
43    KF +0                    ;Analog.Value 43 /
44    KF +0                    ;Analog.Value 44 /
45    KF +0                    ;Analog.Value 45 /
46    KF +0                    ;Analog.Value 46 /
47    KF +0                    ;Analog.Value 47 /
48    KF +0                    ;Analog.Value 48 / Offset-7
49    KF +0                    ;Analog.Value 49 /
50    KF +0                    ;Analog.Value 50 /
51    KF +0                    ;Analog.Value 51 /
52    KF +0                    ;Analog.Value 52 /
53    KF +0                    ;Analog.Value 53 /
54    KF +0                    ;Analog.Value 54 /
55    KF +0                    ;Analog.Value 55 /
56    KF +0                    ;Analog.Value 56 / Offset-8
57    KF +0                    ;Analog.Value 57 /
58    KF +0                    ;Analog.Value 58 /
59    KF +0                    ;Analog.Value 59 /
60    KF +0                    ;Analog.Value 60 /
61    KF +0                    ;Analog.Value 61 /
62    KF +0                    ;Analog.Value 62 /
63    KF +0                    ;Analog.Value 63 /
64    KM 11111111 00000000     ;DL-free/DR-Dig.Val. 0-7   Offs-1
65    KM 11111111 00000000     ;DL-free/DR-Dig.Val. 8-15  Offs-2
66    KM 11111111 00000000     ;DL-free/DR-Dig.Val. 16-23 Offs-3
67    KM 11111111 00000000     ;DL-free/DR-Dig.Val. 24-31 Offs-4
68    KM 11111111 00000000     ;DL-free/DR-Dig.Val. 32-39 Offs-5
69    KM 11111111 00000000     ;DL-free/DR-Dig.Val. 40-47 Offs-6
70    KM 11111111 00000000     ;DL-free/DR-Dig.Val. 48-55 Offs-7
71    KM 11111111 00000000     ;DL-free/DR-Dig.Val. 56-63 Offs-8
```

Figure 10: Data blocks for integer transfers

8.4 Switch Layout and Application Examples

The files contain run time S5 programs. The following switch setup is required on the board.

For 135U/155U (real)	SW1	SW3	SW4	Miscellaneous
This switch setup defines the following configuration: 64 analog and digital values Cache addressing cache is 0 Real-Analog-Format (KG) Word accessing to S5-Bus	1 - OFF 2 - ON 3 - ON 4 - OFF 5 - irr 6 - irr 7 - irr 8 - irr	1 - OFF 2 - OFF 3 - OFF 4 - OFF 5 - OFF 6 - OFF 7 - OFF 8 - OFF	1 - ON 2 - OFF 3 - OFF 4 - OFF 5 - OFF 6 - OFF 7 - OFF 8 - OFF	Switch OFFSET at 8

For 115U	SW1	SW3	SW4	Miscellaneous
This switch setup defines the following configuration: 64 analog and digital values Cache addressing cache is 0 Integer-Analog-Format (KF) Byte accessing to S5-Bus	1 - OFF 2 - ON 3 - OFF 4 - OFF 5 - irr 6 - irr 7 - irr 8 - irr	1 - OFF 2 - OFF 3 - OFF 4 - OFF 5 - OFF 6 - OFF 7 - OFF 8 - OFF	1 - ON 2 - OFF 3 - ON 4 - OFF 5 - OFF 6 - OFF 7 - OFF 8 - OFF	Switch OFFSET at 8

irr = not relevant

These settings allow the programs to be loaded and started in the S5 without modifications. Programs are contained in the timer OBs (OB10, OB13, or OB16) that simulate the analog and digital values.

If measurement data is to be transferred out of the corresponding applications, then the temporary OBs must be removed or disabled.

The DBs DX0 and DB1 which are part of the examples on floppy disk must be modified to fulfil the existing S5 requirements

If several boards are to be cascaded (a max. of 8 possible), then the corresponding offset switch must be set. The data for each interface board always starts at the beginning of the DB. This must be taken into account for the calculation of the channel number.

Example with two boards:

First board: switch OFFSET = 6, i.e. 48 channels (0 through 47)
analog data from DD0, digital data from DR128 (135U/155U)

Second board: switch OFFSET = 2, i.e. 16 channels (48 through 63)
analog data from DD0, digital data from DR128 (135U/155U)

8.5 Multi-Processor Mode 155U

(File: P23-m5st.s5d)

The file P23-m5st.s5d contains two function blocks that have been conceived for multi-processor applications. The measurement values can be inserted into subranges. The FB invoke command defines which measurement channels are concerned. The total measurement range of 64 analog and binary channels is subdivided into several subranges, whereby an analog subrange length can be between 1 and 64 (DD in KG-format or DW in KF-format).

The data can be only inserted byte by byte for binary values:

Byte 0:	bit 7 channel	7	to	bit 0 channel	0
Byte 1:	bit 7 channel	15	to	bit 0 channel	8
Byte 2:	bit 7 channel	23	to	bit 0 channel	16
Byte 3:	bit 7 channel	31	to	bit 0 channel	24
Byte 4:	bit 7 channel	39	to	bit 0 channel	32
Byte 5:	bit 7 channel	47	to	bit 0 channel	40
Byte 6:	bit 7 channel	55	to	bit 0 channel	48
Byte 7:	bit 7 channel	63	to	bit 0 channel	56

When the channel number is taken into account, the measurement entries to the ibaLink-SM-64-io board can be implemented independent of one another from differing CPUs. As a result, no coordination is necessary (asynchronous entry).

Function Blocks	Format
FX250	Real values
FX251	Binary values
FX252	Integer values

These blocks should be invoked cyclically. They do not require default settings. The parameters are not checked due to time optimization constraints.

The blocks utilize: BS - BS60 - BS63

Flags - none

DBs - none

Timers - none

Counters - none

The board uses a 1KW address range of the S5 address space from F0000H to FFFFFH.

Ensure that this address range is not used by the system or other hardware components. These function blocks do not suppress interrupts. If this is necessary, then the user must disable them and write custom code (either outside or within the FB).

FX250: Entering Real Values

This function block transfers a closed set of real values to the ibaLink-SM64-io interface board. The set must lie within an existing DB or DX in the range DW0-DW255.

Parameters:

DBDX D/KY - Data block NR DL=0 then DB / DL><0 then DX, DR=DB/DX-No.

DW D/KF - The first DW in the block (start of block in the DB).

ANLG D/KY - DL number of the first channel (start)/DR number of channels (length)

ADR D/KH - Low word of the address (least significant 16 bits)

FX252: Entering Integer Values

This function block transfers a closed set of real values to the ibaLink-SM64-io interface board. The set must lie within an existing DB or DX in the range DW0-DW255.

Parameters:

DBDX D/KY - Data block NR DL=0 then DB / DL><0 then DX, DR=DB/DX-No.

DW D/KF - The first DW in the block (start of block in the DB)

ANLG D/KY - DL number of the first channel (start)/DR number of channels (length)

ADR D/KH - Low word of the address (least significant 16 bits)

FX251: Entering Binary Measurement Values

This block transmits 1 to 8 bytes of binary values to the ibaLink-SM64-io interface board. The data must all lie within DW0-DW255 in an existing DB/DX.

The binary data is contained in the right hand byte of the DW (DR). The left-hand byte is not utilized and is available to the user for other purposes.

Parameters:

DBDX D/KY - Data block NR DL=0 then DB / DL><0 then DX, DR=DB/DX-No.

DW D/KF - The first DW in the block (start of block in the DB)

ANLG D/KY - DL number of the byte (0-7)/DR number of bytes (1-8)

ADR D/KH - Low word of the address (least significant 16 bits)

Examples:

BA FX250	Real values in KG format			
	DBDX	=	0,40	The data is contained in DB40
	DW	=	120	Start of block DW120
	ANLG	=	10,8	8 channels are transmitted; channel 10 - channel 17
	ADR	=	A000	One block from address FA000H is utilized
BA FX252	Integer values in KF format			
	DBDX	=	0,32	The data is contained in DB32
	DW	=	85	Start of block DW85
	ANLG	=	20,4	4 channels are transmitted; channel 20 - channel 23
	ADR	=	A000	One block from address FA000H is utilized
BA FX251	Binary values; byte by byte			
	DBDX	=	1,20	The data is contained in DX20
	DW	=	10	The data is in DR10, DR11, and DR12 (3 bytes)
	ANLG	=	2,3	3 bytes / start byte 2 (byte 2, 3, 4/channel 16-channel 39)
	ADR	=	A000	One block from address FA000H is utilized.

Switch Settings	SW1	SW3	SW4	Miscellaneous
Address FA000H:	1 - ON	1 - OFF	1 - ON	Switch OFFSET set to 8
	2 - ON	2 - OFF	2 - ON	
	3 - ON	3 - OFF	3 - OFF	the board supplies all 64 channels.
	4 - OFF	4 - ON	4 - OFF	
	5 - OFF	5 - OFF	5 - OFF	
	6 - ON	6 - ON	6 - OFF	
	7 - ON	7 - OFF	7 - OFF	
	8 - OFF	8 - OFF	8 - OFF	

8.6 The simultaneous (bidirectional) send and receive mode (135U)

(file P23-k3st.s5d)

This special mode enables the additional send capability of the ibaLink-SM-64-io for the S5.

This mode is selected when the rotary switch is set to position 9.

- ❑ This mode is available only in S5 cache mode
- ❑ The output variables can be computed with the FB32 and FB33 as usual
- ❑ The 64 Integer input channels can be computed with the FB42 and FB43

FBs

FB42: Integer receive - data presets

FB43: Integer receive - cyclic data transmission

Both FBs use one DB. The function block contains received analog and binary data (as described below) and some internal data for the function blocks. The function block must be created by the user. The minimum length must be 85DWs or more.

FB42 can i.e. be executed in the start OBs OB20, OB 21 and OB22.

The FB43 must be cyclically executed by OB1 or by the TIMER OBs. The cycle of these OBs defines the data collecting rate.

FB42 parameters

DB-B	data block
KACH-D/KY	DL: cache number 0-255 / DR not used
QUIT - A/W	Acknowledge

PB43 parameters

DB-B	data block (equal to FB42)
QUIT - A/W	Acknowledge

QUIT Codes

0	OK, computing with data transfer
1	OK, computing without data transfer
30	Data flow was interrupted
32	Handshake error
40	Transmission disturbed, not receiving
100	Startup failure
101	Card could not be recognized
102	ibaSM64 firmware and FBs have different versions
103	Cache access error
105	Offset switch not in position 9
106	Wrong SW1 or SW4 settings

Flags are not used by these FBs.

The FBs do not disable interrupts. If this is necessary this must be done by the user.

The analog and digital data is stored similar to the send mode in the following order:

Integer 135U FB42 and FB43	
	DW 0 .... DW63 64 analog values in KF/integer
The left parts (DL) are reserved The DB´s length must be 85 DWs or more. The area between DW0 incl. DM84 must not be overwritten	DR64 – binary values 0..7 DR65 – binary values 8..15 DR66 – binary values 16..23 DR67 – binary values 24..31 DR68 – binary values 32..39 DR69 – binary values 40..47 DR70 – binary values 48..55 DR71 – binary values 56..63

Settings for switches SW1, 3 and 4:

SW3: cache number (DEMO = 0)

SW1: 1,4, off / 2,3 on / 5,6,7,8 not relevant

SW4: 1,2,3 on / 4,5,6,7,8, not relevant (3.3 Mbit/s)

8.7 Special features of S5-150U

In addition to the information given in chapter 8, the following must be observed for the S5-150U.

The program package for the S5-150U(S) family can be found in file P23-K4st.s5d.

Four FBs are mainly available here:

- ❑ FB30 and FB31 for reals in cache mode
- ❑ FB32 and FB33 for integers in cache mode

The blocks are parameterized and invoked like 135U/155U. The S5-150U has the following special features:

- ❑ The data block for reals (DB30) must be at least 147 DWs long.
- ❑ The cards may be inserted in the following slots:
  3, 11, 19, 107, 115, 123, 131

The package contains an executable example program with two ibaLink SM64-io cards:

1. Integer, cache no. 12
2. Real, cache no. 8

The FB39 in OB22 prevents the stop when power supply returns. The reason: the ibaLink SM64-io cards may boot slower than the CPU. A waiting time can be defined by parameterizing the FB39.

The FB100 simulates values on some channels.

Processing times (duration of processing of FB31/FB33 during cyclic transfer):

Integer	64 channels	-	260 µs
Real	8 channels	-	350 µs
Real	32 channels	-	1.2 ms
Real	64 channels	-	2.3 ms

9 Technical Data

Name	ibaLink-SM-64-io
Description	System Interface for SIMATIC S5 and MMC
iba order no.:	14.130000
Manufacturer	iba AG
Operating temperature:	0 °C to 50 °C (32 °F…122 °F)
Storage temperature:	-25 °C to 70 °C (-13 °F…158 °F)
Transport temperature:	-25 °C to 70 °C (-13 °F…158 °F)
Cooling:	Natural convection
Installation:	1 slot in standard S5 / MMC chassis
Humidity:	Class F no submersion allowed
Protection class:	None
Power supply:	5 V from backplane
Current consumption:	Typ. 350 mA (operation), switch-on < 400 mA / 5 V
Watchdog:	n.a.
Sample rate	1 ms (all channels)
Max. distance of fiber optical cable (without repeater)	2000 m (6560 ft) with appropriate cable
Communication channels Galvanic isolation	FO in-/output 3.3 Mbit / s by fiber optic
FO connectors	ST Lean 62.5 / 125 µm
Compatibility	The ibaLink-SM-64-io interface has been tested with the following S5 racks and CPUs: S5-155U, CPU 948 S5-150U, CPU 924-927 S5-135U, CPS5U 928B S5-115U, CPU 941B, 942B, 943B, 944B
Dimensions in mm (WxHxD) in inches Front panel	1 S5- / MMC slot x 233,6 mm x 161 mm (Doble Eurocard, single width) 1 S5- / MMC slot x 9.2 " x 6.3 " 6 U / 4 HP
Weight (incl. package/documents)	approx. 1 kg

10 Support and contact

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Note

If you require support, specify the serial number (iba-S/N) of the product.

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