Operating instructions
IO-Link data memory

DSU100

Contents

1   Preliminary note

You will find instructions, technical data, approvals and further information using the QR code on the unit / packaging or at www.ifm.com.

1.1   Symbols used

✓	Requirement
▶	Instructions
▷	Reaction, result
[...]	Designation of keys, buttons or indications
→	Cross-reference
[!]	Important note Non-compliance may result in malfunction or interference.
[i]	Information Supplementary note

1.2   Legal and copyright information

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2   Safety instructions

- The unit described is a subcomponent for integration into a system.

    – The system architect is responsible for the safety of the system.

    – The system architect undertakes to perform a risk assessment and to create documentation in accordance with legal and normative requirements to be provided to the operator and user of the system. This documentation must contain all necessary information and safety instructions for the operator, the user and, if applicable, for any service personnel authorised by the architect of the system.

- Read this document before setting up the product and keep it during the entire service life.

- The product must be suitable for the corresponding applications and environmental conditions without any restrictions.

- Only use the product for its intended purpose (→ Intended use).

- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.

- The manufacturer assumes no liability or warranty for any consequences caused by tampering with the product or incorrect use by the operator.

- Installation, electrical connection, set-up, operation and maintenance of the product must be carried out by qualified personnel authorised by the machine operator.

- Protect units and cables against damage.

3   Intended use

The IO-Link storage device saves data in non-volatile memory in industrial environments. Data is exchanged and device parameters are set via the IO-Link interface.

The device is typically used for identifying interchangeable tools or plant components.

4   Installation

[i] Information about available accessories at www.ifm.com

4.1   Mechanical design

Fig. 1: Device

4.2   Installation on tanks with mounting adapter
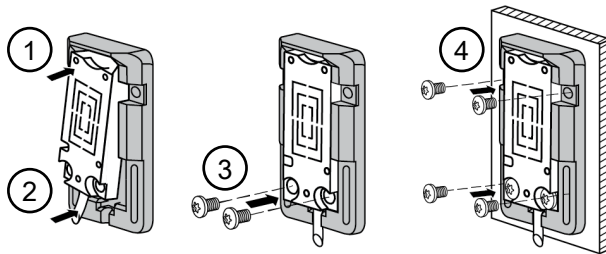
Fig. 2: Installing the device with mounting adapter

The mounting adapter is available as an accessory (article number E12153).

Installing the device with the mounting adapter:

▶ Insert the top of the device (1) into the mounting adapter.

▶ Press the bottom of the device (2) into the mounting adapter.

▷ The device can be inserted into the mounting adapter from the top or the bottom.

▶ Fasten the device on the mounting adapter with the screws supplied (3).

▶ Install the mounting adapter on the tank with the screws supplied (4).

4.3   Installation without mounting adapter
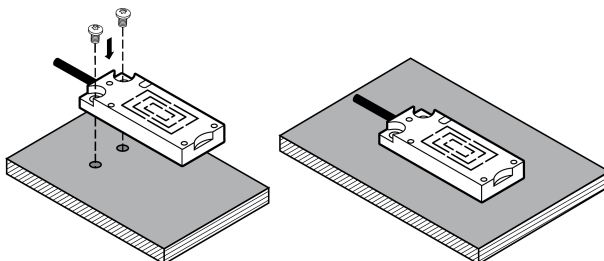
Fig. 3: Installing the device without mounting adapter

Installing the device without mounting adapter:

▶ Install the device at the mounting location with suitable screws or glue.

5   Electrical connection

▷ The device must be connected by a qualified electrician.

▷ Device of protection class III (PC III).

▷ The electrical supply must only be made via PELV/SELV circuits.

▶ Disconnect power before connecting the device.

Connecting the device:

▶ Connect the device to the IO-Link master using the M12 connector.

▷ Voltage is supplied via the IO-Link master.
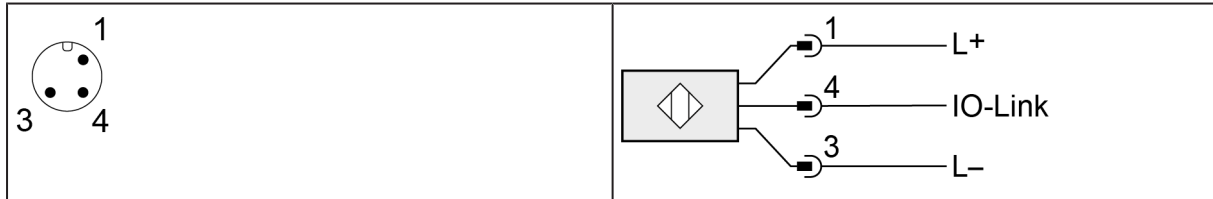
Information about available accessories at www.ifm.com

6   Operating and display elements
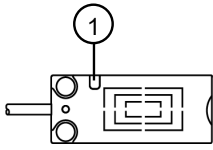
Fig. 4: Light indicators

1 multicolour LED

State	Green LED	Yellow LED
Ready for operation	Green LED is permanently on	
Successful reading/writing from/to IO-Link memory		Yellow LED flashes briefly 1x
Error when reading/writing from/to IO-Link memory		Yellow LED flashes quickly repeatedly
Flashing function	Green LED flashes 2x per second	Yellow LED flashes 2x per second

▷ The device can be easily located in plants with its flashing function.

7   Function

7.1   IO-Link

7.1.1   General information

This device has an IO-Link interface which enables direct access to process and diagnostic data. It is also possible to set the parameters of the device while it is in operation. Operation of the device via the IO-Link interface requires an IO-Link capable module (IO-Link master).

7.1.2   Device-specific information

With a PC, IO-Link software and an IO-Link adapter cable communication is possible when the system is not in operation.

⚑ Necessary information about the IODD, process data structure, diagnostic information, parameter addresses and the required hardware and software can be found at www.ifm.com.

7.1.3   Device-specific parameters

The parameters of the device are set using an IO-Link parameter setting program (for example ifm moneo).

⚑ ▷ More information about the IODD at www.ifm.com.

7.1.3.1   Parameter "Auto-Read/Write Address"

(Index 1903, subindex 0)

In the operating modes "READ DATA AUTO" / "WRITE DATA AUTO", the device automatically reads / writes a specified number of data bytes.

The parameter defines the address in the memory area which is accessed during the read/write operation. The address is indicated in bytes from the start of the memory area.

❗ The data is processed as a data word (2 bytes).

▶ Use data word as format for the address.

▶ Use only even addresses.

❗ The addressed memory area for the read/write operation cannot be outside the memory area of the device:

▶ Address for auto-read/auto-write + data length for auto-read/auto-write ≤ number of available bytes on the device

7.1.3.2   Parameter "Auto-Read/WriteData Length"

(Index 1904, subindex 0)

In the operating mode "READ DATA AUTO" / "WRITE DATA AUTO", the device automatically reads / writes a specified number of data bytes.

The parameter defines the length of the memory area which is read / written from the device in bytes.

❗ The data is processed as a data word (2 bytes).

▶ Specify the data length as a multiple of 2 bytes.

! The addressed memory area for the read/write operation cannot be outside the memory area of the device:

▶ Address for auto-read/auto-write + data length for auto-read/auto-write ≤ number of available bytes on the device

ℹ The minimum length for auto-read/auto-write is 2 bytes and the maximum length is 28 bytes.

8 Operation

The device supports different operating modes. An operating mode is set with the command value in the process data output image.

Command value	Operating mode
0x00	Read UID
0x01	Auto-read data
0x02	Auto-write data
0x03	Read data
0x04	Write data
0x05	Delete data

All operating modes use the same status bits and error values in the process images.

8.1 Status bits

Process input								
Bit	7	6	5	4	3	2	1	0
Name							Cmd End	Cmd Start Acknowl-edge

Process output								
Bit	7	6	5	4	3	2	1	0
Name								Cmd Start

Status bit	Value	Description
Cmd End	0	Read/write operation not yet started or active
	1	Read/write operation terminated
Cmd Start Acknowledge	0	Start of a read/write operation not ac-knowledged
	1	Start of a read/write operation acknowl-edged
Cmd Start	0	Reset trigger for read/write operation
	1	Set trigger for read/write operation

> ▷ The status bits "Cmd Start", "Cmd Start Acknowledge" and "Cmd End" are not used in the "Read UID" operating mode.

8.2 Error values in the process input

Error value	Name	Description
0x00	NOERROR	No error, read/write operation successful
0x01	UNKNOWN_COMMAND	Unknown command value
0x22	COMMAND SYNTAX	Command value is wrong, e.g. wrong address or length indication.

8.3   "Read UID" operating mode

In the „Read UID" operating mode, the UID of the device is read and provided by the latter at the process data input. The UID cannot be changed and deleted. The UID is individually assigned to each device at the factory.

The "Read UID" operating mode is the default operating mode after the device is started.

Byte	Process data output	Process data input
0	Command value = 0x00	Command value = 0x00
1	Status	Status
2	ignored	UID 0
3	ignored	UID 1
4	ignored	UID 2
5	ignored	UID 3
6	ignored	UID 4
7	ignored	UID 5
8	ignored	UID 6
9	ignored	UID 7
10	ignored	0x00
11	ignored	0x00
12	ignored	0x00
13	ignored	0x00
14	ignored	0x00
15	ignored	0x00
16	ignored	0x00
17	ignored	0x00
18	ignored	0x00
19	ignored	0x00
20	ignored	0x00
21	ignored	0x00
22	ignored	0x00
23	ignored	0x00
24	ignored	0x00
25	ignored	0x00
26	ignored	0x00
27	ignored	0x00
28	ignored	0x00
29	ignored	0x00
30	ignored	0x00
31	ignored	Error value

8.4   "Auto-read data" operating mode

In the "Auto-read data" operating mode the data 0 to 27 represent the data in the memory area of the device. The memory area is set by the parameters "Auto-Read/Write Address" and "Auto-Read/Write Data Length".

For memory areas with a data length of < 28 bytes the data remaining in the process image is filled with the value 0x00.

The data in the process image is updated as soon as the memory contents change. The data in the process image is valid as soon as the status bit "Cmd End" is set.

Byte	Process data output	Process data input
0	command value = 0x01	command value = 0x01
1	status	status
2	ignored	data 0
3	ignored	data 1
4	ignored	data 2
5	ignored	data 3
6	ignored	data 4
7	ignored	data 5
8	ignored	data 6
9	ignored	data 7
10	ignored	data 8
11	ignored	data 9
12	ignored	data 10
13	ignored	data 11
14	ignored	data 12
15	ignored	data 13
16	ignored	data 14
17	ignored	data 15
18	ignored	data 16
19	ignored	data 17
20	ignored	data 18
21	ignored	data 19
22	ignored	data 20
23	ignored	data 21
24	ignored	data 22
25	ignored	data 23
26	ignored	data 24
27	ignored	data 25
28	ignored	data 26
29	ignored	data 27
30	ignored	0x00
31	ignored	error value

8.5   "Auto-write data" operating mode

In the "Auto-write data" operating mode the data to be written is defined by the process data output image. The data is set by the parameters "Auto-Read/Write Address" and "Auto-Read/Write Data Length".

Max. 28 bytes can be defined in the process data output image (data 0 to 27). If a shorter length is defined in the parameter "Auto-Read/Write Data Length", the other data bytes are ignored and not written to the internal memory.

If writing was successful, the written data is copied to the process data input image and the status bit "Cmd End" is set.

If writing was unsuccessful, an error value is shown in the process image.

Byte	Process data output	Process data input
0	command value = 0x02	command value = 0x02
1	status	status
2	data 0	data 0
3	data 1	data 1
4	data 2	data 2
5	data 3	data 3
6	data 4	data 4
7	data 5	data 5
8	data 6	data 6
9	data 7	data 7
10	data 8	data 8
11	data 9	data 9
12	data 10	data 10
13	data 11	data 11
14	data 12	data 12
15	data 13	data 13
16	data 14	data 14
17	data 15	data 15
18	data 16	data 16
19	data 17	data 17
20	data 18	data 18
21	data 19	data 19
22	data 20	data 20
23	data 21	data 21
24	data 22	data 22
25	data 23	data 23
26	data 24	data 24
27	data 25	data 25
28	data 26	data 26
29	data 27	data 27
30	ignored	0x00
31	ignored	error value

8.6   "Read data" operating mode

In the "Read data" operating mode more than 28 bytes can be read with a read operation. The data is sequentially transferred from the device to the controller.

Transfer data from the device to the controller:

▶ The controller sets the command value "0x03", the address (32 bits) and the data length (32 bits) in the process data output image.

▶ The controller starts the read operation with the status bit "Cmd Start".

▶ The device acknowledges the start of the read operation by setting the status bit "Cmd Start Acknowledge" in the process data input image.

▶ The device transfers the data to the process data output image (data 0 to 27) and increases the block counter by 1.

▶ The controller acknowledges receipt of the data by increasing the block counter in the process data output image by 1.

▶ The previous two steps are repeated until all data has been transferred.

▶ The device sets the status bit "Cmd End" with the last transfer. Then the read operation is terminated.

> If reading was unsuccessful, the device sets the error value and the status bit "Cmd End" in the process image. Data transfer is interrupted.

Byte	Process data output	Process data input
0	Command value = 0x03	Command value = 0x03
1	Status	Status
2	ignored	Data 0
3	ignored	Data 1
4	Address 3	Data 2
5	Address 2	Data 3
6	Address 1	Data 4
7	Address 0	Data 5
8	Length 3	Data 6
9	Length 2	Data 7
10	Length 1	Data 8
11	Length 0	Data 9
12	ignored	Data 10
13	ignored	Data 11
14	ignored	Data 12
15	ignored	Data 13
16	ignored	Data 14
17	ignored	Data 15
18	ignored	Data 16
19	ignored	Data 17
20	ignored	Data 18
21	ignored	Data 19
22	ignored	Data 20
23	ignored	Data 21
24	ignored	Data 22
25	ignored	Data 23
26	ignored	Data 24
27	ignored	Data 25
28	ignored	Data 26
29	ignored	Data 27
30	Block counter	Block counter
31	ignored	Error value

8.6.1 "Successfully reading" example

The example shows that reading of the data was successful.

	Command value	Address	Length	Data 0 to 27	Block counter	Status bit "Cmd Start"	Command value	Data 0 to 27	Block counter	Error value	Status bit "Cmd End"	Status bit "Cmd Start"
	Process data output image						Process data input image					
Preset command	0x00	0x00	0x00	0x00	0x00	0	0x00	UID	0x00	0x00	0	0
Controller sets command (read 35 bytes from address 0x12)	0x03	0x12	0x23	0x00	0x00	1	0x03	UID	0x00	0x00	0	0
Device acknowledges command	0x03	0x12	0x23	0x00	0x00	1	0x03	0x00	0x00	0x00	0	1
Device sets first byte of the data	0x03	0x12	0x23	0x00	0x00	1	0x03	Data	0x01	0x00	0	1
Controller acknowledges receipt of the data	0x03	0x12	0x23	0x00	0x01	1	0x03	Data	0x01	0x00	0	1
Device sets more data and terminates reading	0x03	0x12	0x23	0x00	0x01	1	0x03	Data	0x02	0x00	1	1
Controller acknowledges receipt of the data	0x03	0x12	0x23	0x00	0x02	1	0x03	Data	0x02	0x00	1	1
Controller withdraws command value	0x00	0x00	0x00	0x00	0x00	0	0x03	Data	0x02	0x00	1	1
The device carries out the preset command	0x00	0x00	0x00	0x00	0x00	0	0x00	UID	0x00	0x00	0	0

8.6.2 "Reading not executed" example

The example shows a reading command abort.

	Command value	Address	Length	Data 0 to 27	Block counter	Status bit "Cmd Start"	Command value	Data 0 to 27	Block counter	Error value	Status bit "Cmd End"	Status bit "Cmd Start"
	Process data output image						Process data input image					
Preset command	0x00	0x00	0x00	0x00	0x00	0	0x00	UID	0x00	0x00	0	0
Controller sets command (read 0 bytes from address 0x12)	0x03	0x12	0x00	0x00	0x00	1	0x03	UID	0x00	0x00	0	0
Device acknowledges command	0x03	0x12	0x00	0x00	0x00	1	0x03	0x00	0x00	0x00	0	1
Device sets first byte of the data	0x03	0x12	0x00	0x00	0x00	1	0x03	Data	0x00	0x00	0	1
Controller acknowledges receipt of the data	0x03	0x12	0x00	0x00	0x01	1	0x03	Data	0x01	0x00	0	1
Device sets error value (Command Syntax)	0x03	0x12	0x00	0x00	0x01	1	0x03	Data	0x01	0x22	1	1

	Command value	Address	Length	Data 0 to 27	Block counter	Status bit "Cmd Start"	Command value	Data 0 to 27	Block counter	Error value	Status bit "Cmd End"	Status bit "Cmd Start"
Controller withdraws command value	0x00	0x00	0x00	0x00	0x00	0	0x03	0x00	0x01	0x22	1	1
The device carries out the preset command	0x00	0x00	0x00	0x00	0x00	0	0x00	UID	0x00	0x00	0	0

8.7 "Write data" operating mode

In the "Write data" operating mode more than 28 bytes can be written with one write operation. The data is sequentially transferred from the controller to the device.

Transferring data from the controller to the device:

▶ The controller sets the command value "0x04", the address (32 bits) and the data length (32 bits) in the process data output image.

▶ The controller starts the write operation with the status bit "Cmd Start".

▶ The device acknowledges the start of the write operation by setting the status bit "Cmd Start Acknowledge" in the process data input image.

▶ The controller fills the data in the process data output image (data 0 to 27) and increases the block counter by 1.

▶ The device acknowledges receipt of the data by increasing the block counter in the process data output image by 1.

▶ The two previous steps are repeated until all data has been transferred.

▶ The device sets the status bit "Cmd End" with the last transfer to the internal memory. Then the write operation is terminated.

ℹ ▷ If writing was unsuccessful, the device sets the error value and the status bit "Cmd End" in the process image. Data transfer is interrupted.

Byte	Process data output when starting the write operation	Process data output during data transfer	Process data input
0	command value=0x04	command value=0x04	command value=0x04
1	status	status	status
2	ignored	data 0	0x00
3	ignored	data 1	0x00
4	address 3	data 2	0x00
5	address 2	data 3	0x00
6	address 1	data 4	0x00
7	address 0	data 5	0x00
8	length 3	data 6	0x00
9	length 2	data 7	0x00
10	length 1	data 8	0x00
11	length 0	data 9	0x00
12	ignored	data 10	0x00
13	ignored	data 11	0x00
14	ignored	data 12	0x00
15	ignored	data 13	0x00

Byte	Process data output when starting the write operation	Process data output during data transfer	Process data input
16	ignored	data 14	0x00
17	ignored	data 15	0x00
18	ignored	data 16	0x00
19	ignored	data 17	0x00
20	ignored	data 18	0x00
21	ignored	data 19	0x00
22	ignored	data 20	0x00
23	ignored	data 21	0x00
24	ignored	data 22	0x00
25	ignored	data 23	0x00
26	ignored	data 24	0x00
27	ignored	data 25	0x00
28	ignored	data 26	0x00
29	ignored	data 27	0x00
30	block counter	block counter	block counter
31	ignored	ignored	error value

8.7.1 "Successfully writing" example

The example shows successful writing of data.

	Command value	Address	Length	Data 0 to 27	Block counter	Status bit "Cmd Start"	Command value	Data 0 to 27	Block counter	Error value	Status bit "Cmd End"	Status bit "Cmd Start"
	Process data output image						Process data input image					
Preset command	0x00	0x00	0x00	0x00	0x00	0	0x00	UID	0x00	0x00	0	0
Controller sets command (write 40 bytes to address 0x10)	0x04	0x10	0x28	0x00	0x00	1	0x04	UID	0x00	0x00	0	0
Device acknowledges command	0x04	0x10	0x28	0x00	0x00	1	0x04	0x00	0x00	0x00	0	1
Controller transfers the first data	0x04	Data			0x01	1	0x04	0x00	0x00	0x00	0	1
Device acknowledges data	0x04	Data			0x01	1	0x04	0x00	0x01	0x00	0	1
Controller transfers more data	0x04	Data			0x02	1	0x04	0x00	0x01	0x00	0	1
Device acknowledges data and terminates writing	0x04	Data			0x02	1	0x04	0x00	0x02	0x00	1	1
Controller withdraws command value	0x00	0x00	0x00	0x00	0x00	0	0x04	0x00	0x02	0x00	1	1
The device carries out the preset command	0x00	0x00	0x00	0x00	0x00	0	0x00	UID	0x00	0x00	0	0

8.7.2 "Writing not executed" example

The example shows a write command abort.

	Command value	Address	Length	Data 0 to 27	Block counter	Status bit "Cmd Start"	Command value	Data 0 to 27	Block counter	Error value	Status bit "Cmd End"	Status bit "Cmd Start"
	Process data output image						Process data input image					
Preset command	0x00	0x00	0x00	0x00	0x00	0	0x00	UID	0x00	0x00	0	0
Controller sets command (write 40 bytes to address 0x10)	0x04	0x10	0x00	0x00	0x00	1	0x04	UID	0x00	0x00	0	0
Device acknowledges command	0x04	0x10	0x00	0x00	0x00	1	0x04	0x00	0x00	0x00	0	1
Controller transfers the first data	0x04	Data			0x01	1	0x04	0x00	0x00	0x00	0	1
Device acknowledges data	0x04	Data			0x01	1	0x04	0x00	0x01	0x00	0	1
Controller transfers more data	0x04	Data			0x02	1	0x04	0x00	0x01	0x00	0	1
Device sets error value (Command Syntax)	0x04	Data			0x02	1	0x04	0x00	0x01	0x22	1	1
Controller withdraws command value	0x00	0x00	0x00	0x00	0x00	0	0x04	0x00	0x01	0x22	1	1
The device carries out the preset command	0x00	0x00	0x00	0x00	0x00	0	0x00	UID	0x00	0x00	0	0

8.8 "Delete data" operating mode

With the "Delete data" operating mode, the complete data contents of the memory are permanently deleted. Deleting starts with setting the command value to "0x05" and changing the status bit "Cmd Start from "0" to "1". Deleting is finished when the status bit "Cmd End" is set.

> ▷ The "Delete data" operating mode cannot be aborted. The stored data are reset to the value "0x00".

Byte	Process data output	Process data input
0	Command value = 0x05	Command value = 0x05
1	Status	Status
2	ignored	0
3	ignored	0
4	ignored	0
5	ignored	0
6	ignored	0
7	ignored	0
8	ignored	0
9	ignored	0
10	ignored	0
11	ignored	0

Byte	Process data output	Process data input
12	ignored	0
13	ignored	0
14	ignored	0
15	ignored	0
16	ignored	0
17	ignored	0
18	ignored	0
19	ignored	0
20	ignored	0
21	ignored	0
22	ignored	0
23	ignored	0
24	ignored	0
25	ignored	0
26	ignored	0
27	ignored	0
28	ignored	0
29	ignored	0
30	ignored	0
31	ignored	Error value

9   Maintenance, repair and disposal

The operation of the unit is maintenance-free.

Only the manufacturer is allowed to repair the unit.

▶ After use dispose of the device in an environmentally friendly way in accordance with the applicable national regulations.

10   Approvals/standards

For approvals and standards, the following information is available:

• Test standards and regulations: documentation.ifm.com

• EU declaration of conformity and approvals: documentation.ifm.com

• Notes relevant for approval: package inserts of the device

List of figures

Glossary

IODD

Digital description of the device. The IODD is required for device parameter setting via IO-Link.

UID

Unique Identification Number; unique identification number of a device.