Operating Instructions
IO-Link Master with EtherCAT interface
DataLine
8 Ports
IP 65 / IP 66 / IP 67

AL1332

IO-Link: 1.1.2
ifm firmware: 2.0.35 or higher
LR DEVICE: 1.2.0.107 or higher

English

7391162/00 12/2017

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1 Preliminary note

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14801

1.1 Legal and copyright information

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1.2 Purpose of the document

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This document is only for device types "IO-Link master - EtherCAT gateway (DataLine) 8 port IP 65 / IP 66 / IP 67" (art. no.: AL1332).

It is part of the device and contains information about the correct handling of the product.

► Read this document before using the device.

► Keep this document during the service life of the device.

1.3 Symbols and styles used

13839

► ... Instructions

> ... Reaction, result

→ ... Cross-reference or internet link

123 Decimal number
0x123 Hexadecimal number
0b010 Binary number

[...] Designation of pushbuttons, buttons or indications

1.4 Modification history

21676

Version	Topic	Date
00	New creation of document	12/2017

2 Safety instructions

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2.1 General

22068

The plant manufacturer is responsible for the safety of the plant in which the device is installed.

If the device is used in a way that is not intended by the manufacturer, the protection supported by the device may be impaired.

Non-observance of the instructions, operation which is not in accordance with use as prescribed below, wrong installation or incorrect handling can affect the safety of operators and machinery.

- ► Observe these operating instructions.
- ► Adhere to the warning notes on the product.

2.2 Required background knowledge

22046

This document is intended for specialists. Specialists are people who, based on their relevant training and experience, are capable of identifying risks and avoiding potential hazards that may be caused during operation or maintenance of the product.

The document contains information about the correct handling of the product.

2.3 Warnings used

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⚠ WARNING

Death or serious irreversible injuries may result.

⚠ CAUTION

Slight reversible injuries may result.

NOTICE

Property damage is to be expected or may result.

Important note
Non-compliance may result in malfunction or interference.

Information
Supplementary note.

2.4 Safety symbols on the device

15021

General warning
When this symbol is shown, consult the corresponding section in the operating instructions.

2.5 Tampering with the unit

11242

⚠ WARNING

Tampering with the units can affect the safety of operators and machinery!
Tampering with the units is not allowed.
In case of non-compliance our liability and warranty expire.

- ► Do not open the devices!
- ► Do not insert any objects into the devices!
- ► Prevent metal foreign bodies from penetrating!

3 Intended use

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3.1 Permitted use

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The IO-Link master serves as a gateway between intelligent IO-Link devices and the fieldbus. The device is designed for use without a control cabinet.

3.2 Prohibited use

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The device may not be used beyond the limits of the technical data (→ **Technical data** (→ p. 61))!

4 Function

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4.1 Communication, parameter setting, evaluation

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4.1.1 IO-Link

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The device offers the following IO-Link functions:

- IO-Link master (IO-Link revision 1.0 and 1.1)
- 8 IO-Link ports for connection of IO-Link devices
- Provision of process data of the connected IO-Link devices for LR SMARTOBSERVER monitoring software (→ www.ifm.com)

4.1.2 EtherCAT

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The device offers the following EtherCAT functions:

- Provision of the functions of a EtherCAT Slave
- 2 port switch for access to the EtherCAT interface (X21/X22)
- Gateway for transmission of the process and parameter data between the connected IO-Link devices and the higher-level EtherCAT controller

4.1.3 Internet of Things (IoT)

8355

The device has an Ethernet port (X23) for Internet-of-Things applications. The interface allows separate access from IT networks to parameters, process and monitoring data of the IO-Link master and the connected IO-Link devices. Different protocols (e.g. TCP/IP JSON) are supported.

4.1.4 Parameter setting

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The device provides the following configuration options:

- Parameter setting of the IO-Link master of the AL1332 with LR DEVICE parameter setting software, EtherCAT projection software or ifm IoT-Core services.
- Parameter setting of the connected IO-Link devices (sensors, actuators) with LR DEVICE parameter setting software, EtherCAT projection software or ifm IoT-Core services
- Storage of parameter sets of the connected IO-Link devices for automatic recovery (data storage)

4.1.5 Visual indication

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The device has the following visual indicators:

- Status and error indication of the gateway, of the EtherCAT connection and of the system
- Status display of the voltage supply
- Status and activity display of the Ethernet connection
- Status, error and short circuit/overload indication of the IO-Link ports

4.2 Digital inputs

7584

The device has 8 additional digital inputs (type 2 according to EN 61131-2).
The digital inputs are on pin 2 of the IO-Link ports X01 ... X08.
All inputs refer to the potential of the device supply (pin 3).

4.3 IO-Link supply

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The device has 8 supplies for IO-Link devices.
The IO-Link ports X01...X08 are ports class A.
Every supply provides short circuit monitoring.
The device ensures fire protection for the connected IO-Link devices by providing a power-restricted circuit at the IO-Link ports (according to IEC61010-1 and Class 2 according to UL1310).

5 Mounting

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5.1 Mount the device

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- ► Disconnect the system from power before installation.
- ► For installation choose a flat mounting surface.
- ► Please observe the maximum tightening torque.

► Fix the unit to the mounting surface using 2 M5 mounting screws and washers.
  - Tightening torque: 1.8 Nm

► Ground the unit via the two mounting screws of the upper mounting lugs.

6 Electrical connection

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6.1 Remarks

18076

A qualified electrician must connect the unit.

► Observe the national and international regulations for the installation of electrical equipment.

Device is only suitable for operation on SELV/PELV voltages.

► Observe the information concerning IO-Link circuits (→ **IO-Link circuits** (→ p. 18))!

The device contains components that can be damaged or destroyed by electrostatic discharge (ESD).

► Observe the required safety measures against electrostatic discharge!

The IP rating depends on the individual protection ratings of the unit, the applied connection elements and the corresponding protective covers.

► For UL applications: For connecting the device and the IO-Link devices use UL certificated cables of category CYJV or PVVA with a minimum temperature rating of 100°C.

► Depending on the installation environments apply a cable relief to avoid invalid load of the mounting points and the M12 connectors.

► Ensure a proper fit and correct installation of the M12 connectors. If disregarded the desired protection rating can not be guaranteed.

Wiring: → **Technical data** (→ p. 61)

The communication interfaces are seperated from the device supply according to EN61010-1 considering basis isolation as secondary circuit with maximum 30 V DC derived from the applied voltage up to 300 V of overvoltage category II. The communication interfaces are designed for a network environment 0 according to IEC TR62102.

6.2 EtherCAT ports

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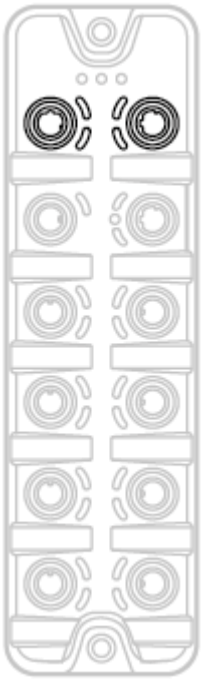

- ► Connect the device via the M12 socket X21 and/or X22 to the EtherCAT network
  (e.g. EtherCAT PLC, additional EtherCAT device)
  - Tightening torque: 0.6...0.8 Nm
- ► To connect the devices, use M12 connectors with protection rating IP 65 / IP 66 / IP 67 or higher (→ **Accessories** (→ p. 60)).
- ► Cover the unused sockets with M12 protective caps (→ **Accessories** (→ p. 60)).
  - Tightening torque 0.6...0.8 Nm

6.3 IoT port

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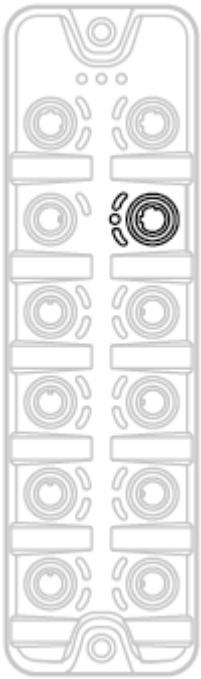

- ► Connect the device via the M12 socket X23 to the IT network (e.g. laptop/PC with installed LR DEVICE parameter setting software, laptop/PC with installed LR SMARTOBSERVER monitoring software)
  - Tightening torque: 0.6...0.8 Nm
- ► To connect the devices, use M12 connectors with protection rating IP 65 / IP 66 / IP 67 or higher (→ **Accessories** (→ p. 60)).
- ► Cover the unused sockets with M12 protective caps (→ **Accessories** (→ p. 60)
  - Tightening torque 0.6...0.8 Nm

6.4 IO-Link ports

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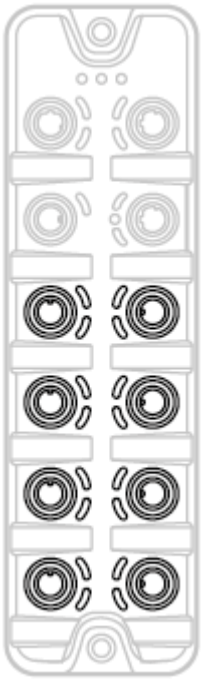

Ports X01...X08: For use as IO-Link port class A:

► Connect the connector of the IO-Link devices with the M12 sockets X01 ... X08.
  - Tightening torque: 0.6...0.8 Nm
  - Maximum cable length per IO-Link interface: 20 m

► For the connection, use M12 connectors with protection rating IP 65 / IP 66 / IP 67 or higher (→ Accessories).

Ports X01...X08: For use as IO-Link port class B:

► Connect the connector of the IO-Link devices via the adapter with the M12 sockets X01 ... X08.
  - Tightening torque: 0.6...0.8 Nm

► To connect the devices, use M12 connectors with protection rating IP 65 / IP 66 / IP 67 or higher (→ Accessories).

► Cover the unused sockets with M12 protective caps (→ Accessories).
  - Tightening torque 0.6...0.8 Nm

6.4.1 Input circuit

18629

The inputs of the ports X01...X08 (pin 2) provide a type 2 behaviour according to standard EN61131-2, the connected electronics must be rated for this electrically.

6.4.2 IO-Link circuits

11616

The IO-Link interfaces of the device meet the requirements of the IO-Link specification 1.0 to 1.1.2.

The connected IO-Link devices may only be supplied via the AL1332.

Exception: Connection of IO-Link devices to ports X01...X08 via suitable connection technology for port class B operation (→ **IO-Link ports** (→ p. 17)):
The external supply for port class B operation must be galvanically separeted from the circuit of the AL1332 by assuring basic isolation (according to EN61010-1, secondary circuit with maximum 30 V DC derived from applied voltage up to 300 V of overvoltage category II)!

The isolation must be done both for IO-Link devices and for the connection technology.

NOTICE

Risk of material damage

If the requirements of galvanic separation of the circuits are not observed, the fire protection of the device can not be assured.

► Observe the requirements of the electrical connection of IO-Link devices for port class B operation!

Further information: → **Technical data** (→ p. 61)

6.5 Connect the device

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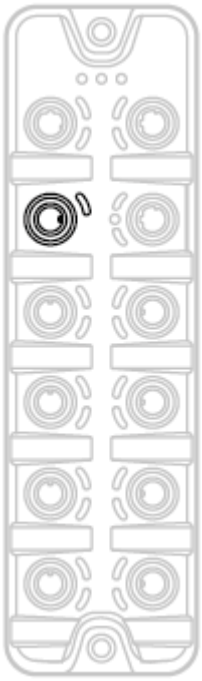

- ► Disconnect power.
- ► Connect the unit via M12 socket X31 to 24 V DC (20...30 V SELV/PELV, for cULus max. 24 V DC; according to EN61010-1, secondary circuit with maximum 30 V DC derived from applied voltage up to 300 V of overvoltage category II).
  - Tightening torque: 0.6...0.8 Nm
  - Maximum cable length: 25 m
- ► To connect the device , use M12 connectors with protection rating IP 65 / IP 66 / IP 67 or higher (→ Accessories).

If the port X01...X08 will be used as IO-Link ports Class B:

- ► Connect adapter for Port Class B operation to 24 V DC (20...30 V SELV/PELV, for cULus max. 24 V DC; according to EN61010-1, secondary circuit with maximum 30 V DC derived from applied voltage up to 300 V of overvoltage category II) (→ **IO-Link ports** (→ p. 17))
  - Tightening torque: 0.6...0.8 Nm

7 Operating and display elements

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7.1 Overview

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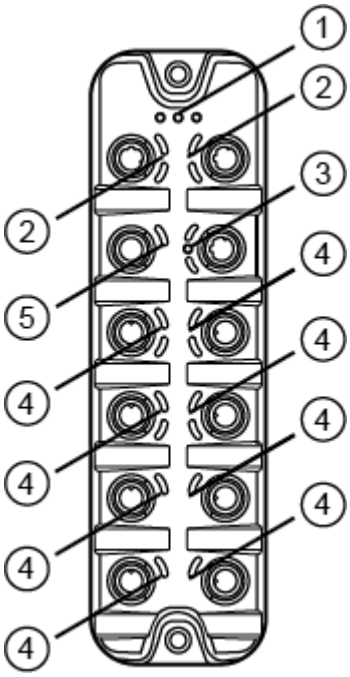

1 RDY, RUN and ERR status LEDs
→ **Status LEDs** (→ p. 21)

2 Status LEDs L/A of the EtherCAT interfaces 1 (X21) and 2 (X22)
→ **EtherCAT interface** (→ p. 22)

3 LNK, ACT status-LEDs and IoT LED of the IoT interface (X23)
→ **IoT port** (→ p. 22)

4 IOL and DI status-LEDs of the IO-Link port (X01...X08)
→ **IO-Link ports (Class A)** (→ p. 23)

5 US status LED of the voltage supply (X31)
→ **Voltage supply** (→ p. 22)

7.2 LED indicators

22024

The device only has the following LED indicators:

7.2.1 Status LEDs

1986

The RDY LED indicates the status of the gateway.
The RUN LED indicates the current state of the EtherCAT state machine.
The ERR LED inidcates occuring errors.

Status LED			**Description**
RDY	green	on	Gateway functions properly.
		flashes 1 Hz	Error
		flashes 5 Hz	Firmware update
		off	Gateway does not function; Device reboots
RUN	green	on	Device in OPERATIONAL state
		flashes (2.5 Hz)	Device in PRE-OPERATIONAL state
		flahes (200 ms on, 1000 ms off)	Device in SAFE-OPERATIONAL state
		flashes (10 Hz)	Device is booting and not yet in INIT state or device is in BOOTSRAP state
		off	Device in INIT state
ERR	red	on	Error in application controler
		flashes (10 Hz)	Boot error
		flashes (200 ms on, 200 ms off, 200 ms on, 1000 ms off)	Watchdog error (EtherCAT or process data)
		flashes (200 ms on, 1000 ms off)	Local error
		flashes (2.5 Hz)	Invalid configuration
		off	No error

7.2.2 EtherCAT interface

17852

Each EtherCAT interface (X21, X22) has 1 L/A LED. The LED indicates the status of the Ethernet connection.

Status LED			Description
L/A	green	on	Ethernet connection established
		flashes	Data is transmitted via the Ethernet interface.
		off	No Ethernet connection

7.2.3 IoT port

7722

The IoT port (X23) has the 3 LNK, ACT and IoT LEDs. The LEDs indicate the status of the Ethernet connection and the device identification.

Status LED			Description
LNK	green	on	Ethernet connection established
		off	No Ethernet connection
ACT	yellow	flashes	Data is transmitted via the Ethernet interface.
		off	No data transmission
IoT	green	flashes	Device identification active

7.2.4 Voltage supply

22026

The interface for voltage supply (X31) has the LED that is marked as US. The LED indicates the status of the voltage supply.

Status LED			Description
US	green	on	The supply voltage Us is applied.
		off	No supply voltage is applied or the applied supply voltage is too low.

7.2.5 IO-Link ports (Class A)

22029

Each IO-Link port Class A (X01 ... X08) has 2 LEDs marked as IOL and DI. The LEDs indicate the status of the IO-Link port.

Status LED			**Description**
IOL	yellow	on	Interface configured as DI/DO: Pin 4 (C/Q) =ON
		off	Interface configured as DI/DO: Pin 4 (C/Q) = OFF
	green	on	IO-Link transmission functions properly
		flashes 1 Hz	Interface configured as IO-Link, but no IO-Link transmission
	red	on	Short circuit or overload in supply voltage
		flashes 1 Hz	Transmission error
DI	yellow	on	Digital input: Pin 2 (DI) = ON
		off	Digital input : Pin 2 (DI) = OFF

8 Configuration

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8.1 LR DEVICE

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22822

On delivery, the AL1332 is configured with the factory settings (→ **Factory settings** (→ p. 59)).

Required software: LR DEVICE (1.2.0.107) (art.-No.: QA0011/QA0012)

8.1.1 Remarks

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Offline parameter setting

22405

The AL1332 supports the offline parameter setting. In this context, the user creates and stores a configuration for the unit and the connected IO-Link devices without being connected to the AL1332. The configuration created in this way can be stored as a file (*.lrp) and loaded to the device and activated at a later date.

Further information about offline parameter setting: → Operating instructions of the parameter setting software LR DEVICE

8.1.2 IoT: Configure access rights

16555

The access rights define which instance may read and / or write the parameter data, process data and event/diagnostic messages.

In order to configure the access rights to the IO-Link master:

► Select [IoT] menu.

> The menu page shows the current settings.

► Set the following parameters as required:

Name	Description	Possible values	
[Access Rights]	The access rights to the parameter data, process data and the event/diagnostic messages of the IO-Link master as well as the connected IO-Link devices	[EtherCAT + IoT]	▪ EtherCAT and IoT Core have read and write access rights to parameters and process data ▪ EtherCAT and <IoT Core> have read access rights to events/alarms
		[EtherCAT + IoT (read-only)]	▪ EtherCAT has read and write access rights to parameters and process data ▪ EtherCAT has read access rights to events/alarms ▪ IoT Core only has read access rights to parameters, process data and events/alarms
		[IoT only]	▪ IoT Core has read and write access rights to parameters and process data ▪ IoT has read access rights to events/alarms ▪ EtherCAT has no access rights

► Save changed values on the device.

If the parameter [Access Rights] = [EtherCAT + IoT]:
Different parameter settings in the EtherCAT projection software and the IoT applications can result in undesired system behaviour. The set values of the EtherCAT projection software apply.

Changes of the parameter [Access Rights] are only effective after restarting the device.
To activate the changed access rights:

► **Firmware: Reboot the device** (→ p. 33)

8.1.3 IoT: Configure IP settings

17713

For access to the IO-Link master via the IT infrastructure the user has to set the IP settings of the IoT port.

To configure the IP settings with DHCP, a DHCP server has to be active in the IT network. If no DHCP server can be reached in the IT network, an IP address is automatically assigned to the IoT port with the Zeroconfig protocol (address range: → Factory settings).

To configure the IP settings of the IoT port:

► Select [IoT] menu.

> The menu page shows the current settings.

► Set the following parameters as required:

Name	Description	Possible values	
[DHCP]	Activate/deactivate the DHCP client of the device	[Static IP]	IP settings were set by the user
		[DHCP]	IP settings are set by a DHCP server in the network.
[IP address]*	IP address of the IoT port	Factory setting: 169.254.X.X	
[Subnet mask]*	Subnet mask of the Ethernet network	Factory setting: 255.255.0.0	
[Default gateway IP address]*	IP address of the network gateway	Factory setting: 0.0.0.0	
[MAC address]	MAC address of the IoT port	The value is firmly set.	

* ... can only be edited if parameter [DHCP] = [Static IP]

► Save changed values on the device.

8.1.4 IoT: Configure the interface to the LR SMARTOBSERVER

16552

To enable data transfer between the device and the LR SMARTOBSERVER monitoring software, the LR SMARTOBSERVER monitoring software interface has to be configured.

► Select [IoT] menu.

> The menu page shows the current settings.

► Set the following parameters as required:

Name	Description	Possible values	
[IP address LR SMARTOBSERVER]	IP address of the PC on which the LR SMARTOBSERVER is installed.	Factory setting: 255.255.255.255	
[Port LR SMARTOBSERVER]	Port number that is used to send process data to the LR SMARTOBSERVER	0 ... 65535	Factory setting:: 35100
[Interval LR SMARTOBSERVER]	Cycle time for the transfer of the process data to the LR SMARTOBSERVER (value in milliseconds)	[Off]	no transfer
		500 ... 2147483647	500 ms ... 2147483647 ms
[Application Tag]	Source identifier of the IO-Link master in the structure of the LR SMARTOBSERVER (String32)	Factory setting: AL1332	

After changing the parameter [Port LR SMARTOBSERVER] or [Application Tag], it may take 120 seconds before the device establishes a new TCP connection.

To prevent the delay:

► Reboot the device after the parameter change.

► Save changed values on the device.

8.1.5 Fieldbus: Configure the EtherCAT port

22759

The user can assign a name for the identification of the IO-Link master in the EtherCAT projection software.

The address of the EtherCAT port is assigned via the EtherCAT projection software.

To configure the fieldbus port:

► Select [Fieldbus] menu.

> The menu page shows the current settings.

> Set the following parameters as required:

Parameter	Description	Possible values
[Hostname]	Name of the device in the EtherCAT network	e.g. al1xxx
[MAC address]	MAC address of the device	The value is firmly set.

► Save changed values on the device.

8.1.6 IO-Link ports: Activate data transfer to the LR SMARTOBSERVER

16551

The user can decide separately for each IO-Link port if the process data of the connected IO-Link devices should be transferred to the LR SMARTOBSERVER.

To transfer process data the interfaces to the LR SMARTOBSERVER have to be correctly configured (→ **IoT: Configure the interface to the LR SMARTOBSERVER** (→ p. 29)).

To activate / deactivate data transfer:

► Select [Port x] menu (x = 1...8).

> The menu page shows the current settings.

► Set the following parameters as required:

Name	Description	Possible values	
[Transmission to LR SMARTOBSERVER]	Transfer of process data of the connected IO-Link device to LR SMARTOBSERVER	[Disabled]	Process data is not transferred
		[Enabled]	Process data is transferred

► Save changed values on the device.

8.1.7 IO-Link ports: Configure operating mode

17439

The IO-Link ports X01...X08 of the device support the following operating modes:

- Digital input (DI): binary input signal at pin 4 (C/Q) of the IO-Link port
- Digital output (DO): binary output signal at pin 4 (C/Q) of the IO-Link port
- IO-Link: IO-Link data transfer via pin 4 (C/Q) of the IO-Link port

The user can set the operating mode separately for each IO-Link port.

To set the operating mode of an IO-Link port:

► Select [Port x] menu (x = 1...8).

> The menu page shows the current settings.

► Set the following parameters as required:

Name	Description	Possible values	
[Mode]	Operating mode of the IO-Link port	[Disabled]	Port deactivated
		[DI]	Operation as digital input
		[DO]	Operation as digital output
		[IO-Link]	Operation as IO-Link interface
[Cycle time actual]**	Current cycle time of the data transfer between IO-Link master and IO-Link device on the port (value in microseconds)	Parameter can only be read	
[Cycle time preset]*	Cycle time of the data transfer between the IO-Link master and the IO-Link device at the port (value in microseconds)	0	The device automatically sets the fastest possible cycle time.
		1 ... 132800	1 microsecond ... 132800 microseconds
[Bitrate]**	Current transmission rate of the data transfer between the IO-Link master and the IO-Link device on the port	Parameter can only be read	

* ... Parameter only available if [Mode] = [IO-Link]
** ... Parameter only visible if the IO-Link device is connected to the IO-Link port.

► Save changed values on the device.

8.1.8 IO-Link ports: Set the device validation and data storage

17945

In the operating mode "IO-Link" the user can set the behaviour of the IO-Link port with regard to device validation and the storage / restoration of the parameter data of the connected IO-Link device.

To configure the device validation and the data storage:

► Select [Port x] menu (x = 1...8).

> The menu page shows the current settings.

► Set the following parameters as required:

Name	Description	Possible values	
[Validation / Data Storage]	Supported IO-Link standard and behaviour of the device during connection of a new IO-Link device on port x (x = 1...8)	[No check and clear]	▪ No verification of the vendor ID and device ID ▪ No data storage
		[Type compatible V1.0 device]	▪ IO-Link device is compatible with the V1.0 IO-Link standard ▪ Verification whether it is an IO-Link device of the same type (validation via vendor ID and device ID) ▪ No data storage
		[Type compatible V1.1 device]	▪ IO-Link device is compatible with the V1.1 IO-Link standard ▪ Verification whether it is an IO-Link device of the same type (validation via vendor ID and device ID) ▪ No data storage
		[Type compatible V1.1 device with Backup + Restore]	▪ IO-Link device is compatible with the V1.1 IO-Link standard ▪ Verification whether it is an IO-Link device of the same type (validation via vendor ID and device ID) ▪ The IO-Link master saves the parameter values of the connected IO-Link device; modifications of the parameter values are also saved (observe the note!) ▪ When connecting an IO-Link device with factory settings, the parameter values stored in the IO-Link master are restored automatically on the IO-Link device.
		[Type compatible V1.1 device with Restore]	▪ IO-Link device is compatible with the V1.1 IO-Link standard ▪ Verification whether it is an IO-Link device of the same type (validation via vendor ID and device ID) ▪ The IO-Link master saves the parameter values of the connected IO-Link device once. ▪ When connecting an IO-Link device with factory settings, the parameter values stored in the IO-Link master are restored automatically on the IO-Link device.
[Vendor ID]	ID of the manufacturer that is to be validated	0 ... 65535	Factory setting: 0 ifm electronic: 310
[Device ID]	ID of the IO-Link device that is to be validated	0 ... 16777215	Factory setting: 0

► Save changed values on the device.

8.1.9 Info: Show device information

12218

To read the general information of the ifm IO-Link master:

► Select [Info] menu.

> The menu page shows the current settings.

Name	Description	Possible values
[Product code]	Article number of the IO-Link master	AL1332
[Device family]	Device family of the IO-Link master	IO-Link master
[Vendor]	Vendor	ifm electronic gmbh
[SW-Revision]	Firmware of the IO-Link master	
[HW revision]	Hardware version of the IO-Link master	
[Bootloader revision]	Bootloader version of the IO-Link master	
[Serial number]	Serial number	

8.1.10 Firmware: Reset device to factory settings

7209

When the IO-Link master is reset, all parameters are set to the factory settings:
To reset the device to factory settings:

► Select [Firmware] menu.

> The menu page shows the current settings.

► Click on [Factory Reset] to reset the device.

> LR DEVICE sets the device to the factory settings.

8.1.11 Firmware: Reboot the device

18105

When rebooting the device, all settings are kept.
To restart the AL1332:

► Select [Firmware] menu.

> The menu page shows the current settings.

► Click on [Reboot] to reboot the device.

> LR DEVICE reboots the ifm IO-Link master.

8.1.12 Configure IO-Link devices

11033

To configure the IO-Link devices connected to the device with the LR DEVICEparameter setting software:

Requirements:

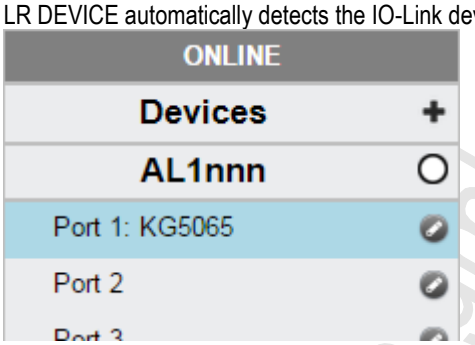
> IO-Link master is correctly installed and connected to the LR DEVICE parameter setting software.
> The IO-Link device is correctly connected to the AL1332.
> Operating mode of the IO-Link port is "IO-Link" (→ **IO-Link ports: Configure operating mode** (→ p. 31)).
> IoT has write access rights to the IO-Link master (→ **IoT: Configure access rights** (→ p. 27)).

1 Select IO-Link master

► Start LR DEVICE.
► Update IODD file library
OR:
Import IODD file of the IO-Link device manually.
► Scan network for devices.
> LR DEVICE detects IO-Link master.

2 Add IO-Link device

► Under [ONLINE]: Click on the required IO-Link master.
> LR DEVICE automatically detects the IO-Link devices connected to the IO-Link master (e.g. ifm sensor KG5065).



3 Configure IO-Link device

► Mouse click on the port to which the <IO> device is connected.
> LR DEVICE reads and shows the current parameter values of the IO-Link device.
► Configure IO-Link device.

Information about the available parameters of the IO-Link device: → IO Device Description (IODD) of the IO-Link device

► Save the changed configuration on the IO-Link device.

8.2 EtherCAT

Contents

17299

On the field bus side, the device can be configured with any EtherCAT compatible projection software.

The information in the following sections refers to the EtherCAT projection software TwinCAT 3.1.

8.2.1 Install ESI file

12762

To represent the AL1332 in a field bus projection software ifm electronic provides an ESI file. The EDS file can be downloaded from ifm's website. In the ESI file, all parameters, process data and their valid value ranges are defined.

To integrate the ESI file into EtherCAT projection software TwinCAT 3.1:

► Download ESI file of the device.

► Copy downloaded file to the following subdirectory of the TwinCAT installation directory:
`..\3.1\Config\Io\EtherCAT`

► Start TwinCAT.

> TwinCAT loads the device description to the device catalogue.

8.2.2 Integrate the AL1332 into the EtherCAT project

17297

The device is integrated into the project as EtherCAT slave.

Requirements

> The ESI file of the AL1332 is installed (→ **Install ESI file** (→ p. 35)).

1 Create/open EtherCAT project

► Launch EtherCAT projection software.

► Create a new project.
OR
Open an existing project.

2 Configure EtherCAT PLC and IO periphery

► Select and configure EtherCAT PLC and requested I/O periphery.

> Project contains EtherCAT PLC and I/O periphery.

3 Integrate the AL1332 into the project

► In the Solution Explorer: Right-click on devices to which the AL1332 is connected.

> Context menu appears.

► In the context menu: Select [Add new item...].

> Window [Insert EtherCAT Device] appears.

► Select the AL1332 in the device tree under [ifm electronic] > [ifm IO-Link master].

► Click on [OK] to add the selected device to the project.

> TwinCAT adds AL1332 to the project.

4 Save the project

► Save the project.

8.2.3 Configure IO-Link master

18602

The IO-Link master is configured via the CoE interface (→ TwinCAT-online help). The configuration is made via the following parameters:

Name	Description	Reference
Current Use Case	Access rights to the IO-Link master	→ **Manufacturer Specific Index (0x20 00)** (→ p. 69)
Reset To Factory	Reset IO-Link master to factory settings	→ **Manufacturer Specific Index (0x20 00)** (→ p. 69)

8.2.4 Configure IO-Link ports

17959

The IO-Link ports are configured via the CoE interface (→ TwinCAT-online help). The user can configure each IO-Link port separately. The configuration is made via the following parameters:

Name	Description	Reference
IO Settings	Configuration of the IO-Link ports X01...X08	→ **IO Settings (0x8000)** (→ p. 72)
Vendor Specific IO Settings	Manufacturer-specific settings of the IO-Link ports X01...X08	→ **IO Settings (0x8000)** (→ p. 72)

8.2.5 Configure cyclic process data

16556

Type and number of cyclic input and output data on the IO-Link ports are defined via the fieldbus modules (→ **EtherCAT modules** (→ p. 67)). In the factory settings, all slots are configured with the module "IOL_4/4_I/O".

To configure the cyclic process data:

Requirements

> AL1332 is integrated (→ **Integrate the AL1332 into the EtherCAT project** (→ p. 36)).

1 Open the device editor

► In the Solution Explorer: Double-click on the node of the AL1332.

> The window shows the available configuration options.

► Select the tab [Slots].

> The window shows the current configuration of the cyclic data.

2 Assign fieldbus modules

► In the left half of the table: Select click on slot of the requested IO-Link port.

► In the right half of the table: Click on the requested fieldbus module.

► Click on [<] to assign the requested fieldbus module to the slot.

3 Configure more IO-Link ports

► optional: repeat step 1 for further IO-Link ports.

> Cyclic data is assigned to the fieldbus slots.

> The Solution Explorer shows the configured modules as subelements of the device node.

4 Save the project

► Save the project.

8.2.6 Read and write cyclic process data

17960

► To check the validity of the cyclic process data, evaluate the PQI byte (→ **Device status / port status (0xF000)** (→ p. 74)).

Even with an interruption of the fieldbus connection the PQI byte indicates that the process data is valid. This can have unintended impact on the control process.

► Take suitable measures to detect an interruption of the fieldbus connection.

They cyclic process data of the IO-Link-Ports X01...X08 is accessible via the following index groups:

Name (Index)	Description	Reference
IO-Link inputs (0x6000)	Cyclic input data at the IO-Link ports X01...X08	→ **IO-Link inputs (0x6000)** (→ p. 71)
IO-Link outputs (0x7000)	Cyclic output data at the IO-Link ports X01...X08	→ **IO-Link outputs (0x7000)** (→ p. 71)

During the configuration of the fieldbus slots TwinCAT automatically creates variables for the cyclic input and output data. They are found in groups in the folders under the respective fieldbus modules. The user can link the variables directly with the elements of a global variable list (GVL).

The following variables are created:

Group > Variable	Variable	Description
[TxPDO]	[input byte n]	Byte n of the cyclic input data of the fieldbus module
[RxPDO]	[output byte m]	Byte m of the cyclic output data of the fieldbus module

n = 0...(max. number of bytes on configured input data)-1
m = 0...(max. number of bytes on configured output data)-1

8.2.7 Read diagnostic and status information

17961

Diagnostic and status information is accessible via the following index groups:

Name (Index)	Description	Reference
MDP Standard Information (0x1000)	▪ Device information via IO-Link master ▪ Identity Object ▪ Diagnostic history	→ **MDP Standard Information (0x1000)** (→ p. 68)
IO Info Data (0x9000)	Information about IO-Link devices at IO-Link-Ports X01...X08	→ **IO Info Data (0x9000)** (→ p. 73)
IO Diag Data (0xA000)	Diagnostic data of the IO-Link ports X01...X08	→ **IO Diag data (0xA000)** (→ p. 73)
Device Status (0xF000)	▪ Status of the IO-Link devices at the IO-Link port X01...X08 ▪ Port qualifier	→ **Device status / port status (0xF000)** (→ p. 74)

When the IO-Link master is integrated into a EtherCAT project, TwinCAT automatically creates variables for diagnostic and status information in the Solution Explorer. They are grouped in folders under the device node. The user can link the variables directly with the elements of a global variable list (GVL).

The following variables are created:

Group > Variable	Description
[TxPDO IO-Link Device Status] > [State of IO-Link Ch.n]	Status of the IO-Link device at the IO-Link port X0n
[TxPDO IO-Link Port Qualifier] > [Qualifier of IO-Link Ch.n]	Port qualifier bits of the IO-Link port X0n
[TxPDO New Diagnosis Message available] > [New Message Available Flag]	Notification of new diagnostic messages

n ... 1...8

8.2.8 Configure IO-Link devices

9031

The IO-Link master supports the configuration of the connected IO-Link devices from the EtherCAT projection software. The parameters of an IO-Link device are set via IO-Link index and subindex. The number of the configurable parameters depends on the connected IO-Link device.

Available parameters of the IO-Link devices: → IO Device Description (IODD) of the IO-Link device

The user can read and write IO-Link index and subindex using the following methods:

- Acyclic communication: → **Use acyclic services** (→ p. 41)

8.2.9 EtherCAT: Programmers' notes

Contents

17965

Use acyclic services

17958

The AL1332 supports following services for acyclic read and write processes:

- AoE - ADS over EtherCAT (→ **Use ADS over EthercCAT** (→ p. 41))
- CoE - CANopen over EtherCAT (→ **Use CANopen over EtherCAT** (→ p. 42))

Use ADS over EthercCAT

9109

AoE is suited for interruption-free access to the connected IO-Link devices during the operating time of the device. Access to the IO-Link master with AoE is not supported.

The function blocks for using AoE are part of the `tc2_system.lib`TwinCAT library.

The following rules apply to the inputs of the ADS function blocks:

Input	Description		Possible values	
PORT	ADS communication port = 0x1000 + IO-Link port number		0x1001 0x1002 ... 0x1008	IO-Link port X01 IO-Link port X02 ... IO-Link port X08
IDXGRP	AoE index group		0xF302	
IDXOFFS	Index Offset		e. g. access to index 21, subindex 0: 0x0021°0x00°0x00	
	Bits 0-7:	IO-Link subindex		
	Bits 8-15:	00000000		
	Bits 16-31:	IO-Link index		
ERRID	ADS error code		e. g. access to parameters of the IO-Link device refused: 0x0700°8023	
	Bits 0-15:	Error code of the IO-Link device		
	Bits 16-31:	ADS device error = 0x0700		

Use CANopen over EtherCAT

16206

CoE is suited for acyclic access to the IO-Link master and the connected IO-Link devices. CoE uses the fieldbus objects "IO-Link acyclic command" (→ **IO-Link Acyclic Command (0x3100)** (→ p. 70)). A separate fieldbus object is provided for each IO-Link port.

To have acyclic access to the device via CoE the user can use the following function blocks:

- FB_EcCoESdoRead: read SDO of an EtherCAT slave
- FB_EcCoeSdoWrite: write SDO of an EtherCAT slave

The function blocks for using CoE are part of the `Tc2_EtherCAT.library` function library.
► Add Tc2_EtherCAT.library function block library to the project
Description of the function blocks: → Help function of TwinCAT

The following rules apply to the inputs of the CoE function blocks:

Input	Description	Possible values	
sNetId	AMS net ID of the EtherCAT master to which the IO-Link master is connected	depends on the project; e.g. 172.16.2.131.2.1	
nSlaveAddr	EtherCAT address of the IO-Link port on the IO-Link master = 0x1000 + IO-Link port number	0x1001 0x1002 ... 0x1008	IO-Link port X01 IO-Link port X02 ... IO-Link port X08
nSubIndex	IO-Link subindex of the parameter	depends on the device; → IODD	
nIndex	IO-Link index of the parameter	depends on the device; → IODD	

General process of an acyclic request:

1. Write command (subindex 0x1)
2. Enquire about status (subindex 0x2 or 0x3)
3. Optional: read requested values (subindex 0x3)

The AL1332 can only process one CoE request at a time. If during an active request another CoE request is started, the device answers with an error (SDO abort code: 0x06090030).

8.3 IoT Core

Contents

17302

The user can access the IoT Core only via IoT port X23 of the ifm IO-Link master.
General notes on the ifm IoT Core: → **Programmers' notes** (→ p. 51)

The AL1332 is of type `device` (→ **Overview: IoT types** (→ p. 80)).
It has the following sub-structures:

Structure	Contents
processdatamaster	▪ Diagnostic data (temperature, voltage, current) ▪ Status of the current / voltage supply
deviceinfo	Device identification
timer[1]	Subscribe to data
timer[2]	Subscribe to data
iotsetup	Parameters of the IoT port (access rights, IP settings, IP settings of the LR SMARTOBSERVER)
fieldbussetup	Parameters of the fieldbus port (IP settings, device identification in fieldbus projection software)
iolinkmaster/port[n]	▪ Parameters of the IO-Link port (operating mode, transmission rate, cycle time, validation and data storage) ▪ Digital input data (pin 2) ▪ Port event
iolinkmaster/port[n]/iolinkdevice	▪ Status information IO-Link devices on the IO-Link port ▪ Device information of the IO-Link device ▪ Process data on input/output ▪ Application-specific identification
firmware	▪ Firmware of the device ▪ Reset devices ▪ Reboot the device

The user can request the available data points and services in the substructures with `gettree`(→ **Service: gettree** (→ p. 81)). The service returns the device description as tree structure. It shows the services supported by a data point: In the sub-element "subs" each data point lists all services that can be applied to it.

8.3.1 Configure IoT port

16540

The parameters of the IoT port X23 are saved in the `iotsetup` substructure. The user can access the following data points:

Name	Description	Access
iotsetup/accessrights	Access rights to the IO-Link master ▪ 0 = EtherCAT + IoT ▪ 1 = EtherCAT + IoT (read only) ▪ 2 = IoT only	rw
iotsetup/smobip	IP address of the LR SMARTOBSERVER	rw
iotsetup/smobport	Port number of the LR SMARTOBSERVER	rw
iotsetup/smobinterval	Cycle time for (value in milliseconds)	rw
iotsetup/network/dhcp	Configuration of the IP settings of the IoT port ▪ 0 = STATIC_IP/OFF ▪ 1 = DHCP/ON	rw
iotsetup/network/ipaddress	IP address of the IoT port	rw
iotsetup/network/subnetmask	Subnet mask of the network segment	rw
iotsetup/network/ipdefaultgateway	IP address of the network gateway	rw

rw ... read and write

8.3.2 Configure the fieldbus port

16564

The parameters of the fieldbus port X21/X22 are saved in the `fieldbussetup` substructure. The user can access the following data points:

Name	Description	Access
fieldbussetup/hostname	Name of the IO-Link master in the fieldbus project	rw
fieldbussetup/fieldbusfirmware	Firmware version of the IO-Link master	r

r = read only
rw ... read and write

8.3.3 Configure IO-Link ports

16454

Parameters of the IO-Link ports of the IO-Link master are saved in the `iolinkmaster/port[n]` substructure. There are the following data points for each IO-Link-Port X01...X08 :

Name	Description	Access
iolinkmaster/port[n]/senddatatosmob	Send process data to LR SMARTOBSERVER	rw
iolinkmaster/port[n]/mode	Operating mode of the IO-Link port	rw*
iolinkmaster/port[n]/mastercycletime_preset	Cycle time of the data transfer at the IO-Link port (value in microseconds)	rw
iolinkmaster/port[n]/mastercycletime_actual	Current cycle time of the data transfer at the IO-Link port (value in microseconds)	r
iolinkmaster/port[n]/validation_datastorage_mode	Response of the IO-Link port when a new IO-Link device is connected	rw*
iolinkmaster/port[n]/validation_vendorid	IO-Link ID of the manufacturer that is to be validated	rw*
iolinkmaster/port[n]/validation_deviceid	IO-Link ID of the device that is to be validated	rw*

n ... 1...8)
r = read only
rw ... read and write
* ... only available if EtherCAT PLC is separated from the device

8.3.4 Set application identification

16580

The application name of the IO-Link master is saved in the `devicetag` substructure. The user can access the following data points:

Name	Description	Access
devicetag/applicationtag	Name of the IO-Link master in the fieldbus project (application tag)	rw

rw ... read and write

8.3.5 Read / write cyclic process data

10994

Cyclic process data of the IO-Link ports X01...X08 is saved in the `iolinkmaster/port[n]` substructure. The user can access the following data points:

Name	Description	Access
iolinkmaster/port[n]/pin2in	Digital input signal to pin 2 of the IO-Link port n	r
iolinkmaster/port[n]/iolinkdevice/pdin	IO-Link input signal at pin 4 of the IO-Link port n	r
iolinkmaster/port[n]/iolinkdevice/pdout	IO-Link output signal at pin 4 of the IO-Link port n	rw*

n ... 1...8
r = read only
rw ... read and write
* ... only available if EtherCAT PLC is separated from the device

8.3.6 Read diagnostic data

16571

Diagnostic data is saved in the `processdatamaster` substructure. The user can access the following data points:

Name	Description	Access
processdatamaster/temperature	Temperature of the IO-Link master (value in °C)	r
processdatamaster/voltage	Voltage applied (value in V)	r
processdatamaster/current	Current (value in A)	r
processdatamaster/supervisionstatus	Diagnostic information of the device supply ▪ 0 = no error ▪ 1 = short circuit ▪ 2 = overload ▪ 3 = undervoltage	r

r = read only

8.3.7 Read device information

17133

Device information is saved in the `deviceinfo` substructure. The user can access the following data points:

Name	Description	Access
deviceinfo/productcode	Article Number	r
deviceinfo/vendor	Vendor	r
deviceinfo/devicefamily	Device family	r
deviceinfo/hwrevision	Hardware revision	r
deviceinfo/serialnumber	Serial number	r
deviceinfo/swrevision	Firmware version	r
deviceinfo/bootloaderrevision	Bootloader revision	r
deviceinfo/extensionrevisions		r

r = read only

Additional information about the AL1332 can be read with the `getidentity` service (→ **Service: getidentity** (→ p. 83)).

8.3.8 Read information about IO-Link devices

16553

Information about an IO-Link device connected via an IO-Link port is saved in the `iolinkmaster/port[n]/iolinkdevice/` substructure. The user can access the following data points:

Name	Description	Access
iolinkmaster/port[n]/iolinkdevice/status	Status of the connected IO-Link device 0 = SENSOR_NOT_CONNECTED 1 = SENSOR_IN_PREOPERATE 2 = SENSOR_IN_OPERATE 3 = SENSOR_WRONG	r
iolinkmaster/port[n]/iolinkdevice/vendorid	IO-Link ID of the manufacturer	r
iolinkmaster/port[n]/iolinkdevice/deviceid	IO-Link ID of the IO-Link device	r
iolinkmaster/port[n]/iolinkdevice/productname	Product name of the IO-Link device	r
iolinkmaster/port[n]/iolinkdevice/serial	Serial number of the IO-Link device	r
iolinkmaster/port[n]/iolinkdevice/applicationspecifictag	Device-specific identification (application tag)	rw

n ... 1...8

8.3.9 Configure IO-Link devices

11002

The ifm IoT Core supports the configuration of the connected IO-Link devices. A parameter is accessed via IO-Link index and subindex (→ IO Device Description (IODD) of the device)

The user can use the following services:

Service	Description	Access
iolinkmaster/port[n]/iolinkdevice/iolreadacyclic	Acyclic reading of a parameter of an IO-Link device	r
iolinkmaster/port[n]/iolinkdevice/iolwriteacyclic	Acyclic writing of a parameter of an IO-Link device	rw

n ... 1...8
r = read only
rw ... read and write

8.3.10 Control IO-Link master

17963

The device can be controlled via the following services:

Service	Description	Access
firmware/version	Firmware version of the IO-Link master	r
firmware/reboot	Reboot IO-Link master	rw
firmware/factoryreset	Reset IO-Link master to factory settings	rw

r = read only
rw ... read and write

8.3.11 Examples

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16577

Example: Read process data of an IO-Link device

16574

Task: Read the current measured value of the ifm temperature sensor TN2531 at IO-Link port X06

Solution: Read the data point for the process input data with the `getdata` service.

- Request object:

```
{"code":10,"cid":4711,"adr":"/iolinkmaster/port[6]/iolinkdevice/pdin/getdata"}
```

- Return object:

```
{"cid": 4711,"data":{"value": "03C9"},"code": 200}
```

The return value is given in hexadecimal format. Besides the temperature value the return value comprises additional information (→ IO Device Description (IODD) of the sensor). The temperature value is shown in bits 2 to 15.

0x03C9 = 0b**11110010**01

Temperature value: 0b11110010 = 242

Therefore: The current temperature value is 24.2 °C.

Example: Read several parameter values of the IO-Link master simultaneously

17310

Task: The following current values are to be read by the IO-Link master. Temperature, serial number

Solution: Read the current parameter values using the getdatamult (data point temperature service: /processdatamaster/termperature; Data point serial number: /deviceinfo/serialnumber)

Request object:

```
{"code":10,"cid":4711,"adr":"/getdatamulti","data":{"datatosend":["/processdatamas
ter/temperature"],["/deviceinfo/serialnumber"]}}
```

Return object:

```
{"cid":4711,"data":{"processdatamaster/temperature":{"code":200,"data":44},"device
info/serialnumber":{"code":200,"data":"000174210147"}},"code":200}
```

Example: Change name of the IO-Link master

10987

Task: Set the name of the IO-Link master for the representation in the LR SMARTOBSERVER to AL1332.

Solution: Change the parameter [Application Tag] with the setdata service to the value [AL1332].

The data point of the parameter [Application Tag] in the device description object is /devicetag/applicationtag.

- Request object:

```
{"code":10,"cid":4711,"adr":"/devicetag/applicationtag/setdata","data":{"newvalue"
:"AL1332"}}
```

- Return object:

```
{"cid":4711,"code":200}
```

Example: read the parameter value of an IO-Link device

16546

Task: Read the serial number of the ifm temperature sensor TN2531 at IO-Link port X02

Solution: Read the serial number with the `iolreadacyclic` service from the IO-Link device (index: 21, subindex: 0)

- **Request object:**

```
{
"code":10,
"cid":4711,
"adr":"/iolinkmaster/port[2]/iolinkdevice/iolreadacyclic",
"data":{"index":21,"subindex":0}
}
```

- **Return object:**

```
{
"cid":4711,
"data":{"value":"4730323134323830373130"},
"code":200
}
```

The returned value is given in hexadecimal format. The conversion of the HEX value in a STRING value is: G0214280710

Example: change the parameter value of an IO-Link device

16578

Task: Set the output configuration OUT1 of the ifm temperature sensor TN2531 at IO-Link port X02 to the value "Hnc / hysteresis function, normally closed".

Solution: Change the parameter [ou1] of the sensor to the value 4 using the iolwriteacyclicdata service. The parameter can be accessed via IO-Link index 580, subindex 0 (→ IO-Link description of the sensor).

- Request object:

```
{"code":10,"cid":4711,"adr":"/iolinkmaster/port[2]/iolinkdevice/iolwriteacyclic","
data":{"index":580,"subindex":0,"value":4}}
```

- Response object:

```
{"cid":4711,"code":200}
```

Example: Subscribe to event

17946

Task: The current values of the following parameters should be sent regularly to a network server with IP address 192.168.0.4: product name of the IO-Link device at IO-Link port X02, cyclic input data of the IO-Link device at IO-Link port X02 and the operating temperature of the IO-Link master.

Solution: Subscribe to the required data using the subscribe service.

- **Request object:**

```
{
"code":80,
"cid":4711,
"adr":"/timer[1]/counter/datachanged/subscribe",
"data":
{
"callback":"192.168.0.44/temp",
"datatosend":[
"/iolinkmaster/port[2]/iolinkdevice/productname",
"/iolinkmaster/port[2]/iolinkdevice/pdin",
"/processdatamaster/temperature"]
}
}
```

8.3.12 Programmers' notes

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10989

ifm IoT Core: General information

16576

The DataLine device family has one IoT Core. This component allows the user to address the IO-Link master from IT networks and to integrate it into Internet-of-Things applications.

The IoT Core provides the user with the following functions:

- Control device
- Monitoring of process data
- Read / write parameters of the IO-Link master
- Read / write parameters of the connected IO-Link devices
- Collect diagnostic data

Device description

14411

The IoT Core creates a device description on the AL1332. This device description is a structured, machine-readable data object in JSON format. All current values of parameters, diagnostic data and device information are mapped in this data object. The user can access this data object from IT networks.

The complete device description can be read using the gettree (→ service **Service: gettree** (→ p. 81)).

Access ifm-IoT Core

17561

To activate the changes of the parameter values the IoT Core must have the respective write access rights to the IO-Link master (→ Parameter [Access Rights]).

The ifm IoT Core supports HTTP requests. The following request methods are available.

GET method

21300

Using the GET method the user has read access to a data point.
The syntax of the request to the IoT Core is:
`ip/datapoint/service`

Description	Description
ip	IP address of the IoT port X23 of the IO-Link master
data_point	Data point which is to be accessed
service	Service

The syntax of the return of the IoT Core is:

```
{
"cid":id,
"data":{"value":resp_data},
"code":err_code
}
```

parameter	Description
id	Correlation ID for the assignment of request and return
resp_data	Value of the data point; depending on the data type of the data point
err_code	Error code (→ **IoT Core: Diagnostic codes** (→ p. 54))

Example:
Request (via browser): `192.168.0.250/devicetag/applicationtag/getdata`
Return: `{"cid":-1,"data":{"value":"AL1332"}, "code":200}`

POST method

16548

Using the POST method the user has read and write access to a data point. A form with the required information is transferred to the IP address of the IO-Link master (IoT port X23).

The syntax of the request to the IoT Core is:

```
{
"code":code_id,
"cid":id,
"adr":"data_point/service",
"data":{req_data}
}
```

Parameter	Description	
code_id	ID of the service class	
	10	Request
	11	Transaction
	80	Event
id	Correlation ID for the assignment of request and return	
data_point	Data point which is to be accessed	
service	Service to be performed (→ **Overview: IoT services** (→ p. 81))	
req_data	Data to be transferred to the IoT Core (e.g. new values); indication optional (depending on the service)	

The syntax of the return of the IoT Core is:

```
{
"cid":id,
"data":{"value":resp_data},
"code":err_code
}
```

Parameter	Description
id	Correlation ID for the assignment of request and return
resp_data	Value of the data point; depending on the data type of the data point
err_code	Error code (→ **IoT Core: Diagnostic codes** (→ p. 54))

Example:

Request: `{"code":10,"cid":4711, "adr":"devicetag/applicationtag/getdata"}`

Return: `{"cid":4711,"data":{"value":"AL1332"}, "code":200}`

IoT Core: Diagnostic codes

17437

The ifm IoT Core uses the following diagnostic codes:

Code	Description
200	OK
230	OK; but reboot required
231	OK, but block request not yet terminated
232	Data accepted but changed internally
233	IP settings changed; application has to reboot the device; Wait for min. 1 second before the device is rebooted
400	Invalid request
403	Unauthorised access
500	Internal server fault
503	Service not available
530	Requested data is invalid
531	IO-Link error
532	Error in PLC

9 Operation

Contents

22368

9.1 Identify device

16568

In the online mode, the user can identify the device using the RDY and IoT status LEDs.

► Start LR DEVICE.
► Scan network for devices.
> LR DEVICE recognises the IO-Link master.
► Click on the selection field next to the device name.
> The RDY and IoT status LEDs are flashing.

9.2 Firmware update

16582

The new firmware is installed via the device's web interface.

If the firmware update is not successful, deactivate all connections to the EtherCAT PLC, LR SMARTOBSERVER and LR DEVICE and repeat the process.

- ► Stop EtherCAT PLC.
- ► Set the parameter [IP address SmartObserver] to 255.255.255.255 (→ **IoT: Configure the interface to the LR SMARTOBSERVER** (→ p. 29)).
- ► Stop the LRAgent.LRDevice service in the Windows task manager.

To install a new firmware version on the device:

Requirements

> File with new firmware has been downloaded.

> Ethernet connection between laptop/PC and device is established.

1 Call up web interface

- ► Start web browser.
- ► Enter the following into the address field of the browser: and confirm with [ENTER]:
  `<IP address of the device>/web/update`

> Web browser shows the [Firmware Update] page.

2 Load new firmware to AL1332

- ► Click on [Search...].

> Dialogue window appears.

- ► Select the firmware file and click on [Open] in order to adopt the file.
- ► Click on [Submit] to start the firmware update.

> Firmware is being loaded to the device.

> After successful storage, the success message is displayed.

3 Restart the device

- ► Click on [Restart device now] to restart the device.

> The status LED RDY flashes quickly.

> Firmware is updating.

- ► Follow the instructions in the browser.

9.3 Exchange IO-Link device

7775

To exchange an IO-Link device:

Requirement:

> IO-Link device is with factory settings.

> IO-Link device supports IO-Link standard 1.1 or higher.

1 Set data storage

► Set the following parameters of the IO-Link port:
[Validation / Data Storage] = Type compatible V1.1 device with Restore
OR
[Port x IO-Link Validation / Data Storage] = Type compatible V1.1 device with Restore

► Save changes.

2 Exchange IO-Link device

► Disconnect old IO-Link device from AL1332.

► Connect new IO-Link device with the same IO-Link port of the AL1332.

> IO-Link master copies parameter values from the data memory to the new IO-Link device.

10 Maintenance

21577

The operation of the unit is maintenance-free.

- ► Clean the surface of the unit when necessary. Do not use any caustic cleaning agents for this!
- ► After use, dispose of the unit in an environmentally friendly way in accordance with the applicable national regulations.

11 Factory settings

16549

In the factory settings, the device has the following parameter settings:

Parameter	Factory setting
[IP address] (IoT interface)	169.254.X.X
[Subnet mask] (IoT interface)	255.255.0.0
[IP gateway address] (IoT interface)	0.0.0.0
[Host name]	blank
Data memory (data storage)	blank

12 Accessories

17853

List of accessories of AL1332: → www.ifm.com > Product page > Accessories

13 Appendix

Contents

7156

13.1 Technical data

Contents

9011

13.1.1 Application

23710

Application	
Application	I/O modules for field applications
Daisy-chain function	Fieldbus interface

13.1.2 Electrical data

22819

Electrical data	
Operating voltage [V]	20...30 DC; (US; to SELV/PELV; cULus: max. 24 DC)
Current Consumption [mA]	300...3900; (US)
Protection class	III
Sensor supply US	
Max. current load total [A]	3.6

13.1.3 Inputs / outputs

23711

Inputs / outputs	
Total number of inputs and outputs	16; (configurable)

13.1.4 Inputs

22820

Inputs	
Number of digital inputs	16; (IO-Link Port Class A: 8 x 2)
Switching level high [V]	11...30 DC
Switching level low [V]	0...5 DC
Digital inputs protected against short circuits	yes

13.1.5 Outputs

22821

Outputs (digital)	
Output function	8; (IO-Link Port Class A: 8 x 1)
Max. current load per output [mA]	200
Short-circuit protection	yes

13.1.6 Interfaces

17947

Interfaces	
Communication interface	Ethernet; IO-Link
Communication interface	IO-Link; TCP/IP; PROFINET IO
Ethernet	
Transmission standard	10Base-T; 100Base-TX
Transmission rate [MBit/s]	10; 100
Protocol	TCP/IP; PROFINET IO
Factory settings	MAC address: see type label
IO-Link master	
Type of transmission	COM 1 / COM 2 / COM 3
IO-Link revision	V1.1
Number of ports Class A	8
IoT interface	
Transmission standard	10Base-T; 100Base-TX
Transmission rate [MBit/s]	10; 100
Protocol	DCP, DCHP, Auto IP
Factory settings	▪ IP address: 169.254.X.X ▪ Subnet mask: 255.255.0.0 ▪ Gateway IP address: 0.0.0.0 ▪ MAC address: see type label

13.1.7 Operating conditions

22823

Operating conditions	
Applications	Indoor use
Ambient temperature [°C]	-25...60
Storage temperature [°C]	-25...85
Max. perm. relative air humidity [%]	90
Max. height above sea level [m]	2000
Protection rating	IP 65; IP 66; IP 67
Pollution Degree	2

13.1.8 Approvals / tests

22824

Approval / tests	
EMC	▪ EN 61000-6-2 ▪ EN 61000-6-4
MTTF [Years]	90

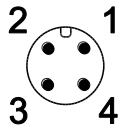
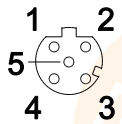
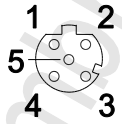
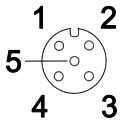
13.1.9 Mechanical data

22825

Mechanical data	
Weight [g]	378.2
Materials	Housing: PA; socket: brass nickel-plated

13.1.10 Electrical connection

17850

Voltage supply IN X31	
Plug and socket connection	M12
Wiring	 1: + 24 V DC (US) 2: - 3: GND (US) 4: -
Ethernet IN / OUT X21, X22	
Plug and socket connection	M12
Wiring	 1: TX + 2: RX + 3: TX - 4: RX - 5: -
IoT X32	
Plug and socket connection	M12
Wiring	 1: TX + 2: RX + 3: TX - 4: RX - 5: -
Process connection IO-Link ports Class A X01...X0<IOL_AnzPorts>	
Plug and socket connection	M12
Wiring	 1: + 24 V DC (US) 2: DI 3: GND (US) 4: C/Q IO-Link 5: -

13.2 EtherCAT

Contents

22433

13.2.1 Parameter data

Contents

1568

Fieldbus parameters

8953

The fieldbus parameters contain information for the integration of the device into the EtherCAT network:

Name	Description	Possible values
EtherCAT address	"Explicit Device ID" of the device	0...65534

ESI file

10277

To represent the AL1332 in a field bus projection software ifm electronic provides an ESI file. The EDS file can be downloaded from ifm's website. In the ESI file, all parameters, process data and their valid value ranges are defined.

13.2.2 Cyclic data

Contents

22429

EtherCAT modules

9461

Module	Description	
IOL_In_4Byte	IO-Link activated	4-byte input data
IOL_In_8Byte		8-byte input data
IOL_In_16Byte		16-byte input data
IOL_In_32Byte		32-byte input data
IOL_Out_4Byte		4-byte output data
IOL_Out_8Byte		8-byte output data
IOL_Out_16Byte		16-byte output data
IOL_Out_32Byte		32-byte output data
IOL_4/4_I/O bytes		4-byte input data / 4-byte output data (default)
IOL_8/8_I/O bytes		8-byte input data / 8-byte output data
IOL_4/16_I/O bytes		4-byte input data / 16-byte output data
IOL_16/4_I/O bytes		16-byte input data / 4-byte output data
IOL_16/16_I/O bytes		16-byte input data / 16-byte output data
IOL_32/32_I/O bytes		32-byte input data / 32-byte output data
Digital_IN	IO-Link deactivated	Digital input
Digital_OUT		Digital output
Deactivated	deactivated	

13.2.3 Acyclic data

22427

Note

16560

The device implements a "Modular Device Profile" with an "IO-Link profile" according to ETG.5001.1.

MDP Standard Information (0x1000)

9043

Identity information about the device and current and available process data constellations

Index	Description	Possible values / reference	Data type / access
0x1000	Device Type	MDP Profile = 0x184C1389	UINT32 / ro
0x1008	Manufacturer Device Name	"<IOL_ECAT_ProdName>"	STRING / ro
0x1009	Manufacturer Hardware Version	e.g. "AA"	STRING / ro
0x100A	Manufacturer Software Version		STRING/ ro
0x1018	Identity Object		
	▪ Subindex 0x1: Vendor ID	0x622	UINT32 / ro
	▪ Subindex 0x2: Product Code	"AL1332"	UINT32 / ro
	▪ Subindex 0x3: Revision Number:		UINT32 / ro
	▪ Subindex 0x4: Serial Number		UINT32 / ro
0x10F3	Diagnostics History		
	▪ Subindex 0x1: Maximum Messages		UINT8 / ro
	▪ Subindex 0x2: Newest Messages		UINT8 / ro
	▪ Subindex 0x3: Newest Ack. Message		UINT8 / rw
	▪ Subindex 0x4: New Message Available		BOOL / rw
	▪ Subindex 0x5: Flags		UINT16 / rw
	▪ Subindex 0x06: Diagnostics Message 01		STRING / ro
	...		
	▪ Subindex 0x45: Diagnostics Message 64		STRING / ro
0x10F8	Timestamp (value in ns)		UINT64 / ro
0x160n	TxPDO Mapping of IO-Link Outputs		ro
0x1A0n	TxPDO Mapping of IO-Link Inputs		ro
0x1A08	TxPDO Mapping of New Messages Available		ro
0x1A09	TxPDO Mapping of Timestamp		ro
0x1A81	TxPDO Maspping of IO-Link Device Status		ro
0x1A82	TxPDO Mapping of IO-Link Port Qualifier		

ro = read only
rw ... read and write

Manufacturer Specific Index (0x20 00)

11011

Manufacturer-specific parameters

Index	Description	Possible values	Data type / access
0x2001	Component Name	"EtherCAT IO-Link Gateway"	STRING / ro
0x2002	Vendor Name	"ifm electronic"	STRING / ro
0x2003	Vendor URL	"www.ifm.com"	STRING / ro
0x2004	Order Number	"AL1332"	STRING / ro
0x2005	Manufacturing Date		STRING / ro
0x2006	QS Date		STRING / ro
0x2007	Installation Location	Location of installation (user-defined)	STRING / rw
0x200A	Equipment ID	Device name (user-defined)	STRING /rw
0x2F00	Reset To Factory	▪ MSB: 0xA5 ▪ LSB: 0x00 = Factory Reset of System + NVMEM 0x01 = Factory Reset of System	UINT16 / w
0x2F01	Device Localization	0x00: LED RDY flashing for 5 s	UINT8 / w
0x2F02	Current Use Case (Access Rights)	▪ MSB: 0xA5 ▪ LSB: 0x00: EtherCAT + IoT 0x01: EtherCAT + IoT (read only) 0x02: IoT (only)	UINT16 / rw

ro = read only
rw ... read and write
w ... write only

IO-Link Acyclic Command (0x3100)

16566

Selection of the IO-Link port via n (n = 0: port X01, n = 1: port X02,...)

Index	IO-Link parameters	Possible values	Data type / access
0x31n0	IO-Link Acyclic Command		
	▪ Subindex 0x01: Command Buffer	Byte 0: Command (0x0 = Read, 0x1 = Write) Byte 1: IO-Link index, LSB Byte 2: IO-Link index, MSB Byte 3: IO-Link subindex Byte 4: For write only: Length of following data (0x01...0xE8) Byte 5: For write only: Data (0x00...0xFF)	ARRAY_ OF_BYTE / ro
	▪ Subindex 0x02: Status	0x0: Command completed, no error, no response data 0x1: Command completed, no error, response data available 0x2: Command completed, error, no response data 0x3: Command completed, error, response data available 0xFF: Command is executing (pending)	UINT8 / ro
	▪ Subindex 0x03: Response Buffer	Byte 0: Status (see Subindex 0x02) Byte 1: reserved Byte 2: If status = 0x1 | 0x3: Length of the following data Byte 3..m: If status = 0x1: Read data If status = 0x3: 1 byte IO-Link error code + 1 byte additional code	ARRAY_ OF_BYTE / ro

ro = read only

IO-Link inputs (0x6000)

2260

Input data of the IO-Link ports X01...X08
Selection of the IO-Link port via n (n = 0: port X01, n = 1: port X02,...)

Index	Description	Possible values	Data type / access
0x60n0	IO-Link inputs ▪ Subindex 0x01: Byte 1 ... ▪ Subindex 0x20: Byte 32	each byte: 0x00...0xFF	each byte: UINT8 / ro

ro = read only

IO-Link outputs (0x7000)

23089

Output data of the IO-Link ports X01...X08
Selection of the IO-Link port via n (n = 0: port X01, n = 1: port X02,...)

Index	Description	Possible values	Data type / access
0x70n0	IO-Link outputs ▪ Subindex 0x01: Byte 1 ... ▪ Subindex 0x20: Byte 32	per byte: 0x00...0xFF	each byte: UINT8 / ro

ro = read only

IO Settings (0x8000)

16550

Manufacturer-specific settings of the IO-Link ports X01...X08
Selection of the IO-Link port via n (n = 0: port X01, n = 1: port X02,...)

Index	IO-Link parameters	Possible values	Data type / access
0x80n0	IO Settings		
	▪ Subindex 0x04: Device ID	0x000000...0xFFFFFF	UINT32 / rw
	▪ Subindex 0x05: Vendor ID	0x0000...0xFFFF ifm electronic: 0x136	UINT32 / rw
	▪ Subindex 0x20: IO-Link revision	0x10: IO-Link revision 1.0 0x11: IO-Link revision 1.1	UINT8 / rw
	▪ Subindex 0x22. Cycle Time		UINT32 / rw
	▪ Subindex 0x24: Process Data In Length		UINT8 / rw
	▪ Subindex 0x25: Process Data Out Length		UINT8 / rw
	▪ Subindex 0x028: Master Control	0x00: Deactivated 0x01: Digital input 0x02: Digital output 0x03: IO-Link	UINT16 / rw
0x80n8	Vendor Specific IO Settings		
	▪ Subindex 0x01: Validation ID	0x00: No check 0x01: V1.0 device, no DS 0x02: V1.1 device, no DS 0x03: V1.1 device, backup + restore 0x04: V1.1 device, restore	UINT8 / rw
	▪ Subindex 0x02: Reconfigure	0x00: No action 0xFF: Activate configuration	UINT8 / rw
	▪ Subindex 0x03: Byte Swap	0x00: No action 0x01: Byte swap	UINT8 / rw

rw ... read and write

IO Info Data (0x9000)

17300

Current value of the connected IO-Link devices
Selection of the IO-Link port via n (n = 0: port X01, n = 1: port X02,...)

Index	IO-Link parameters	Possible values	Data type / access
0x90n0	IO Info Data		
	▪ Subindex 0x04: Device ID		UINT32 / ro
	▪ Subindex 0x05: Vendor ID		UINT32 / ro
	▪ Subindex 0x20: IO-Link revision		UINT8 / ro
	▪ Subindex 0x21: Frame capability		UINT8 / ro
	▪ Subindex 0x22. Cycle time		UINT8 / ro
	▪ Subindex 0x24: PD In length		UINT8 / ro
	▪ Subindex 0x25: PD Out length		UINT8 / ro

ro = read only

IO Diag data (0xA000)

16537

The device provides the following diagnostic data for each port:
Selection of the IO-Link port via n (n = 0: port X01, n = 1: port X02,...)

Index	IO-Link parameters	Possible values	Data type / access
0xA0n0	IO Diag Data0		
	▪ Subindex 0x01: IO-Link state	0x00: INACTIVE 0x01: DIGINPUT 0x02: DIGOUTPUT 0x08: OPERATE 0x09: STOP	UINT8 / ro
	▪ Subindex 0x02: Lost frames		UINT8 / ro

ro = read only

Device status / port status (0xF000)

17933

Status of the IO-Link device at the port X01...X08
Selection of the IO-Link port via n (n = 0: port X01, n = 1: port X02,...)

Index	IO-Link parameters	Possible values	Data type / access
0xF000	Module device profile		
	▪ Subindex 0x01: Module index distance	0x0010	UINT16 / ro
	▪ Subindex 0x02: Maximum number of modules	0x0008	UINT16 / ro
0xF030	Configured module Ident list		
0xF050	Detected module ident list		
0xF100	Device status		UINT8 / ro
	▪ High nibble (0x**bb**bb)	0x0: No error 0x3: Invalid device ID 0x4: Invalid vendor ID 0x7: Invalid cycle time 0x8: Invalid length of PD In 0x9: Invalid length of PD Out 0xA: No device detected 0xB: Supply voltage low or short circuit 0xD: Unspecified error	
	▪ Low nibble (0xbb**bb**)	0x0: Deactivated 0x1: Digital input 0x2: Digital output 0x3: OP: IO-Link, operating state 0x4: STOP: IO-Link, not operating state (fault or no device) 0x5: PreOP: IO-Link, device in PreOP state	
0xF101	IO-Link port qualifier		
	▪ Subindex 0x00: PQI port X01	→ **Mapping: Port qualifier (0xF101)** (→ p. 75)	
	...		
	▪ Subindex 0x0n: PQI port X08		

ro = read only

Mapping: Port qualifier (0xF101)

14998

Port Qualifier Information (PQI) contains diagnostic information about the IO-Link port. In addition to the process data, the IO-Link master sends the PQI to the EtherCAT controller.

Bit							
7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
PVI	DE	DA	DACT	PVO	--	DI2	DI4

Legend:

DI4	Signal status of the digital input on pin 4 (if used)	0 1	OFF ON
DI2	Signal status of the digital input on pin 2 (if used)	0 1	OFF ON
PVO	Port validity output: Validity of the output data of the IO-Link device	0 1	invalid valid
DACT	Device deactivated: shows if the IO-Link port is configured and can be used	0 1	deactivated or not available activated and can be used
DA	Device available: shows if the IO-Link device has been recognised and if the device is in the "preoperate" or in the "operate" state	0 1	No device device detected
DE	Device error: shows if an error or a warning occurred; Note: The user needs to determine the cause of the fault separately via acyclic services.	0 1	no error Error
PVI	Port validity input: Validity of the input data of the IO-Link device	0 1	invalid valid

13.3 ifm IoT Core

Contents

8988

13.3.1 Overview: IoT profile

Contents

17711

Profile: deviceinfo

17135

Element (identifier)	Properties	mandatory	Comments
deviceinfo	▪ type = structure ▪ profiles = deviceinfo		characterises the element as device information
deviceinfo/devicename	type = data	optional	
deviceinfo/devicefamiliy	type = data	optional	
deviceinfo/devicevariant	type = data	optional	
deviceinfo/devicesymbol	type = data	optional	
deviceinfo/deviceicon	type = data	optional	
deviceinfo/serialnumber	type = data	mandatory	
deviceinfo/productid	type = data	optional	
deviceinfo/productname	type = data	optional	
deviceinfo/productcode	type = data	mandatory	
deviceinfo/producttext	type = data	optional	
deviceinfo/ordernumber	type = data	optional	
deviceinfo/productiondate	type = data	optional	
deviceinfo/productioncode	type = data	optional	
deviceinfo/hwrevision	type = data	mandatory	
deviceinfo/swrevision	type = data	mandatory	
deviceinfo/bootloaderrevision	type = data	optional	
deviceinfo/vendor	type = data	optional	
deviceinfo/vendortext	type = data	optional	
deviceinfo/vendorurl	type = data	optional	
deviceinfo/vendorlogo	type = data	optional	
deviceinfo/productwebsite	type = data	optional	
deviceinfo/supportcontact	type = data	optional	
deviceinfo/icon	type = data	optional	
deviceinfo/image	type = data	optional	
deviceinfo/standards	type = data	optional	

Profile: devicetag

17438

Element (identifier)	Properties	mandatory	Comments
devicetag	▪ type = structure ▪ profiles = devicetag		
devicetag/applicationtag	type = data	mandatory	
devicetag/applicationgroup	type = data	optional	
devicetag/machinecode	type = data	optional	
devicetag/tenant	type = data	optional	

Profile: iolinkmaster

14997

Element (identifier)	Properties	mandatory	Comments
masterport	▪ type = structure ▪ profiles = iolinkmaster		Executable service
masterport/mode	▪ type = data ▪ profile = parameter	mandatory	
masterport/comspeed	▪ type = data ▪ profile = parameter	mandatory	
masterport/mastercycletime_actual	▪ type = data ▪ profile = parameter	mandatory	
masterport/mastercycletime_preset	▪ type = data ▪ profile = parameter	mandatory	
masterport/validation_datastorage_mode	▪ type = data ▪ profile = parameter	mandatory	
masterport/validation_vendorid	▪ type = data ▪ profile = parameter	mandatory	
masterport/validation_deviceid	▪ type = data ▪ profile = parameter	mandatory	
masterport/additionalpins_in	▪ type = data ▪ profile = processdata	optional	
masterport/additionalpins_out	▪ type = data ▪ profile = processdata	optional	
masterport/portevent	▪ type = data	mandatory	
masterport/iolinkdevice	▪ type = structure ▪ profile = iolinkdevice_full	mandatory	

Profile: parameter

16545

The profile is used to mark the elements of type `data` as parameters (acyclic data). The profile defines no substructure.

Profile: processdata

16569

The profile is used to mark the elements of type `data` as process data (cyclic data). The profile does not define a substructure.

Profile: service

16575

Element (identifier)	Properties	mandatory	Comments
service	▪ type = service ▪ profiles = service		Executable service

Profile: software

10999

Element (identifier)	Properties	mandatory	Comments
software	▪ type = structure ▪ profiles = software		characterises the element as software
software/version	type = data	mandatory	
software/reboot	type = service	optional	
software/factoryreset	type = service	optional	
software/status	type = structure	optional	
software/diag	type = structure	optional	

Profile: timer

10997

Element (identifier)	Properties	mandatory	Comments
timer	▪ type = structure ▪ profiles = timer		Executable service
timer/counter	▪ type = data ▪ profile = parameter	mandatory	
timer/interval	▪ type = data ▪ profile = parameter	optional	
timer/start	type = service	optional	
timer/start	type = service	optional	

13.3.2 Overview: IoT types

16547

The ifm IoT Core uses the following element types:

Name	Description
structure	Element is a structure element (like a folder in a file system)
service	Element is a service that can be addressed from the network
Event	Element is an event that can be started by the firmware and sends messages.
data	Element is a data point
device	Root element a device represents

13.3.3 Overview: IoT services

Contents

17708

Service: factoryreset

12188

Name: factoryreset

Description: The service sets the parameters of the device to the factory settings.

Applicable to: different objects

Request data: none

Return data (data): none

Service: gettree

17435

Name: gettree

Description: The service reads the complete device description of the AL1332 and provides it as JSON object.

Applicable to: Objects of the `device` type

Request data: none

Return data (data):

Data field	Required field	Data type	Default	Description
Identifier	mandatory	STRING		Identifier of the root element
type	mandatory	STRING		Type of the element
format	optional	JSON object	empty	Format of the data content
uid	optional	STRING	empty	
profiles	optional	JSON array	empty	
subs	mandatory	JSON array		Subelements
hash	optional	STRING		

Service: getdata

12223

Name: getdata
Description: Service reads the value of a data point and provides it.
Applicable to: Objects of the `data` type
Request data: none
Return data (data):

Data field	Required field	Data type	Default	Description
value	mandatory	STRING		Value of the element/data point

Example: `{"code":10,"cid":4711,"adr":"devicetag/applicationtag/getdata"}`

Service: getdatamulti

17964

Name: getdatamulti
Description: The service sequentially reads the values of several data points and provides them. The value and the diagnostic code are provided for each data point.
Applicable to: Objects of the `data` type
Request data:

Data field	Required field	Data type	Default	Description
datatosend	mandatory	ARRAY OF STRINGS		List of data points to be requested; data points must support the service getdata
consistent	optional	BOOL	false	

Return data (data): for each requested data point

Data field	Required field	Data type	Default	Description
Data point	mandatory	STRING		Data point request
code	mandatory	INT		Diagnostic code of the request
data	mandatory	STRING		Value of the data point

Service: getidentity

17134

Name: getidentity

Description: The service reads the complete device description of the AL1332 and provides it as JSON object.

Applicable to: Objects of the `device` type

Request data: none

Return data (data):

Data field	Required field	Data type	Default	Description
iot		device		Device description as JSON object
iot.name	mandatory	STRING		
iot.uid	optional	STRING		
iot.version	mandatory	STRING		
iot.catalogue	optional	ARRAY OF OBJECTS		
iot.deviceclass	optional	ARRAY OF STRING		
iot.serverlist		ARRAY OF OBJECTS		
device	optional			AL1332
device.serialnumber	optional			Serial number
device.hwrevision	optional			Hardware version
device.swrevision	optional			Software version
device.custom	optional			

Service: getsubscriptioninfo

17436

Name: getsubscriptioninfo

Description: The service provides information about an existing subscription (subscribe).

Applicable to: Objects of the `event` type

Request data:

Data field	Required field	Data type	Default	Description
subscriptionid	mandatory	INT		ID of the subscription

Return data (data): none

Service: iolreadacyclic

12222

Name: iolreadacyclic
Description: The service acyclically reads the parameter value of an IO-Link device. It is accessed via IO-Link index and subindex.
Applicable to: IO-Link specific objects
Request data:

Data field	Required field	Data type	Default	Description
index	mandatory	NUMBER		IO-Link index of the parameter
subindex	mandatory	NUMBER		IO-Link subindex of the parameter

Return data (data):

Data field	Required field	Data type	Default	Description
value	mandatory	STRING		Value in hexadecimal format

Service: iolwriteacyclic

11035

Name: iolwriteacyclic
Description: The service acyclically writes the parameter value of an IO-Link device. It is accessed via IO-Link index and subindex.
Applicable to: IO-Link specific objects
Request data:

Data field	Required field	Data type	Default	Description
index	mandatory	NUMBER		IO-Link index of the parameter
subindex	mandatory	NUMBER		IO-Link subindex of the parameter
value	mandatory	NUMBER		New value of the parameter

Return data (data): none

Service: reboot

10986

Name: reboot
Description: The service reboots the device.
Applicable to: different objects
Request data: none
Return data (data): none

Service: setblock

12224

Name: setblock
Description: The service simultaneously sets the values of several data points of a structure.
Applicable to: Objects of the `data` type
Request data:

Data field	Required field	Data type	Default	Description
datatosend	mandatory	ARRAY OF (STRINGS)		List of data points and their new values; data points must support the service setdata
consistent	optional	BOOL	false	

Return data (data): none

Example:

```
{
"code":10,
"cid":4711,
"adr":"/iotsetup/network/setblock",
"data":{"consistent":true,"datatosend":["ipaddresse":"192.168.0.6","ipdefaultgatew
ay":"192.168.0.250"]}
}
```

Service: setdata

11036

Name: setdata
Description: The service sets the value of the data point.
Applicable to: Objects of the `data` type
Request data:

Data field	Required field	Data type	Default	Description
newvalue	mandatory	STRING		New value of the element/data point

Return data (data): none
Example:

```
{
"code":10,
"cid":4711,
"adr":"devicetag/applicationtag/setdata",
"data":{"newvalue":"ifm IO-Link master"}
}
```

Service: setelementinfo

7159

Name: setelementinfo
Description: The service sets the uid of an element.
Applicable to: Objects of the `device` type
Request data:

Data field	Required field	Data type	Default	Description
url	mandatory	STRING		URL of the element to be changed
uid	optional	STRING		UID to be set
profiles	optional	JSON array		
format	optional	JSON object		

Return data (data):

Data field	Required field	Data type	Default	Description
identifier	mandatory	STRING		Identifier of the element
type	mandatory	STRING		Type of the element
format	optional	JSON object	blank	Format of the data or the service content
uid	optional	STRING	blank	
profiles	optional	JSON array	blank	
hash	optional	STRING	--	

Service: subscribe

10920

Name: subscribe
Description: The service subscribes to the values of data points. The data points to be subscribed are transferred as a list. The IO-Link master sends changes to the data drain defined in callback.
Applicable to: Objects of the `event` type
Request data:

Data field	Required field	Data type	Default	Description
callback	mandatory	STRING		Address to which IoT Core event notifications are to be sent; complete URL: ipaddress:port/path
datatosend	mandatory	ARRAY OF STRINGS		List from URLs of data elements; elements have to support getdata

Return data (data): none

Service: unsubscribe

16567

Name: unsubscribe

Description: The service deletes an existing subscription. unsubcribe is successful if cid and the callback address are registered for a subscription (subscribe). If the STRING "DELETE" is provided in callback, the IO-Link master deletes all active subscriptions.

Applicable to: Objects of the `event` type

Request data:

Data field	Required field	Data type	Default	Description
callback	mandatory	STRING		Address to which IoT Core event notifications are to be sent; complete URL: ipaddress:port/path

Return data (data): none

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