NORGREN

Operation Manual

IO Link Master – EtherNet/IP
NC-ME-4A4B-12DLA / AL1423
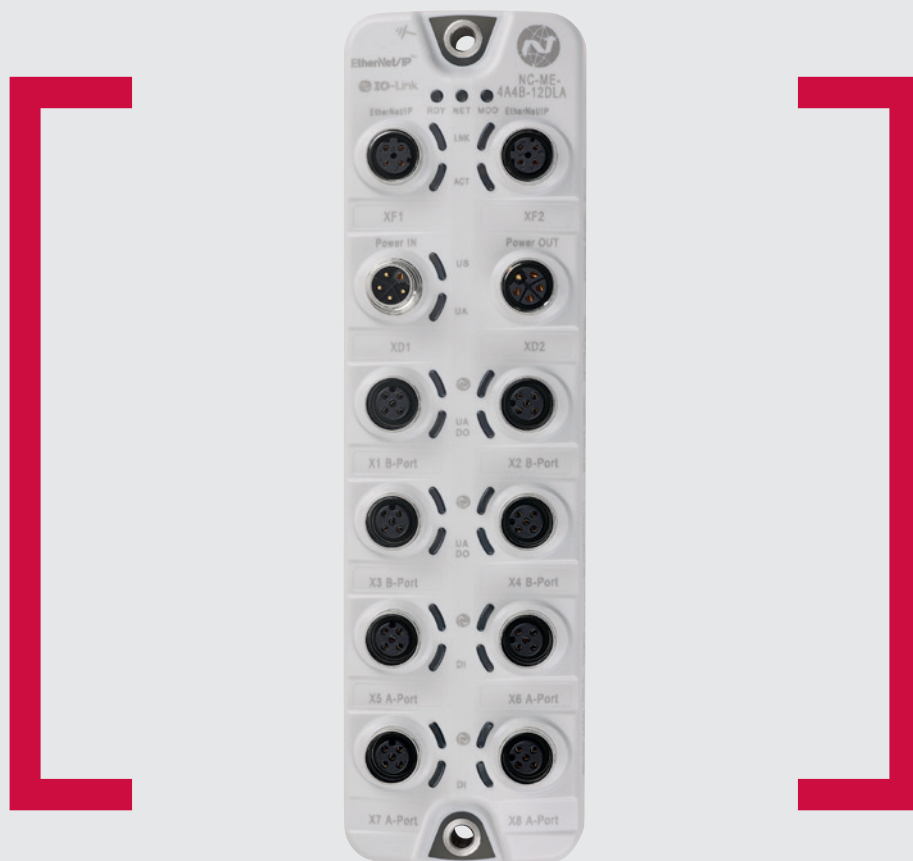
IMI

Contents

1. Preliminary note

Content

1.1. Legal and copyright information

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1.2. Purpose of the document

This document is only for device types "IO-Link master - EtherNet/IP gateway 8 port IP 65 / IP 66 / IP 67"
(art. no.: NC-ME-4A4B-12DLA/AL1423).

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. Explanation of Symbols

	WARNING
	Warning of serious personal injury. **Death or serious irreversible injuries may result.**

	CAUTION
	Warning of personal injury. **Slight reversible injuries may result.**

	NOTICE
	Warning of damage to property

	Important note Non-compliance can result in malfunction or interference
	Information Supplementary note
▸	Request for action
»	Reaction, result
→	"see"
abc	Cross-reference
123	Decimal number
0x123	Hexadecimal number
0b010	Binary number
[...]	Designation of pushbuttons, buttons or indications

1.4. Modification history

Version	Topic	Date
00	New creation of document	11/2019

OM-IO-Link Master.06

This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

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2. Safety instructions

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2.1. General

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

This document is intended for specialists. Specialists are people who, based on their relevant training and experience, can identify 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. Safety symbols on the device

General warning

Observe instructions in chapter "Electrical connection" (→ **Electrical connection** (→ P. 13))!

2.4. Tampering with the unit

WARNING

Tampering with the unit.
> In case of non-compliance:
  • Possible effects on safety of operators and machinery

  • Expiration of liability and warranty

▸ Do not open the devices!

▸ Do not insert any objects into the devices!

▸ Prevent metal foreign bodies from penetrating!

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This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

OM-IO-Link Master.07

3. Intended use

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3.1. Permitted use

The IO-Link master serves as a gateway between intelligent IO-Link devices and the EtherNet/IP network.
The device is designed for use without a control cabinet in the plant construction.

3.2. Prohibited use

The device may not be used beyond the limits of the technical data (→ **Technical data** (→ P. 53))!

4. Function

Content

4.1. Parameter setting

The device provides the following configuration options:

- Parameter setting of the IO-Link master of the NC-ME-4A4B-12DLA/AL1423 with parameter setting software Norgren IO-Link Configuration Tool and/or EtherNet/IP projection software

- Parameter setting of the connected IO-Link devices (sensors, actuators) with parameter setting software Norgren IO-Link Configuration Tool and/or EtherNet/IP projection software

- Storage of parameter sets of the connected IO-Link devices for automatic recovery (data storage)

4.2. Visual indication

The device has the following visual indicators:

- Status and error indication of the gateway, of the EtherNet/IP 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

4.3. EtherNet/IP

The device offers the following EtherNet/IP functions:

• EtherNet/IP Device

• 2 port switch for access to the EtherNet/IP interface

• Gateway for transmission of the process and parameter data between the connected IO-Link devices and the higher-level EtherNet/IP controller

• Min. cycle time: 1 ms (RPI)

• Connection classes: 1, 3

• Connection Application types: Exclusive Owner, Input Only, Listen Only Connections

• UCMM supported

  • Predefined standard objects:

  • Identity Object (0x01)

  • Message Router Object (0x02)

  • Assembly Object (0x04)

  • Connection Manager (0x06)

  • DLR Object (0x47)

  • QoS Object (0x48)

  • TCP/IP Interface Object (0xF5)

  • Ethernet Link Object (0xF6)

• Supported protocols: DHCP, BOOTP, ACD, DLR

• Device description: EDS file

4.4. IO-Link

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

4.4.1. IO-Link supply

The device has 8 supplies for IO-Link devices (sensors, actuators).

The X1...X4 ports are class B ports. The ports X5...X8 are Ports Class A.

The pin 2 (UA) of the X1...X4 ports supports different operating modes (disconnected from power, supply voltage UA, digital output).

The current intensity of the supply voltages US and UA of the X1...X4 ports can be adjusted. The current intensity of the supply voltage US of the ports X5...X8 can be set.

Every supply provides short circuit monitoring.

The device ensures fire protection for connected IO-Link devices by providing an energy-limited circuit at the ports (according to IEC61010-1 and Class 2 to UL1310).

OM-IO-Link Master.010

This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

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4.4.2. Digital inputs

The device has 4 additional digital inputs (type 2 according to EN 61131-2).

The digital inputs are on pin 2 of the ports X5...X8.

All inputs refer to the potential of the device supply (pin 3).

4.4.3. Digital outputs

The device has 4 digital outputs that can be activated as an option (switching output DC-13 according to IEC 60947-5-1, 20 W).

The digital outputs are connected to pin 2 of the X1...X4 ports.

The digital outputs are supplied with the UA voltage. They refer to the potential of UA (pin 5).

4.5. Voltage output

The device has a voltage output (XD2) to supply an additional device. This makes it possible to supply several devices with one voltage source (daisy chain).

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This device is "powered by ifm". In all electronic interfaces, this device will
appear as AL1423. All firmware and electronic files are provided by ifm.

OM-IO-Link Master.011

5. Mounting

Content

5.1. Installing the device

> ▶ Disconnect power before installation.
>
> ▶ Please observe the maximum tightening torque.
>
> ▶ Use a plane mounting surface for installation.

▶ Fix the unit to the mounting surface using 2 M5 mounting screws and washers.

  • Tightening torque: 1.8 Nm

6. Electrical connection

Content

6.1. Notes

⚠ A qualified electrician must connect the unit.

▸ The national and international for regulations setting up electrical equipment must be complied with.

The unit is only suitable for operation using SELV/PELV voltages.

▸ Please note the information concerning IO-Link wiring!

This unit contains components that may be damaged or destroyed by electrostatic discharge (ESD).

▸ Please observe the required precautions against electrostatic discharge!

The IP rating of the overall system depends on the protection ratings of the individual devices, the applied connection elements and the corresponding protective caps.

▸ Provide cables with a strain relief depending on the mounting conditions to avoid excessive strain on the installation points and the M12 connections.

▸ Ensure correct fit and proper assembly of the M12 connecting parts. If these instructions are not complied with, the specified protection rating cannot be guaranteed.

For UL applications:

▸ To connect the IO-Link master and the IO-Link devices, only use UL-certified cables of the CYJV or PVVA category with a minimum temperature of 80°C (75°C in case of maximum ambient temperature of 40°C).

Wiring: → **Technical data** (→ P. 53)

By means of basic insulation according to EN61010-1, the circuits are separated from each other and from device surfaces that could be touched (secondary circuit with 30 V DC maximum, supplied from mains circuit up to 300 V overvoltage category II).

By means of basic insulation according to EN61010-1, the communication interfaces are separated from each other and from device surfaces that could be touched (secondary circuit with 30 V DC maximum, supplied from mains circuit up to 300 V overvoltage category II). They are designed for network environment 0 according to IEC TR62102.

6.2. Connect EtherNet/IP ports

▸ Connect the device via the M12 socket XF1 and/or XF2 with the EtherNet/IP network (e.g. EtherNet/IP PLC, additional EtherNet/IP device)

• Tightening torque: 0.6. 0.8 Nm

▸ Connect the device via the M12 socket XF1 and/or XF2 with the IT network (e.g. PC with parameter setting software Norgren IO-Link Configuration Tool, PC with monitoring software LR SMARTOBSERVER)

• 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. 51)).

▸ Cover the unused sockets with M12 protective caps (art. no.: E73004).

• Tightening torque 0.6. 0.8 Nm

6.3. IO-Link Port connection

Wiring Notes:

• The power supply of the connected IO-Link devices may only be provided via the NC-ME-4A4B-12DLA/AL1423

• The ports of the device meet the requirements of the IO-Link specification 1.0 to 1.1.2

• The additional digital output ports X1 ... X4 (pin 2) meet the requirements of utilization category DC-13 according to standard IEC 60947-5-1: 20W. The connected electronics must be electrically designed for this.

• The additional digital input of ports X5 ... X8 (pin 2) meet the requirements of type 2 behavior according to standard EN 61131-2. The connected electronics must be designed electrically for this.

⚠ CAUTION

Connection of IO-Link Class A devices Class with Class B ports with 4/5 pole connectors
> Risk of fire
> Impairment of electrical safety
> Malfunctions
▶ To connect IO-Link Class A devices to Class B ports, use 3-pole connectors only!

ℹ Detailed information: → IO-Link planning directive (→ www.io-link.com)
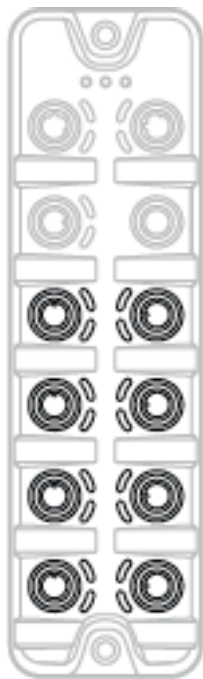
▶ Connect the connector of the IO-Link devices to the M12 sockets X1...X8.
  • Torque to 0,6...0,8 Nm
  • Maximum cable length per port: 20m
▶ Use M12 connectors with at least protection class IP65 / IP6 / IP67 for the connection (→ **Accessories** (→ P. 51)).
▶ Seal unused sockets with M12 sealing caps.
  • Torque: 0,6...0,8 Nm

OM-IO-Link Master.015

6.4. Ground the device

The FE potential is connected to the following points of the device:

- Upper mounting lug of the housing

- Ports XD1 and XD2: Pin 5 (FE)

- Ports XF1 and XF2

To ensure the protection of the device against electrical interference and to ensure the safe function of the device, the housing must be connected to the GND of the installation using the shortest possible route.
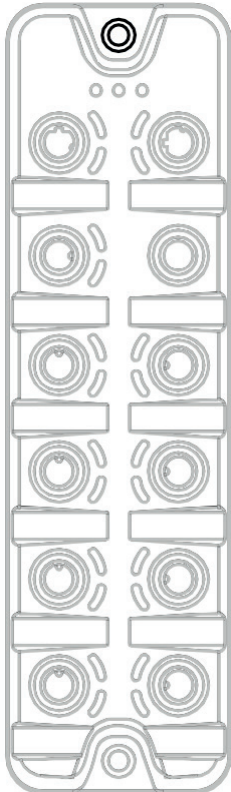
▶ Ground the unit via the mounting screw of the upper mounting lugs.

- Tightening torque: 1.8 Nm

▶ Optional: Connect pin 5 of the port XD1 or XD2 via an L-coded M12 connector with the FE socket of the power supply.

OM-IO-Link Master.016

This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

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6.5. Connect the device

> ⚠️ **CAUTION**
>
> Exceeding the maximum input current of 12 A
> > Fire hazard
> ▶ Select I_U and I_A of the power supplies US and UA taking into account the derating characteristics of the NC-ME-4A4B-12DLA/AL1423 (→ **Derating behavior** (→ P. 54))!

▶ Disconnect power.

▶ Connect the device via M12 socket X31 to US and UA supplying 24 V DC each (20...30 V SELV/PELV; according to IEC 61010-1, secondary circuit with maximum 30 V DC, supplied from mains circuit up to 300 V of overvoltage category II).

   • Tightening torque: 0.6. 0.8 Nm

   • Recommended maximum cable length: 25 m

▶ To connect the device, use L-coded M12 connectors with at least protection rating IP 65 / IP 66 / IP 67 (→ **Accessories** (→ P. 51)).

Optional: Supply of an additional devices (Daisy chain):
▶ Connect additional Master to M12 socket X32 of the NC-ME-4A4B-12DLA/AL1423 (Daisy-chain function).

   • Tightening torque: 0.6. 0.8 Nm

   • Recommended maximum cable length: 25 m

▶ To connect the device, use L-coded M12 connectors with at least protection rating IP 65 / IP 66 / IP 67 (→ **Accessories** (→ P. 51)).

ℹ️ In case of cables that are longer than 25 m, take the voltage drop and the necessary minimum supply voltage of 20 V into consideration!

7. Operating and display elements

Content
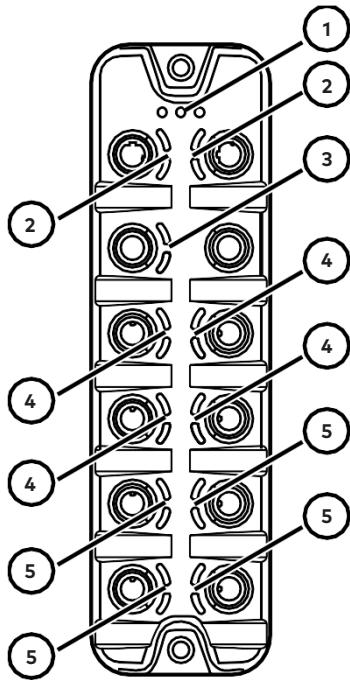
① Status LEDs RDY, NET and MOD (→ **Status LEDs** (→ P. 19))

② Status LEDs LNK and ACT of the EtherNet/IP interfaces
1 (XF1) and 2 (XF2) (→ **Ethernet ports** (→ P. 19))

③ Status LEDs US and UA of the voltage supply (XD1/XD2) (→ **Voltage supply** (→ P. 20))

④ Status LEDs IOL and UA/DO of the IO-Link Class B ports
(X1...X4) (→ **IO-Link Ports (Class B)** (→ P. 20))

⑤ Status LEDs IOL and DI of the IO-Link Port Class A
(X5...X8) (→ **IO-Link Ports (Class A)** (→ P. 21))

7.2. LED indicators

The device only has the following LED indicators:

7.2.1. Status LEDs

The RDY LED shows the status of the gateway.

The BF LED (Bus Failure) shows the status of the EtherNet/IP connection. The
SF LED (System Failure) shows the status of the system.

Status LED			Description
RDY	green	on	Status: OK
		flashes 5 Hz	Status: Error
		flashes (200 ms on, 800 ms off)	Status: Firmware update is running
		off	Status: Gateway not running or gateway booting
BF	red	on	Bus error
		flashes 1 Hz	No connection to the EtherNet/IP controller
		off	error-free
SF	red	on	• Error in gateway • At least 1 IO-Link device sends warning / alarm (temperature, over/under current, over/under voltage, shortcut)
		off	error-free

7.2.2. Ethernet ports

Each Ethernet port has 2 LEDs (LNK and ACT). The LEDs indicate the status of the Ethernet connection.

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

7.2.3. Voltage supply

The port for the voltage supply (XD1) has the LEDs with the designation US
and UA. The LEDs indicate the status of the supply voltage.

Status LED			Description
US	green	on	Supply voltage US is connected
		off	either there is no supply voltage or the connected supply voltage is too low
UA	green	on	Supply voltage UA is connected
		Off	either there is no supply voltage or the connected supply voltage is too low

7.2.4. IO-Link Ports (Class B)

Each IO-Link Port Class B has 2 LEDs with the designation IOL and
UA/DO. The LEDs show the status of the IO-Link ports.

Status LED			Description
IOL	yellow	Off	Port configured as DI/DO: pin 4 (C/Q) = OFF
		on	Port configured as DI/DO: pin 4 (C/Q) =ON
	green	flashing 1 Hz	Port configured asIO-Link: no IO-Link device found
		Flashing with 2 Hz	Port configured asIO-Link: Status PREOPERATE
		on	Port configured asIO-Link: Status OPERATE
	red	Flashing with 2 Hz	Port configuration error or short circuit / overload on US
		on	Transmission error
UA/DO	yellow	Off	Digital output: Pin 2 (UA) = OFF
		on	Digital output: Pin 2 (UA) = ON
	green	Off	IO-Link type A supply: Pin 2 (UA) = OFF
		on	IO-Link type B supply: Pin 2 (UA) = ON (not switchable)
	red	on	Error: Overcurrent or undervoltage

7.2.5. IO-Link Ports (Class A)

Each IO-Link Port Class A has 2 LEDs labelled IOL and DI. The LEDs indicate the status of the IO-Link port.

Status LED			Description
IOL	yellow	Off	Port configured as DI/DO: pin 4 (C/Q) = OFF
		on	Port configured as DI/DO: pin 4 (C/Q) =ON
	green	flashing 1 Hz	Port configured asIO-Link: no IO-Link device found
		Flashing with 2 Hz	Port configured asIO-Link: Status PREOPERATE
		on	Port configured asIO-Link: Status OPERATE
	red	Flashing with 2 Hz	Port configuration error or short circuit / overload on US
		on	Transmission Error
DI	yellow	Off	digital input: pin 2 = OFF
		on	digital input: pin 2 = ON

8. Setup

When the supply voltages have been switched on, the NC-ME-4A4B-12DLA/AL1423 starts with the factory settings.

The LEDs signal the current operating status of the device and the ports (→ **LED indicators** (→ P. 19)).

8.1. Parameter setting options

The device can be configured with the following options:

• Software Norgren IO-Link Configuration Tool (→ **Norgren IO-Link Configuration Tool** (→ P. 24)

• EtherNet/IP projecting software (→ **Ethernet/IP** (→ P. 38)

OM-IO-Link Master.022

This device is "powered by ifm". In all electronic interfaces, this device will
appear as AL1423. All firmware and electronic files are provided by ifm.

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9. Configuration

Content

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This device is "powered by ifm". In all electronic interfaces, this device will
appear as AL1423. All firmware and electronic files are provided by ifm.

OM-IO-Link Master.023

9.1. Norgren IO-Link Configuration Tool

Content

On delivery, the NC-ME-4A4B-12DLA/AL1423 is configured with the factory settings
(→ **Factory Settings** (→ P. 50)). Required software: Norgren IO-Link Configuration
Tool (1.6.x or higher) (art.-no.: NC-PS-SOFT-00001)

9.1.1. Remarks

Content

LR AGENT and LR SMARTOBSERVER

Norgren is working in partnership with ifm. These products can support ifm's LR Agent and
SmartObserver software, which can be helpful in developing IoT machines and services.

Online parameter setting

The parameters of the IO-Link master and the connected sensors and actuators
can be set before installation and set-up or during operation.

> **(!)** If parameters are changed during operation, this will influence the function of the plant.
> ▸ Ensure that there will be no malfunctions in your plant.

During the parameter setting process, the IO-Link master and the sensor stay in operating mode. They continue
their monitoring functions with the existing parameters until the parameter setting has been completed.

Offline parameter setting

The NC-ME-4A4B-12DLA/AL1423 supports the offline parameter setting. In this context, the user creates
and stores a configuration for the IO-Link master and the connected IO-Link devices without being
connected to the NC-ME-4A4B-12DLA/AL1423 (OFFLINE mode). The configuration created in this way
can be stored as a file (*.lrp) and loaded to the NC-ME-4A4B-12DLA/AL1423 and activated later.

> **(!)** Further information about offline parameter setting: → Operating instructions Norgren IO-Link Configuration Tool

VPN connection

> **(!)** An active VPN connection blocks the access of the parameter setting software Norgren IO-Link
> Configuration Tool to the EtherNet/IP interface of the NC-ME-4A4B-12DLA/AL1423.

> ▸ Deactivate the VPN connection in order to be able to access the NC-ME-4A4B-12DLA/AL1423
> with the Norgren IO-Link Configuration Tool.

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This device is "powered by ifm". In all electronic interfaces, this device will
appear as AL1423. All firmware and electronic files are provided by ifm.

OM-IO-LinkMaster.025

9.1.2. IoT: Configure IP settings

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** (→ P. 50)).

To configure the IP settings of the IoT interface:

▸ 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.

9.1.3. IoT: Configure access rights

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	[EtherNet/IP + IoT]*	• EtherNet/IP and IoT Core have read and write access rights to parameters and process data • EtherNet/IP and <IoT Core> have read access rights to events/alarms
		[EtherNet/IP + IoT (read-only)]	• EtherNet/IP has read and write access rights to parameters and process data • EtherNet/IP 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 • EtherNet/IP has no access rights

* ... Factory setting

▸ Save changed values on the device.

> If in Norgren IO-Link Configuration Tool and EtherNet/IP projection software the parameter [Access Rights] is
= [EtherNet/IP + IoT], the parameter values set in the EtherNet/IP projection software will always apply.

> If the parameter [Access Rights] = [IoT only] in Norgren IO-Link Configuration Tool, set the parameter [Access Rights]

> = [Keep settings] in the projection software.

> Changes of the parameter [Access Rights] will only be effective after restarting
the IO-Link master (→ Firmware: **Reboot the device** (→ P. 36)).

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This device is "powered by ifm". In all electronic interfaces, this device will
appear as AL1423. All firmware and electronic files are provided by ifm.

OM-IO-Link Master.027

9.1.4. IoT: Configure the interface to LR AGENT or LR SMARTOBSERVER

To enable transfer of process data from the IO-Link master to LR AGENT or LR SMARTOBSERVER, the interface has to be configured accordingly.

▸ Select [IoT] menu.

> The menu page shows the current settings.

▸ Set the following parameters as required:

Name	Description	Possible values	
[IP address LR Agent or SMARTOBSERVER]	IP address of LR AGENT or LR SMARTOBSERVER	Factory setting: 255.255.255.255	
[Port LR Agent or SMARTOBSERVER]	Port number that is used to send process data to LR AGENT or LR SMARTOBSERVER	0 ... 65535	Factory setting: 35100
[Interval LR Agent or SMARTOBSERVER]	Cycle time for the transfer of the process data to LR AGENT or 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 LR AGENT or LR SMARTOBSERVER (String32)	Factory setting: AL1423	

> ❗ After changing the parameter [Port LR Agent or 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 changing the parameter.

▸ Save changed values on the device.

9.1.5. Fieldbus: Configure IP settings

For communication with the EtherNet/IP network, the EtherNet/IP interface must be configured.

▸ Select [Fieldbus] menu.

> The menu page shows the current settings.

▸ Set the following parameters as required:

Name	Description	Possible values	
[DHCP]	Enable / disable the DHCP client of the device	[Static IP]	IP parameters are set by the user
		[DHCP]	IP parameters are set by a DHCP server in the network.
		[BOOTP]	IP parameters are set via the Bootstrap Protocol (BOOTP)
[IP address]*	IP address of the EtherNet/IP port	Factory setting: 192.168.1.250	
[Subnet mask]*	Subnet mask of the IP network	Factory setting: 255.255.255.0	
[Default gateway IP address]*	IP address of the gateway	Factory setting: 0.0.0.0	
[Host name]	Name of the device in the EtherNet/IP network	e.g. al1xxx	
[MAC address]	MAC address of the device	The value is firmly set.	
[Fieldbus firmware]		e.g. 3.4.04 (EtherNet/IP Adapter)	

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

▸ Save changed values on the device.

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This device is "powered by ifm". In all electronic interfaces, this device will
appear as AL1423. All firmware and electronic files are provided by ifm.

OM-IO-LinkMaster.029

9.1.6. Fieldbus: set the configuration mode

The NC-ME-4A4B-12DLA/AL1423 supports the EtherNet/IP configuration modes "top-down" and "independent".

Additionally, the user can configure the length of the transmitted process data and select the required connection types.

▸ Select [Fieldbus] menu.

> The menu page shows the current settings.

▸ Set the following parameters as required:

Name	Description	Possible values	
[Configuration]*	EtherNet/IP configuration mode	Independent mode off	Configuration via fieldbus PLC
		Independent mode on	Configuration via NC-ME-4A4B-12DLA/AL1423
[Process data length]*	Length of process data per IO-Link port	2 bytes input 2 bytes output	2 bytes input data, 2 bytes output data
		4 bytes input 4 bytes output	4 bytes input data, 4 bytes output data
		8 bytes input 8 bytes output	8 bytes input data, 8 bytes output data
		16 bytes input 16 bytes output	16 bytes input data, 16 bytes output data
		32 bytes input 32 bytes output	32 bytes input data, 32 bytes output data
[Swap]*	Sequence of bytes in the data word	off	as Array of Bytes
		on	as Integer16 value; during an update of the process data, the bytes are exchanged
[Explicitpdmode]**	Enable / disable explicit PD mode and select the process data to be transmitted (connection types)	Explicit process data mode off	Explicit PD mode disabled
		Explicit process data mode with IO-Link I/O + Acyclic + Diag	Explicit PD mode enabled: IO-Link inputs / outputs, acyclic data and diagnostic data are transmitted
		Explicit process data mode with IO-Link I/O + Acyclic + Diag + EnMo	Explicit PD mode enabled: IO-Link inputs / outputs and acyclic data, diagnostic data and data for energy monitoring are transmitted
		Explicit process data mode with IO-Link I/O	Explicit PD mode enabled: IO-Link inputs/outputs are transmitted

* ... Parameter can only be changed if the EtherNet/IP controller is disconnected

** ... Parameter only valid if [Configuration] = [Independent mode on]

▸ Save changed values on the device.

9.1.7. IO-Link ports: Activate data transfer to LR AGENT or LR SMARTOBSERVER

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

[!] To transfer process data the interface to the LR AGENT or LR SMARTOBSERVER has to be correctly
configured (→ IoT: **Configure the interface to LR AGENT or LR SMARTOBSERVER** (→ P. 28)).

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 Agent or SMARTOBSERVER]	Transfer of process data of the connected IO-Link device to LR AGENT over LR SMARTOBSERVER	[Disabled]	Transfer process data
		[Enabled]	Do not transfer process data

▶ Save changed values on the device.

9.1.8. IO-Link ports: Set the operating mode Pin 2 (UA)

The pin 2 of the IO-Link ports X1...X4 supports the following operating modes:

• Off: Pin 2 is disconnected from power; The port functions as IO-Linkport type A

• On: The voltage UA is connected to pin 2; the ports functions as IO-Linkport Class B

• Digital output (DO): A binary output signal is on pin 2; the port functions as a digital switching output

The user can set the operating mode separately for each IO-Link port. To
set the operating mode of pin 2 (UA) of an IO-Link port:

▶ Select menu [Port x] (x = 1...X1...X4)

> The menu page shows the current settings.

▶ Set the following parameters as required:

Name	Description	Possible values	
[Mode Pin2 UA]	Operating mode of pin 2 of the port	[Off (IO-Link Type A Supply)]	IO-Link Port Class A
		[On (IO-Link Type B Supply)]	IO-Link Port Class B
		[Digital Output]	Digital switching output

▶ Save changed values on the device.

9.1.9. IO-Link ports: Set the operating mode Pin 4

Pin 4 of the IO-Link-Ports X1...X8 supports the following operating modes:

· Disabled: no data transmission to pin 4 (C/Q) of the IO-Link port

· 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 type of pin 4 (US) 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 Pin4 US]	Operating mode of the pin 4 of the port	[Disabled]	no data transmission
		[DI]	digital input
		[DO]	digital output
		[IO-Link]	IO-Link data
[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.

OM-IO-Link Master.032
This device is "powered by ifm". In all electronic interfaces, this device will
appear as AL1423. All firmware and electronic files are provided by ifm.
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9.1.10. IO-Link Ports: restrict current intensity

For the IO-Link ports X1...X4, the following features can be set:

• Max. current intensity of the supply voltage US

• Max. current intensity of the supply voltage UA

For the IO-Link ports X5...X8, the following features can be set:

• Max. current intensity of the supply voltage US

To set the max. current intensity of the supply voltages US and UA 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	
[Current Limit Pin2 UA]*	Max. current intensity of the supply voltage UA on the port (value in milliamps)	0 ... 2000*	0 mA* 2000 mA
[Current Limit Pin1 + Pin4 US]	Max. current intensity of the supply voltage US on the port (value in milliamps)	0 ... 450* ... 2000	0 mA 450 mA 2000 mA

* ... Factory setting

** ... Parameters only available for IO-Link ports X1...X4

▸ Save changed values on the device.

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This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

OM-IO-Link Master.033

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

The user can choose how the IO-Link ports are to behave regarding the device validation and the storage / recovery of parameter data of the connected IO-Link device.

The following options are available:

Option	Validation of the IO-Link device	Storage of the parameter values	Recovery of the parameter values
[No check and clear]	no	no	no
[Type compatible V1.0 device]	yes, test the compatibility with IO-Link standard V1.0	no	no
[Type compatible V1.1 device]	yes, test the compatibility with IO-Link standard V1.1	no	no
[Type compatible V1.1 device with Backup + Restore]	yes, test the compatibility with IO-Link standard V1.1 and identity of design (vendor ID and device ID)	yes, automatic storage of the parameter values; changes of the current parameter values will be stored	yes, recovery of the parameter values when connecting an identical IO-Link device with factory settings
[Type compatible V1.1 device with Restore]	yes, test the compatibility with IO-Link standard V1.1 and identity of design (vendor ID and device ID)	no, there is no automatic storage changes of the current parameter values will not be stored	yes, recovery of the parameter values when connecting an identical IO-Link device with factory settings

> ❗ The options only apply if the IO-Link port is in the operating mode "IO-Link".
>
> For options [Type compatible V1.1 device with Backup + Restore] and [Type compatible V1.1 device with Restore]: If the vendor ID and device ID are changed in the online mode, the data memory will be deleted and a new backup of the parameter values of the connected IO-Link device will be created in the IO-Link master.

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 behavior of the IO-Link master when connecting a new IO-Link device at port x (x = 1...8)	[No check and clear]	
		[Type compatible V1.0 device]	
		[Type compatible V1.1 device]	
		[Type compatible V1.1 device with Backup + Restore]	
		[Type compatible V1.1 device with Restore]	
[Vendor ID]	ID of the manufacturer that is to be validated	0...65535	Factory setting: 0# IMI Norgren: 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.

OM-IO-Link Master.034

This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

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9.1.12. IO-Link Ports: Set fails-safe values

For the configuration mode "Independent" the user can set fail-safe values for the outputs of IO-Link ports.
The fail-safe values will be activated in case of an interruption of the EtherNet/IP connection.

To set the fail-safe values:

▸ Select [Port x] menu (x = 1...8).

> The menu page shows the current settings.

▸ Set the following parameters as required:

Name	Description	Possible values	
[Fail-safe digital out]*	Fail-safe value of the output for operating mode "Digital Output (DO)"	[Reset]	OFF
		[Old]	old value
		[Set]	ON
[Fail-safe IO-Link]*	Fail-safe value of the output for operating mode "IO-Link"	[Off]	no Fail-safe
		[Reset]	Fail-safe: OFF
		[Old	Fail-safe: old value
		[Pattern]	Fail-safe: byte pattern

* ... Parameter only changeable if the connection to the EtherNet/IP controller is closed

▸ Save changed values on the device.

9.1.13. Info: Show device information

To read the general information of the IMI Norgren 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	AL1xxx
[Device family]	Device family of the IO-Link master	IO-Link master
[Vendor]	Vendor	Norgren
[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	

9.1.14. Firmware: Reset device to factory settings

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.

> Norgren IO-Link Configuration Tool sets the device to the factory settings.

9.1.15. Firmware: Reboot the device

When rebooting the device, all settings are kept.

To restart the NC-ME-4A4B-12DLA/AL1423:

▸ Select [Firmware] menu.

> The menu page shows the current settings.

▸ Click on [Reboot] to reboot the device.

> Norgren IO-Link Configuration Tool reboots the IMI Norgren IO-Link master.

9.1.16. Configure IO-Link devices

To configure the IO-Link devices connected to the device with the Norgren IO-Link Configuration Tool parameter setting software:

Requirements

> IO-Link master is correctly installed and connected to the Norgren IO-Link Configuration Tool parameter setting software.

> The IO-Link device is connected correctly with the NC-ME-4A4B-12DLA/AL1423.

> Operating mode of the IO-Link port is "IO-Link" (→ **IO-Link ports: Set the operating mode Pin 4** (→ P. 32)).

> IoT has write access rights to the IO-Link master (→ **IoT: Configure access rights** (→ P. 27)).

1. Select IO-Link master

▸ Start Norgren IO-Link Configuration Tool.

▸ Update IODD file library OR:
Import IODD file of the IO-Link device manually.

▸ Scan network for devices.

> Norgren IO-Link Configuration Tool detects IO-Link master.

2. Add IO-Link device

▸ Under [ONLINE]: Click on the required IO-Link master.

> Norgren IO-Link Configuration Tool automatically detects the IO-Link devices connected to the IO-Link master (e.g. IMI Norgren sensor KG5065).
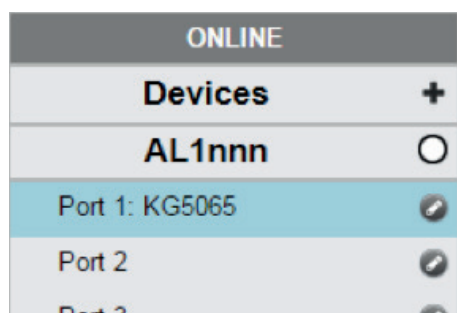
3. Configure IO-Link device

▸ Mouse click on the port to which the IO-Link device is connected.

> Norgren IO-Link Configuration Tool 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) describes IO-Link Devices

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

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This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

OM-IO-Link Master.037

9.2. EtherNet/IP

Content

On the fieldbus side, the device can be configured with any EtherNet/IP compatible projection software.

The information in the following sections refers to the EtherNet/IP projection software RSLogix 5000.

9.2.1. EtherNet/IP: Programmers' notes

The programmer can access on the following data from the PLC application:

• Read device information of the NC-ME-4A4B-12DLA/AL1423

• Read diagnostics and alarms

• Set parameters of the connected IO-Link devices

The following sections show the available options.

> Further information about the functional/operational blocks:
> → Help function of the EtherNet/IP projection software

Supported configuration options

The NC-ME-4A4B-12DLA/AL1423 supports the following EtherNet/IP configuration modes:

• Top-Down

> Configuration of the EtherNet/IP slave (IO-Link master) via EtherNet/IP projecting software (Configuration Assembly)

> The created configuration is transferred to the EtherNet/IP slave (IO-Link master) via the EtherNet/IP controller.

• Independent

> Configuration of the EtherNet/IP slave (IO-Link master) via Norgren IO-Link Configuration Tool

> Configuration Assembly in the EtherNet/IP project will not be evaluated.

OM-IO-Link Master.038
This device is "powered by ifm". In all electronic interfaces, this device will
appear as AL1423. All firmware and electronic files are provided by ifm.
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9.2.2. Registration of the EDS file

Norgren provides an EDS file to integrate the NC-ME-4A4B-12DLA/AL1423 in a EtherNet/IP projection software. The user can download the EDS file from the Norgren website (→ www.Norgren.com).
In the EDS file, all parameters, process data, and their valid value ranges are defined.

To add the NC-ME-4A4B-12DLA/AL1423 to the device catalogue of RSLogix5000:

▸ Download the EDS file of the NC-ME-4A4B-12DLA/AL1423 from the Norgren website.

▸ Start RSLogix5000.

▸ Select [Tools] > [EDS Hardware Installation Tool].

> EDS Wizard appears.

▸ Register the downloaded EDS file of the NC-ME-4A4B-12DLA/AL1423 with the EDS Wizard.

> EDS Wizard installs the EDS file and adds the AL1423 to the device catalogue.

9.2.3. Integrate the IO-Link Master into the EtherNet/IP project

The NC-ME-4A4B-12DLA/AL1423 is integrated as module of an I/O scanner in the EtherNet/IP project.

Requirements

> The EDS file of the NC-ME-4A4B-12DLA/AL1423 is installed (→ **Registration of the EDS file** (→ P. 39)).

1. Create/open EtherNet/IP project

▸ Start RSLogix 5000.

▸ Create new EtherNet/IP project. OR
  Open an existing EtherNet/IP project.

2. Configure EtherNet/IP PLC and IO scanner

▸ Select and configure EtherNet/IP controller and IO scanner.

> EtherNet/IP project includes a EtherNet/IP controller and an IO scanner.

3. Integrate NC-ME-4A4B-12DLA/AL1423 in project

▸ In the Controller Organizer: Right mouse click on the IO scanner.

> Context menu appears.

▸ In the context menu: Select [New Module...].

> The window [Select Module Type] appears.

▸ Select AL1423 and click on [Create].

> The [New Module] window appears.

▸ Enter name and IP address of the NC-ME-4A4B-12DLA/AL1423.

▸ Click on [OK] to adopt the entered values.

> RSLogix 5000 adds AL1423 as sub-element of the IO scanner to the project.

4. Save the project

▸ Save EtherNet/IP project

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This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

OM-IO-LinkMaster.039

9.2.4. Configure connection types

With the connection types, the user defines which process data is transferred in Input Assembly and Output Assembly.

Connection type	Process data	
	Inputs	Outputs
Exclusive Owner IO + Acyclic + Diag + EnMo	• cyclic input data • Port Qualifier Information (PQI) • Acyclic command channel (response) • Diagnostic data (events, status information) • Energy monitoring	• cyclic output data • Acyclic command channel (request)
Exclusive Owner IO + Acyclic + Diag	• cyclic input data • Port Qualifier Information (PQI) • Acyclic command channel (response) • Diagnostic data (events, status information)	• cyclic output data • Acyclic command channel (request)
Exclusive Owner IO	• cyclic input data • Port Qualifier Information (PQI)	• cyclic output data
Input only	→ IO + Acyclic + Diag	-
Listen only	→ IO + Acyclic + Diag	-

Additionally, the user can set the Request Package Interval (RPI). To set the connection type:

Requirements

> NC-ME-4A4B-12DLA/AL1423 is correctly integrated in the EtherNet/IP project
   (→ **Integrate the IO-Link Master into the EtherNet/IP project** (→ P. 39)).

1. Open module settings

▸ In the Controller Organizer: Double-click on the IO-Link master node

> A dialogue window appears.

2. Set the connection type

▸ Click on [Change…].

> The [Module Definition] dialogue window appears.

▸ Select the required connection type from the list [Connections].

▸ Click on [OK] to adopt the changes.

3. Set the RPI

▸ Click on the [Connection] tab.

> The connection settings are shown.

▸ Select the required value in the [RPI] list.

▸ Click on [OK] to adopt the changes.

OM-IO-Link Master.040

This device is "powered by ifm". In all electronic interfaces, this device will
appear as AL1423. All firmware and electronic files are provided by ifm.

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9.2.5. Configure the IO-Link master

The user can set the following parameters for the IO-Link master:

• Communication profile

• Length of the process data

Details about the parameters of the IO-Link master: → **Configuration Assembly (Instance 199)** (→ P. 62)

Use the Controller Tag to configure the IO-Link master. To configure the IO-Link master:

Requirements

> The IO-Link master is integrated correctly in the EtherNet/IP project
(→ **Integrate the IO-Link Master into the EtherNet/IP project (→ P. 39)).**

1. Open controller tags

▸ In the Controller Organizer: Double click on [Controller Name_of_Project] > [Controller Tags]

> [Controller Tags] window appears.

▸ In the tree view: Click on [AL1423:C].

> Controller tags for the configuration are displayed.

2. Configure the IO-Link master

▸ Set the Controller Tags as required.

> Save the project

9.2.6. Configure IO-Link ports

The user can set the following parameters separately for each IO-Link port:

• Port configuration (operating mode pin 4, cycle time, process data alignment (Swap), device validation
and data storage, fail-safe values operating modes "Digital Output" and "IO-Link")

• Operating mode supply voltage UA (pin 2)

• Fail-safe value for operating mode "Digital Output" of the supply voltage UA (Pin 2)

• max. current rating of the supply voltage UA (pin 2) (class B ports)

• max. current rating of the supply voltage US (pin 1 + pin 4)

Details about the parameters of the IO-Link ports: → **Configuration Assembly (Instance 199)** (→ P. 62)

Use the Controller Tags to configure the IO-Link ports. To configure the IO-Link ports:

Requirements

> The IO-Link master is integrated correctly in the EtherNet/IP project
(→ **Integrate the IO-Link Master into the EtherNet/IP project (→ P. 39)).**

1. Open controller tags

▸ In the Controller Organizer: Double click on [Controller Name_of_Project] > [Controller Tags]

> [Controller Tags] window appears.

▸ In the tree view: Click on [AL1423:C].

> Controller tags for the configuration are displayed.

2. Configure the IO-Link master

▸ Set the Controller Tags as required.

> Save the project

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This device is "powered by ifm". In all electronic interfaces, this device will
appear as AL1423. All firmware and electronic files are provided by ifm.

OM-IO-Link Master.041

9.2.7. Configure IO-Link devices

The NC-ME-4A4B-12DLA/AL1423 supports the configuration of the connected IO-Link devices from the EtherNet/IP projection software. For this, Norgren offers the EtherNet/IP object "IO-Link Request" (→ IO-Link requests (object class: 0x80) (→ P. 102)). The object enables direct read and write access to IO-Link objects of the IO-Link device (Indexed Service Data Unit (ISDU)). The extent of the configurable parameters depends on the IO-Link device.

The following services are available:

Name	Description	Reference
Read request	Send a request to read an IO-Link object	→ **Read_ISDU** (→ P. 103)
Write request	Send a request to write an IO-Link object	→ **Write_ISDU** (→ P. 106)

> [!] Information for the execution of acyclic commands: → **Use acyclic services** (→ P. 44) Available parameters of the IO-Link devices: → Operating instructions of the IO-Link device

9.2.8. Read process data

The user can access the cyclic input data of the connected sensors and IO-Link devices via the controller tags of the NC-ME-4A4B-12DLA/AL1423.

> [!] To check the validity of the cyclic process data, evaluate the PQI byte (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74)).
>
> Even if the fieldbus connection is interrupted, the PQI byte indicates that the process data is valid. This may have an unintended impact on the control process.
>
> > Take suitable measures to detect an interruption of the fieldbus connection.

To access the input data:

▸ start RSLogix5000.

▸ Open a EtherNet/IP project.

▸ In the project tree: Mouse click on [Controller Tags] > [AL1423.I]

> The window shows the data structure with cyclic input data ([AL1423.I:Data]).

▸ Link process data to variables.

> [!] The mapping of the process data to the data structure [AL1423.I:Data] depends on the configured instance of the input assembly object (→ **Cyclic data** (→ P. 67)).

OM-IO-Link Master.042

This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

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9.2.9. Write process data

The user can access the cyclic output data of the connected actuators and
IO-Link devices via the controller tags of the NC-ME-4A4B-12DLA/AL1423.

(!) To check the validity of the cyclic process data, evaluate the PQI byte (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74)).

Even if the fieldbus connection is interrupted, the PQI byte indicates that the process data is valid. This may have an unintended impact on the control process.

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

To access the input data:

▸ start RSLogix5000.

▸ Open a EtherNet/IP project.

▸ In the project tree: Mouse click on [Controller Tags] > [AL1423.I]

> The window shows the data structure with cyclic input data ([AL1423.I:Data]).

▸ Link process data to variables.

(!) The mapping of the process data to the data structure [AL1423.I:Data] depends on the configured instance of the input assembly object (→ **Cyclic data** (→ P. 67)).

9.2.10. Read diagnostic information and events

Diagnostic and status information is a part of the cyclically transmitted process data.

The following information is available:

• Short circuit / overload of the IO-Link ports

• Status of the supply voltages US and UA

• Device ID and vendor ID of the connected IO-Link devices

• Events of the IO-Link ports

• present current and voltage values of the supply voltages US and UA

• present current values of the supply voltages US and UA of the IO-Link ports

To access the input data:

▸ start RSLogix5000.

▸ Open a EtherNet/IP project.

▸ In the project tree: Mouse click on [Controller Tags] > [AL1423.I]

> The window shows the data structure with cyclic input data ([AL1423.I:Data]).

▸ Link process data to variables.

(!) The mapping of the process data to the data structure [AL1423.I:Data] depends on the configured instance of the input assembly object (→ **Cyclic data** (→ P. 67)).

9.2.11. Use acyclic services

The NC-ME-4A4B-12DLA/AL1423 offers the following options to execute acyclic commands:

Command channels in cyclic process data

Within the cyclic input and output data, special areas are available for the acyclic data transmission. Both read and write access can be implemented via the areas.

Principle of the command channels

General process of an acyclic communication:

1. Write command request

▸ In the request channel: write requested command data (without [Trigger] bit)

▸ Set [Trigger] = 1.

> Change of [Trigger] = 1 indicates a new command.

> In the response channel: all bytes are set to 0.

> Command processing is started.

2. Check status

▸ In the response channel: check [Handshake] bit.

  • If [Handshake] <> 0: command processing completed, continue with step 3.

  • If [Handshake] == 0: command is processed, repeat step 2.

3. Read command response

▸ In the response channel: read response user data.

▸ In the request channel: set [Trigger] = 0.

Acyclic port commands

For the acyclic access to the configuration of the IO-Link ports of the NC-ME-4A4B-12DLA/AL1423,
the following commands are available:

Name	Description	Reference
Set mode	Set the operating type of the IO-Link port	→ Command 0x10 – Set mode (→ P. 87)
Set Validation ID / Data Storage	Adjust the supported IO-Link standard and the behavior of the IO-Link master when connecting a new IO-Link device to the IO-Link port	→ Command 0x20 – Set validation ID / data storage (→ P. 89)
Set fail-safe data pattern	Behavior of the outputs when the EtherNet/IP connection is interrupted and setting of the corresponding fail-safe values	→ Command 0x30 – Set fail-safe data pattern (→ P. 91)

The port commands use the same mechanisms as the acyclic command channel (→ **Acyclic command channel** (→ P. 81)).

EtherNet/IP mechanisms for acyclic commands

Acyclic commands can be executed with the EtherNet/IP command Message (MSG).
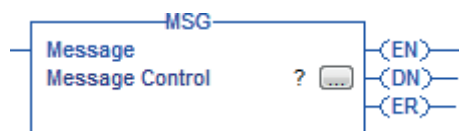
Parameters of the available field bus objects: → **Field bus objects** (→ P. 93)

For detailed information about the Message (MSG) command: → Operating instructions RSLogix 5000

10. Operation

Content

10.1. Use web-based management

The device has an integrated web server The web server generates a website with the following data:

• Status information of the ports

• Diagnostic information of the device

• Version information of the installed firmware components

To access the web interface of the IO-Link master:

▸ Connect the IO-Link master via port XF1 or XF2 with the laptop / PC.

▸ Optional: Check the IP settings of the EtherNet/IP interface.

▸ Start web browser.

▸ In the address field of the web browser, enter the IP address of the EtherNet/IP interface and confirm with [ENTER].

> The web browser shows the website with the status and diagnostic information of the device.

OM-IO-Link Master.046

This device is "powered by ifm". In all electronic interfaces, this device will
appear as AL1423. All firmware and electronic files are provided by ifm.

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11. Maintenance, repair and disposal

Content

The operation of the unit is maintenance-free.

▸ Dispose of the unit in an environmentally friendly way in accordance with the applicable national regulations when it is no longer used.

11.1. Cleaning process

▸ Clean the surface of the unit when necessary.

▸ Do not use any caustic cleaning agents for this!

11.2. Update the firmware

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

▸ During the firmware update, ensure that the device is connected to the supply voltages US and UA.

Before the firmware update:

▸ Deactivate the connection to the EtherNet/IP PLC.

▸ Set the parameter [IP address LR AGENT or SMARTOBSERVER] to 255.255.255.255 or 0.0.0.0.

▸ Stop the LRAgent. Norgren IO-Link Configuration Tool service in the Windows task manager.

After the firmware update:

▸ Check the settings of the interface to the LR AGENT and LR SMARTOBSERVER.

To install a new firmware version on the device:

Requirements

> Zip file with new firmware has been downloaded and unpacked.

> 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]:
http://<IP address of device>/web/update

> Web browser shows the [Firmware Update] page.

2. Load the new firmware to the IO-Link master

▸ Click on [File choose].

> A dialogue window appears.

▸ Select the firmware file (.bin) 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. Reboot the IO-Link master

▸ Click on [Restart device now] to restart the device.

> The RDY status LED flashes rapidly.

> Firmware is updating.

▸ Follow the instructions in the browser.

OM-IO-Link Master.048

This device is "powered by ifm". In all electronic interfaces, this device will
appear as AL1423. All firmware and electronic files are provided by ifm.

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11.3. Exchanging the IO-Link device

To exchange an IO-Link device:

Requirements

> The new IO-Link device is in the default state, as on delivery (factory settings).

> The new IO-Link device supports the IO-Link standard 1.1 or higher.

1. Store the parameter set of the old IO-Link device

▸ Create the following parameter of the IO-Link port
Device validation and data storage = [Type compatible V1.1 device with Restore]

▸ Save the changes on the device.

> The IO-Link master saves the parameter values of the connected IO-Link device in the data memory.

2. Exchange IO-Link device

▸ Disconnect the old IO-Link device from the IO-Link master.

▸ Connect the new IO-Link device with the same IO-Link port of the NC-ME-4A4B-12DLA/AL1423.

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

> The new IO-Link device works with the restored parameter set.

12. Factory Settings

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

Parameter	Factory setting
[IP address]	192.168.1.250
[Subnet mask]	255.255.255.0
[IP gateway address]	0.0.0.0
[Host name]	blank
Data Storage	empty

13. Accessories

List of accessories of NC-ME-4A4B-12DLA/AL1423: → www.Norgren.com > Product page > Accessories

14. Appendix

Content

14.1. Technical data

Content

14.1.1. Application

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

14.1.2. Electrical data

Electrical data	
Operating voltage [V]	20…30 DC; (US; according to SELV/PELV)
Current consumption [mA]	300…3900; (US)
protection class	III
Additional voltage supply[V]	20…30 DC; (UA)
Sensor supply US	
Total current rating [A]	3,6
Current rating per port [A]	2; (configurable: 0…2; factory setting: 0.45)
Actuator supply UA	
Total current rating [A]	8
Current rating per port [A]	2; (configurable: 0…2; factory setting: 2)

Derating behavior

Derating without daisy chain
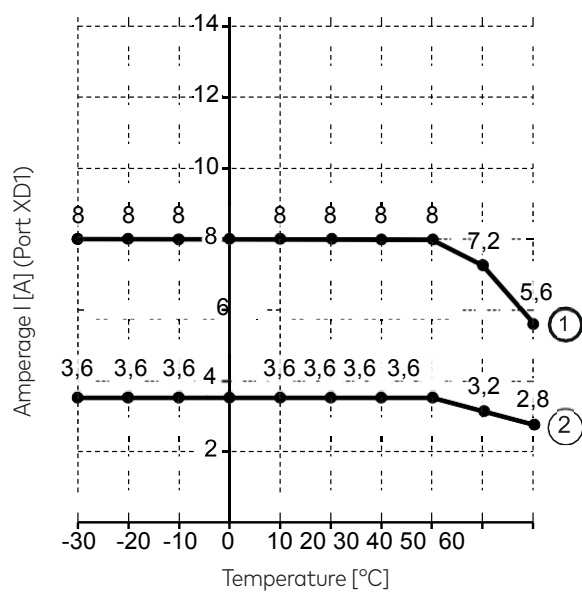
(1) UA to ports X1…X4

(2) US to ports X1…X8

Derating without daisy chain
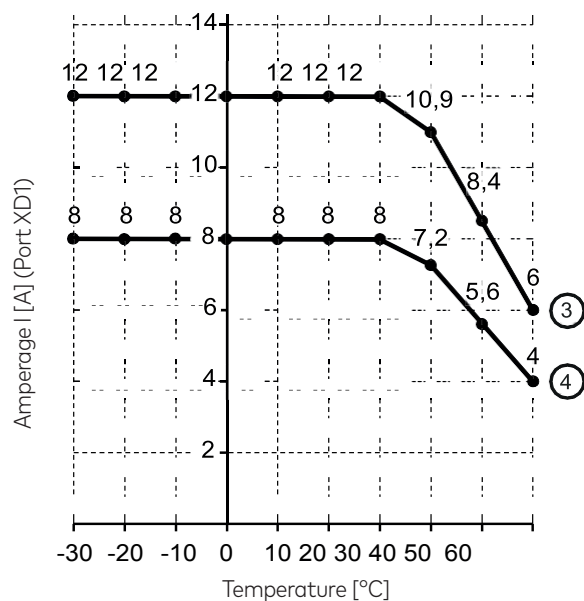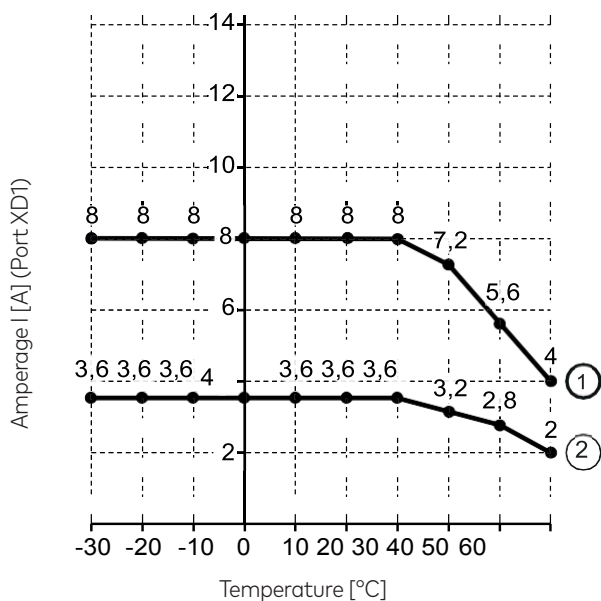
1 XD1: UA to port X1...X4

2 XD1: US to port X1...X8

3 XD2: $UA_{daisychain}$

4 XD2: $US_{daisychain}$

Example:

Temperature	I_{UA}	I_{US}	$I_{UAdaisychain}$	$I_{USdaisychain}$
30°C	8 A	3.6 A	8 A	12 A

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This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

OM-IO-LinkMaster.055

14.1.3. Inputs/outputs

Inputs/outputs	
total number of inputs and outputs	24; (configurable)
Number of inputs and outputs	Number of digital inputs: 12; Number of outputs: 12

14.1.4. Inputs

Inputs	
Number of digital inputs	12; (IO-Link Port Class A: 4 x 2; IO-Link Port Class B: 4 x 1)
Switching level high [V]	11...30
Switching level low [V]	0...5
Digital inputs protected against short circuits	yes

14.1.5. Outputs

Outputs	
Number of digital outputs	12; (IO-Link Port Class A: 4 x 1; IO-Link Port Class B: 4 x 2)
Short-circuit protection	yes
Actuator supply UA	
Max.current load per output [mA]	2000
Sensor supply US	
Max. current load per output [mA]	2000

14.1.6. Interfaces

Interfaces	
Communication interface	Ethernet; IO-Link
Ethernet	
Transmission standard	10Base-T; 100Base-TX
Transmission rate [MBit/s]	10; 100
Protocol	EtherNet/IP
Factory settings	• IP address: 192.168.1.250 • Subnet mask: 255.255.255.0 • Gateway IP address: 0.0.0.0 • MAC Address: see type label
Addition	CC-C (Conformance Class C); S2 redundancy; Configuration in Run (CiR); IRT capability; SNMP
IO-Link Master	
Type of transmission	COM 1 / COM 2 / COM 3
IO-Link revision	1.1
Number of ports class A	4
Number of class B ports	4

14.1.7. Environmental conditions

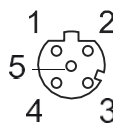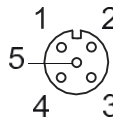| Environmental conditions	
Ambient temperature [°C]	-25...60
Storage temperature [°C]	-25...85
Max. perm. relative air humidity [%]	90
Protection rating	IP 65; IP 66; IP 67
Degree of soiling	2
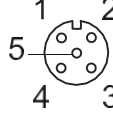
14.1.8. Approvals / tests

Approvals / tests	
EMC	• EN 61000-6-2 • EN 61000-6-4
Shock resistance	DIN EN 60068-2-27
Vibration resistance	• DIN EN 60068-2-64 2009-04 • DIN EN 60068-2-6 2008-10

14.1.9. Mechanical data

Mechanical data	
Weight [g]	412,1
Materials	Housing: PA; socket: brass nickel-plated

14.1.10. Electrical connection

Voltage supply IN XD1		
Connector	M12 (L-coded)	
Wiring		1: + 24 V DC (US)
		2: GND (UA)
		3: GND (US)
		4: +24 V DC (UA)
		5: FE
Voltage supply OUT XD2		
Connector	M12 (L-coded)	
Wiring		1: + 24 V DC (US)
		2: GND (UA)
		3: GND (US)
		4: +24 V DC (UA)
		5: FE
Ethernet IN / OUT XF1, XF2		
Connector	M12	
Wiring		1: TX +
		2: RX +
		3: TX -
		4: RX -
		5: -
Process connection Ports Class B X1...X4		
Connector	M12	
Wiring		1: Sensor supply (US) L+
		2: Actuator supply (UA) L+ / DO
		3: Sensor supply (US) L-
		4: C/Q IO-Link
		5: Actuator supply (UA) L-
Process connection of Ports Class A X5...X8		
Connector	M12	
Wiring		1: Sensor supply (US) L+
		2: DI
		3: Sensor supply (US) L-
		4: C/Q IO-Link
		5: -

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14.2. EtherNet/IP

Content

14.2.1. Supported connection types

Name	Configuration Assembly	Input Assembly - Instance	Output Assembly - Instance
Exclusive Owner IO-Acyc-Diag	199	100	150
Exclusive Owner IO-Acyc-Diag-EnMo	199	103	150
Exclusive Owner IO	199	102	151
Input only	199	100	193 (empty)
Listen only	199	100	192 (empty)

14.2.2. Parameter data

Content

Configuration Assembly (Instance 199)

Bytes	Contents
0	Communication Profile
1	Port Process Data Size
2...13	Port X1: Port Configuration (→ **Mapping: Port configuration** (→ P. 64))
14...25	Port X2: Port Configuration (→ **Mapping: Port configuration** (→ P. 64))
26...37	Port X3: Port Configuration (→ **Mapping: Port configuration** (→ P. 64))
38...49	Port X4: Port Configuration (→ **Mapping: Port configuration** (→ P. 64))
50...61	Port X5: Port Configuration (→ **Mapping: Port configuration** (→ P. 64))
62...73	Port X6: Port Configuration (→ **Mapping: Port configuration** (→ P. 64))
74...85	Port X7: Port Configuration (→ **Mapping: Port configuration** (→ P. 64))
86...97	Port X8: Port Configuration (→ **Mapping: Port configuration** (→ P. 64))
98	Port X1: Mode - Pin 2 UA
99	Port X2: Mode - Pin 2 UA
100	Port X3: Mode - Pin 2 UA
101	Port X4: Mode - Pin 2 UA
102	Port X1: Failsafe DO Mode - Pin 2 UA
103	Port X2: Failsafe DO Mode - Pin 2 UA
104	Port X3: Failsafe DO Mode - Pin 2 UA
105	Port X4: Failsafe DO Mode - Pin 2 UA
106...107	Port X1: Current Limit - Pin 2 UA (→ **Mapping: Current Limit - Pin 2 UA** (→ P. 66))
108...109	Port X2: Current Limit - Pin 2 UA (→ **Mapping: Current Limit - Pin 2 UA** (→ P. 66))
110...111	Port X3: Current Limit - Pin 2 UA (→ **Mapping: Current Limit - Pin 2 UA** (→ P. 66))
112...113	Port X4: Current Limit - Pin 2 UA (→ **Mapping: Current Limit - Pin 2 UA** (→ P. 66))
114...115	Port X1: Current Limit - Pin 1 + Pin 4 US (→ **Mapping: Current Limit - Pin 1 + Pin 4 US** (→ P. 66))
116...117	Port X2: Current Limit - Pin 1 + Pin 4 US (→ **Mapping: Current Limit - Pin 1 + Pin 4 US** (→ P. 66))
118...119	Port X3: Current Limit - Pin 1 + Pin 4 US (→ **Mapping: Current Limit - Pin 1 + Pin 4 US** (→ P. 66))
120...121	Port X4: Current Limit - Pin 1 + Pin 4 US (→ **Mapping: Current Limit - Pin 1 + Pin 4 US** (→ P. 66))
122...123	Port X5: Current Limit - Pin 1 + Pin 4 US (→ **Mapping: Current Limit - Pin 1 + Pin 4 US** (→ P. 66))
124...125	Port X6: Current Limit - Pin 1 + Pin 4 US (→ **Mapping: Current Limit - Pin 1 + Pin 4 US** (→ P. 66))
126...127	Port X7: Current Limit - Pin 1 + Pin 4 US (→ **Mapping: Current Limit - Pin 1 + Pin 4 US** (→ P. 66))
128...129	Port X8: Current Limit - Pin 1 + Pin 4 US (→ **Mapping: Current Limit - Pin 1 + Pin 4 US** (→ P. 66))

Legend:

[Communication Profile]	The access rights to the parameter data, process data and the events/diagnostic messages of the IO-Link master as well as the connected IO-Link devices.	1 byte	0x0	EtherNet/IP + IoT
			0x1	EtherNet/IP + IoT (read-only)
			0x02	EtherNet/IP only
			0x03	Keep current Communication Profile

[Port Process Data Size]	Length of the process input data and process output data per IO-Link port	1 byte	0x0	2 Bytes Input / 2 Bytes Output Data
			0x01	4 Bytes Input / 4 Bytes Output Data
			0x02	8 Bytes Input / 8 Bytes Output Data
			0x03	16 Bytes Input / 16 Bytes Output Data
			0x04	32 Bytes Input / 32 Bytes Output Data
[Mode Pin 2 UA]	Operating mode of the supply voltage UA of the IO-Link port	1 byte	0x00	Off: IO-Link Type A Supply
			0x01	On: IO-Link Type B Supply
			0x02	Digital Output
[Failsafe DO Mode Pin 2 UA]	Fail-safe mode for output data of the port if the EtherNet/IP connection is interrupted (only valid for operating mode: Digital Output)	1 byte	0x0	Failsafe Reset Value
			0x01	Failsafe Old Value
			0x02	Failsafe Set Value

Mapping: Port configuration

Byte (offset)	Contents
n	Port Mode
n+1	Port Cycle Time
n+2	Swap
n+3	Validation / Data Storage
n+4	Vendor ID (LSB)
n+5	Vendor ID (MSB)
n+6	Device ID (LSB)
n+7	Device ID
n+8	Device ID (MSB)
n+9	reserved
n+10	Failsafe Mode -- Pin 4 (IO-Link)
n+10	Failsafe Mode -- Pin 4 (DO)

Legend:

[Port Mode]	Operating mode of the port	1 byte	0x00	Disabled
			0x01	Digital Input (Pin 4)
			0x02	Digital Output (Pin 4)
			0x03	IO-Link (Pin 4)
[Port Cycle Time]	Cycle time of the data transmission between the IO-Link master and the IO-Link device	1 byte	0x00	As fast as possible
			0x01	2 ms
			0x02	4 ms
			0x03	8 ms
			0x04	16 ms
			0x05	32 ms
			0x06	64 ms
			0x07	128 ms
[Swap]	Visualisation of the process data (EtherNet/IP uses Little Endian Format (Intel), IO-Link uses Big Endian Format (Motorola))	1 byte	0x00	Disabled
			0x01	Enabled
[Validation / Data Storage]	Supported IO-Link standard and behaviour of the IO-Link master if new IO-Link devices are connected to the port (only valid for Port Mode: IO-Link)	1 byte	0x00	No device check and clear
			0x01	Type compatible V1.0 Device
			0x02	Type compatible V1.1 Device
			0x03	Type compatible V1.1 Device with Backup + Restore
			0x04	Type compatible V1.1 Device with Backup

[Vendor ID]	Vendor ID of the manufacturer of the device at the port (only valid for Port Mode: IO-Link) Vendor ID = 0x1234 • Vendor ID (MSB) = 0x12 • Vendor ID (LSB) = 0x34	2 bytes	0x0000...0xFFFF	
[Device ID]	Device ID of the device at the port (only valid for Port Mode: IO-Link) Device ID = 0x123456 • Device ID (MSB) = 0x12 • Device ID = 0x34 • Device ID (LSB) = 0x56	3 bytes	0x000000...0xFFFFFF	
[Failsafe Mode -- Pin 4 (IO-Link)]	Fail-safe mode for output data of the port if the EtherNet/IP connection is interrupted (only valid for port mode: IO-Link)	1 byte	0x00	No Failsafe
			0x01	Failsafe Reset Value
			0x02	Failsafe Old Value
			0x03	Failsafe with Pattern
[Failsafe Mode -- Pin 4 (DO)]	Fail-safe value for output data of the port if the EtherNet/IP connection is interrupted (only valid for port mode: Digital Output (DO)	1 byte	0x00	Failsafe Reset Value
			0x01	Failsafe Old Value
			0x02	Failsafe Set Value

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This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

OM-IO-LinkMaster.065

Mapping: Current Limit - Pin 2 UA

Byte (offset)	Contents
n	Current Limit - Pin 2 UA (LSB)
n+1	Current Limit - Pin 2 UA (MSB)

Legend:

[Current Limit - Pin 2 UA]	Current limitation of the supply voltage UA of the port (value in mA)	2 bytes	0x0000	0 mA
	Current Limit - Pin 2 UA = 0x1234		...	...
	• Current Limit - Pin 2 UA (MSB) = 0x12		**0x012C**	**300 mA**
	• Current Limit - Pin 2 UA (LSB) = 0x34		...	...
			0x07D0	2000 mA

Mapping: Current Limit - Pin 1 + Pin 4 US

Byte (offset)	Contents
n	Current Limit - Pin 1 + Pin 4 US (LSB)
n+1	Current Limit - Pin 1 + Pin 4 US (MSB)

Legend:

[Port Xm: Current Limit - Pin 1 + Pin 4 US]	Current limitation of the supply voltage US on the IO-Link port (value in mA)	2 bytes	0x0000	0 mA
	Current Limit - Pin 1 + Pin 4 US = 0x1234		...	...
	• Current Limit - Pin 1 + Pin 4 US (MSB) = 0x12		**0x012C**	**300 mA**
	• Current Limit - Pin 1 + Pin 4 US (LSB) = 0x34		...	...
			0x07D0	2000 mA

14.2.3. Cyclic data

Content

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This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

OM-IO-Link Master.067

IOLM Proxy: Mix Mode with Energy Monitoring

Byte	Contents							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Port X8: Pin 4	Port X7: Pin 4	Port X6: Pin 4	Port X5: Pin 4	Port X4: Pin 4	Port X3: Pin 4	Port X2: Pin 4	Port X1: Pin 4
1	Port X8: Pin 2	Port X7: Pin 2	Port X6: Pin 2	Port X5: Pin 2	Port X4: Pin 2	Port X3: Pin 2	Port X2: Pin 2	Port X1: Pin 2
2	Port X8: Short / OL	Port X7: Short / OL	Port X6: Short / OL	Port X5: Short / OL	Port X4: Short / OL	Port X3: Short / OL	Port X2: Short / OL	Port X1: Short / OL
3	reserved	reserved	reserved	reserved	reserved	reserved	Status Sensor Supply UA	Status Sensor Supply US
4...45	Acyclic Command Area: Response Channel (→ **Response channel** (→ P. 83))							
46...47	Port X1: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
48...63	Port X1: Vendor-ID, Device ID, Events (→ **Mapping: IO-Link port information** (→ P. 75))							
64...65	Port X2: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
66...81	Port X2: Vendor-ID, Device ID, Events (→ **Mapping: IO-Link port information** (→ P. 75))							
82...83	Port X3: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
84...99	Port X3: Vendor-ID, Device ID, Events (→ **Mapping: IO-Link port information** (→ P. 75))							
100...101	Port X4: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
102...117	Port X4: Vendor-ID, Device ID, Events (→ **Mapping: IO-Link port information** (→ P. 75))							
118...119	Port X5: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
120...135	Port X5: Vendor-ID, Device ID, Events (→ **Mapping: IO-Link port information** (→ P. 75))							
136...137	Port X6: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
138...153	Port X6: Vendor-ID, Device ID, Events (→ **Mapping: IO-Link port information** (→ P. 75))							
154...155	Port X7: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
156...171	Port X7: Vendor-ID, Device ID, Events (→ **Mapping: IO-Link port information** (→ P. 75))							
172...173	Port X8: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
174...189	Port X8: Vendor-ID, Device ID, Events (→ **Mapping: IO-Link port information** (→ P. 75))							
190	Port X1: Input Data IO-Link (n Bytes)							
190+n	Port X2: Input Data IO-Link (n Bytes)							
190+2n	Port X3: Input Data IO-Link (n Bytes)							
190+3n	Port X4: Input Data IO-Link (n Bytes)							
190+4n	Port X5: Input Data IO-Link (n Bytes)							
190+5n	Port X6: Input Data IO-Link (n Bytes)							
190+6n	Port X7: Input Data IO-Link (n Bytes)							
190+7n	Port X8: Input Data IO-Link (n Bytes)							

Legend:

[Pin 4]	Signal level on pin 4 of the port (port mode: DI)	1 bit	0x0	LOW
			0x1	HIGH
[Pin 2]	Signal level on pin 2 of the port	1 bit	0x0	LOW
			0x1	HIGH

[Short / OL]	Occurrence of a short circuit or of an overvoltage on the IO-Link port	1 bit	0x0	no error
			0x1	Short circuit or overvoltage detected
[Status Sensor Supply US]	Status of the supply voltage US	1 bit	0x0	no error
			0x1	Overvoltage on US (> 3,6 A)
[Status Sensor Supply UA]	Status of the supply voltage UA	1 bit	0x0	no error
			0x1	no UA connected
[Input Data IO-Link (n Bytes)]	IO-Link process data on pin 4 of the port (port mode: IO-Link)	n bytes	Pro byte: 0x00...0xFF	
	n = [2, 4, 8, 16, 32]; is determined by the parameter [Port Process Data Size] (→ **Configuration**			
	Assembly (Instance 199) (→ P. 62))			

Input Assembly (Instance 102): I/O

Byte	Contents							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Port X8: Pin 4	Port X7: Pin 4	Port X6: Pin 4	Port X5: Pin 4	Port X4: Pin 4	Port X3: Pin 4	Port X2: Pin 4	Port X1: Pin 4
1	Port X8: Pin 2	Port X7: Pin 2	Port X6: Pin 2	Port X5: Pin 2	Port X4: Pin 2	Port X3: Pin 2	Port X2: Pin 2	Port X1: Pin 2
2	Port X8: Short / OL	Port X7: Short / OL	Port X6: Short / OL	Port X5: Short / OL	Port X4: Short / OL	Port X3: Short / OL	Port X2: Short / OL	Port X1: Short / OL
3	reserved	reserved	reserved	reserved	reserved	reserved	Status Sensor Supply UA	Status Sensor Supply US
4...5	Port X1: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
6...7	Port X2: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
8...9	Port X3: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
10...11	Port X4: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
12...13	Port X5: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
14...15	Port X6: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
16...17	Port X7: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
18...19	Port X8: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
20	Port X1: Input Data IO-Link (n Bytes)							
20+n	Port X2: Input Data IO-Link (n Bytes)							
20+2n	Port X3: Input Data IO-Link (n Bytes)							
20+3n	Port X4: Input Data IO-Link (n Bytes)							
20+4n	Port X5: Input Data IO-Link (n Bytes)							
20+5n	Port X6: Input Data IO-Link (n Bytes)							
20+6n	Port X7: Input Data IO-Link (n Bytes)							
20+7n	Port X8: Input Data IO-Link (n Bytes)							

Legend:

[Pin 4]	Signal level on pin 4 of the port (port mode: DI)	1 bit	0x0	LOW
			0x1	HIGH
[Pin 2]	Signal level on pin 2 of the port	1 bit	0x0	LOW
			0x1	HIGH
[Short / OL]	Occurrence of a short circuit or of an overvoltage on the IO-Link port	1 bit	0x0	no error
			0x1	Short circuit or overvoltage detected
[Status Sensor Supply US]	Status of the supply voltage US	1 bit	0x0	no error
			0x1	Overvoltage on US (> 3,6 A)
[Status Sensor Supply UA]	Status of the supply voltage UA	1 bit	0x0	no error
			0x1	no UA connected

OM-IO-Link Master.070

This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

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[Input Data IO-Link (n Bytes)]	IO-Link process data on pin 4 of the port (port mode: IO-Link)	n bytes	Pro byte: 0x00…0xFF
	n = [2, 4, 8, 16, 32]; is determined by the parameter [Port Process Data Size] (→ **Configuration Assembly (Instance 199)** (→ P. 62))		

IOLM Proxy: Mix Mode with Energy Monitoring

Byte	Contents							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Port X8: Pin 4	Port X7: Pin 4	Port X6: Pin 4	Port X5: Pin 4	Port X4: Pin 4	Port X3: Pin 4	Port X2: Pin 4	Port X1: Pin 4
1	Port X8: Pin 2	Port X7: Pin 2	Port X6: Pin 2	Port X5: Pin 2	Port X4: Pin 2	Port X3: Pin 2	Port X2: Pin 2	Port X1: Pin 2
2	Port X8: Short / OL	Port X7: Short / OL	Port X6: Short / OL	Port X5: Short / OL	Port X4: Short / OL	Port X3: Short / OL	Port X2: Short / OL	Port X1: Short / OL
3	reserved	reserved	reserved	reserved	reserved	reserved	Status Sensor Supply UA	Status Sensor Supply US
4…45	Acyclic Command Area: Response Channel (→ **Response channel** (→ P. 83))							
46…47	Port X1: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
48…63	Port X1: Vendor-ID, Device ID, Events (→ **Mapping: IO-Link port information** (→ P. 75))							
64…65	Port X2: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
66…81	Port X2: Vendor-ID, Device ID, Events (→ **Mapping: IO-Link port information** (→ P. 75))							
82…83	Port X3: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
84…99	Port X3: Vendor-ID, Device ID, Events (→ **Mapping: IO-Link port information** (→ P. 75))							
100…101	Port X4: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
102…117	Port X4: Vendor-ID, Device ID, Events (→ **Mapping: IO-Link port information** (→ P. 75))							
118…119	Port X5: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
120…135	Port X5: Vendor-ID, Device ID, Events (→ **Mapping: IO-Link port information** (→ P. 75))							
136…137	Port X6: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
138…153	Port X6: Vendor-ID, Device ID, Events (→ **Mapping: IO-Link port information** (→ P. 75))							
154…155	Port X7: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
156…171	Port X7: Vendor-ID, Device ID, Events (→ **Mapping: IO-Link port information** (→ P. 75))							
172…173	Port X8: Port Qualifier Information (→ **Mapping: Port Qualifier Information** (PQI) (→ P. 74))							
174…189	Port X8: Vendor-ID, Device ID, Events (→ **Mapping: IO-Link port information** (→ P. 75))							
190…193	Voltage + Current Actuator Supply UA (→ **Mapping: Voltage + Current Actuator Supply UA** (→ P. 77))							
194…197	Voltage + Current Sensor Supply US (→ **Mapping: Voltage + Current Sensor Supply US** (→ P. 77))							
198…199	Port X1: Current Pin 2 (Actuator UA) (→ **Mapping: Current Pin 2** (Actuator UA) (→ P. 78))							
200…201	Port X2: Current Pin 2 (Actuator UA) (→ **Mapping: Current Pin 2** (Actuator UA) (→ P. 78))							
202…203	Port X3: Current Pin 2 (Actuator UA) (→ **Mapping: Current Pin 2** (Actuator UA) (→ P. 78))							
204…205	Port X4: Current Pin 2 (Actuator UA) (→ **Mapping: Current Pin 2** (Actuator UA) (→ P. 78))							
206…207	Port X1: Current Pin 1 + Pin 4 (Sensor US) (→ **Mapping: Current Pin 1 + Pin 4** (Sensor US) (→ P. 78))							
208…209	Port X2: Current Pin 1 + Pin 4 (Sensor US) (→ **Mapping: Current Pin 1 + Pin 4** (Sensor US) (→ P. 78))							
210…211	Port X3: Current Pin 1 + Pin 4 (Sensor US) (→ **Mapping: Current Pin 1 + Pin 4** (Sensor US) (→ P. 78))							
212…213	Port X4: Current Pin 1 + Pin 4 (Sensor US) (→ **Mapping: Current Pin 1 + Pin 4** (Sensor US) (→ P. 78))							
214…215	Port X5: Current Pin 1 + Pin 4 (Sensor US) (→ **Mapping: Current Pin 1 + Pin 4** (Sensor US) (→ P. 78))							
216…217	Port X6: Current Pin 1 + Pin 4 (Sensor US) (→ **Mapping: Current Pin 1 + Pin 4** (Sensor US) (→ P. 78))							
218…219	Port X7: Current Pin 1 + Pin 4 (Sensor US) (→ **Mapping: Current Pin 1 + Pin 4** (Sensor US) (→ P. 78))							

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Byte	Contents							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
220...221	Port X8: Current Pin 1 + Pin 4 (Sensor US) (→ **Mapping: Current Pin 1 + Pin 4** (Sensor US) (→ P. 78))							
222	Port X1: Input Data IO-Link (n Bytes)							
222+n	Port X2: Input Data IO-Link (n Bytes)							
222+2n	Port X3: Input Data IO-Link (n Bytes)							
222+3n	Port X4: Input Data IO-Link (n Bytes)							
222+4n	Port X5: Input Data IO-Link (n Bytes)							
222+5n	Port X6: Input Data IO-Link (n Bytes)							
222+6n	Port X7: Input Data IO-Link (n Bytes)							
222+7n	Port X8: Input Data IO-Link (n Bytes)							

Legend:

[Pin 4]	Signal level on pin 4 of the port (port mode: DI)	1 bit	0x0	LOW
			0x1	HIGH
[Pin 2]	Signal level on pin 2 of the port	1 bit	0x0	LOW
			0x1	HIGH
[Short / OL]	Occurrence of a short circuit or of an overvoltage on the IO-Link port	1 bit	0x0	no error
			0x1	Short circuit or overvoltage detected
[Status Sensor Supply US]	Status of the supply voltage US	1 bit	0x0	no error
			0x1	Overvoltage on US (> 3,6 A)
[Status Sensor Supply UA]	Status of the supply voltage UA	1 bit	0x0	no error
			0x1	no UA connected
[Input Data IO-Link (n Bytes)]	IO-Link process data on pin 4 of the port (port mode: IO-Link)	n bytes	Pro byte: 0x00...0xFF	
	n = [2, 4, 8, 16, 32]; is determined by the parameter [Port Process Data Size] (→ **Configuration Assembly (Instance 199)** (→ P. 62))			

Mapping: Port Qualifier Information (PQI)

Byte (offset)	Contents							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
n	Diagnosis present	Wrong Length PD OUT	Wrong Length PD IN	Wrong Cycle Time	Wrong VID / DID	Invalid Data	Dev Not Conn	IOL Mode
n+1	res.	res.	res.	res.	res.	res.	Status Sensor Supply US	Status Actuator Supply UA

Legend:

[IOL Mode]	Operating mode of the IO-Link port	1 bit	0x0	Other
			0x1	IO-Link
[Dev Not Conn]	Connection between IO-Link device and IO-Link port	1 bit	0x0	connected
			0x1	not connected
[Invalid Data]	Status of the process input data on the IO-Link port	1 bit	0x0	valid data
			0x1	invalid data
[Wrong VID/DID]	Verification whether the current and configured vendor ID and device ID are identical	1 bit	0x0	OK
			0x1	No match
[Wrong Cycle Time]	Verification whether the current and configured cycle time are identical	1 bit	0x0	OK
			0x1	No match
[Wrong PD Input Length]	Verification whether the size of the received input data are identical with the configured size	1 bit	0x0	OK
			0x1	Configured size too small
[Wrong PD Output Length]	Verification whether the size of the sent output data is identical with the size expected by the IO-Link device	1 bit	0x0	OK
			0x1	Configured size too small
[Diagnosis present]	Indication of a new event (Coming Event, Single Shot Event). • Coming Events disappear when the corresponding Disappearing Event occurs • Single Shot Events disappear automatically	1 bit	0x0	no event
			0x1	New event is there
[Status Actuator Supply UA]	Status of the supply voltage UA on pin 2 of the IO-Link port	1 bit	0x0	no error
			0x1	no UA connected Operating mode „ON" and „Digital Output": Short circuit pin 2 - pin 5; Overvoltage (higher than the set limit value)
[Status Sensor Supply US]	Status of the supply voltage US on pin 1 and pin 4 of the IO-Link port	1 bit	0x0	no error
			0x1	US is not connected or current too low (< 3.6 A)

Mapping: IO-Link port information

Byte	Contents							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
n	VID (LSB)							
n+1	VID (MSB)							
n+2	DID (LSB)							
n+3	DID							
n+4	DID (MSB)							
n+5	reserved							
n+6	Event 1: Mode		Event 1: Type		Event 1: Src	Event 1: Instance		
n+7	Event 1: Code (LSB)							
n+8	Event 1: Code (MSB)							
n+9	Event 2: Mode		Event 2: Type		Event 2: Src	Event 2: Instance		
n+10	Event 2: Code (LSB)							
n+11	Event 2: Code (MSB)							
n+12	Event 3: Mode		Event 3: Type		Event 3: Src	Event 3: Instance		
n+13	Event 3: Code (LSB)							
n+14	Event 3: Code (MSB)							
n+15	reserved							

Legend:

[VID]	Vendor ID of the connected IO-Link device VID = 0x1234	2 bytes	0x0000...0xFFFF	
	• DID (MSB) = 0x12			
	• DID (LSB) = 0x34			
[DID]	Device ID of the connected IO-Link device DID = 0x123456	3 bytes	0x000000...0xFFFFFF	
	• DID (MSB) = 0x12			
	• DID = 0x34			
	• DID (LSB) = 0x56			
[Event m: Mode]	Mode: Mode of the event	2 bits	0x0	reserved
			0x1	One-time event
			0x2	Event has disappeared
			0x3	Event has appeared
[Event m: Type]	Type: category of the event	2 bits	0x0	reserved
			0x1	Notification
			0x2	Warning
			0x3	Error
[Event m: Src]	Source: Source of the event	1 bit	0x0	IO-Link Device
			0x1	IO-Link master
[Event m: Instance]	Instance: Trigger of the event	3 bits	0x0	Unknown
			0x1 ... 0x3	reserved
			0x4	Application
			0x5 ... 0x7	reserved

[Event m: Code]	Code: Event code Code = 0x1234	2 bytes	depends on the device (→ IODD description of the IO-Link device)
	• Code (MSB) = 0x12		
	• Code (LSB) = 0x34		

Mapping: Voltage + Current Actuator Supply UA

Byte (offset)	Contents
n	Voltage Actuator Supply UA (LSB)
n+1	Voltage Actuator Supply UA (MSB)
n+2	Current Actuator Supply UA (LSB)
n+3	Current Actuator Supply UA (MSB)

Legend:

[Voltage Actuator Supply UA]	voltage value of the supply voltage UA (value in mV) Voltage Actuator Supply UA = 0x1234	2 bytes	0x4E20	20000 mV
	• Voltage Actuator Supply UA (MSB) = 0x12		...	
	• Voltage Actuator Supply UA (LSB) = 0x34		0x7530	30000 mV
[Current Actuator Supply UA]	Current intensity value of the supply voltage UA (value in mA)	2 bytes	0x0000	0 mA
	Current Actuator Supply UA = 0x1234		...	
	• Current Actuator Supply UA (MSB) = 0x12		0x1F40	8000 mA
	• Current Actuator Supply UA (LSB) = 0x34			

Mapping: Voltage + Current Sensor Supply US

Byte (offset)	Contents
n	Voltage Sensor Supply US (LSB)
n+1	Voltage Sensor Supply US (MSB)
n+2	Current Sensor Supply US (LSB)
n+3	Current Sensor Supply US (MSB)

Legend:

[Voltage Sensor Supply US]	Voltage value of the sensor supply US (value in mV) Voltage Sensor Supply US = 0x1234	2 bytes	0x4E20	20000 mV
	• Voltage Sensor Supply US (MSB) = 0x12		...	
	• Voltage Sensor Supply US (LSB) = 0x34		0x7530	30000 mV
[Current Sensor Supply US]	Current value of the sensor supply US (value in mA) Current Sensor Supply US = 0x1234	2 bytes	0x0000	0 mA
	• Current Sensor Supply US (MSB) = 0x12		...	
	• Current Sensor Supply US (LSB) = 0x34		0x0E10	3600 mA

Mapping: Current Pin 2 (Actuator UA)

Byte (offset)	Contents
n	Current Pin 2 (Actuator UA) (LSB)
n+1	Current Pin 2 (Actuator UA) (MSB)

Legend:

[Current Pin 2 (Actuator UA)]	Current value of the supply voltage UA on pin 2 of the IO-Link port (value in mA)	2 bytes	0x0000	0 mA
	Current Pin 2 (Actuator UA) = 0x1234		...	
	• Current Pin 2 (Actuator UA) (MSB) = 0x12		0x07D0	2000 mA
	• Current Pin 2 (Actuator UA) (LSB) = 0x34			

Mapping: Current Pin 1 + Pin 4 (Sensor US)

Byte (offset)	Contents
n	Current Pin 1 + Pin 4 (Sensor US) (LSB)
n+1	Current Pin 1 + Pin 4 (Sensor US) (MSB)

Legend:

[Current Pin 1 + Pin 4 (Sensor US)]	Current value of the supply voltage US on pin 1 and pin 4 and the IO-Link port (value in mA)	2 bytes	0x0000	0 mA
	Current Pin 1 + Pin 4 (Sensor US) = 0x1234		...	
	• Current Pin 1 + Pin 4 (Sensor US) (MSB) = 0x12		0x07D0	2000 mA
	• Current Pin 1 + Pin 4 (Sensor US) (LSB) = 0x34			

Output Assembly (Instance 150): I/O + Acyclic

Byte (offset)	Contents							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Port X8: Pin 4	Port X7: Pin 4	Port X6: Pin 4	Port X5: Pin 4	Port X4: Pin 4	Port X3: Pin 4	Port X2: Pin 4	Port X1: Pin 4
1	reserved	reserved	reserved	reserved	Port X4: Pin 2	Port X3: Pin 2	Port X2: Pin 2	Port X1: Pin 2
2	reserved							
3	reserved							
4...45	Acyclic Command Area: Request Channel (→ **Request channel** (→ P. 82))							
46	Port X1: Output Data IO-Link (n Bytes)							
46+n	Port X2: Output Data IO-Link (n Bytes)							
46+2n	Port X3: Output Data IO-Link (n Bytes)							
46+3n	Port X4: Output Data IO-Link (n Bytes)							
46+4n	Port X5: Output Data IO-Link (n Bytes)							
46+5n	Port X6: Output Data IO-Link (n Bytes)							
46+6n	Port X7: Output Data IO-Link (n Bytes)							
46+7n	Port X8: Output Data IO-Link (n Bytes)							

Legend:

[Pin 4]	Signal level on pin 4 of the port (port mode: DO)	1 bit	0x0	LOW
			0x1	HIGH
[Pin 2]	Signal level on pin 2 of the port	1 bit	0x0	LOW
			0x1	HIGH
[Input Data IO-Link (n Bytes)]	IO-Link process data on pin 4 of the port (port mode: IO-Link)	n bytes	Pro byte: 0x00...0xFF	
	n = [2, 4, 8, 16, 32]; is determined by the parameter [Port Process Data Size] (→ **Configuration Assembly (Instance 199)** (→ P. 62))			

Output Assembly (Instance 151): I/O

Byte (offset)	Contents							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Port X8: Pin 4	Port X7: Pin 4	Port X6: Pin 4	Port X5: Pin 4	Port X4: Pin 4	Port X3: Pin 4	Port X2: Pin 4	Port X1: Pin 4
1	reserved	reserved	reserved	reserved	Port X4: Pin 2	Port X3: Pin 2	Port X2: Pin 2	Port X1: Pin 2
2	Port X1: Output Data IO-Link (n Bytes)							
2+n	Port X2: Output Data IO-Link (n Bytes)							
2+2n	Port X3: Output Data IO-Link (n Bytes)							
2+3n	Port X4: Output Data IO-Link (n Bytes)							
2+4n	Port X5: Output Data IO-Link (n Bytes)							
2+5n	Port X6: Output Data IO-Link (n Bytes)							
2+6n	Port X7: Output Data IO-Link (n Bytes)							
2+7n	Port X8: Output Data IO-Link (n Bytes)							

Legend:

[Pin 4]	Signal level on pin 4 of the port (port mode: DO)	1 bit	0x0	LOW
			0x1	HIGH
[Pin 2]	Signal level on pin 2 of the port	1 bit	0x0	LOW
			0x1	HIGH
[Input Data IO-Link (n Bytes)]	IO-Link process data on pin 4 of the port (port mode: IO-Link)	n bytes	Pro byte: 0x00...0xFF	
	n = [2, 4, 8, 16, 32]; is determined by the parameter [Port Process Data Size] (→ **Configuration Assembly (Instance 199)** (→ P. 62))			

14.2.4. Acyclic data

Content

Acyclic command channel

In the cyclic process data, command channels for the transmission of acyclic data is available.

Object	Contents	Bytes	Access
Output assembly	Request channel (field bus PLC >>> IO-Link master) → Request channel (→ P. 82)	4...45	r/w
Input assembly	Response channel (IO-Link master >>> fieldbus PLC) → Response channel (→ P. 83)	4...45	r

Legend:

r = only read access rights

r/w = read and write access rights

Request channel

Byte	Contents							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4	Port No. (LSB)							
5	Port No. (MSB)							
6	Index (LSB)							
7	Index (MSB)							
8	Sub-index (LSB)							
9	Sub-index (MSB)							
10	Trigger	Command id						
11	Length of the user data (number of bytes)							
12	Data (byte 0)							
13	Data (byte 1)							
..	...							
43	Data (byte 31)							
44	reserved							
45	reserved							

Legend:

[Port No.]	Number of the IO-Link port Port No. = 0x1234	1 Word	0x0001	Port X1
	• Port No. (MSB) = 0x12		0x0002	Port X2
	• Port No. (LSB) = 0x34		...	
			0x0008	Port X8
[Index]	Index of the IO-Link object Index = 0x1234	1 Word	0x0000...0xFFFF	
	• Index (MSB) = 0x12			
	• Index (LSB) = 0x34			
[Subindex]	Subindex of the IO-Link object Subindex = 0x1234	1 Word	0x0000...0xFFFF	
	• Subindex (MSB) = 0x12			
	• Subindex (LSB) = 0x34			
[Trigger]	Control of the command execution	1 Bit	0x0	do not process command
			0x1	execute command
[Command ID]	Command number	7 Bit	0x01	read
			0x02	write
[Length of user data (number of bytes)]	Number of bytes that contain relevant user data	1 Byte	0x00	0 bytes
			...	
			0x20	32 bytes
[Data (byte n)]	User data	1 Byte	per byte: 0x00...0xFF	

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Response channel

Byte	Contents							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4	Port No. (LSB)							
5	Port No. (MSB)							
6	Index (LSB)							
7	Index (MSB)							
8	Sub-index (LSB)							
9	Sub-index (MSB)							
10	Handshake	Command ID						
11	Result							
12	Length of response data (number of bytes)							
13	Data (byte 0) or Error Code							
14	Data (byte 1) or Additional Code							
...	...							
44	Data (byte 31)							
45	reserved							

Legend:

[Port No.]	Number of the IO-Link port Port No. = 0x1234	1 Word	0x0001	Port X1
	• Port No. (MSB) = 0x12		0x0002	Port X2
	• Port No. (LSB) = 0x34		...	
			0x0008	Port X8
[Index]	Index of the IO-Link object Index = 0x1234	1 Word	0x0000...0xFFFF	
	• Index (MSB) = 0x12			
	• Index (LSB) = 0x34			
[Subindex]	Subindex of the IO-Link object Subindex = 0x1234	1 Word	0x0000...0xFFFF	
	• Subindex (MSB) = 0x12			
	• Subindex (LSB) = 0x34			
[Handshake]	Validity of the IO-Link response data	1 Bit	0x0	Data invalid
			0x1	Data valid
[Command ID]	Command number	7 Bit	0x01	read
			0x02	write
[Result]	Status of the command processing	8 bits	0x00	OK
			0x0F	OK, data read >32 bytes
			0xFF	Error occurred
[Length of user data (number of bytes)]	Number of bytes that contain relevant user data	1 Byte	0x00	0 bytes
			...	
			0x20	32 bytes

[Data (byte 0) or Error Code]	User data (byte 0) or error codes	1 Byte	User data: 0x00...0xFF
			Error Code: → **Error codes** (→ P. 85)
[Data (byte 1) or Additional Code]	User data (byte1) or additional error codes	1 Byte	User data: 0x00...0xFF
			Additional Code: → **Additional Codes** (→ P. 85)
[Data (byte n)]	User data (byte n)	1 Byte	0x00...0xFF

Error codes

Error code	Description
0x71	Service not available (unknown command has been sent to the IO-Link port)
0x72	Port blocked (another cyclic process accesses the IO-Link port)
0x73	Forbidden (access rights don't allow command processing)
0x74	Invalid data (wrong parameter has been sent in the command)
0x76	Wrong port (wrong port number)
0x77	Wrong port function (wrong port function or wrong parameter has been sent to the device)
0x78	Invalid length (set length is > 0x20)
0x80	Error in the device application; observe additional code (→ Additional Codes (→ P. 85))

Additional Codes

Code	Name	Description
0x00	APP_DEV	Device application error - no details
0x11	IDX_NOTAVAIL	Index not available
0x12	SUBIDX_NOTAVAIL	Subindex not available
0x20	SERV_NOTAVAIL	Service temporarily not available
0x21	SERV_NOTAVAIL_LOCCTRL	Service temporarily not available - local control
0x22	SERV_NOTAVAIL_DEVCTRL	Service temporarily not available - device control
0x23	IDX_NOT_WRITEABLE	Access denied
0x30	PAR_VALOUTOFRNG	Parameter value out of range
0x31	PAR_VALGTLIM	Parameter value above limit
0x32	PAR_VALLTLIM	Parameter value below limit
0x33	VAL_LENOVRRUN	Parameter length overrun
0x34	VAL_LENUNDRUN	Parameter length underrun
0x35	FUNC_NOTAVAIL	Function not available
0x36	FUNC_UNAVAILTEMP	Function temporarily not available
0x40	PAR_SETINVALID	Invalid parameter set
0x41	PAR_SETINCONSIST	Inconsistent parameter set
0x82	APP_DEVNOTRDY	Application not ready

> Additional Codes are only available if Error Code = 0x80
> (→ **Error codes** (→ P. 85))

Acyclic commands

Content

Command 0x10 – Set mode

The command changes the operating mode of an IO-Link port of the NC-ME-4A4B-12DLA/AL1423.

❗ Corresponding parameter: [Port Mode] (→ **Mapping: Port configuration** (→ P. 64))

Command request

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4	Port No. (LSB)							
5	Port No. (MSB)							
6	reserved							
7	reserved							
8	reserved							
9	reserved							
10	Trigger				0x10			
11	Target Mode							
12…45	reserved							

Legend:

[Port No.]	Number of the IO-Link port Port No. = 0x1234	1 Word	0x0001	Port X1
	• Port No. (MSB) = 0x12		0x0002	Port X2
	• Port No. (LSB) = 0x34		…	
			0x0008	Port X8
[Trigger]	Control of the command execution	1 Bit	0x0	do not process command
			0x1	execute command
[Target Mode]	Operating type of the IO-Link port	1 Byte	0x00	deactivated
			0x01	operation as digital input (DI)
			0x02	operation as digital output (DO)
			0x03	operation as IO-Link intervals

Command response

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4	Port No. (LSB)							
5	Port No. (MSB)							
6	reserved							
7	reserved							
8	reserved							
9	reserved							
10	Handshake		0x10					
11	Result							
12	Target Mode							
13...45	reserved							

Legend:

[Port No.]	Number of the IO-Link port Port No. = 0x1234	1 Word	0x0001	Port X1
	• Port No. (MSB) = 0x12		0x0002	Port X2
	• Port No. (LSB) = 0x34		...	
			0x0008	Port X8
[Handshake]	Status of the execution of the command	1 Bit	0x0	command is executed
			0x1	execution of the command was successful
[Result]	Error indication	1 byte	0x00	no error
			0x01	error occurred
[Target Mode]	Operating type of the IO-Link port	1 Byte	0x00	deactivated
			0x01	operation as digital input (DI)
			0x02	operation as digital output (DO)
			0x03	operation as IO-Link intervals

Command 0x20 – Set validation ID / data storage

The command sets the behavior of the IO-Link master when connecting a new IO-Link device to an IO-Linkport of the device.

❗ Corresponding parameter: [Validation ID] (→ **Mapping: Port configuration** (→ P. 64))

Command request

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4	Port No. (LSB)							
5	Port No. (MSB)							
6	reserved							
7	reserved							
8	reserved							
9	reserved							
10	Trigger				0x20			
11	Validation ID							
12...45	reserved							

Legend:

[Port No.]	Number of the IO-Link port Port No. = 0x1234	1 Word	0x0001	Port X1
	• Port No. (MSB) = 0x12		0x0002	Port X2
	• Port No. (LSB) = 0x34		...	
			0x0008	Port X8
[Trigger]	Control of the command execution	1 Bit	0x0	do not process command
			0x1	execute command
[Validation ID]	Behavior of the IO-Link master when connecting an IO-Link device to the IO-Link port	1 Byte	0x00	No check
			0x01	Type compatible V1.0 Device
			0x02	Type compatible V1.1 Device
			0x03	Type compatible V1.1 Device with Backup + Restore
			0x04	Type compatible V1.1 Device with Restore

Command response

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4					Port No. (LSB)			
5					Port No. (MSB)			
6					reserved			
7					reserved			
8					reserved			
9					reserved			
10	Handshake				0x20			
11					Result			
12					Validation ID			
13...45					reserved			

Legend:

[Port No.]	Number of the IO-Link port Port No. = 0x1234	1 Word	0x0001	Port X1
	• Port No. (MSB) = 0x12		0x0002	Port X2
	• Port No. (LSB) = 0x34		...	
			0x0008	Port X8
[Handshake]	Status of the execution of the command	1 Bit	0x0	command is executed
			0x1	execution of the command was successful
[Result]	Error indication	1 byte	0x00	no error
			0x01	error occurred
[Validation ID]	Behavior of the IO-Link master when connecting an IO-Link device to the IO-Link port	1 Byte	0x00	No check
			0x01	Type compatible V1.0 Device
			0x02	Type compatible V1.1 Device
			0x03	Type compatible V1.1 Device with Backup + Restore
			0x04	Type compatible V1.1 Device with Restore

OM-IO-Link Master.090

This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

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Command 0x30 – Set fail-safe data pattern

The command sets the behavior of the outputs when the EtherNet/IP connection and the corresponding fail-safe values are interrupted.

Corresponding parameter: [Fail-safe Mode] (→ **Mapping: Port configuration** (→ P. 64)

The number of the required fail-safe values results from the size of the output data (→ **Configuration Assembly (Instance 199)** (→ P. 62)).

Command request

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4	Port No. (LSB)							
5	Port No. (MSB)							
6	reserved							
7	reserved							
8	reserved							
9	reserved							
10	Trigger		0x30					
11	Fail-safe mode							
12	Byte Length N							
13	Fail-safe data (byte 0)							
...	...							
44	Fail-safe data (byte 31)							
45	reserved							

Legend:

[Port No.]	Number of the IO-Link port Port No. = 0x1234	1 Word	0x0001	Port X1
	• Port No. (MSB) = 0x12		0x0002	Port X2
	• Port No. (LSB) = 0x34		...	
			0x0008	Port X8
[Trigger]	Control of the command execution	1 Bit	0x0	do not process command
			0x1	execute command
[Fail-safe Mode]	Behavior of the outputs when the EtherNet/IP connection is interrupted and setting of the corresponding fail-safe values	1 Byte	0x00	No Fail-safe
			0x01	Fail-safe Reset Value
			0x02	Fail-safe Old Value
			0x03	Fail-safe with Pattern
[Byte Length N]	Number of the bytes that contain fail-safe values	1 byte	0x00	0 Bytes
			...	
			0x20	32 Bytes
[Fail-safe Data (Byte n)]	Fail-Safe value n (n = 0...31)	1 byte	per byte: 0x00...0xFF	

Command response

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4				Port No. (LSB)				
5				Port No. (MSB)				
6				reserved				
7				reserved				
8				reserved				
9				reserved				
10	Handshake			0x30				
11				Result				
12				Fail-safe mode				
13...45				reserved				

Legend:

[Port No.]	Number of the IO-Link port Port No. = 0x1234	1 Word	0x0001	Port X1
			0x0002	Port X2
	• Port No. (MSB) = 0x12		...	
	• Port No. (LSB) = 0x34		0x0008	Port X8
[Handshake]	Status of the execution of the command	1 Bit	0x0	command is executed
			0x1	execution of the command was successful
[Result]	Error indication	1 byte	0x00	no error
			0x01	error occurred
[Fail-safe Mode]	Behavior of the outputs when the EtherNet/IP connection is interrupted	1 Byte	0x00	No Fail-safe
			0x01	Fail-safe Reset Value
			0x02	Fail-safe Old Value
			0x03	Fail-safe with Pattern

14.2.5. Field bus objects

Content

CIP class services

The device supports the following class and instance services:

Class code		Service	Description	
dec	hex			
01	01	Get Attribute All	Read all attribute values of the class or instance	
02	02	Set Attribute All	Change all attribute values of the class or instance	
05	05	Reset	Reset	
09	09	Delete	Delete	
14	0E	Get Attribute Single	Read single attribute value of the class or instance	
16	10	Set Attribute Single	Change single attribute value of the class or instance	
75	4B	Read ISDU	Read ISDU	
76	4C	Write ISDU	Write ISDU	
77	4D	Write Failsafe Pattern	Write failsafe pattern	
78	4E	Forward Close	Close connection	
84	54	Forward Open	Open new connection	

CIP object classes

The device supports the following CIP object classes:

Class code		Object type	Reference
dec	hex		
01	01	Identity Object	→ **Identity Object (object class: 0x01)** (→ P. 95)
02	02	Message Router Object	→ **Message Router Object (object class: 0x02)** (→ P. 97)
04	04	Assembly Object	→ **Assembly Object (object class: 0x04)** (→ P. 98)
06	06	Connection Manager Object	→ **Connection Manager Object (object class: 0x06)** (→ P. 99)
71	47	Device Level Ring Object	→ **Device Level Ring Object (object class: 0x47)** (→ P. 100)
72	48	Quality of Service	→ **Quality of Service (object class: 0x48)** (→ P. 101)
128	80	IO-Link Requests	→ **IO-Link requests (object class: 0x80)** (→ P. 102)
245	F5	TCP/IP Object	→ **TCP/IP object (object class: 0xF5)** (→ P. 112)
246	F6	Ethernet Link Object	→ **Ethernet Link Object (object class: 0xF6)** (→ P. 114)

OM-IO-Link Master.094

This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

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Identity Object (object class: 0x01)

The Identity Object contains the general information about the device.

Class attributes

Attr. ID	Access	Name	Data type	Description	Value
1	Get	Revision	UINT	Revision of the object	1
2	Get	Max instance	UINT	Max. number of instances of the object	1
6	Get	Maximum ID Number Class Attributes	UINT	ID of the last class attribute	7
7	Get	Maximum ID Number Instance Attributes	UINT	ID of the last instance attribute	9

Instance attributes

Attr. ID	Access	Name	Data type	Description	Preset
1	Get	Vendor ID	UINT	Manufacturer ID	322
2	Get	Device type	UINT	Type of unit	12
3	Get	Product code	UINT	Identification of a particular product of a vendor	1422
4	Get	Revision	STRUCT	Revision of the article that is represented by the Identity Object	1.1
		• Major revision	USINT	Main revision (1...127)	1
		• Minor revision	USINT	Side revision (3 digits, if necessary, with zeros in the beginning)	1
5	Get	Status	WORD	Status of the device	
6	Get	Serial number	UDINT	Serial number of the device	
7	Get	Product Name	SHORT STRING	Readable device designation (max. 32 ASCII characters)	IO-Link Master PFL EIP 8P IP67
8	Get	State	USINT	Current status of the device (according to status transition diagram)	
				0 — Nonexistent	
				1 — Device Self Testing	
				2 — Standby	
				3 — Operational	
				4 — Major Recoverable Fault	
				5 — Major Unrecoverable Fault	
				6...254 — Reserved	
				255 — Default for Get_Attributes_All service	
9	Get	Configuration Consistency Value	UINT	The content shows the configuration of the device	0

Supported services

Service code		Name	Class	Attribute	Description
dec	hex				
01	01	Get_Attribute_All	yes	yes	Read all attributes
05	05	Reset	yes	yes	Reset
14	0E	Get_Attribute_Single	yes	yes	Read single attribute
16	10	Set_Attribute_Single	yes	yes	Change single attribute

If an Identity Object receives a reset request, it carries out the following actions:

• It checks if it supports the requested reset type.

• It responds to the request.

• It tries to execute the requested reset type.

Supported reset types:

0   Reboot the device (obligatory for all EtherNet/IP devices).

1   Restore factory settings and reboot the device.

OM-IO-Link Master.096

This device is "powered by ifm". In all electronic interfaces, this device will
appear as AL1423. All firmware and electronic files are provided by ifm.

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Message Router Object (object class: 0x02)

The Message Router Object provides an access with which an EtherNet/IP client can address a service to any object class or instance in the physical device.

Class attributes

Attr. ID	Access	Name	Data type	Description	Value
1	Get	Revision	UINT	Revision of the object	1
2	Get	Max instance	UINT	Max. number of instances of the object	1
3	Get	Number of Instances	UINT	Number of instances	1
6	Get	Maximum ID Number Class Attributes	UINT	ID of the last class attribute	7
7	Get	Maximum ID Number Instance Attributes	UINT	ID of the last instance attribute	0

Instance attributes

The object has no instance attributes.

Supported services

Service code		Name	Class	Attribute	Description
dec	hex				
14	0E	Get_Attribute_Single	yes	no	Read single attribute value

Assembly Object (object class: 0x04)

The Assembly Object combines attributes of several objects to allow data to
be sent to or received from each object via one connection.

Class attributes

Attr. ID	Access	Name	Data type	Description	Value
1	Get	Revision	UINT	Revision of the object	2
2	Get	Max instance	UINT	Max. number of instances of the object	0x00C7
3	Get	Number of Instances	UINT	Number of instances	3
6	Get	Maximum ID Number Class Attributes	UINT	ID of the last class attribute	7
7	Get	Maximum ID Number Instance Attributes	UINT	ID of the last instance attribute	4

Instance attributes

Attr. ID	Access	Name	Data type	Description	Preset
100	Get	Input Assembly	STRUCT	Cyclic input data (→ **Input Assembly (Instance 100): I/O + Acyclic + Diag** (→ P. 68))	2
102	Get	Input Assembly	STRUCT	Cyclic input data (→ **Input Assembly (Instance 102): I/O** (→ P. 70))	0x00C7
103	Get	Input Assembly	STRUCT	Cyclic input data (→ **Input Assembly (Instance 103): I/O + Acyclic + Diag + EnMo** (→ P. 72))	3
150	Get, Set	Output Assembly	STRUCT	Cyclic output data (→ **Output Assembly (Instance 150): I/O + Acyclic** (→ P. 79))	3
151	Get, Set	Output Assembly	STRUCT	Cyclic output data (→ **Output Assembly (Instance 151): I/O** (→ P. 80))	7
199	Get, Set	Configuration Assembly	STRUCT	Configuration data (→ **Configuration Assembly (Instance 199)** (→ P. 62))	4

Supported services

Service code		Name	Class	Attribute	Description
dec	hex				
14	0E	Get_Attribute_Single	yes	yes	Read attribute value
16	10	Set_Attribute_Single	no	yes	Change attribute value

OM-IO-Link Master.098

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appear as AL1423. All firmware and electronic files are provided by ifm.

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Connection Manager Object (object class: 0x06)

The Connection Manager Object structures and manages the internal resources that are used for the connection.

Class attributes

Attr. ID	Access	Name	Data type	Description	Value
1	Get	Revision	UINT	Revision of the object	1
2	Get	Max instance	UINT	Max. number of instances of the object	1
3	Get	Number of Instances	UINT	Number of instances	3
6	Get	Maximum ID Number Class Attributes	UINT	ID of the last class attribute	7
7	Get	Maximum ID Number Instance Attributes	UINT	ID of the last instance attribute	0

Instance attributes

The object has no instance attributes.

Supported services

Service code		Name	Class	Attribute	Description
dec	hex				
14	0E	Get_Attribute_Single	yes	yes	Read single attribute
16	10	Set_Attribute_Single	no	yes	Change single attribute
78	4E	Forward_Close	yes	no	Close connection
84	54	Forward_Open	yes	no	Open new connection

Device Level Ring Object (object class: 0x47)

The Device Level Ring (DLR) Object represents the interface for configuration and status information.

Class attributes

Attr. ID	Access	Name	Data type	Description	Value
1	Get	Revision	UINT	Revision of the object	3
2	Get	Max instance	UINT	Max. number of instances of the object	1
6	Get	Maximum ID Number Class Attributes	UINT	ID of the last class attribute	7
7	Get	Maximum ID Number Instance Attributes	UINT	ID of the last instance attribute	12

Instance attributes

Attr. ID	Access	Name	Data type	Description		Preset
1	Get	Network Topology	USINT	current network topology		0
2	Get	Network status	USINT	current network status		0
10	Get	Active Supervisor	STRUCT of	Identification of the supervisor		0
			• UDINT	IP address of the supervisor		
			• ARRAY OF 6 usint s	MAC address of the supervisor		
12	Get	Capability Flags	DWORD	DLR functions of the device		0x82
				Bit 0	Announced-based ring node	0
				Bit 1	Beacon-based ring node	1
				Bit 2...4	reserved	--
				Bit 5	Supervisor capable	0
				Bit 6	Redundant Gateway capable	0
				Bit 7	Flush_Table frame capable	1
				Bit 8..31	reserved	--

Supported services

Service code		Name	Class	Attribute	Description
dec	hex				
1	01	Get_Attribute_All	no	yes	Read all attribute values
14	0E	Get_Attribute_Single	yes	yes	Read single attribute value

OM-IO-Link Master.0100

This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

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Quality of Service (object class: 0x48)

Quality of Service (QoS) enables prioritizing of Ethernet frames. The priorities of the Ethernet frames can be influenced with the attributes "Differentiate Service Code Points" (DSCP) or "802.1Q Tag".

Class attributes

Attr ID	Access	Name	Data type	Description	Value
1	Get	Revision	UINT	Revision of the object	3
2	Get	Max instance	UINT	Max. number of instances of the object	1
6	Get	Maximum ID Number Class Attributes	UINT	ID of the last class attribute	7
7	Get	Maximum ID Number Instance Attributes	UINT	ID of the last instance attribute	8

Instance attributes

Attr ID	Access	Name	Data type	Description	Value
1	Get	802.1Q tagRevision	USINT	Current network topology	0
2	Get, Set	DSCP PTP Event	USINT	DSCP value for PTP event frames	59
3	Get, Set	DSCP PTP general	USINT	DSCP value for PTP general frames	47
4	Get, Set	DSCP PTP Urgent	USINT	DSCP value for implicit messages with "urgent" priority	55
5	Get, Set	DSCP Scheduled	USINT	DSCP value for implicit messages with "scheduled" priority	47
6	Get, Set	DSCP High	USINT	DSCP value for implicit messages with "high" priority	43
7	Get, Set	DSCP Low	USINT	DSCP value for implicit messages with "low" priority	31
8	Get, Set	DSCP explicit	USINT	DSCP value for explicit messages with "scheduled" priority	27

Supported services

Service code		Name	Class	Attribute	Description
dec	hex				
01	01	Get_Attribute_All	yes	yes	Read all attribute values
14	0E	Get_Attribute_Single	no	yes	Read single attribute value

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This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

OM-IO-LinkMaster.0101

IO-Link requests (object class: 0x80)

The manufacturer-specific object "IO-Link Requests" enables read and write access to the IO-Link objects of an IO-Link device connected to a NC-ME-4A4B-12DLA/AL1423 via ISDU (Index Service Data Unit). The object projects the mechanisms of the CIP addressing on the IO-Link protocol.

Class attributes

Attr ID	Access	Name	Data type	Description	Value
1	Get	Revision	UINT	Revision of the object	4
2	Get	Max instance	UINT	Max. number of instances of the object	2
6	Get	Maximum ID Number Class Attributes	UINT	Number of instances of the object	8

Instance attributes

The required IO-Link port of the device is addressed via the instance attribute.

Supported services

Service code		Name	Class	Attribute	Description
dec	hex				
75	4B	→ **Read_ISDU** (→ P. 103)	no	yes	Read ISDU
76	4C	→ **Write_ISDU** (→ P. 106)	no	yes	Read ISDU
77	4D	→ **Write Failsafe Pattern** (→ P. 109)	no	yes	Write failsafe values of IO-Link port

Read_ISDU

With Read_ISDU, parameters of a connected IO-Link device can be read.

Request

CIP Attribute determines the IO-Link port to which the IO-Link device is connected. The area CIP User Specific Service Data contains the IO-Link index and the IO-Link sub-index of the IO-Link object whose value is to be read:

CIP format	Data type	MSG Config	IO-Link mapping
CIP Class ID	UINT	0x80	IO-Link acyclic access
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attributes	USINT	0x01...0x08	Port number
CIP Service code ID	USINT	0x4B	Request "Read_ISDU"
CIP User specific Service Data	UINT	0x0000...0xFFFF	IO-Link ISDU object index
	USINT	0x00...0xFF	IO-Link ISDU object sub-index

Response

• Positive response

If the service has been executed successfully (CIP Error Code = 0), the read data are returned bit by bit (CIP User Specific Service Data). The answer has the following format:

CIP format	Data type	MSG Config	IO-Link mapping
CIP Class ID	UINT	0x80	IO-Link acyclic access
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attributes	USINT	0x01...0x08	Port number
CIP Service Code ID	USINT	0x4C	Response "Read_ISDU"
CIP Error Code	USINT	0x00	--
CIP Extended Error Code	USINT	0x00	--
CIP User Specific Service Data	USINT	0x00...0xFF	Data (byte 0)
	USINT	0x00...0xFF	Data (byte 1)
	...		...
	USINT	0x00...0xFF	Data (byte n)

[!] The read data is in the IO-Link format. If necessary, the user needs to adapt the byte arrangement of the read data to the CIP format.

• **Negative response**

If an error occurs while executing the service (CIP Error Code <> 0), an extended error code is transmitted. If the CIP Error Code = 0x1E, then the CIP Extended Error Code = 0x00 and the CIP User Specific Service Data area contains the IO-Link Error Code as well as IO-Link Additional Code. The answer has the following format:

CIP format	Data type	MSG Config	IO-Link mapping
CIP Class ID	UINT	0x80	IO-Link acyclic access
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attributes	USINT	0x01...0x08	Port number
CIP Service Code ID	USINT	0x4B	Response "Read_ISDU"
CIP Error Code	USINT	<> 0x00	Error code: see table below
CIP Extended Error Code	USINT	0x00	Extended error code
CIP User Specific Service Data	USINT	<> 0x00	IO-Link Error Code: → **Error codes** (→ P. 85) (only if CIP Error Code = 0x1E)
	USINT	<> 0x00	IO-Link Additional Code: → **Additional codes** (→ P. 85) (only if CIP Error Code = 0x1E)

CIP Error Code:

Code	Description
0x02	Resource not available: The IO-Link port is busy processing another acyclic service.
0x05	Invalid class ID or instance ID
0x08	Wrong service ID: only service code 0x4B or 0x4C is permitted
0x09	Wrong attribute ID: wrong port number
0x20	Invalid parameter value (e.g. invalid length)
0x1E	Embedded service, error: Error occurred during an IO-Link service. Byte 0 and byte 1 of the User Specific Service Data contain the IO-Link error code and an additional code that are returned by the IO-Link master.

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Example: reading the parameter value of anIO-Link device

Task: reading the value of the parameter X of an IO-Link device

• IO-Link device at the port: 0x02• Parameter X in the object directory of an IO-Link device: Index: 90, sub-index 3

• Parameter X in the object directory of an IO-Link device: Index: 90, sub-index 3

From this, the following results for the configuration of the EtherNet/IP command Message (MSG):

CIP format	Data type	MSG Config	Description
CIP Class ID	UINT	0x80	IO-Link acyclic access
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attributes	USINT	0x02	Port number
CIP Service Code ID	USINT	0x4B	Request "ISDU_Read"
CIP User Specific Service Data	UINT	0x005A	IO-Link ISDU object index
	USINT	0x03	IO-Link ISDU object sub-index

After successful execution of the request, the response area has the following content:

CIP format	Data type	MSG Config	Description
CIP format	Data type	MSG Config	Description
CIP Class ID	UINT	0x80	Object class "IO-Link requests"
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attributes	USINT	0x02	Port number
CIP Service Code ID	USINT	0x4B	Response "ISDU_Read"
CIP Error Code	USINT	0x00	Request processed successfully
CIP User Specific Service Data	USINT	e.g. 0x12	Parameter value that has been read (byte 0)
	USINT	e.g. 0x34	Parameter value that has been read (byte 1)

If an error occurs while the request is executed, the response area has the following content:

CIP format	Data type	MSG Config	Description
CIP Class ID	UINT	0x80	Object class "IO-Link requests"
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attributes	USINT	0x02	Port number
CIP Service code ID	USINT	0x4B	Response "ISDU_Read"
CIP Error code	USINT	0x1E	Error code: Embedded service error
CIP Extended error code	USINT	0x00	--
CIP User Specific Service Data	USINT	e.g. 0x80	IO-Link Error Code: Error in device application
	USINT	e.g. 0x20	IO-Link Additional Code: Service temporarily unavailable

02/21

This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

OM-IO-LinkMaster.0105

Write_ISDU

With Write_ISDU, the parameters of a connected IO-Link device can be changed.

Request

CIP Attribute determines the IO-Link port to which the IO-Link device is connected. The area CIP User Specific Service Data contains the IO-Link index, the IO-Link sub-index of the IO-Link object whose value is to be changed. It is followed, bit by bit, by the value that is to be assigned to the parameter.

CIP format	Data type	MSG Config	IO-Link mapping
CIP Class ID	UINT	0x80	IO-Link acyclic access
CIP Instance ID	UINT	0x1	IO-Link master
CIP Attribute	USINT	0x01...0x08	Port number
CIP Service Code ID	USINT	0x4C	Request "Write_ISDU"
CIP User Specific Service Data	UINT	0x0000...0xFFFF	IO-Link ISDU object index
	USINT	0x00...0xFF	IO-Link ISDU object sub-index
	USINT	0x00...0xFF	IO-Link ISDU data (byte 0)
	USINT	0x00...0xFF	IO-Link ISDU data (byte 1)

Response

• Positive response

If the service has been executed successfully (CIP Error Code = 0), the area CIP User Specific Service Data stays empty The answer has the following format:

CIP format	Data type	MSG Config	IO-Link mapping
CIP Class ID	UINT	0x80	IO-Link acyclic access
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attribute	USINT	0x01...0x08	Port number
CIP Service Code ID	USINT	0x4C	Response "Write_ISDU"
CIP Error Code	USINT	0x00	--
CIP Extended Error Code	USINT	0x00	--

OM-IO-Link Master.0106

This device is "powered by ifm". In all electronic interfaces, this device will appear as AL1423. All firmware and electronic files are provided by ifm.

02/21

• Negative response

If an error occurs while executing the service (CIP Error Code <> 0), an extended error code is transmitted. If the CIP Error Code = 0x1E, then the CIP Extended Error Code = 0x00 and the CIP User Specific Service Data area contains the IO-Link Error Code as well as IO-Link Additional Code. The answer has the following format:

CIP format	Data type	MSG Config	IO-Link mapping
CIP Class ID	UINT	0x80	IO-Link acyclic access
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attributes	USINT	0x01...0x08	Port number
CIP Service Code ID	USINT	0x4C	Response "Write_ISDU"
CIP Error Code	USINT	<> 0x00	Error code. see table below
CIP Extended Error Code	USINT	0x00	Extended error code
CIP User Specific Service Data	USINT	<> 0x00	IO-Link Error Code: → **Error codes** (→ P. 85) (only if CIP Error Code = 0x1E)
	USINT	<> 0x00	IO-Link Additional Code: → **Additional codes** (→ P. 85) (only if CIP Error Code = 0x1E)

CIP Error Code:

Code	Description
0x02	Resource not available: The IO-Link port is busy processing another acyclic service.
0x05	Invalid class ID or instance ID
0x08	Wrong service ID: only service code 0x4B or 0x4C is permitted
0x09	Wrong attribute ID: wrong port number
0x20	Invalid parameter value (e.g. invalid length)
0x1E	Embedded service, error: Error occurred during an IO-Link service. Byte 0 and byte 1 of the User Specific Service Data contain the IO-Link error code and an additional code that are returned by the IO-Link master (see below).

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

Task: changing the parameter X of an IO-Link device

• IO-Link device at the port: 0x03

• Parameter X in the object directory of an IO-Link device: Index: 91, sub-index 5

• New parameter value: 0xABCD

From this, the following results for the configuration of the EtherNet/IP command Message (MSG):

CIP format	Data type	MSG Config	Description
CIP Class ID	UINT	0x80	IO-Link acyclic access
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attributes	USINT	0x03	Port number
CIP Service code ID	USINT	0x4C	Service "Write_ISDU"
CIP User Specific Service Data	UINT	0x005B	IO-Link ISDU object index
	USINT	0x05	IO-Link ISDU object sub-index
	USINT	0xAB	New parameter value (MSB)
	USINT	0xCD	New parameter value (LSB)

After successful execution of the request, the response area has the following content:

CIP format	Data type	MSG Config	Description
CIP Class ID	UINT	0x80	Object class "IO-Link Requests"
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attributes	USINT	0x03	Port number
CIP Service code ID	USINT	0x4B	Service "Write_ISDU"
CIP Error code	USINT	0x00	Request processed successfully
CIP Extended error code	USINT	0x00	--

If an error occurs while the request is executed, the response area has the following content:

CIP format	Data type	MSG Config	Description
CIP Class ID	UINT	0x80	Object class "IO-Link Requests"
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attributes	USINT	0x03	Port number
CIP Service code ID	USINT	0x4B	Service "Write_ISDU"
CIP Error code	USINT	0x1E	Error code: Embedded Service Error
CIP Extended error code	USINT	0x00	--
CIP User Specific Service Data	USINT	0x80	IO-Link Error Code: Error in device application
	USINT	0x23	IO-Link Additional Code: Access denied

Write Failsafe Pattern

By using Write Failsafe Pattern the fail-safe value of a IO-Link port can be written.

Request

CIP Attribute determines the IO-Link port. The area CIP User Specific Service Data includes the fail-safe mode and the fail-safe value (Failsafe Pattern).

CIP Format	Data type	MSG Config	Description
CIP Class ID	UINT	0x80	IO-Link acyclic access
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attribute	USINT	0x01...0x08	Port number
CIP Service Code ID	USINT	0x4D	Request "Write Failsafe Pattern"
CIP User Specific Service Data	USINT	0x00 = No Fail-safe 0x01 = Fail-safe Reset Value 0x02 = Fail-safe Old Value 0x03 = Fail-safe with Pattern	Failsafe Mode
	USINT	0x00...0xFF	Failsafe Pattern (MSB)
	USINT	0x00...0xFF	Failsafe Pattern (LSB)

Response

• Positive response

If the service was executed successfully (CIP Error Code = 0), the area "User Specific Data" will remain empty.
The response has the following format:

CIP Format	Data type	MSG Config	Description
CIP Class ID	UINT	0x80	IO-Link acyclic access
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attribute	USINT	0x01...0x08	Port number
CIP Service Code ID	USINT	0x4D	Response "Write Failsafe Pattern"
CIP Error Code	USINT	0x00	--
CIP Extended Error Code	USINT	0x00	--

• **Negative response**

If an error occurs while executing the service (CIP Error Code <> 0), an extended error code is transmitted (CIP Extended Error Code). The answer has the following format:

CIP-Format	Data type	MSG Config	Description
CIP Class ID	UINT	0x80	IO-Link acyclic access
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attribute	USINT	0x01...0x08	Port number
CIP Service Code ID	USINT	0x4D	Response "Write Failsafe Pattern"
CIP Error Code	USINT	<> 0x00	Error code: see below
CIP Extended Error Code	USINT	<> 0x00	Extended error code

CIP Error Code:

Code	Description
0x02	Resource not available: The IO-Link port is busy processing another acyclic service.
0x05	Invalid class ID or instance ID
0x08	Wrong service ID: only service 0x4B, 0x4C or 0x4D is permitted
0x09	Wrong attribute ID: wrong port number
0x20	Invalid parameter value (e.g. invalid length)
0x1E	Embedded service, error: Error occurred during an IO-Link service. Byte 0 and byte 1 of the User Specific Service Data contain the IO-Link error code and an additional code that are returned by the IO-Link master (see below).
0x0F	Insufficient access rights

Example: Write fail-safe value

Task: Write fail-safe mode for IO-Link port X02 to "Fail-safe with pattern" and fail-safe value to 0x1234

• IO-Link device in the port: 0x02

• Fail-safe mode: 0x03

• Fail-safe value: 0x1234

From this, the following results for the configuration of the EtherNet/IP command message (MSG):

CIP Format	Data type	MSG Config	Description
CIP Class ID	UINT	0x80	IO-Link acyclic access
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attribute	USINT	0x02	Port number
CIP Service Code ID	USINT	0x4D	Request "Write Failsafe Pattern"
CIP User Specific Service Data	USINT	0x03	"Fail-safe with Pattern" mode
	USINT	0x12	Failsafe Pattern (MSB)
	USINT	0x34	Failsafe Pattern (LSB)

After successful execution of the request, the response area has the following content:

CIP-Format	Data type	MSG Config	Description
CIP Class ID	UINT	0x80	IO-Link acyclic access
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attribute	USINT	0x02	Port number
CIP Service Code ID	USINT	0x4D	Response "Write Failsafe Pattern"
CIP Error Code	USINT	0x00	Request processed successfully
CIP Extended Error Code	USINT	0x00	--

If an error occurs while the request is executed, the response area will have the following content:

CIP-Format	Data type	MSG Config	Description
CIP Class ID	UINT	0x80	IO-Link acyclic access
CIP Instance ID	UINT	0x01	IO-Link master
CIP Attribute	USINT	0x02	Port number
CIP Service Code ID	USINT	0x4D	Response "Write Failsafe Pattern"
CIP Error Code	USINT	e. g. 0x0F	Error code: Insufficient access rights
CIP Extended Error Code	USINT	0x00	No additional information

TCP/IP object (object class: 0xF5)

TCP/IP Interface Object enables the configuration of the physical network interface of the device.

Class attributes

Attr ID	Access	Name	Data type	Description	Value
1	Get	Revision	UINT	Revision of the object	4
2	Get	Max instance	UINT	Max. number of instances of the object	1

Instance attributes

Attr. ID	Access	Name	Data type	Description			Preset
1	Get	Status	DWORD	Status of the TCP/IP interface			
				Bit 0...3	Configuration status of the interface		
				Bit 4	Mcast pending (always 0)		
				Bit 5	Interface configuration pending		
				Bit 6	ACD Status		
				Bit 7	ACD Fault		
				Bit 8...31	reserved		
2	12	Configuration Capability	DWORD	Functions of the interface (flags)			0x95 (BOOTP,DHCP Client,TCP/IP configurable, ACD capable)
				Bit 0	BOOTP Client		
				Bit 1	reserved		
				Bit 2	DHCP Client		
				Bit 3	reserved		
				Bit 4	TCP/IP configurable via EtherNet/IP		
				Bit 5	reserved		
				Bit 6	reserved		
				Bit 7	ACD Capable		
				Bit 8...31	reserved		
3	12	Configuration Control	DWORD	Interface control (control flags):			0
				Bit 0...3	Start-up configuration		
					0	Static IP configuration	
					1	Configuration via BOOTP	
					2	Configuration via DHCP	
				Bit 4	reserved		
				Bit 5...31	reserved		
4	Get	Physical Link Object path	STRUCT:	Logical path to the physical communication interface: the Ethernet Link object			
		• Path Size	• UINT	Length (in Little Endian Format as WORD)			02 00

Attr. ID	Access	Name	Data type	Description		Preset
		• Path	• Padded EPATH	Path		20 F6 24 01
				Class ID = 0xF6 Ethernet Link Object		
				Instance ID = 1		
5	Get, Set	Interface Configuration	STRUCT:	TCP/IP configuration		
		• IP Address	• UINT	IP address		192.168.1.250
		• Network mask	• UINT	Subnet mask		255.255.255.0
		• Gateway address	• UINT	Default gateway address		0.0.0.0
		• Name Server	• UINT	1. Name Server		0.0.0.0
		• Name Server 2	• UINT	2. Name Server		0.0.0.0
		• Domain Name	• STRING	Default domain name		0
6	Get, Set	Host name	STRING	Host name		0
				0	no name configured	
8	Get	TTL value		TTL value		1
9	Get	Mcast Config				0
10	Get, Set	SelectAcd	BOOL	activate ACD		1
				0	deactivate	
				1	activate	
11	Get, Set	Last Conflict Detected	STRUCT:	Structure with information via the latest detected conflict		0
			• USINT	Condition of the ACD activity with the latest detected conflict		
				0	Noconflictdetetcted	
				1	Probelpv4Address	
				2	OngoingDetection	
				3	SemiActiveProbe	
			• ARRAY of 6 USINT	MAC address		
			• ARRAY of 28 USINT	Copy of the data of the ARP PDU in which the conflict was detected		
13	Get, Set	Encapsulation Inactivity Timeout	UINT	Inactivity before the TCP connection is deactivated (in seconds)		120

Supported services

Service code		Name	Class	Attribute	Description
dec	hex				
01	01	Get_Attribute_All	no	yes	Read all attributes
14	0E	Get_Attribute_Single	yes	yes	Read single attribute
16	10	Set_Attribute_Single	no	yes	Change single attribute

Ethernet Link Object (object class: 0xF6)

The Ethernet Link Object contains status information of the Ethernet interface.

Class attributes

Attr ID	Access	Name	Data type	Description	Value
1	Get	Revision	UINT	Revision of the object	4
2	Get	Max Instance	UINT	Max. number of instances of the object	2
3	Get	Number of Instances	UINT	Number of instances of the object	2

Instance attributes

Attr. ID	Access	Name	Data type	Description			Preset
1	Get	Interface Speed	UDINT	Current data rate (in bytes/s) 10 Mbps,100 Mbps.			100
2	Get	Interface Status Flags	DWORD	Status flag of the interface			0x20
				Bit 0	Link status		
				Bit 1	Half/full duplex		
				Bit 2...4	Auto negotiation status		
				Bit 5	Manual setting requires reset		
				Bit 6	Local Hardware Fault		
				Bit 7...31	reserved		
3	Get	Physical Address	ARRAY of 6 USINTS	MAC address			
4	Get	Interface Counters	STRUCT of 11 UDINTs	Interface-specific counter			
5	Get	Media counters	STRUCT of 12 UDINTs	Medium-specific counter			
6	Get, Set	Interface control	STRUCT of	Control bits: Bit 0: Auto negotiate Bit 1: Forced Duplex Mode (full 1, half 0)			0
			• WORD	Control bits of the interface			
				Bit 0	0 = auto-negotiation active		
					1 = auto-negotiation inactive		
				Bit 1	0 = Half duplex		
					1 = Full duplex		
				Bit 2..15	reserved		
			• UINT	Data rate of the interface			
				10	10 Mbps		
				100	100 Mpbs		
7	Get	Interface Type	USINT	Physical interface type			2
				0	unknown		
				1	Internal interface		

Attr. ID	Access	Name	Data type	Description		Preset
				2	Twisted pair	
				3	Optical fibre	
				4...255	reserved	
8	Get	Interface state	USINT	Current status of the interface		0
				0	unknown	
				1	active; ready for transmission and reception	
				2	not active	
				3	Test mode	
				4...255	reserved	
9	Get	Admin State	USINT	Control of the access to the interface		1
				0	reserved	
				1	Activate interface	
				2	Deactivate interface	
				3...255	reserved	
10	Get	Interface label	SHORT_ STRING	Designation of the interface		„X21" (instance 1) „X22" (instance 2)
11	Get	Interface capability	STRUCT of	Capabilities of the interface		
			• DWORD	Transmission rate		
				10	10 Mbps	
				100	100 Mbps	
			• DWORD	Duplex mode		
				HD	Half duplex	
				FD	Full duplex	
300	Get, Set	MDIX	???	MDIX configuration		3
				0		
				1	MDI	
				2	MDIX	
				3	autoMDI	
				4...255	reserved	

Supported services

Service code		Name	Class	Attribute	Description
dec	hex				
01	01	Get_Attribute_All	no	yes	Read all attribute values
14	0E	Get_Attribute_Single	yes	yes	Read single attribute value
16	10	Set_Attribute_Single	no	yes	Change single attribute value

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15. Index

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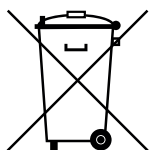
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