

Actuator controls
AC(V) 01.2/AC(V)ExC 01.2
EtherNet IP (integrated)



Read operation instructions first.

- Heed safety instructions.

Purpose of the document:

This document contains information for the commissioning staff of the distributed control system and DCS software engineers. This document is intended to support actuator integration into the DCS via the communication interface.

Reference documents:

- Operation instructions (Assembly and commissioning) for the actuator
- Manual (Operation and setting) AC 01.2/ACExC 01.2 actuator controls

Reference documents are available on our website <https://www.auma.com>.

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1 Safety instructions

1.1 Prerequisites for the safe handling of the product

Standards/directives	The end user or the contractor must ensure that all legal requirements, directives, guidelines, national regulations and recommendations with respect to assembly, electrical connection, commissioning and operation are met at the place of installation. Depending on the device version, this includes: - Standards and directives such as IEC 60079: - Part 14: Electrical installations design, selection and erection - Part 17: Electrical installations inspection and maintenance - Configuration guidelines for the respective fieldbus or network applications
Health and safety requirements	The relevant occupational health and safety requirements in accordance with Annex III of regulation (EU) 2023/1230 of the European Parliament and the Council are listed in the following chapter: .
Safety instructions/warnings	All personnel working with this device must be familiar with the safety and warning instructions in this manual and heed the instructions given. Safety instructions and warning signs on the device must be observed to avoid personal injury or property damage.
Qualification of staff	Assembly, electrical connection, commissioning, operation, and maintenance must be carried out by suitably qualified personnel authorised by the end user or contractor of the plant only. Prior to working on this product, the staff must have thoroughly read and understood these instructions and, furthermore, know and observe officially recognised rules regarding occupational health and safety. Work performed in potentially explosive atmospheres is subject to special regulations which have to be observed. The end user or contractor of the plant is responsible for respect and control of these regulations, standards, and laws.
Electrostatic charging	Highly efficient charge generating processes (processes more efficient than manual friction) on the device surface must be excluded at any time. Highly efficient charge generating processes will lead to brush discharges or propagating brush discharges and therefore to ignition of a potentially explosive atmosphere. This safety instruction also applies to fireproof coatings or covers available as an option. When using a stem protection tube, any type of charge generating processes must be excluded at its protective cap as well as the V-seal (e.g. only wipe with a damp cloth). Otherwise, ignitable electrostatic discharges might occur.
Commissioning	Prior to commissioning, imperatively check that all settings meet the requirements of the application. Incorrect settings might present a danger to the application, e.g. cause damage to the valve or the installation. The manufacturer will not be held liable for any consequential damage. Such risk lies entirely with the user.
Operation	Prerequisites for safe and smooth operation: - Correct transport, proper storage, mounting and installation, as well as careful commissioning. - Only operate the device if it is in perfect condition while observing these instructions. - Immediately report any faults and damage and allow for corrective measures. - Heed recognised rules for occupational health and safety. - Heed national regulations. - During operation, the housing warms up and surface temperatures > 60 °C may occur. To prevent possible burns, we recommend checking the surface temperature using an appropriate thermometer and wearing protective gloves, prior to working on the device.

Protective measures	The end user or the contractor are responsible for implementing required protective measures on site, such as enclosures, barriers, or personal protective equipment for the staff.
Maintenance	Any device modification requires prior written consent of the manufacturer.

1.2 Range of application

AUMA actuator controls are exclusively designed for the operation of AUMA actuators. Other applications require explicit (written) confirmation by the manufacturer.

The following applications are not permitted, e.g.:

- Motor control
- Pump control

No liability can be assumed for inappropriate or unintended use.

Observance of these instructions and the operation instructions pertaining to the actuator is considered as part of the device's designated use.

1.3 Warnings and notes

The following warnings draw special attention to safety-relevant procedures in these operation instructions, each marked by the appropriate signal word (DANGER, WARNING, CAUTION, NOTICE).



Indicates an imminently hazardous situation with a high level of risk. Failure to observe this warning results in death or serious injury.



Indicates a potentially hazardous situation with a medium level of risk. Failure to observe this warning could result in death or serious injury.



Indicates a potentially hazardous situation with a low level of risk. Failure to observe this warning could result in minor or moderate injury. May also be used with property damage.



Potentially hazardous situation. Failure to observe this warning could result in property damage. Is not used for personal injury.

The  safety symbol warns of a potential personal injury hazard. The signal word (e.g. DANGER) indicates the level of hazard.

1.4 References and symbols

The following references and symbols are used in these instructions:



The ⓘ symbol stands for the **Information** concept. This text provides important notes and information.

Information: If the **Information** term is part of instruction, the text will give important notes and information to this action step.



Symbol for CLOSED (valve closed)



Symbol for OPEN (valve open)

M▷ Via the menu to parameter

Describes the menu path to the parameter. When using the local controls, the required parameter can be quickly found in the display. Display texts are shaded in grey: **Display**.

⇒ **Result of a process step**

Describes the result of a preceding process step.

→ **Action step**

Describes one single action step.

▶ **Reference to the page number**

Refers to the page number for further information. To return from the target to the previous view, it is possible to jump back to the previous view within PDF documents:

When using Adobe Acrobat via **Menu > Previous view** or using the key combination **Alt + left**.

2 Basic information

2.1 General information on EtherNet/IP

EtherNet/IP is a communication protocol for industrial automation engineering standardised by the ODVA organisation worldwide. EtherNet/IP enables real time communication with short cycle times as well as acyclic communication for configuration and diagnostics.

As a communication network for field devices, EtherNet/IP reserves many advantages across the total lifecycle of a site. Advantages include economy in cable connections and system components as well as simplification of processes within the overall business environment.

Some of the advantageous EtherNet/IP features are:

- Virtually unlimited number of participants within the network
- Flexible topologies (line, star, tree, ring, ...)
- Topologies can easily be scaled and expanded
- Large network expansion by cascading via switches
- Appropriate for high to medium real time requests due to cycle times within the range of 10 – 40 ms, in particular when dealing with large data quantities (diagnostics, file transfer, ...)
- Simple maintenance
- Communication/routing without special gateway across network segments
- Use of standard network components (switch, etc.) and IT practices
- Seamless and vertical integration of process and production data from field level into the cross-functional information systems
- Simple access to device data on field level without proprietary gateways
- Multitude of network components, software tools and safety technologies available
- Combination of various transmission media like copper cables, fibre optic cables or WLAN

Based on Ethernet and IT protocols, EtherNet/IP automatically benefits from the continuous development thanks to a large number of market competitors. Consequently, EtherNet/IP is a future-proof device communication and protects long-term investments.

2.2 Basic characteristics

EtherNet/IP defines the technical and functional features of a communication system based on Industrial Ethernet, used for interconnecting distributed digital automation devices. EtherNet/IP uses the “Common Industrial Protocol” (CIP), known from DeviceNet, as application protocol with IP addressing. Change-over to the new technology is therefore very convenient for DeviceNet users.

For this, the CIP protocol encapsulated and transmitted within the data packet of standard Ethernet frames. Depending on the task and the type of connection, UDP/IP or TCP/IP data transmission mechanisms are used.

EtherNet/IP distinguishes between scanners (typically the host) and adapters (field devices). EtherNet/IP is designed in particular for fast data exchange on field level. Here, central control devices (PLC or PC) communicate via a fast network with peripheral field devices such as input devices, output devices, valves and actuators.

2.3 Data exchange and types of communication

Producer - Consumer
model

Like for conventional fieldbus protocols, the core function of the EtherNet/IP protocol is the data exchange of devices between each other or with the distributed control system. For data exchange between devices, EtherNet/IP uses the Producer - Consumer model. An EtherNet/IP device sending data produces such data within the network. A

receiving EtherNet/IP device consumes data from the network. In general, a field device/adaptor as producer provides the DCS/scanner as consumer with the process data in cyclic intervals.

Producers send data without request at a pre-set refresh rate. This refresh rate is designated as “Request Packet Interval” (RPI) and can be set via the device configuration. Output data is also written without delay at the same or a deviating refresh rate from the DCS (consumer) to the field devices (producer).

Producers send data via multi cast addressing to the consumers within the network. On the basis of a connection ID, consumers decide themselves whether to process the received message.

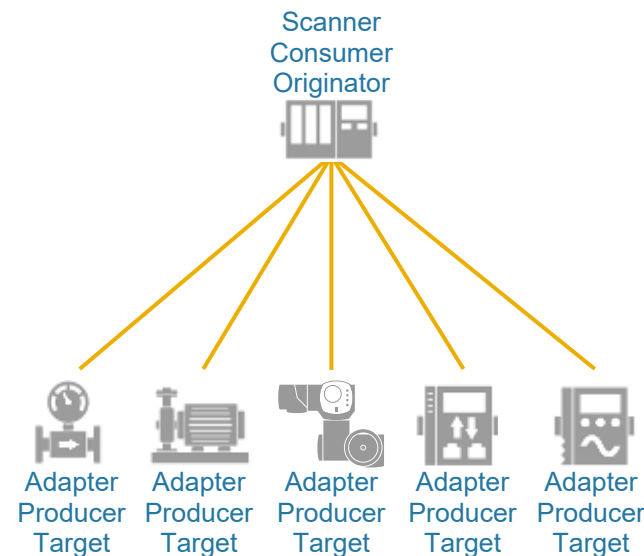
In turn, consumers use specific unicast addresses to communicate with producers.

Basically, each EtherNet/IP device can act as producer or as consumer or adopt both roles simultaneously.

Establishing the connection - originator and target

Typically, scanners establish the EtherNet/IP connection by sending a “Forward Open Command” via TCP to the adapter devices. Within this framework of establishing the connection, scanners adopt the role as “Originator”, whereby adapter field devices are designated as “Target”.

Figure 1: Set-up and roles of an EtherNet/IP network



Communication types - implicit and explicit messaging

EtherNet/IP makes the distinction between cyclic and acyclic communication. For this, two different message types are used: “implicit messaging” for time-relevant, cyclic I/O data transmission and “explicit messaging” for sporadic, acyclic communication.

“Implicit messaging” establishes fixed relations, so-called I/O connections, between producing and consuming application objects already during commissioning. An unambiguous ID is assigned to each of these connections. These messages do not contain any address or service information. Each consuming device decides on the basis of the connection ID, whether and how to process the message. The UDP protocol is used for fast and efficient transmission of this cyclic data.

Acyclic communication by means of “explicit messaging” is performed via request/response messages which are managed within the device by the message router object. Acyclic requests comprise a service code with path indication to the desired object within the target device. The TCP/IP protocol is used for this sporadic and time-irrelevant communication.

Communication connections

EtherNet/IP divides the described communication types or communication connections additionally into two classes:

Class 1 communication: Cyclic I/O communication via implicit messaging

Class 3 communication: Acyclic request/response communication via explicit messaging

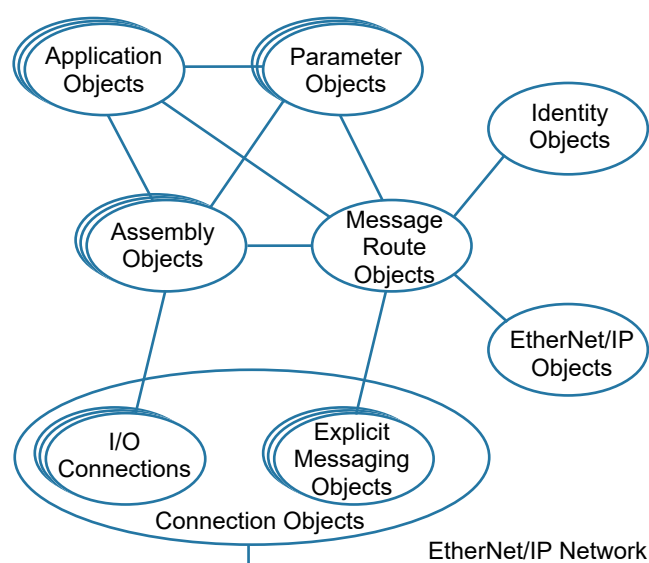
For class 1 connections it is further defined whether the data is transmitted one-sided or in both directions between the participants. Distinction is made between connection types “exclusive owner”, “input only” and “listen only”. “Exclusive owner” connections involve data exchange in both directions between originator and target. If the target device (actuator) does not receive any output data from the originator (controls) following a predefined timeout, the target device stops sending further input data.

2.4 EtherNet/IP as object-oriented protocol

EtherNet/IP and CIP describe all data and functions of a device based on an object model. This object-oriented description leads to a clear device model. Thanks to the individual objects, a device can be completely defined. Access from the network to the individual objects is exclusively made via connection objects. An object stands for the abstract representation of a component within a device. It is determined by its data or attributes, its external functions and services offered as well as the specified behaviour.

CIP comprises a comprehensive object library to support the general network communication, network services such as e.g. file transfer and typical automation functions. Examples are analogue and digital I/O devices, HMI, motion control and position feedback. Process data are accordingly included as attributes within the CIP data objects. To ensure interoperability, objects or object groups implemented into two or several devices act identically. Grouping objects within a device is designated as device object model.

Figure 2: General EtherNet/IP object model



Data and executed services of an object are addressed by means of a hierarchical addressing structure with the following components:

- **Class ID**
Integer ID assigned to a certain class of objects. A class abstractly describes structure, features and behaviour of similar objects within a device.
- **Instance ID**
Integer ID assigned to a certain object instance to distinguish this instance from other instances of the same class. An instance or an object is an operational representative of a class. Each instance of the same class possesses the same attributes, however the values are different.
- **Attribute ID**
Integer ID assigned to a certain object or class attribute. An attribute represents data of an object or describes the features of the class.
- **Service code**

Service codes or function codes describe the functions or services provided by an object and which are addressed via an ID. A scanner writes or reads at acyclic intervals the attributes of an adapter by means of function codes.

2.5 EtherNet/IP basic functions

An EtherNet/IP scanner cyclically reads input information from the adapter field devices and writes output information to the adapters. In addition to this cyclic data transfer of the process representation, EtherNet/IP also provides powerful functions for diagnostics and commissioning. The data traffic is monitored by the monitoring function (timeout mechanisms) by both scanner and adapter.

2.6 Communication technology

- Full duplex, 100 Mbit/s switched Ethernet (100BASE-TX) IEEE 802.3
- Wiring according to IEC 61784-5-3. Cable with twisted wire pairs for each direction RX and TX
- Simultaneous communication into both send and receive direction
- Ethernet switches coordinate data transmission and prevent collisions on the cable

2.7 Bus access

- Switched Ethernet with flexible priority control, no collision domains, no coordination of the network access required – all participants have simultaneous access.
- Data exchange in compliance with provider-consumer model: The provider (adapter/field device) supplies process data to one or several consumers (scanner/controls).
- The maximum number of EtherNet/IP devices per network depends on used controls (scanner).

2.8 Network topology – interconnection of EtherNet/IP devices

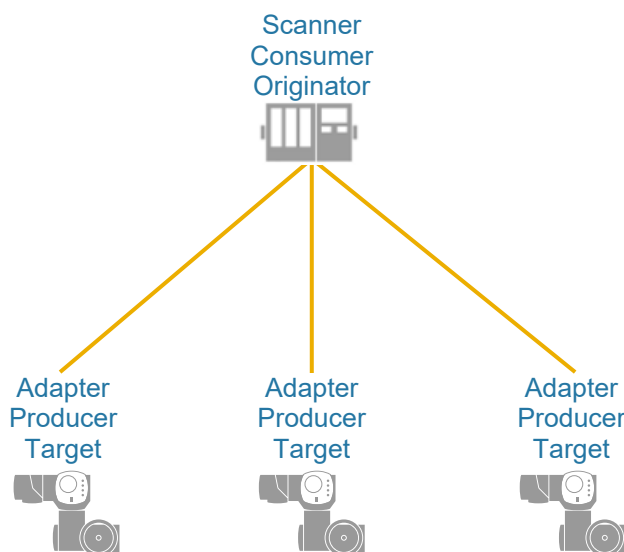
EtherNet/IP is characterised by the virtually free network topology implementation. If the required response times of messages for the automation application are exceeded, the maximum network depth – the number of cascaded EtherNet/IP participants – have been reached. The maximum distance between two network participants is 100 metres. When using switches with fibre optic cable communication, distances can be increased.

Due to possible multicast data traffic in EtherNet/IP networks, only “managed” industrial switches with IGMP function should be used. The EtherNet/IP based automation network should be logically separated from the remaining IT infrastructure. Based on existing network load by office applications, uncoordinated mixing of office network and automation network can lead to unpredictable problems with the EtherNet/IP application. In general, hubs may not be used since this could lead to network collision.

The following topologies and combinations are possible using EtherNet/IP:

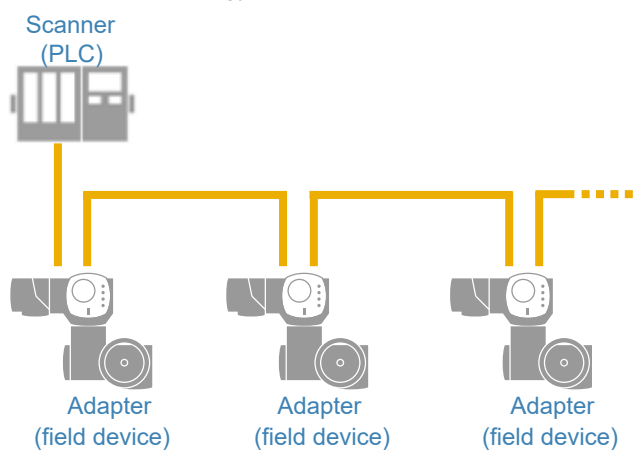
Point-to-point or star topology	Devices in this topology only have one connection to the DCS (point-to-point) or to the Ethernet switch (star).
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Figure 3: Point-to-point or star topology



Line topology With this topology, devices and DCS are interconnected in series. To connect the devices, no additional Ethernet switch is required.

Figure 4: Line topology

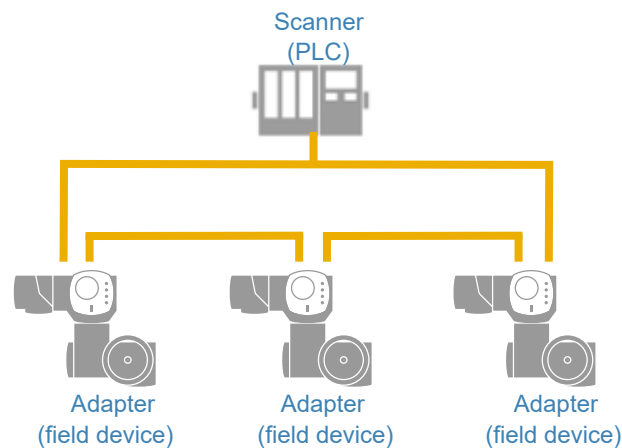


For Ethernet networks, this topology is not recommended. If one participant or network switch fails, the other participants along the line are no longer accessible. Therefore, it is advised to use ring topology.

Ring topology When applying this topology, the devices and the DCS are connected in series. The major difference to line topology is that both the first and the last device are connected to the DCS.

The ring topology is recommended when redundancy structures are required. The prerequisite is that all network participants support the DLR ring protocol and that one of the network switches deployed can be used as DLR ring manager. The EtherNet/IP actuators support the role of a DLR participant.

Figure 5: Ring topology



2.9 EtherNet/IP communication cables

According to IEC 61156-6, CAT 5 cables are specified as minimum requirement for EtherNet/IP. However, using CAT 5e and CAT 6 cables is recommended. For further references on planning and installation of EtherNet/IP networks, a respective publication, the “Infrastructure Guide”, is available with ODVA (www.odva.org).

The following tables list the available cable types, namely A through C, with regard to the respective application:

Table 1: Cable types

Cable types for dual pair network cables			
Cable types	Application type A	Application type B	Application type C
Version	Dual pair data cable	Dual pair data cable	Dual pair data cable
Type of installation	Fixed installation, immobile after installation	Flexible installation, occasional movement, vibration or twisting after installation	Special applications (e.g. for continuous movement, vibration or torsion)
Cable parameter			
Designation (minimum)	“EtherNet/IP or PROFINET type A“	“EtherNet/IP or PROFINET type B“	“EtherNet/IP or PROFINET type C“
Cross section	AWG 22/1 ≥ 0.610 mm²	AWG 22/7 ≥ 0.318 mm²	AWG 22/.. ≥ 0.318 mm²
Outer cable diameter	5.5 to 8.0 mm		depending on the application
Wire diameter	1.4 ± 0.2 mm		depending on the application
Colour of sheath	Green RAL6018		depending on the application
Colour of wire insulation	Pair 1: white, blue Pair 2: yellow, orange		
Number of wires	4		
Cable design	Dual pair or star quad		
Shield	Aluminium foil + copper braid		depending on the application
Communication requirements			
Applicable standards	ISO/IEC 11801 Edition 2.0 IEC 61140-1 IEC 61156-5 (minimum device group 5)		IEC 61140-1 IEC 61156-6 (minimum device group 5)
Delay	≤ 20 ns/100 m		
Coupling attenuation	≥ 80 dB bei 30 – 100 MHz “Channel Class-D“ according to EN 50174-2		

Minimum cable spacing The minimum spacing (according to IEC 61918) required between laying EtherNet/IP cables and other cables must be respected. They are shown in the table below.

Table 2: Minimum cable spacing

Minimum spacing for Profinet cables			
	Spacing to Profinet cable		
	Without or with non-metal cutoff bridge	Aluminium cutoff bridge	Steel cutoff bridge
Signal transmission cable			
For example other Profinet cables, Profibus cables, data cables for PCs, programming devices, shielded analogue inputs	0 mm	0 mm	0 mm
Power supply cables			
Unshielded power supply cables	200 mm	100 mm	50 mm
Shielded power cables	0 mm	0 mm	0 mm

Further references Available EtherNet/IP recommendations, particularly planning, assembly and commissioning guidelines of the ODVA user organisation must be met.

Examples: "EtherNet/IP Media Planning and Installation Manual", "EtherNet/IP Network Infrastructure Guide".

2.10 Supported functionality

Actuator controls offer the following functionality:

Ethernet port functionality

- Auto negotiation, auto cross-over
- 2 100BASE-TX Ethernet Ports

Device functionality

EtherNet/IP adapter:

- Data exchange based on generic I/O objects
- Supports a cyclic communication relation (Implicit Messages, Exclusive Owner)
- Supports an acyclic connections (Explicit messages, POINT2POINT)
- I/O connection type:
 - Exclusive Owner, cyclic
 - Originator to Target Type: POINT2POINT
 - Target to Originator Type: POINT2POINT, MULTICAST
- Cyclic I/O communication (class1 connection):
 - Process representation input 40 bytes - Input Assembly Instance
 - Process representation output 26 bytes - Output Assembly Instance
- Acyclic request/response communication (UCMM or class 3 connection):
 - Device configuration - Configuration Object
 - Device identification - Identity Object
 - Network interface settings - TCP/IP Interface Object
 - Ethernet information – Ethernet Link Object

Network:

- DHCP for IP address assignment (default)
- Network configuration via EtherNet/IP services of the DCS, the local controls, AUMA CDT, AUMA Assistant App or the integral web server
- Device Level Ring Protocol DLR (integral switch function within AC 01.2)

2.11 Protective functions

- Monitoring cyclic input data with adjustable monitoring timer for the EtherNet/IP scanner
- Monitoring the scanner output data via EtherNet/IP adapter
- Access protection for inputs/outputs (sync and freeze)

2.12 Device types

- **Scanner:** e. g. central automation devices such as PLC
- **Adapter:** Devices with binary and analogue input and outputs (e.g. actuators or valves)
- **Network components:** e. g. switches, access points, routers

3 Commissioning

3.1 Introduction

Just few steps are required to integrate an AUMA actuator into an EtherNet/IP environment. For commissioning the EtherNet/IP device, DCS configuration is possible using a configuration file, but not necessarily required. Either a standardised electronic data sheet (EDS file) is integrated into the DCS or a generic Ethernet module is selected and configured. The process representation input and output bytes are used to control the actuator and to supply the feedback signals.

Major settings for establishing a connection to the EtherNet/IP scanner are:

- IP address
- Assembly instance numbers

The assembly instance numbers are specifically defined and must be correctly set within the scanner. This includes the number of data strings or the size of the process representation.

3.2 Electronic Data Sheet (EDS)

Function and properties of an EtherNet/IP device are described by the device manufacturer by means of a standardised electronic data sheet (EDS) in ASCII format. Here, the EDS is a type of template describing all device data and functions. The EDS file defines the parameters with their class ID, instance ID and attribute ID as well as the respectively permissible minimum and maximum values. The EDS file simplifies integration and commissioning of an EtherNet/IP adapter via the configuration software of the EtherNet/IP scanner used.

For AUMA actuators with actuator controls, the suitable EDS file is available on the AUMA website (www.auma.com).

Manufacturer ID: 129

Device Type: Generic Device

Product Code: 1

Product Name: AUMATIC AC 01.2

3.3 EtherNet/IP addressing

Addressing of EtherNet/IP participants within the network is made via the configured IP address. Assignment of IP address is made either manually or via a DHCP server.

IP address assignment is arbitrary and should, however, be of the same network class as the scanner. Should this not be the case, a gateway must be registered for routing the protocol accordingly. Data addressing is made via class ID, instance ID and attribute ID.

3.4 Configuration of the EtherNet/IP interface

Configuration of cyclic data transfer is made via the EtherNet/IP scanner which sends the configuration when establishing the cyclic data transfer to the device. No connection settings are made within the device itself. The configuration procedure depends on the implemented tool. The number of input and output bytes sent or received by the EtherNet/IP adapter to or from the scanner are predefined within actuator controls. Accordingly, once the scanner starts cyclic communication, the required communication relations are negotiated with the adapter.

AUMA actuators currently support the basic objects standardised by EtherNet/IP. Further devices profiles are irrelevant. Data exchange is based on generic I/O objects.

3.5 Communication start

EtherNet/IP is based on the connection-oriented communication model. For this, the respective instances of the “Connection Objects” must be implemented and configured within the EtherNet/IP device.

The EtherNet/IP scanner as originator establishes the communication connection with the target device by means of a “Forward Open” command and hereby determines the update rate (RPI - request packet interval) of the cyclic data exchange. The actuator as EtherNet/IP adapter then confirms the connection and starts sending or producing the requested input data. At the same time, the EtherNet/IP scanner starts transmitting the output data to the EtherNet/IP actuator.

An EtherNet/IP connection request (forward open request) contains the following information:

- Timeout information for the connection
- Network CID for the connection between originator and target (output data)
- Network CID for the connection between target and originator (input data)
- Information on the identity of the originator (vendor ID and serial number)
- Maximum file size of connections in bytes
- Indication relating to the connection type (exclusive owner)
- Trigger of data transmission (cyclic)
- Indication whether communication is unicast or multicast

3.6 Communication monitoring

3.6.1 Connection monitoring of the EtherNet/IP communication

The active EtherNet/IP communication is continuously monitored. In case of failure, a failure behaviour is initiated which can be defined as requested.

3.6.2 Communication status

Correct EtherNet/IP communication to the actuator can be checked via the local controls display or via the AUMA CDT service software. The relevant information can be found in the menu: **Diagnostics [M0244] > EtherNet/IP [M3867] > Communication status [M3868] > Channel 1 DataEx** and **Channel 1 activity**, or: **Channel 2 activity**

- 0 = no communication active
- 1 = communication

The **Channel 1 activity** or **Channel 2 activity** indications describe whether data traffic could be detected on the respective Ethernet port 1 or port 2 and thus whether a correct network connection was generally established. However, data does not have to be directly addressed to the actuator.

The **Channel 1 DataEx** indication describes whether the device can correctly communicate using one of the two ports and whether the EtherNet/IP data has directly been sent via the device address. An EtherNet/IP application relation to the DCS (scanner) exists.

4 Description of the data interface

Object model The EtherNet/IP interface of AUMA actuator controls provides 6 different CIP objects:

Table 3: List of objects within actuator controls (hex)

Object Class	Class ID	Instance IDs	Messages	Contained data
Identity Object	1 _{hex}	0, 1	Explicit	Device identification, manufacturer ID, device type, serial number, etc.
Message Router Object	2 _{hex}	0	Explicit	Distributes received messages to further objects
Assembly Object	4 _{hex}	0, 100, 101, 102	Explicit und Implicit	Input and output data, status information, device configuration
TCP/IP Interface Object	F5 _{hex}	0, 1	Explicit	Information and settings of the network interface
DLR Object	47 _{hex}	0	Explicit	Information and settings on DLR (Device Level Ring)
Configuration Objects	67 _{hex} – C7 _{hex}	0	Explicit	Device parameters and process data as virtual manufacturer-specific objects

Identity Object: Device ID: Manufacturer ID, device type, serial number, etc. of deployed EtherNet/IP communication module. No identification data of the AUMA actuator are stored here.

Message Router Object: distributes received messages to the further objects of the EtherNet/IP interface.

Assembly Object: combines attributes of several objects. This allows for data exchange to the objects comprised using only one connection. This minimises the number of messages to be transmitted within a network and allows for reduced cycle times. The Assembly Object comprises I/O data as well as status information for the cyclic as well as the acyclic data exchange:

Table 4: Input Assembly Instance

Input Assembly Instance	Process representation input (cyclic)
Output Assembly Instance	Process representation output (cyclic)
Status Assembly Instance	Status information (acyclic)
Configuration Instance	Device configuration (acyclic)

Connection Manager Object: is used for the first establishment of connection prior to exchanging messages.

TCP/IP Interface Object: Information and settings of network interface (IP address, network mask, gateway, ...).

Ethernet Link Object: Information on settings at Ethernet level (speed, MAC address, ...).

Upon receipt of an EtherNet/IP message, it is detected whether dealing with an explicit message or an implicit message. Explicit messages can directly access the assembly object or further objects via the message router object. An implicit message can only access the process representation data of the assembly object.

Process interface

Data structure is described on the basis of the automation system:

- Input data: Are sent by the measurement device to the automation system
- Output data: Are sent by the automation system to the measuring device

Byte order

For EtherNet/IP, data (variables, parameters, signals, etc.) consisting of several bytes are stored and transferred in Little Endian format, contrary to most other communication types.

This means the byte with the lowest value is stored or transferred first. Profinet, for example, uses the Big Endian format.

In AUMA actuators, this affects e.g. the input data for actual position, torque and analogue inputs such as the output data for setpoint position and analogue outputs.

In case a DCS or SCADA system reads or interprets the Data in Big Endian format, this will result in incorrect values.

A possible solution is to adapt the byte order by means of the parameter **Byte Order Setting** [PRM_6567]:

M▷ Device configuration [M0053]

EtherNet/IP [M3865]

Default value: Little Endian

Setting values:

Little Endian Lowest value byte is stored or transferred first

Big Endian Highest value byte is stored or transferred first

4.1 Input data (process representation input) – signals

The process representation input allows the consumer (scanner/controller) to read the state of the provider (actuator).

4.1.1 Process representation input (default process representation)

Grey bits are collective signals. They contain the results of a disjunction (OR operation) of other information.

Definition:

- Assembly Object ID: 4 (hex)
- Assembly Instance: 102 (hex)
- Attribute: 3 (hex)
- Input Size: 40 (hex)

Byte 1: Logic signals

Bit 7	Fault
Bit 6	Warning
Bit 5	Running CLOSE
Bit 4	Running OPEN
Bit 3	Not ready REMOTE
Bit 2	Setpoint pos. reached
Bit 1	End position CLOSED
Bit 0	End position OPEN

Byte 2: Actuator signals

Bit 7	Torque sw. CLOSE
Bit 6	Torque sw. OPEN
Bit 5	Limit switch CLOSED
Bit 4	Limit switch OPEN
Bit 3	Selector sw. LOCAL
Bit 2	Selector sw. REMOTE
Bit 1	Phase failure
Bit 0	Thermal fault

Byte 3: Actual position (L)

Actual position low byte
(position transmitter)

Byte 4: Actual position (H)

Actual position high byte
(position transmitter)

Byte 5: Device status

Bit 7	Device ok
Bit 6	Failure
Bit 5	Function check
Bit 4	Out of specification
Bit 3	Maintenance required
Bit 2	Fault
Bit 1	Warning
Bit 0	Not ready REMOTE

Byte 6: Operation status

Bit 7	Running LOCAL
Bit 6	Running REMOTE
Bit 5	Handwheel operation
Bit 4	Actuator running
Bit 3	--
Bit 2	Start stepping mode
Bit 1	In intermed. position
Bit 0	Op. pause active

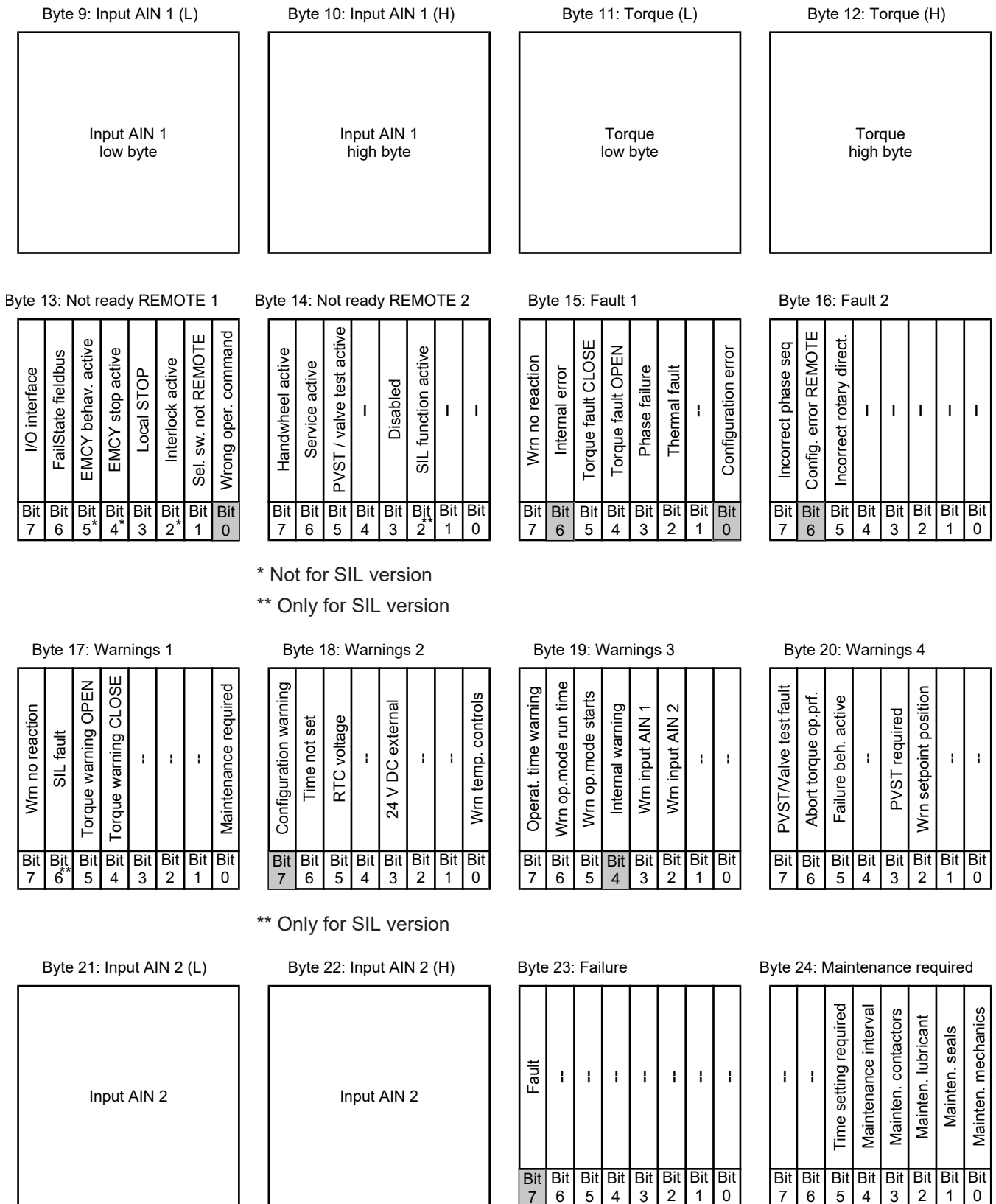
Byte 7: Intermediate positions

Bit 7	Intermediate pos. 8
Bit 6	Intermediate pos. 7
Bit 5	Intermediate pos. 6
Bit 4	Intermediate pos. 5
Bit 3	Intermediate pos. 4
Bit 2	Intermediate pos. 3
Bit 1	Intermediate pos. 2
Bit 0	Intermediate pos. 1

Byte 8: Discrete inputs

Bit 7	Bluetooth connected
Bit 6	Input DIN 7
Bit 5	Input DIN 6
Bit 4	Input DIN 5
Bit 3	Input DIN 4
Bit 2	Input DIN 3
Bit 1	Input DIN 2
Bit 0	Input DIN 1

Figure 6:



Byte 25: Out of specification 1

Wrn no reaction	SIL fault	Torque warning OPEN	Torque warning CLOSE	--	--	--	--
Bit 7	Bit 6*	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Byte 26: Out of specification 2

Configuration warning	Time not set	RTC voltage	Battery low	24 V DC external	--	--	Wrn temp. controls
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Byte 27: Out of specification 3

Operat. time warning	Wrn op.mode run time	Wrn op.mode starts	Internal warning	Wrn input AIN 1	Wrn input AIN 2	--	--
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Byte 28: Out of specification 4

PVST/Valve test fault	Abort torque op.prf.	Failure beh. active	--	PVST required	Wrn setpoint position	--	--
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

** Only for SIL version

Byte 29: Function check 1

--	--	PVST active	EMCY stop active	Handwheel oper.	Service active	Sel. sw. not REMOTE	Local STOP
Bit 7	Bit 6	Bit 5	Bit 4*	Bit 3	Bit 2	Bit 1	Bit 0

Byte 30: Function check 2

--	--	--	--	--	--	--	--
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Byte 31: Function check 3

Channel 2 activity	Channel 1 activity	--	--	--	DataEx	--	--
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

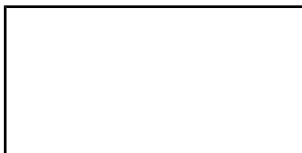
Byte 32: SIL signals

Commissioning disab.	--	--	--	Safe ESD	Safe Stop	SIL fault	SIL function active
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3**	Bit 2**	Bit 1**	Bit 0**

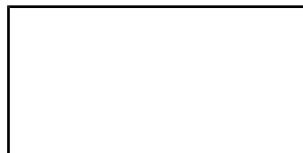
* Not for SIL version

** Only for SIL version

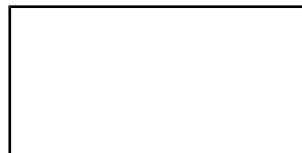
Byte 33: Reserve



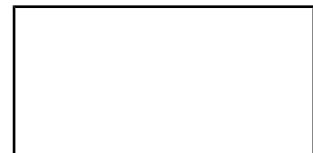
Byte 34: Reserve



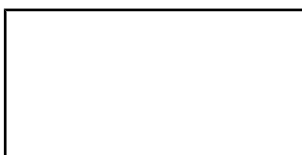
Byte 35: Reserve



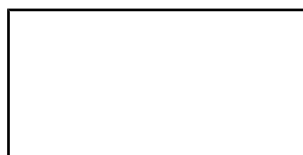
Byte 36: Reserve



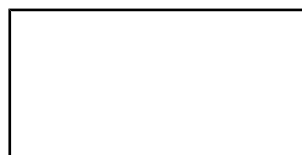
Byte 37: Reserve



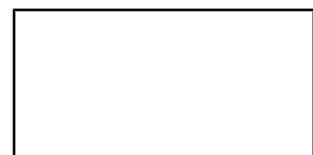
Byte 38: Reserve



Byte 39: Reserve



Byte 40: Reserve



4.1.2 Description of the bytes in the process representation input

Byte 1: Logic signals

Bits 3, 6, and 7 are collective signals.

Bits 5 and 4 of the logical signals (byte1) indicate a logical operation of the actuator, i.e. they are set when the actuator has received the command for an electrical operation (also active when e.g. the actuator is in a stepping pause during stepping mode or waiting for the end of the dead time).

Table 5: Byte 1: Logic signals

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	End position OPEN	(2) = "Bit: End p. OPEN"	1	For limit seating: Limit switch operated in direction OPEN. For torque seating: Torque switch and limit switch operated in direction OPEN.
			0	No signal.
1	End position CLOSED	(1) = "Bit: End p. CLOSED"	1	For limit seating: Limit switch operated in direction CLOSE. For torque seating: Torque switch and limit switch operated in direction CLOSE.
			0	No signal.
2	Setpoint pos.reached	(5) = "Bit: Setpoint reached"	1	The position setpoint is within max. error variable (outer dead band). Is only signalled if Profibus DP master has set the Fieldbus SETPOINT bit (process representation output).
			0	No signal.
3	Not ready REMOTE	(22) = "Bit: Not ready REMOTE"	1	Collective signal 04: Contains the result of a disjunction (OR-operation) of all bits comprised in bytes 13 and 14 (Not ready REMOTE 1 and Not ready REMOTE 2). The actuator cannot be operated from REMOTE. The actuator can only be operated via the local controls.
			0	In bytes 13 and 14, no signals are active (all bits are set to 0).
4	Running OPEN	(7) = "Bit: Running OPEN"	1	An operation command via the local controls or via fieldbus in direction OPEN is executed: Fieldbus OPEN or Fieldbus SETPOINT (process representation output). This bit remains also set during operation pauses (e.g. due to the dead time or the reversing prevention time).
			0	Operation in direction OPEN via fieldbus is not executed.
5	Running CLOSE	(6) = "Bit: Running CLOSE"	1	An operation command via the local controls or via fieldbus in direction CLOSE is executed: Fieldbus CLOSE or Fieldbus SETPOINT (process representation output). This bit remains also set during operation pauses (e.g. due to the dead time or the reversing prevention time).
			0	Operation in direction CLOSE via fieldbus is not executed.
6	Warning	(21) = "Bit: Warnings"	1	Collective signal 02: Contains the result of a disjunction (OR-operation) of all bits of bytes 17 to 20 (Warning 1 to Warning 4).
			0	In bytes 17 and 20, no warnings are active (all bits are set to 0).
7	Fault	(20) = "Bit: Fault"	1	Collective signal 03: Contains the result of a disjunction (OR-operation) of all bits of bytes 15 and 16 (Fault 1 and Fault 2). The actuator cannot be operated.
			0	In bytes 15 and 16, no faults are active (all bits are set to 0).

Byte 2: Actuator signals

Table 6: Byte 2: Actuator signals

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	Thermal fault	(56) = "Bit: Thermal fault"	1	Motor protection tripped.
			0	No signal.
1	Phase fault	(57) = "Bit: Phase fault"	1	- When connecting to a 3-phase AC system and with internal 24 V DC supply of the electronics: Phase 2 is missing. - When connecting to a 3-phase or 1-phase AC system and with external 24 V DC supply of the electronics: One of the phases L1, L2 or L3 is missing.
			0	All phases are available.
2	Selector sw. REMOTE	(9) = "Bit: Sel. sw. REMOTE"	1	Selector switch is in position REMOTE.
			0	Selector switch is not in position REMOTE.
3	Selector sw. LOCAL	(8) = "Bit: Selector sw. LOCAL"	1	Selector switch is in position LOCAL.
			0	Selector switch is not in position LOCAL.
4	Limit switch OPEN	(12) = "Bit: Limit sw. OPEN"	1	Limit switch in end position OPEN active.
			0	No signal.

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
5	Limit switch CLOSED	(11) = "Bit: Limit sw. CLOSED"	1	Limit switch in end position CLOSED active.
			0	No signal.
6	Torque sw. OPEN	(14) = "Bit: Torque sw. OPEN"	1	Torque switch operated in direction OPEN.
			0	No signal.
7	Torque sw. CLOSE	(13) = "Bit: Torque sw. CLOSE"	1	Torque switch operated in direction CLOSE.
			0	No signal.

Byte 3 and byte 4: Actual position

Byte 3 = low byte, Byte 4 = high byte.

If a position transmitter is installed in the actuator, bytes 3 and 4 are used to transmit the current actuator position. The value is transmitted in per mil (value: 0 – 1,000).

Byte 5: Device status

Table 7: Byte 5: Device status

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	Not ready REMOTE	(22) = "Bit: Not ready REMOTE"	1	Collective signal 04: Contains the result of a disjunction (OR-operation) of all bits comprised in bytes 13 and 14 (Not ready REMOTE 1 and Not ready REMOTE 2). The actuator cannot be operated from REMOTE. The actuator can only be operated via the local controls.
			0	In bytes 13 and 14, no signals are active (all bits are set to 0).
1	Warning	(21) = "Bit: Warnings"	1	Collective signal 02: Contains the result of a disjunction (OR-operation) of all bits of bytes 17 to 20 (Warning 1 to Warning 4).
			0	In bytes 17 and 20, no warnings are active (all bits are set to 0).
2	Fault	(20) = "Bit: Fault"	1	Collective signal 03: Contains the result of a disjunction (OR-operation) of all bits of bytes 15 and 16 (Fault 1 and Fault 2). The actuator cannot be operated.
			0	In bytes 15 and 16, no faults are active (all bits are set to 0).
3	NAMUR mainten. req.	(19) = "Bit: Maintenance requ."	1	Collective signal 09: Indication according to NAMUR recommendation NE 107 Recommendation to perform maintenance. Contains the result of a disjunction (OR-operation) of all bits of byte 24 (Maintenance required).
			0	In all bits of byte 24, no signals are active (all bits are set to 0).
4	NAMUR out of spec.	(18) = "Bit: Out of spec."	1	Collective signal 07: Indication according to NAMUR recommendation NE 107 Actuator is operated outside the normal service conditions. Contains the result of a disjunction (OR-operation) of all bits of bytes 25 to 28 (Out of specification 1 to 4).
			0	In bytes 25 and 28, no signals are active (all bits are set to 0).
5	NAMUR funct. check	(17) = "Bit: Function check"	1	Collective signal 08: Indication according to NAMUR recommendation NE 107 The actuator is being worked on; output signals are temporarily invalid. Contains the result of a disjunction (OR-operation) of all bits of bytes 29 and 30 (Function check 1 and 2).
			0	In bytes 29 and 30, no signals are active (all bits are set to 0).
6	NAMUR failure	(16) = "Bit: Failure"	1	Collective signal 10: Indication according to NAMUR recommendation NE 107 Actuator function failure, output signals are invalid. Contains the result of a disjunction (OR-operation) of all bits of byte 23 (Failure).
			0	In all bits of byte 23, no signals are active (all bits are set to 0).

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
7	Device ok	(15) = "Bit: Device ok"	1	Collective signal 05: The device is ready for remote control. No AUMA warnings, AUMA faults or signals according to NAMUR are present. Bit 7 is set if bits 0 to 6 are deleted.
			0	Contains the result of a disjunction (OR-operation) of bits 0 to 6 (device status).

Byte 6: Operation status

They include information about the actuator movement.

Table 8: Byte 6: Operation status

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	Operation pause active	(23) = "Bit: Op. pause active"	1	The actuator is in off-time (e.g. reversing prevention time).
			0	No signal.
1	In intermediate pos.	(29) = "Bit: In interm. position"	1	The actuator is in an intermediate position e.g. neither in end position OPEN nor in end position CLOSED.
			0	No signal.
2	Start stepping mode	Start stepping mode	1	The actuator is within the set stepping range.
			0	The actuator is outside the set stepping range.
3	—	—		No signal (reserved).
4	Actuator running	(25) = "Bit: Actuator running"	1	Actuator is running (output drive is moving) Hard wired collective signal consisting of signals: (26) Running LOCAL (27) Running REMOTE (28) Handwheel oper.
			0	No signal.
5	Handwheel oper.	(28) = "Bit: Running via handw."	1	Output drive rotates without electric operation command.
			0	No signal.
6	Running REMOTE	(27) = "Bit: Running REMOTE"	1	Output drive rotates due to operation command from REMOTE.
			0	No signal.
7	Running LOCAL	(26) = "Bit: Running LOCAL"	1	Output drive rotates due to operation command from LOCAL.
			0	No signal.

Byte 7: Intermediate positions

Table 9: Byte 7: Intermediate positions

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	Intermediate pos. 1	(31) = "Bit: Intermediate pos. 1"	1	Intermediate position 1 reached.
			0	No signal.
1	Intermediate pos. 2	(32) = "Bit: Intermediate pos. 2"(32) = "Bit: Intermediate pos. 2"	1	Intermediate position 2 reached.
			0	No signal.
2	Intermediate pos. 3	(33) = "Bit: Intermediate pos. 3"	1	Intermediate position 3 reached.
			0	No signal.
3	Intermediate pos. 4	(34) = "Bit: Intermediate pos. 4"	1	Intermediate position 4 reached.
			0	No signal.
4	Intermediate pos. 5	(35) = "Bit: Intermediate pos. 5"	1	Intermediate position 5 reached.
			0	No signal.
5	Intermediate pos. 6	(36) = "Bit: Intermediate pos. 6"	1	Intermediate position 6 reached.
			0	No signal.
6	Intermediate pos. 7	(37) = "Bit: Intermediate pos. 7"	1	Intermediate position 7 reached.
			0	No signal.
7	Intermediate pos. 8	(38) = "Bit: Intermediate pos. 8"	1	Intermediate position 8 reached.
			0	No signal.

Byte 8: Discrete inputs

Table 10: Byte 8: Discrete inputs

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	Input DIN 1	(39) = "Bit: Input DIN 1"	1	A high signal (+24 V DC) is present at digital input 1.
			0	No signal.
1	Input DIN 2	(40) = "Bit: Input DIN 2"	1	A high signal (+24 V DC) is present at digital input 2.
			0	No signal.
2	Input DIN 3	(41) = "Bit: Input DIN 3"	1	A high signal (+24 V DC) is present at digital input 3.
			0	No signal.
3	Input DIN 4	Input DIN 4	1	A high signal (+24 V DC) is present at digital input 4.
			0	No signal.
4	Input DIN 5	Input DIN 5	1	A high signal (+24 V DC) is present at digital input 5.
			0	No signal.
5	Input DIN 6	Input DIN 6	1	A high signal (+24 V DC) is present at digital input 6.
			0	No signal.
6	Input DIN 7	Input DIN 7	1	A high signal (+24 V DC) is present at digital input 7.
			0	No signal.
7	Bluetooth connected	(46) = "Bit: Input DIN 7"	1	The Bluetooth interface is connected.
			0	No signal.

Byte 9 and byte 10: Input AIN 1

Byte 9 = low byte, Byte 10 = high byte.

Bytes 9 and 10 transmit the value of the first additional free analogue current input of the EtherNet/IP interface. The start and end values can be set via the display. (For operation, please refer to the respective operation instructions for the actuator.)

If the measuring values are 0.3 mA below the initial value, a signal loss is indicated.

The value is transmitted in per mil (value: 0 – 1,000).

Byte 11 and byte 12: Torque

Byte 11 = low byte, Byte 12 = high byte.

Bytes 11 and 12 transmit the current torque of the actuator (only if an MWG is installed in the actuator).

The value transmitted is the current torque in percent or per mil of the nominal actuator torque.

The value is transmitted in per mil (value: 0 – 1,000).

- The value 1,000 corresponds to 127,0 % torque in direction OPEN.
- The value 500 is the torque zero point.
- The value 0 corresponds to 127.0 % torque in direction CLOSE.

Byte 13: Not ready REMOTE 1

Table 11: Byte 13: Not ready REMOTE 1

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	Wrong oper. cmd	(98) = "Bit: Wrong operation cmd"	1	Wrong operation command. Indicates that several operation commands were received simultaneously via Profibus DP (e.g. Remote OPEN and Remote CLOSE simultaneously or Remote CLOSE/Remote OPEN and Remote SETPOINT simultaneously) or that the max. value for a setpoint position has been exceeded (setpoint position > 1,000).
			0	Operation commands are OK.
1	Sel. sw. not REMOTE	(53) = "Bit: Sel. sw. not REMOTE"	1	Selector switch is in position LOCAL or OFF .
			0	Selector switch is in position REMOTE .

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
2	Interlock active	(52) = "Bit: Interlock active"	1	Actuator is locked.
			0	No signal.
3	Local STOP	Local STOP	1	Push button STOP of local controls is operated.
			0	No signal.
4	EMCY stop active	(50) = "Bit: EMCY stop active"	1	Operation mode EMERGENCY stop is active (EMERGENCY stop button has been pressed).
			0	EMERGENCY stop button not pressed (normal operation).
5	EMCY behav. active	(49) = "Bit: EMCY behav.act."	1	Operation mode EMERGENCY behaviour is active (EMERGENCY signal was sent).
			0	No signal.
6	Fail state fieldbus	(47) = "Bit: FailState fieldbus"	1	No valid communication via fieldbus (despite available connection).
			0	Communication via fieldbus is OK.
7	I/O interface	(48) = "Bit: I/O interface"	1	The actuator is controlled via the I/O interface (parallel).
			0	The actuator is controlled via the fieldbus.

Byte 14: Not ready REMOTE 2

Table 12: Byte 14: Not ready REMOTE 2

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	—	—		No signal (reserved).
1	—	—		No signal (reserved).
2	SIL function active	SIL function active	1	Safety function of the SIL module is active.
			0	No signal.
3	Disabled	Disabled	1	The actuator is in operation mode Disabled.
			0	No signal.
4	—	—		No signal (reserved).
5	PVST / valve test active	(116) = "Bit: PVST active"	1	The Partial Valve Stroke Test (PVST) or the torque profile operation (reference or comparative operation) is active.
			0	No signal.
6	Service active	(51) = "Bit: Service active"	1	Operation mode Service is active.
			0	No signal.
7	Handwheel active	Handwheel active	1	Manual operation is active (handwheel is engaged); optional signal.
			0	No signal.

Byte 15: Fault 1

The fault signals contain the causes why the actuator cannot be operated.

Table 13: Byte 15: Fault 1

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	Configuration error	(72) = "Bit: Configuration error"	1	Incorrect configuration, i.e. the current setting of the actuator controls is invalid.
			0	Configuration is OK.
1	—	—		No signal (reserved).
2	Thermal fault	(56) = "Bit: Thermal fault"	1	Motor protection tripped.
			0	No signal.
3	Phase fault	(57) = "Bit: Phase fault"	1	- When connecting to a 3-phase AC system and with internal 24 V DC supply of the electronics: Phase 2 is missing. - When connecting to a 3-phase or 1-phase AC system and with external 24 V DC supply of the electronics: One of the phases L1, L2 or L3 is missing.
			0	No signal.
4	Torque fault OPEN	(61) = "Bit: Torque fault OPEN"	1	Torque fault in direction OPEN.
			0	No signal.

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
5	Torque fault CLOSE	(60) = "Bit: Torque fault CLOSE"	1	Torque fault in direction CLOSE.
			0	No signal.
6	Internal error	(69) = "Bit: Internal fault"	1	Collective signal 14: Internal error.
			0	No internal fault.
7	Wrn no reaction	(71) = "Bit: No reaction"	1	No actuator reaction to operation commands within the set reaction time.
			0	No signal.

Byte 16: Fault 2

The fault signals contain the causes why the actuator cannot be operated.

Table 14: Byte 16: Fault 2

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	—	—		No signal (reserved).
1	—	—		No signal (reserved).
2	—	—		No signal (reserved).
3	—	—		No signal (reserved).
4	—	—		No signal (reserved).
5	Incorrect rotary direct.	—		Wrong direction of rotation.
6	Config. error REMOTE	(123) = "Bit: Config error remote"	1	Config. error of REMOTE interface active.
			0	No signal.
7	Incorrect phase seq	Incorrect phase sequence	1	The phase conductors L1, L2 and L3 are connected in the wrong sequence.
			0	Phase sequence is OK.

Byte 17: Warnings 1

The warning signals are for information only and do not interrupt or disable an operation (as opposed to faults).

Table 15: Byte 17: Warnings 1

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	Maintenance required		1	Maintenance is required.
			0	No signal.
1	—	—		No signal (reserved).
2	—	—		No signal (reserved).
3	—	—		No signal (reserved).
4	Torque wrn CLOSE	(125) = "Bit: Torque wrn CLOSE"	1	Warning: Limit value for torque warning in direction CLOSE exceeded.
			0	No signal.
5	Torque wrn OPEN	(124) = "Bit: Torque wrn OPEN"	1	Warning: Limit value for torque warning in direction OPEN exceeded.
			0	No signal.
6	SIL fault	SIL fault	1	Warning: No actuator reaction to operation commands within the set reaction time.
			0	No signal.
7	Wrn no reaction	(71) = "Bit: No reaction"	1	No actuator reaction to operation commands within the set reaction time.
			0	No signal.

Byte 18: Warnings 2

Table 16: Byte 18: Warnings 2

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	Wrn controls temp.	(88) = "Bit: WrnControlsTemp"	1	Warning: Temperature within actuator controls housing too high.
			0	No signal.

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
1	—	—		No signal (reserved).
2	—	—		No signal (reserved).
3	24 V DC external	24V DC, external	1	The external 24 V DC voltage supply of the actuator controls has exceeded the power supply limits.
			0	No signal.
4	—	—		No signal (reserved).
5	RTC voltage	(126) = "Bit: RTC button cell"	1	Warning: The voltage of the RTC button cell is too low.
			0	No signal.
6	Time not set	(77) = "Bit: RTC not set"	1	The real time clock has not yet been set on the basis of valid values.
			0	No signal.
7	Config. warning	(108) = "Bit: Config. Warning"	1	Warning: Configuration setting is incorrect. The device can still be operated with restrictions.
			0	No signal.

Byte 19: Warnings 3

Table 17: Byte 19: Warnings 3

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	—	—		No signal (reserved).
1	—	—		No signal (reserved).
2	Wrn input AIN 2	Warning input AIN 2	1	Warning: Loss of signal analogue input 2
			0	No signal.
3	Wrn input AIN 1	(91) = "Bit: Wrn input AIN 1"	1	Warning: Loss of signal analogue input 1
			0	No signal.
4	Internal warning	(70) = "Bit: Internal warning"	1	Collective signal 15: Internal warning.
			0	No internal warning.
5	Wrn op.mode starts	(85) = "Bit: WrnOnTiStarts"	1	Warning: Max. number of motor starts exceeded.
			0	No signal.
6	Wrn op.mode run time	(84) = "Bit: WrnOnTiRunning"	1	Warning: Max. running time/h exceeded.
			0	No signal.
7	Op. time warning	(63) = "Bit: Operat. time warning"	1	Warning: Max. permissible operating time for an operation (OPEN-CLOSE) exceeded.
			0	No signal.

Byte 20: Warnings 4

Table 18: Byte 20: Warnings 4

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	—	—		No signal (reserved).
1	—	—		No signal (reserved).
2	Wrn setpoint position	(95) = "Bit: WrnSetpointPos"	1	Warning: Signal loss of actuator setpoint position.
			0	No signal.
3	PVST required	PVST required	1	Warning: A Partial Valve Stroke Test (PVST) should be performed.
			0	
4	—	—		No signal (reserved).
5	Failure behav. active	(30) = "Bit: Failure behav. active"	1	The failure behaviour is active.
			0	No signal.
6	Abort torque op.prf.	(118) = "Bit: PVST abort"	1	The Partial Valve Stroke Test (PVST) or the torque profile operation (reference or comparative operation) was aborted or could not be started. Remedy: Perform RESET or restart PVST.
			0	No signal.

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
7	PVST/Valve test fault	(117) = "Bit: PVST fault"	1	The Partial Valve Stroke Test (PVST) or the torque profile operation (reference or comparative operation) could not be successfully executed.
			0	No signal.

Byte 21 and byte 22: Input AIN 2

Byte 21 = low byte, Byte 22 = high byte.

Bytes 21 and 22 transmit the value of the first additional free analogue current input of the EtherNet/IP interface. The start and end values can be set via the display. (For operation, please refer to the respective operation instructions for the actuator.)

If the measuring values are 0.3 mA below the initial value, a signal loss is indicated.

The value is transmitted in per mil (value: 0 – 1,000).

Byte 23: Failure

Causes of the Failure signal in accordance with NAMUR recommendation NE 107.

Table 19: Byte 23: Failure

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	—	—		No signal (reserved).
1	—	—		No signal (reserved).
2	—	—		No signal (reserved).
3	—	—		No signal (reserved).
4	—	—		No signal (reserved).
5	—	—		No signal (reserved).
6	—	—		No signal (reserved).
7	Fault	(20) = "Bit: Fault"	1	Collective signal 03: Contains the result of a disjunction (OR-operation) of all bits of bytes 15 and 16 (Fault 1 and Fault 2). The actuator cannot be operated.
			0	In bytes 15 and 16, no faults are active (all bits are set to 0).

Byte 24: Maintenance required

Causes of the Maintenance required signal in accordance with NAMUR recommendation NE 107.

Table 20: Byte 24: Maintenance required

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	Mainten. mechanics	"Maintenance mechanics"	1	Maintenance required of mechanics (AUMA Service).
			0	No signal.
1	Mainten. seals	"Maintenance seals"	1	Maintenance required of seals (AUMA Service).
			0	No signal.
2	Mainten. lubricant	"Maintenance lubricant"	1	Maintenance required of lubricants (AUMA Service).
			0	No signal.
3	Mainten. contactors	"Maintenance contactors"	1	Maintenance requirement of contactors (AUMA Service).
			0	No signal.
4	Mainten. interval	"Maintenance interval"	1	The set maintenance interval has expired.
			0	No signal.
5	Time setting required	"Time set required"	1	Request for time synchronisation.
			0	No signal.
6	—	—		No signal (reserved).
7	—	—		No signal (reserved).

Byte 25: Out of specification 1

Causes of the Out of specification signal in accordance with NAMUR recommendation NE 107.

Table 21: Byte 25: Out of specification 1

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	—	—		No signal (reserved).
1	—	—		No signal (reserved).
2	—	—		No signal (reserved).
3	—	—		No signal (reserved).
4	Torque wrn CLOSE	(125) = "Bit: Torque wrn CLOSE"	1	Warning: Limit value for torque warning in direction CLOSE exceeded.
			0	No signal.
5	Torque wrn OPEN	(124) = "Bit: Torque wrn OPEN"	1	Warning: Limit value for torque warning in direction OPEN exceeded.
			0	No signal.
6	SIL fault	SIL fault	1	Warning: No actuator reaction to operation commands within the set reaction time.
			0	No signal.
7	Wrn no reaction	(71) = "Bit: No reaction"	1	No actuator reaction to operation commands within the set reaction time.
			0	No signal.

Byte 26: Out of specification 2

Table 22: Byte 26: Out of specification 2

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	Wrn controls temp.	(88) = "Bit: WrnControlsTemp"	1	Warning: Temperature within actuator controls housing too high.
			0	No signal.
1	—	—		No signal (reserved).
2	—	—		No signal (reserved).
3	24 V DC external	24V DC, external	1	The external 24 V DC voltage supply of the actuator controls has exceeded the power supply limits.
			0	No signal.
4	Battery low	"Battery almost empty"	1	Battery flat.
			0	No signal.
5	RTC voltage	(126) = "Bit: RTC button cell"	1	Warning: The voltage of the RTC button cell is too low.
			0	No signal.
6	Time not set	(77) = "Bit: RTC not set"	1	The real time clock has not yet been set on the basis of valid values.
			0	No signal.
7	Config. warning	(108) = "Bit: Config. Warning"	1	Warning: Configuration setting is incorrect. The device can still be operated with restrictions.
			0	No signal.

Byte 27: Out of specification 3

Table 23: Byte 27: Out of specification 3

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	—	—		No signal (reserved).
1	—	—		No signal (reserved).
2	Wrn input AIN 2	Warning input AIN 2	1	Warning: Loss of signal analogue input 2
			0	No signal.
3	Wrn input AIN 1	(91) = "Bit: Wrn input AIN 1"	1	Warning: Loss of signal analogue input 1
			0	No signal.
4	Internal warning	(70) = "Bit: Internal warning"	1	Collective signal 15: Internal warning.
			0	No internal warning.

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
5	Wrn op.mode starts	(85) = "Bit: WrnOnTiStarts"	1	Warning: Max. number of motor starts exceeded.
			0	No signal.
6	Wrn op.mode run time	(84) = "Bit: WrnOnTiRunning"	1	Warning: Max. running time/h exceeded.
			0	No signal.
7	Op. time warning	(63) = "Bit: Operat. time warning"	1	Warning: Max. permissible operating time for an operation (OPEN-CLOSE) exceeded.
			0	No signal.

Byte 28: Out of specification 4

Table 24: Byte 28: Out of specification 4

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	—	—		No signal (reserved).
1	—	—		No signal (reserved).
2	Wrn setpoint position	(95) = "Bit: WrnSetpointPos"	1	Warning: Signal loss of actuator setpoint position.
			0	No signal.
3	PVST required	PVST required	1	Warning: A Partial Valve Stroke Test (PVST) should be performed.
			0	
4	—	—		No signal (reserved).
5	Failure behav. active	(30) = "Bit: Failure behav. active"	1	The failure behaviour is active.
			0	No signal.
6	Abort torque op.prf.	(118) = "Bit: PVST abort"	1	The Partial Valve Stroke Test (PVST) or the torque profile operation (reference or comparative operation) was aborted or could not be started. Remedy: Perform RESET or restart PVST.
			0	No signal.
7	PVST/Valve test fault	(117) = "Bit: PVST fault"	1	The Partial Valve Stroke Test (PVST) or the torque profile operation (reference or comparative operation) could not be successfully executed.
			0	No signal.

Byte 29: Function check 1

Causes of the Function check signal in accordance with NAMUR recommendation NE 107.

Table 25: Byte 29: Function check 1

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	Local STOP	Local STOP	1	Push button STOP of local controls is operated.
			0	No signal.
1	Sel. sw. not REMOTE	(53) = "Bit: Sel. sw. not REMOTE"	1	Selector switch is in position LOCAL or OFF .
			0	Selector switch is in position REMOTE .
2	Service active	(51) = "Bit: Service active"	1	Operation mode Service is active.
			0	No signal.
3	Handwheel oper.	Handwheel active	1	Manual operation is active (handwheel is engaged); optional signal.
			0	No signal.
4	EMCY stop active	(50) = "Bit: EMCY stop active"	1	Operation mode EMERGENCY stop is active (EMERGENCY stop button has been pressed).
			0	EMERGENCY stop button not pressed (normal operation).
5	PVST active	(116) = "Bit: PVST active"	1	The Partial Valve Stroke Test (PVST) or the torque profile operation (reference or comparative operation) is active.
			0	No signal.
6	—	—		No signal (reserved).
7	—	—		No signal (reserved).

Byte 30: Function check 2

The contents are reserved for further Function check signals in accordance with NAMUR recommendation NE 107.

Byte 31: Fieldbus status

Information on fieldbus status.

Table 26: Byte 31: Fieldbus status

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	—	—		No signal (reserved).
1	—	—		No signal (reserved).
2	DataEx	Channel 1 DataEx	1	Channel 1 is in the data exchange state (DataEx)
			0	No signal.
3	—	—		No signal (reserved).
4	—	—		No signal (reserved).
5	—	—		No signal (reserved).
6	Channel 1 activity	Channel 1 activity	1	Communication on channel 1.
			0	No signal.
7	Channel 2 activity	Channel 2 activity	1	Communication on channel 2.
			0	No signal.

Byte 32: SIL signals

Table 27: Byte 32: SIL signals

Bit	Designation (process representation)	Prm-Text-Def GSD file	Value	Description
0	Safe ESD	Safe ESD	1	Safe ESD (Emergency Shut Down) safety function of the SIL module is active.
			0	No signal.
1	Safe Stop	Safe STOP	1	Safe STOP safety function of the SIL module is active.
			0	No signal.
2	SIL fault	SIL fault	1	Collective signal Warning: A SIL fault of the SIL module has occurred.
			0	No signal.
3	SIL function active	SIL function active	1	A safety function of the SIL module is active.
			0	No signal.
4	—	—		No signal (reserved).
5	—	—		No signal (reserved).
6	—	—		No signal (reserved).
7	Commissioning disab.		1	Signal: Commissioning locked.
			0	No signal.

Byte 33 to byte 40: Reserve

The contents are reserved for future extensions.

4.2 Output data (process representation output)

The consumer (scanner/controller) can control the provider (actuator) via the process representation output.

4.2.1 Process representation output arrangement



The actuator must be in operation mode REMOTE to be able to perform remote operation.

Defintion

- Assembly Object Class ID: 4_(hex)
- Assembly Instance: 101_(65hex)
- Attribute: 3_(hex)
- Input Size: 26 bytes

Figure 7:

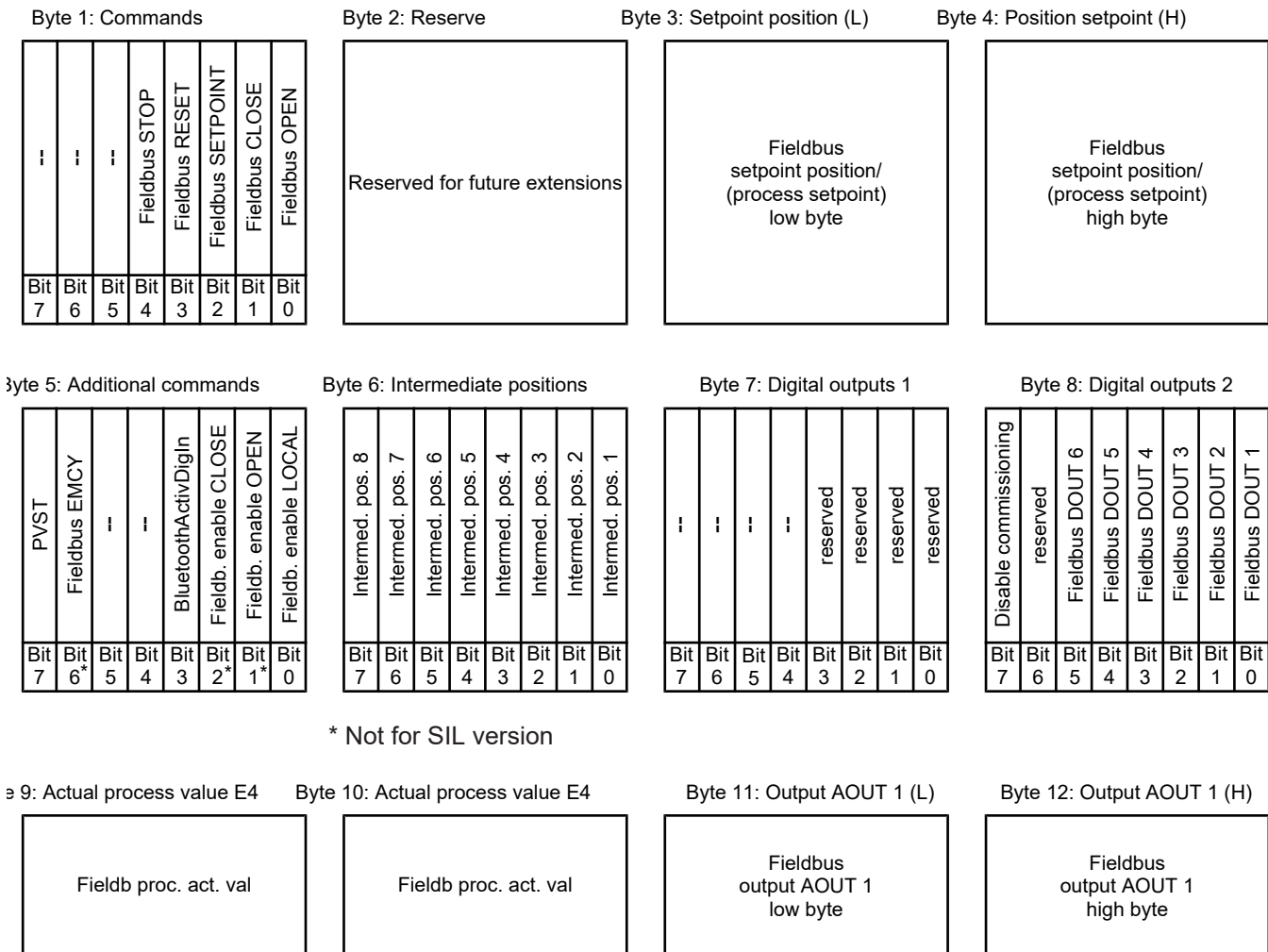
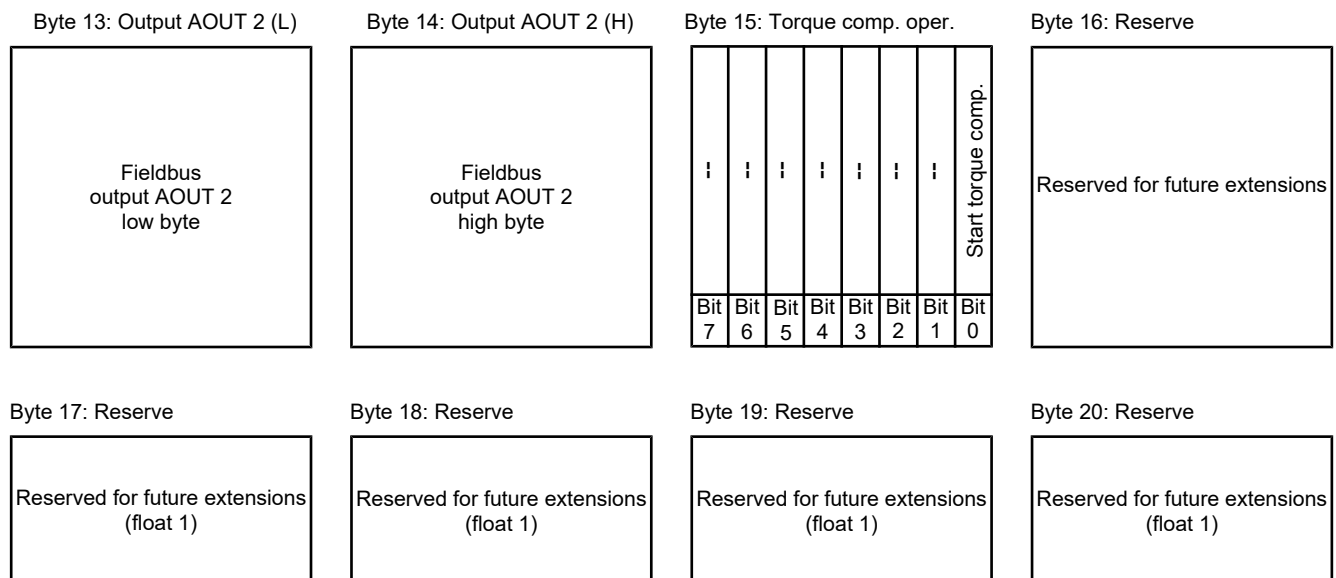


Figure 8:



Byte 21: Reserve

Reserved for future extensions
(float 1)

Byte 22: Reserve

Reserved for future extensions
(float 2)

Byte 23: Reserve

Reserved for future extensions
(float 2)

Byte 24: Reserve

Reserved for future extensions
(float 2)

Byte 25: Reserve

Reserved for future extensions
(float 2)

Byte 26: Reserve

Reserved for future extensions
(float 2)

4.2.2 Description of the output data

Byte 1: Commands

Table 28: Byte 1: Commands

Bit	Designation (process representation)	Value	Description
0	Fieldbus OPEN	1	Operation command in direction OPEN.
		0	No command.
1	Fieldbus CLOSE	1	Operation command in direction CLOSE.
		0	No command.
2	Fieldbus SETPOINT	1	Run to setpoint. Setpoint is provided via bytes 3 and 4. In combination with a process controller, this bit is used to select between process controller operation and OPEN-CLOSE operation.
		0	No command. In combination with a process controller, this bit is used to select between process controller operation and OPEN-CLOSE operation.
3	Fieldbus RESET	1	Certain indications can be reset using this command in operation mode REMOTE via fieldbus (e.g. PTC tripping device and torque fault).
		0	No command.
4	Not used		Fieldbus STOP.
5	—		No command (reserved).
6	—		No command (reserved).
7	—		No command (reserved).

Bits 0, 1, 2 = operation commands

Bits 0 – 2 are used to transmit operation commands to the actuator. Only one of these bits may be set to 1 at any given time. If several bits are set, no operation is performed and the following signal is given: **Wrong oper. cmd**

For operation commands via bit 2 (Fieldbus SETPOINT):

- If the setpoint is 0 per mil, the actuator runs to end position CLOSED; it runs to end position OPEN for 1000 per mil.
- If the limit of 1,000 is exceeded, the actuator completely runs to end position OPEN.
- To avoid placing too much strain on the actuator mechanics, reversion of direction is delayed. The default setting in the factory for the reversing prevention time is 300 ms.

Bits 4, 5, 6, 7 Bits 4 through 7 are not used and must be set to 0.

Byte 2: Reserve

Reserved for future extensions.

Bytes 3 and 4: Setpoint /(process setpoint, option)

Byte 3 = low byte, Byte 4 = high byte.

The setpoint position is transmitted via bytes 3 and 4 (value: 0 – 1,000), using the position controller.

- The value 1,000 corresponds to the maximum setpoint, e.g. end position OPEN.
- The value 0 corresponds to the minimum setpoint, e.g. end position CLOSED.

As an alternative, the process setpoint can be transmitted via bytes 3 and 4 (value 0...1,000), using a process controller (option). Value 1,000 corresponds to the maximum process setpoint, value 0 to the minimum process setpoint.

Byte 5: Additional commands

Table 29: Byte 5: Additional commands

Bit	Designation (process representation)	Value	Description
0	Fieldb. enable LOCAL	1	Actuator operation via local controls enabled.
		0	Actuator operation via local controls disabled.
1	Fieldb. enable OPEN	1	Enabling operation command in direction OPEN.
		0	Operation command in direction OPEN disabled.
2	Fieldb. enable CLOSE	1	Enabling operation command in direction CLOSE.
		0	Operation command in direction CLOSE disabled.
3	BluetoothActivDigIn	1	Activation of Bluetooth interface.
		0	Activation of Bluetooth interface disabled.
4	—		No command (reserved).
5	—		No command (reserved).
6	Fieldbus EMCY	1	EMERGENCY signal, triggers EMERGENCY behaviour.
		0	No command.
7	PVST	1	Start Partial Valve Stroke Test (PVST).
		0	No operation command

Byte 6: Intermediate positions

Byte 6 is used for coding operation commands. Thus, 8 intermediate positions can be directly selected via fieldbus commands. Hereby, the selected intermediate position is approached directly, without stopping in another intermediate position.

In this case, the actuator continues running until the selected intermediate position has been reached. Example: Operation from position 5 to 7 without stopping at position 6.

Table 30: Byte 6: Operation commands for intermediate positions

Value	Behaviour
0x01	Position 1 is approached selecting the shortest travel.
0x02	Position 2 is approached selecting the shortest travel.
0x04	Position 3 is approached selecting the shortest travel.
0x08	Position 4 is approached selecting the shortest travel.
0x10	Position 5 is approached selecting the shortest travel.
0x20	Position 6 is approached selecting the shortest travel.
0x40	Position 7 is approached selecting the shortest travel.
0x80	Position 8 is approached selecting the shortest travel.

If the multiport valve function is active (option), the entire byte 6 is used for coding of multiport valve operation commands. Up to 12 positions can either be approached selecting the shortest travel, in clockwise direction (CW), or in counterclockwise direction (CCW). Furthermore, the actuator can also be operated without any position indications in clockwise or counterclockwise direction (CW or CCW).

Table 31: Operation commands via byte 6 for activated multiport valve function

Value	Operation direction/position	Behaviour
0x01	Position 1	Position 1 is approached selecting the shortest travel.
0x02	Position 2	Position 2 is approached selecting the shortest travel.
0x04	Position 3	Position 3 is approached selecting the shortest travel.
0x08	Position 4	Position 4 is approached selecting the shortest travel.
0x10	Position 5	Position 5 is approached selecting the shortest travel.
0x20	Position 6	Position 6 is approached selecting the shortest travel.
0x40	Position 7	Position 7 is approached selecting the shortest travel.
0x80	Position 8	Position 8 is approached selecting the shortest travel.
0x81	Position 9	Position 9 is approached selecting the shortest travel.
0x82	Position 10	Position 10 is approached selecting the shortest travel.
0x83	Position 11	Position 11 is approached selecting the shortest travel.
0x84	Position 12	Position 12 is approached selecting the shortest travel.
0x90	CW	Actuator operates in clockwise direction (without stop at any position).
0x91	CW Position 1	Position 1 is approached in clockwise direction (CW).
0x92	CW Position 2	Position 2 is approached in clockwise direction (CW).
0x93	CW Position 3	Position 3 is approached in clockwise direction (CW).
0x94	CW Position 4	Position 4 is approached in clockwise direction (CW).
0x95	CW Position 5	Position 5 is approached in clockwise direction (CW).
0x96	CW Position 6	Position 6 is approached in clockwise direction (CW).
0x97	CW Position 7	Position 7 is approached in clockwise direction (CW).
0x98	CW Position 8	Position 8 is approached in clockwise direction (CW).
0x99	CW Position 9	Position 9 is approached in clockwise direction (CW).
0x9A	CW Position 10	Position 10 is approached in clockwise direction (CW).
0x9B	CW Position 11	Position 11 is approached in clockwise direction (CW).
0x9C	CW Position 12	Position 12 is approached in clockwise direction (CW).
0xA0	CCW	Actuator operation in counterclockwise direction (without stop at any position).
0xA1	CCW Position 1	Position 1 is approached in counterclockwise direction (CCW).
0xA2	CCW Position 2	Position 2 is approached in counterclockwise direction (CCW).
0xA3	CCW Position 3	Position 3 is approached in counterclockwise direction (CCW).
0xA4	CCW Position 4	Position 4 is approached in counterclockwise direction (CCW).
0xA5	CCW Position 5	Position 5 is approached in counterclockwise direction (CCW).
0xA6	CCW Position 6	Position 6 is approached in counterclockwise direction (CCW).
0xA7	CCW Position 7	Position 7 is approached in counterclockwise direction (CCW).
0xA8	CCW Position 8	Position 8 is approached in counterclockwise direction (CCW).

Value	△ Operation direction/position	Behaviour
0xA9	CCW Position 9	Position 9 is approached in counterclockwise direction (CCW).
0xAA	CCW Position 10	Position 10 is approached in counterclockwise direction (CCW).
0xAB	CCW Position 11	Position 11 is approached in counterclockwise direction (CCW).
0xAC	CCW Position 12	Position 12 is approached in counterclockwise direction (CCW).

Byte 7: Digital outputs 1

The digital outputs Fieldbus DOUT 1 – DOUT 6 of the fieldbus interface can be used as commands for the output contacts. For this, the outputs of the output contacts have to be assigned with the **Fieldbus DOUT 1 – Fieldbus DOUT 6** signals.

Table 32: Byte 7: Digital outputs 1

Bit	Designation (process representation)	Value	Description
0	—		No command (reserved).
1	—		No command (reserved).
2	—		No command (reserved).
3	—		No command (reserved).
4	—		No command (reserved).
5	—		No command (reserved).
6	—		No command (reserved).
7	—		No command (reserved).

Byte 8: Digital outputs 2

Table 33: Byte 8: Digital outputs 2

Bit	Designation (process representation)	Value	Description
0	Fieldbus DOUT 1	1	Digital output 1 is activated.
		0	Output is deactivated.
1	Fieldbus DOUT 2	1	Digital output 2 is activated.
		0	Output is deactivated.
2	Fieldbus DOUT 3	1	Digital output 3 is activated.
		0	Output is deactivated.
3	Fieldbus DOUT 4	1	Digital output 4 is activated.
		0	Output is deactivated.
4	Fieldbus DOUT 5	1	Digital output 5 is activated.
		0	Output is deactivated.
5	Fieldbus DOUT 6	1	Digital output 6 is activated.
		0	Output is deactivated.
6	—		No command (reserved).
7	Disable commissioning	1	Disable commissioning.
		0	Enable commissioning.

Byte 9 and byte 10: Actual process value E4

Fieldb proc. act. val

Byte 11 and byte 12: Fieldbus output AOUT 1

Byte 11 = low byte, Byte 12 = high byte.

Bytes 11 and 12 can be used to send an analogue value to the actuator.

The value is transmitted in per mil (value: 0 – 1,000).

The “Fieldbus output AOUT 1” and “Fieldbus output AOUT 2” outputs can be used as output values via the analogue outputs. For this, the outputs of the analogue outputs hat to be assigned with the **Fieldbus AOUT 1** or **Fieldbus AOUT 2** signals.

Byte 13 and byte 14: Reserve

Reserved for future extensions.

Byte 15: Start torque comparative operation

Byte 15, bit 0 - Start torque comparative operation.

Start torque ref.

Byte 16 to byte 26: Reserve

The contents are reserved for future extensions.

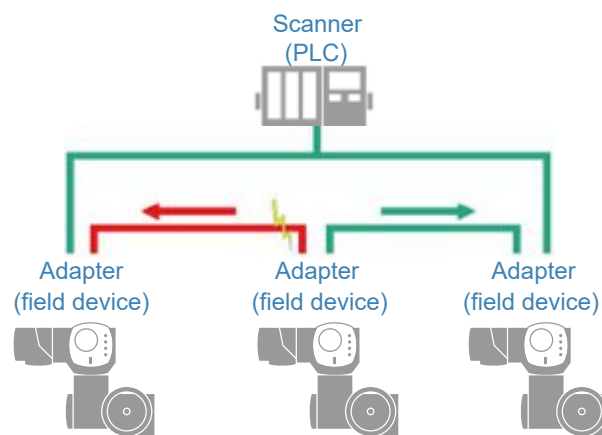
4.3 EtherNet/IP services

Acyclic communication

Acyclic communication by means of explicit messaging is performed via request/response messages which are managed within the device by the message router object. Acyclic requests comprise a service code with path indication to the desired object within the target device. Acyclic communication allows alternative access to the data of all described objects.

4.4 Redundancy

Media redundancy (ring) The media redundancy available for EtherNet/IP warrants for high availability within the plant. The actuator is equipped with two physically isolated communication ports to the host controller and can be connected within a simple ring topology. If the first channel fails, e.g. on the basis of line interruption, the second communication channel is automatically used. For this, the Device Level Ring Protocol (DLR) as defined in the EtherNet/IP standard is used. It allows the establishment of a redundant and protocol-independent ring topology whereby the change-over time is less than 5 ms. DLR is defined in the IEC 62439 standard.



This deals with a redundancy of the transmission medium. The EtherNet/IP interface of the device is not available twice.

5 Corrective actions

5.1 Troubleshooting

In case of problems with EtherNet/IP communication, the actuator provides important information on troubleshooting via the display, **Diagnostics** [M0022] menu. Assumption: Port 1/channel 1 is used as uplink in direction of the scanner (no ring topology).

Table 34: Troubleshooting table

			Causes and remedies
1.	Actuator can be controlled via EtherNet/IP?	Yes	No fault
		No	→ Continue with step 2
2.	Select menu: Diagnostics [M0022]		→ Continue with step 3
3.	Select menu: EtherNet/IP [M3866]		→ Continue with step 4
4.	Communication status [M3868]	Channel 1 DataEx	Valid telegrams to the own address. Active connection to a scanner and valid data was received by the scanner. If yes: → Continue with step 5 If no: → Continue with Channel 1 activity
		Channel 1 activity	Activity of communication interface on channel 1. Valid telegrams, however not necessarily sent to the own address. If yes: → Continue with Module status If no: → Continue with Network status
		Channel 2 activity	Activity of communication interface on channel 2. Valid telegrams, however not necessarily sent to the own address. If yes: → Continue with Module status If no: → Continue with Network status
		Network status Link Status Port 1	If yes: → Network connection to scanner available, no communication. → Continue with Module status If no: → No network connection available, check cables and connection
		Network status Link Status Port 2	If yes: → Network connection to subsequent device available, no communication. If no: → No network connection available, check cables and connection
		Module status	Wait Process Device waiting for I/O connection to a scanner. Scanner configuration incorrect → Correct parameter data within scanner/controller. → Check addressing.
			Idle I/O Connected scanner in STOP mode or has not yet sent valid data. → Check scanner configuration.
			Process Active I/O → Continue with step 5.
			Error Configuration data is inconsistent or starting parameters faulty. → Check scanner configuration.
			Exception Serious error or unexpected behaviour of EtherNet/IP module or EtherNet/IP application detected.
5.	Is operation via buttons at the device possible?	Yes	Possible causes and remedies: - Scanner does not issue an operation command. - Scanner issues incorrect operation command. → Check program of DCS.
		No	Possible causes and remedies: Faults such as torque, thermal or internal fault → Check logic board, motor control and motor.

5.2 Diagnostics

Various internal Modbus communication states to the EtherNet/IP module can be checked via the **Diagnostics [M0022]** menu.

The **Diagnostics ▶ 39** table shows information on the EtherNet/IP interface..

Table 35: Diagnostic information via EtherNet/IP

Indication on display	Value and description
Device identification [M3867]	Device identification for EtherNet/IP.
ODVA vendor ID [M3869] [PRM3675]	Vendor ID at the ODVA for use with EtherNet/IP.
IDENT Code [M3870] [PRM3633]	Ident code for identification within the AUMA Group (corresponds to device ID).
Device designation [M3871] [PRM1164]	Device designation of the actuator controls
CIPSerialNumber [PZD2230]	Unambiguous serial number for CIP devices with EtherNet/IP. Calculated from the AUMA serial number.
FW version module [PRM5219]	Firmware version of EtherNet/IP module.
CIPSerialNumber [M4013] [PZD2230]	Unambiguous serial number for CIP devices with EtherNet/IP. Calculated from the AUMA serial number.
Module FW Version [M4011] [PRM5219]	Firmware version of EtherNet/IP module.
SerialNo. IE module [M4012] [PZD2223]	Serial number of the module for Industrial Ethernet communication.
MAC address module [M3908] [PRM5205]	MAC address of the EtherNet/IP module.
IP address [M3905] [PZD2231]	Own active IP address.
SubnetMask [M3906] [PZD2232]	Own active subnet mask.
Gateway address [M3907] [PZD2233]	Own active gateway address.
DNS server 1 [M3875] [PRM6382]	IP address of DNS server 1 for Industrial Ethernet.
DNS server 2 [M3876] [PRM6383]	IP address of DNS server 2 for Industrial Ethernet.
Domain name [M3877] [PRM6384]	Domain name for indication in web server of EtherNet/IP, max. 40 characters.
Host name Part 1 [M3878] [PRM6376]	Host name for EtherNet/IP, first part of a 64-byte string.
Host name Part 2 [M3879] [PRM6377]	Host name for EtherNet/IP, second part of a 64-byte string.

6 Technical data



The following tables include standard and optional features. For detailed information on the specific version, refer to the order-related data sheet. The order-related data sheet can be downloaded from our website at www.auma.com in both German and English (please state the order number).

6.1 Technical data EtherNet/IP interface

Settings/programming the EtherNet/IP interface

The settings of EtherNet/IP interface (assignment of network parameters such as IP address, etc.) is made automatically via DHCP (default), via local controls, AUMA CDT, AUMA Assistant App or the integral web server.

General data of EtherNet/IP interface

Communication protocol	EtherNet/IP according to IEC 61158 and IEC 61784
Network topology	Star topology, point-to-point, line and ring (DLR). Integral switch function enables line and redundant ring topologies (DLR).
Connection	Ethernet IEEE 802.3 Dual pair cabling in compliance with IEC 61784-5-3, Auto Negotiation and Auto Crossover are supported.
EtherNet/IP Connection	2 x Ethernet push-in type connection terminals, integral screen with strain relief, suitable for all Ethernet cable types.
Transmission rate	100 Mbits/s (100BASE-TX), full duplex
Cable length	Max. 100 m
Device classes	Originator/Scanner/Consumer: Controller or DCS Target/adaptor/producer: Actuator
Communication model	Producer - Consumer model
Supported EtherNet/IP Specification	EtherNet/IP Conformance Test CT21
Supported EtherNet/IP Functions	• Data exchange based on generic I/O objects • Cyclic communication relation (Implicit Messages, Exclusive Owner) • Cyclic connection (Explicit messages, POINT2POINT) • I/O connection type: Exclusive Owner, cyclic – Originator to Target Type: POINT2POINT – Target to Originator Type: POINT2POINT, MULTICAST • Cyclic I/O communication (class1 connection): – Process representation input 40 bytes - Input Assembly Instance – Process representation output 20 bytes - Output Assembly Instance • Acyclic request/response communication (UCMM or class 3 connection): – Device configuration - Configuration Object – Device identification - Identity Object – Network interface settings - TCP/IP Interface Object – Ethernet information – Ethernet Link Object
Not supported EtherNet/IP Functions	No Redundant Owner connection
Supported network diagnostics and management protocols	ACD (Address Conflict Detection) ARP (Address Resolution Protocol) LLDP (Link Layer Discovery Protocol) in accordance with IEEE 802.1AB
EtherNet/IP redundancy	Device Level Ring Protocol DLR (integral switch function within AC 01.2) ring node/participant
Vendor ID	129
Product Code	1
EtherNet/IP device type	Generic Device
Device diagnostics via Ethernet	Via TCP/IP and integral web server possible Via FDI package & software for diagnostics/commissioning
Device integration	Via EDS file (available at www.auma.com) or as a Generic Device.

Commands and signals of the EtherNet/IP interface

Process representation output (command signals)	OPEN, STOP, CLOSE, position setpoint, RESET, EMERGENCY operation command, enable local controls, Interlock OPEN/CLOSE, PVST
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Commands and signals of the EtherNet/IP interface	
Process representation input (feedback signals)	End positions OPEN, CLOSED Actual position value Actual torque value, requires MWG in actuator Selector switch in position LOCAL/REMOTE Running indication (directional) Torque switches OPEN, CLOSE Limit switches OPEN, CLOSED Manual operation by handwheel or via local controls Analogue (2) and digital (4) customer inputs
Process representation input (fault signals)	Motor protection tripped Torque switch tripped prior to reaching the end position One phase missing Failure of analogue customer inputs
Behaviour on loss of communication	The behaviour of the actuator is programmable: • Stop at current position • Travel to end position OPEN or CLOSED • Travel to any intermediate position • Execute last received operation command

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