

MEM-BUS ABSOLUTE ENCODER

EtherNet/IP™

Instruction Manual



MEM620-Bus

MEM520-Bus

MEM540-Bus

MEM440-Bus

MEM450-Bus

Compliance certified by



CERTIFICATE NO. 11803.01



CERTIFICATE NO.E510647



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References

- THE CIP NETWORKS LIBRARY
Volume 1 – Common Industrial Protocol (CIP™), Edition 3.23
Volume 2 – EtherNet/IP Adaptation of CIP, Edition 1.23

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CERTIFICATE NO.E510647

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1 EtherNet/IP™

1.1 General information

EtherNet/IP™ (Ethernet Industrial Protocol) is a frame-based computer networking technology for local industrial area networks.

It follows the seven layers of the OSI (Open System Interconnection) model:

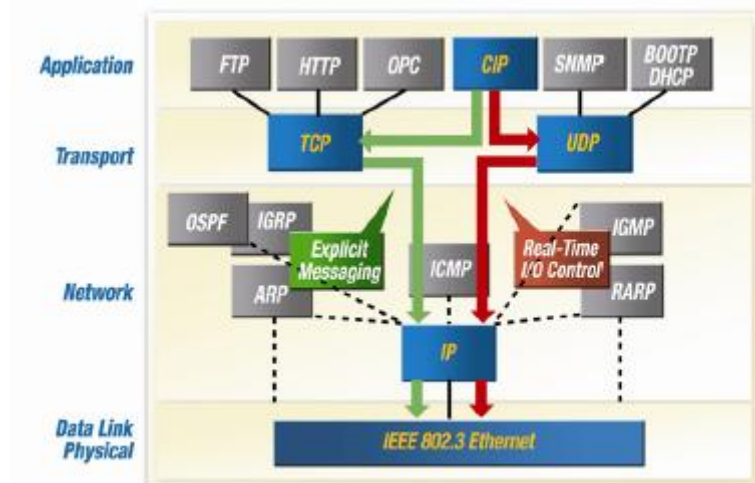
Layer	Function
7. Application	It supplies network services to end-user application.
6. Presentation	It handles syntax processing of message data such as format conversions and encryption / decryption needed to support the application layer above it.
5. Session	It manages the sequence and flow of events that initiate and tear down network connections. It is built to support multiple types of connections that can be created dynamically and run over individual networks.
4. Transport	It delivers data across network connections. Different transport protocols may support a range of optional capabilities including error recovery, flow control, and support for re-transmission.
3. Network	Logical addressing is translated here into physical addressing.
2. Data Link	It checks for physical transmission errors and packages bits into data "frames".
1. Physical	It is responsible for ultimate transmission of digital data bits from the Physical layer of the sending (source) device over network communications media to the Physical layer of the receiving (destination) device.

Table 1.1 – OSI model layers

1.2 CIP™ Protocol

As an application layer (number 7 in the OSI model), EtherNet/IP uses the Common Industrial Protocol (CIP™) for process control. ELAP MEM-BUS encoder meets all the requirements of the EtherNet/IP protocol according to IEC61784-1 and those of the encoder profile.

The encoder is an I/O adapter in the EtherNet/IP. It receives and sends explicit and implicit messages either cyclic or on request (polled).



EtherNet/IP uses TCP/IP (Transmission Control Protocol) and UDP/IP (User Datagram Protocol) for communication.

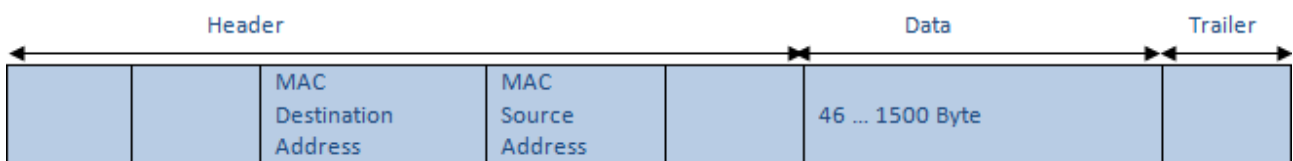
Implicit messaging is used for real-time communication between a programmable logic controller (PLC) and the encoder in EtherNet/IP. With implicit messaging a connection is established between exactly two devices within the CIP™ protocol to transfer, for example, I/O data such as position and velocity from the encoder to the PLC. Implicit messaging uses UDP/IP via port 2222. As a result, a fast data rate is used.

Explicit messaging is used in EtherNet/IP for communication that does not need to take place in real time; it is used, for example, to transfer parameters from the PLC to the encoder. Explicit messaging uses TCP/IP.

Devices that originate or use data on the network have factory-assigned media access control (MAC) addresses for unique identification. The MAC address (MAC ID) consists of 6 bytes. The first three bytes identify the manufacturer. The last three bytes are unique to the device.

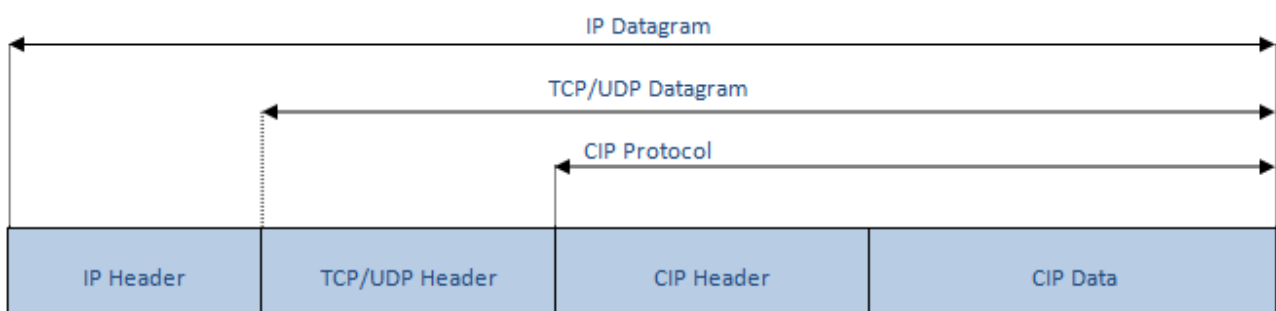
The MAC address of ELAP MEM-BUS encoders is 60-D7-E3-1x-xx-xx.

EtherNet/IP is based on the standard Ethernet frame, which consists of the Ethernet header, the Ethernet data, and the Ethernet trailer. The MAC IDs of the receiver (destination address) and of the source (source address) are contained in the Ethernet header.



The Ethernet data field consists of several nested protocols:

- The IP datagram is transported in the user data of the Ethernet data field.
- The TCP segment or the UDP datagram is transported in the user data of the IP datagram.
- The CIP™ protocol is transported in the user data of the TCP segment or the UDP datagram.



CIP™ is a message-based protocol that implements a relative path to send a message from the “producing” device to the “consuming” devices. The producing device contains the path information that steers the message along the proper route to reach its consumers. Because the producing device holds this information, the other devices along the path simply pass it, without any need to store it.

The Producer/Consumer model has two significant benefits:

- You do not need to configure routing table in the bridging modules, which greatly simplifies maintenance and module replacement.
- You maintain full control over the route taken by each message, which enables you to select alternative paths for the same end device.

1.3 The “Producer / Consumer” Model

The CIP *Producer/Consumer* networking model replaces the old *source/destination* model (Known as *master/slave*). The Producer/Consumer model reduces network traffic and increases speed of transmission.

In traditional I/O systems, controllers poll input modules to obtain their input status. In the CIP system input modules are not polled any more. Instead, they produce their data either upon a change of state or periodically. The frequency of update depends upon the options that are chosen during configuration and the topology of the network. Each input module, therefore, is a **producer** of input data, while the controller is a **consumer** of data.

The controller can also produce data for other controllers to consume. The produced and consumed data is accessible by multiple controllers and other devices over the EtherNet/IP network. This data exchange conforms to the Producer/Consumer model.

1.4 RPI Parameter

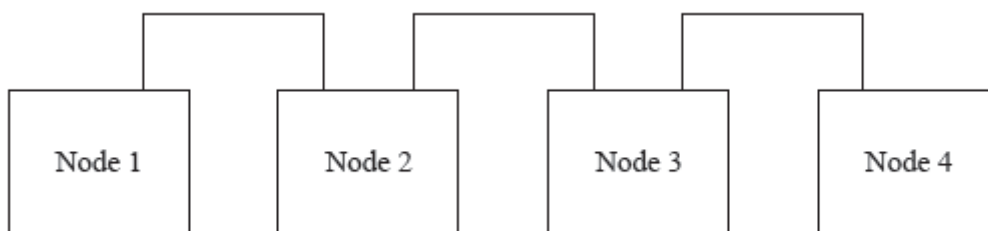
The requested packet interval (RPI) is the update rate that is specified for a particular piece of data in the network. This value specifies how often to produce the data for that device. For example, if RPI = 50 ms, it means that every 50 ms the device sends its data to the controller or the controller sends its data to the device.

RPIs are only used for devices that exchange data. For example, a ControlLogix® EtherNet/IP bridge in the same chassis as the controller does not require an RPI because it is not a data-producing member of the system; it is used only as a bridge to remote modules.

1.5 EtherNet/IP™ topologies

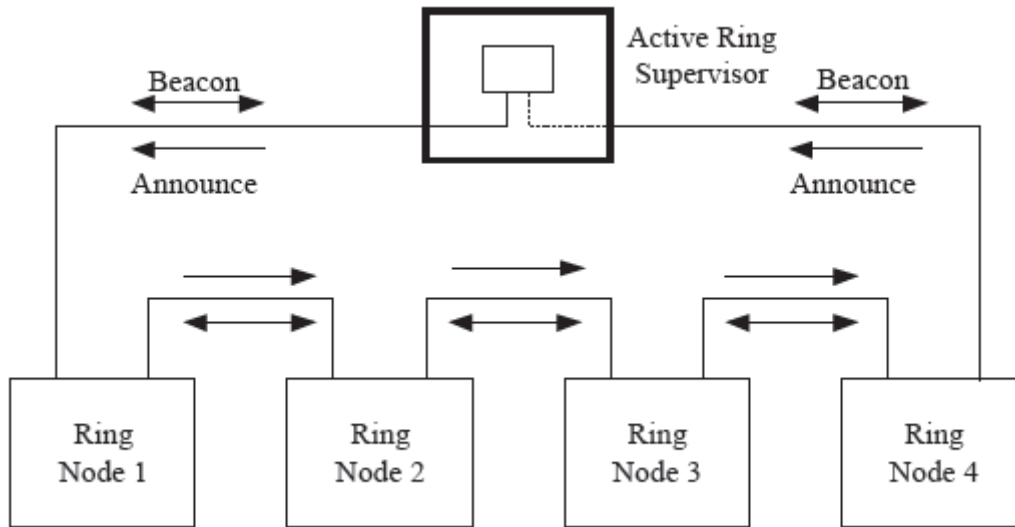
ELAP MEM-BUS encoders can be connected in any of three network topologies: star, linear, or Device Level Ring (DLR).

The linear topology uses the embedded switching capability to form a daisy chain style network that has a beginning and an end.



Linear topology simplifies installation and reduces wiring and installation costs, but a break in the network disconnects all devices downstream from the break.

A DLR network is a single-fault-tolerant ring network that is intended for the interconnection of automation devices. DLR topology is advantageous as it can tolerate a break in the network. If a break is detected, the signals are sent out in both directions.



The EtherNet/IP™ specification include the Device Level Ring (DLR) protocol, allowing multi-port devices to be connected in a ring topology. DLR provides for fast network fault detection and recognition in order to support the most demanding control applications. For example, a ring of 50 nodes implementing the DLR protocol has a worst case fault recovery time of less than 3 ms.

The DLR protocol operates at layer 2, in the OSI model. The presence of the ring topology and the operation of the DLR protocol are transparent to higher layers protocols, such as TCP/IP and CIP, with the exception of a DLR object that provides a DLR configuration and diagnostic interface via CIP.

1.6 CIP™ Object Model

EtherNet/IP uses an object model for network communication wherein all functions and data of a device are defined. CIP objects are organized in Classes, Instances and Attributes.

- **Class**
It contains related objects of a device, which is organized in instances.
- **Instance**
It consists of different attributes that describe the properties of the instance. Different instances of a class have the same services, the same behavior, and the same attributes. They can, however, have different values.
- **Attributes**
They represent the data that a device provides over EtherNet/IP. The attributes include the current values of a configuration or an input. Typical attributes are configuration and status information.
- **Services**
They are used to access the classes or the attributes of a class or to generate specific events. These services execute defined actions such as reading/writing the attributes.

1.7 EDS File

The EDS (Electronic Data Sheet) file, provided by ELAP, contains all information that is related to the measuring-system-specific parameters and the operating modes of the MEM-BUS EtherNet/IP encoders.

The EDS file is integrated using the EtherNet/IP network configuration tool to configure and place in operation the MEM-BUS EtherNet/IP encoder.

2 Installation

The encoder must be installed by qualified experts only, with net voltage off and standstill shaft. The operating instructions of the machine manufacturer must be always observed. It is recommended to keep the present manual as reference.

2.1 Safety

- Always observe prevention and safety norms during the installation and operation of the device.
- Use the encoder exclusively for its intended purpose.
- High voltage, current and rotating parts may cause serious or fatal injuries.
- Encoders must not be operated outside the specified limited values (see detailed product documentation).

2.2 Transport and storage

- Always transport or store encoders in their original packaging.
- Never drop encoders or expose them to major vibrations.

2.3 Mechanical assembly

- Do not open the device.
- Do not carry out mechanical changes on the device.
- Avoid impacts or shocks on the housing and shaft.
- Operate the device within its environmental specifications. Ambient temperature 60°C max.

2.4 Electrical supply

- Carry out the wiring operations exclusively with unplugged voltage supply
- Do not operate on the electrical plant while the encoder is on.
- Ensure that the entire plant complies with EMC requirements. The installation environment and wiring affect the electromagnetic compatibility of the encoder. In particular:
 - before handling and installing the encoder, eliminate any electrostatic charge from your body and from any tool that will get in contact with the device;
 - supply the encoder with steady voltage free from electrical noise; if necessary, install EMC filters for the supply input;
 - always use shielded and, if possible, twisted cables;
 - do not use longer cables than necessary;
 - the device cable path should be away from power cables;
 - install the device away from possible interference sources, or shield it effectively;
 - connect the cable shield and the connector case to a protective earth and make sure that the protective earth is free from electrical noise; the connection to earth can be carried out at the encoder side and/or at the user side; it is up to the user to evaluate which is the best solution to keep the electrical interference as low as possible.

In order to achieve the highest possible noise immunity, the Ethernet cable screen must be connected to ground on both ends.

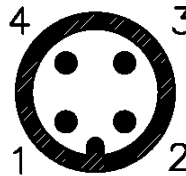
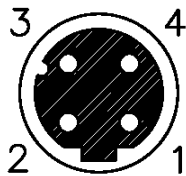
In certain cases current might flow over the screen, therefore it is recommended to use equipotential connections.

Connector Port1 and Port2
D-code female M12 connector

Pin	Signal
1	Tx+
2	Rx+
3	Tx-
4	Rx-

Supply connector
A-code male M12 connector

Pin	Signal
1	+Vsupply (10–30Vdc)
2	N.C.
3	GND (0V)
4	N.C.



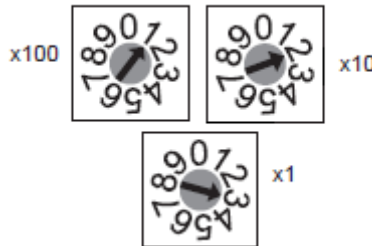
2.5 Rotary switches

ELAP MEM-BUS encoder is provided with three rotary switches, for hardware settings.

2.5.1 IP Address H/W Setting

A static IP address can be assigned directly with the rotary switches, to select the last byte value (192.168.1.xxx).

Set the three switches to a valid address, in the range of 001 – 254, and take a cycle power to the encoder. The MEM-BUS encoder will power up with the IP address set to 192.168.1.xxx, where xxx is given by the position of the three network address switches. In the picture below, it is xxx = 123.



2.5.2 Dynamic IP Address via BOOTP/DHCP

Use the BOOTP/DHCP protocol to assign a dynamic IP address.

Set the three rotary switches to **777** (for BOOTP) or **999** (for DHCP) and then take a cycle power to the encoder. At power up, the MEM-BUS encoder will request an IP address from a BOOTP/DHCP server, which must be in the same network. This IP address, just assigned, can be statically allocated by disabling the

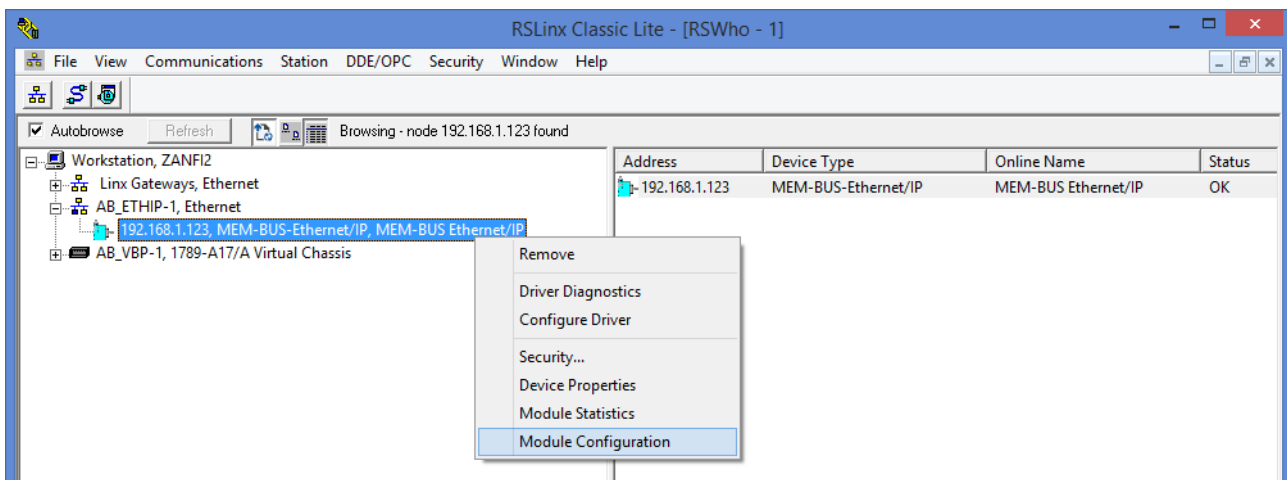
BOOTP/DHCP mode via software and setting the rotary switches to **000**. At next cycle power, no further request is sent to the BOOTP/DHCP server and the last assigned IP is used.

2.5.3 Reset to factory settings

Set the rotary switches to **888** to reset the encoder to factory settings. The default IP is **192.168.1.123**.

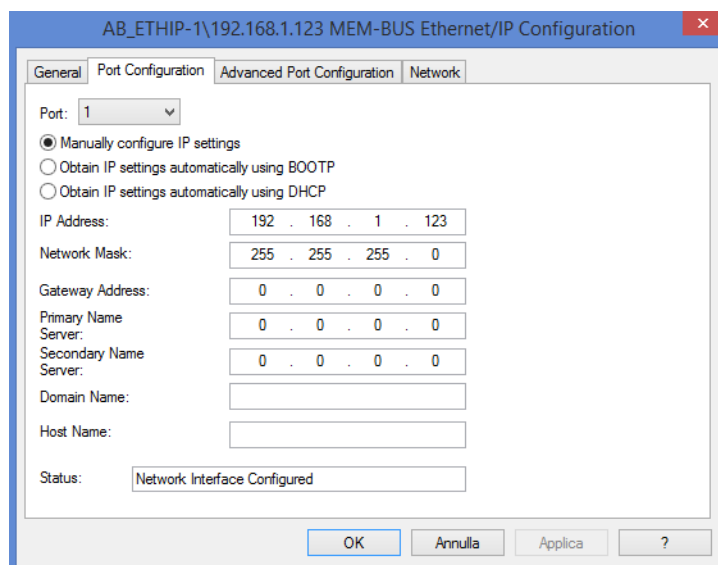
2.6 IP Address S/W Setting

1. Set the rotary switches to **888** and take a cycle power in order to load the default factory settings.
2. Set the rotary switches to **000** and take a cycle power in order to enable S/W configuration.
3. Run **RXLinx Classic Lite** for Rockwell Automation networks.



ELAP MEM-BUS encoder appears in the main window, with its default IP address (192.168.1.123).

Click the right mouse button and select **Module Configuration** command.



In the “Port Configuration” table, it is possible to configure the TCP/IP interface (see attributes 3 e 5 of object F5, section 3.4).

2.7 Preset button

The preset button allows the user to reset the position value of the encoder. Remove the screw cover from the back of the encoder and briefly press the button inside (see also par. 4.6, Preset Function). This button is active only when the encoder is powered.

Note: Pressing the preset button result in a change of position reading. This can cause unexpected motion which could result in personal injury or damage to the product or equipment.

2.8 LED Indicators

Four LEDs show the working conditions of the EtherNet/IP interface.

The Link1 and Link2 LEDs, display the status of the physical connection on the Ethernet interface.

Link1 / Link2	
OFF	Power off or no Ethernet connection.
Steady Green	Ethernet connection established.
Yellow	Data transmission TxD/RxD.

Table 2.1 – Ethernet link indicators

The Mod LED shows the device status.

Mod	
OFF	Power off.
Steady Green	Device in operation.
Flashing Green	Standby device, not configured, no IP address assigned.
Flashing Red	Major recoverable fault (for example, inconsistent configuration).
Steady Red	Major unrecoverable fault, device <u>not</u> operational.
Flashing Green/Red	Self-test at power on.

Table 2.2 – Module status indicator

The Net LED show the status of the CIP connection.

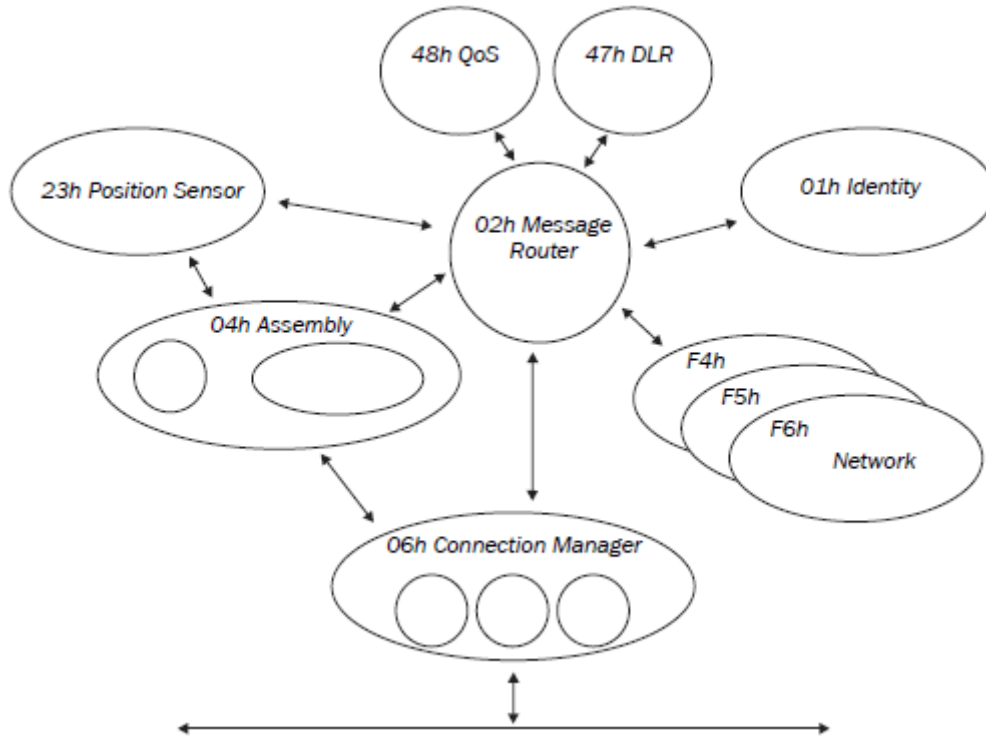
Net	
OFF	Power off or no IP address configured.
Flashing Green	Device not connected: an IP address is configured, but no CIP connections are established.
Steady Green	Device connected: an IP address is configured, at least one CIP connection is established.
Flashing Red	Connection timeout: a reset or a new CIP connection are requested.
Steady Red	Error: the device has detected that its IP address is already in use.
Flashing Green/Red	Self-test at power on.

Table 2.3 – Network status indicator

3 CIP Objects

The ELAP MEM-BUS encoder, with EtherNet/IP interface, is an absolute multiturn encoder. The encoder profile 22H is supported, according to the CIP™ protocol specifications.

The objects implemented and their interactions are shown in the picture below.



The following table shows the implemented objects and the number of instances available for each class.

Class	Description	Instances
01H: Identity Object	It includes all device specific data (manufacturer, device type, device status, etc.).	1
02H: Message Router Object	It includes all supported class codes of the encoder and the maximum number of connections.	1
04H: Assembly Object	It assembles the data of several objects to one single object (for example, position and velocity values).	4
06H: Connection Manager Object	It includes connection specific attributes for triggering, transport, connection type, etc.	1
23H: Position Sensor Object	It includes the attributes for programming the encoder parameters, such as scaling, counting direction, etc.	1
F5H: TCP/IP Interface Object	It includes the attributes for TCP/IP interface, such as IP address, subnet mask, gateway and acquisition of the IP address via BOOTP/DHCP or hardware switches, etc.	1
F6H: Ethernet Link Object	It includes connection specific attributes such as transmission speed, interface status, MAC address, etc.	2
47H: Device Level Ring (DLR) Object	It includes status attributes and configuration attributes for the DLR protocol.	1
48H: Quality of Service (QoS) Object	It contains mechanism for processing data streams with different priorities.	1

Table 3.1 – Implemented CIP objects and instances

3.1 Identity Object – 01H

This object provides general information about the device.

Instance 0 includes the attributes of the class itself, while instance 1 includes the device identification data.

The following services are supported:

- 01H – *Get_attribute_All* (for both instances 0 and 1)
- 0EH – *Get_Attribute_Single*
- 05H – *Reset*
 - 0 → The device is re-initialized (power on).
 - 1 → The device is re-initialized (power on) and reset to the factory settings.
- 4BH – *Flash_LEDs*
 - 9 → The device executes 6 flashing sequences of its LEDs.
 - 0 → Stops the flashing.

Table 3.2 shows the supported attributes for instance 0.

INSTANCE 0, CLASS 01H				
Attribute	Access	Name – Description	Data type	Value
1	Get	Revision	UINT	0001H
2	Get	Max instance	UINT	0001H
6	Get	Number ID of the last class attribute	UINT	0007H
7	Get	Number ID of the last instance attribute	UINT	0009H

Table 3.2 – Class attributes of the object 01H

Table 3.3 shows the supported attributes for instance 1.

INSTANCE 1, CLASS 01H				
Attribute	Access	Name – Description	Data type	Value
1	Get	Manufacturer identification	UINT	0580H (ELAP)
2	Get	Device type	UINT	0022H (Encoder)
3	Get	Product code	UINT	000AH
4	Get	Revision Major code Minor code	STRUCT USINT USINT	01H 01H
5	Get	Device status	WORD	See table 3.4
6	Get	Serial number	UDINT	
7	Get	Product name	STRING	MEM-BUS EtherNet/IP
8	Get	Present state of the device	USINT	0 → Unknown 1 → Device self testing 2 → Standby 3 → Operational 4 → Recoverable fault (minor) 5 → Unrecoverable fault (major) 6 – 254 → Reserved 255 → Default (if not implemented)
9	Get	Configuration consistency	UINT	0000H

Table 3.3 – Instance 1 attributes, for object 01H

The attribute number 5, which is defined as a bit string, shows the current state of the device. The meanings of the individual bits are shown in the table below.

Bit	Name	Meaning
0	Owned	= 1 if 1 object, at least, of the device has got an owner. This bit is set if at least a class 1 or class 3 connection was established.
1		= 0, Reserved.
2	Configured	= 1 if 1 application attribute, at least, was changed as against the default settings.
3		= 0, Reserved.
4 - 7	Extended device status	0000 → Self-test 0001 → Firmware update is active 0010 → 1 I/O connection, at least, is in Error status (timeout detected) 0011 → There are no I/O connections in the Established status 0100 → The saved configuration is defective 0101 → A serious error has been detected; Bit 10 or Bit 11 is set 0110 → 1 I/O connection, at least, is active (RUN status) 0111 → 1 I/O connection, at least, is in the Established status (IDLE status) 1000...1111 → Values reserved for manufacturer information, not used.
8	Minor Recoverable Fault	= 1 if the device has detected a non-serious and reparable fault (for example a I/O connection has detected a timeout).
9	Minor Unrecoverable Fault	
10	Major Recoverable Fault	
11	Major Unrecoverable Fault	
12 - 15		Reserved, value = 0

Table 3.4 – Device status

3.2 Position Sensor Object – 23H

This object provides specific data for the encoder.

Instance 0 includes the attributes of the class itself, while instance 1 includes the device specific data.

The following services are supported:

- 0EH – *Get_Attribute_Single*
- 10H – *Set_Attribute_Single*

Table 3.5 shows the supported attributes for instance 0.

INSTANCE 0, CLASS 23H				
Attribute	Access	Name – Description	Data type	Value
1	Get	Revision	UINT	0002H
2	Get	Max instance	UINT	0001H
3	Get	Number of instances	UINT	0001H
6	Get	Number ID of the last class attribute	UINT	0007H
7	Get	Number ID of the last instance attribute	UINT	0064H

Table 3.5 – Class attributes of the object 23H

Table 3.6 shows the supported attributes for instance 1.

INSTANCE 1, CLASS 23H				
Attribute	Access	Name – Description	Data type	Value
10	Get	Position Value	DINT	
11	Get	Position Sensor Type	UINT	2 → Absolute encoder, multiturn
12	Get/Set	Direction Counting Toggle	BOOL	0 → CW 1 → CCW
14	Get/Set	Scaling Function Control	BOOL	0 → Disabled 1 → Enabled
16	Get/Set	Measuring Units per Span	UDINT	1 – 8192
17	Get/Set	Total Measuring Range	UDINT	1 – 536870912
19	Get/Set	Preset Value	DINT	0
21	Get	Position Status Register (see values of attributes 22 and 23).	BYTE	Bit0 → Position is out of range Bit1 → Over range Bit2 → Under range
22	Get/Set	Position Low Limit	DINT	0 – 536870911
23	Get/Set	Position High Limit	DINT	0 – 536870911
24	Get	Velocity Value	DINT	
25	Get/Set	Velocity Format	ENG UINT	1F04H → step/s (default) 1F05H → step/ms 1F0FH → turns/min
26	Get/Set	Velocity Resolution	UDINT	1
27	Get/Set	Minimum Velocity Setpoint	DINT	-2147483648 – 2147483647
28	Get/Set	Maximum Velocity Setpoint	DINT	-2147483648 – 2147483647
41	Get	Operating status of the encoder	BYTE	Bit0 → Direction (0 = CW) Bit1 → Scaling (0 = Disabled) Bit2...7 → Not used
42	Get	Physical Resolution Span	UDINT	8192 (13 Bit)
43	Get	Physical Resolution Number of Span	UINT	65535
44	Get	Alarms	WORD	Bit0 → Position error Bit1 → Diagnostic error Bit2...15 → Not used
45	Get	Supported Alarms	WORD	0003H
46	Get	Alarm Flag	BOOL	0 → No alarms 1 → Alarm / error
47	Get	Warnings	WORD	Bit4 → Battery charge Bit6 → Velocity below min. value Bit7 → Max Velocity exceeded Bit10 → Position Limits exceeded
48	Get	Supported Warnings	WORD	04D0H
49	Get	Warning Flag	BOOL	0 → No warnings 1 → Warning
51	Get	Offset Value (calculated by the Preset function).	DINT	
100	Get	Rotary Switches Value	UINT	0...999

Table 3.6 – Instance 1 attributes, for object 23H

Attribute 10, Position Value

It is the output position value of the encoder, that is eventually modified by the scaling parameters (see attributes 14, 16 and 17).

Attribute 12, Direction Counting Toggle

Rotation direction, seen from the shaft side:

- 0 → CW, the position value increases with a clockwise rotation.
- 1 → CCW, the position value increases with a counter clockwise rotation.

Attribute 14, Scaling Function Control

- 0 → The scaling function is disabled. Physical resolution is used for calculations (13 bit for single turn and 16 bit for number of revolutions).
- 1 → The scaling function is enabled. The values of attributes 16 and 17 are used for calculations.

Attribute 16, Measuring Units per Span

It sets the number of pulses for a single turn. It is active when the scaling function is enabled (that is attribute 14 = 1). Values lower or equal to physical resolution (that is 8192 pulses per turn) are accepted.

Note: When the scaling parameters change, it is recommended to execute a Preset function (writing of attribute 19) in order to reset the encoder and restart it from a correct position.

Attribute 17, Total Measuring Range

it sets the total measuring range for position values. It is active when the scaling function is enabled (that is attribute 14 = 1).

The setting value is calculated as:

$$\text{Measuring Units per Revolution (6001.00) x Number of Revolutions}$$

Values lower or equal to the global physical resolution (that is 536870912) are accepted.

Note: When the scaling parameters change, it is recommended to execute a Preset function (writing of attribute 19) in order to reset the encoder and restart it from a correct position.

Attribute 19, Preset Value

It sets the Preset value. The Preset function, that is executed when writing the attribute 19, is used to adjust the measuring system to any position value within a range to the total measuring length - 1.

Note:

1. When the scaling parameters change, it is recommended to execute a Preset function in order to reset the encoder and restart it from a correct position.
2. When the scaling function is disabled (attribute 14 = 0), the Preset value shall be lower than the global physical resolution (536870912).
3. When the scaling function is enabled (attribute 14 = 1), the Preset value shall be lower than the total resolution (attribute 17).

Attribute 21, Position Status Register

This attribute contains the actual area status of the encoder position (see attributes 22 and 23).

- Bit0 = 1, if the position value is out of range (attributes 22 and 23)
- Bit1 = 1, if the position value is higher than its high limit (attribute 23)
- Bit2 = 1, if the position value is lower than its low limit (attribute 22)

This function allows a replacement of external proximity switches.

Attributes 22 and 23, Position Low / High Limit

These attributes define a configurable work area within the measuring range.

Attribute 24, Velocity Value

It is the encoder current speed, where the format of this value is defined in attribute 25.

Attribute 25, Velocity Format

It is the format of the velocity attribute, in engineering units.

The following values are accepted:

- 1F04H → step/s (default)
- 1F05H → step/ms
- 1F0FH → turns/min

Note : If this attribute is changed, both *Minimum Velocity Setpoint* (attribute 27) and *Maximum Velocity Setpoint* (attribute 28) are reset to their default values.

Attribute 26, Velocity Resolution

It specifies the smallest incremental change of the velocity value (attribute 24).

Attributes 27 and 28, Minimum and Maximum Velocity Setpoint

The actual velocity speed limit values with minimum and maximum can be configured in attributes 27 and 28. The corresponding flags in attribute 47 (Bit6 and Bit7) are affected.

Attribute 41, Operating Status

This attribute contains the operating status of the encoder.

- Bit0 → Information about rotation direction is given. Position value is increasing (0) or decreasing (1). Attribute 12 shall be used to set the counting direction.
- Bit1 → Information about scaling function is given (0 → Disabled, 1 → Enabled). Attribute 14 shall be used to enable/disable the scaling function.

Attribute 42, Physical Resolution

This attribute contains the number of measuring steps per revolution which can be output by the measuring system. See attributes 16 and 17 in order to set a specific resolution.

Attribute 43, Physical Resolution Number of Spans

This attribute contains the number of distinguishable revolutions that the measuring system can output.

The global physical resolution of the ELAP MEM-BUS encoder is calculated as follows

$$\text{Single Turn Resolution} \times \text{Number of revolutions} = 8192 \times 65536 = 536870912$$

See attributes 16 and 17 in order to set a specific total resolution.

Attribute 44, Alarms

An alarm is set when the encoder has detected a status which can result in an incorrect position. As soon as an alarm status is detected, the corresponding bit is set to logical high.

- Bit0 → Position error
- Bit1 → Diagnostic error
- Bit2, ..., Bit11 → Reserved
- Bit12, ..., Bit15 → Not used

Attribute 45, Supported Alarms

This attribute contains information about the alarms supported by the device.

ELAP MEM-BUS encoder supports the position error only (Bit 0); so this attribute value is 0001H.

Attribute 46, Alarm Flag

It indicates that an alarm error has occurred (attribute 44 is not zero).

Attribute 47, Warnings

Warnings are signaled by the encoder when the tolerance for certain internal parameters have been exceeded. In contrast to alarms (attribute 44), warnings don't imply incorrect position values.

- Bit4 → Battery charge too low.
- Bit6 → Velocity has dropped below its minimum value (attribute 27).
- Bit7 → Velocity has exceeded its maximum value (attribute 28).
- Bit10 → Position limits exceeded (see attributes 22 and 23).

Attribute 48, Supported Warnings

This attribute contains information about the warnings supported by the device.

ELAP MEM-BUS encoder supports the warnings of battery charge (Bit 4), Position limits exceeded (Bit 10) and Velocity limits exceeded (Bit6, Bit7); so this attribute value is 04D0H.

Attribute 49, Warning Flag

It indicates that a warning error has occurred (attribute 47 is not zero).

Attribute 51, Offset Value

The offset value attribute is calculated by the preset function and shifts the position value attribute. It is stored automatically by the device and can be read from the encoder for diagnostic purposes.

It is

$$\text{Offset (attr.51)} = \text{Preset (attr.19)} - \text{Position Value (attr.10)}$$

Attribute 100, Rotary Switches Value

The value corresponding to the position of the three rotary switches can be read for diagnostic purposes. These rotary switches are used by the encoder only at power on. So, it is possible to change their position when the encoder is powered, in order to check them.

3.3 Assembly Object – 04H

The Assembly Object binds attributes of multiple objects, which allows data to or from each object to be sent or received over a single connection. Assembly objects can be used to bind input data or output data, where the terms ‘input’ and ‘output’ are defined from the network’s point of view.

An input will produce data on the network, while an output will consume data from the network.

Instance 0 includes the attributes of the class itself.

The following services are supported:

- 0EH – *Get_Attribute_Single*

Table 3.7 shows the supported attributes for instance 0.

INSTANCE 0, CLASS 04H				
Attribute	Access	Name – Description	Data type	Value
1	Get	Revision	UINT	0002H
2	Get	Max instance	UINT	006EH
3	Get	Number of instances	UINT	0005H
6	Get	Number ID of the last class attribute	UINT	0007H
7	Get	Number ID of the last instance attribute	UINT	0004H

Table 3.7 – Class attributes of the object 04H

The following table contains all supported instance attributes of the assembly object.

Attribute	Access	Name – Description	Data type	Value
3	Get	Data of the assembly instance	BYTE ARRAY	See table 3.9
4	Get	Number of bytes in attribute 3	UINT	See table 3.9

Table 3.8 – Assembly object, instance attributes

ELAP MEM-BUS encoder supports 4 I/O assembly instances. Assembly instances are also called *connection points*. Two connection point types are defined:

- O → T (Originator → Target = Encoder): These connection points represent **output data** from the control system (PLC).
- T → O (Target = Encoder → Originator): These connection points represent **input data** for control system (PLC). The instances T → O contain, for example, the position and velocity values of the encoder.

According to the Encoder Device Profile, instances 1, 2 and 3 are provided for input data. Instance 110 is vendor specific.

Instance 100 is defined as the configuration assembly instance. Use of this assembly instance when establishing class 1 connections is one possibility for configuration of the encoder.

The following table shows the values of attributes 3 and 4, for the assembly instances.

Instance	Type	Attribute 3 (data)	Attribute 4 (size)
1	Input	Position Value (23H, attr.10)	4 Byte
2	Input	Position (23H, attr.10) + Alarm Flag (23H, attr.46) + Warning Flag (23H, attr.49)	5 Byte
3	Input	Position Value (23H, attr.10) + Velocity Value (23H, attr.24)	8 Byte
100	Output	Configuration Data (see table 3.11)	28 Byte
110	Input	Position Value (23H, attr.10) + Velocity Value (23H, attr.24) + Position Status Register (23H, attr.21) + Warnings (23H, attr.47)	12 Byte

Table 3.9 – Attributes 3 and 4 of the assembly instances

The data format of the input assembly instances are listed in the table below.

Instance	Byte	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	0	Position LSB							
	1	Position							
	2	Position							
	3	Position MSB							
2	0	Position LSB							
	1	Position							
	2	Position							
	3	Position MSB							
	4							Warn Flag	Alarm Flag
3	0	Position LSB							
	1	Position							
	2	Position							
	3	Position MSB							
	4	Velocity LSB							
	5	Velocity							
	6	Velocity							
	7	Velocity MSB							
110	0	Position LSB							
	1	Position							
	2	Position							
	3	Position MSB							
	4	Velocity LSB							
	5	Velocity							
	6	Velocity							
	7	Velocity MSB							
	8	Position Status Register							
	9	Reserved							
	10	Warnings LSB							
	11	Warnings MSB							

Table 3.10 – Input assembly instance data format

Instance 110 is ELAP specific. It consists of 3 input data of type *DINT*. The last value has to be read as an array of flag bit:

- Bit1 → 1 if position value has exceeded its high limit
- Bit2 → 1 if position value has dropped below its low limit
- Bit20 → 1 if battery charge is too low
- Bit22 → 1 if velocity value has dropped below its minimum setpoint
- Bit23 → 1 if velocity value has exceeded its maximum setpoint

The data format of the configuration assembly is listed in the table below.

Instance	Byte		Data	
100	0	LSB	Object 23H Attribute 16	Measuring Units per Span
	1			
	2			
	3	MSB	Object 23H Attribute 17	Total Measuring Range
	4	LSB		
	5			
	6		Object 23H Attribute 12	Direction Counting Toggle in Bit0
	7	MSB		
	8			
	9		Object 23H Attribute 14	Scaling Function Control in Bit0
	10	LSB		
	11	MSB		
	12	LSB	Object 23H Attribute 25	Velocity Format
	13			
	14			
	15	MSB	Object 23H Attribute 22	Position Low Limit
	16	LSB		
	17			
	18		Object 23H Attribute 23	Position High Limit
	19	MSB		
	20	LSB		
	21		Object 23H Attribute 27	Minimum Velocity Setpoint
	22			
	23	MSB		
	24	LSB	Object 23H Attribute 28	Maximum Velocity Setpoint
	25			
	26			
27	MSB			

Table 3.11 – Configuration data

3.4 TCP/IP Interface Object – F5H

The TCP/IP Interface Object provides the mechanism to configure a device’s TCP/IP network interface. Examples of configuration items include the device’s IP address, Network Mask and Gateway Address. This Object provides an attribute that identifies the link-specific object for the associated physical communication interface.

The following services are supported:

- 01H – *Get_Attribute_All* (for instance 1 only)
- 0EH – *Get_Attribute_Single*
- 10H – *Set_Attribute_Single*

Table 3.12 shows the supported attributes for instance 0.

INSTANCE 0, CLASS F5H				
Attribute	Access	Name - Description	Data type	Value
1	Get	Revision	UINT	0004H
2	Get	Max instance	UINT	0001H

Table 3.12 – Class attributes of the object F5H

Table 3.13 shows the supported attributes for instance 1.

INSTANCE 1, CLASS F5H				
Attribute	Access	Name – Description	Data type	Value
1	Get	Interface Status	DWORD	
2	Get	Configuration Capability	DWORD	0000 00B5H
3	Get / Set	Configuration Control	DWORD	0000 0000H
4	Get	Path to Physical Link Object (F6H) Path Size (number of 16 bit words) Path (logical segment)	STRUCT UINT EPATH	2 20H F6H 24H 01H
5	Get / Set	TCP/IP Interface Configuration IP Address Network Mask Gateway Address Primary Server Name Secondary Server Name Domain Name	STRUCT UDINT UDINT UDINT UDINT UDINT STRING	Max 48 ASCII characters
6	Get / Set	Host Name	STRING	Max 64 ASCII characters
8	Get/Set	TTL Value	USINT	01H
9	Get/Set	Multicast Configuration IP Multicast Addresses Allocation Control Reserved Number of IP Multicast Addresses Starting Multicast Address	STRUCT USINT USINT UINT UDINT	00H 00H 32 239.192.x.x
10	Get/Set	Enable ACD	BOOL	1 (enabled)
11	Get/Set	Last Conflict Detected ACD Activity Remote MAC Address ARP PDU in which a conflict was detected	STRUCT USINT USINT(6) USINT(28)	
13	Get / Set	Encapsulation Inactivity Timeout (in sec)	UDINT	120

Table 3.13 – Instance 1 attributes, for object F5H

Attribute 1, Interface Status

This attribute is a bitmap, indicating the status of the TCP/IP interface. Now, only bits from 0 to 3 are used, in order to show its configuration status:

- 0 → Attribute 5 has not been configured.
- 1 → Attribute 5 contains configuration obtained from BOOTP/DHCP or from device's internal memory.
- 2 → Attribute 5 contains configuration obtained from hardware settings (rotary switches).
- 3, ... 15 → Reserved for future use.

Attribute 2, Configuration Capability

This attribute is a bitmap, indicating the device's support for optional network configuration capability. This attribute value is 00B5H for ELAP MEM-BUS encoder, that is:

- Bit0 = 1, the encoder is capable of obtaining its network configuration (attribute 5) via BOOTP.
- Bit2 = 1, the encoder is capable of obtaining its network configuration (attribute 5) via DHCP.
- Bit4 = 1, the interface configuration attribute (attribute 5) is settable.
- Bit5 = 1, IP address is hardware configurable.
- Bit7 = 1, the encoder is capable to detect IP address conflicts (ACD).

Attribute 3, Interface Control

This attribute is a bitmap and it is used to control network configuration options.

The following values are accepted:

- 0 → In order to assign a static IP address, through the rotary switches (see section 2.5)
- 1 → In order to assign an IP address via BOOTP
- 2 → In order to assign an IP address via DHCP

Attribute 4, Path to Physical Link Object

This attribute identifies the object associated with the underlying physical communications interface. In this case, it is the instance 1 of the object F6H:

- 20H → The following byte identifies a class
- F6H → Class code of the *Ethernet Link Object*
- 24H → The following byte identifies an instance
- 01H → Instance number 1.

Attribute 5, TCP/IP Interface Configuration

This attribute contains the configuration parameters required for a device to operate as a TCP/IP node.

In particular:

- IP Address.
- Network Mask: It is used when the IP network has been partitioned into subnets. The mask is used to determine whether an IP address is located on another subnet.
- Gateway Address: When a destination IP address is on a different subnet, packets are forwarded to the default gateway for routing to the destination subnet.
- Name Server: IP address of the primary name server, which is used to resolve host names.

- **Name Server 2:** IP address of the secondary name server, which is used when the primary name server is not available, or it is unable to resolve a host name.
- **Domain Name:** The default domain name is used when resolving host names that are not fully qualified. For example, if the default domain name is “odva.org”, and the device needs to resolve a host name of “plc”, then the device will attempt to resolve the host name as “plc.odva.org”.

Attribute 6, Host Name

This attribute contains the host name of the encoder.

Attribute 8, TTL Value

It is the value the device shall use for the IP header Time-to-Live field when sending EtherNet/IP packets via IP multicast. All values between 1 and 255 are accepted.

Attribute 9, Multicast Configuration

This attribute contains the configuration of the device’s IP multicast addresses to be used for EtherNet/IP multicast packets. There are 3 elements in this data structure:

- IP Multicast Addresses Allocation Control
 - = 0 → Multicast addresses shall be generated using the default allocation algorithm.
 - = 1 → Multicast addresses shall be allocated according to the values specified in the parameters
- Number of IP multicast addresses
- Stating multicast IP address

Attribute 10, Enable ACD (Address Conflict Detection)

This attribute enables (1) or disables (0) the address conflict detection activity.

Attribute 11, Last Conflict Detected

When the ACD function is active, this attribute provides information on the last address conflict detected.

Attribute 13, Encapsulation Inactivity Timeout

This attribute is used to enable TCP socket or DTLS session cleanup (closing) when the defined number of seconds (default is 120) have elapsed with no Encapsulation activity.

3.5 Ethernet Link Object – F6H

This object maintains link-specific counters and status information for an IEEE 802.3 communications interface. Each internal accessible interface has its own instance.

The following services are supported:

- 01H – *Get_Attribute_All* (only for instances 1 and 2)
- 0EH – *Get_Attribute_Single*
- 10H – *Set_Attribute_Single*

Table 3.14 shows the supported attributes for instance 0.

INSTANCE 0, CLASS F6H				
Attribute	Access	Name – Description	Data type	Value
1	Get	Revision	UINT	0004H
2	Get	Max instance	UINT	0002H
3	Get	Number of instances	UINT	0002H

Table 3.14 – Class attributes of the object F6H

Table 3.15 contains the two supported instances, 1 for P1 port and 2 for P2 port.

INSTANCES 1 and 2, CLASS F6H				
Attribute	Access	Name – Description	Data type	Value
1	Get	Interface Speed (Mbps)	UDINT	100
2	Get	Interface Flags	DWORD	0000 000FH
3	Get	Physical Address (MAC)	ARRAY of 6 USINT	60H D7H E3H 1xH ...
4	Get	Interface Counters	STRUCT	
5	Get	Media Counters	STRUCT	
6	Get / Set	Interface Control Control Bits Forced Interface Speed	STRUCT WORD UINT	
7	Get	Interface Type	USINT	2 (Twisted - Pair)
8	Get	Interface State	USINT	01H
9	Get/Set	Administrative State	USINT	01H
10	Get	Interface Label	STRING	“Port 1” / “Port 2”
11	Get	Interface Capability Capability Bits Speed/Duplex Options Number of elements Speed/Duplex Array Interface Speed Duplex Mode	STRUCT DWORD STRUCT of USINT ARRAY of STRUCT UINT USINT	0000 000EH 04H

Table 3.15 – Instances 1 and 2 attributes, object F6H

Attribute 1, Interface Speed

This attribute value indicates the speed at which the interface is currently running. A value of 0 is used to indicate that the speed of the interface is indeterminate.

Attribute 2, Interface Flags

This attribute value is a bitmap, showing status and configuration information about the physical interface.

- **Bit0 → Link Status**
It indicates whether or not the communication interface is connected to an active network.
- **Bit1 → Half / Duplex Link**
0 indicates the interface is running Half-Duplex, 1 indicates Full-Duplex.
- **Bit2–4 → Negotiation Status**
Indicate the status of link auto-negotiation
 - = **0**, auto-negotiation in progress.
 - = **1**, auto-negotiation and speed detection failed; using default values for speed and duplex;
 - = **2**, auto-negotiation failed but detected speed; using default value for duplex.
 - = **3**, successfully negotiated speed and duplex.
 - = **4**, auto-negotiation not attempted; forced speed and duplex.
- **Bit5 → Manual Setting Requires Reset**
= 0, the interface can automatically adopt changes of attributes of the Ethernet Link Object, without resetting for activation.
- **Bit6 → Local Hardware Fault**
= 0, indicates the interface detects no local hardware faults.
- **Bit7, ..., Bit31 → Reserved.**

Attribute 3, Physical Address (MAC)

This attribute value contains the interface's MAC layer address. The MAC address consists a 6 byte Ethernet address for each individual device and it is unique worldwide. The MAC address consists of two parts, the first 3 bytes represents the manufacturer-specific ID, while the last 3 bytes represents a consecutive number. The MAC address for ELAP MEM-BUS encoder is 60-D7-E3-1x-xx-xx.

Attribute 4, Interface Counters

This attribute is a data structure consisting of 11 UDINT counters, concerning the receipt of packets on the interface.

Attribute 5, Media Counters

This attribute is a data structure consisting of 12 UDINT counters, specific to Ethernet media.

Attribute 6, Interface Control

This attribute is a data structure consisting of **Control Bits** and **Forced Interfaced Speed**.

Control Bits:

- **Bit0 → 1** indicates the link auto-negotiation is disabled; in this case, the device shall use the settings indicated by the Forced Duplex Mode and Forced Interface Speed bits.
- **Bit1 →** When the auto-negotiate bit is 0 (Bit0 = 0), it indicates whether the interface shall operate in full or half duplex mode (0 → Half Duplex, 1 → Full Duplex).
- **Bit2, ..., Bit15 → Reserved**, shall be set to 0.

Forced Interface Speed:

When the auto-negotiate bit is 0 (Bit0 = 0), it indicates the speed at which the interface shall operate. Speed is specified in megabits per second (Mbps).

Attribute 7, Interface Type

This attribute value indicates the type of physical interface. ELAP MEM-BUS encoder has got an interface of type 2, *Twisted-pair* (10Base-T, 100Base-T, 1000Base-T, etc.).

Attribute 8, Interface State

This attribute value indicates the current operational state of the interface.

- = 0, unknown interface state.
- = 1, the interface is enabled and ready to send and receive data.
- = 2, the interface is disabled.
- = 3, the interface is testing.
- = 4, ..., 256 reserved values.

Attribute 9, Administrative State

This attribute value allows administrative setting of the interface state.

- = 1, enable the interface.
- = 2, disable the interface.

Attribute 10, Interface Label

This attribute value is a text string, describing the interface.

Attribute 11, Interface Capability

This attribute value indicates the set of capabilities for the interface. It is a data structure with two main elements: **Capability Bits** and **Speed/Duplex Options**.

Capability Bits: it is an array of bits, indicating whether the interface supports capabilities such as auto-negotiation and auto-MDIX.

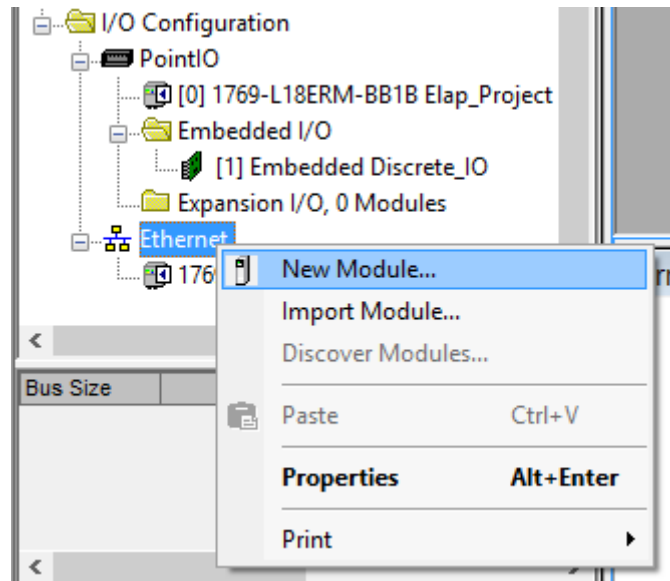
- Bit0 → Manual Setting Requires Reset.
It indicates whether or not the device requires a reset to apply changes made to attribute 6;
= 0, the device automatically applies changes, without any reset operation.
- Bit1 → Auto-negotiate.
= 1, indicates that the interface supports link auto-negotiation.
- Bit2 → Auto-MDIX.
= 1, indicates that the interface supports auto-MDIX operation.
- Bit3 → Manual Speed/Duplex.
= 1, indicates that the interface supports manual setting of speed/duplex via the attribute 6.
- Bit4, ..., Bit31 → Reserved, shall be set to 0.

Speed/Duplex Options: it is an array of speed/duplex pairs that may be set via the attribute 6 (for example, 10 Mbps – Half Duplex, 100 Mbps – Full Duplex, etc.).

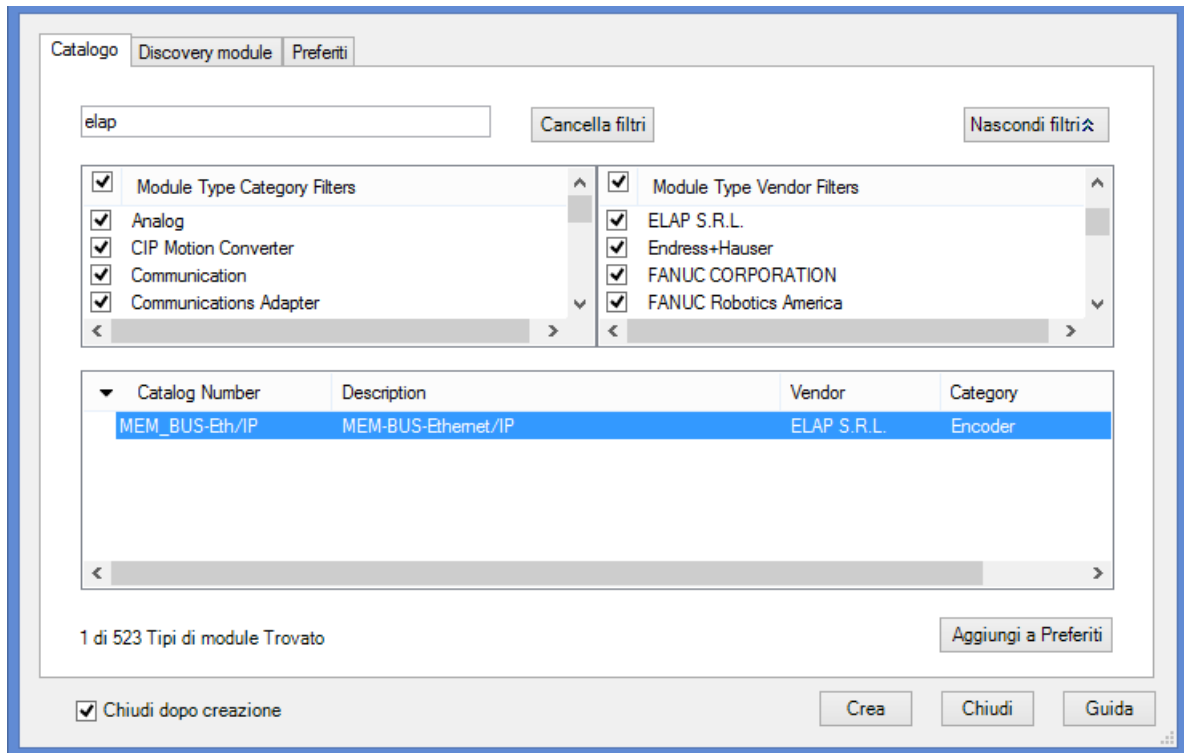
4 Configuring the encoder using RSLogix5000

This chapter guides you through the steps required to configure your MEM-BUS encoder using RSLogix5000 software, version 30, by Rockwell Automation.

1. Use command **File** → **New ...** in order to create a new project and select the proper CPU. In this case it is 1769 – L18ERM – BB1B CompactLogix™ controller.
2. Install your EDS file, provided by ELAP, using command **Tools** → **EDS Hardware Installation Tool**.
3. Select the Ethernet network and press your mouse right button; then select **New Module...**

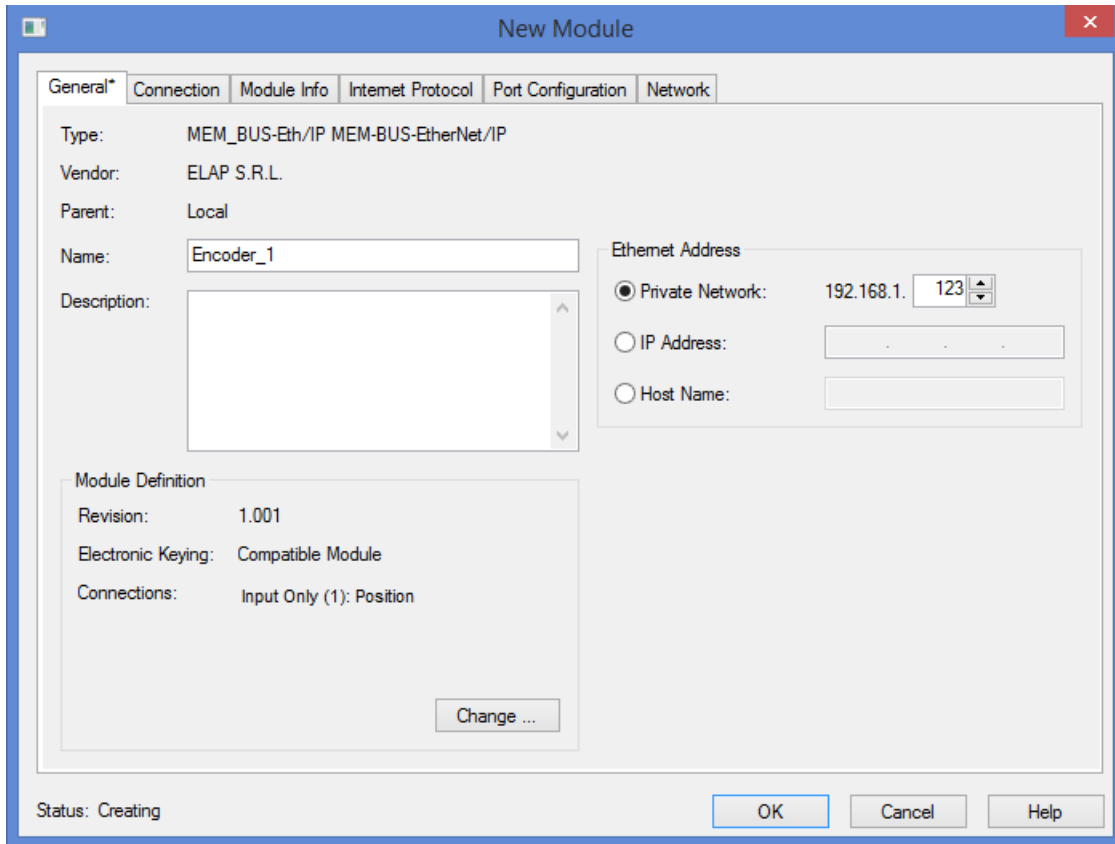


4. Select MEM_BUS-Eth/IP encoder and click the **Create** button.



5. Complete your module profile with all requested information.

4.1 General tab



Enter a name for the encoder, for example *Encoder_1*. Short descriptive names are recommended. Enter a description of the encoder’s function and then set its Ethernet address. In this example, the address is 192.168.1.123, where the value 123 is the address assigned with the hardware rotary switches.

The Ethernet address can be set when the controller is offline. Three options are available:

- **Private Network:** Enter a value of 1 ... 254 for the last segment of the address. Be sure not to duplicate the address of an existing device.

Ethernet Address

Private Network: 192.168.1. 123

IP Address: . . .

Host Name:

- **IP Address:** Enter the desired address.

Ethernet Address

Private Network: 192.168.1.

IP Address: 192 . 168 . 16 . 200

Host Name:

- **Host Name:** Enter the name of the host. In this example, the host name is ELAP1.

Ethernet Address

Private Network: 192.168.1.

IP Address: . . .

Host Name: ELAP1

Click the *Change* button, in *Module Definition* section, in order to select input data for controller and their format.

Module Definition

Revision: 1 001

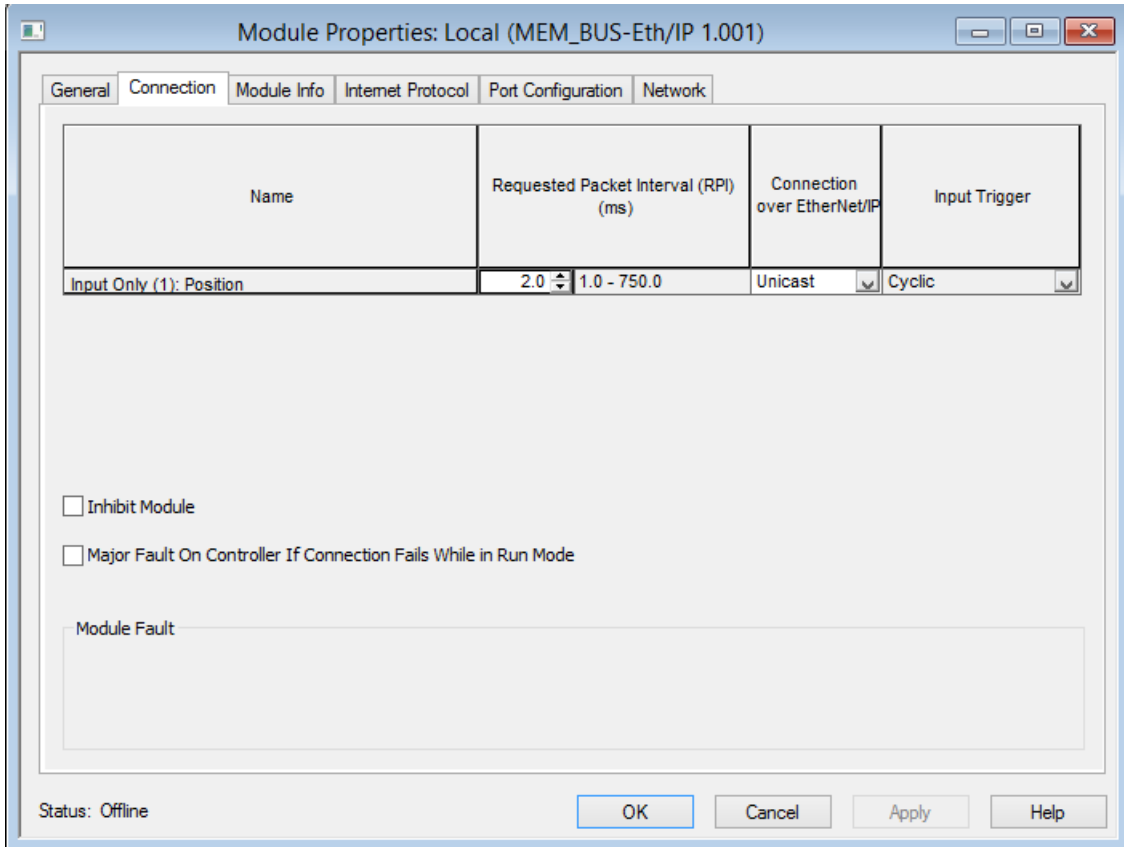
Electronic Keying: Compatible Module

Connections:

Name	Input:	Size	Output:	Tag Suffix
Input Only (1): Position	1	DINT	0	Encoder_1:11
				<none>
Select a connection				

OK Cancel Help

4.2 Connection tab



The following settings are available:

Requested Packet Interval: It is the measure of how frequently the originating application requires the transmission of data from the target application. All values between 1 and 750 ms are accepted.

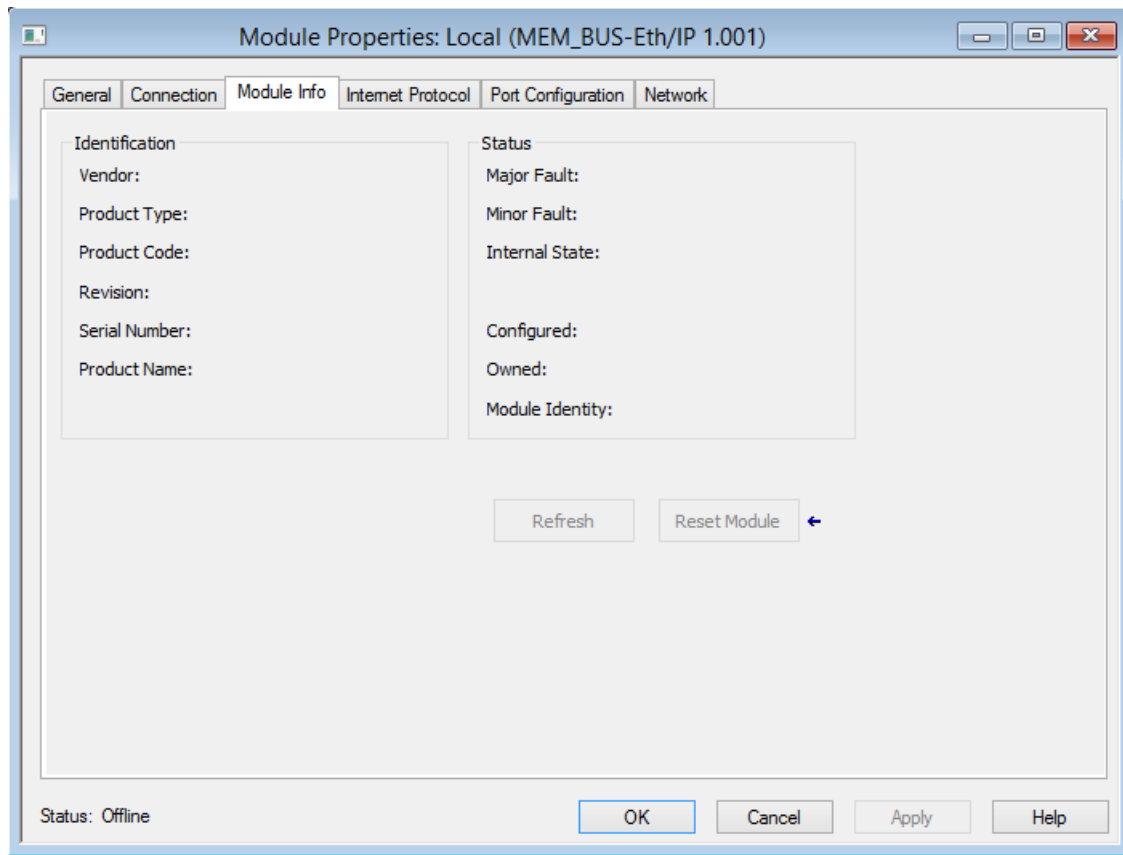
Connection over EtherNet/IP: Unicast connections are point to point connections, while multicast connections are considered one to many. Select unicast in order to reduce the amount of network bandwidth used.

Inhibit Module: When checked, the encoder is not polled for information any more. Any data provided will be ignored by the controller.

Major Fault On Controller If Connection Fails While In Run Mode: Check this box if a connection failure should be considered a major fault.

Module Fault: Fault messages will appear in this box.

4.3 Module Info tab



This section shows general read-only data and it is populated when the controller goes online.

The **Identification panel** shows vendor, product type, product code, revision level, serial number and product name.

The **Status panel** shows the fault status, internal state (for example Run Mode) and whether the module corresponds to its description file .EDS.

The **Refresh** and **Reset Module** buttons are active when the controller is online. Click **Refresh** in order to refresh data in the window. Click **Reset Module** with care as it momentarily disconnects the module and control is interrupted.

4.4 Internet Protocol, Port Configuration and Network tabs

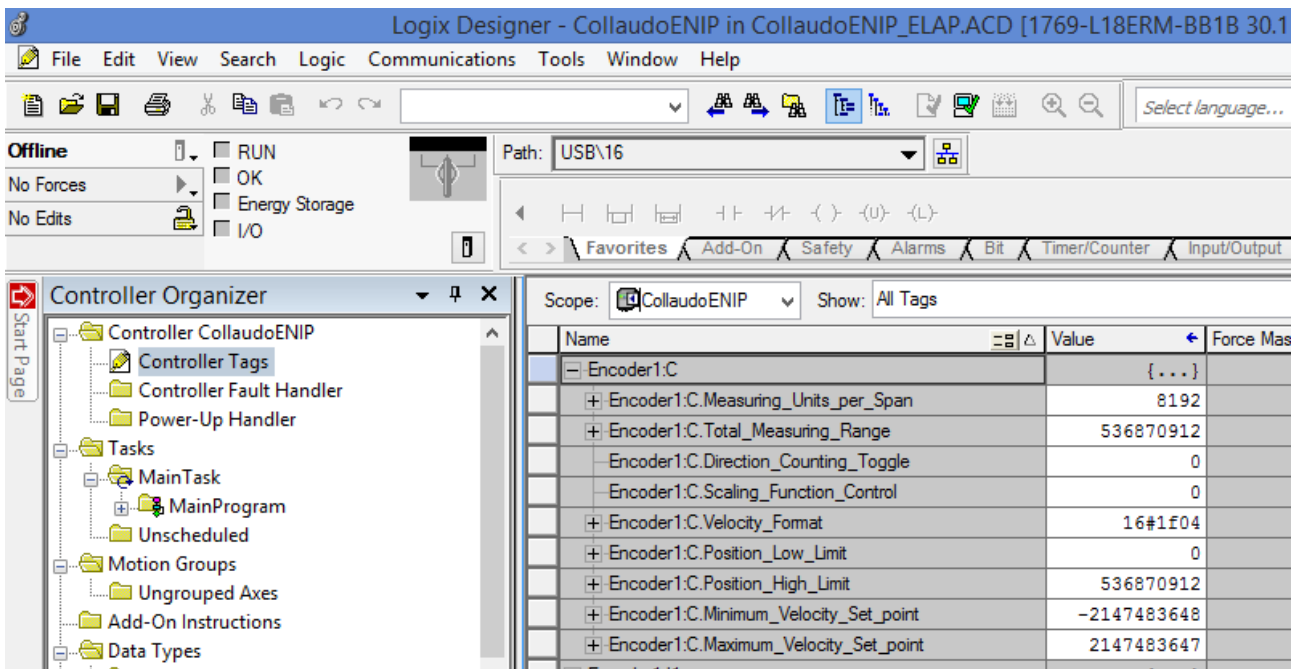
These sections contain reads-only data, that are visible when the controller is online.

4.5 Configuration

ELAP MEM-BUS encoder is supplied with the following parameters:

- Direction counting = 0 (clockwise)
- Scaling function = 0 (disabled)
- Steps per revolution = 8192
- Total resolution = 536870912
- Velocity measuring Unit = 1F04H (step/s)

These values can be changed in the **Controller Tags** table of your project, with tool RSLogix5000.



Here, the encoder data are divided into 2 categories, whose names are composed by the name assigned to the encoder (in this case *Encoder_1*), followed by:

- C for configuration
- I for input

Expand the configuration table *Encoder_1.C*, in order to set the desired configuration values.

4.6 Preset function

The Preset function is used to adjust the measuring system to any position value within a range to the total measuring length – 1. Two modes are available:

Preset button: The position value is set to zero when preset button is pressed. This button is active only when the encoder is powered.

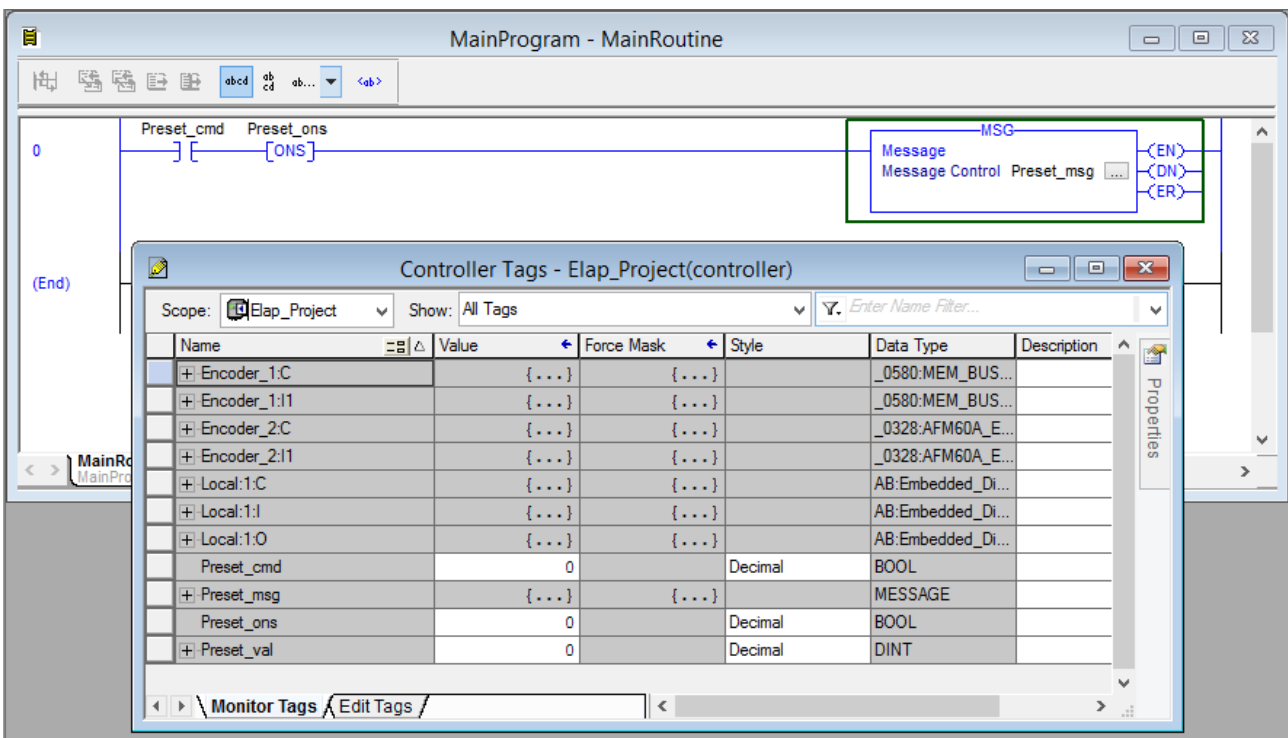
Note: Pressing the preset button result in a change of position reading. This can cause unexpected motion which could result in personal injury or damage to the product or equipment.

PLC command: The preset function can be performed by writing the Preset attribute value (class 23H, instance 1, attribute 19) with an explicit message in the PLC program.

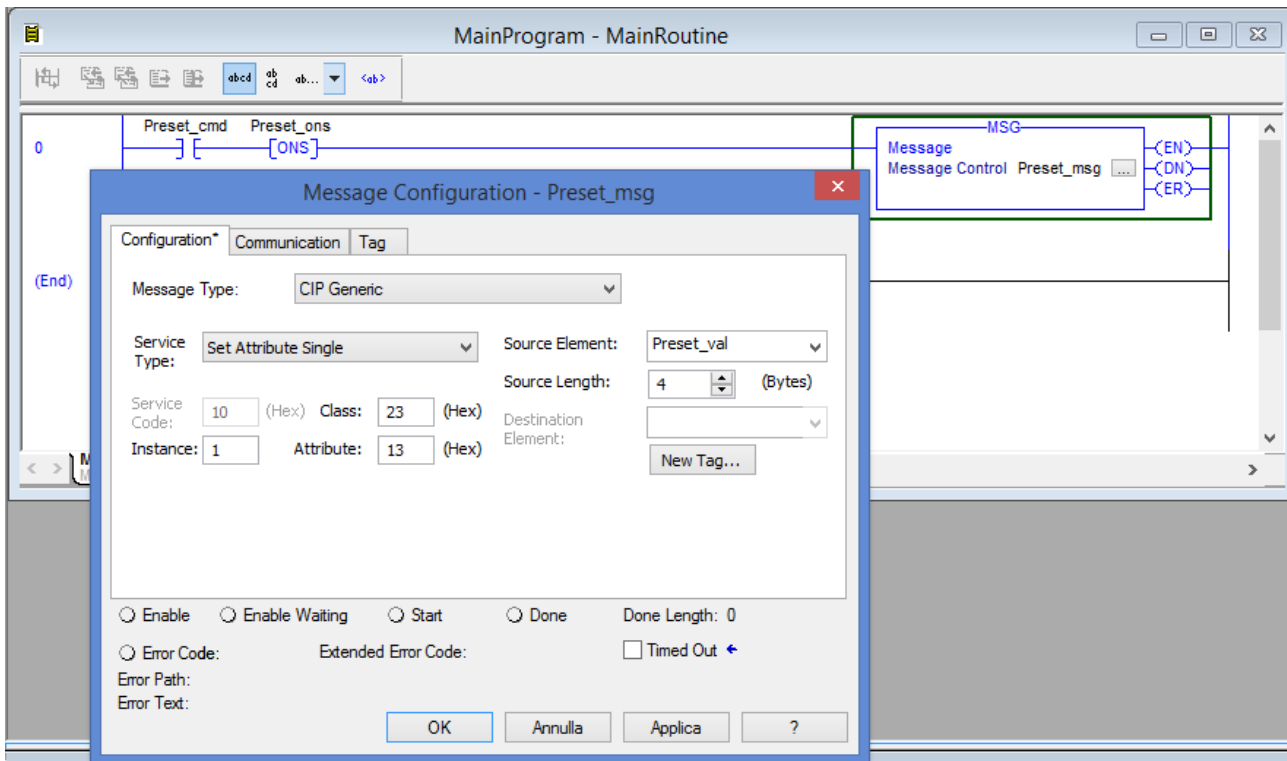
Note:

1. When the scaling parameters change, it is recommended to execute a Preset function (writing of attribute 19) in order to reset the encoder and restart it from a correct position.
2. When the scaling function is disabled (attribute 14 = 0), the Preset value shall be lower than the global physical resolution (536870912).
3. When the scaling function is enabled (attribute 14 = 1), the Preset value shall be lower than the total resolution (attribute 17).

In your PLC program, create a new message data type named *Preset_msg* and a DINT named *Preset_val*.



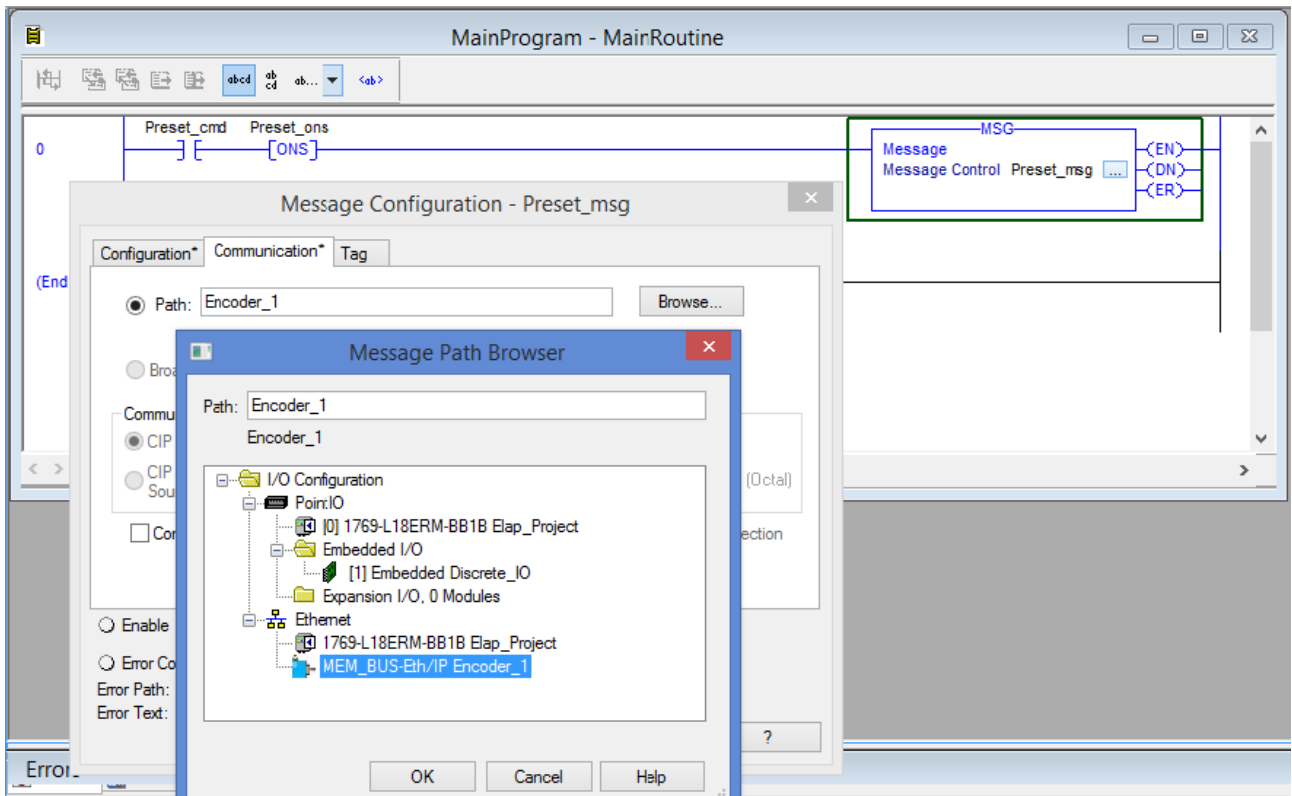
Double-click the gray box on the message instruction to configure it.



In the configuration tab select:

- Message Type: CIP Generic
- Service Type: Set Attribute Single
- Service Code: 10H (automatic)
- Class: 23H (Position Sensor Object)
- Instance: 1
- Attribute: 13H (19)
- Source Element: Preset_val
- Source Length: 4

Note: the numbers of class, instance and attribute are hexadecimal values.



In the communication tab, browse to the MEM_BUS-Eth/IP encoder on the Ethernet network, then click **OK**.

TECHNICAL SPECIFICATIONS

MECHANICAL & ENVIRONMENTAL SPECIFICATIONS			
		<i>MEM-BUS 620 / 520 / 540</i>	<i>MEM-BUS 440 / 450</i>
<i>Materials:</i>	<i>case</i>	Aluminium	
	<i>shaft</i>	Stainless steel	
<i>Weight</i>		500 g	
<i>Shaft/joint hole Ø</i>		6, 8, 10 mm	8, 10, 12, 14, 15 mm
<i>Revolutions/minute</i>		6000	
<i>Starting torque</i>		≤ 0.8 Ncm	
<i>Inertia</i>		≤ 25 g cm ²	
<i>Max load</i>		80 N axial/100 N radial	
<i>Vibrations resistance</i>	<i>(10÷2000 Hz)</i>	100 m/sec ²	
<i>Shock</i>	<i>(11 ms)</i>	50 G	
<i>Protection degree</i>		IP67 – IP65 shaft side	
<i>Operating temperature</i>		-30 ÷ 70°C	
<i>Ambient temperature</i>		60°C max	
<i>Stocking temperature</i>		-30 ÷ 85°C	

ELECTRICAL & OPERATING SPECIFICATIONS	
<i>Operating principle</i>	Magnetic
<i>Resolution/revolution</i>	8192 steps/rev – 13 bit
<i>Revolutions no.</i>	65536 - 16 bit
<i>Initializing time</i>	< 1 s
<i>Data memory</i>	> 20 years
<i>Field bus</i>	No motion – Power off
<i>Supply</i>	EtherNet/IP™
<i>Power consumption</i>	10 ÷ 30 V dc
<i>Accuracy</i>	Protection against polarity reversal
<i>Connection</i>	2 W
<i>Interference immunity</i>	± ½ LSB
<i>Emitted interference</i>	2 M12 female connectors +1 M12 male connector
	EN 61000-6-2
	EN 61000-6-4

EtherNet/IP™ IEC 61784-1	
<i>Physical Layer</i>	EtherNet/IP™ 100Base-TX, Fast Ethernet, ISO/IEC 8802-3
<i>Output code</i>	Binary
<i>Device profile</i>	CIP™ Protocol, encoder profile 22H
<i>Cycle time</i>	≥ 1 ms
<i>Transmission rate</i>	100 Mbit/s
<i>Transmission</i>	CAT-5 cable, shielded (STP), ISO/IEC 11801
<i>Programmable via CIP™</i>	<ul style="list-style-type: none"> ○ Counting direction ○ Measuring steps per revolution ○ Total measuring length in steps ○ Preset value ○ Velocity measuring unit ○ IP Address

ORDERING INFORMATION

MEM520B	EIP	M	10
	INTERFACE	No. of TURNS M = Multiturn	SHAFT/HOLLOW SHAFT Ø Shaft: 6 – 8 – 10 mm Hollow shaft: 8 – 10 – 12 – 14 –
TYPE	EIP = EtherNet/IP		

MEM520-Bus = Round flange Ø 58 mm

MEM540-Bus = Round flange Ø 58 mm

MEM620-Bus = Square flange 63.5x63.5 mm

MEM440-Bus = Blind hollow shaft for motor coupling

MEM450-Bus = Blind hollow shaft, fixing by elastic support



DECLARATION OF CONFORMITY

Declaration of Conformity (DOC) Reference Information

File Number: 11803.01

Part 1 of 1

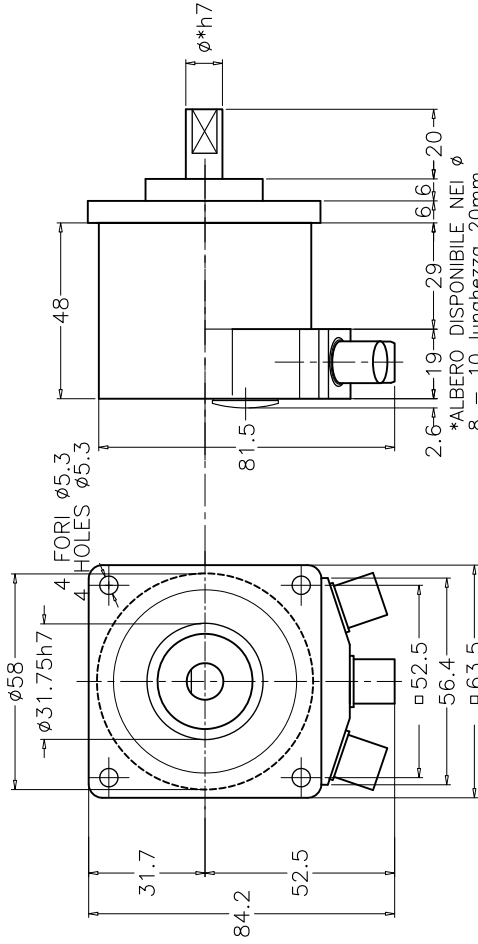
Year Last Issued:

2018

Identity for Product(s) Covered Under this Declaration of Conformity

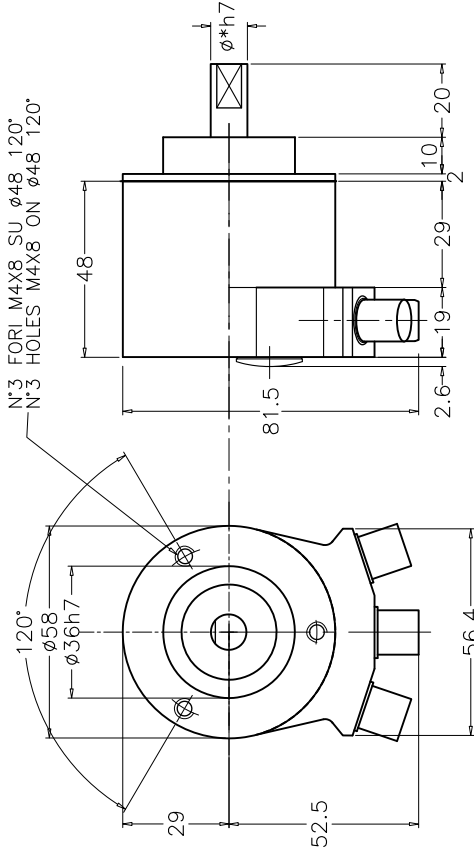
No.	Product Code	Product Name	Product Revision
1	10	MEM-BUS EtherNet/IP	1.001

MEM620Bus



*ALBERO DISPONIBILE NEI ϕ
 8 - 10 lunghezza 20mm
 6 lunghezza 10mm
 * AVAILABLE SHAFT DIAMETERS
 8 - 10 length 20mm
 6 length 10mm

MEM540Bus

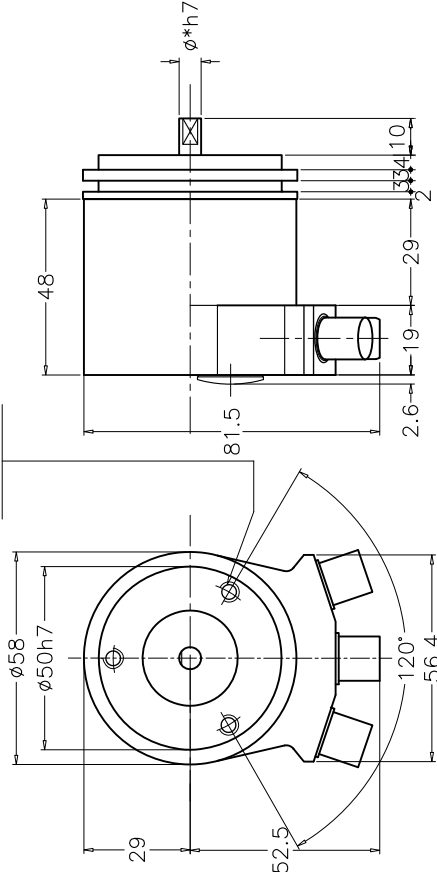


N°3 FORI M4X8 SU ϕ 48, 120°
 N°3 HOLES M4X8 ON ϕ 48 120°

*ALBERO DISPONIBILE NEI ϕ
 8 - 10 lunghezza 20mm
 6 lunghezza 10mm
 * AVAILABLE SHAFT DIAMETERS
 8 - 10 length 20mm
 6 length 10mm

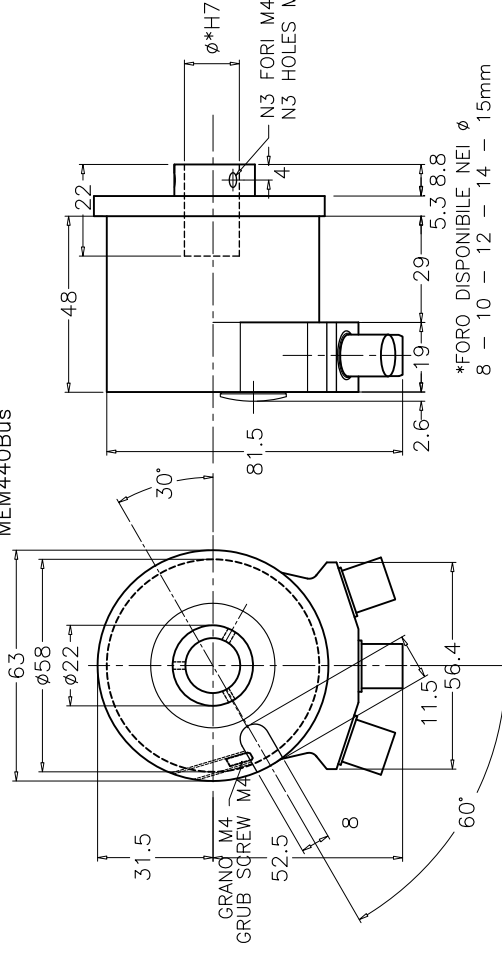
MEM520Bus

3 FORI M4x8 SU ϕ 42
 3 HOLES M4x8 ϕ 42



*ALBERO DISPONIBILE NEI ϕ
 8 - 10 lunghezza 20mm
 6 lunghezza 10mm
 * AVAILABLE SHAFT DIAMETERS
 8 - 10 length 20mm
 6 length 10mm

MEM440Bus



GRAND M4
 GRUB SCREW M4

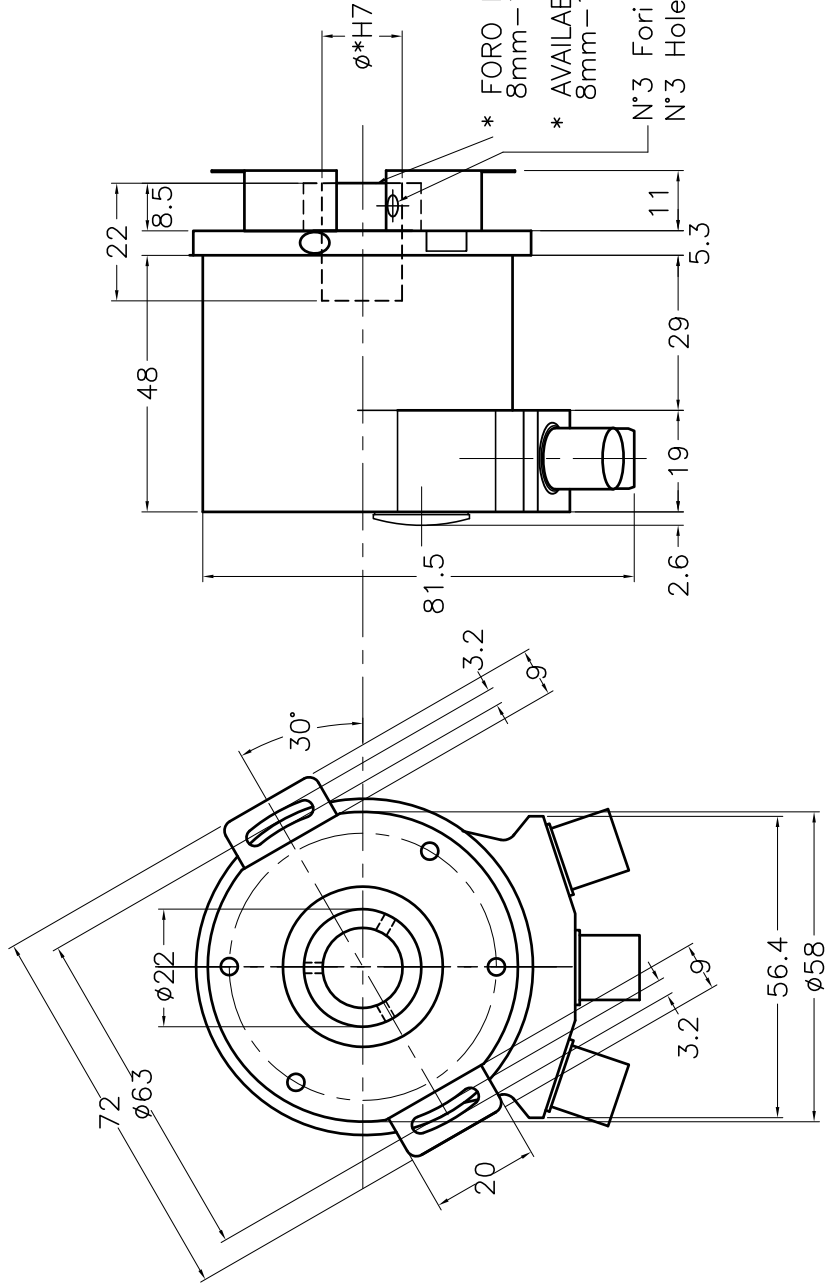
N3 FORI M4 SU 120°
 N3 HOLES M4 ON 120°

*FORO DISPONIBILE NEI ϕ
 8 - 10 - 12 - 14 - 15mm
 * AVAILABLE HOLES DIAMETER
 8 - 10 - 12 - 14 - 15mm

DESIGNO N.	COORCE	SCALA	FOGLIO	SOSTITUTO DA	DATA	FRIMA	DESIGNATO	DATA	SOFTWARE
M2079		1:1	1 di 1				T.R.		
DENOMINAZIONE		TOLL.	MATER.	SOSTITUISE	DATA	FRIMA	NETO	FILE	M2079.DWG
MEM.BUS_EIP DIMENSIONI PER ETHERNET II/II		V.note			DATA	FRIMA			
NOTE		DESCRIZIONE							
CLIENTE		MODIFICHE							



SA VITTORIO (SHEFO,
 SOCIETA' S.p.A.)
 TEL. 024515951 FAX. 0245103406

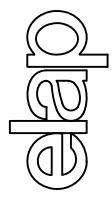


* FORO DISPONIBILE nei diametri
8mm-10mm-12mm-14mm-15mm

* AVAILABLE HOLE DIAMETERS
8mm-10mm-12mm-14mm-15mm

N°3 Fori M4 su 120°
N°3 Holes M4 on 120°

DISEGNO N.	M2080	CODICE		SCALA	1:1	FOLIO	1 di 1	SOSTITUITO DA		FIRMA		DISEGNATO	T.R.	DATA	13.7.18	SOFTWARE		
DENOMINAZIONE	MEM450-EIP Dimensione d'ingombro EtherNet/IP			TOLL.		MATER.	Vari	SOSTITUISCE		FIRMA		VISTA	FILE	M2080.DWG				
NOTE	Tolleranza gen.li ISO 2768 - m			DESCRIZIONE														
CLIENTE				MODIFICHE														
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MANUALS, SOFTWARE and DIMENSIONAL DRAWING DOWNLOAD AT:

<https://www.elap.it/absolute-encoders/encoder-mem-bus-ethernet-ip/>



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