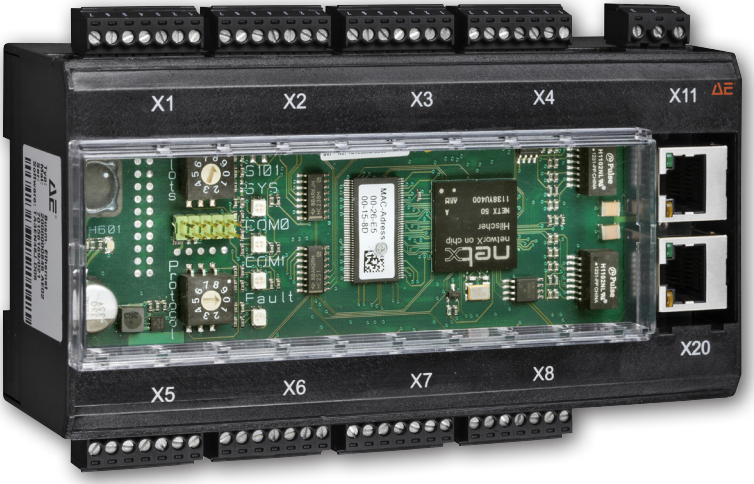
BUS MODULE ETHERNET/IP

FOR THYRO-S, THYRO-A, THYRO-AX, THYRO-POWER MANAGER,
THYRO-STEP CONTROLLER, THYRO-MEASUREMENT UNIT,
THYRO-A ...C01, ...C02, ...C03, ...C05 AND ...C07

January 2015 DE/EN - V4



CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

TPM	Thyro–Power Manager
TSC	Thyro–Step Controller
TMU	Thyro–Measurement Unit
TIO	Thyro-Input / Output Unit

1. SAFETY INSTRUCTIONS

The safety instructions and operating manual are to be read carefully prior to installation and commissioning.

1.1 OBLIGATION TO GIVE INSTRUCTIONS

The following safety and operating instructions must be carefully read before assembly, installation and commissioning of EtherNet/IP interface module by those persons working with or on EtherNet/IP bus module. These operating instructions are part of the EtherNet/IP bus module and of Thyro-A, Thyro-AX, Thyro-S, Thyro-Step Controller, Thyro-Measurement Unit and/or Thyro-Power Manager operating instructions.

The operator of this device is obligated to provide these operating instructions to all persons transporting, commissioning, maintaining or performing other work on the Thyro-A, Thyro-AX, Thyro-S, Thyro-Step Controller, Thyro-Measurement Unit and/or Thyro-Power Manager without any restrictions.
In accordance with the Product Liability Act, the manufacturer of a product has an obligation to provide explanations and warnings as regards:

- the use of the product other than for the intended use,
- the residual product risk and
- operating error and its consequences.

The information given below must be understood in this respect. It is to warn the product user and protect him and his systems.

1.2 PROPER USE

- The EtherNet/IP interface module is an interface component which may only be used in connection with one of the versions of types indicated on the cover page.
- As a component the EtherNet/IP interface module is unable to operate alone and must be projected for its intended use to minimize residual risks.
- The EtherNet/IP interface module may only be operated in the sense of its intended use; otherwise, personal hazards (for instance electrical shock, burns) and hazards for systems (for instance overload) may be caused.
- Any unauthorized reconstructions and modification of the device, use of spare and exchange parts not approved by Advanced Energy as well as any other use of the device is not allowed.
- The manufacturer warranty applies only under acceptance and compliance of these operating instructions.

- The bus modules can be installed in any desired order.
- The devices supplied have been produced in accordance to the quality standard ISO 9001.
- The power supply of the interface module results from external 24 V DC power supply.
- When the bus module is linked to Thyro-AX, please be aware that data transfer is the same as for Thyro-A, whereas special features or other additional parameters are excluded from this.

1.3 RESIDUAL HAZARDS OF THE PRODUCT

Even in case of proper use, in case of fault, it is possible that control of currents, voltages and power is no longer performed in the load circuit by the Thyristor Power Controller.
In case of destruction of the power components (for instance breakdown or high resistance), the following situations are possible: power interruption, continuous power flow.
If such a situation occurs, then load voltages and currents are produced from the physical dimensions of the overall power circuit. It must be ensured by system design that no uncontrolled large currents, voltages or power results.
It is not possible to totally exclude that during operation of Thyristor power controllers other loads show abnormal behavior.
The physically determined network reactions, depending on the operating mode, must be considered.

1.4 MALOPERATION AND ITS RESULTS

With maloperation, it is possible that power, voltage or current levels which are higher than planned reach the Ethernet bus module EtherNet/IP, the device indicated on the cover page or load. On principle, this can lead to the EtherNet/IP interface module, the Power Controller
or load being damaged.
It is important that preset parameters are not adjusted in any way that may cause the EtherNet/IP interface module to overload.

1.5 SCOPE OF SUPPLY

The package consists of the following parts:
- Ethernet bus module EtherNet/IP
- Operating instructions

1.6 STORING

The devices are only allowed to be stored in original packaging in dry, vented spaces.

- Approvable temperature: -25 °C up to +55 °C
- Approvable comparative air humidity: max. 85%

For sustainable storage the devices should be sealed airtight by using commercial desiccant and being vacuumed within foil.

1.7 INSTALLATION

- If stored in a cold environment: ensure that the device is absolutely dry. (Allow the device a period of at least two hours to acclimatize before commissioning)
- Ensure sufficient ventilation of the cabinet if mounted in a cabinet.
- Observe minimum spacing.
- Ensure that the device cannot be heated up by heat sources below it.
- Ground the device in accordance with local regulations.
- Connect the device in accordance with the connection diagrams.

For further details please see chapter 7. INSTALLATION.

1.8 CONNECTION

Prior to connection, it must be ensured that the voltage information on the type plate corresponds with the mains voltage.
The electrical connection is carried out at the designated points with the required cross section and the appropriate screw cross sections.

1.9 OPERATION

The EtherNet/IP interface module may only be connected to the mains voltage if it has been ensured that any hazard to people and system, especially in the load section, has been eliminated.

- Protect the device from dust and moisture.
- Do not block vents.

1.10 MAINTENANCE, SERVICE, MALFUNCTIONS

The icons used below are explained in the chapter SAFETY REGULATIONS.
In order to avoid personal and material damages, the user must observe before all work the following:

- Secure the device against accidentally being switched back on.
- Use suitable measuring instruments and check that there is no voltage present.
- Ground and short circuit the device.
- Provide protection by covers or barriers for any neighboring live parts.
- The device may only be serviced and repaired by trained electrotechnical personnel.

CAUTION
Should fume, odorant or fire occur the power controller must be disconnected immediately from the mains.

CAUTION
For maintenance and repair work, the power controller must be disconnected from all external voltage sources and protected against restarting. Make sure to wait minimum of two minutes after switch-off due to the discharge time of the attenuation capacitors. The voltage-free state is to be determined by means of suitable measuring instruments. The unit is to be grounded and short-circuited. Cover or shield any adjacent live parts. This work is only to be carried out by a skilled electrician. The electrical regulations which are locally valid are to be adhered.

CAUTION
The thyristor power controller contains hazardous voltages. Repairs may generally only be performed by qualified and trained maintenance personnel.

CAUTION
Hazard of electrical shock. Even after disconnection from the mains voltage, capacitors may still contain a dangerously high power level.

CAUTION
Hazard of electrical shock. Even when the thyristor power controller is not triggered, the load circuit is not disconnected from the mains.

ATTENTION
Different components in the power section are screwed in place using exact torques. For safety reasons, power components repairs must be performed by Advanced Energy.

1.11 DECOMMISSIONING AND REMOVAL

In case of a decommissioning and the disassembly of the unit due to relocation or disposal the following safety regulations have to be ensured at the beginning of any work:

CAUTION MAINS VOLTAGE!
Safety regulations for working on electrical systems:
1. switch voltage-free
2. secure against switching on
3. determine if it is voltage-free
4. ground and short-circuit it
5. cover or shield any adjacent live parts

For removal please observe the following rules:
1. Disconnect the unit from the main power supply 230 VAC as well as 110 VAC.
2. Disconnect all further connections.

The electrical connections are to be removed and after that the unit can be removed from the DIN rail.

2. SAFETY REGULATIONS

2.1 IMPORTANT INSTRUCTIONS AND EXPLANATIONS

Operation and maintenance according to regulation as well as observance of the listed safety regulations are required for protection of the staff and to preserve readiness to operate.
Personnel installing/uninstalling the device, commissioning them, maintaining them, must know and observe these safety regulations. All work may only be performed by specialist personnel trained for this purpose using the tools, devices, test instruments and consumables provided for this purpose and in good shape.
In these operating instructions are warnings of dangerous actions. These warnings are divided into the following danger categories:

DANGER
Dangers that can lead to serious injuries or fatal injuries.

WARNING
Dangers that can lead to serious injuries or considerable damages to property.

CAUTION
Dangers that can lead to injuries and damages to property.

CAUTION
Dangers that can lead to minor damage to property

The warnings can also be supplemented with a special danger symbol (e.g. “Electric current“ or “Hot parts“), e.g.

Risk of electric current or

Risk of burns

In addition to the warnings, there is also a general note for useful information.

NOTE

Content of note

2.2 ACCIDENT PREVENTION RULES

DANGER

ELECTRIC CURRENT

Risks that can lead to serious injuries or fatal injuries.

DANGER

ELECTRIC CURRENT

Risk of injury from current carrying parts / danger of damaging the bus module.

• Never operate the device without the covering.

DANGER

HOT DEVICE

Risk of burns from heat sinks and neighboring plastic parts (> 70°C possible)

Do not touch the hot parts of the device.

Affix the “Risk of burns” warning symbol in the immediate vicinity of the device.

DANGER

DANGERS DURING INSTALLATION

- Nonobservance of the safety instructions in these operating instructions of the used power controllers causes risk of injury / risk of damage of the device and accordingly the system.

DANGER

UNSAFE SYSTEM DUE TO INCORRECT INSTALLATION

The plant cannot be operated safely and poses a threat to persons.

- Only install the device in an upright position.
- Ensure sufficient ventilation of the cabinet if mounted in a cabinet.
- Ensure that the device cannot be heated up by heat sources below it. (The power loss is given in the type overview table, see chapter‚Technical data')
- Ground the device in accordance with local regulations (grounding screw / nut for protective conductor connection to fixing adapter). Grounding also serves for EMC means (Y capacitor 4.7 nF).

CAUTION

USE OF INCORRECT CONNECTION CABLES

Incorrect connection cables can lead to malfunctions. Use shielded control conductors to connect the control signals.

For use in UL conditions: Only use 60 °C or 75 °C copper conductors for power connections (as indicated in the technical data).

2.3 QUALIFIED PERSONNEL

Only qualified electro-technical personnel who are familiar with the pertinent safety and installation regulations may perform the following:

- Transport
- Installation
- Connection
- Commissioning
- Maintenance
- Testing
- Operation

These operating instructions must be read carefully by all persons working with or on the equipment prior to installation and initial start-up.

2.4 OPERATOR REQUIREMENTS

The person responsible for the system must ensure that:

- The safety regulations and operating instructions are available and are observed.
- The operating conditions and restrictions resulting from the technical data are observed.
- The safety devices are used.
- Should abnormal voltages, noises, increased temperatures, vibration or similar occur, the device is immediately to put out of operation and the maintenance personnel is informed.
- The accident prevention regulations valid in the respective country of use and the general safety regulations are observed.
- All safety devices (covers, warning signs etc.) are present, in perfect condition and are used correctly.
- The national and regional safety regulations are observed.
- The personnel have access to the operating instructions and safety regulations at all times.

2.5 INTENDED USE

CAUTION

The intended use of the Ethernet Bus Module EtherNet/IP is to operate as an interface module of Thyro-A power controller, Thyro-AX power controller, Thyro-S power switch, Thyro-Step Controller, Thyro-Measurement Unit and Thyro-Power Manager so that they can be connected to the EtherNet/IP bus system. The device may only be used for the purpose for which it was intended as persons may otherwise be exposed to dangers (e.g. electric shock, burns) and plants also (e.g. overload).

Any unauthorized reconstructions and modification to the unit, use of spare and exchange parts not approved by Advanced Energy as well as any other use of the unit is not allowed.

These operating instructions contain all information required by specialists for use of EtherNet/IP interface module. Additional information and hints for unqualified persons and for use of EtherNet/IP interface module outside of industrial installations are not contained in these operating instructions.

The warranty obligation of the manufacturer applies only if these operating instructions are observed.

The device is a component that cannot operate alone.

Project planning must account for the proper use of the device.

2.6 LIABILITY

In case of use of EtherNet/IP interface module for applications not provided for by the manufacturer, no liability is assumed. The responsibility for required measures to avoid hazards to persons and property is borne by the operator respectively the user. In case of complaints, please immediately notify us stating:

- type name
- production number
- objection
- duration of use
- ambient conditions

2.7 GUIDELINES

The devices of the type range indicated on the cover page, EtherNet/IP interface module is a part of these, conform to the currently applicable EN 50178 and EN 60146-1-1.

The CE mark on the device confirms observation of the general EG guidelines for 2006/95/EG

- low voltage and for 2004/108/EG – electromagnet compatibility, if the instructions on installation and commissioning described in the operating instructions are observed.

Regulations and definitions for qualified personnel are contained in DIN 57105/VDE 0105 Part 1.

Safe isolation according to VDE 0160 (EN 50178 Chapter 3).

3. REMARKS ON THE PRESENT OPERATING INSTRUCTIONS

3.1 VALIDITY

These operating instructions refer to latest technical specification of EtherNet/IP interface module at the time of publication and are for information purpose only. Every effort has been taken to ensure the accuracy of this specification, however, in order to maintain our technological lead and for product enhancement, Advanced Energy is continually improving their products which could, without notice, result in amendments or omissions to this specification. Advanced Energy cannot accept responsibility for damage, injury, loss or expenses resulting therefrom.
The operating instructions serve only in conjunction with and as an addition to the operating instructions of the Advanced Energy devices indicated on the cover page in the versions of the types indicated on the covering page. The safety instructions contained therein are to
be observed in particular. If you have not got any available operating instructions of Thyro-A, Thyro-AX, Thyro-S, Thyro-Step Controller, Thyro-Measurement Unit and/or Thyro-Power Manager, please contact your supplier immediately.

3.2 HANDLING

These operating instructions for EtherNet/IP interface module are organized in a way that all work required for commissioning, maintenance and repair may be performed by corresponding specialist personnel.
If hazards to personnel and property cannot be excluded for certain work, then this work is marked using certain icons. The meaning of these icons may be found in the prior chapter SAFETY REGULATIONS.

3.3 WARRANTY

Customer shall provide written particulars, enclosing the delivery note, within 8 working days to Advanced Energy on becoming aware of any defects in the goods during the warranty period and shall use its best endeavors to provide Advanced Energy with all necessary access, facilities and information to enable Advanced Energy to ascertain or verify the nature and cause of the defect and carry out its warranty obligations.

If goods are found not to be defective or if any defect is attributable to customer's design or material in operation of the goods, Advanced Energy will levy a testing charge and where relevant will return the goods to customer at customer's expense, and shall be entitled to payment in advance if the whole testing and transport charge before such return.

Advanced Energy accepts no liability for defects caused by the customer's design or installation of the goods; or if the goods have been modified or repaired otherwise than as authorized in writing by Advanced Energy; or if the defect arises because of the fitting of the goods to unsuitable equipment.
Advanced Energy will cancel all possible obligations incurred by Advanced Energy and its dealers, such as warranty commitments, service agreements, etc., without prior notice if other than original Advanced Energy spare parts or spare parts purchased from Advanced Energy are used for maintenance or repair.

3.4 COPYRIGHT

No part of these operating instructions may be transmitted, reproduced and/or copied by any electronic or mechanical means without the express prior written permission of Advanced Energy.
© Copyright Advanced Energy Industries GmbH 2014.
All rights reserved.

3.5 COPYRIGHT NOTICE

Thyro-™, Thyro-S™, Thyro-A™, Thyro-AX™ are registered trademarks of Advanced Energy Industries GmbH.
All other company and product names are (registered) trademarks of the respective owners.

4. CONTACT INFORMATION

4.1 TECHNICAL QUERIES

Do you have any technical queries regarding the subjects dealt with in these operating instructions?
If so, please get in touch with our team for power controllers:
Phone: +49 (0) 2902 763-520
Phone: +49 (0) 2902 763-290
E-Mail: powercontroller@aei.com

4.2 COMMERCIAL QUERIES

Do you have any commercial queries on power controllers?
If so, please get in touch with our team for power controllers.
Phone: +49 (0) 2902 763-558
E-Mail: powercontroller@aei.com

4.3 SERVICE

Advanced Energy Industries GmbH
Branch Office Warstein-Belecke
Emil-Siepmann-Straße 32
D-59581 Warstein
Phone: +49 (0) 2902 763-0
E-Mail: powercontroller@aei.com

4.4 INTERNET

Further information on our company or our products can be found on the Internet under: http://www.advanced-energy.com

5. INTRODUCTION

5.1 GENERAL

The Ethernet bus module can connect up to 8 power controller modules of type Thyro-A, Thyro-AX, Thyro-S, Thyro-Power Manager, Thyro-Step Controller and Thyro-Measurement Unit in any desired order with a master.
Several bus modules can be used on one system.
The power supply of the bus module comes from an external 24V DC voltage source (150mA), which is to be fed in (reverse polarity protected) at X11.1 (+) and X11.2 (ground).
Several modules can be operated from one power supply.
The ground connection at terminal X11.3 should be as short as possible for EMC reasons.

5.2 SPECIAL FEATURES

- The Ethernet bus module connects the modules to different Ethernet bus systems. By setting the "Protocol" switch to 2, the Ethernet bus module becomes an EtherNet/IP-device.
- When position 9 "Set all default" is active during power-up, the card will be reset to factory defaults for settings and address.
- Function control via LED
- 8 free application outputs X1 to X8 on terminal 5
- C-rail assembly
- When the bus module is linked to Thyro-AX, please be aware that data transfer is the same as for Thyro-A, whereas special features or other additional parameters are excluded from this.

5.3 TYPE DESIGNATION

The order number of the Ethernet bus module EtherNet/IP is 2.000.000.846.

6. FUNCTIONS

6.1 PROCESSING THE SET POINT Thyro-S

Only local set points, no bus set point
Switching signal (24V DC) at the control terminal X22.1 of the Thyro-S
> No wiring of the terminal point X22.4 at the power controller
- The bus module is fully functional. The analog signal from the control terminal X22.1 is used as set point (on/off).

Set point from the bus module (X22.3), no local set point
> Connect the ground to terminal X22.4 of the power controller.
- The master set point of the bus module is used. For this purpose the set point is interpreted as the operating mode.

Bus set point, switching over to "local" in case of bus fault
Only use the set point of the bus module if there is an IO connection.
> Connect terminal X22.4 of the power controller to one of the terminals X1.1 to X8.1 of the bus module.
- If there is an IO connection the master set point is used. If not then the analog signal from the control terminal X22.1 is used as set point (on/off).

Switching over to bus / local set point reversible for each controller in operation
Individual set point by bus module for each power controller.
> Connect terminal X22.4 of the power controller to one of the terminals X1.5 to X8.5 of the bus module.
- The power controllers can be switched over individually (targeted) via the bus between master set point and terminal X22.1.

6.2 PROCESSING THE SET POINT Thyro-A/Thyro-AX

Only local set points, no bus set point:
Analog input at control terminal X2.4 of Thyro-A/Thyro-AX
> Do not connect anything to terminal X22.1 of the power controller.
- The bus module is fully functional. The analog signal from the control terminal X2.4 is used as set point (on/off).

Set point from the bus module (X22.3), no local set point:
> Connect the ground to terminal X22.1 of the power controller.
- The master set point of the bus module is used.

Bus set point, switching over to "local" in case of bus fault:
Only use the set point of the bus module if there is an IO connection.
> Connection between X22.1 Thyro-A and bus module X1.1 to X8.1
During normal operation, the set point is digital.
If an error is detected in the bus module or Ethernet IP communications, then the bus module will automatically float the bus module, X1.1 output.
This causes the Thyro-A, X22.1 input to go high and switches to analog set point for Thyro-A (switches to 4-20mA or potentiometer control).
For further details: chapter 17. CONNECTION DIAGRAMS Thyro-A / Thyro-AX

- If there is an IO connection the master set point is used. If there is no IO connection then the analog signal from the control terminal X2.4 is used as set point.

Switching over to bus / local set point reversible for each controller in operation:
Individual set point from the bus module for each power controller.
> Connection between X22.1 Thyro-A and bus module X1.5 to X8.5
During normal operation, the set point is analog (bit set to 0)
If the bit is set to 1 then the Thyro-A set point is switched to digital.
If an error is detected in the bus module or Ethernet IP communications, then the bus module will automatically float the bus module, X1.5 output.
For further details: chapter 17. CONNECTION DIAGRAMS Thyro-A / Thyro-AX

- The power controllers can be switched over individually (targeted) via the bus between master set point and terminal X2.4.

6.3 PROCESSING THE SET POINT Thyro-Step Controller

Only local set points, no bus set point
Analog input at control terminal X6.1 or X6.4 (depending on X6.7) of the TSC.
> Do not connect anything to terminal X2.1 of the power controller.
- The bus module is fully functional. The analog signal from the control terminal X6.1 or X6.4 is used as a set point.

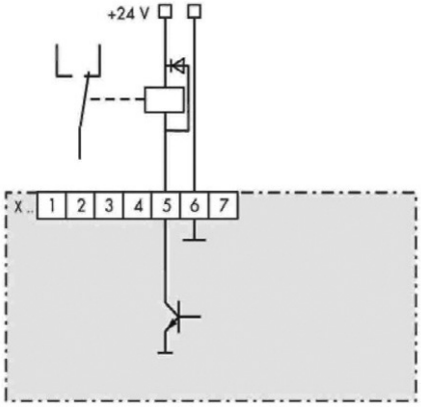
Set point from the bus module (X22.3), no local set point
> Connect the ground to terminal X2.1 of the TSC.
- The master set point of the Ethernet bus module is used.

Bus set point, switching over to "local" in case of bus fault
Only use the set point of the bus module if there is an IO connection.
> Connect terminal X2.1 of the TSC to one of the terminals X1.1 to X8.1 of the bus module.
- If there is an IO connection the master set point is used. If there is no IO connection then the analog set point is used.

Switching over to bus / local set point value reversible for each controller in operation
Individual set point from the bus module for each power controller.
> Connect terminal X2.1 of the power controller to one of the terminals X1.5 to X8.5 of the bus module.
- The power controllers can be switched over individually (targeted) via the bus between master set point and the analog set point.

6.4 FREELY ADDRESSABLE DIGITAL OUTPUTS

> As long as the terminals X1.5 to X8.5 of the bus module are not being used for switching over the set point, these can be used as switch outputs.
> Connect the relay to a 24V DC coil voltage for free use. The idle circuit is integrated. The actuating current is a maximum 120 mA per output. As a result it is possible to switch over, for example, the room ventilators, anti-condensation heating, circuit breakers or control lamps via the bus.



RELAY CONTROL

7. INSTALLATION

DANGER

DANGERS DURING INSTALLATION
Risk of injury/Risk of damage to the device or system
Observe all safety regulations in the chapter SAFETY REGULATIONS.

7.1 CONNECTION TERMINALS (OVERVIEW)

TABLE 1 CONNECTING TERMINALS (OVERVIEW)

TERMINAL		DESCRIPTION
X11	.1	24V (+)
	.2	24V (ground)
	.3	grounding, carry out as short as possible
X1 to X8	.1	jointly reversible ground potential
	.2	RxD
	.3	TxD
	.4	ground
	.5	separately reversible ground potential
	.6	ground
	.7	ground potential for shield connection

Connection diagram see chapter 17. CONNECTION DIAGRAMS Thyro-A/ Thyro-AX.

7.2 CONNECTING A 24 V POWER SUPPLY

> Switch off the main power supply including the external 24V power source and make sure these cannot be accidentally switched back on again.
> Connect the external 24V voltage supply (150 mA) to X11.1 (+) and X11.2 (-) (reverse polarity protection).
> Ground the X11.3 terminal by a route being as short as possible (for EMC reasons).

NOTE
24V DC power source
Several bus modules can be operated with one power supply.
> In cases of SELV (safety extra low voltages) do not ground the 24V power source.

7.3 CONNECTING THE POWER CONTROLLER TO X1-X8

> Switch off the main power supply including the external 24V power source and make sure these cannot accidentally be switched back on again.
> Connect the interfaces X1 to X8 of the bus module to the system interfaces of the power controller (shielded four-wire cable)

ATTENTION: To control all parameters by EtherNet/IP it is recommened to close the Thyro-A/Thyro-AX switches S1.3, S1.4, S1.5 (Thyro-Tool Mode).

7.4 CONNECTING THE ETHERNET BUS MODULE TO THE MASTER

The Ethernet bus module has two Ethernet ports which are equipped with a switch functionality which allows a line topology to be constructed.
A standard patch cable is required for connecting with a switch. For a direct connection (line topology) a cross-over cable is required.

8. SETTINGS

8.1 SETTING THE PROTOCOL

The Ethernet bus module supports various real time Ethernet bus systems. The desired system can be selected using the rotary switch “Protocol”. For EtherNet/IP this needs to be set to 2.

From firmware version 2.1 on, the vendor ID has changed from AEG to Advanced Energy Industries, Inc. Therefore the new EDS file version 2.1 has to be used, older versions are not compatible anymore. For replacements of existing systems with older EDS file versions, the previous firmware is still available by setting the switch “Protocol“ to 6. In this case please refer to the old manual “Bus module Ethernet/IP V3“.

8.2 SETTING THE NUMBER OF SLOTS

The number of devices, which are connected to the Ethernet bus module, is set with the rotary switch “Slots”. After switching on, the Ethernet bus module reads all the parameters of the device. Following this it starts communicating.

If one power controller is not correctly connected or has no supply, the fault LED starts to flash. The number of flashes reflects the port where the error is. For example when the LED is repeatedly flashing twice, the power controller at X2 is not connected or has no power supply.

ATTENTION

To change the number of slots when switched on, the switch “Slots” must first be turned to 0. Communication with the master is then interrupted. Following this the desired number can be set. After leaving the position 0 there is about 2 seconds time for this.

8.3 CONFIGURATION AND LED DISPLAYS

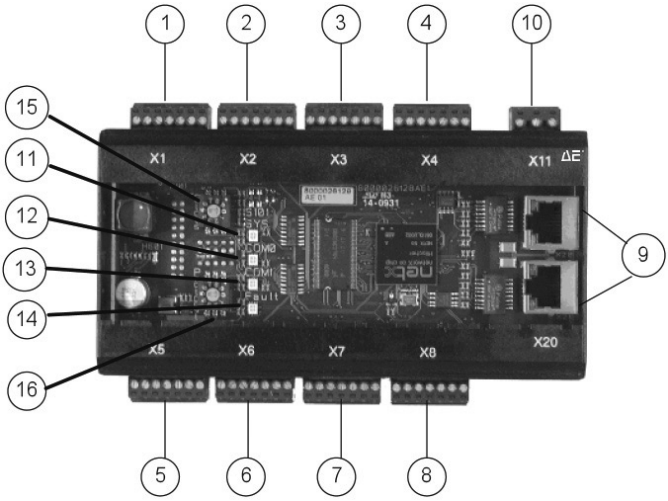


FIG. 1 CONFIGURATION AND LED DISPLAYS

1 Terminal X1
2 Terminal X2
3 Terminal X3
4 Terminal X4
5 Terminal X5
6 Terminal X6
7 Terminal X7
8 Terminal X8
9 Ethernet Port (with Link LED and Activity LED)
10 Terminal X11
11 SYS LED
12 MS (COM 0) LED
13 NS (COM 1) LED
14 Fault LED
15 Switch Slots
16 Switch Protocol

For the error analysis there are several LEDs on the PCBA. They give information about the status of the application and the bus system.

The two-colored (green/red) Module Status (MS) LED shows if the device is supplied with power and whether it functions properly.

The two-colored (green/red) Network Status (NS) LED shows the status of the communication connection.

The Link LED and the Activity LED on the Ethernet Ports show the status of the Ethernet communication.

TABLE 2 OPERATING DISPLAY OF THE BUS MODULE

LED	COLOR	STATUS	MEANING
SYS [Run]	green	ON	Operating system running
	yellow	flashing cyclic with 1 Hz	Device indicates boot error
		static	Waiting for boot procedure
	-	OFF	Power supply is missing or hardware defect
MS [Module Status]	green	ON	Device is operating
		flashing	Standby: device has not been configured
	red	ON	Error (non-recoverable)
		flashing	Error (recoverable, e.g. incorrect or inconsistent configuration)
	red / green	flashing	Self-test
	-	OFF	No power
NS [Network Status]	green	ON	Device is connected
		flashing	No established connections, but device has obtained IP address
	red	ON	Device has detected that its IP address is already in use
		flashing	One or more of the connections in which this device is the target has timed out
	red / green	flashing	Self-test
	-	OFF	No power or no IP address
FAULT [Error]	red	flashing (in groups)	Number of flash indicates which slot does not communicate (after power up)
		flashing (steady)	Internal communication fault
		OFF	No communication fault

LED	COLOR	STATUS	MEANING
LINK / RJ45 Ch0 & Ch1	green	ON	Connection to Ethernet
	-	OFF	No connection to Ethernet
ACT / RJ45 Ch0 & Ch1	yellow	flashing	Device sends / receives Ethernet frames

9. ETHERNET/IP COMMUNICATION MODEL

EtherNet/IP protocol uses standard Ethernet and TCP/IP technology to transport common industrial protocol (CIP) communications messages at the user level.

CIP (common industrial protocol) is a network independent, connection-oriented user protocol which is based upon an object-oriented model for describing the characteristics of devices and which uses the classic object-oriented definitions such as objects, classes, instances, attributes, data types, services etc. By using encapsulation the actual CIP messages from the application layer are packaged as payload into the TCP frame and sent to another application via the Ethernet.

9.1 OBJECT SPECIFICATION

Communication and application are depicted in the case of CIP on an object model.

An object is the abstract representation of a device component (partial functionality of the device). A class describes a set of objects, which represent identical device components. Objects which belong to the same class are called instances. The instance is the physical representation of an object. Data elements within the object are called attributes (parameters). The attributes describe visible characteristics of an object, e.g. status or configuration information. The attributes can be addressed with the help of class, instance and attribute identifiers (ID). This address information is called EPATH and has a structured format. The EPATH of a parameter is: 20 [Class ID] 24 [Instance ID] 30 [Attr. ID].

EXAMPLE:

The parameter address of the configuration parameter MODULE_POS_ERROR_CONFIG for EtherNet/IP bus module is: 20 64 24 01 30 13.

The notation is hexadecimal and has the following meaning: Class ID = 0x64, Instance ID = 0x01, Attribute ID = 0x13.

EtherNet/IP defines common classes, which are mandatory for every

device, and user-specific classes, which describe the actual functionality of the device.

Services are explicit tasks which an object carries out. They can be assigned to a specific instance or to the class itself, which then affects all instances in the class.

Among the general services are:
- Get_Attribute_Single (Reading an attribute)
- Set_Attribute_Single (Writing an attribute)
- Get_Attributes_All (Reading all attributes of an instance), etc.

CIP provides so called "implicit messaging" and "explicit messaging" for the exchange of messages.

For cyclical data exchange (transmission of I/O data e.g. process data) CIP uses the "implicit messaging". An I/O message consists of a connection ID and data. The end points know the format of the I/O frame, which means that they know which data are expected. This reduces the overhead and makes the data transfer more efficient. The transmission is time controlled or triggered by a parameter change. The I/O connection can be "point to point" or "multicast". The multicast connection enables several participants to receive simultaneously the same frame.

Acyclic data (configuration data, parameter data etc.) are exchanged via the typical "request – response" mechanism and use "explicit messaging" with transmission of additional information (overhead).
In the following chapters the classes implemented in the EtherNet/IP bus module are described in more detail.

9.2 DATA TYPES

The following table contains the most widely used data types in CIP. The hexadecimal notation in the Code column is used also in the EDS parameter description. Multibyte variables are transmitted to the bus in EtherNet/IP in "little-endian" format (LSB byte first):

TABLE 3 DATA TYPES

NAME OF DATA TYPE	CODE	DESCRIPTION	RANGE
SINT	0xC2	short integer	-128 to 127
INT	0xC3	integer	-32768 to 32767
DINT	0xC4	double integer	-2^{31} to $2^{31}-1$
LINT	0xC5	long integer	-2^{63} to $2^{63}-1$
USINT	0xC6	unsigned short integer	0 to 255
UINT	0xC7	unsigned integer	0 to 65535
UDINT	0xC8	unsigned double integer	0 to $2^{31}-1$
ULINT	0xC9	unsigned long integer	0 to $2^{63}-1$
REAL	0xCA	float	
STRING	0xD0	character string (1 byte per character)	
BYTE	0xD1	bit-string 8 Bits	
WORD	0xD2	bit-string 16 Bits	
DWORD	0xD3	bit-string 32 Bits	
EPATH	0xDC	CIP path segments	
SHORT STRING	0xDA	character string (1 byte per character, 1 byte length indicator)	

10. ETHERNET/IP COMMON CLASSES

This chapter describes the mandatory objects which are implemented in every EtherNet/IP device.

10.1 IDENTITY OBJECT (CLASS CODE 0X01)

This object identifies the device and makes general information about the device available. The Identity Object contains the following mandatory attributes:

TABLE 4 0X01 IDENTITY OBJECT

ATTR. ID	ACCESS RULE	NAME	DATA TYPE	DESCRIPTION OF ATTRIBUTE	DEFAULT PARAMETER
1	Get	Vendor ID	UINT	Manufacturer identification number	198
2	Get	Device Type	UINT	Detail of general product type. This device is a communication adapter.	12
3	Get	Product Code	UINT	Identification of a particular product of a manufacturer.	1002
4	Get	Revision	STRUCT	Revision of the Identity Object.	
		Major revision	USINT	Major revision is restricted to 7 bits.	
		Minor revision	USINT	Minor revision is presented as a 3 figure number (with a leading 0 if necessary).	
5	Get	Status	WORD	Shows the current status of the device	
6	Get	Serial number	UDINT	Serial number of the device	
7	Get	Product Name	SHORT STRING	Short text description of the product (max. 32 ASCII characters)	
8	Get	State	USINT	Current status of the device according to the status machine: 0 = Nonexistent 1 = Device Self Testing 2 = Standby 3 = Operational 4 = Major Recoverable Fault 5 = Major Unrecoverable Fault 6 – 254 = Reserved 255 = Default for Get_Attributes_All service	
9	Get	Configuration Consistency Value	UINT	Shows alterations in the device configuration	

The production code for Ethernet bus module Ethernet/IP is 1002.
The serial number of the device results of the last 3 bytes of the MAC address.
The identity object attributes are “Read Only“ parameters.

The identity object supports the services: Get_Attribute_Single, Get_Attribute_All and Reset. The Reset service causes the device to restart (emulates Power Off/On). Only Reset with service parameter 0 (Power On/Off) is supported.

10.2 MESSAGE ROUTER OBJECT (CLASS CODE 0X02)

The Message Router Object provides a messaging connection point through which a client may address a service to any object class or instance residing in the physical device.

10.3 CONNECTION MANAGER OBJECT (CLASS CODE 0X06)

This object controls the internal resources associated with both I/O and Explicit Messaging Connections.

10.4 TCP/IP INTERFACE OBJECT (CLASS CODE 0XF5)

The TCP/IP Interface Object (class code = 0xF5) provides the mechanism for configuring the TCP/IP network interface of the device, e.g. IP address, network mask, gateway address. The device supports one instance per TCP/IP interface. The object defines the following mandatory attributes:

TABLE 5 0XF5 TCP/IP INTERFACE OBJECT

ATTR. ID	ACCESS RULE	NAME	DATA TYPE	DESCRIPTION OF ATTRIBUTE	DEFAULT PARAMETER
1	Get	Status	DWORD	TCP/IP Network Interface Status Bits 0..3: 0 – Interface not configured 1 – Interface configured via DHCP, BOOTP or saved remanently	
2	Get	Configuration Capability	DWORD	Interface flags, which describe the possible types of configuration: Bits: 0 – BOOTP Client 1 – DNS Client 2 – DHCP Client 3 – DHCP-DNS Update 4 – Configuration is settable	4
3	Get, Set	Configuration Control	DWORD	Defines the TCP/IP configuration of the device after the first restart: Bits 0..3 Startup Configuration: 0 – uses the saved configuration, 1 – configuration via BOOTP 2 – configuration via DHCP - DNS Enable 5-31 reserved	
4	Get	Physical Link Object	STRUCT:	Logical path to the physical link object e.g.	
		Path Size	UINT	Size in Little Endian Format	02 00
		Path	EPATH (Padded)	Class ID = 0xF6 EtherNet Link Object Instance ID = 1	20 F6 24 01
5	Get	Interface Con-figuration	STRUCT:	TCP/IP configuration	
		IP Address	UDINT	IP address	
		Network mask	UDINT	network mask	
		Gateway Address	UDINT	Standard Gateway Address	
		Name Server	UDINT	Primary Name Server	
		Name Server 2	UDINT	Secondary Name Server	
		Domain Name	STRING	Standard Domain Name	
6		Host Name	STRING	Host Name, size = 0 means that no name is configured	0

10.5 ETHERNET/IP LINK OBJECT (CLASS CODE 0XF6)

The EtherNet/IP Link Object contains connection-specific counters and status information for a communication interface of type IEEE 802.3. The device supports one instance per IEEE 802.3 communication interface. The following attributes and services are supported:

TABLE 6 0XF6 ETHERNET/IP LINK OBJECT

ATTR. ID	ACCESS RULE	NAME	DATA TYPE	DESCRIPTION OF ATTRIBUTE	DEFAULT PARAMETER
1	Get	Interface Speed	UDINT	Current transmission speed: 0 – not defined 10 Mbps, 100 Mbps, etc	
2	Get	Interface Flags	DWORD	Interface configuration/status information Bit 0: link status Bit 1: half/full duplex Bit 2 – 4: recognition status Bit 5: manual inputs, requires Reset Bit 6: local hardware error Bit 7 – 31: reserved	4
3	Get	Physical Address	ARRAY of 6 USINTS	MAC address	0

11. USER-DEFINED OBJECTS

The device parameters of the bus module are mapped on two user-defined object classes:

Object with Class ID 101	Thyro-S 1S..H1, 1S..HRL1, Thyro-A 1A..H1, 1A..HRL1, 1A..HRLP1, 2A..H1, 2A..HRL1, 2A..HRLP1, 3A..H1, 3A..HRL1, 3A..HRLP1, 1A..C01, 1A..C02, 1A..C03, 1A..C05, 1A..C07 Thyro-AX 1A..HRLP2, 2A..HRLP2, 3A..HRLP2
Object with Class ID 102	TPM automatic mode and manual mode, TSC mode, TIO mode, TMU mode

The supported attributes depend on the module type. The instance defines the slot of the module in the range from 1 to 8.

The EtherNet/IP bus module contains max. 8 instances of the two objects.

11.1 CONFIGURATION PARAMETERS (CLASS CODE 0X64)

All configuration parameters (start parameters) of the Ethernet bus module device are specified as attributes in the user-defined object 0x64:

TABLE 7 0X64 CONFIGURATION PARAMETER OBJECT

ATTR. ID	NAME	SYMBOL	DATA TYPE	DESCRIPTION OF ATTRIBUTE	R/W	DEFAULT
1	Scanner Configured Module in Slot 1		UINT		R	
2	Scanner Configured Module in Slot 2		UINT		R	
3	Scanner Configured Module in Slot 3		UINT		R	
4	Scanner Configured Module in Slot 4		UINT		R	
5	Scanner Configured Module in Slot 5		UINT		R	
6	Scanner Configured Module in Slot 6		UINT		R	
7	Scanner Configured Module in Slot 7		UINT		R	
8	Scanner Configured Module in Slot 8		UINT		R	
9	Actual Module in Slot 1		UINT		R	
10	Actual Module in Slot 2		UINT		R	
11	Actual Module in Slot 3		UINT		R	
12	Actual Module in Slot 4		UINT		R	
13	Actual Module in Slot 5		UINT		R	
14	Actual Module in Slot 6		UINT		R	
15	Actual Module in Slot 7		UINT		R	
16	Actual Module in Slot 8		UINT		R	
17	Configure Param eter Number of slots in use	MODULE_POS_NUM-BER_OF_SLOT	UINT	0	R	
18	Configure Parameter Numbers of values for averageing	MODULE_POS_AVE-RAGE	UINT	0-1 = off, max= 20	R/W	
19	Configure Parameter Bit 0 = Without IO connection Set point master = 0 Bit 1 = Without IO connection Digital out = 0	MODULE_POS_ER-ROR_CONFIG	UINT	Bit 0 Bit 1	R/W	3

11.2 DEVICE PARAMETERS (CLASS CODE 0X65)

Object class ID 101 describes the device parameters of the module types:

- Thyro-S 1S..H1, 1S..HRL1,
- Thyro-A 1A..H1, 1A..HRL1, 1A..HRLP1, 2A..H1, 2A..HRL1, 2A..HRLP1, 3A..H1, 3A..HRL1, 3A..HRLP1,
- Thyro-A 1A..C01, 1A..C02, 1A..C03, 1A..C05, 1A..C07
- Thyro-AX 1A..HRLP2, 2A..HRLP2, 3A..HRLP2

The following table contains all parameters with attribute IDs, symbolic names, names, data type and access rights:

TABLE 8 0X65 DEVICE PARAMETER OBJECT

ATTR. ID	SYMBOL	NAME	VALUE RANGE	DATA TYPE	R/W
1	AD_P_I_TYP	Controller type current	0..	UINT	R
2	AD_P_U_TYP	Controller supply voltage	0…1000	UINT	R
3	AD_P_P_TYP_H	Controller type output power	0…	UDINT	R
6	AD_P_BETR	Operating mode	0…3	UINT	R/W
7	AD_P_AN1	Phase angle of 1st half wave	0..180	UINT	R/W
8	AD_P_SST	Soft start duration (given)		UINT	R/W
9	AD_P_SDN	Soft stop duration (given)	0…1000	UINT	R/W
10	AD_P_T0	Cycle period duration	0…1000	UINT	R/W
11	AD_P_MP	Minimum interval	0...10	UINT	R/W
12	AD_P_TSMA	Maximum cycle turn on time	1...T0	UINT	R/W
13	AD_P_TSMI	Minimum cycle turn on time	0...T0	UINT	R/W
14	AD_P_VIE	Front pulse stop	0...180	UINT	R/W
15	AD_P_HIE	Back pulse stop	0...180	UINT	R/W
16	AD_P_REGELUNG	Control (analog output value)	0…8	UINT	R/W
17	AD_P_TI	PI controller, I part	0= OFF 0…65535	UINT	R/W
18	AD_P_KP	PI controller, P part	0= OFF 0…65535	UINT	R/W
19	AD_P_KR	PI controller, counter P part	0…65535	UINT	R/W
20	AD_P_TD	Temperature coefficient of the heating tape	0…65535	UINT	R/W
21	AD_P_UEMA	Effective voltage set point maximum	0…	UINT	R/W
22	AD_P_IEMA	Effective current set point maximum	0…	UINT	R/W
23	AD_P_PMA	Power set point maximum	0…	UDINT	R/W
24	AD_SW_ENABLE	Set point activation	0…3	UINT	R
28	AD_P_OF_A	Actual value output offset 1	0...4096	UINT	R/W
29	AD_P_FA_A	Scale end value actual value output 1	0...4096	UINT	R/W
30	AD_P_SPG_MIN	Mains voltage monitoring min.	0…4096	UINT	R/W
31	AD_P_SPG_MAX	Mains voltage monitoring max.	0...1000	UINT	R/W
32	AD_P_UN_S	Undercurrent monitoring	0…1 (ON, OFF)	UINT	R/W
33	AD_P_RELAIS_CTRL2	Relay configuration 2	0…65535 bit coded	UINT	R/W
34	AD_P_LASTBRUCH_MIN_ABS	Load fault, minimum value	0…4505	UINT	R/W
36	AD_P_SYNC_ADR	Synch cycle address	0…65535	UINT	R/W
37	AD_P_IMAB,	Pulse switch-off in case of failure	0…65535 bit coded	UINT	R/W
38	AD_P_STA_RE	Control start controller analog set point	0…65535	UINT	R/W
39	AD_P_STE_RE	Control end controller analog set point	0…65535	UINT	R/W
40	AD_P_STATUS_3A	Configuration 3A		UINT	R/W
41	AD_P_MOSI_FA	Peak current value limit	0…4096	UINT	R/W
42	AD_P_DAC1_CTRL	Analog output configuration 1	0…10	UINT	R/W
44	AD_P_VER_DAY	Version day	1…31	UINT	R
45	AD_P_VER_MONTH	Version month	1…12	UINT	R
46	AD_P_VER_JEAR	Version year	0…9999	UINT	R
48	AD_P_REGLERSP_ANF	Controller inhibit	0…1 (ON, OFF)	UINT	R/W

ATTR. ID	SYMBOL	NAME	VALUE RANGE	DATA TYPE	R/W
49	AD_P_RELAIS_CTRL	Relay configuration 1	0…65535 bit coded	UINT	R/W
56	AD_P_DAC_MITTELWERT	Averaging analog output 1	0…65535	UINT	R/W
84	AD_IW_TEMP_INT	Temperature	0…65535	UINT	R/W
100	AD_P_FA_NR_GERAET_H	Device number		UDINT	R
102	AD_P_FA_LFD_NR	Serial number		UINT	R
103	AD_P_FA_NR_LK_H	PCB number		UDINT	R
109	AD_P_DAC_MITTELWERT_2	Averaging analog output 2	0…65535	UINT	R/W
110	AD_P_OF_A_2	Actual value output offset 2	0…4096	UINT	R/W
111	AD_P_FA_A_2	Scale end value actual value output 2	0…4096	UINT	R/W
112	AD_P_DAC2_CTRL	Analog output configuration 2	0…10	UINT	R/W
115	AD_P_DAC_MITTELWERT_3	Averaging analog output 3	0…65535	UINT	R/W
116	AD_P_OF_A_3	Actual value output offset 3	0…4096	UINT	R/W
117	AD_P_FA_A_3	Scale end value actual value output 3	0…4096	UINT	R/W
118	AD_P_DAC3_CTRL	Analog output configuration 3	0…10	UINT	R/W
119	AD_P_U_MIN	Voltage limit minimum	0…65535	UINT	R/W
120	AD_P_U_MAX	Voltage limit maximum	0…65535	UINT	R/W
121	AD_P_I_MIN	Current limit minimum	0…65535	UDINT	R/W
122	AD_P_I_MAX	Current limit maximum	0…65535	UINT	R/W
123	AD_P_P_MIN	Power limit minimum	0…	UINT	R/W
124	AD_P_P_MAX	Power limit maximum	0…	UINT	R/W

11.3 DEVICE PARAMETERS (CLASS CODE 0X66)

The object with Class ID 0x66 contains the acyclic parameter of the TMU, TIO and TSC modules.

The following table shows the parameters with attribute ID, symbolic name, parameter name, data range, data type and access

TABLE 9 0X65 DEVICE PARAMETER OBJECT

ATTR. ID	SYMBOL	NAME	VALUE RANGE	DATA TYPE	R/W
1	AD_P_W1_TYP	Type value transformer 1	1..65535	UINT	R/W
2	AD_P_W2_TYP	Type value transformer 2	1..65535	UINT	R/W
3	AD_P_W3_TYP	Type value transformer 3	1..65535	UINT	R/W
4	AD_P_WANDLER_CTRL	Transformer setting	0..65535 bit coded	UINT	R/W
5	AD_P_U_TYP	Type value U mains	1..260	UINT	R/W
7	AD_P_T0	Measuring and cycle time	1…1500	UINT	R/W
8	AD_P_SYT_ANZ	Number	1..11	UINT	R/W
9	AD_P_SYT_T01	1st phase	0..T0	UINT	R/W
10	AD_P_SYT_T02	2nd phase	0..T0	UINT	R/W
11	AD_P_SYT_T03	3rd phase	0..T0	UINT	R/W
12	AD_P_SYT_T04	4th phase	0..T0	UINT	R/W
13	AD_P_SYT_T05	5th phase	0..T0	UINT	R/W
14	AD_P_SYT_T06	6th phase	0..T0	UINT	R/W
15	AD_P_SYT_T07	7th phase	0..T0	UINT	R/W
16	AD_P_SYT_T08	8th phase	0..T0	UINT	R/W
17	AD_P_SYT_T09	9th phase	0..T0	UINT	R/W
18	AD_P_SYT_T10	10th phase	0..T0	UINT	R/W
31	AD_SW1_STA	Control start set point 1	0…4096	UINT	R/W
32	AD_SW1_STE	Control stop set point 1	0…4096	UINT	R/W
37	AD_SW2_STA	Control start set point 2	0…4096	UINT	R/W
38	AD_SW2_STE	Control stop set point 2	0…4096	UINT	R/W
39	AD_P_DAC1_OF	Offset 1	0..4095	UINT	R/W
40	AD_P_DAC1_FA	Scale end value 1	0..4096	UINT	R/W
41	AD_P_DAC1_CTRL	Output value 1	1..16	UINT	R/W
42	AD_P_DAC2_OF	Offset 2	0..4095	UINT	R/W
43	AD_P_DAC2_FA	Scale end value 2	0..4096	UINT	R/W
44	AD_P_DAC2_CTRL	Output value 2	1..16	UINT	R/W
45	AD_P_DAC3_OF	Offset 3	0..4095	UINT	R/W
46	AD_P_DAC3_FA	Scale end value 3	0..4096	UINT	R/W
47	AD_P_DAC3_CTRL	Output value 3	1..16	UINT	R/W
48	AD_P_DAC4_OF	Offset 4	0..4095	UINT	R/W
49	AD_P_DAC4_FA	Scale end value 4	0..4096	UINT	R/W
50	AD_P_DAC4_CTRL	Output value 4	1..16	UINT	R/W
51	AD_P_DAC5_OF	Offset 5	0..4095	UINT	R/W
52	AD_P_DAC5_FA	Scale end value 5	0..4096	UINT	R/W
53	AD_P_DAC5_CTRL	Output value 5	1..16	UINT	R/W
54	AD_P_DAC6_OF	Offset 6	0..4095	UINT	R/W

ATTR. ID	SYMBOL	NAME	VALUE RANGE	DATA TYPE	R/W
55	AD_P_DAC6_FA	Scale end value 6	0..4096	UINT	R/W
56	AD_P_DAC6_CTRL	Output value 6	1..16	UINT	R/W
57	AD_P_DAC_MITTELWERT	Average	0…65355	UINT	R/W
58	AD_P_SPG_MIN	Lower limit mains voltage	0…5120	UINT	R/W
59	AD_P_SPG_MAX	Upper limit mains voltage	0…5120	UINT	R/W
60	AD_P_W1_MAX	Limit transformer 1	0…8192	UINT	R/W
61	AD_P_W2_MAX	Limit transformer 2	0…8192	UINT	R/W
62	AD_P_W3_MAX	Limit transformer 3	0…8192	UINT	R/W
63	AD_P_WATCH_CTRL	Monitoring mode transformer	0…65535 bit coded	UINT	R/W
64	AD_P_ERROR_CTRL1	Fault output	0…65535 bit coded	UINT	R/W
66	AD_P_ALARM_CTRL1	Alarm output	0…65535 bit coded	UINT	R/W
68	AD_P_VER_DAY	Firmware version day	1…31	UINT	R
69	AD_P_VER_MONTH	Firmware version month	1…12	UINT	R
70	AD_P_VER_YEAR	Firmware version year	0…9999	UINT	R
76	AD_P_TEMP_MAX	Limiting value temperature	0…255	UINT	R/W
121	AD_P_FA_NR_GERAET_H	Device number	0…	UDINT	R
123	AD_P_FA_LFD_NR	Serial number	0…	UINT	R
124	AD_P_FA_NR_LK_H	PCB number	0…	UINT	R
126	AD_P_FREQUENZ_MIN_MAX	Frequency limit	100…2500	UINT	R
127	AD_P_FREQUENZ_TOL	Frequency tolerance	1…25	UINT	R
128	AD_P_DAC4_CTRL_TSC			UINT	R

Parameter 128 exists only in the TSC module.

12. CYCLIC DATA

The structure of device input/output data corresponds to the order of the configured modules.

The following chapters show the input and output data for each device module:

Object with Class ID 101	Thyro-S 1S..H1, 1S..HRL1, Thyro-A 1A..H1, 1A..HRL1, 1A..HRLP1, 2A..H1, 2A..HRL1, 2A..HRLP1, 3A..H1, 3A..HRL1, 3A..HRLP1, 1A..C01, 1A..C02, 1A..C03, 1A..C05, 1A..C07 Thyro-AX 1A..HRLP2, 2A..HRLP2, 3A..HRLP2
Object with Class ID 102	TPM automatic mode and manual mode, TSC mode, TIO mode, TMU mode

12.1 CYCLIC DATA FOR OBJECT WITH CLASS ID 101

The Thyro-S interprets the set point as operating mode.

TABLE 10 INTERPRETATION OF THE MASTER SET POINT FOR Thyro-S

SET POINT (MASTER)	STATUS (RETURN VALUE)	(TOTAL SET POINT)
0 to 409	= OFF	0 =
410 to 1091	1/5	819
1092 to 1706	= 1/3	1365 =
1707 to 3071	1/2	2047
3072 to 4096	= ON	4096

12.1.1 CYCLIC DATA WITH Thyro-S 1S..H1

TABLE 11 CYCLIC INPUT AND OUTPUT DATA WITH Thyro-S 1S..H1

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	63	Load voltage L1	AD_IW_U_EFF_LSB_1	Float 32	4	[V]
4	70	Mains voltage L1	AD_IW_MAIN_LSB_1	UINT	2	[V]
6	26	Total set point	AD_SW_SUMME	UINT	2	4096=100%
8	78	Fault (see table 13)	AD_IW_STOER	UINT	2	-
10	80	Status (see table 14)	AD_IW_STATUS	UINT	2	-
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	25	Master set point	AD_SW_MASTER	UINT	2	4096=100%

12.1.2 CYCLIC DATA WITH Thyro-S 1S..HRL1

TABLE 12 CYCLIC INPUT AND OUTPUT DATA WITH Thyro-S 1S..HRL1

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	63	Load voltage L1	AD_IW_U_EFF_LSB_1	Float32	4	[V]
4	60	Load current L1	AD_IW_I_EFF_LSB_1	Float32	4	[A]
8	70	Mains voltage L1	AD_IW_MAIN_LSB_1	UINT	2	[V]
10	26	Total set point	AD_SW_SUMME	UINT	2	4096=100%
12	78	Fault (see table 13)	AD_IW_STOER	UINT	2	-
14	80	Status (see table 14)	AD_IW_STATUS	UINT	2	-
OFFSET	ATTR. ID	OUTUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	25	Master set point	AD_SW_MASTER	UINT	2	4096=100%

TABLE 13 Thyro-S FAULTS

DESCRIPTION	BIT	LEDs	RELAY
Frequency measurement outside of 47 Hz to 63 Hz	Bit 0	Test LED flashing slowly	open
SYNC error, no zero-crossing within the gate	Bit 1	Test LED flashing slowly	open
Temperature monitoring triggered	Bit 2	Load Fault flashing slowly	open
Load fault	Bit 3	Load Fault on	open
Flash values invalid	Bit 4	Test LED and Load Fault LED flashing simultaneously quickly	open
Mains undervoltage (<AD_P_SPG_MIN)	BIT 5	Load fault LED and Test LED on	open
Mains overvoltage (>AD_P_SPG_MAX)	Bit 6	None	closed

TABLE 14 Thyro-S STATUS

DESCRIPTION	BIT	LEDs	RELAY
Pulse inhibit active (bridge X2.1-X2.2 open)	Bit 0	none	open
Mains frequency is 60Hz	Bit 2	none	open
Relay status (0=relay off / 1=relay on)	Bit 8	none	open
Device switched off	Bit 9	-	closed
Wrong device	Bit 10	-	-
Bus module active (0=no bus module / 1=bus module active)	Bit 11	none	-
Thyristor short-circuit	Bit 14	Test LED and Load Fault LED flashing alternately slowly	-

12.1.3 CYCLIC DATA WITH Thyro-A 1A..H1

TABLE 15 CYCLIC INPUT AND OUTPUT DATA WITH Thyro-A 1A..H1

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	63	Load voltage L1	AD_IW_U_EFF_LSB_1	Float32	4	[V]
4	70	Mains voltage L1	AD_IW_MAIN_LSB_1	UINT	2	[V]
6	73	Switch-on time T_S	AD_IW_TS	UINT	2	[period]
8	74	Switch-on angle alpha	AD_IW_ALPHA	UINT	2	[0.01 °el]
10	26	Total set point	AD_SW_SUMME	UINT	2	4096=100%
12	78	Fault (see table 24)	AD_IW_STOER	UINT	2	-
14	80	Status (see table 25)	AD_IW_STATUS	UINT	2	-
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	25	Master set point	AD_SW_MASTER	UINT	2	4096=100%

12.1.4 CYCLIC DATA WITH Thyro-A 1A..HRL1/ Thyro-AX 1A..HRL2

TABLE 16 CYCLIC INPUT AND OUTPUT DATA WITH Thyro-A 1A..HRL1

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	63	Load voltage L1	AD_IW_U_EFF_LSB_1	Float32	4	[V]
4	60	Load current L1	AD_IW_I_EFF_LSB_1	Float32	4	[A]
8	70	Mains voltage L1	AD_IW_MAIN_LSB_1	UINT	2	[V]
10	73	Switch-on time T_S	AD_IW_TS	UINT	2	[period]
12	74	Switch-on angle alpha	AD_IW_ALPHA	UINT	2	[0.01 °el]
14	26	Total set point	AD_SW_SUMME	UINT	2	4096=100%
16	78	Fault (see table 24)	AD_IW_STOER	UINT	2	-
18	80	Status (see table 25)	AD_IW_STATUS	UINT	2	-
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	25	Master set point	AD_SW_MASTER	UINT	2	4096=100%

12.1.5 CYCLIC DATA WITH Thyro-A 1A..HRLP1/ Thyro-AX 1A..HRLP2

TABLE 17 CYCLIC INPUT AND OUTPUT DATA WITH Thyro-A 1A..HRLP1/Thyro-AX 1A..HRLP2

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	63	Load voltage L1	AD_IW_U_EFF_LSB_1	Float32	4	[V]
4	60	Load current L1	AD_IW_I_EFF_LSB_1	Float32	4	[A]
8	66	Power L1	AD_IW_P_LSB_1	Float32	4	[W]
12	70	Mains voltage L1	AD_IW_MAIN_LSB_1	UINT	2	[V]
14	73	Switch-on time T_s	AD_IW_TS	UINT	2	[period]
16	74	Switch-on angle alpha	AD_IW_ALPHA	UINT	2	[0.01 °el]
18	26	Total set point	AD_SW_SUMME	UINT	2	4096=100%
20	78	Fault (see table 24)	AD_IW_STOER	UINT	2	-
22	80	Status (see table 25)	AD_IW_STATUS	UINT	2	-
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	25	Master set point	AD_SW_MASTER	UINT	2	4096=100%

12.1.6 CYCLIC DATA WITH Thyro-A 2A..H1

TABLE 18 CYCLIC INPUT AND OUTPUT DATA WITH Thyro-A 2A..H1

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	63	Load voltage L1	AD_IW_U_EFF_LSB_1	Float32	4	[V]
4	65	Load voltage L3	AD_IW_U_EFF_LSB_3	Float32	4	[V]
8	70	Mains voltage L1	AD_IW_MAIN_LSB_1	UINT	2	[V]
10	72	Mains voltage L3	AD_IW_MAIN_LSB_3	UINT	2	[V]
12	73	Switch-on time T_s	AD_IW_TS	UINT	2	[period]
14	26	Total set point	AD_SW_SUMME	UINT	2	4096=100%
16	78	Fault (see table 24)	AD_IW_STOER	UINT	2	-
18	80	Status (see table 25)	AD_IW_STATUS	UINT	2	-
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	25	Master set point	AD_SW_MASTER	UINT	2	4096=100%

12.1.7 CYCLIC DATA WITH Thyro-A 2A..HRL1/ Thyro-AX 2A..HRL2

TABLE 19 CYCLIC INPUT AND OUTPUT DATA WITH Thyro-A 2A..HRL1

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	63	Load voltage L1	AD_IW_U_EFF_LSB_1	Float32	4	[V]
4	65	Load voltage L3	AD_IW_U_EFF_LSB_3	Float32	4	[V]
8	60	Load current L1	AD_IW_I_EFF_LSB_1	Float32	4	[A]
12	61	Load current L2	AD_IW_I_EFF_LSB_2	Float32	4	[A]
16	62	Load current L3	AD_IW_I_EFF_LSB_3	Float32	4	[A]
20	70	Mains voltage L1	AD_IW_MAIN_LSB_1	UINT	2	[V]
22	72	Mains voltage L3	AD_IW_MAIN_LSB_3	UINT	2	[V]
24	73	Switch-on time T_S	AD_IW_TS	UINT	2	[period]
26	26	Total set point	AD_SW_SUMME	UINT	2	4096=100%
28	78	Fault (see table 24)	AD_IW_STOER	UINT	2	-
30	80	Status (see table 25)	AD_IW_STATUS	UINT	2	-
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	25	Master set point	AD_SW_MASTER	UINT	2	4096=100%

12.1.8 CYCLIC DATA WITH Thyro-A 2A..HRLP1/ Thyro-AX 2A..HRLP2

TABLE 20 CYCLIC INPUT AND OUTPUT DATA WITH Thyro-A 2A..HRLP1/Thyro-AX 2A..HRLP2

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	63	Load voltage L1	AD_IW_U_EFF_LSB_1	Float32	4	[V]
4	65	Load voltage L3	AD_IW_U_EFF_LSB_3	Float32	4	[V]
8	60	Load current L1	AD_IW_I_EFF_LSB_1	Float32	4	[A]
12	61	Load current L2	AD_IW_I_EFF_LSB_2	Float32	4	[A]
16	62	Load current L3	AD_IW_I_EFF_LSB_3	Float32	4	[A]
20	66	Power L1	AD_IW_P_LSB_1	Float32	4	[W]
24	68	Power L3	AD_IW_P_LSB_3	Float32	4	[W]
28	69	Total power	AD_IW_P_LSB_GES	Float32	4	[W]
32	70	Mains voltage L1	AD_IW_MAIN_LSB_1	UINT	2	[V]
34	72	Mains voltage L3	AD_IW_MAIN_LSB_3	UINT	2	[V]
36	73	Switch-on time T_S	AD_IW_TS	UINT	2	[period]
38	26	Total set point	AD_SW_SUMME	UINT	2	4096=100%
40	78	Fault (see table 24)	AD_IW_STOER	UINT	2	-
42	80	Status (see table 25)	AD_IW_STATUS	UINT	2	-
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	25	Master set point	AD_SW_MASTER	UINT	2	4096=100%

12.1.9 CYCLIC DATA WITH Thyro-A 3A..H1

TABLE 21 CYCLIC INPUT AND OUTPUT DATA WITH Thyro-A 3A..H1

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	63	Load voltage L1	AD_IW_U_EFF_LSB_1	Float32	4	[V]
4	64	Load voltage L2	AD_IW_U_EFF_LSB_2	Float32	4	[V]
8	65	Load voltage L3	AD_IW_U_EFF_LSB_3	Float32	4	[V]
12	70	Mains voltage L1	AD_IW_MAIN_LSB_1	UINT	2	[V]
14	71	Mains voltage L2	AD_IW_MAIN_LSB_2	UINT	2	[V]
16	72	Mains voltage L3	AD_IW_MAIN_LSB_3	UINT	2	[V]
18	73	Switch-on time T_S	AD_IW_TS	UINT	2	[period]
20	74	Switch-on angle alpha	AD_IW_ALPHA	UINT	2	[0.01 °el]
22	26	Total set point	AD_SW_SUMME	UINT	2	4096=100%
24	78	Fault (see table 24)	AD_IW_STOER	UINT	2	-
26	80	Status (see table 25)	AD_IW_STATUS	UINT	2	-
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	25	Master set point	AD_SW_MASTER	UINT	2	4096=100%

12.1.10 CYCLIC DATA WITH Thyro-A 3A..HRL1/ Thyro-AX 3A..HRL2

TABLE 22 CYCLIC INPUT AND OUTPUT DATA WITH Thyro-A 3A..HRL1

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	63	Load voltage L1	AD_IW_U_EFF_LSB_1	Float32	4	[V]
4	64	Load voltage L2	AD_IW_U_EFF_LSB_2	Float32	4	[V]
8	65	Load voltage L3	AD_IW_U_EFF_LSB_3	Float32	4	[V]
12	60	Load current L1	AD_IW_I_EFF_LSB_1	Float32	4	[A]
16	61	Load current L2	AD_IW_I_EFF_LSB_2	Float32	4	[A]
20	62	Load current L3	AD_IW_I_EFF_LSB_3	Float32	4	[A]
24	70	Mains voltage L1	AD_IW_MAIN_LSB_1	UINT	2	[V]
26	71	Mains voltage L2	AD_IW_MAIN_LSB_2	UINT	2	[V]
28	72	Mains voltage L3	AD_IW_MAIN_LSB_3	UINT	2	[V]
30	73	Switch-on time T_S	AD_IW_TS	UINT	2	[period]
32	74	Switch-on angle alpha	AD_IW_ALPHA	UINT	2	[0.01 °el]
34	26	Total set point	AD_SW_SUMME	UINT	2	4096=100%
36	78	Fault (see Table 25)	AD_IW_STOER	UINT	2	-
38	80	Status (see Table 26)	AD_IW_STATUS	UINT	2	-
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	25	Master set point	AD_SW_MASTER	UINT	2	4096=100%

12.1.11 CYCLIC DATA WITH Thyro-A 3A..HRLP1/ Thyro-AX 3A..HRLP2

TABLE 23 CYCLIC INPUT AND OUTPUT DATA WITH Thyro-A 3A..HRLP1/Thyro-AX 3A..HRLP2

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	63	Load voltage L1	AD_IW_U_EFF_LSB_1	Float32	4	[V]
4	64	Load voltage L2	AD_IW_U_EFF_LSB_2	Float32	4	[V]
8	65	Load voltage L3	AD_IW_U_EFF_LSB_3	Float32	4	[V]
12	60	Load current L1	AD_IW_I_EFF_LSB_1	Float32	4	[A]
16	61	Load current L2	AD_IW_I_EFF_LSB_2	Float32	4	[A]
20	62	Load current L3	AD_IW_I_EFF_LSB_3	Float32	4	[A]
24	66	Power L1	AD_IW_P_LSB_1	Float32	4	[W]
28	67	Power L2	AD_IW_P_LSB_2	Float32	4	[W]
32	68	Power L3	AD_IW_P_LSB_3	Float32	4	[W]
36	69	Total power	AD_IW_P_LSB_GES	Float32	4	[W]
40	70	Mains voltage L1	AD_IW_MAIN_LSB_1	UINT	2	[V]
42	71	Mains voltage L2	AD_IW_MAIN_LSB_2	UINT	2	[V]
44	72	Mains voltage L3	AD_IW_MAIN_LSB_3	UINT	2	[V]
46	73	Switch-on time T_s	AD_IW_TS	UINT	2	[period]
48	74	Switch-on angle alpha	AD_IW_ALPHA	UINT	2	[0.01 °el]
50	26	Total set point	AD_SW_SUMME	UINT	2	4096=100%
52	78	Fault (see table 24)	AD_IW_STOER	UINT	2	-
54	80	Status (see table 25)	AD_IW_STATUS	UINT	2	-
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	25	Master set point	AD_SW_MASTER	UINT	2	4096=100%

TABLE 24 Thyro-A/Thyro-AX FAULTS

DESCRIPTION	BIT	LEDs	RELAY
Frequency measurement outside of 47Hz to 63Hz	Bit 0	Pulse Inhibit LED flashing slowly	open
SYNC error, no zero crossing within the gate	Bit 1	Pulse Inhibit LED flashing slowly	open
Temperature monitoring triggered	Bit 2	Load Fault LED flashing slowly	open
Load fault	Bit 3	Load fault LED on	open
Flash values invalid	Bit 4	Pulse Inhibit LED and Load Fault LED flashing simultaneously quickly	open
Mains undervoltage (<AD_P_SPG_MIN)	Bit 5	Pulse Inhibit LED, Load Fault LED and Test LED on	open
Mains overvoltage (>AD_P_SPG_MAX)	Bit 6	none	open
Master / slave fault (only with2A)	Bit 8	none	closed
Undervoltage limit	Bit 9	none	closed
Overvoltage limit	Bit 10	none	closed
Undercurrent limit	Bit 11	none	closed
Overcurrent limit	Bit 12	none	closed
Low power limit	Bit 13	none	closed
High power limit	Bit 14	none	closed

TABLE 25 Thyro-A/Thyro-AX STATUS

DESCRIPTION	BIT	LEDs	RELAY
Pulse inhibit active (bridge X2.1-X2.2 open)	Bit 0	Pulse Inhibit LED on	closed
Mains frequency is 60Hz	Bit 2	none	closed
U-limiting	Bit 4	Pulse Inhibit LED and Load Fault LED flashing alternately slowly	closed
I-limiting	Bit 5	Pulse Inhibit LED and Load Fault LED flashing alternately slowly	closed
P-limiting	Bit 6	Pulse Inhibit LED and Load Fault LED flashing alternately slowly	closed
Relay status (0=relay off / 1=relay on)	Bit 8	none	on/off
Device switched off	Bit 9	-	-
Wrong device	Bit 10	-	-
Bus module active (0=no bus module / 1=bus module active)	Bit 11	none	closed
Thyristor short-circuit	Bit 14	only with Thyro-S	-
Failure rotating field / phase (only Thyro-A 2A or 3A/Thyro-AX 2A or 3A)	Bit 15	Pulse inhibit LED and test LED flashing simultaneously slowly	closed
Overcurrent limit	Bit 12	none	closed
Low power limit	Bit 13	none	closed
High power limit	Bit 14	none	closed

12.1.12 CYCLIC DATA WITH Thyro-A 1A..C01

TABLE 26 CYCLIC INPUT AND OUTPUT DATA WITH Thyro-A 1A..C01

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	63	Load voltage L1	AD_IW_U_EFF_LSB_1	Float32	4	[V]
4	60	Load current L1	AD_IW_I_EFF_LSB_1	Float32	4	[A]
8	66	Power L1	AD_IW_P_LSB_1	Float32	4	[W]
12	70	Mains voltage L1	AD_IW_MAIN_LSB_1	UINT	2	[V]
14	73	Switch-on time T_s	AD_IW_TS	UINT	2	[period]
16	74	Switch-on angle alpha	AD_IW_ALPHA	UINT	2	[0.01 °el]
18	26	Total set point	AD_SW_SUMME	UINT	2	4096=100%
20	78	Fault (see table 24)	AD_IW_STOER	UINT	2	-
22	80	Status (see table 25)	AD_IW_STATUS	UINT	2	-
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	25	Master set point	AD_SW_MASTER	UINT	2	4096=100%

12.1.13 CYCLIC DATA WITH Thyro-A 1A..C02

TABLE 27 CYCLIC INPUT AND OUTPUT DATA WITH Thyro-A 1A..C02

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	63	Load voltage phase 1	AD_IW_U_EFF_LSB_1	Float32	4	[V]
4	61	Load current phase 1	AD_IW_I_EFF_LSB_2	Float32	4	[A]
8	62	Load current phase 2	AD_IW_I_EFF_LSB_3	Float32	4	[A]
12	60	Total load current	AD_IW_I_EFF_LSB_1	Float32	4	[A]
16	70	Mains voltage L1	AD_IW_MAIN_LSB_1	UINT	2	[V]
18	74	Switch-on angle alpha phase 1	AD_IW_ALPHA	UINT	2	[0.01 °el]
20	26	Total set point	AD_SW_SUMME	UINT	2	4096=100%
22	78	Fault (see table 24)	AD_IW_STOER	UINT	2	-
24	80	Status (see table 25)	AD_IW_STATUS	UINT	2	-
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	25	Master set point	AD_SW_MASTER	UINT	2	4096=100%

12.1.14 CYCLIC DATA WITH Thyro-A 1A..C03

TABLE 28 CYCLIC INPUT AND OUTPUT DATA WITH Thyro-A 1A..C03

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	63	Load voltage L1	AD_IW_U_EFF_LSB_1	Float32	4	[V]
4	60	Load current L1	AD_IW_I_EFF_LSB_1	Float32	4	[A]
8	66	Power L1	AD_IW_P_LSB_1	Float32	4	[W]
12	70	Mains voltage L1	AD_IW_MAIN_LSB_1	UINT	2	[V]
14	73	Switch-on time T_s	AD_IW_TS	UINT	2	[period]
16	74	Switch-on angle alpha	AD_IW_ALPHA	UINT	2	[0.01 °el]
18	26	Total set point	AD_SW_SUMME	UINT	2	4096=100%
20	78	Fault (see table 24)	AD_IW_STOER	UINT	2	-
22	80	Status (see table 25)	AD_IW_STATUS	UINT	2	-
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	25	Master set point	AD_SW_MASTER	UINT	2	4096=100%

12.1.15 CYCLIC DATA WITH Thyro-A 1A..C05

TABLE 29 CYCLIC INPUT AND OUTPUT DATA WITH Thyro-A 1A..C05

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	63	Load voltage phase 1	AD_IW_U_EFF_LSB_1	Float32	4	[V]
4	61	Load current phase 1	AD_IW_I_EFF_LSB_2	Float32	4	[A]
8	62	Load current phase 2	AD_IW_I_EFF_LSB_3	Float32	4	[A]
12	60	Total load current	AD_IW_I_EFF_LSB_1	Float32	4	[A]
16	66	Power phase 1	AD_IW_P_LSB_1	Float32	4	[W]
20	68	Power phase 2	AD_IW_P_LSB_3	Float32	4	[W]
24	69	Total power	AD_IW_P_LSB_GES	Float32	4	[W]
28	70	Mains voltage L1	AD_IW_MAIN_LSB_1	UINT	2	[V]
30	74	Switch-on angle alpha phase 1	AD_IW_ALPHA	UINT	2	[0.01 °el]
32	26	Total set point	AD_SW_SUMME	UINT	2	4096=100%
34	78	Fault (see table 24)	AD_IW_STOER	UINT	2	-
36	80	Status (see table 25)	AD_IW_STATUS	UINT	2	-
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	25	Master set point	AD_SW_MASTER	UINT	2	4096=100%

12.1.16 CYCLIC DATA WITH Thyro-A 1A..C07

TABLE 30 CYCLIC INPUT AND OUTPUT DATA WITH Thyro-A 1A..C07

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	63	Load voltage L1	AD_IW_U_EFF_LSB_1	Float32	4	[V]
4	60	Load current L1	AD_IW_I_EFF_LSB_1	Float32	4	[A]
8	66	Power L1	AD_IW_P_LSB_1	Float32	4	[W]
12	70	Mains voltage L1	AD_IW_MAIN_LSB_1	UINT	2	[V]
14	88	Load temperature	AD_P_IW_TEMP_LOAD	UINT	2	[°C]
16	74	Switch-on angle alpha	AD_IW_ALPHA	UINT	2	[0.01 °el]
18	26	Total set point	AD_SW_SUMME	UINT	2	4096=100%
20	78	Fault (see table 24)	AD_IW_STOER	UINT	2	-
22	80	Status (see table 25)	AD_IW_STATUS	UINT	2	-
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	25	Master set point	AD_SW_MASTER	UINT	2	4096=100%

12.2 CYCLIC DATA FOR OBJECT WITH CLASS ID 102

The input and output data of Thyro-Power Manager, Thyro-Step Controller and Thyro-Measurement Unit depend on the operating mode. The following table shows the operating modes supported by the modules.

TABLE 31 SUPPORTED OPERATING MODES TPM; TSC; TMU

	TPM		TSC	TIO	TMU
	AUTOMATIC TPM_AUTO	MANUAL TPM_MAN			
Thyro-Power Manager	X	X	X	X	X
Thyro-Step Controller	-	-	X	X	X
Thyro-Measurement Unit	-	-	-	X	X

12.2.1 TPM AUTOMATIC AND MANUAL MODE (TPM_AUTO, TPM_MAN)

TABLE 32 CYCLIC DATA TPM AUTOMATIC AND MANUAL MODE (TPM_AUTO, TPM_MAN)

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	92	AC input 1	AD_IW_I_EFF_LSB_1	Float32	4	[A],[V]
4	93	AC input 2	AD_IW_I_EFF_LSB_2	Float32	4	[A],[V]
8	94	AC input 3	AD_IW_I_EFF_LSB_3	Float32	4	[A],[V]
12	98	Power	AD_IW_P_LSB	Float32	4	[W]
16	99	Energy	AD_IW_W_LSB_H	Float32	4	[kWh]
20	30	DC input 1	AD_SW1_ANALOG	UINT	2	4096=100%
22	36	DC input 2	AD_SW2_ANALOG	UINT	2	4096=100%
24	119	DC input 3	AD_IW_RESERVE	UINT	2	4096=100%
26	102	Mains voltage	AD_IW_MAIN_LSB_1	UINT	2	[A]
28	111	Period duration	AD_IW_FREQUENZ	UINT	2	[µs]
30	116	Temperature	AD_IW_TEMP_INT	UINT	2	[°C]
32	112	Fault (see Table 36)	AD_IW_ERROR1	UINT	2	-
34	114	Status (see Table 36, Table 37)	AD_IW_STATUS1	UINT	2	-

12.2.2 TSC MODE

TABLE 33 CYCLIC DATA TSC MODE

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	92	AC input 1	AD_IW_I_EFF_LSB_1	Float32	4	[A],[V]
4	93	AC input 2	AD_IW_I_EFF_LSB_2	Float32	4	[A],[V]
8	94	AC input 3	AD_IW_I_EFF_LSB_3	Float32	4	[A],[V]
12	98	Power	AD_IW_P_LSB	Float32	4	[W]
16	99	Energy	AD_IW_W_LSB_H	Float32	4	[kWh]
20	30	DC input 1	AD_SW1_ANALOG	UINT	2	4096=100%
22	36	DC input 2	AD_SW2_ANALOG	UINT	2	4096=100%
24	119	DC input 3	AD_IW_RESERVE	UINT	2	4096=100%
26	102	Mains voltage	AD_IW_MAIN_LSB_1	UINT	2	[A]
28	111	Period duration	AD_IW_FREQUENZ	UINT	2	[µs]
30	116	Temperature	AD_IW_TEMP_INT	UINT	2	[°C]
32	112	Fault (see Table 36)	AD_IW_ERROR1	UINT	2	-
34	114	Status (see Table 36, Table 37)	AD_IW_STATUS1	UINT	2	-
36	108	Analog output 4	AD_IW_DAC4	UINT	2	4096=100%
38	103	Steps	AD_IW_STEPS	UINT	2	-
40	29	Total set point	AD_SW1_SUMME	UINT	2	4096=100%
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	NAME	DATA TYPE	SIZE	UNIT
0	28	Master set point	AD_SW1_MASTER	UINT	2	4096=100%

12.2.3 TIO MODE

TABLE 34 CYCLIC DATA TIO MODE

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	92	AC input 1	AD_IW_I_EFF_LSB_1	Float32	4	[A],[V]
4	93	AC input 2	AD_IW_I_EFF_LSB_2	Float32	4	[A],[V]
8	94	AC input 3	AD_IW_I_EFF_LSB_3	Float32	4	[A],[V]
12	98	Power	AD_IW_P_LSB	Float32	4	[W]
16	99	Energy	AD_IW_W_LSB_H	Float32	4	[kWh]
20	30	DC input 1	AD_SW1_ANALOG	UINT	2	4096=100%
22	36	DC input 2	AD_SW2_ANALOG	UINT	2	4096=100%
24	119	DC input 3	AD_IW_RESERVE	UINT	2	4096=100%
26	102	Mains voltage	AD_IW_MAIN_LSB_1	UINT	2	[A]
28	111	Period duration	AD_IW_FREQUENZ	UINT	2	[µs]
30	116	Temperature	AD_IW_TEMP_INT	UINT	2	[°C]
32	112	Fault (see Table 36)	AD_IW_ERROR1	UINT	2	-
34	114	Status (see Table 36, Table 37)	AD_IW_STATUS1	UINT	2	-
OFFSET	ATTR. ID	OUTPUT DATA, SET POINT	SYMBOL	DATA TYPE	SIZE	UNIT
0	117	Digital output	AD_IW_COUNT	UINT	2	4096=100%
2	105	Analog output 1	AD_IW_DAC1	UINT	2	4096=100%
4	106	Analog output 2	AD_IW_DAC2	UINT	2	4096=100%
6	107	Analog output 3	AD_IW_DAC3	UINT	2	4096=100%
8	108	Analog output 4	AD_IW_DAC4	UINT	2	4096=100%
10	109	Analog output 5	AD_IW_DAC5	UINT	2	4096=100%
12	110	Analog output 6	AD_IW_DAC6	UINT	2	4096=100%

12.2.4 TMU MODE

TABLE 35 CYCLIC DATA TMU MODE

OFFSET	ATTR. ID	INPUT DATA, ACTUAL VALUES	SYMBOL	DATA TYPE	SIZE	UNIT
0	92	AC input 1	AD_IW_I_EFF_LSB_1	Float32	4	[A],[V]
4	93	AC input 2	AD_IW_I_EFF_LSB_2	Float32	4	[A],[V]
8	94	AC input 3	AD_IW_I_EFF_LSB_3	Float32	4	[A],[V]
12	98	Power	AD_IW_P_LSB	Float32	4	[W]
16	99	Energy	AD_IW_W_LSB_H	Float32	4	[kWh]
20	30	DC input 1	AD_SW1_ANALOG	UINT	2	4096=100%
22	36	DC input 2	AD_SW2_ANALOG	UINT	2	4096=100%
24	119	DC input 3	AD_IW_RESERVE	UINT	2	4096=100%
26	102	Mains voltage	AD_IW_MAIN_LSB_1	UINT	2	[A]
28	111	Period duration	AD_IW_FREQUENZ	UINT	2	[µs]
30	116	Temperature	AD_IW_TEMP_INT	UINT	2	[°C]
32	112	Fault (see Table 36)	AD_IW_ERROR1	UINT	2	-
34	114	Status (see Table 36, Table 37)	AD_IW_STATUS1	UINT	2	-

TABLE 36 FAULT TPM, TSC, TIO, TMU

DESCRIPTION	BIT	FAULT LED, FAULT OUTPUT*
Frequency measurement outside of 47Hz to 63Hz	Bit 0	on
SYNC error, no cero crossing within the gate	Bit 1	on
Temperature max. limit has been exceeded	Bit 2	on
Temperature min. limit has been exceeded	Bit 3	on
One or more parameters outside the limits	Bit 4	on
Mains voltage lower than lower voltage limit	Bit 5	on

TABLE 37 STATUS TPM, TSC, TIO, TMU

DESCRIPTION	BIT	FAULT LED, FAULT OUTPUT*
Mains frequency is 60Hz	Bit 2	off
Transformer 1 fallen below min. limit	Bit 3	on
Transformer 1 exceeded max. limit	Bit 4	on
Transformer 2 fallen below min. limit	Bit 5	on
Transformer 2 exceeded max. limit	Bit 6	on
Transformer 3 fallen below min. limit	Bit 7	on
Transformer 3 exceeded max. limit	Bit 8	on
Device switched off	Bit 9	-
Wrong device	Bit 10	-
Bus module active (0=no bus module / 1=bus module active)	Bit 11	off

* Default setting can be parameterized.

13. ASSEMBLY OBJECT (CLASS CODE 0X04)

The cyclic data are transmitted by means of assemblies. Assemblies enable the sending or receiving of data via a single connection. This can be input and output data, status and control or diagnostics information. The terms input and output assemblies are defined from the point of view of the network. The input assemblies produce (send) data on the bus; the output assemblies consume (receive) data from the bus.

The assemblies are addressed by means of Instance IDs. The user-defined address range is from 100 (0x64) to 199 (0xC7) and from 768 (0x300) to 2047 (0x4FF).

The cyclic data for bus module EtherNet/IP are transmitted by means of one input and one output assembly.

Configuration data are also combined in an assembly (configuration assembly with instance ID 100) which is downloaded onto the device when opening the connection.

13.1 CONFIGURATION ASSEMBLY 100

The configuration assembly (Instance 100) defines the modular structure of the EtherNet/IP bus module. It contains the following attributes of the configuration object with Class ID 100.

TABLE 38 CONFIGURATION ASSEMBLY 100

BYTE OFFSET	ATTR. ID	DATA TYPE	NAME	SYMBOL
0-1	17	UINT	Set configuration dig. outputs	CONF_DIG_OUT
2-3	1	UINT	Set configuration slot 1	CONF_MODULE_SLOT_1
4-5	2	UINT	Set configuration slot 2	CONF_MODULE_SLOT_2
6-7	3	UINT	Set configuration slot 3	CONF_MODULE_SLOT_3
8-9	4	UINT	Set configuration slot 4	CONF_MODULE_SLOT_4
10-11	5	UINT	Set configuration slot 5	CONF_MODULE_SLOT_5
12-13	6	UINT	Set configuration slot 6	CONF_MODULE_SLOT_6
14-15	7	UINT	Set configuration slot 7	CONF_MODULE_SLOT_7
16-17	8	UINT	Set configuration slot 8	CONF_MODULE_SLOT_8
18-19	18	UINT	Number of slots	MODULE_POS_NUMBER_OF_SLOT
20-21	19	UINT		MODULE_POS_AVERAGE
22-23	20	UINT	-	MODULE_POS_ERROR_ CONFIG

13.2 OUTPUT ASSEMBLY 101

The Output Assembly with Instance ID 101 contains the Output Data of all modules in the same order in which they are plugged into the slots from 1 to N. The size of the Output Data Assembly is equal to the sum of the output data of the configured modules. The first 2 bytes transmit always the digital outputs of the device.

TABLE 39 OUTPUT ASSEMBLY 101

BYTE	ATTR. ID	DATA TYPE	NAME
0-2		UINT	Output Data
2-M		REAL	Module output data from module 1 to module N

13.3 INPUT ASSEMBLY 102

The Input Assembly with Instance ID 102 contains the Input Data of all modules in the same order in which they are plugged in.

The EPATH for addressing the assembly data has the following format: “20 04 24 XX 30 03“. XX is the assembly instance ID in hexadecimal format. With attribute 4 (“20 04 24 XX 30 04“) the size of the data in assembly XX can be read.

13.4 GROUP ASSEMBLIES 111..118

Assemblies may also be used for accessing a group of several parameters. The Input data of each slot are mapped on assembly objects with instance numbers from 111 to 118 and so they can be read acyclically by a single read service.

14. PROJECT SET UP OF ETHERNET BUS MODULE ETHERNET/IP

14.1 EDS (ELECTRONIC DATA SHEETS)

The device description file (EDS) is a text file which contains the necessary information for accessing configurable device parameters, I/O data and connections. The EDS file is made available by the device manufacturer and is adapted to individual product functions. The EDS can be used by configuration tools (e.g. RSNetWorks or RSLogix™ 5000 from Rockwell Automation) to configure the device and as such it makes the set up and integration process of the device easier.

The connection manager section of the EDS file defines the supported IO connections.

14.2 SETTING THE IP ADDRESS

The IP address of the Ethernet bus module can be set via a DHCP server. The IP address is stored in a nonvolatile memory in the device. After power cycle the device waits for the IP address to be assigned by a DHCP server. If no DHCP server is found within 136 seconds the device starts with the stored address. If the stored IP address is 0.0.0.0 (initial startup) then the green network status LED remains off (see chapter 8.3 CONFIGURATION AND LED DISPLAYS).

14.3 PROJECT SET UP WITH ROCKWELL AUTOMATION

Rockwell Automation provides the Logix platform for EtherNet/IP. Different levels of the Logix family can be used depending on the required capacity of the system.

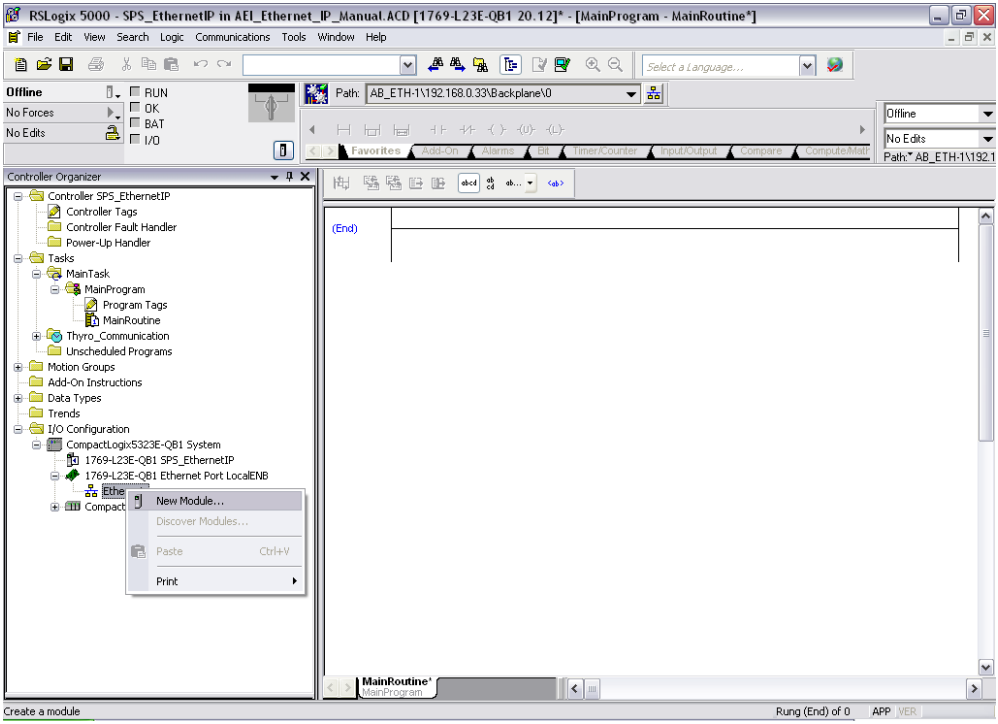
For smaller applications the following components can be used:

- CompactLogix™ L23E Processor with integrated EtherNet/IP port
- RSLogix™ 5000 program software for Logix controllers
- RSLinx is a communication server and supports the programming software and component software products (OPC) from Rockwell

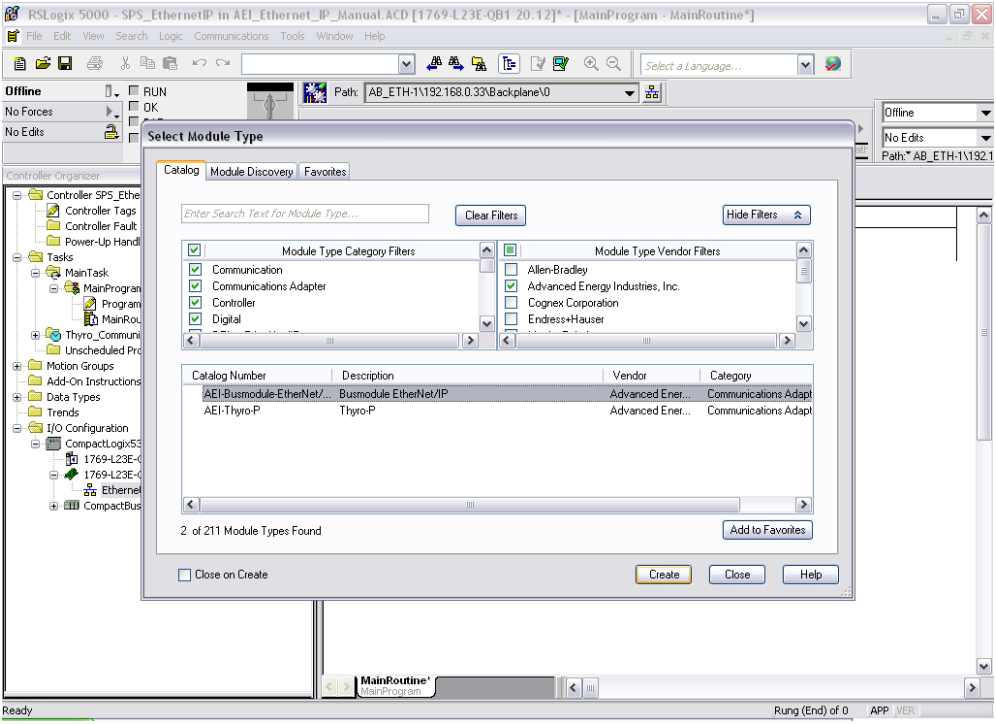
As an option, the RSNetWorks tool can be used. RSNetworks is the configuration tool for EtherNet/IP and enables the graphical display of the system, the integration of EDS files from Ethernet devices, the display of I/O and configuration data, connection information, etc. The EDS file of Ethernet bus module can be read in via RSNetWorks and the device conveniently configured.

Due to Advanced Energy Industries, Inc. being a Rockwell Encompass partner, the EDS file of the Ethernet bus module can be loaded into RSLogix 5000 directly, and the Ethernet/IP bus module can be configured as follows:

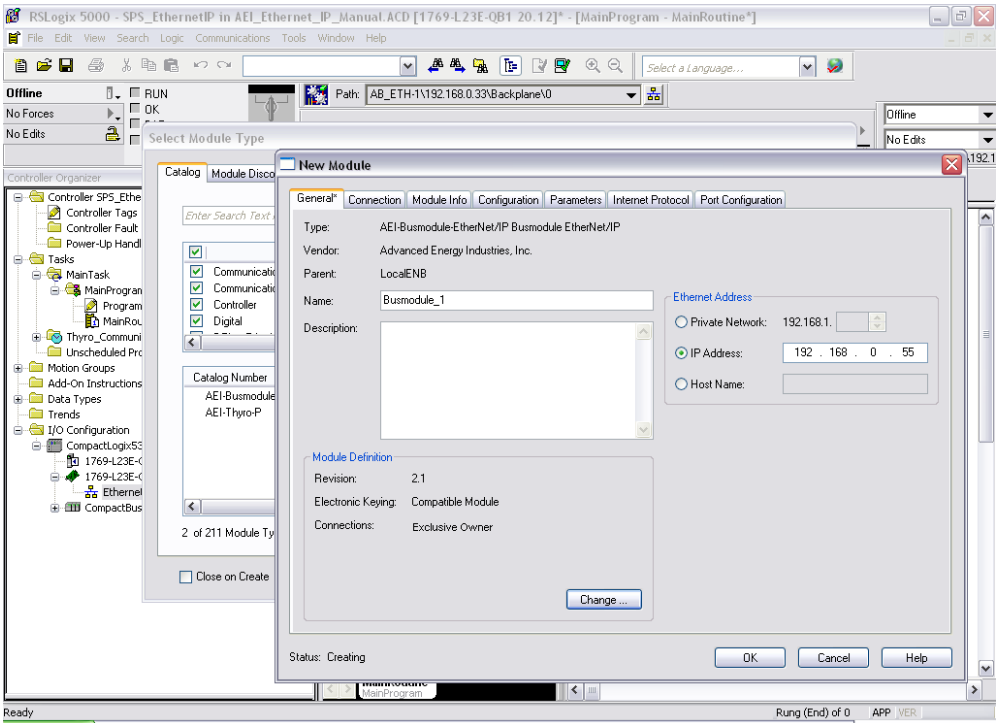
First add a new module on the respective Ethernet in the I/O configuration.



Then select AEI-Busmodule-EtherNet/IP as module type and create it.

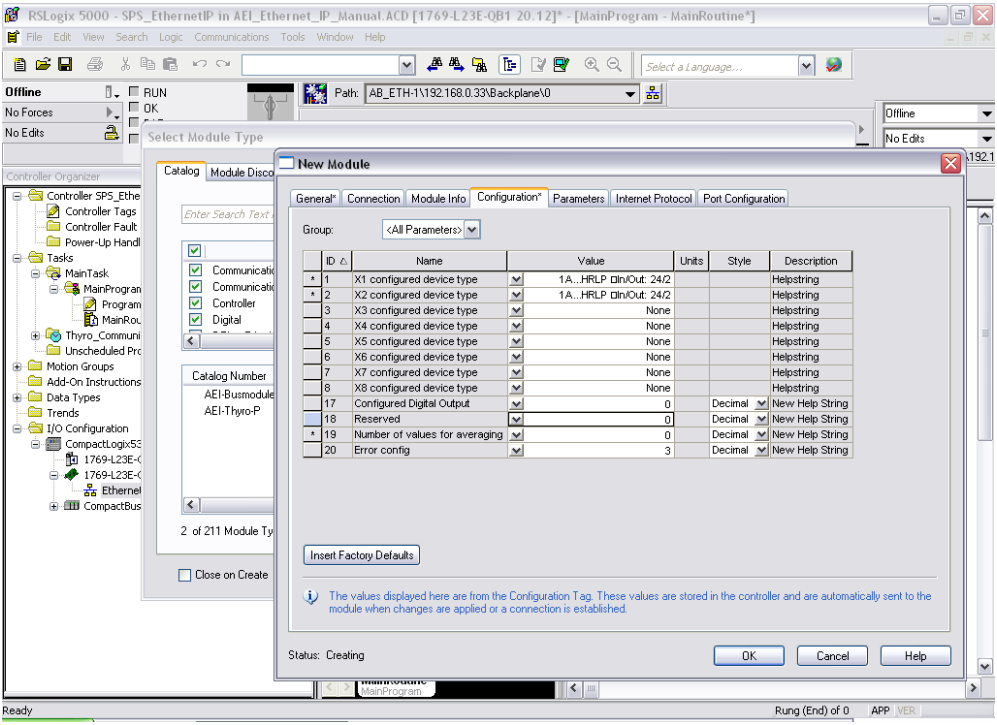


Set the Ethernet IP address on the register card “General”.



Then activate the register card "Configuration" select the correct device types that will be connected to the respective terminals X1 – X8.

In this example there are two power controller modules of the type Thyro-A 1A …-… HRLP connected to X1 and X2, and no devices are connected to X3 – X8.



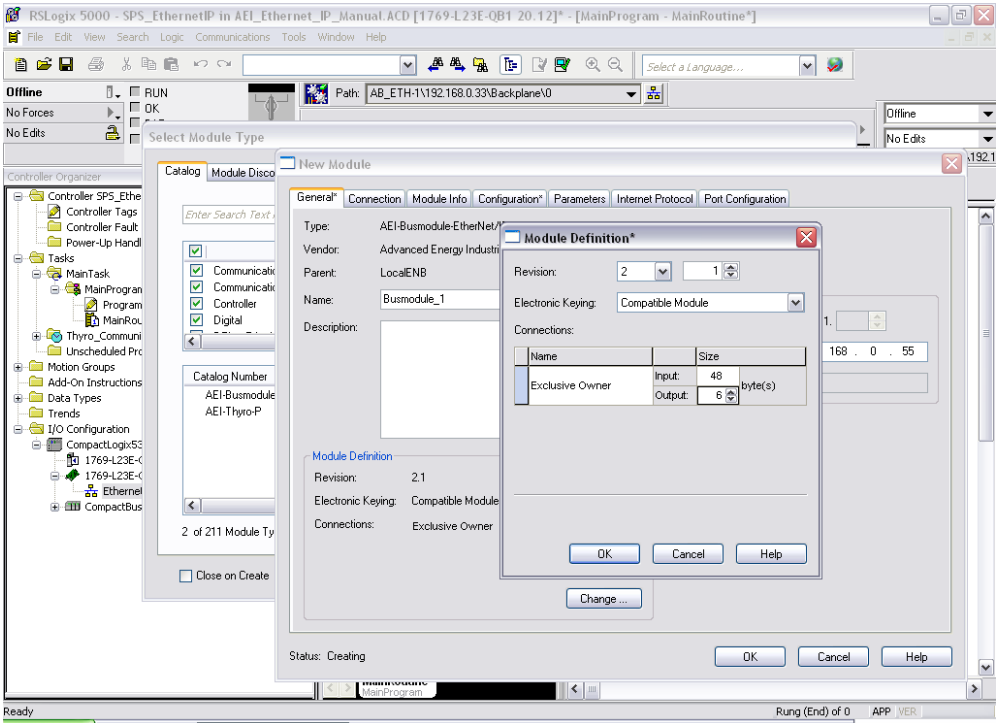
Pay attention to the input and output data bytes required by each of the devices in this example:

Each Thyro-A 1A … HRLP	Input data: 24 bytes output data: 2 bytes
Both devices (X1 & X2)	Input data: 48 bytes output data: 4 bytes

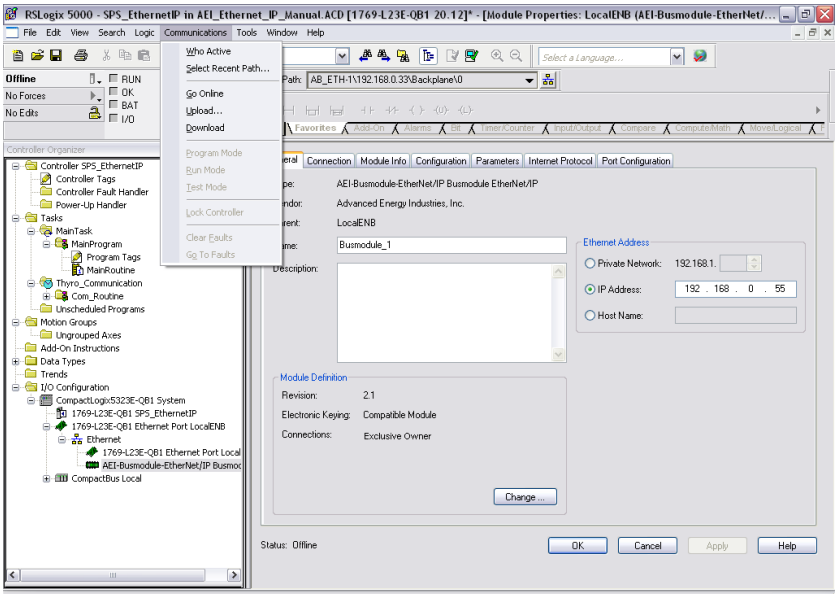
For general purposes, 2 bytes output data need to be added.

Totally required data	Input data: 48 bytes output data: 6 bytes (= 4+2)

These input and output data lengths need to be filled into the respective configuration window “Module Definition” that opens after click on the “Change” button on the register card “General”.



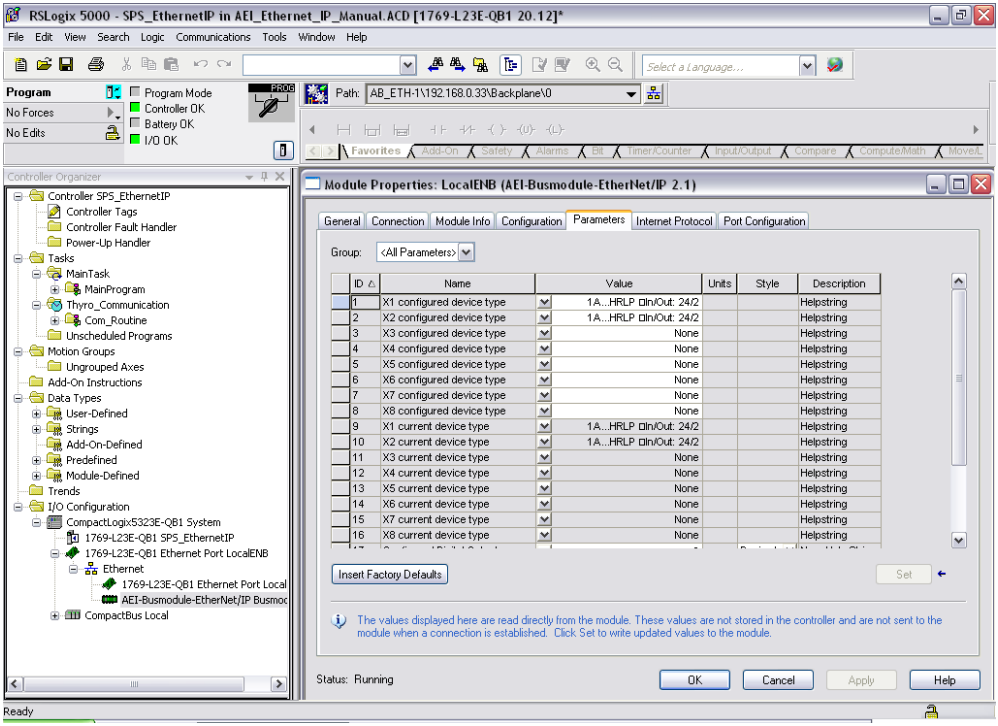
The switch on the RSLogix should be moved to position “Remote”. The online operating mode (Go Online) is activated below in the “Communications” menu and afterwards the “Download” function is activated:



Then the configuration is downloaded and when the download is completed without errors the cyclical connection to Ethernet bus module is build up.

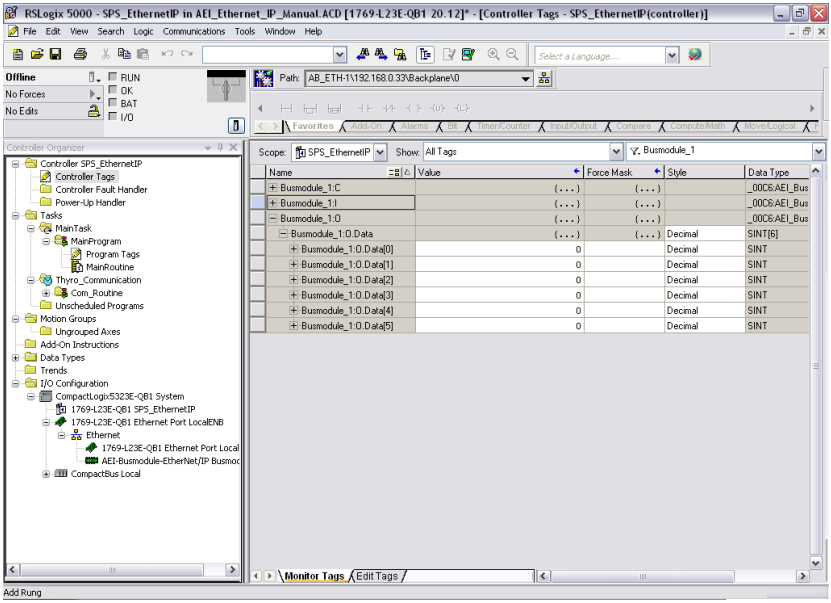
The following screenshot shows the Module Properties of the Ethernet/IP bus module of the example when the two Thyro-A 1A … HRLP being connected and recognized as configured types.

There is a green I/O OK flag, and the same device types appear as configured device type and current device type.



The cyclic input data can be viewed in Module-View over (AB:ETHENET_ MODULE:I:0).

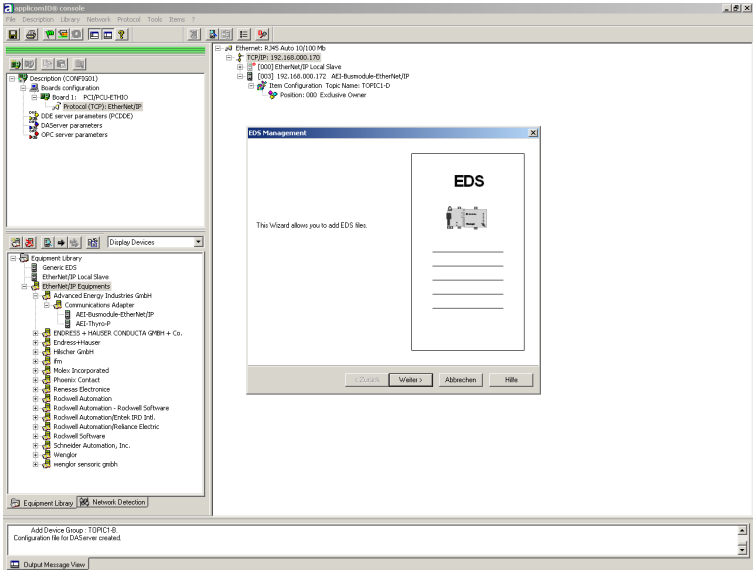
The cyclic output data might be set in the "Monitor" View over (AB:ETHENET_MODULE:O:0):



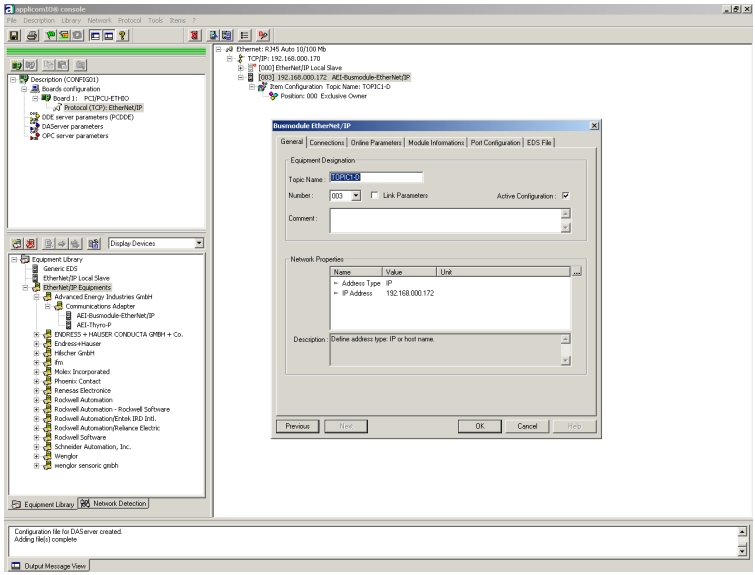
14.4 PROJECT SET UP WITH APPLICOM FROM MOLEX

applicomIO is a PC communication application for automating and visualizing industrial processes. The EtherNet/IP protocol is available via the applicomIO PCI-ETHIO cards. The applicomIO application consists of a configuration console, test and diagnosis tools and interfaces for data access on the field device. The configuration of the device is done by its EDS file.

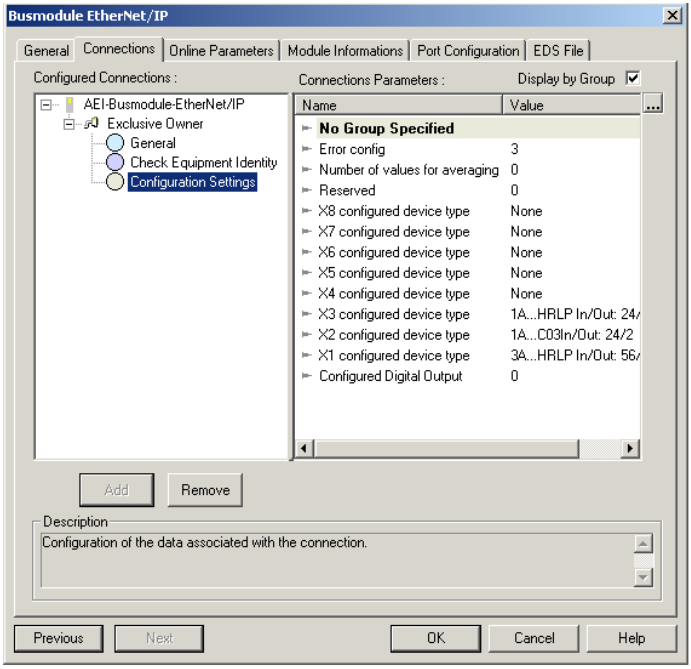
The administration of the EDS files is carried out in the Equipment Library Area of applicomIO via the "Add" menu:



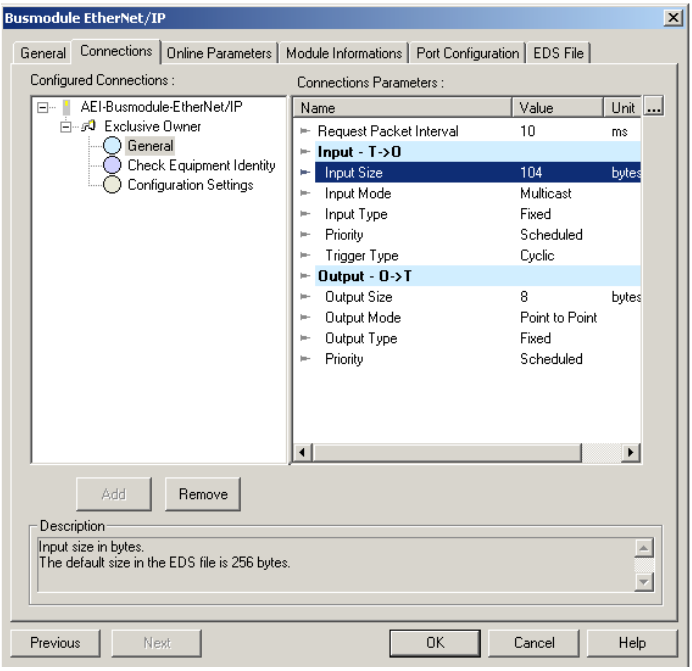
After the EDS file has been successfully scanned in the Ethernet bus module device, it appears with a corresponding catalogue number in the Equipment Library. Using drag and drop the device is then configured in the scanner and the IP address of the Ethernet bus module is set:



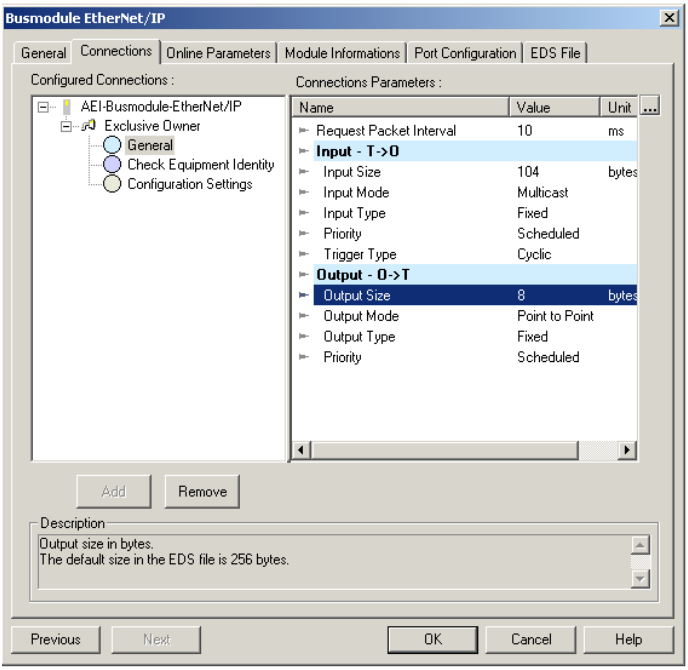
Under “Connections” the available modules may be configured:



The free slots are configured as “none”

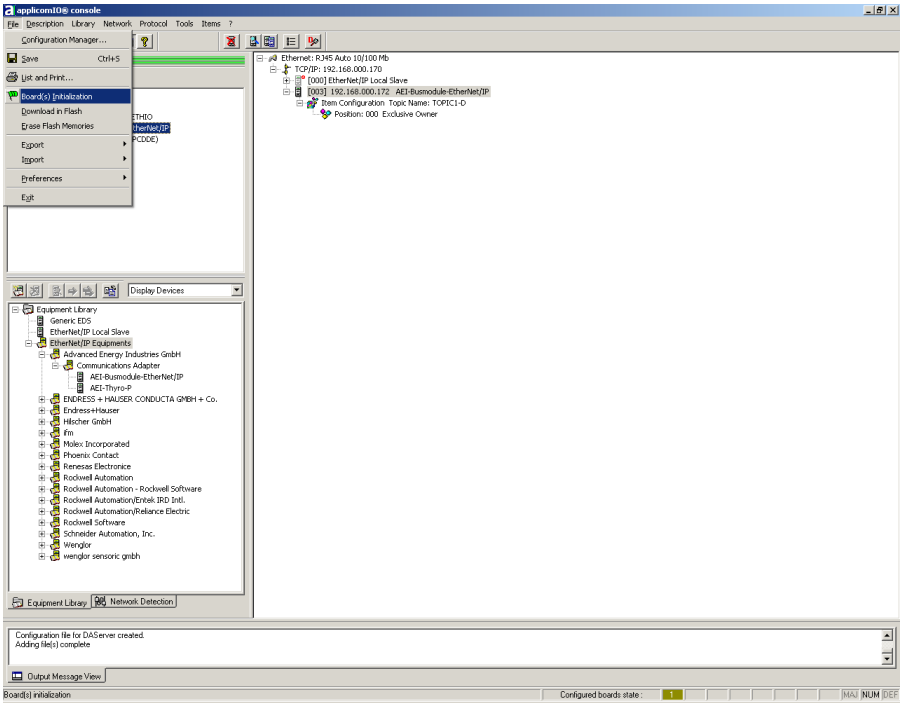


Under "General" the exact sizes of the input and output data (in bytes) is entered:

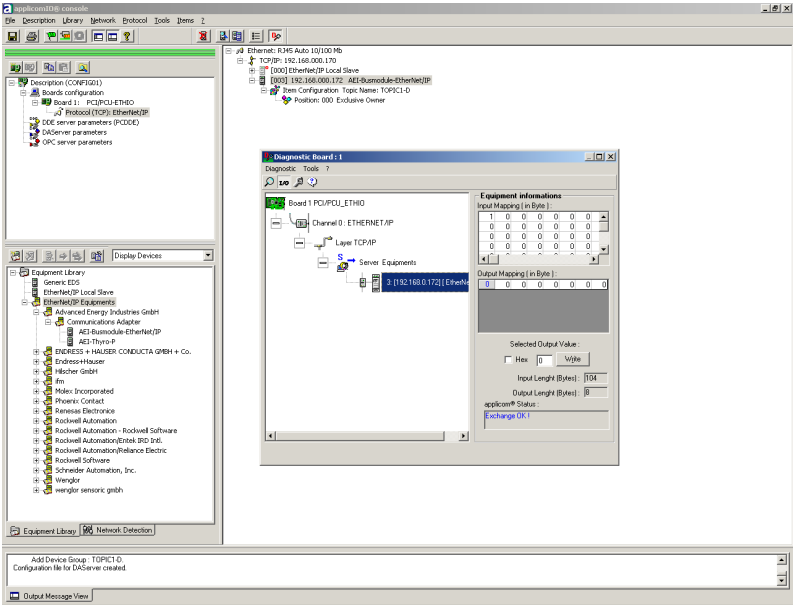


The number in the output size field is the sum of the output data of all plugged in modules + 2 for the digital outputs.

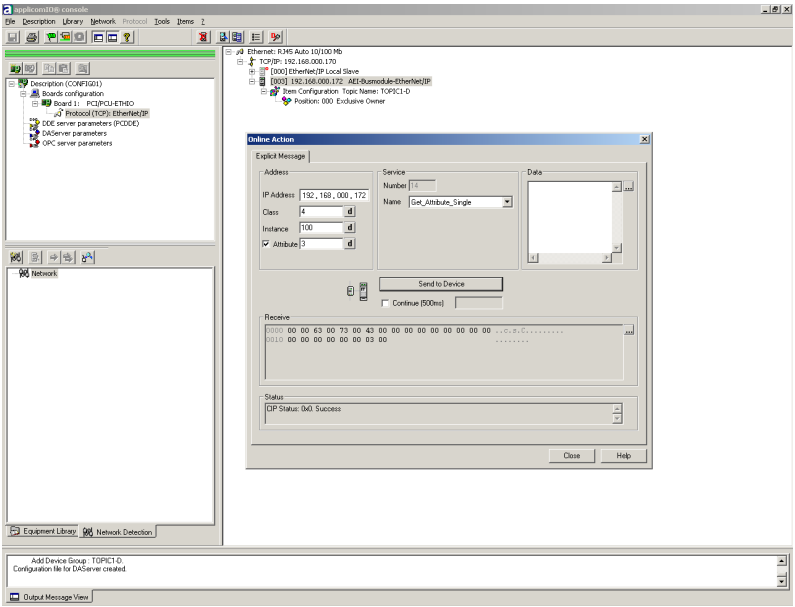
In the menu “File/Board Initialization“ the configuration of bus module EtherNet/IP is loaded into applicomIO. After the successful configuration, the cyclic communication is automatically set up and the NS-LED on the device lights up solid green.



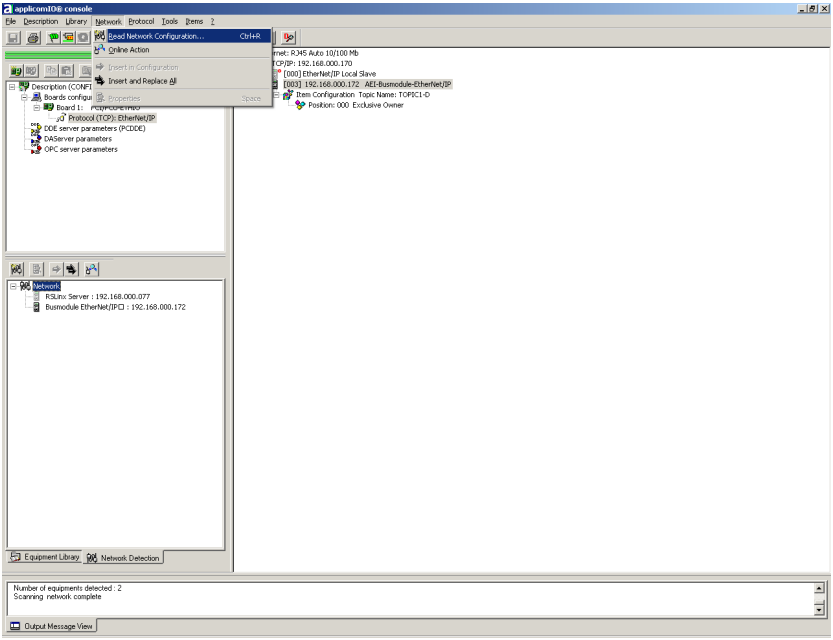
In the menu “Protocol/Diagnostic…” or with the “Diagnostic” button the input and output data of the assemblies can be displayed:



Via the menu “Online Action” in the “Network Detection” field data can be read or written acyclically from the device, even if the device is not entered into the configuration. The illustration shows the reading of all attributes of the identity object:



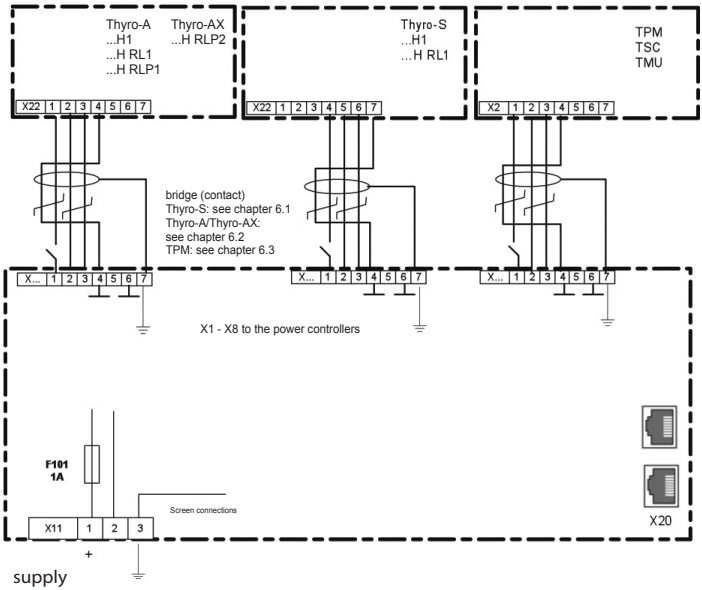
If the IP address of Ethernet bus module EtherNet/IP is not known, the “Automatic Detection“ function can be activated and located devices appear left below “Network“:



15. EXTERNAL CONNECTIONS

15.1 POWER SUPPLY

+24V to X11, current consumption approx. 150mA



supply

24V DC (approx. 150mA)

The foregoing circuit diagram shows the connection of the bus module.

15.2 OPERATING ELEMENTS AND TERMINAL BLOCKS

This chapter describes the available terminal blocks, plug connectors and operating elements.

Configuration of the 7 pin connector of slots X1 to X8:

1 Switched ground potential. All pins 1 of slots X1 to X8 are connected.

2 RxD

3 TxD

4 Ground

5 Switchable ground potential. The slots X1 to X8 can be switched as desired.

6 Ground

7 Ground potential for shield connection

Configuration of the 3 pin connector X11:

1 +24V

2 24V - ground

3 Grounding, cable should be as short as possible for EMC reasons

16. INTERFACES

16.1 SYSTEM INTERFACE

The bus module is connected with the relevant system interfaces of the power controllers via X1 to X8 (four-wire, 2x2 twisted, shared shielding).

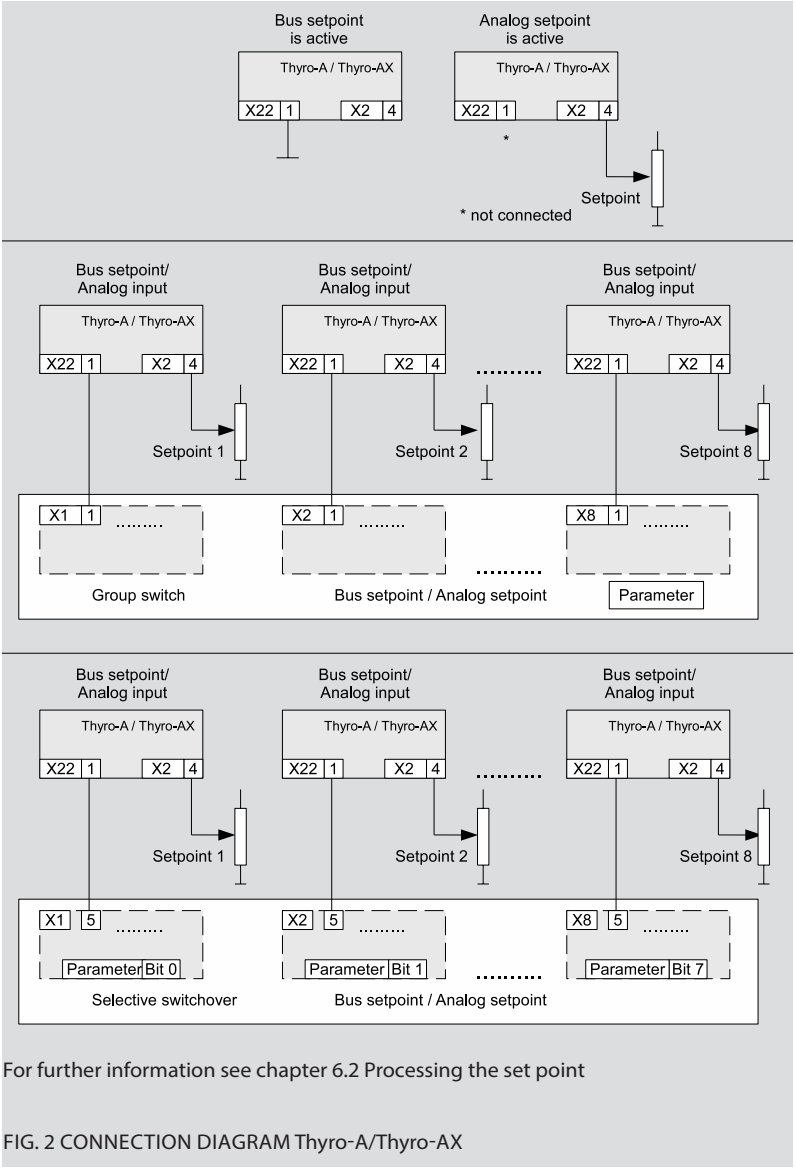
The transmission rate is 38,400 Bd.

The asynchronous characters are transferred with 8bit, no parity, and one stop bit. The protocol starts with STX, followed by an identifier, the data, and is concluded with a check sum. Invalid frames are ignored.

16.2 ETHERNET INTERFACE

Communication medium	CAT 5e
Network topology	tree, star and line
Maximum cable length	100m
EtherNet/IP-participants	restricted to the maximum supported number of devices by the controller used
Transmission rate	100 Mbit/s

17. CONNECTION DIAGRAMS Thyro-A/Thyro-AX



For further information see chapter 6.2 Processing the set point

FIG. 2 CONNECTION DIAGRAM Thyro-A/Thyro-AX

18. CONNECTION DIAGRAMS Thyro-S

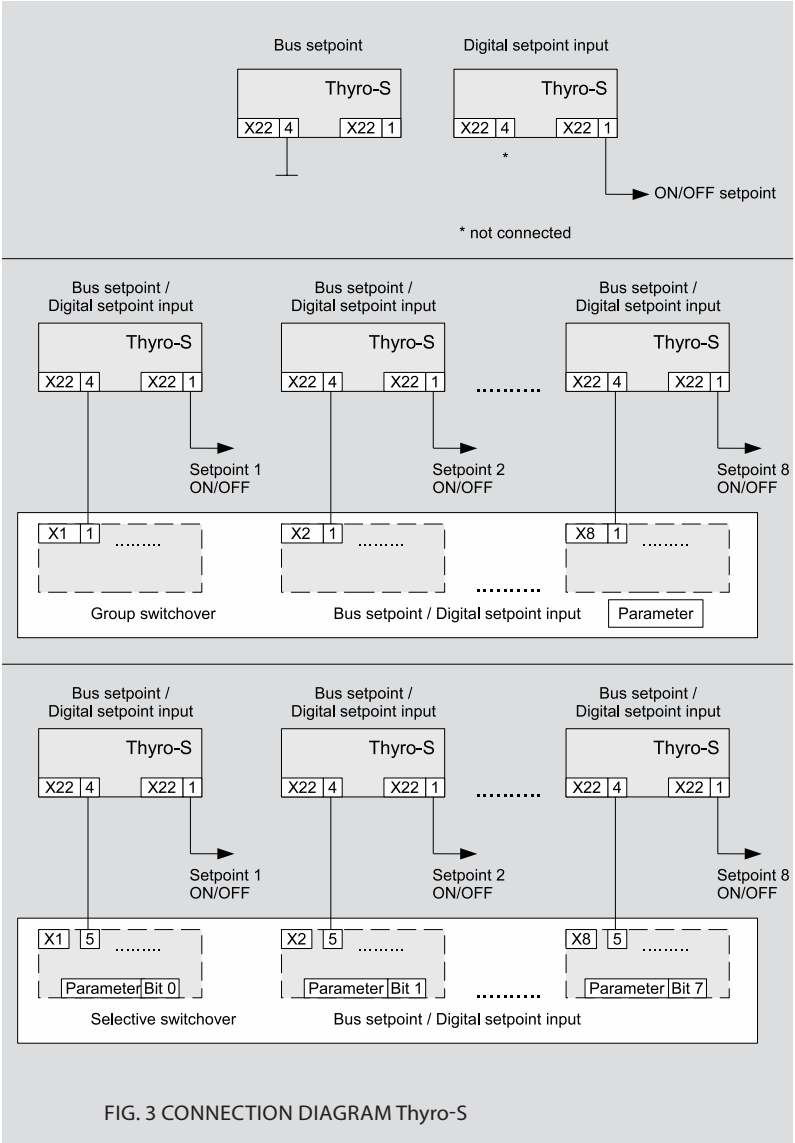


FIG. 3 CONNECTION DIAGRAM Thyro-S

19. CONNECTION DIAGRAMS Thyro-Step Controller

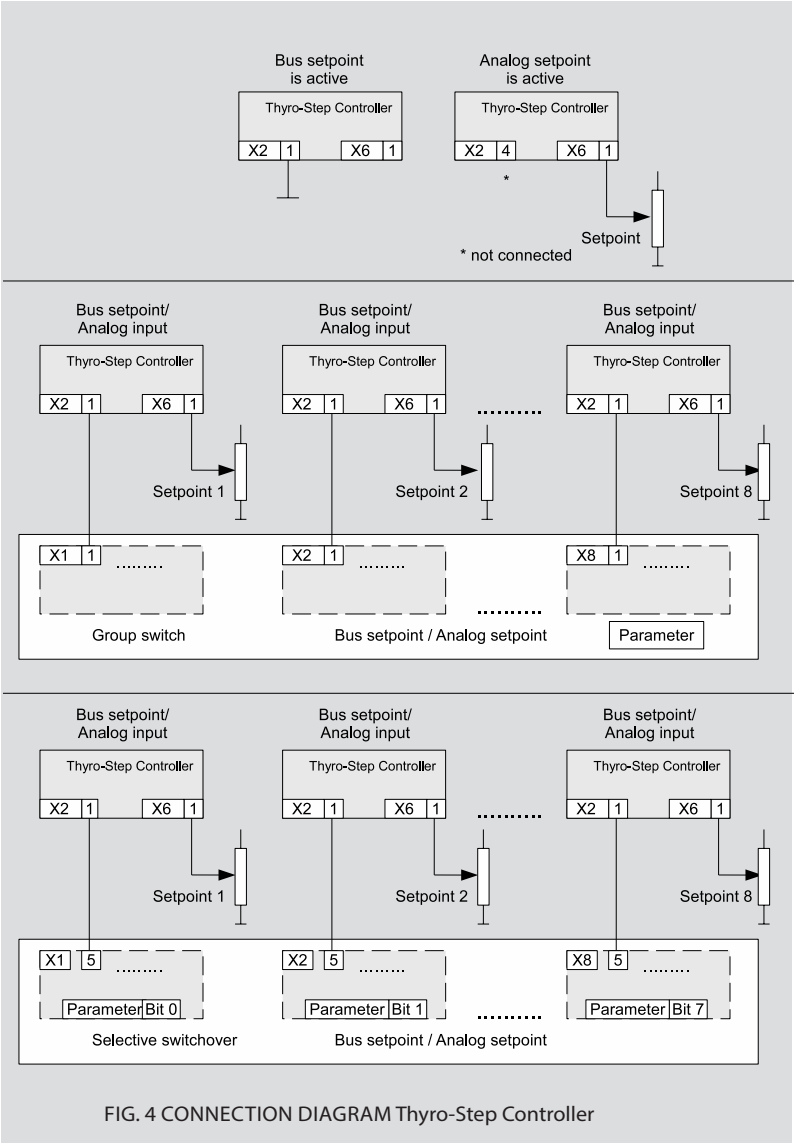
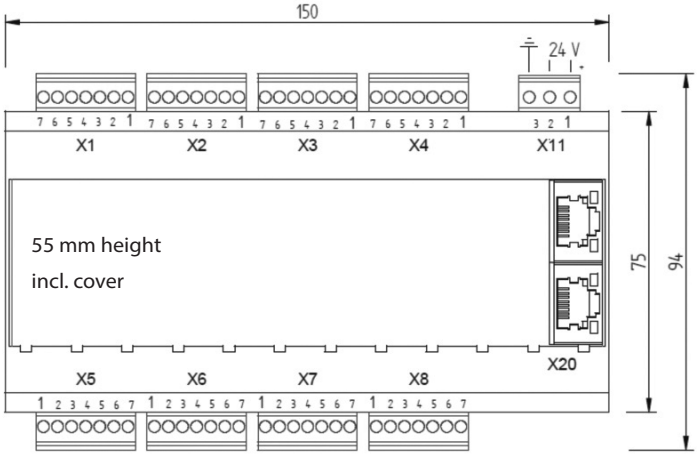


FIG. 4 CONNECTION DIAGRAM Thyro-Step Controller

20. TECHNICAL DATA

Power supply	24 VDC (+/-20 %)150mA
Connection options	for up to 8 Advanced Energy power controllers of series Thyro-S, Thyro-A, Thyro-AX and the Thyro-Power Manager series
Function control	LED
Assembly	DIN rail
Ambient temperature	maximum 55°C
Dimensions (WxDxH):	150 x 60 x 95mm
Weight circa:	0.35 kg

21. DIMENSION DRAWING



22. ADDITIONAL OPTIONS

Ready-made bus module side shielded cable.

A set of cables consist of 4 connection cables for connecting 4 power controllers.

Order number 2000 000 848: bus module connection cable for 4 controllers, 2.5m long

Order number 2000 000 849: bus module connection cable for 4 controllers, 1.5m long

23. APPROVALS AND CONFORMITY

- Quality standard in acc. to DIN EN ISO 9001
- CE conformity
- EtherNet/IP conformity
- RoHS compliant 5/6
- Directives

The CE mark on the device confirms compliance with the EG directives 2006 / 95 / EEC for low voltage and 2004 / 108 / EEC for electromagnetic compatibility if the instructions on installation and commissioning described in the operating instructions are followed.

IN DETAIL

DEVICE APPLICATION CONDITIONS		
Ethernet/IP		CIP 3.10 April, 2011
Built-in device (VDE0160)		EN 50 178
Storage temperature (D)		-25°C - +55°C
Transport temperature		-25°C - +70°C
Operating temperature (better B)		-10°C - +55°C
Humidity class	B	EN 50 178 tab. 7 (EN 60 721)
Degree of contamination	2	EN 50 178 tab. 2
Air pressure		900mbar * 1000m above sea level
Degree of protection	IP00	EN 69 529
EMC-testing		EN 61000-6-2 (-4)
Emitted interference		CISPR 16
Radiated immunity		EN/IEC 61000-4-3
Conducted immunity		EN/IEC 61000-4-6
ESD	8kV (A)	EN/IEC 61000-4-2
Burst control lines	1kV (A)	EN 61000-4-4

ANNEX 1

FIELD REPLACEMENT OF THYRO-A CONNECTED TO ETHERNET IP BUS MODULE

INTRODUCTION

This procedure provides instructions for field replacement of a Thyro-A, which is currently connected to AE's Ethernet IP bus module, order no. 2.000.000.846.

After completing this procedure, the replacement Thyro-A will have all of the required configuration settings.

SETUP AND INSTALLATION

1. Confirm that all existing connections in place and power applied to the bus module and Thyro-A

2. For Ethernet IP operation, the bus module rotary switches must be set to the correct position. Confirm the "Protocol" switch is in position 2 for Ethernet I/P Communications. (Position 0 = Profinet; Position 1 = Modbus TCP; Position 2 = Ethernet IP; [Position 6 = Ethernet IP with previous Vendor ID (old firmware version)]; Position 9 = Load factory defaults)

3. Confirm that the "Slots" switch, position 0-8, is to equal the number of power controllers being interfaced to the bus module.

4. Under the Ethernet IP bus module topology, there are two methods for configuring Thyro-A. The method used depends upon whether the original Thyro-A settings need to be changed or not.

METHOD 1: AUTO-CONFIGURATION ENABLED
(Bus module configures the Thyro-A)

If a new Thyro-A is replacing an existing Thyro-A and will retain the same parameters as the previous unit, then the bus module's auto-configure feature can be used to automatically program the new unit.

With bus module and Thyro-A control power off, simply remove the old and plug the new Thyro-A into the existing bus slot. Then apply control power first to the Thyro-A and then the bus module. The bus module will automatically load the existing parameter settings into the new Thyro-A.

METHOD 2: PARAMETERS CHANGED - AUTO-CONFIGURATION DISABLED
(Bus module learns new Thyro-A settings)

If the existing or new Thyro-A settings have been changed via Thyro-Tool Family software, the auto configure function of the bus module needs to be disabled in order to store the new configuration settings into the bus modules memory.

1. With power applied to both the bus module and existing Thyro-A, switch the bus module 24V supply off then set the "slots" switch to zero.

2. Disconnect the existing Thyro-A from the bus module and connect it to Thyro-Tool Family. If a new Thyro-A is being used then connect it to Thyro-Tool Family.

3. Set the new parameters via Thyro-Tool Family and save them into the Thyro-A non-volatile RAM.

4. Disconnect the Thyro-A from the Thyro-Tool Family software and reconnect it to the bus module.

5. Apply power to the bus module and switch the "slots" switch from zero back to the original position. This will cause the bus module to read and store the new configuration.

World Headquarters
1625 Sharp Point Drive
Fort Collins, CO 80525 USA

970.221.4670 Main
970.221.5583 Fax

www.advanced-energy.com

Specifications are subject to change without notice.

© 2014 Advanced Energy Industries, Inc. All rights reserved. Advanced Energy® and Thyro-S™, Thyro-A™, Thyro-AX™ are trademarks of Advanced Energy Industries, Inc.

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Ethernet Modules ***category:***

Click to view products by Advanced Energy ***manufacturer:***

Other Similar products are found below :

TDKEZW3 V23993-USB1029A 100-POE4 I210T1BLK X520QDA1 BCM84794A1KFSBG X520DA2OCP 808-38157 7506GX2 TC EXTENDER 2001 ETH-2S 105FX-SC-MDR 110FX2-SC 7000-P3201-P050150 750-1515 750-494 750-495 750-497 750-501 750-612 750-613 750-627 750-643 750-940 753-440 753-540 753-650/003-000 852-1322 852-1328 852-1812 852-1813 852-1816 LANTICK PE-0-16 LANTICK PE-16-0 RBMTXLITE-L4X2.X.X.X.X. USR-TCP232-T2 2017008 EKI-7708E-4F-AE EKI-7708E-4FP-AE EKI-7708G-4FP-AE 2352903-2 753-620 EGU-0702-SFP-T EKI-2706G-1GFPI-BE SW-125 SW-525 SW-725 7000-74712-4780030 7000-74712-4780060 7000-74712-4780100 7000-74712-4780150