



EtherNet/IP™

ODVA™
MEMBER

COMBIVERT x6

Instruction Manual | **EtherNet/IP™** for Firmware v2.3.x





Instruction Manual
Document 20186304 EN 01

1 Preface

The hardware and software described in the following document are developments of KEB Automation KG. The enclosed document corresponds to the current version at the time of printing. Misprint, mistakes, and technical changes reserved.

1.1 Signal words and symbols

Certain operations can cause hazards during the installation, operation or thereafter. Refer to the safety information in the documentation about these operations. Security signs are located on the device or on the machine. A warning contains signal words which are explained in the following table:

	➤ Dangerous situation, which will cause death or serious injury in case of non-observance of this safety instruction.
	➤ Dangerous situation, which may cause death or serious injury in case of non-observance of this safety instruction.
	➤ Dangerous situation, which may cause minor injury in case of non-observance of this safety instruction.
	➤ Situation, which can cause damage to property in case of non-observance.

RESTRICTION

Is used when the validity of statements is subject to certain conditions or a result is limited to a certain validity range.



- Is used when the result will be better, more economic or trouble-free by following these procedures.

1.2 More symbols

- ▶ This arrow starts an action step.
- /- Enumerations are marked with dots or indents.
- => Cross reference to another chapter or another page.

	Note to further documentation. Document search on www.keb.de	
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1.3 Laws and guidelines

KEB Automation KG confirms with the CE mark and the EC declaration of conformity that our device complies with the essential safety requirements.

The CE mark is located on the name plate. The EC declaration of conformity can be downloaded on demand via our website. Further information is provided in chapter "Certification".

1.4 Warranty

The warranty on design, material, or workmanship for the acquired device is given in the current terms and conditions.

	<p>Here you will find our current terms and conditions.</p> <p>Terms and Conditions</p>	
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Further agreements or specifications require a written confirmation.

1.5 Support

Through multiple applications not every imaginable case has been taken into account. If you require further information or if problems occur which are not detailed in the documentation, you can request the necessary information via the local KEB Automation KG agency.

The use of our units in the target products is beyond our control and therefore exclusively the responsibility of the machine manufacturer, system integrator, or customer.

The information contained in the technical documentation, as well as any user-specific advice in spoken and written and through tests is made to the best of our knowledge and information about the application. However, they are considered for information only without responsibility. This also applies to any violation of industrial property rights of a third-party.

Selection of our units in view of their suitability for the intended use must be done generally by the user.

Tests can only be done by the machine manufacturer in combination with the application. They must be repeated, even if only parts of hardware, software or the unit adjustment are modified.

1.6 Copyright

The customer may use the instructions for use as well as further documents or parts from it for internal purposes. Copyrights are with KEB Automation KG and remain valid in its entirety.

Other wordmarks and/or logos are trademarks (™) or registered trademarks (®) of their respective owners and are listed in the footnote on the first occurrence.

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2 Basic Safety Instructions

The COMBIVERT is designed and constructed in accordance with state-of-the-art technology and the recognized safety rules and regulations. However, the use of such devices may cause functional hazards for life and limb of the user or third parties, or damages to the system and other material property.

The following safety instructions have been created by the manufacturer for the area of electric drive technology. They can be supplemented by local, country- or application-specific safety instructions. This list is not exhaustive. Non-observance will lead to the loss of any liability claims.

ATTENTION

Hazards and risks through ignorance!

- Read all parts of the operating instructions!
- Observe the safety and warning instructions!
- If anything is unclear, please contact KEB!

2.1 Target group

This instruction manual is determined exclusively for electrical personnel. Electrical personnel for the purpose of this instruction manual must have the following qualifications:

- Knowledge and understanding of the safety instructions.
- Skills for installation and assembly.
- Start-up and operation of the product.
- Understanding of the function in the used machine.
- Detection of hazards and risks of the electrical drive technology.
- Knowledge of DIN IEC 60364-5-54.
- Knowledge of national safety regulations (e.g. *DGUV regulation 3*).

2.2 Validity of this manual

This manual is to be used as follows:

- Describes the parameterization of the communication module for the Multi-Real-Time Ethernet Module on F6A and S6A.
- Contains only supplementary safety instructions.
- Is only valid in connection with the installation instructions and the programming instructions of the COMBIVERT x6.

2.3 Electrical connection

DANGER

Voltage at the terminals and in the device!

Danger to life due to electric shock!

- For any work on the unit switch off the supply voltage and secure it against switching on.
- Wait until the drive has stopped and verify that no regenerative energy can be generated.
- Await capacitor discharge time (5 minutes) if necessary, measure DC voltage at the terminals.
- Never bridge upstream protective devices (also not for test purposes).

For a trouble-free and safe operation please pay attention to the following instructions:

- The electrical installation shall be carried out in accordance with the relevant requirements.
- Cable cross-sections and fuses must be dimensioned according to the design of the machine manufacturer. Specified minimum / maximum values may not be fallen below /exceeded.
- With existing or newly wired circuits the person installing the units or machines must ensure the EN requirements are met.
- For drive converters that are not isolated from the supply circuit (in accordance with [EN 61800-5-1](#)) all control lines must be included in other protective measures (e.g. double insulation or shielded, earthed and insulated).
- When using components without isolated inputs/outputs, it is necessary that equipotential bonding exists between the components to be connected (e.g. by the equipotential line). Disregard can cause destruction of the components by equalizing currents.

2.4 Start-up and operation

The drive converter must not be started until it is determined that the installation complies with the machine directive; [EN 60204-1](#) must be observed.

WARNING

Software protection and programming!

Hazards caused by unintentional behavior of the drive!

- Check especially during initial start-up or replacement of the drive converter if parameterization is compatible to the application.
- Securing a unit solely with software-supported functions is not sufficient. It is imperative to install external protective measures (e.g. limit switch) that are independent of the drive converter.
- Secure motors against automatic restart.

3 Product Description

3.1 Validity of the manual

This manual describes the parameterization for EtherNet/IP™ communications of the

- Device Series: COMBIVERT F6/S6
- Hardware: Control board A(application)
- Software: Version 2.3



➤ This manual is for software Version 2.3 only. More functionality will be available in later versions of software. For now the device acts as a Communications Adapter and will be identified as one by your PLC in the Identity Object.

3.2 Functional overview

- Explanation of the EtherNet/IP™ Adapter interface
- Hardware setup
- Software setup

3.3 Used terms and abbreviations

Term	Description
Adapter	The device that responds to requests from a Scanner
CIP	Common Industrial Protocol
COMBIVERT	KEB drive converter
COMBIVIS	KEB start-up and parameterization software
DC	DC current or voltage
DS 402	CiA DS 402 - CAN device profile for drives
EDS File	Electronic Data Sheet is an ASCII text file that describes the features of the device.
EMC	Electromagnetic compatibility
Emergency stop	Shutdown of a drive in emergency case (not de-energized)
Emergency switching off	Switching off the voltage supply in emergency case
EN	European standard
Ethernet	Real-time bus system - defines protocols, connectors, cable types
EtherNet/IP™	Ethernet/Industrial Protocol communication system
Explicit Messaging	Exchange of data over a request/response orientated function
FE	Functional earth
GND	Reference potential, ground
HMI	Human-Machine Interface (touchscreen)
IEC	International standard
IEEE	Institute of Electrical and Electronics Engineers
Implicit Messaging	Exchange of data across I/O connections
Modulation	Power components of the drive are being controlled and active
PE	Protective earth

Term	Description
PLC	Programmable Logic Controller
Scanner	The device that gives requests to an Adapter

Table 3.1: Used terms and abbreviations

4 KEB Tools

KEB offers a wide range of tools to support easy commissioning of KEB devices. They are designed with the user in mind to give the capability of quick setup and diagnostics of the devices.

4.1 COMBIVIS 6

Combivis 6 is a software program from KEB that gives the user the ability to parameterize and setup KEB devices. It is used for diagnostics such as uploads and downloads of KEB parameters. There is a scope mode that can be used to graph parameter information in real time. The program is royalty free and available on the KEB website.

4.2 COMBIVIS 6 studio

This software program has the same capabilities as Combivis 6. The studio software opens up more functionality to KEB devices. This program is based on the IEC-61131-3 software programming languages and architecture.

4.3 KEB FTP Application

This tool runs on Windows XP or higher with the .NET Framework. It uses a COM port or the Windows IP Stack to transfer to and from KEB devices. This tool is available along with the installation of Combivis.

5 Hardware Description

5.1 Hardware Overview

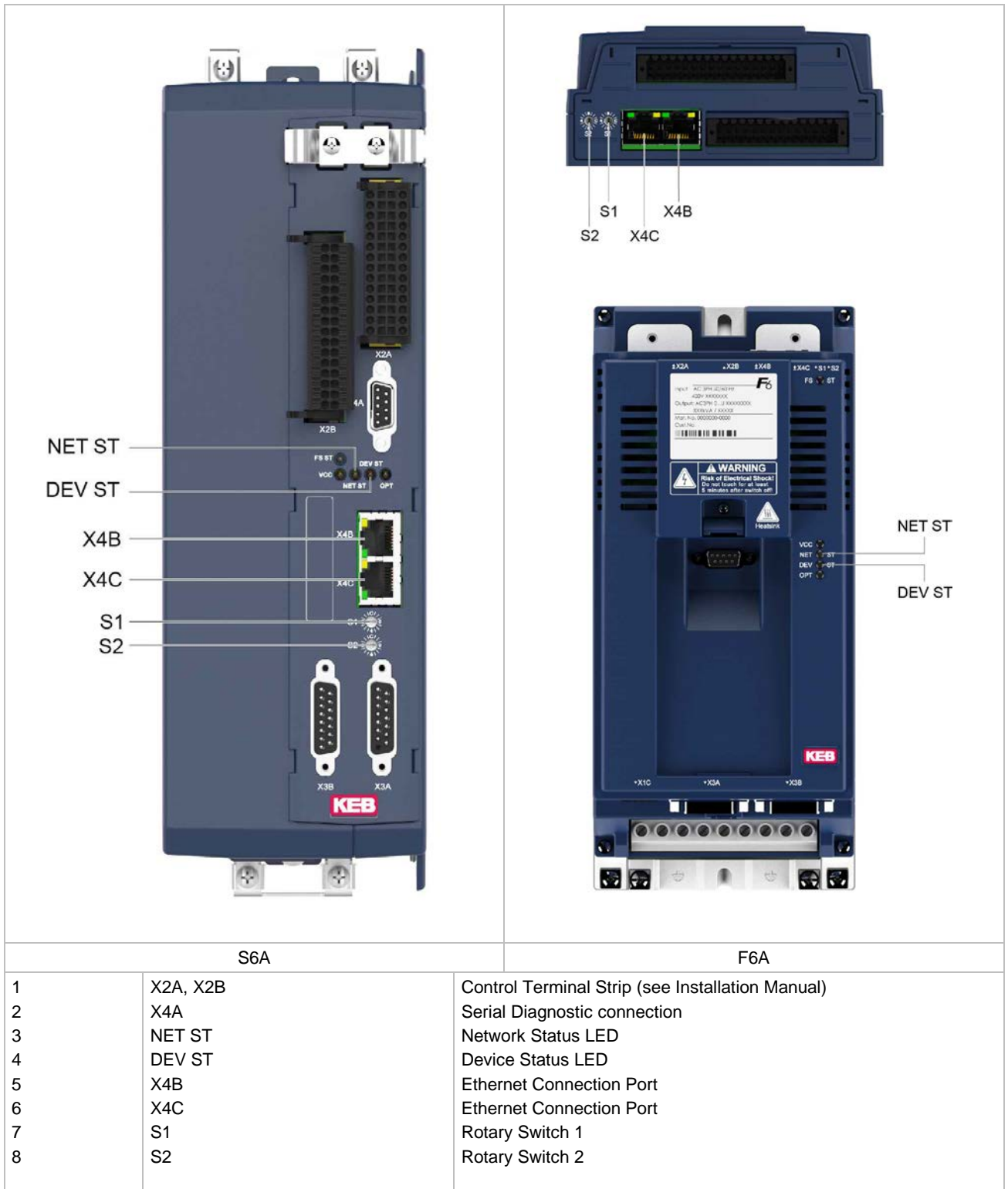


Figure 5.1: Hardware connections

5.2 Diagnostic Interface

The integrated serial interface provides the following functions:

- Parameterization of the device with the KEB software COMBIVIS
- Connection of an F6 operator
- The control can be supplied via the diagnostic interface
- DIN66019II protocol is used for communications

ATTENTION

Prevent damage of the serial interface!

- Please use the correct cables provided from KEB for the diagnostic interface.
- The diagnostic interface is not electrically isolated

In order to use the diagnostic interface with KEB diagnostic tools (e.g., COMBIVIS), it is necessary to configure the parameters. The following parameters can be used to configure the diagnostic interface:

Index	Id-Text	Name	Function
0x2B0E	fb13	DIN66019 node ID	Node Address of the device
0x2B0D	fb14	DIN66019 baud rate	Baud rate for the serial communications

Table 5.1: Diagnostic Parameters



- The diagnostic interface is not intended for permanent operation of the device.
- By default the node ID is 1 and the baud rate is 38400bit/s.
- For more information about the diagnostic interface please refer to the Programming Manual

5.2.1 Connection Specifications

5.2.1.1 Pin Assignment of the Serial Interface

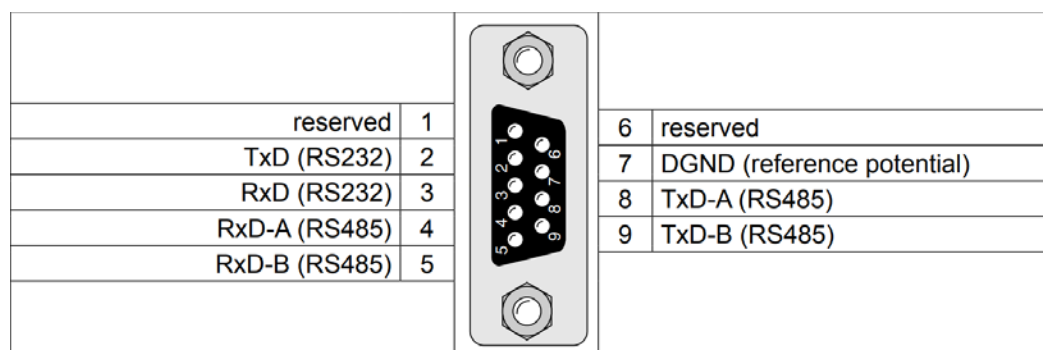


Figure 5.2: Pin Assignment of X4A

5.2.1.2 Cable Description

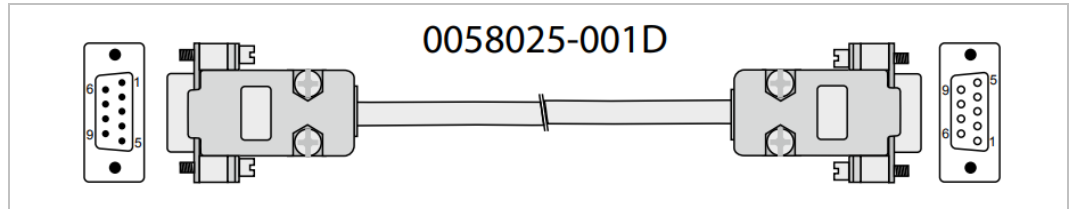


Figure 5.3: Serial Cable for PC Connection

5.3 EtherNet/IP™ Interface

For connection to the EtherNet/IP™ bus the hardware offers two connections. The connections are two RJ-45 sockets X4B and X4C.

5.3.1 Connection Specifications

Connection to the Ethernet Port is done by connecting a certified Ethernet 8-conductor cable with RJ-45 connectors. For consistent performance the physical setup needs to follow the IEEE 802.3 standards.

Name	Description
X4B	Ethernet Port 0
X4C	Ethernet Port 1
LED1	Yellow
LED2	Green
S1	Rotary Switch 1
S2	Rotary Switch 2

Figure 5.4: Ethernet Connections and Switches

5.3.2 Rotary Switches



➤ Rotary Switches are NOT available in software version 2.3.x. Ip Address will be defined via software in parameter fb108.



Figure 5.5: Rotary Switches

The rotary switches can define the last octet in the IP Address when the IP configuration parameter is set to the “static” method.

6 EtherNet/IP™

EtherNet/IP™ is a communication protocol for use in industrial environments. It allows for the exchange of application information between devices. EtherNet/IP™ is built upon the standard Ethernet and TCP/IP technology. It uses this to transport the CIP (Common Industrial Protocol) communication packets. The EtherNet/IP™ protocol and CIP are managed by the ODVA.

6.1 Data Transmission

EtherNet/IP™ uses a producer/consumer model to exchange time-critical application information. The sender (producer) makes the information available for the consumer (receiver) of the information. This allows the producer to make the data available to multiple consumers without the need to transmit the data multiple times.

EtherNet/IP™ uses the standard IEEE 802.3 specification. It is recommended to use commercial switching technology along with 100 Mbps bandwidth and full-duplex operation. This will allow the best results and provide a more deterministic performance.

6.1.1 Explicit Messaging (Parameter Channel)

The explicit messaging enables the controller to address a parameter in the drive to READ or WRITE. This function allows access to every parameter in the KEB frequency inverter. Furthermore, with this function special management functions called Services can be carried out. The available Services are:

Service Code	Service Name	Service Description
0x01	Get_Attributes_All	Reads all the attributes of an object (not supported by all classes)
0x0E	Get_Attribute_Single	Reading the attribute of an object.
0x10	Set_Attribute_Single	Writing the attribute of an object.
0x05	Reset	Resetting of an object (Only supports class 0x01)

Table 6.1: Available Services

In each message the user needs to define the type of Service that will be used along with the Class, Instance, and Attribute of the object. The objects in the drive conform to the CiA 301 object specification. Each parameter in the drive has an Index and Sub Index to identify it.

6.1.1.1 Class

The Class determines what type of object you want to access in the device. In this case the value of 0x64 or 100 decimal represents the parameter objects in the drive. These parameters are accessed with a 32 bit data width.

6.1.1.2 Instance

The Instance represents the drive parameter Index or Address in the drive. This can be found in the application manual.

6.1.1.3 Attribute

The Attribute represents the drive parameter Sub Index.

6.1.1.4 Example READ

Here is an example of reading the system time parameter from the drive. The parameter is ru53: system time. It has an Index of 0x2C35 or 11317 decimal. The Sub-Index is 0x00 or 0 decimal. The service get_attribute_single will be used.

Service: 0x0E (Get_Attribute_Single)

Class: 0x64

Instance: 0x2C35

Attribute: 0x00

6.1.1.5 Example WRITE

Here is an example of writing a value of 1000 to the vl05: velocity max amount forward on the drive. It has an Index of 0x2305 or 8965 decimal. The Sub-Index is 0x00 or 0 decimal. The service set_attribute_single will be used.

Service: 0x10 (Set_Attribute_Single)

Class: 0x64

Instance: 0x2305

Attribute: 0x00

Data: 0x03E8 or 1000 decimal

6.1.2 Implicit Messaging (Process Data Communication)

Implicit messaging provides a dedicated communication path between producing and consuming applications. This path can move application specific data. This is also known as an I/O connection.

This documentation uses the terms process data output (PDOOUT) and process data input (PDIN) for the direction of the process data. The terms are based on the perspective from the control unit to the Combivert.

PDOOUT refers to the data going from the PLC (Scanner) to the drive (Adapter).

PDIN refers to the data going from the drive (Adapter) to the PLC (Scanner).

The drive supports multiple assemblies for communication. Assemblies 100 and 101 are special vendor specific assemblies made by KEB.

6.2 EtherNet/IP™ Objects

6.2.1 Identity Object (Class Code: 0x01)

The identity object includes parameters that provide identification and general information about the device in use. These parameters can be used for electronic keying, general status indication, and for applications trying to determine what devices are on the network.

6.2.1.1 Class Attributes

Class	Instance	Attribute	Name	Type	Access
1	0	1	Revision	UINT	RO
1	0	2	Max Instance	UINT	RO
1	0	6	Max. Class Attribute	UINT	RO
1	0	7	Max. Instance Attribute	UINT	RO

Table 6.2: Identity Class Objects

6.2.1.2 Instance Attributes

Class	Instance	Attribute	Name	Type	Access
1	1	1	Vendor ID	UINT	RO
1	1	2	Device Type	UINT	RO
1	1	3	Product Code	UINT	RO
1	1	4	Revision	STRUCT of	RO
			Major	USINT	RO
			Minor	USINT	RO
1	1	5	Status	WORD	RO
1	1	6	Serial Number	UDINT	RO
1	1	7	Product Name	SHORT STRING	RO
1	1	8	State	USINT	RO
1	1	9	Configuration	UINT	RO

Table 6.3: Identity Instance Objects

6.2.2 Assembly Object (Class Code: 0x04)

This assembly object includes parameters that join attributes of multiple objects. This allows data to or from each object to be sent or received over a single connection. Assembly objects can be used to bind input data or output data. KEB's process data out (PDOOUT) consumes data from a controlling scanner and the process data in (PDIN) produces data from the frequency inverter adapter for the controller and network.

6.2.2.1 Class Attributes

Class	Instance	Attribute	Name	Type	Access
4	0	1	Revision	UINT	RO

Table 6.4: Assembly Class Objects

6.2.2.2 Instance Attributes

Class	Instance	Attribute	Name	Type	Access
4	100	3	KEB Data	ARRAY of BYTE	RW
4	100	4	Size in Bytes	UINT	RO
4	101	3	KEB Data	ARRAY of BYTE	RW
4	101	4	Size in Bytes	UINT	RO

Table 6.5: Assembly Instance Objects

6.2.3 TCP/IP Interface Object (Class Code: 0xF5)

The TCP/IP Interface Object provides the mechanism to configure and examine a device's network interface. The physical link contains parameters such as the IP Address and Network Mask.

6.2.3.1 Class Attributes

Class	Instance	Attribute	Name	Type	Access
F5	0	1	Revision	UINT	RO
F5	0	2	Max Instance	UINT	RO

Table 6.6: Interface Class Objects

6.2.3.2 Instance Attributes

Class	Instance	Attribute	Name	Type	Access
F5	1	1	Status	DWORD	RO
F5	1	2	Configuration Capability	DWORD	RO
F5	1	3	Configuration Control	DWORD	RW
F5	1	4	Physical Link	STRUCT of	
			Path Size	UINT	RO
			Path	EPATH	RO
F5	1	5	Interface Configuration	STRUCT of	
			IP Address	UDINT	RW
			Network Mask	UDINT	RW
			Gateway Address	UDINT	RW
			Name Server	UDINT	RW
			Name Server 2	UDINT	RW
		Domain Name	STRING	RW	
F5	1	6	Host Name	STRING	RW

Table 6.7: Interface Instance Objects

6.2.4 Ethernet Link Object (Class Code: 0xF6)

The Ethernet Link object contains link-specific status information for an IEEE 802.3 interface. This supports two instances for the two ports connected.

6.2.4.1 Class Attributes

Class	Instance	Attribute	Name	Type	Access
F6	0	1	Revision	UINT	RO
F6	0	2	Max Instance	UINT	RO
F6	0	3	Number of Instances	UINT	RO

Table 6.8: Link Class Objects

6.2.4.2 Instance Attributes

Class	Instance	Attribute	Name	Type	Access
F6	1,2	1	Interface Speed	UDINT	RO

Class	Instance	Attribute	Name	Type	Access
F6	1,2	2	Interface Flags	DWORD	RO
F6	1,2	3	Physical Address	ARRAY of USINT	RO
F6	1,2	4	Interface Counters	STRUCT of	
			IN Octets	UDINT	RO
			IN Ucast Packets	UDINT	RO
			IN Non-Ucast Packets	UDINT	RO
			IN Discards	UDINT	RO
			IN Errors	UDINT	RO
			IN Unknown Protocols	UDINT	RO
			OUT Octets	UDINT	RO
			OUT Ucast Packets	UDINT	RO
			OUT Non-Ucast Packets	UDINT	RO
			OUT Discards	UDINT	RO
			OUT Errors	UDINT	RO
F6	1,2	5	Media Counters	STRUCT of	
			Alignment Errors	UDINT	RO
			FCS Errors	UDINT	RO
			Single Collisions	UDINT	RO
			Multiple Collisions	UDINT	RO
			SQE Test Errors	UDINT	RO
			Deferred Transmissions	UDINT	RO
			Late Collisions	UDINT	RO
			Excessive Collisions	UDINT	RO
			MAC Transmit Errors	UDINT	RO
			Carrier Sense Errors	UDINT	RO
			Frame Too Long	UDINT	RO
MAC Receive Errors	UDINT	RO			
F6	1,2	6	Interface Control	STRUCT of	
			Control Bits	WORD	RO
			Forced Interface Speed	UINT	RO
F6	1,2	7	Interface Type	USINT	RO
F6	1,2	8	Interface State	USINT	RO
F6	1,2	9	Admin State	USINT	RW
F6	1,2	10	Interface Label	SHORT STRING	RW
F6	1,2	11	Interface Capability	STRUCT of	
			Capability Bits	WORD	RO
			Speed/Duplex Options	STRUCT of	
			Array Count	USINT	RO

Class	Instance	Attribute	Name	Type	Access
			Speed/Duplex Array	ARRAY of STRUCT of	
			Interface Speed	UINT	RO
			Interface Duplex Mode	USINT	RO

Table 6.9: Link Instance Objects

6.2.5 KEB Inverter Object (Class Code: 0x64)

The KEB Inverter Object allows access to the parameters in the inverter. This class allows the reading and writing of objects. The use of the Get_Attribute_Single and the Set_Attribute_Single services can be used for parameter access.

6.2.5.1 Class Attributes

There are no class attributes.

6.2.5.2 Instance Attributes

The parameter access in the inverter is defined and an example is given in the 6.1.1 section. A list of parameter Index values can be found in the Application Programming Manual.

Class	Instance	Attribute	Name	Type	Access
0x64	Index	Sub Index	Parameter Name	Type	RO/RW

Table 6.10: KEB Inverter Instance Objects

6.3 Status Codes

The following table lists the general status codes that can be found in the response message. The extended code field is also available for further describing a general status code.

General Status Code	Status Name	Description
0x00, 0(dec)	Success	A service was successfully performed by the object.
0x01, 1(dec)	Connection failure	Connection failed along the connection path.
0x02, 2(dec)	Resource unavailable	Resources required to perform the requested service were not available.
0x03, 3(dec)	Invalid parameter value	A parameter associated with the request was invalid.
0x04, 4(dec)	Path segment error	Path segment error has been encountered. Evaluation of the path failed.
0x05, 5(dec)	Path destination unknown	The path references an unknown path for the object class, instance, or attribute and aborts the processing.
0x06, 6(dec)	Partial transfer	Only part of the data could be transferred.
0x07, 7(dec)	Connection lost	Connection for messaging has been lost.
0x08, 8(dec)	Service not supported	The requested service is not supported by the object.
0x09, 9(dec)	Invalid attribute	The attribute data is not valid for the object.

General Status Code	Status Name	Description
	value	
0x0A, 10(dec)	Attribute list error	An attribute in the Get_Attribute_List or Set_Attribute_List has a non-zero status.
0x0B, 11(dec)	Already in requested state	The object is already in the requested mode or state requested by the service.
0x0C, 12(dec)	Object state conflict	The object is not able to perform the requested service in the current state.
0x0D, 13(dec)	Object already exists	Error when requesting of the creation of an object that already exists.
0x0E, 14(dec)	Attribute not settable	Error when requesting the change of an attribute that is not modifiable.
0x0F, 15(dec)	Privilege violation	Check of permissions failed.
0x10, 16(dec)	Device state conflict	The device's current state prohibits the requested service.
0x11, 17(dec)	Reply data too large	The data to be transmitted in the response buffer is larger than the allocated space for the buffer.
0x12, 18(dec)	Fragmentation of primitive	The service specified an operation that will fragment a primitive data value, i.e. half a REAL data type.
0x13, 19(dec)	Not enough data	The service did not supply enough data to perform the specified operation.
0x14, 20(dec)	Attribute not supported	The specified attribute in the request is not supported.
0x15, 21(dec)	Too much data	The service supplied more data than was expected.
0x16, 22(dec)	Object does not exist	The specified object does not exist.
0x17, 23(dec)	Service fragmentation	The fragmentation sequence for this service is not currently active.
0x18, 24(dec)	No stored attribute data	The attribute data of this object was not saved prior to the requested service.
0x19, 25(dec)	Store operation failure	The attribute data of this object was not saved due to a failure during the attempt.
0x1A, 26(dec)	Routing failure, request packet too large	The service request packet was too large for transmission on a network in the path to the destination. The routing service was forced to abort.
0x1B, 27(dec)	Routing failure, response packet too large	The service response packet was too large for transmission on a network in the path from the destination. The routing service was forced to abort.
0x1C, 28(dec)	Missing attribute list entry data	The service did not supply an attribute in a list of attributes that was needed by the service to perform the requested behavior.
0x1D, 29(dec)	Invalid attribute value list	The service is returning the list of attributes supplied with status information for those attributes that were invalid.
0x1E, 30(dec)	Embedded service error	An embedded service resulted in an error.
0x1F, 31(dec)	Vendor specific error	A vendor specific error has been encountered. This will occur when none of the other general errors can correctly be applied.
0x20, 32(dec)	Invalid parameter	A parameter associated with the request was invalid. The parameter does not meet the requirements of the specification or application.
0x21, 33(dec)	Write-once already written	An attempt was made to write to a write-once medium that has already been written, or to modify a value that cannot be changed once established.

General Status Code	Status Name	Description
0x22, 34(dec)	Invalid reply	An invalid reply was received. Reply service does not match the request service code, or reply message is shorter than the minimum expected reply size.
0x23, 35(dec)	Buffer overflow	The message received is larger than the receiving buffer can handle. The entire message was discarded.
0x24, 36(dec)	Invalid message format	The format of the received message is not supported.
0x25, 37(dec)	Key failure in path	The key segment that was included as the first segment in the path does not match the destination module.
0x26, 38(dec)	Path size invalid	The size of the path which was sent with the service request is either not large enough to allow the request to be routed to an object or too much routing data was included.
0x27, 39(dec)	Unexpected attribute	An attempt was made to set an attribute that is not settable at this time.
0x28, 40(dec)	Invalid Member ID	The Member ID specified does not exist.
0x29, 41(dec)	Member not settable	A request to modify a non-modifiable member was received.
0x2A-0xCF, 42-207(dec)	Reserved	Reserved for future extension.
0xD0-0xFF, 208-255(dec)	Reserved	Reserved for object class specific errors.

Table 6.11: General Status Codes

7 KEB Device Setup

The device can be setup using Combivi6. Using this program you can setup the IP Address and the Implicit data settings through the Fieldbus Wizard. You can use the default settings to get up and running. You can also customize your data if needed. Once the communications are setup it is advised to use the Application Programming Manual to learn how to control the drive.



- You can select the help tab in the menu to have a look at the Combivi 6 manual for a more detailed explanation on how to use the software.

7.1 Combivis Diagnostic Communication Setup

- Verify hardware has been setup properly by following the guide. Connect the communication cable and power up the device.
- Start up the KEB Combivis program and create a new project. Give it a name and a Location to store it.

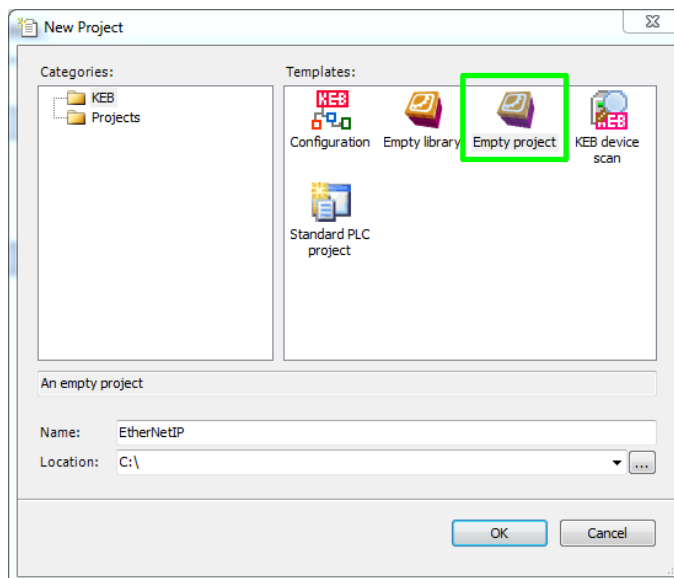


Figure 7.1: Combivis New Project

- Select the magnifying glass on the menu to scan for devices.

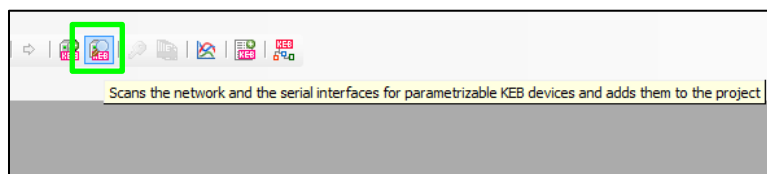


Figure 7.2: Combivis Scan for Devices

- Verify the serial interface you have connected with.

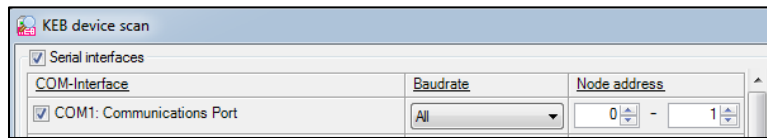


Figure 7.3: Combivis Serial Interfaces

- De-select the “TCP/IP UDP”. It is not needed for this application.

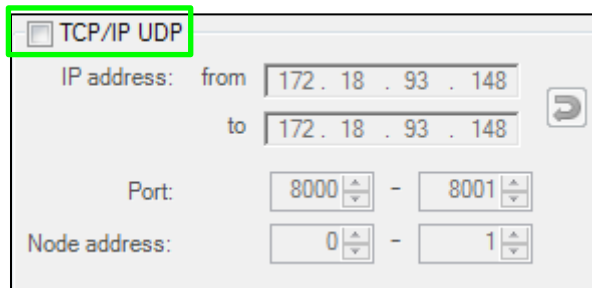


Figure 7.4: Combivis TCP/IP UDP

- Select “Start search...”

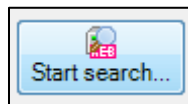


Figure 7.5: Combivis Start search

- Select the device and add it to the project by clicking the “Add selected devices” button.

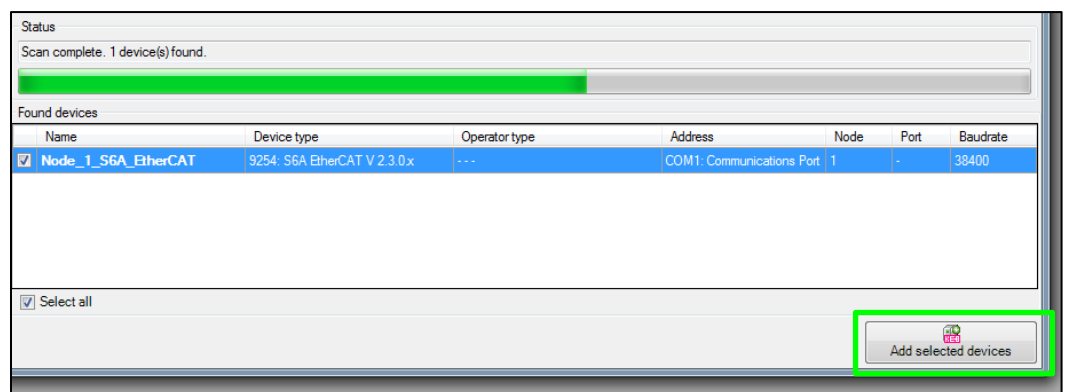


Figure 7.6: Combivis Add Device



- If the device is not found, verify that the hardware connections are correct and that the device is powered on. Also, check to see if another program on your PC is currently using the desired COM port.

- The device will be added to the Navigator on the left as shown below.

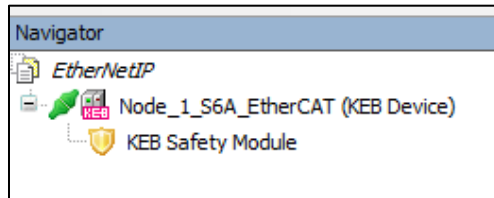


Figure 7.7: Combivis Device in Navigator

By default the name is EtherCAT as that is the default communication system. You can change the name of your device easily by clicking on the name and renaming it.

- Double-click the device in the Navigator tree to open it in the Device Editor. From here you can adjust the settings of the device.

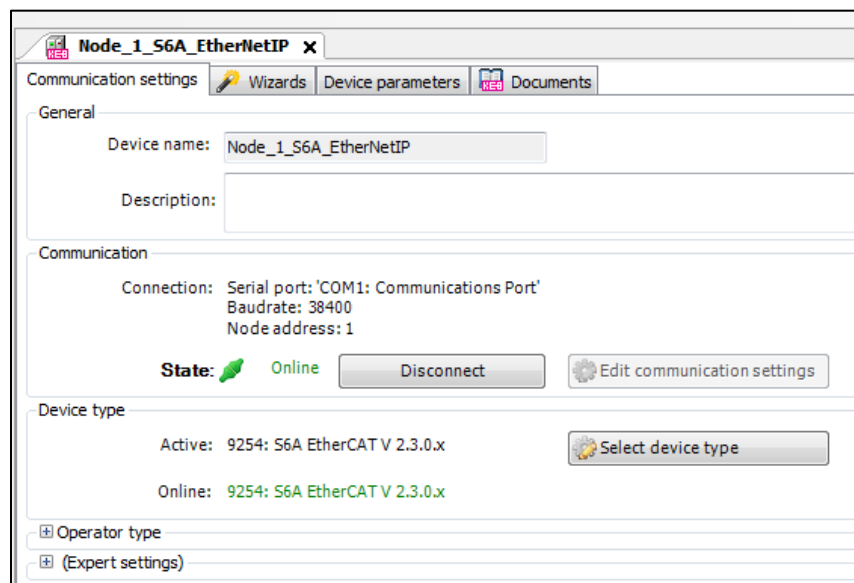


Figure 7.8: Combivis Device Editor

7.2 Parameter Setup

Once connected to the KEB drive the parameters can be changed for your application. Combivis allows access to these drive parameters. Parameters are grouped together for different controls and modules. The most important parameters for the EtherNet/IP™ communication can be found in the Fieldbus parameter group.

- Click the “Device parameters” tab and locate the fb: fieldbus parameter group. You can type ‘f’ on the keyboard to use a shortcut to the group.

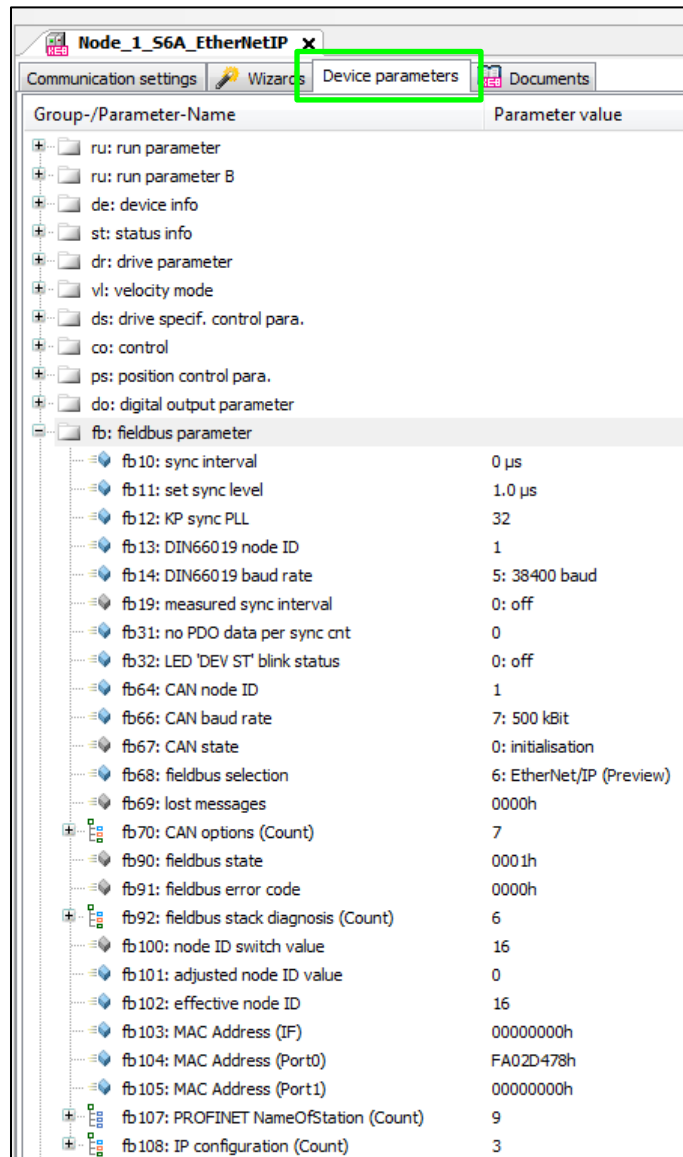


Figure 7.9: Combivis Device Parameters

- Verify fb68 is set to 6:EtherNet/IP (Preview)
- Setup your IP configuration in parameter fb108. Fill in the IP address and subnet mask the values you would like to use.

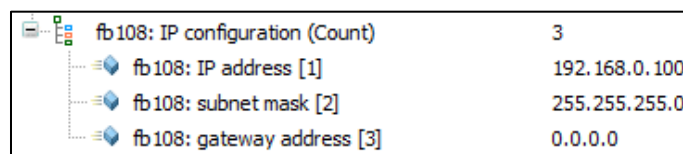


Figure 7.10: Combivis IP Configuration

- These parameters are all that you need to get the communications setup and running.
- Reboot the device for it to use the new values.

7.3 Fieldbus Wizard

The Fieldbus Wizard can be used to setup the Process data mapping for the Implicit Data communications on the fieldbus system. A default data mapping or a custom data mapping can be used. Follow the sections below for setup:

7.3.1 Default Mapping

The default settings are recommended for first time users. Follow the steps below to set-up a default mapping.



- When using default mappings, it is the customers responsibility to verify that the data to and from the KEB device matches that of the PLC program. Verify data paramters, size, and data types before running an application.

- Click on the “Wizards” tab in the Device Editor window. Verify that your Fieldbus selection is set to EtherNet/IP (Preview)

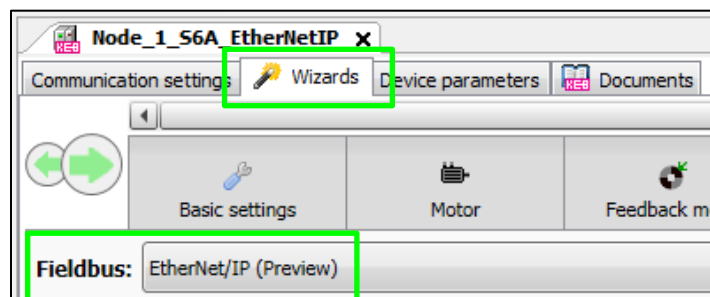


Figure 7.11: Combivis Fieldbus Wizard

- Click on the “Stored mappings” button on the lower right side of the Wizard screen.

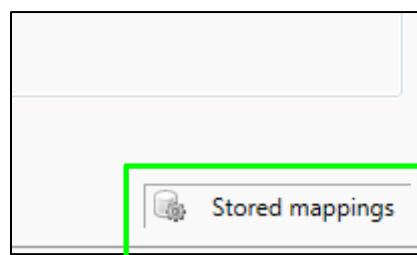


Figure 7.12: Combivis Stored Mappings

- Load the standard PD mapping (F6/H6/S6)

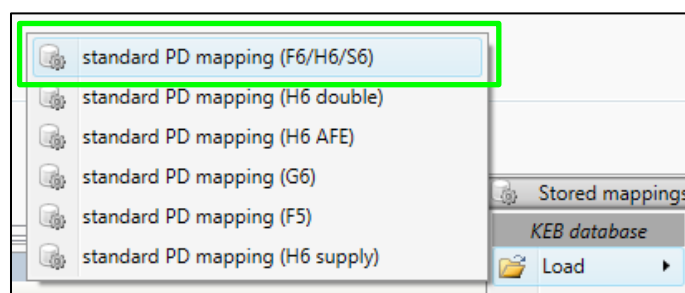


Figure 7.13: Combivis Load Mapping

- The mappings are displayed as follows:

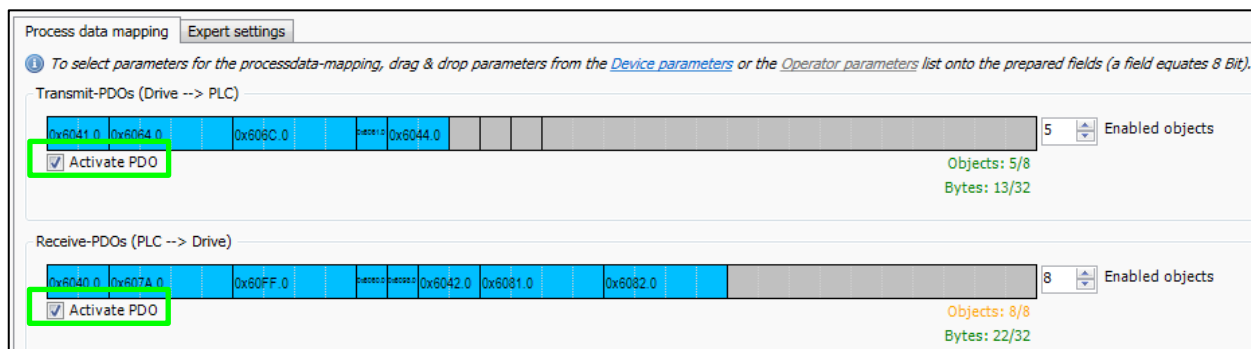


Figure 7.14: Combivis Process Data Mappings

- When the “Activate PDO” check boxes are filled, the process data is ready to transmit and receive.

The standard default mapping is the following:

Process Data Input (Data going from Drive to PLC)			
Index	Size (Bytes)	Name	Description
0x6041	2	statusword	Current status of KEB device
0x6064	4	position actual value	Position value according to CiA402
0x606C	4	velocity actual value	Scaled velocity actual value
0x6061	1	modes of operation display	Shows the mode. Velocity mode is default.
0x6064	2	vl velocity actual value	Velocity Mode actual value

Figure 7.15: Combivis PDIN Default

Process Data Output (Data going from PLC to Drive)			
Index	Size (Bytes)	Name	Description
0x6040	2	controlword	Control of device according to CiA402
0x607A	4	target position	Target position in position profile mode
0x60FF	4	target velocity	Target velocity
0x6060	1	modes of operation	Select mode of operation
0x6098	1	homing method	Select homing method
0x6042	2	vl target velocity	Target velocity in velocity mode
0x6081	4	profile velocity	Profile velocity value
0x6082	4	end velocity	Profile end velocity value

Figure 7.16: Combivis PDOOUT Default

7.3.2 Custom Mapping

Experienced users with familiarity of KEB devices have the option to setup custom data mappings. These can be saved, imported, and exported.



-
- When using custom mappings, it is the customers responsibility to verify that the data to and from the KEB device matches that of the PLC program. Verify data paramters, size, and data types before running an application.
-

Parameters can be dragged and dropped into the wizard. More info can be found in the application programming manual.

8 Rockwell Automation Setup

The following shows the steps involved for setting up the KEB device with a Rockwell Automation Programmable Logic Controller (PLC). In this example the following Rockwell Automation hardware and software were used:

- CompactLogix™ 5380 PLC
- Studio 5000 Logix Designer® Version 31.00.00
- RSLinx
- EDS Hardware Installation Tool

8.1 EDS File Installation

The EDS file (Electronic Data Sheet) is a text file that contains setup data for the KEB device. The extension of the file ends with *.eds. The file can be found on the KEB website here: [EDS file X6](#)

To register the device follow the following steps:

- Start the EDS Hardware Installation Tool
- In Logix Designer® go to the TOOLS menu
- You can also find it in the Tools folder in the RSLinx program
- Select the EDS Hardware Installation Tool as shown:

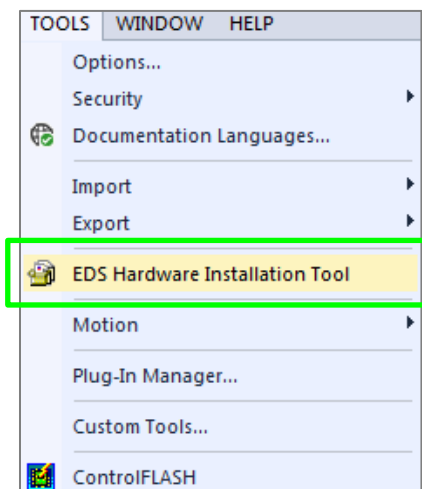


Figure 8.1: Rockwell Tools Menu

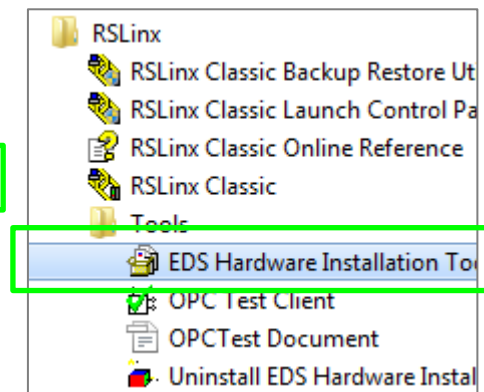


Figure 8.2: RSLinx Folder

- Follow the prompts and click “Next” to install

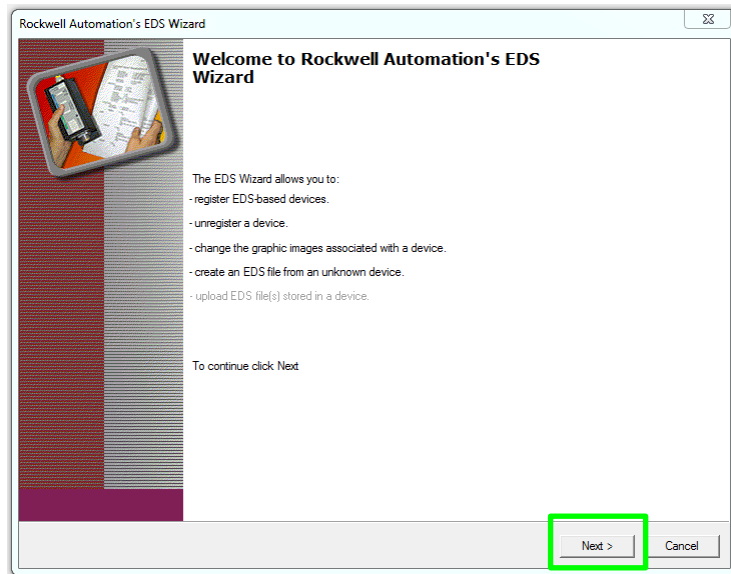


Figure 8.3: EDS Wizard

- Select Register an EDS file(s).

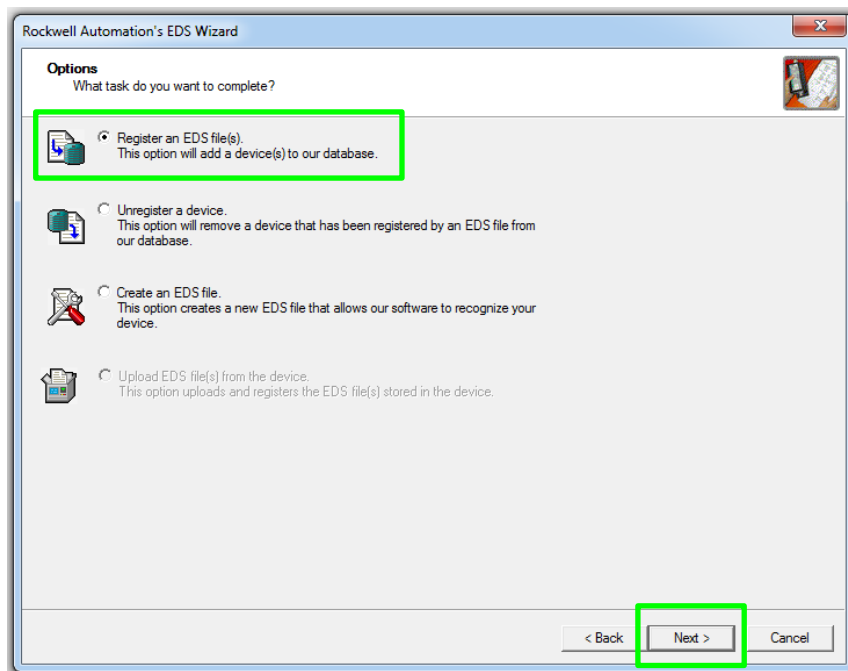


Figure 8.4: EDS Wizard Task

- Enter the path where your file has been downloaded and click "Next":

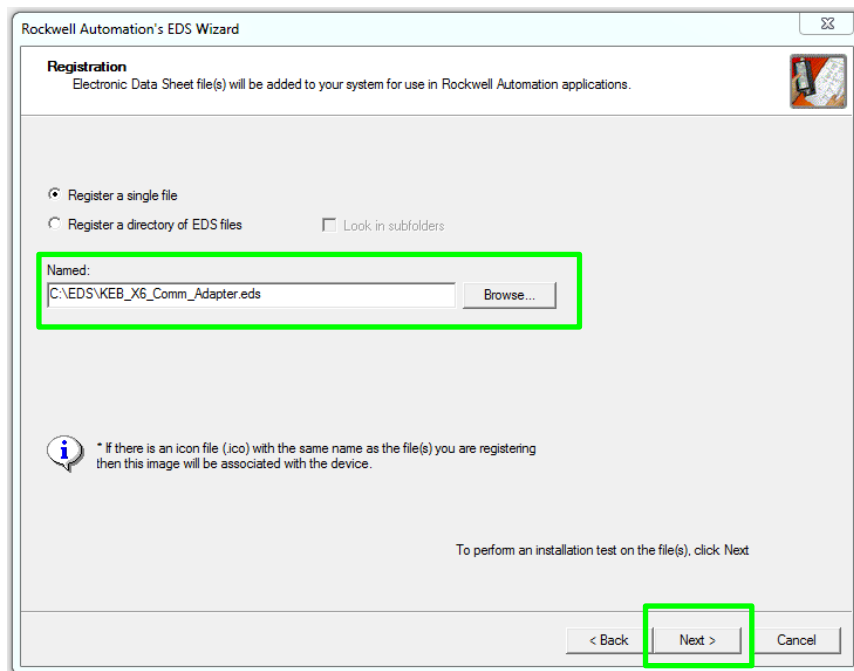


Figure 8.5: EDS Wizard File Path Selection

- Test Results should produce a green check mark indicating no errors. Click “Next” to continue:

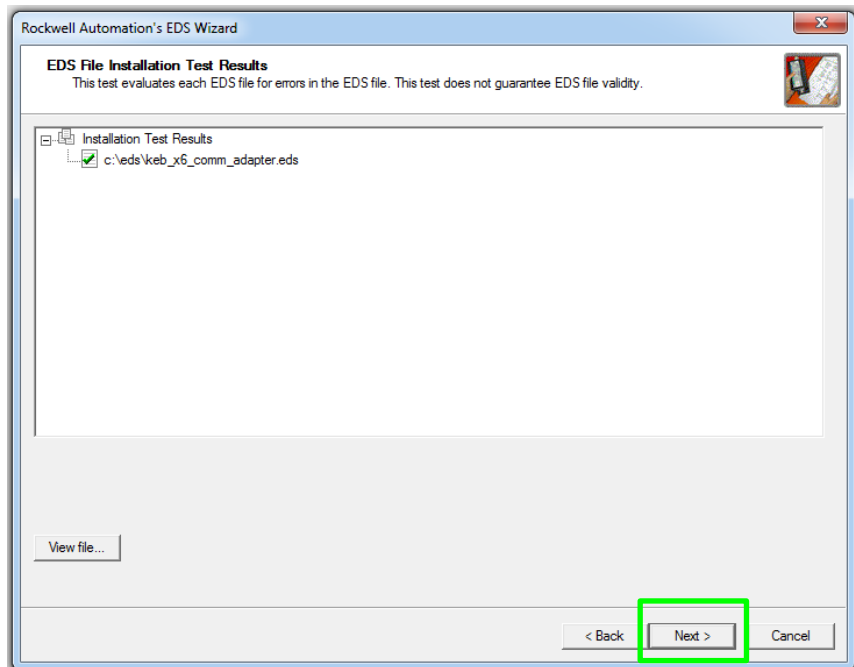


Figure 8.6: EDS Wizard Test Results

- The “KEB” icon should be shown under the Product Types:

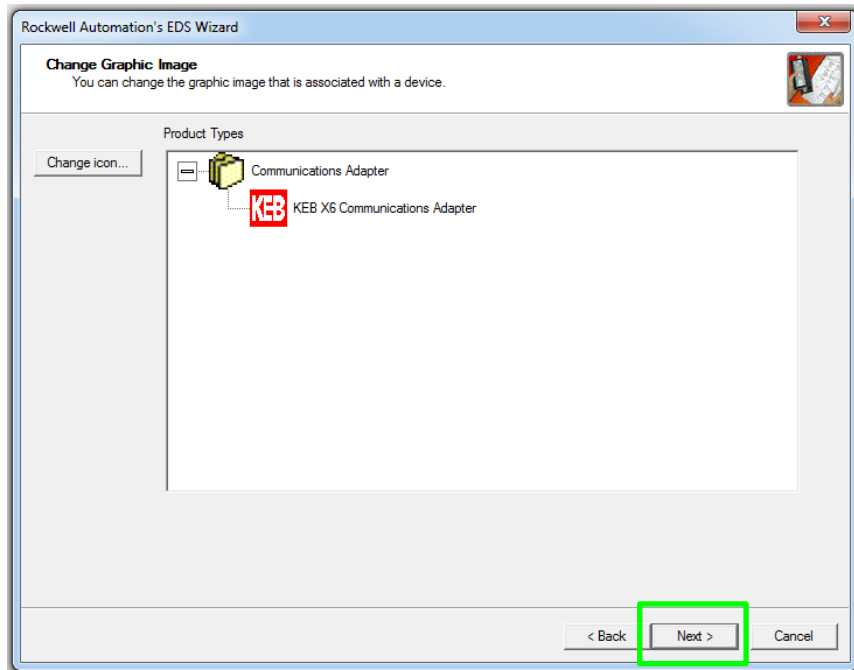


Figure 8.7: EDS Wizard Icon Selection

- Register the device by clicking “Next”

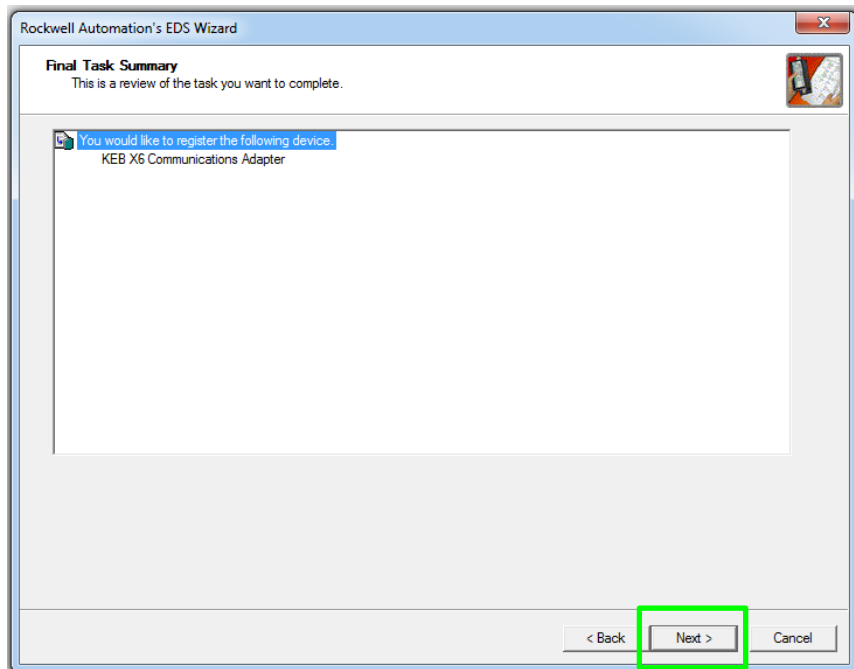


Figure 8.8: EDS Wizard Register Device

- After installation the following screen will be shown. Click “Finish” to exit the wizard.

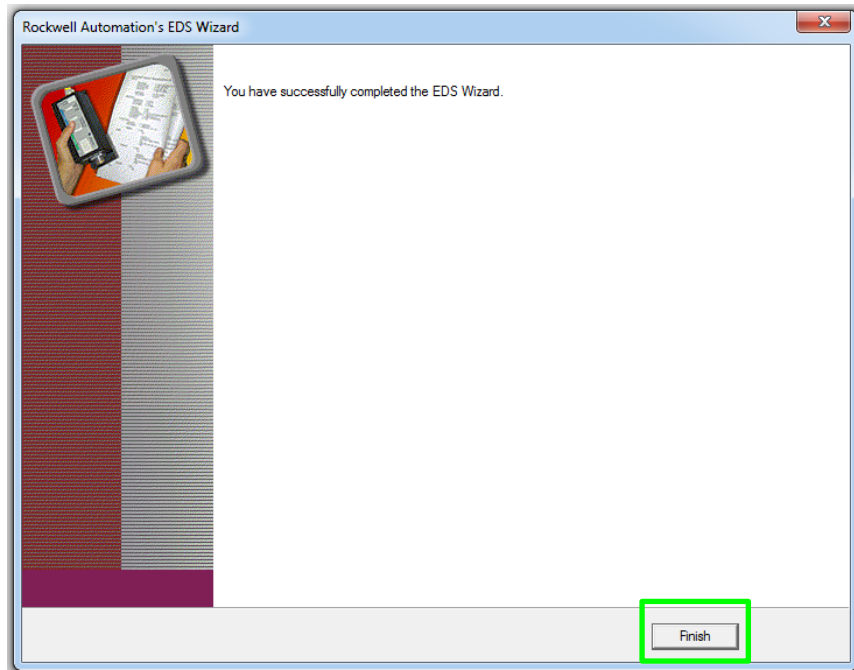


Figure 8.9: EDS Wizard Complete

- The EDS file has now been successfully installed. Read the next sections to add the module to a project.

8.2 Addition of the KEB Module with the EDS file

- Start a new project or open an existing project in Logix Designer®
- Add or create an Ethernet module if one doesn't exist

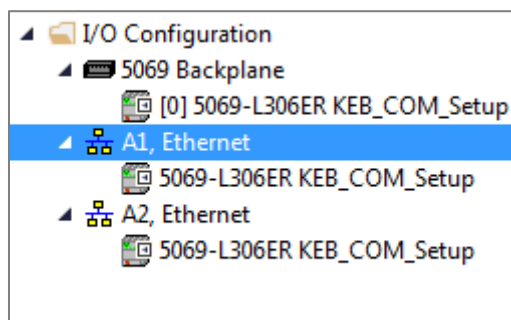


Figure 8.10: Ethernet Module

- Right click the Ethernet Module
- Select "New Module..."

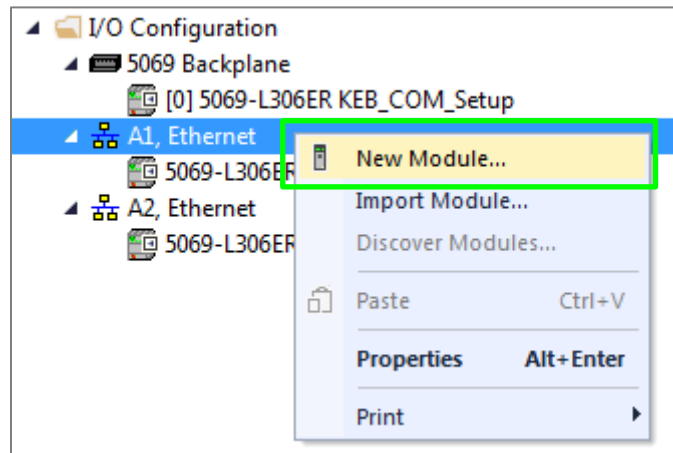


Figure 8.11: Create New Module

- Enter “keb” into the search box.
- Select the KEB X6 module to add
- Click “Create” to make the module

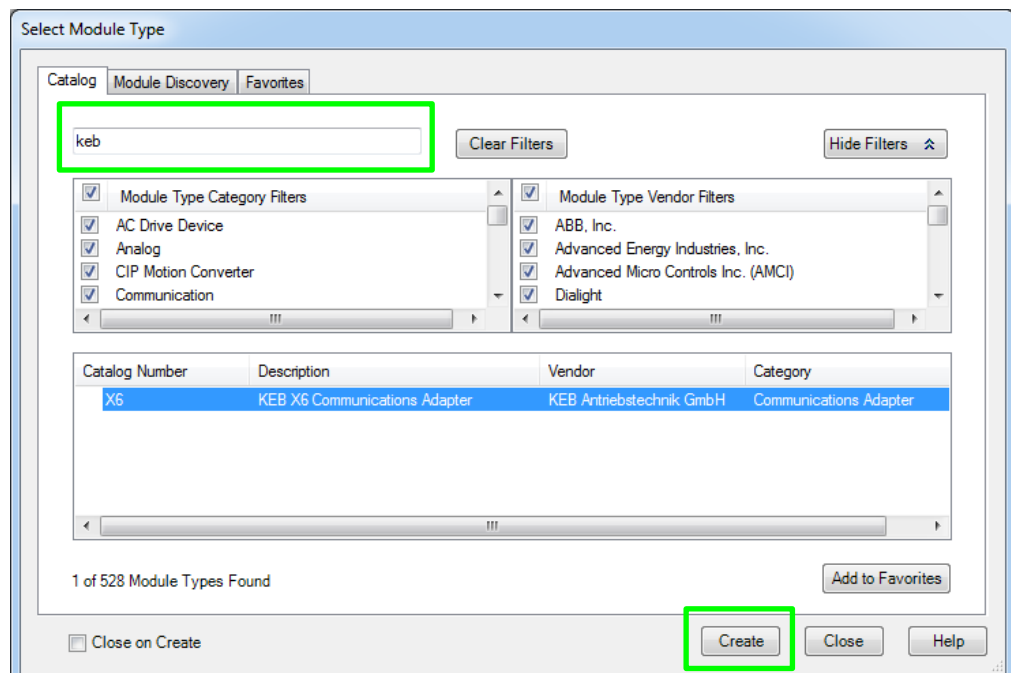


Figure 8.12: Select Module Type

- In the next screen give a name to the module and an IP Address. The default IP Address for the KEB device is 192.168.0.100. It is a good idea to give the device a good descriptive name to remember which device you will be working with. Example: “KEB_X6_Robot_Alpha_Z_Axis”

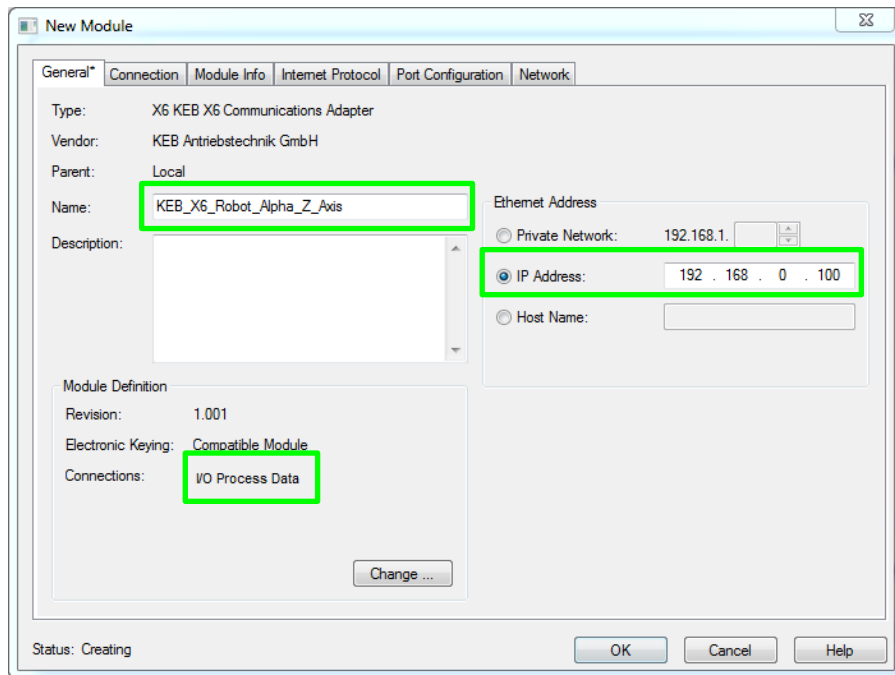


Figure 8.13: New Module Name and IP Address Entry

- The default connection is setup for you as I/O Process Data.
- Selecting the “Change...” button allows the changing of the Assemblies if needed.
- Select the “Connection” tab.

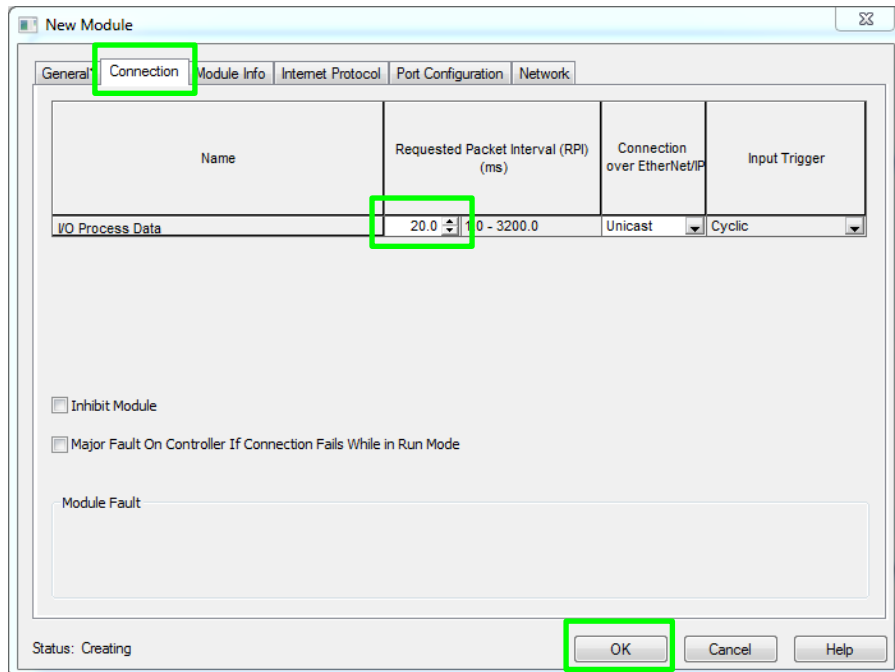


Figure 8.14: New Module RPI

- Set up your Requested Packet Interval time in milliseconds. By default it is set to 20.0ms.

- Click “OK” to add the module.

8.3 Addition of the KEB module using a Generic Module

This sets up the device using a generic module. This can be used if you need a quick simple I/O connection or do not have the necessary .EDS file for device setup.

- Start a new project or open an existing project in Logix Designer®
- Add or create an Ethernet module if one doesn't exist

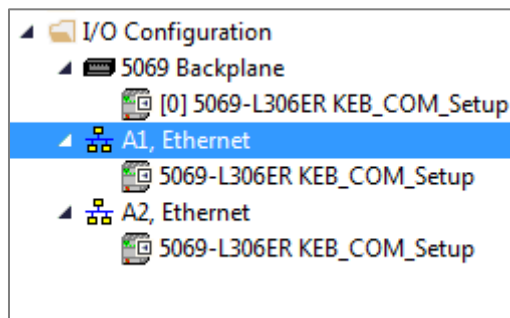


Figure 8.15: Ethernet Module

- Right click the Ethernet Module
- Select “New Module...”

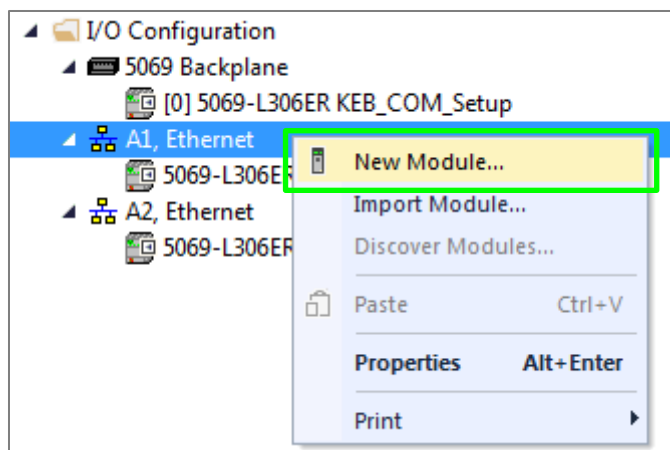


Figure 8.16: Create New Generic Module

- Enter “generic Ethernet module” into the search box.
- Select the Generic Ethernet Module to add.
- Click “Create” to make the module.

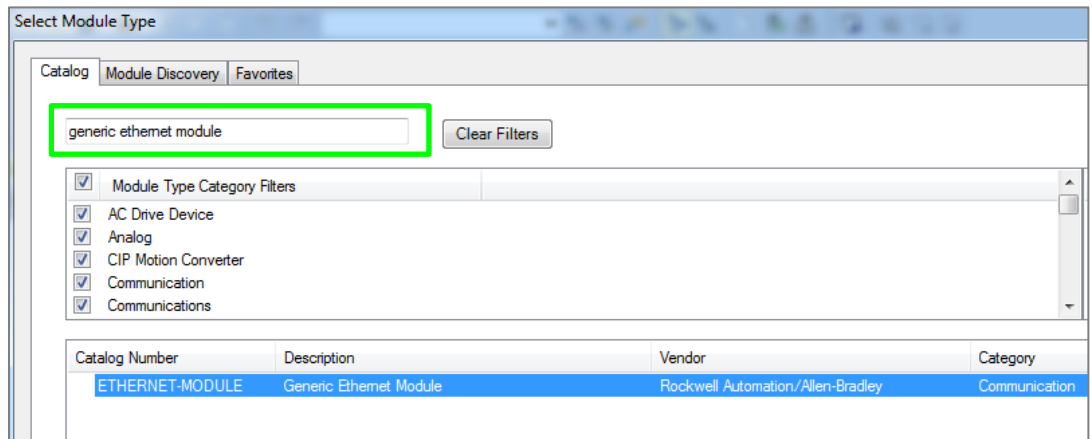


Figure 8.17: Create Generic Ethernet Module

- Fill in the Name and IP Address
- Make the Comm Format and Connection Parameters as follows:

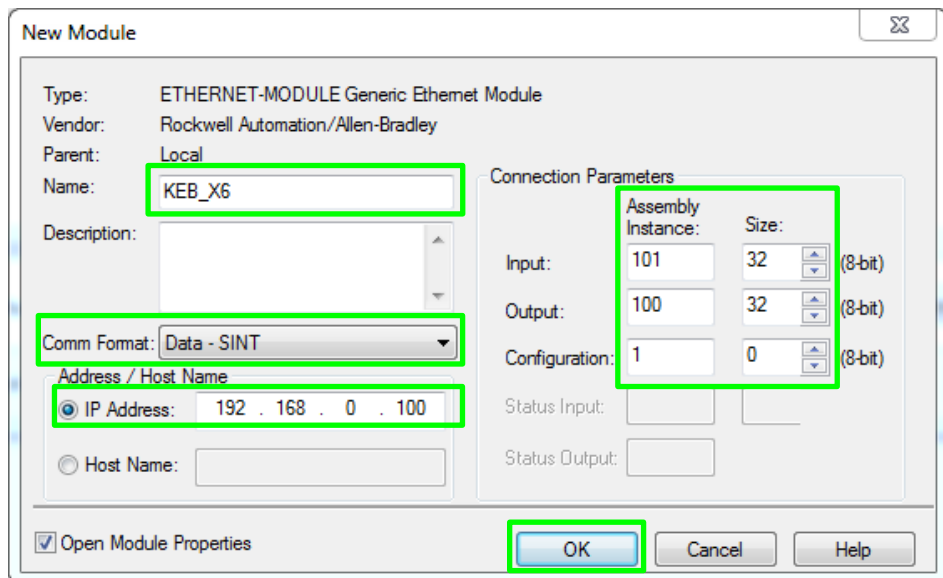


Figure 8.18: Setup Generic Ethernet Module

- Click OK to accept the module settings.

9 Annex

9.1 Inverter parameters (address / resolution /type)

Abbreviations	RO	ReadOnly		
	nPD	not available for ProcessDataCommunication		
	CAN	CAN-OPEN type	V	VAR
			ST	Structure
A			Array	



- The following parameters are associated with the basic EtherNet/IP™ setup. More parameters are available and will be shown in Combivis, but are not needed for specific setup of the communication functionality.

ID	Index	Sub-Idx	CAN	Type	Name	Upper limit	Lower limit	Mult.	Div	Unit	nPD	RO
fb68	2B44h	0	V	UINT8	fieldbus selection	6	0	1	1	---	X	---
fb100	2B64h	0	V	UINT8	node ID switch value	255	0	1	1	---	X	X
fb101	2B65h	0	V	UINT8	adjusted node ID value	255	0	1	1	---	X	---
fb102	2B66h	0	V	UINT8	effective node ID	255	0	1	1	---	X	X
fb013	2B67h	0	V	UINT32	MAC Address (IF)	4211081215	0	1	1	---	X	---
fb104	2B68h	0	V	UINT32	MAC Address (Port0)	4211081215	0	1	1	---	X	---
fb105	2B69h	0	V	UINT32	MAC Address (Port1)	4211081215	0	1	1	---	X	---
fb108	2B6Dh	0	ST	UINT8	IP configuration	3	3	1	1	---	X	X
		1		UINT32	IP address	4294967295	0	1	1	---	X	---
		2		UINT32	subnet mask	4294967295	0	1	1	---	X	---
		3		UINT32	gateway address	4294967295	0	1	1	---	X	---

Table 9.1: Fieldbus Parameters

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