

COMBICOM



GB Instruction Manual

EtherNet/IP™

Mat.No.	Rev.
CNF50E0-K100	1A





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1. General Information

The presented documentation as well as the herein mentioned hardware and software are developments of Karl E. Brinkmann GmbH. Errors excepted.

The Karl E. Brinkmann GmbH have prepared the documentation, hardware and software to the best of their knowledge, however, no guarantee is given that the specifications will provide the efficiency aimed at by the user.

Karl E. Brinkmann GmbH reserves the right to alter specifications without notice to third parties.

1.1 Ordering Information

This Instruction Manual:	CN.F5.0E0-K100
F5 EtherNet/IP™ operator:	00.F5.060-M100

Utilities for the diagnostic interface

HSP5-cable between PC and adapter:	00.F5.0C0-0010
Adapter DSUB / Western:	00.F5.0C0-0020

1.2 F5 EtherNet/IP™ Operator

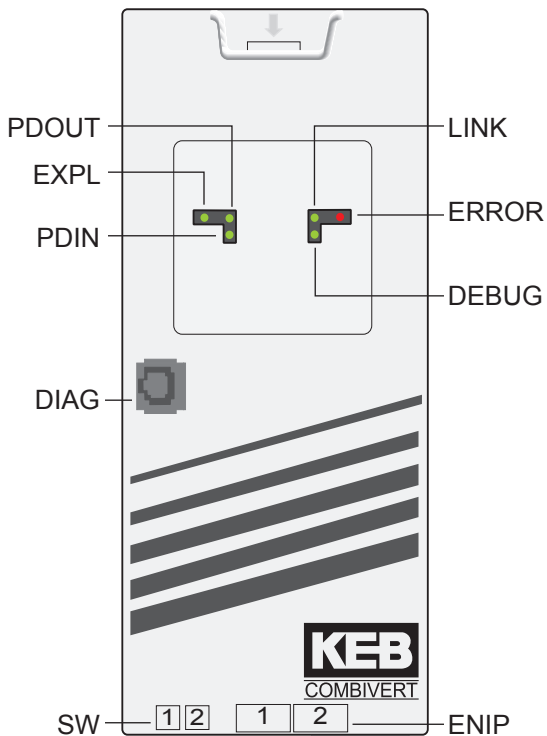
KEB-Antriebstechnik develop, produce and sell static frequency inverters worldwide in the industrial power range. The inverters of the type F5 can be equipped optionally with an EtherNet/IP™ interface.

It concerns an intelligent interface, that controls the access over EtherNet/IP™ to the parameters of the frequency inverter.

The EtherNet/IP™ operator is integrated into the FI-housing by a simple plug-in and fits into all KEB-F5-frequency inverters. Parallel to the fieldbus operation the operation for diagnosis/parameterization (KEB Combivis) is possible via the diagnostic port.

For programming the KEB-F5-inverter by EtherNet/IP™ the user requires in addition to this manual the instruction manual of the respective frequency inverter control [1].

2. Hardware Description



EXPL	Explicit-Message-communication active.
PDOUT	PDOUT-data are written to the FI-control.
PDIN	PDIN-data are read by the FI-control.
DIAG	Diagnostic interface to the PC (see diagnostic interface)
LINK	On: Network hardware up and running Off: Network hardware error
ERROR	Constantly on: Inverter ready for operation Flashing: Inverter in Error-Status Off: No power supply
DEBUG	For diagnostic purposes
SW	Node Switch for IP Address (see EtherNet/IP™ interface)
ENIP	EtherNet/IP™ (see EtherNet/IP™ interface)

2.1 Diagnostic Interface



To prevent the damage of the serial interface on your Personal Computer be sure that you use the special HSP5 cable from KEB for connecting your PC to the diagnostic interface of the EtherNet/IP™ Operator.

An HSP5-cable is connected to the diagnostic interface via an adapter (see order informations). When connected correctly, access to all parameters of the frequency inverter is possible using the PC-software KEB Combivis. Also, the operator's internal parameters can be read out and partly adjusted or parameterized with download.

2.2 EtherNet/IP™ interface

For the connection to the EtherNet/IP™ bus the EtherNet/IP™ KEB F5 Operator offers two RJ-45 sockets. Ports 1 and 2 as shown in the Hardware Description section.

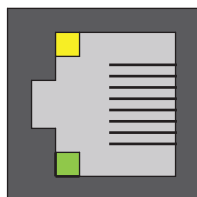


IMPORTANT: Only Port1 on the Operator is active for this application. This is where the ethernet cable should be connected.

The EtherNet/IP™ interface adheres to the specifications made by [2].

2.2.1 Connection Specifications

Connection to Port1 is done by connecting an 8-conductor cable with a RJ-45 plug into the RJ-45 socket with the wiring diagram shown below. For consistent error free operation the physical setup needs to follow the IEEE 802.3 standards. The lights shown on the socket will indicate when a connection is up and running.



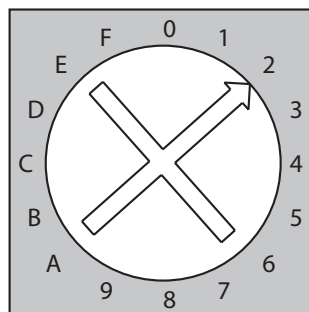
Pin assignment RJ-45 Connector:	
Pin	Signal
1	Transmit +
2	Transmit -
3	Receive +
4	Unused
5	Unused
6	Receive -
7	Unused
8	Unused

2.2.2 Node Switches

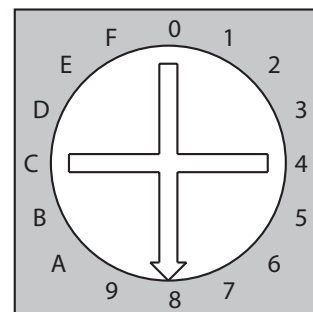
The use of two rotary switches allows the selection of an IP address. The node switch value is used to calculate the last byte of the address as in 192.168.0.XX where XX indicates the two switches. The values of the switches go from zero up to fifteen. This is indicated in hexadecimal code. The values can extend from 1 to 255. If these switches are both set to zero, the selection of the IP address is done by software in parameter OS15 of the operator parameters. The switches are shown below:

Example:

1. Switch1 = 0x02, Switch2 = 0x08
2. Node Value = (Switch1 * 16¹) + (Switch2 * 16⁰)
3. Node Value = 40
4. IP Address = 192.168.0.40



Node Switch 1



Node Switch 2

3. EtherNet/IP™

EtherNet/IP™ is an industrial communication protocol that is built upon the physical layer of Ethernet. The EtherNet/IP™ protocol is defined and managed by the Open DeviceNet Vendor Association (ODVA) (see [2] and [3]). This protocol extends the Common Industrial Protocol (CIP) to ethernet. The EtherNet/IP™ application layer uses TCP for communicating via explicit messages and UDP for sending and receiving implicit messages. This is all accomplished on a standard ethernet connection.

3.1 Data Transmission

Communicating on EtherNet/IP™ is done with explicit and implicit messaging.

Every manufacturer that realizes an EtherNet/IP™ interface connection must apply for a so-called **Vendor-Id**. **KEB Antriebstechnik** has been assigned the **Vendor-Id = 744 (decimal)**.

Each EtherNet/IP™ node has its own IP address to distinguish itself from the other devices on the network. This can be set by software or by the use of the rotary switches on the hardware.

The EtherNet/IP™ interface connection of the KEB-F5 frequency inverter supports the product type of a **communications adapter**.

Summarization of Important EtherNet/IP™ properties:	
Vendor-Id	= 744(dec)
Device Type	= 12(Communications Adapter)
Product Code	= 1111
Product Revision	= v1.1
Product Name	= KEB EtherNet/IP Operator

3.1.1 Explicit Messaging (Parameter Channel)

The EtherNet/IP™ specification [2] explains the function of addressing an object explicitly. This function allows the access to every parameter in the KEB frequency inverter and the operator. Furthermore, with this function special management functions called Services can be carried out. The available Services are:

GetAttributeAll	1(dec), 0x01	Reading all the attributes of an object (only supports class 0x01,0xF5,and 0xF6)
GetAttributeSingle	14(dec), 0x0E	Reading the attribute of an object.
SetAttributeSingle	16(dec), 0x10	Writing the attribute of an object.
Reset	5(dec), 0x05	Resetting an object (only supports class 0x01)

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 parameter.

In EtherNet/IP™ the addressing of an object is done over Class, Instance and Attribute. The class determines if you write or read to the inverter or the operator. The Instance is the actual parameter address value. The attribute is the "set" according to KEB.

The parameters are divided into inverter parameters and operator parameters. Inverter parameters are realized in the inverter control, operator parameters are localized directly in the EtherNet/IP™ operator.

On access to inverter parameters the operator passes on the inquiry of EtherNet/IP™ over an internal serial interface to the inverter control. In contrast the access to operator parameters is processed directly in the operator. The differentiation between inverter parameters and operator parameters takes place over the Class in the Explicit Message request. The KEB internal addressing provides a 16 bit parameter address. In addition some parameters exist several times in so-called sets. The KEB-F5 frequency inverter has 8 such parameter sets (set 0 to set 7). The conversion of the KEB internal parameter addressing to the pattern of Explicit Message of EtherNet/IP™ was solved as follows:

- Class = 100(dec), 0x64 : Inverter parameter with 16 bit data width
- Class = 101(dec), 0x65 : Inverter parameter with 32 bit data width
- Class = 102(dec), 0x66 : Operator parameter access

Instance = Parameter address (from the application manual for inverter parameters)

Attribute	= 100(dec), 0x64	Value in set 0
Attribute	= 101(dec), 0x65	Value in set 1
Attribute	= 102(dec), 0x66	Value in set 2
Attribute	= 103(dec), 0x67	Value in set 3
Attribute	= 104(dec), 0x68	Value in set 4
Attribute	= 105(dec), 0x69	Value in set 5
Attribute	= 106(dec), 0x6A	Value in set 6
Attribute	= 107(dec), 0x6B	Value in set 7
Attribute	= 108(dec), 0x6C	Value in active set
Attribute	= 109(dec), 0x6D	Value in current set (Fr.09)

Also, it is possible to write to any combination of sets 0 through 7 just by adding an offset of 1000 (dec) or 0x3E8 to the attribute. The value of one byte will select which sets by setting the bit as in the example below:

Example:

Writing a value to sets 1,4, and 6 of a parameter.

1. First choose the sets you would like to write to, these are 1,4, and 6
2. Mark X's in the sets chosen.
3. Turn X's to ones and convert the value of binary to the attribute needed
4. Add the offset of 1000(dec)

Sets of Parameter	7	6	5	4	3	2	1	0
Set chosen to write to		X		X			X	
Attribute Value(binary)	0	1	0	1	0	0	1	0
Attribute value needed	0101_0010(binary) +1000(dec) = 1082(dec), 0x43A							

Please note, that most inverter parameters have a real data width of 16 bit. Only a few parameters possess genuine 32 bit data width.

Nevertheless, you can address every inverter parameter as 32 bit parameter (over class = 101(dec)).

3.1.2 Implicit Messaging (Process Data Communication)

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

Process output data refers to the data that the PLC or control unit transfers to the slave or operator.

Process input data refers to the data that the slave or operator sends to the PLC or control unit.

The KEB F5 EtherNet/IP™ interface supports special process data communication. It is possible to write 4 parameters at maximum at the same time (process output data) and cyclical read 4 parameters at maximum (process input data). Which parameters are mapped onto the process data is adjustable by special operator parameters (see chapter Operator Parameters). It is possible to have a total of 8 parameters for input and 8 parameters for output. However only 4 parameters 'in' and 4 parameters 'out' can be updated at one time. This means your update rate is 1/2 the time if the choice is to have more process data. There is a tradeoff between speed and the number of parameters used in the process data. The process data functionality exists only once in the operator.

The change of the process data mapping by the connection attributes 'produced connection path' and 'consumed connection path', specified by EtherNet/IP™, is not supported here. That means these attributes of the process data connection are not changeable, but changeable is the assignment of the process data by the above mentioned operator parameters.

When activating this connection, the process data in the KEB EtherNet/IP™ interface connection are read cyclical by the inverter control. How often the process input data is read and updated depends on the value of the parameter PDIN_Cycle. The cycle time is established in milliseconds.

4 Operator Parameters

These parameters are located in the EtherNet/IP™ operator.

Access to these parameters is carried out directly by the operator and not passed on via the HSP5 interface to the inverter control.

Most operator parameters are available by the diagnostic interface (COMBIVIS) as well as by the EtherNet/IP™ Explicit message.

At the following parameter descriptions the line "Class/Instance/Attribute" specifies the addressing for the Explicit message and COMBIVIS address' specifies the parameter address for the access by the diagnostic interface.

In the following only the parameters important for the user are listed.

All operator parameters additionally listed in the operator parameter window exist purely for debug purposes and are of no importance to the user.

Please note that some operator parameters are already predefined by EtherNet/IP™. Unlike the parameters specified by KEB these are not found in the Class range of 102 (dec). These parameters can be found in section 4.2.

4.1 KEB Operator Parameters

Operator Type	OS00	
	Class/Instance/Attribute (dec)	102/384/100
	COMBIVIS address	0180h
	Data length	4 Bytes
	Access	READ_ONLY
	Meaning	Describes the type of operator
Password	OS01	
	Class/Instance/Attribute (dec)	102/385/100
	COMBIVIS address	0181h
	Data length	4 Byte
	Access	READ_WRITE
	Meaning	Access level of the operator, coincides with the Frequency Inverter's password.
Software date	OS02	
	Class/Instance/Attribute (dec)	102/386/100
	COMBIVIS address	0182h
	Data length	4 Byte
	Access	READ_ONLY
	Meaning	Specifies the software date of the interface
	Coding	The last decimal place specifies the year. The next two high-order decimal places specify the month. The most significant decimal place(s) specify the day. Example: 11108 means 11.10.2008, Oct.11,2008

Diag Baudrate	OS05																
Class/Instance/Attribute (dec)	102/389/100																
COMBIVIS address	0185h																
Data length	4 Byte																
Access	READ_WRITE																
Meaning	Sets the transmission speed of the diagnostic port																
Coding	<table border="0"> <thead> <tr> <th>Value</th> <th>Baud</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>= 1200 bits/s</td> </tr> <tr> <td>1</td> <td>= 2400 bits/s</td> </tr> <tr> <td>2</td> <td>= 4800 bits/s</td> </tr> <tr> <td>3</td> <td>= 9600 bits/s</td> </tr> <tr> <td>4</td> <td>= 19200 bits/s</td> </tr> <tr> <td>5</td> <td>= 38400 bits/s</td> </tr> <tr> <td>6</td> <td>= 55500 bits/s (no standard PC bit rate!!)</td> </tr> </tbody> </table>	Value	Baud	0	= 1200 bits/s	1	= 2400 bits/s	2	= 4800 bits/s	3	= 9600 bits/s	4	= 19200 bits/s	5	= 38400 bits/s	6	= 55500 bits/s (no standard PC bit rate!!)
Value	Baud																
0	= 1200 bits/s																
1	= 2400 bits/s																
2	= 4800 bits/s																
3	= 9600 bits/s																
4	= 19200 bits/s																
5	= 38400 bits/s																
6	= 55500 bits/s (no standard PC bit rate!!)																
Default	5 = 38400 bits/s																
Notice	Value can be set via SY.07 parameter in inverter																
MAC Address	OS10																
Class/Instance/Attribute (dec)	102/394/100																
COMBIVIS address	018Ah																
Data length	4 Byte																
Access	READ_ONLY																
Meaning	Media Access Control Address																
NetX_FwVersion	OS11																
Class/Instance/Attribute (dec)	102/395/100																
COMBIVIS address	018Bh																
Data length	4 Byte																
Access	READ_ONLY																
Meaning	Version of Firmware on NetX hardware chip																
Serial number	OS12																
Class/Instance/Attribute (dec)	102/396/100																
COMBIVIS address	018Ch																
Data length	4 Byte																
Access	READ_WRITE																
Meaning	For unique identification of device																
QS number	OS13																
Class/Instance/Attribute (dec)	102/397/100																
COMBIVIS address	018Dh																

Operator Parameters

Data length	4 Byte
Access	READ_ONLY
Meaning	Currently Not Used

Node Switch Value OS14

Class/Instance/Attribute (dec)	102/398/100
COMBIVIS address	018Eh
Data length	4 Byte
Access	READ_ONLY
Meaning	Value of the two node switches.
Coding	Used in calculation of IP Address if not equal to zero. If set to zero, IP Address is set in software. See section 2.2.2 Node Switches

IP Address OS15

Class/Instance/Attribute (dec)	102/399/100
COMBIVIS address	018Fh
Data length	4 Byte
Access	READ_WRITE
Meaning	Software settable address of device.
Notice	Activated after device reset
Default	192.168.192.30, 0xC0A8C01E

Network Mask OS16

Class/Instance/Attribute (dec)	102/400/100
COMBIVIS address	0190h
Data length	4 Byte
Access	READ_WRITE
Meaning	Software settable mask of device
Notice	Activated after device reset
Default	255.255.255.0, 0xFFFFFFFF00

Gateway Address OS17

Class/Instance/Attribute (dec)	102/401/100
COMBIVIS address	0191h
Data length	4 Byte
Access	READ_WRITE
Meaning	Software settable gateway of device
Notice	Activated after device reset
Default	0.0.0.0, 0x00000000

Active IP Address OS18

Class/Instance/Attribute (dec)	102/402/100
COMBIVIS address	0192h
Data length	4 Byte
Access	READ_ONLY
Meaning	IP Address being used by the device

Active Network Mask OS19

Class/Instance/Attribute (dec)	102/403/100
COMBIVIS address	0193h
Data length	4 Byte
Access	READ_ONLY
Meaning	Network mask being used by the device

Active Gateway Address

OS20

Class/Instance/Attribute (dec)	102/404/100
COMBIVIS address	0194h
Data length	4 Byte
Access	READ_ONLY
Meaning	Gateway address being used by the device

Network Config Flags

OS21

Class/Instance/Attribute (dec)	102/405/100			
COMBIVIS address	0195h			
Data length	4 Byte			
Access	READ_WRITE			
Meaning	Setup configuration of network settings			
Coding	These flags are bit coded into 4 bytes:			
	Byte3	Byte2	Byte1	Byte0
	Bit31..Bit24	Bit23..Bit16	Bit15...Bit8	Bit7..Bit0
Default Bits	00000000	00000000	00000100	00000011
Default Hexadecimal	0x00	0x00	0x04	0x03
Bits	Description			
	31 - 13:	Reserved for future use		
	12:	Speed Selection: If set, the device will operate at 100Mbps/s, else 10Mbps/s. This will not be in effect if bit 10 is set for Auto-Negotiation		
	11:	Duplex Operation: If set, full-duplex operation is enabled, else half-duplex. This will not be in effect if bit 10 is set for Auto-Negotiation		

Operator Parameters

10:	Auto-Negotiation: If set, the device will auto-negotiate link parameters with the remote hub or switch. This bit overrides bits 11 and 12.
9 - 5:	Reserved for future use
4:	Enable DHCP: If set, device obtains its configuration from a DHCP server.
3:	Enable BOOTP: If set, the device obtains its configuration from a BOOTP server.
2:	Gateway Available: If set, the gateway parameter will be evaluated, else device assumes no gateway exists.
1:	NetMask Available: If set, NetMask parameter will be evaluated, else device will assume to be an isolated host. The gateway parameter will be ignored in this case.
0:	IP Address Available: If set, the IP Address will be evaluated.
Notice	If operator is defaulted, the settings will return to their default state after the device is rebooted.

Com_Cycle

Fb00

Class/Instance/Attribute (dec)	102/640/100
COMBIVIS address	0280h
Data length	4 Byte
Access	READ_ONLY
Meaning	Currently Not Used

FBS Config

Fb01

Class/Instance/Attribute (dec)	102/641/100
COMBIVIS address	0281h
Data length	4 Byte
Access	READ_WRITE
Meaning	Fieldbus configuration, Currently Not Used

FBS Command

Fb04

Class/Instance/Attribute (dec)	102/644/100
COMBIVIS address	0284h
Data length	4 Byte
Access	READ_WRITE
Meaning	Fieldbus command for functions
Coding	If set to 1, the operator returns important parameters to the default state. For the settings to take effect the operator must be rebooted.

PDOUT_Hsp5 Service Fb05

Class/Instance/Attribute (dec)	102/645/100
COMBIVIS address	0285h
Data length	4 Byte
Access	READ_WRITE
Meaning	Selection of service for process data output

PDIN_Hsp5 Service Fb06

Class/Instance/Attribute (dec)	102/646/100
COMBIVIS address	0286h
Data length	4 Byte
Access	READ_WRITE
Meaning	Selection of service for process data input.

PDIN_Cycle Fb07

Class/Instance/Attribute (dec)	102/647/100
COMBIVIS address	0287h
Data length	4 Byte
Access	READ_WRITE
Meaning	Cycle time to read process input data from the frequency inverter.
Notice	When the second set of process data is enabled, the refresh rate of all the process parameters is two times the PDIN_Cycle time.

Default PD-Mapping Fb08

Class/Instance/Attribute (dec)	102/648/100
COMBIVIS address	0288h
Data length	4 Byte
Access	READ_WRITE
Meaning	Sets process data PDINx and PDOUTx to defaults
Coding	If zero, the current mappings of the parameters addresses and sets are used, else the mappings are returned to their standard default settings as shown in the parameters definition.

PDINx Address

(with x = 1...4)

Fb09, Fb11, Fb13, Fb15

Class/Instance/Attribute (dec)	102/647+2x/100
COMBIVIS address	0287h + (2 * x)
Data length	2 Byte

further on next side

Operator Parameters

Access	READ_WRITE			
Meaning	Defines mapping for the process input data. Value zero means, that this mapping is not assigned.			
Coding	0x1234, address of specified inverter parameter. Operator parameters cannot be used here.			
Default value	PDIN1 Address = 0033h, Status Word (low), 16 bit value PDIN2 Address = 0035h, Actual Speed Value, 16 bit value PDIN3 Address = FFFFh, off PDIN4 Address = FFFFh, off			
Notice				
	Byte0	Byte1	Byte2	Byte3
	Status Word (SY.51)		Actual Speed (SY.53)	
	Hig-Byte:	Low-Byte:	High-Byte:	Low-Byte:
	Bit 15...Bit 8	Bit 7...Bit 0	Bit 15...Bit 8	Bit 7...Bit 0

PDINx_Set

(with x = 1...4)

Fb10, Fb12, Fb14, Fb16

Class/Instance/Attribute (dec)	102/648 +2x/100
COMBIVIS address	0288h + (2 * x)
Data length	1 Byte
Access	READ_WRITE
Meaning	Defines which sets to read for the process input data.
Coding	Set coding as in Frequency Inverter manual. Can only read from one set at a time. Combinations of sets are not allowed.
Default value	PDIN1 Set = 01h, set 0 PDIN2 Set = 01h, set 0 PDIN3 Set = 01h, set 0 PDIN4 Set = 01h, set 0

PDOUTx Address

(with x = 1...4)

Fb17, Fb19, Fb21, Fb23

Class/Instance/Attribute (dec)	102/655+2x/100
COMBIVIS address	028Fh + (2 * x)
Data length	2 Byte
Access	READ_WRITE

Meaning	Defines mapping for the process output data. Value zero means that this mapping is not assigned.			
Coding	0x1234, address of specified inverter parameter. Operator parameters cannot be used here.			
Default value	PDIN1 Address = 0032h, Control Word (low), 16 bit value PDIN2 Address = 0034h, Set Speed Value, 16 bit value PDIN3 Address = FFFFh, off PDIN4 Address = FFFFh, off			
Notice				
	Byte0	Byte1	Byte2	Byte3
	Control Word (SY.50)		Set Speed (SY.52)	
	Hig-Byte:	Low-Byte:	High-Byte:	Low-Byte:
	Bit 15...Bit 8	Bit 7...Bit 0	Bit 15...Bit 8	Bit 7...Bit 0

PDOUTx_Set
(with x = 1...4)

Fb18, Fb20, Fb22, Fb24

Class/Instance/Attribute (dec)	102/656 +2x/100
COMBIVIS address	0290h + (2 * x)
Data length	1 Byte
Access	READ_WRITE
Meaning	Defines which sets to write to for the process output data.
Coding	Set coding as in Frequency Inverter manual. Combinations of sets can be used here.
Default value	PDOUT1 Set = 01h, set 0 PDOUT2 Set = 01h, set 0 PDOUT3 Set = 01h, set 0 PDOUT4 Set = 01h, set 0

PDIN_Enabled Fb25

Class/Instance/Attribute (dec)	102/665/100
COMBIVIS address	0299h
Data length	1 Byte
Access	READ_WRITE
Meaning	Activates or deactivates the processing of the process input data.
Coding	0: Process input data are not active. Otherwise: Process input data are active.
Default value	FFh

PDOUT_Enabled Fb26

Operator Parameters

Class/Instance/Attribute (dec)	102/666/100
COMBIVIS address	029Ah
Data length	1 Byte
Access	READ_WRITE
Meaning	Activates or deactivates the processing of the process output data.
Coding	0: Process Output data are not active. Otherwise: Process Output data are active.
Default value	FFh

PDOUT2_Hsp5 Service Fb27

Class/Instance/Attribute (dec)	102/667/100
COMBIVIS address	029Bh
Data length	4 Byte
Access	READ_WRITE
Meaning	Selection of service for second group of process data output

PDIN2_Hsp5 Service Fb28

Class/Instance/Attribute (dec)	102/668/100
COMBIVIS address	029Ch
Data length	4 Byte
Access	READ_WRITE
Meaning	Selection of service for second group of process data output

PDINx Address

(with x = 5...8) Fb29, Fb31, Fb33, Fb35

Class/Instance/Attribute (dec)	102/667 + [2 * (x - 4)]/100
COMBIVIS address	029Bh + [2 * (x - 4)]
Data length	2 Byte
Access	READ_WRITE
Meaning	Defines mapping for the process input data. Value zero means, that this mapping is not assigned.
Coding	0x1234, address of specified inverter parameter. Operator parameters cannot be used here.
Default value	PDIN5 Address = FFFFh, off PDIN6 Address = FFFFh, off PDIN7 Address = FFFFh, off PDIN8 Address = FFFFh, off

PDINx_Set

(with x = 5...8) Fb30, Fb32, Fb34, Fb36

Class/Instance/Attribute (dec)	102/668 + [2 * (x - 4)]/100
COMBIVIS address	029Ch + [2 * (x - 4)]
Data length	1 Byte
Access	READ_WRITE
Meaning	Defines which sets to read for the process input data.
Coding	Set coding as in Frequency Inverter manual. Can only read from one set at a time. Combinations of sets are not allowed.
Default value	PDIN5 Set = 01h, set 0 PDIN6 Set = 01h, set 0 PDIN7 Set = 01h, set 0 PDIN8 Set = 01h, set 0

PDOUTx Address

(with x = 5...8) Fb37, Fb39, Fb41, Fb43

Class/Instance/Attribute (dec)	102/675 + [2 * (x - 4)]/100
COMBIVIS address	02A3h + [2 * (x - 4)]
Data length	2 Byte
Access	READ_WRITE
Meaning	Defines mapping for the process output data. Value zero means that this mapping is not assigned.
Coding	0x1234, address of specified inverter parameter. Operator parameters cannot be used here.
Default value	PDIN5 Address = FFFFh, off PDIN6 Address = FFFFh, off PDIN7 Address = FFFFh, off PDIN8 Address = FFFFh, off

PDOUTx_Set

(with x = 5...8) Fb38, Fb40, Fb42, Fb44

Class/Instance/Attribute (dec)	102/656 + [2 * (x - 4)]/100
COMBIVIS address	0290h + [2 * (x - 4)]
Data length	1 Byte
Access	READ_WRITE
Meaning	Defines which sets to write to for the process output data.
Coding	Set coding as in Frequency Inverter manual. Combinations of sets can be used here.
Default value	PDOUT5 Set = 01h, set 0 PDOUT6 Set = 01h, set 0 PDOUT7 Set = 01h, set 0 PDOUT8 Set = 01h, set 0

PDIN2_Enabled Fb45

Operator Parameters

Class/Instance/Attribute (dec)	102/685/100
COMBIVIS address	02ADh
Data length	1 Byte
Access	READ_WRITE
Meaning	Activates or deactivates processing of the second group of process input data.
Coding	0: Process input 2 data are not active. Otherwise: Process input 2 data are active.
Default value	FFh

PDOOUT2_Enabled Fb46

Class/Instance/Attribute (dec)	102/686/100
COMBIVIS address	02AEh
Data length	1 Byte
Access	READ_WRITE
Meaning	Activates or deactivates the processing of the second group of process output data.
Coding	0: Process output 2 data are not active. Otherwise: Process Output 2 data are active.
Default value	FFh

4.2 Parameters defined by the EtherNet/IP™ and CIP™ Specifications[2],[3]

4.2.1 Identity Object(Class = 0x01)

Vendor-Id

Class/Instance/Attribute (dec)	1/1/1
COMBIVIS address	not available
Data length	2 Byte
Access	READ_ONLY
Meaning	Vendor-Id of the manufacturer. Assigned by the ODVA.
Coding	s. ODVA
Default value	744 = KEB Antriebstechnik

Device Type

Class/Instance/Attribute (dec)	1/1/2
COMBIVIS address	not available
Data length	2 Byte
Access	READ_ONLY
Meaning	Unit-type
Coding	s.(3)
Default value	12 = Communication Adapter

Prod Code

Class/Instance/Attribute (dec)	1/1/3
COMBIVIS address	not available
Data length	2 Byte
Access	READ_ONLY
Meaning	Product Code. Specifies the control type of the KEB-frequency inverter.
Coding	after allocation of the KEB-COMBIVIS-Config-Ids

Revision

Class/Instance/Attribute (dec)	1/1/4
COMBIVIS address	not available
Data length	2 Byte
Access	READ_ONLY
Meaning	Version of the EtherNet/IP™ software, Major.Minor
Coding Example: v1.1	Bit15...Bit8: Major = 01 Bit7.....Bit0: Minor = 01

Serial number

Class/Instance/Attribute (dec)	1/1/6
COMBIVIS address	not available
Data length	4 Byte
Access	READ_ONLY
Meaning	Serial number for the distinct identification of the device.

Prod name

Class/Instance/Attribute (dec)	1/1/7
COMBIVIS address	not available
Data length	25 Byte
Access	READ_ONLY
Meaning	Product name in ASCII-String
Coding	KEB EtherNet/IP Operator

Operator Parameters

State

Class/Instance/Attribute (dec)	1/1/8
COMBIVIS address	not available
Data length	1 Byte
Access	READ_ONLY
Meaning	Current state of the device
Coding	As pertaining to the ODVA specs[3]: 0 = Nonexistant 1 = Device self testing 2 = Standby 3 = Operational 4 = Major Recoverable Fault 5 = Major Unrecoverable Fault

Consistency Value

Class/Instance/Attribute (dec)	1/1/9
COMBIVIS address	not available
Data length	2 Bytes
Access	READ_ONLY
Meaning	Configuration Consistency Value
Default value	0

4.2.2 Assembly Object (Class = 0x04)

Process Data

Class/Instance/Attribute (dec)	4/100/3
COMBIVIS address	not available
Data length	user defined
Access	READ_WRITE
Meaning	values of process data output
Default value	0
Notice	

Size

Class/Instance/Attribute (dec)	4/100/4
COMBIVIS address	not available
Data length	2 Bytes
Access	READ_ONLY
Meaning	Length of process data in Bytes
Default value	8
Notice	Coincides with Fb48 parameter

Process Data

Class/Instance/Attribute (dec)	4/101/3
COMBIVIS address	not available
Data length	user defined
Access	READ_ONLY
Meaning	values of process data input
Default value	0
Notice	

Size

Class/Instance/Attribute (dec)	4/101/4
COMBIVIS address	not available
Data length	2 Bytes
Access	READ_ONLY
Meaning	Length of process data in Bytes
Default value	8
Notice	Coincides with Fb47 parameter

4.2.3 TCP/IP Interface Object (Class = 0xF5)

Status

Class/Instance/Attribute (dec)	F5/1/1
COMBIVIS address	not available
Data length	4 Bytes
Access	READ_ONLY
Meaning	Status of device given by [2]
Default value	
Bit(s)	Description
0 - 3, Status of configuration	0 = Interface configuration not configured 1 = Valid configuration through BOOTP, DHCP, or non-volatile storage. 2 = Valid configuration through hardware settings 3-15 = Reserved for future use

Operator Parameters

4, Mcast Pending	Indicates a pending configuration change
------------------	--

Capability Flags

Class/Instance/Attribute (dec)	F5/1/2
COMBIVIS address	not available
Data length	4 Bytes
Access	READ_ONLY
Meaning	Indicates the device's support for optional network configuration given by [2]
Default	5 = Capable of DHCP and BOOTP

Configuration

Class/Instance/Attribute (dec)	F5/1/3
COMBIVIS address	not available
Data length	4 Bytes
Access	READ_ONLY
Meaning	Bitmap used to control network configuration options
Default value	0 = Device shall use interface configuration values previously stored in non-volatile memory or via hardware switches

Physical Link

Class/Instance/Attribute (dec)	F5/1/4
COMBIVIS address	not available
Data length	6 Bytes
Access	READ_ONLY
Meaning	Identifies the underlying physical communications interface. This contains a path size and a path
Default value	path size: 00 02 path : 20 F6 24 01
Notice	Path contains a logical segment, type class, logical segment, and instance as specified by [2]

Interface

Class/Instance/Attribute (dec)	F5/1/5
COMBIVIS address	not available
Data length	22 Bytes
Access	READ_ONLY
Meaning	Configuration parameters of the network
Default value	All zeros until the BOOTP or DHCP reply is received
Notice	Contains the IP Address, Network Mask, Gateway Address, Name Server, Name Server 2, and Domain Name in order.

Host Name

Class/Instance/Attribute (dec)	F5/1/6
COMBIVIS address	not available
Data length	User defined
Access	READ_WRITE
Meaning	Host name used for DHCP
Default value	0
Notice	The host name does not need to be set for the device to operate properly. However, it can be set for informational purposes.

4.2.4 EtherNet Link Object (Class = 0xF6)

Interface speed

Class/Instance/Attribute (dec)	F6/1/1
COMBIVIS address	not available
Data length	4 Bytes
Access	READ_ONLY
Meaning	Indicates speed of the connection currently in use
Default value	100, 0x64
Coding	Shown in Mbps, 0 if the speed is indeterminate

Interface flags

Class/Instance/Attribute (dec)	F6/1/2
COMBIVIS address	not available
Data length	4 Bytes
Access	READ_ONLY
Meaning	Contains status and configuration information about the physical interface
Default value	47, 0x2F
Bits	Description

Operator Parameters

0, Link status	Indicates whether or not the 802.3 communications interface is connected to an active network, 1 = active
1, Half/Full duplex	Duplex mode currently in use, 1 = full duplex
2 - 4, Negotiation Status	0 = Negotiation in process
	1 = Auto-negotiation and speed detection failed
	2 = Auto-negotiation failed but detected speed
	3 = Successfully negotiated speed and duplex
4 = Auto-negotiation not attempted, forced speed and duplex	
5, Reset indication	1 = device must be reset for changes to take effect
6, Hardware Fault	1 = indicates local hardware fault
7 - 31	reserved and set to zero

MAC Address

Class/Instance/Attribute (dec)	F6/1/3
COMBIVIS address	not available
Data length	6 Bytes
Access	READ_ONLY
Meaning	Physical address set by KEB
Default value	Unique for each operator, shown as six octets: "XX-XX-XX-XX-XX-XX"

Control Bits

Class/Instance/Attribute (dec)	F6/1/6
COMBIVIS address	not available
Data length	4 Bytes
Access	READ_ONLY
Meaning	Indicates what setup is in use
Default value	1
Bits	Description
0, Auto-negotiate	0 = 802.3 link auto-negotiation disabled 1 = enabled If disabled, the device shall use the settings for Forced Duplex Mode and Forced Indicated Speed.
1, Forced Duplex Mode	If Auto-negotiate is disabled, this bit indicates whether the interface will operate in full or half duplex. 0 = Half Duplex 1 = Full Duplex
2 - 15	reserved and set to zero

5 List of Operator Parameters

5.1 Standard EtherNet/IP™ Objects

The following parameters are standardized to be included in any hardware/software device configuration of EtherNet/IP™ that adheres to the ODVA specifications of CIP and EtherNet/IP™.

5.1.1 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 applications trying to determine what devices are on a network.

Supported Services	Class	Inst.	Attrib.	PAddr	Name	Dlen	Access	Memory
Get Attribute All Get Attribute Single	1	0	1	---	Revision	2	RO	CONST
	1	0	2	---	Max. Instance	2	RO	CONST
	1	0	6	---	Max. Class Attrib.	2	RO	CONST
	1	0	7	---	Max. Instance Attrib.	2	RO	CONST
Get Attribute All Get Attribute Single	1	1	1	---	Vendor-Id	2	RO	CONST
	1	1	2	---	Device Type	2	RO	CONST
	1	1	3	---	Product Code	2	RO	CONST
	1	1	4	---	Major Revision	1	RO	CONST
					Minor Revision	1	RO	CONST
	1	1	5	---	Status	2	RO	NO
	1	1	6	---	Serial Nr	4	RO	CONST
	1	1	7	---	Product name	25	RO	CONST
	1	1	8	---	State	1	RO	NO
1	1	9	---	Configuration	2	RO	CONST	

5.1.2 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 master and process data in "PDIN" produces data from the frequency inverter for the controller and network.

Supported Services	Class	Inst.	Attrib.	PAddr	Name	Dlen	Access	Memory
Get Attribute Single	4	0	1	---	Revision	2	RO	CONST
	4	0	2	---	Max. Instance	2	RO	CONST
Get Attribute Single Set Attribute Single	4	100	3	---	Data	-	RW	NO
	4	101	3	---	Data	-	RW	NO
Get Attribute Single	4	100	4	---	Size in Bytes	2	RO	AUTO
	4	101	4	---	Size in Bytes	2	RO	AUTO

List of Operator Parameters

The assembly object includes dynamic instances of 100 and 101 (0x64 and 0x65 in hexadecimal format) for accessing the input and output data. The size and attributes of the input/output data can be configured by changing the fieldbus parameters.

5.1.3 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.

Supported Services	Class	Inst.	Attrib.	PAddr	Name	Dlen	Access	Memory
Get Attribute Single	F5	0	1	---	Revision	2	RO	CONST
	F5	0	2	---	Max. Instance	2	RO	CONST
Get Attribute Single Set Attribute Single	F5	1	1	---	Status	4	RO	CONST
	F5	1	2	---	Capability Flags	4	RO	CONST
	F5	1	3	---	Configuration Flags	4	RW	CONST
	F5	1	4	---	Physical Link Object	6	RO	AUTO
	F5	1	5	---	Interface	22	RO	NO
F5	1	6	---	Host Name	2	RW	CONST	

5.1.4 Ethernet Link Object (Class Code: 0xF6)

The Ethernet Link object contains link-specific status information for Ethernet 802.3 interfaces.

Supported Services	Class	Inst.	Attrib.	PAddr	Name	Dlen	Access	Memory
Get Attribute Single	F6	0	1	---	Revision	2	RO	CONST
	F6	0	2	---	Max. Instance	2	RO	CONST
Get Attribute Single Set Attribute Single	F6	1	1	---	Interface Speed	4	RO	NO
	F6	1	2	---	Interface Flags	4	RO	NO
	F6	1	3	---	MAC Address	6	RO	CONST
	F6	1	6	---	Control Bits	4	RW	AUTO

5.2 KEB EtherNet/IP™ Objects

KEB's EtherNet/IP™ objects are specific to the KEB frequency inverter and operator.

5.2.1 Inverter Parameter Object (Class Code: 0x64), 100 decimal

The Inverter Parameter Object allows access to parameters located in the frequency drive as indicated in the KEB F5 Application Manual.

5.2.2 Operator Parameter Object (Class Code: 0x66), 102 decimal

The Operator Parameter Object provides access to the operator system, fieldbus, and debug group parameters.

Supported Services	ID	Class	Inst.	Attrib.	PAddr	Name	Dlen	Access	Memory
Get Attribute Single Set Attribute Single	OS00	102	384	100	0x0180	Operator type	4	RO	CONST
	OS01	102	385	100	0x0181	Password	4	RO	AUTO
	OS02	102	386	100	0x0182	Software date	4	RO	CONST
	OS05	102	389	100	0x0185	Diag Baudrate	4	RO	AUTO
	OS10	102	394	100	0x018A	MAC Address	4	RO	CONST
	OS11	102	395	100	0x018B	NetX_FwVersion	4	RO	CONST
	OS12	102	396	100	0x018C	Serial Number	4	RW	CONST
	OS13	102	397	100	0x018D	QS Number	2	RO	CONST
	OS14	102	398	100	0x018E	NodeSwitchValue	2	RO	NO
	OS15	102	399	100	0x018F	IP Address	2	RW	AUTO
	OS16	102	400	100	0x0190	Network Mask	2	RW	AUTO
	OS17	102	401	100	0x0191	Gateway Address	6	RW	AUTO
	OS18	102	402	100	0x0192	Active IP Address	4	RO	CONST
	OS19	102	403	100	0x0193	Active Network Mask	4	RO	CONST
	OS20	102	404	100	0x0194	Active Gateway Address	4	RO	CONST
	OS21	102	405	100	0x0195	Network Config Flags	4	RW	AUTO
	Fb00	102	640	100	0x0280	Com_Cycle	4	RO	NO
	Fb01	102	641	100	0x0281	FBS Config	2	RW	NO
	Fb04	102	644	100	0x0284	FBS Command	2	RW	NO
	Fb05	102	645	100	0x0285	PDOUT_Hsp5 Service	1	RW	AUTO
	Fb06	102	646	100	0x0286	PDIN_Hsp5 Service	1	RW	AUTO
	Fb07	102	647	100	0x0287	PDIN_Cycle	2	RW	AUTO
	Fb08	102	648	100	0x0288	Default PD-Mapping	1	RW	NO
	Fb09	102	649	100	0x0289	PDIN1 Address	2	RW	AUTO
	Fb10	102	650	100	0x028A	PDIN1 Set	1	RW	AUTO
	Fb11	102	651	100	0x028B	PDIN2 Address	2	RW	AUTO
	Fb12	102	652	100	0x028C	PDIN2 Set	1	RW	AUTO
	Fb13	102	653	100	0x028D	PDIN3 Address	2	RW	AUTO
	Fb14	102	654	100	0x028E	PDIN3 Set	1	RW	AUTO
	Fb15	102	655	100	0x028F	PDIN4 Address	2	RW	AUTO
	Fb16	102	656	100	0x0290	PDIN4 Set	1	RW	AUTO

List of Operator Parameters

Supported Services	ID	Class	Inst.	Attrib.	PAddr	Name	Dlen	Access	Memory
	Fb17	102	657	100	0x0291	PDOUT1 Address	2	RW	AUTO
	Fb18	102	658	100	0x0292	PDOUT1 Set	1	RW	AUTO
	Fb19	102	659	100	0x0293	PDOUT2 Address	2	RW	AUTO
	Fb20	102	660	100	0x0294	PDOUT2 Set	1	RW	AUTO
	Fb21	102	661	100	0x0295	PDOUT3 Address	2	RW	AUTO
	Fb22	102	662	100	0x0296	PDOUT3 Set	1	RW	AUTO
	Fb23	102	663	100	0x0297	PDOUT4 Address	2	RW	AUTO
	Fb24	102	664	100	0x0298	PDOUT4 Set	1	RW	AUTO
	Fb25	102	665	100	0x0299	PDIN Enabled	1	RW	AUTO
	Fb26	102	666	100	0x029A	PDOUT Enabled	1	RW	AUTO
	Fb27	102	667	100	0x029B	PDOUT2_Hsp5 Service	1	RW	AUTO
	Fb28	102	668	100	0x029C	PDIN2_Hsp5 Service	1	RW	AUTO
	Fb29	102	669	100	0x029D	PDIN5 Address	2	RW	AUTO
	Fb30	102	670	100	0x02E	PDIN5 Set	1	RW	AUTO
	Fb31	102	671	100	0x029F	PDIN6 Address	2	RW	AUTO
	Fb32	102	672	100	0x02A0	PDIN6 Set	1	RW	AUTO
	Fb33	102	673	100	0x02A1	PDIN7 Address	2	RW	AUTO
	Fb34	102	674	100	0x02A2	PDIN7 Set	1	RW	AUTO
	Fb35	102	675	100	0x02A3	PDIN8 Address	2	RW	AUTO
	Fb36	102	676	100	0x02A4	PDIN8 Set	1	RW	AUTO
	Fb37	102	677	100	0x02A5	PDOUT5 Address	2	RW	AUTO
	Fb38	102	678	100	0x02A6	PDOUT5 Set	1	RW	AUTO
	Fb39	102	679	100	0x02A7	PDOUT6 Address	2	RW	AUTO
	Fb40	102	680	100	0x02A8	PDOUT6 Set	1	RW	AUTO
	Fb41	102	681	100	0x02A9	PDOUT7 Address	2	RW	AUTO
	Fb42	102	682	100	0x02AA	PDOUT7 Set	1	RW	AUTO
	Fb43	102	683	100	0x02AB	PDOUT8 Address	2	RW	AUTO
	Fb44	102	684	100	0x02AC	PDOUT8 Set	1	RW	AUTO
	Fb45	102	685	100	0x02AD	PDIN2 Enabled	1	RW	AUTO
	Fb46	102	686	100	0x02AE	PDOUT2 Enabled	1	RW	AUTO
	Fb47	102	687	100	0x02AF	PDIn Byte Length	2	RW	AUTO
	Fb48	102	688	100	0x02B0	PDOut Byte Length	2	RW	AUTO

Dlen	Data length in Bytes
Access	RW : Write and readable (SetAttributeSingle and GetAttributeSingle). RO : Read-only (GetAttributeSingle)
Memory	AUTO : Value of the parameter is stored automatically non-volatile. CONST : Value is constant NO : Value is not stored non-volatile and must be written again after every re-start.

6 EDS-File

For the KEB-EtherNet/IP™ slave interface connection the EDS-files (Electronic Data Sheets) are available.

All relevant information is contained in it.

You receive the desired EDS-file directly from KEB Antriebstechnik.

www.KEB.de in the downloads section

7 List of Literature

[1]	Operating Instructions frequency inverter control KEB Combivert F5 with Application Manual.
[2]	EtherNet/IP™ Adaption of CIP™, Volume II , Edition 1.5, April 2008, Open DeviceNet Vendor Association (ODVA™)
[3]	Common Industrial Protocol (CIP™), Volume I , Edition 3.4, April 2008, Open DeviceNet Vendor Association (ODVA™)

8 Appendix

8.1 Troubleshooting

coming soon

8.2 Quickstart Guides for EtherNet/IP™

8.2.1 Combivis Quick Start

Attached at the end of the manual.

8.2.2 RSLOGIX® 5000 Software

coming soon



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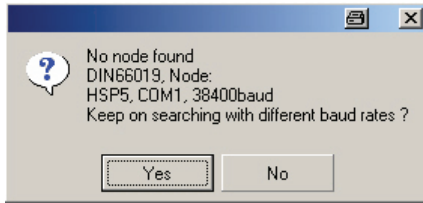
5100 Valley Industrial Blvd. South
USA-Shakopee, MN 55379
fon: +1 952 224-1400 • fax: +1 952 224-1499
net: www.kebamerica.com • mail: info@kebamerica.com

More and newest addresses at <http://www.keb.de>

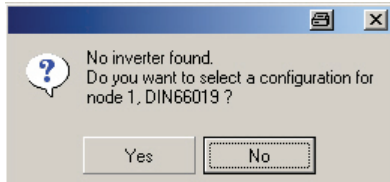
© KEB	
Mat.No.	CNF50E0-K100
Rev.	1A
Date	10/2016

For “Out of Box” setup: Attach HSP5 cable (part# 00F50C0-0010) 9-pole D-SUB connector end to COM1 serial port on a computer and the RJ45 DSUB adapter (part# 00F50C0-0002) to diagnostic port X6B on Operator. **DO NOT CONNECT TO ETHERNET/ IPTM PORT!** Install the appropriate files and Config files (80510.bin for EtherNet/IP™) for Combivis and follow the steps below:

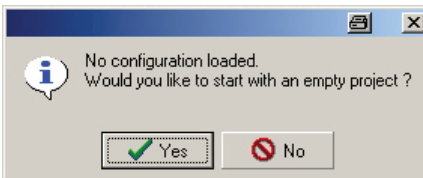
1. The EtherNet/IP™ 80510.bin file that is provided to you should be in the path: C:\Program Files\KEB\CFG5
2. Start the Combivis Software. It will look for a connection. If it does not find one, it will display:



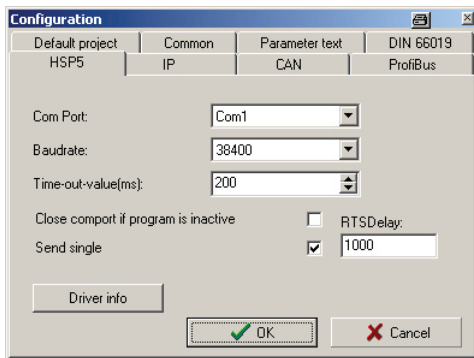
3. Click “Yes” to search. If it still does not find a connection, this window pops up:



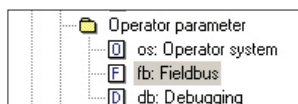
4. Click “No” A new window will ask to start an empty project as shown below: Click “Yes”



5. A new project will start. In the file menu click *Edit* then *Configuration* and fill in as shown for the HSP5 tab. Make sure the Default project tab has the HSP5 check box checked.



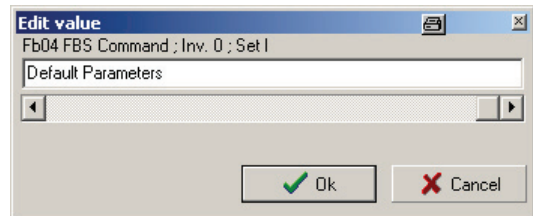
6. Now from the menu select *File* then *New project*. A connection to the operator should be obtained if settings are correct.
7. Double click *Operator parameter* folder in the explorer window:



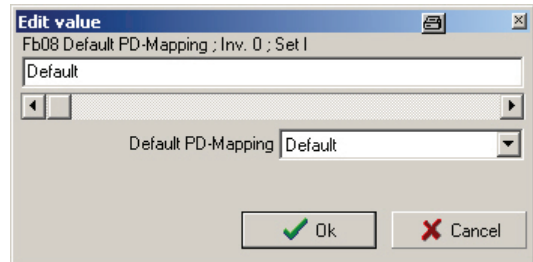
8. Select *Fieldbus* parameters in the explorer window:

ID:	Name:	Value:
Fb00	Com_Cycle	0
Fb01	FBS Config	0000h
Fb04	FBS Command	No Command
Fb05	PDOUT_Hsp5Service	49
Fb06	PDIN_Hsp5Service	49
Fb07	PDIN_Cycle	25 ms
Fb08	Default PD-Mapping	Use Existing
Fb09	PDIN1 Address	0200h
Fb10	PDIN1 Set	01h

9. Select Fb04, choose Default Parameters, and click “Ok”:



10. Select Fb08, choose Default, and click “Ok”:



11. Click the *Operator system* parameters:



12. This shows the default network parameters:

OS14	NodeSwitchVal	0
OS15	IP Address	192.168.192.30
OS16	Network Mask	255.255.255.0
OS17	Gateway Address	0.0.0.0
OS18	Active IP Address	192.168.192.30
OS19	Active Network Mask	255.255.255.0
OS20	Active Gateway Address	0.0.0.0
OS21	Network Config Flags	00000403h

13. If NodeSwitchVal is 0, then OS15 can be set to the value of your choice. If the NodeSwitchVal is not zero, then the IP address is 192.168.0.(NodeSwitchValue).

14. OS16 and OS17 can be set for your custom network.

15. By default Process Data will be enabled by Fb25 and Fb26.

16. Reboot the Operator for the settings to take effect. This may be done by unplugging and plugging in the Operator.

17. The operator is now set up in the default mode for process data in and out. The OS18, OS19, and OS20 parameters show the active network settings being used by the Operator.