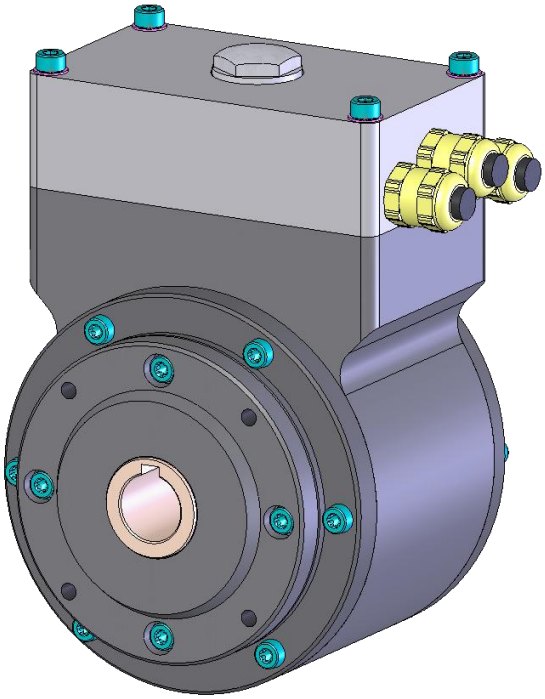
English

JOHANNES HÜBNER GIESSEN
ideas and solutions



Operating and Assembly Instructions
Hollow-Shaft Absolute Encoder AMNH 40
with DeviceNet™ interface

Read the Operating and Assembly Instructions prior to assembly, starting installation and handling!
Keep for future reference!

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Directory

1 General

1.1 Information about the Operating and Assembly Instructions

These Operating and Assembly Instructions provide important instructions for working with the device. They must be carefully read prior to starting all tasks, and the instructions contained herein must be followed.

In addition, applicable local regulations for the prevention of industrial accidents and general safety regulations must be complied with.

1.2 Scope of delivery

Hollow-Shaft Absolute Encoder AMNH 40, Operating and Assembly Instructions.
CD with configuration data.

1.3 Explanation of symbols

Warnings are indicated by symbols in these operating and assembly instructions. The warnings are introduced by signal words that express the scope of the hazard.
The warnings must be strictly heeded; you must act prudently to prevent accidents, personal injury, and property damage.

WARNING!
Indicates a possibly dangerous situation that can result in death or serious injury if it is not avoided.

CAUTION!
Indicates a possibly dangerous situation that can result in minor injury if it is not avoided.

CAUTION!
Indicates a possibly dangerous situation that can result in material damage if it is not avoided.

NOTES!
Indicates useful tips and recommendations as well as information for efficient and trouble-free operation.

NOTES!
Do not use a hammer or similar tool when installing the device due to the risk of damage occurring to the bearings or coupling!

DANGER!
Life-threatening danger due to electric shock!
Indicates a life-threatening situation due to electric shock. If the safety instructions are not complied with there is danger of serious injury or death. The work that must be executed should only be performed by a qualified electrician.

1.4 Disclaimer

All information and instructions in these Operating and Assembly Instructions have been provided under due consideration of applicable guidelines, as well as our many years of experience.
The manufacturer assumes no liability for damages due to:

- Failure to follow the instructions in the operating and assembly instructions
- Non-intended use
- Deployment of untrained personnel
- Opening of the device or conversions of the device

In all other aspects the obligations agreed in the delivery contract as well as the delivery conditions of the manufacturer apply.

1.5 Copyright

NOTES!
Content information, text, drawings, graphics, and other representations are protected by copyright and are subject to commercial property rights.
It is strictly forbidden to make copies of any kind or by any means for any purpose other than in conjunction with using the device without the prior written agreement of the manufacturer. Any copyright infringements will be prosecuted.

1.6 Guarantee terms

The guarantee terms are provided in the manufacturer's terms and conditions.

1.7 Customer service

For technical information personnel is available that can be contacted by telephone, fax or email. See manufacturer's address on page 2.

2 Safety

DANGER!
This section provides an overview of all the important safety aspects that ensure protection of personnel, as well as safe and trouble-free device operation.
If these safety instructions are not complied with significant hazard can occur.

2.1 Responsibility of the owner

The device is used in commercial applications. Consequently the owner of the device is subject to the legal occupational safety obligations and subject to the safety, accident prevention and environmental protection regulations that are applicable for the device's area of implementation.

2.2 Intended use

The device has been designed and constructed exclusively for the intended use described here.

Series AMNH 40 Hollow- Shaft Absolute Encoders are used for measurement of rotations, for instance of electrical and mechanical drives and shafts.

Claims of any type due to damage arising from non-intended use are excluded; the owner bears sole responsibility for non-intended use.

2.3 Non- intended use

The device may not be used in explosion-threatened areas.

On the device no other mechanical load may be exercised except his dead weight and the oscillations without fail appearing during the company and pushes.

- Examples of inadmissible mechanical charges (incomplete listing):
- Connection of transport or lifting means in the device, e.g., load hook for raising of an engine.
- Connection of packaging parts in the device, e.g., instep belts, tarpaulin, etc.
- Use of the device as a step, e.g., for going up of a person on an engine.
- It is not permitted to use the device in locations higher than 3000 m above sea level.

2.4 Personal protective equipment

For tasks such as assembly, disassembly or commissioning the use of personal protective equipment such as safety footwear and protective work clothing is required.
The regulations specified by the owner and that are locally specified apply.

2.5 Personnel

Installation and commissioning as well as disassembly routines must be carried out by skilled technical staff only.

2.6 Special dangers

Residual risks that have been determined based on a risk assessment are cited below.

2.6.1 Electrical current

DANGER!

Life-threatening danger due to electrical shock!
There is an imminent life-threatening hazard if live parts are touched. Damage to insulation or to specific components can pose a life-threatening hazard.
Therefore:
Immediately switch off the device and have it repaired if there is damage to the insulation of the power supply.
De-energize the electrical equipment and ensure that all components are connected for all tasks on the electrical equipment.
Keep moisture away from live parts. Moisture can cause short circuits.

2.6.2 Rotating shafts / Hot surfaces

WARNING!

Danger of injury due to rotating shafts and hot surfaces!
Touching rotating shafts can cause serious injuries.
Therefore:
Do not reach into moving parts/shafts or handle moving parts/shafts during operation.
Close to protect from injury all access openings in flanges with the corresponding plug screw, and provided you exposed rotating components with protective covers.
Do not open covers during operation. Prior to opening the covers ensure that all parts have come to a standstill.
The encoder can become hot during prolonged use.
In case of contact risk of burns is existing.

2.6.3 Safeguarding against restart

DANGER!

Life-threatening danger if restarted without authorization!
When correcting faults there is danger of the power supply being switched on without authorization.
This poses a life-threatening hazard for persons in the danger zone.
Therefore:
Prior to starting work, switch off the system and safeguard it from being switched on again.

3 Technical Data

3.1 Type plate

The type plate is located on the outside of the housing and contains the following information:

- Manufacturer, Address
- Type, Year of construction
- CE marking
- Serial number (S/N)
- Commission number (C/N)
- Resolution singleturn 12 bit
- Resolution multiturn 12 bit
- Power supply
- Degree of protection (IP66)

3.2 Type key

AM	N	H	J	40	K	1212	20P

Absolute encoder
M = multiturn
S = singleturn

Absolute encoder with
DeviceNet™ interface

Hollow shaft design

With isolated bearings –hybrid bearings-

Series

Connection
K = Terminal box

Resolution (see type plate)
Singleturn 12 bit
Multiturn 12 bit

Inner diameter hollow shaft
20 P (**standard**)
P: feather key

3.3 Electrical and mechanical data

Type	**AMNH 40 K-1212**
Supply voltage	12 V … 30 V DC
Resolution Singleturn	max. 12 bit (4096 steps per revolution)
Resolution Multiturn	max. 12 bit (4096 revolutions)
Supply current	150 mA (+24V)
Data interface	RS 485 electrically isolated from encoder electronic
Baud rate	(125, 250, 500) kbaud
Device address	adjustable 0 -63
Bus termination	switchable
Coding	binär
Programmable functions	
Operating parameters	Counting direction Resolution/revolution Resolution Preset

Device temperature range	
Standard	-25°C…+85°C

Protection class acc. to DIN EN 60529	Sealing	Mech. permissible speed	Rotor moment of inertia	Breakaway torque
IP66	with labyrinth seal	≤ 4000 rpm (*)≤ 3000 rpm	1325 gcm²	approx. 10 Ncm
IP66	with axial shaft seal	≤ 2000 rpm (*)≤ 2000 rpm	1175 gcm²	approx. 25 Ncm
IP66	with radial shaft seal (for special applications, e.g. wet areas in rolling mills)	≤ 2000 rpm (*)≤ 2000 rpm	1175 gcm²	approx. 30 Ncm

(*) with isolated bearings –hybrid bearings-

Vibration resistance	DIN EN 60068-2-6 / IEC 68-2-6 (10 … 2000 Hz)	20 g (=200 m/s²)
Shock resistance	DIN EN 60068-2-27 / IEC 68-2-27 (6 ms)	150 g (=1500 m/s²)
Weight	Type AMNH 40 K	approx. 4,2 kg

NOTES!
The hollow shaft device AMNH 40 reduces the degree of protection to IP 65, if the cover screw is not mounted. At maximum speed the permissible ambient temperature will be reduced to 60°C.

4 Transport, packaging and storage

4.1 Safety instructions for transport

CAUTION!
Material damage caused by improper transport!
Observe the symbols and information on the packaging:

- Do not throw - risk of breakage
- Keep dry
- Do not expose to heat above 40 °C or direct sunlight.

4.2 Incoming goods inspection

Check delivery immediately upon receipt for completeness and possible transport damage.

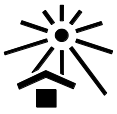
Inform the forwarder directly on receipt of the goods about existing transport damages (prepare pictures for evidence).

4.3 Packaging / disposal

The packaging is not taken back and must be disposed of in accordance with the respective statutory regulations and local guidelines.

4.4 Storage of packages (devices)

Keep dry
Keep packages dry and free from dust; protect from moisture.



Protect against heat
Protect packages from heat above 40 °C and direct sunlight.

If you intend to store the device for a longer period of time (> 6 months) we recommend you use protective packaging (with desiccant).

NOTES!
Turn the shaft of the device every 6 month to prevent the bearing grease solidifying!

5 Installation and commissioning

5.1 Safety instructions

Personnel

Installation and commissioning must be carried out by skilled technical staff only.

WARNING!

Observe the safety instructions contained in **Chapter 2** when inspecting or working on the device!

5.2 Technical information

NOTES!

Do not use a hammer or similar tool when installing the device due to the risk of damage occurring to the bearings or coupling!

Ambient temperature

The max. permissible ambient temperature depends on the speed and degree of protection of the device, the signal frequency, the length of the signal cable and the place of installation (please refer to Chapter 3.3).

Degree of protection

To fulfil degree of protection requirements the diameter of the connection cable must correspond to that of the cable gland (please refer to Chapter 16 dimension drawings)!

Deep groove ball bearings

Hollow-Shaft Absolute Encoders AMNH 40 are fitted with maintenance-free, greased "for-life" deep groove bearings. Bearings must be changed by the manufacturer only. Opening the encoder renders the guarantee null and void.

Screw retention

We recommend using Loctite® 243 threadlocker (medium strength) on all fastening screws to prevent loosening.

5.3 Required tools

- Spanners: 10 mm, 17 mm, 24 mm
- Allen keys: 4 mm, 5 mm
- Flat-blade screwdrivers:
- Assembly grease
- Loctite® 243 (medium strength threadlocker)

5.4 Mounting preparations

1. Ensure all accessories are available (please refer to Chapter 16 Dimension drawings).

NOTES!
Fastening screws and earth cable are not included in the range of supply.

2. Preparing the place of attachment: Clean the (motor) shaft, centering, bolting surfaces and fastening threads; check for damage. Repair any damage!

5.5 Mounting hollow-shaft type Absolute Encoders

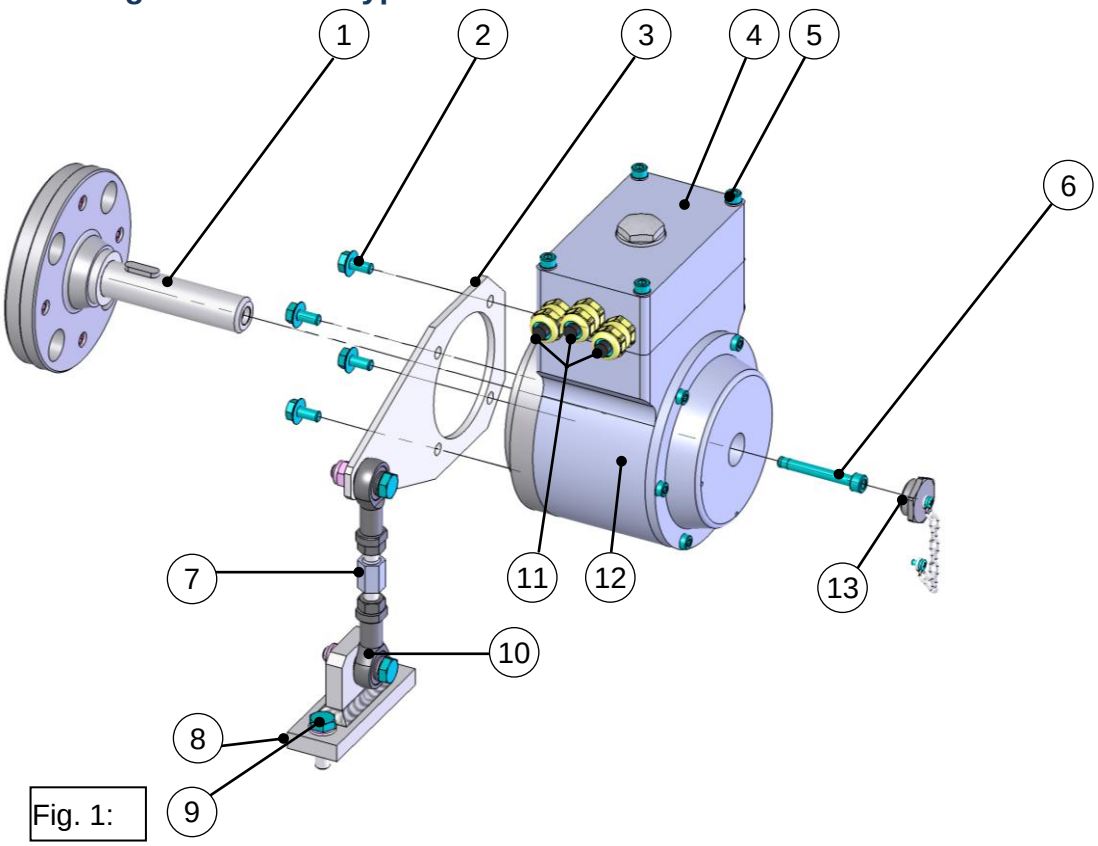


Fig. 1:

1. Mount adapter shaft (1) and align using dial gauge.

NOTES!
The maximum radial run-out of the adapter shaft is 0.05 mm.
If necessary, use the ball thrust adjustment screw to align the adapter shaft. Secure ball thrust screws with Loctite® 243. Remove unused ball thrust screws or secure with Loctite® 243. Max. tightening torque for M12 approx. 25 Nm, for M16 approx. 35 Nm.
Use parallel keys to DIN 6885.
Please also observe the supplement data sheet *Mounting accuracy for hollow shaft encoders.*
You should also observe the Installation instructions supplied with the adapter shaft when installing!

2. Lightly grease the adapter shaft (1).
3. Secure the torque bracket (3) to the hollow-shaft device (12) with 4 tensilock screws (2).

NOTES!
When fitting to the device is possible to align the torque bracket in four different directions. If possible fit the device in a manner that ensures the cable glands(11) points downwards!

4. Mount the hollow-shaft device to the adapter shaft.

NOTES!
The hollow shaft device must slide easily onto the adapter shaft. Never use excessive force, otherwise the bearings may be damaged. If necessary, use emery cloth or a file to produce a better fit between the adapter shaft and the key. Do not allow the device to hit hard against the collar of the shaft.

5. Secure the hollow-shaft device with the aid of the hexagon socket head cap screw (6). (Fig. 1).

NOTES!
The axial tensioning disc is supplied with several hexagon head socket cap screws of different lengths. To select the suitable hexagon head socket cap screw please refer to the dimensioning drawings in Chapter 16.
The hexagon head socket cap screws are coated with a microencapsulated adhesive as locking agent.

6. close hollow shaft encoder with captive closing screw (13)
7. Fastening the torque bracket:

   Ideally, the bracket arm (3) should be mounted at an angle of 90° to the link rod (7).

   Fastening without base plate:
   Secure the link rod head (10) of the link rod (7) to a fixed point (for example on the motor housing).

   Fastening with base plate:
   Secure the base plate (8) to a fixed point with two hexagon head screws (9) – (for example on the motor housing or the foundations).

NOTES!
Once fitted the link rod must rotate easily around the link rod heads! Failure to observe this point may result in damage to the bearings!

NOTES!
The link heads are maintenance free. However, ensure they remain free from soiling and paint!

5.6 Electrical connection of the absolute encoder

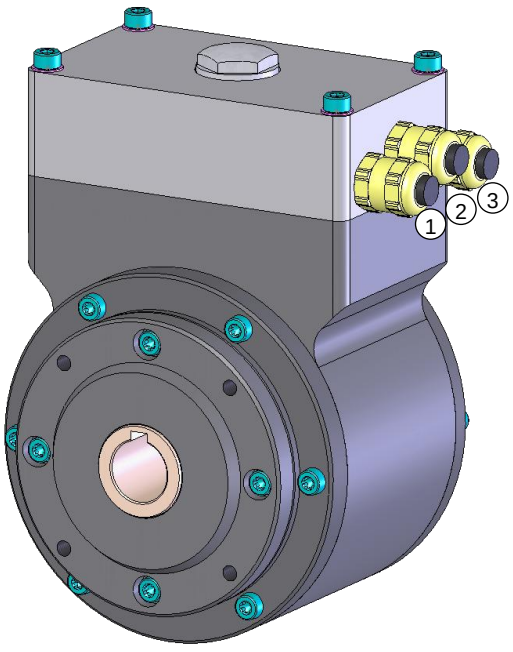
5.6.1 Connections

Cable glands are closed with a stopper to protect the devices on transport and storage.
Connection is run to the appropriate device type.

Connection diagrams have to be considered!
See connection diagram and in the terminal box.
Use of connection cables with diameter of min. 9 mm – max. 13 mm is essential to ensure the protection class. Cable outlet should show preferably downwards.

Wiring arrangement and shielding:
(EMV measurement)
The cable shielding has to be connected on both ends.
The shield of the signal cable can be connected directly to the housing of the encoder by the cable gland.
The common guidelines for EMI concerned cable routing have to be considered!

The 3 cables on the hollow shaft absolute encoder are for:



1 = SUPPLY VOLTAGE
2 = BUS IN
3 = BUS OUT

6 Dismantling

6.1 Safety instructions

Personnel

Dismantling must be carried out by skilled technical staff only.

WARNING!

Observe the safety instructions contained in **Chapter 2** when inspecting or working on the device!

NOTES!

Do not use a hammer or similar tool when installing the device due to the risk of damage occurring to the bearings or coupling!

6.2 Dismantling the encoder

Remove all electrical cables from the device before dismantling. To dismantling the absolute encoder follow the instructions given in Chapters 5.5 and 5.6 in the reverse order.

7 Introduction

Absolute rotary encoders provide a definite value for every possible position. All these values are reflected on one or more code discs. The beams of infrared LEDs are sent through code discs and detected by Opto-Arrays. The output signals are electronically amplified and the resulting value is transferred to the interface.

The absolute rotary encoder has a maximum resolution of 65536 steps per revolution (16 Bit). The Multi-Turn version can detect up to 16384 revolutions (14 Bit). Therefore the largest resulting resolution is 30 Bit = 1.073.741.824 steps. The standard Single-Turn version has 12 Bit, the standard Multi-Turn version 24 Bit.

The integrated CAN-Bus interface of the absolute rotary encoder supports all of the DeviceNet™ functions. The following modes can be programmed and enabled or disabled:

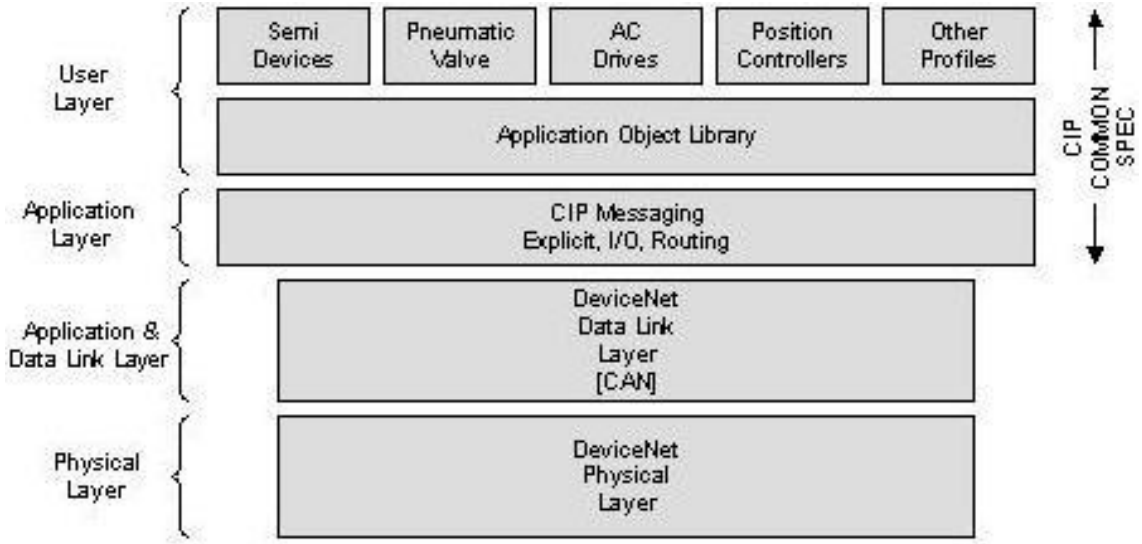
- Polled Mode
- Change of State

The protocol supports the programming of the following additional functions:

- Code sequence (Complement)
- Resolution per revolution
- Total resolution
- Preset value
- Baudrate
- MAC-ID

The general use of absolute rotary encoders with DeviceNet™ interface is guaranteed.

7.1 Common Industrial Protocol (CIP)



The DeviceNet™ specification defines the Application Layer and the Physical Layer. The Data Link layer is based on the CAN-specification. For the optimal industrial control will be defined two different messaging types. I/O messaging (Implicit Messaging) and explicit messaging.With Implicit Messaging becoming I/O data exchanged in realtime and with Explicit Messaging becoming data exchanged to configure a device.
CIP (Common Industrial Protocol) make for the user available four essential functions:

- Unique control service
- Unique communication service
- Unique allocation of messaging
- Common knowledge base

7.2 Object model

DeviceNet™ describes all data and functions of a device considering as object model. By means of that object-oriented description a device can be defined complete with single objects. A object is defined across the centralization by associated attributes (e.g. processdata), his functions (read- or write access of a single attribute) as well as by the defined behaviour.

DeviceNet™ distinction is drawn between three different objects:

- Communication object

Define the exchange messages over DeviceNet™ and becoming designated as Connection Objects. (DeviceNet™ Object, Message Router Object, Connection Object, Acknowledge Handler Object)

- System objects

Define common DeviceNet™-specific data and functions. (Identity Object, Parameter Object)

- Applications-specific objects

Define device-specific data and functions. (Application Object, Assembly Object)

8 Data Transmission

The data transmission in the DeviceNet™ network is realised by message telegrams. Basically, these telegrams can be divided into the CAN-ID and 8 following bytes as shown in the table below:

CAN-ID	Message Header	Message Body
11 Bit	1 Byte	7 Byte

8.1 The Object Dictionary

Instance Attribute of the Position Sensor Objects

Class Code: 23 hex

Attribute ID	Access	Name	Data Type	Description
1 hex	Get	Number of Attributes	USINT	Number of supported Attributes
2 hex	Get	Attribute	Array of USINT	List of supported Attribute
3 hex	Get	Position value	DINT	current position
70 hex	Get / Set	Code sequence	Boolean	Controls the code sequence clockwise or counterclockwise
71 hex	Get / Set	resolution per revolution	INT	resolution for one revolution
72 hex	Get / Set	total resolution	DINT	total measurable resolution
73 hex	Get / Set	preset value	DINT	setting a defined position value
6E hex	Get / Set	Baudrate		Adjustment of the Baudrate
6F hex	Get / Set	MAC ID		Adjustment of the MAC ID

Get / Set: : read, write

8.2 Definition of the CAN-ID

DeviceNet™ is based on the standard CAN-protocol and used a 11Bit (2048 specifiable messages) messages identifier. For the identification of a device in a DeviceNet™ network are 6Bit enough because a network belongs 64 nodes. That nodes will be call MAC-ID. The CAN-Identifier consists of the Message Group, Message ID and the MAC ID of the device.

By our absolute rotary encoder it is a matter of a Group 2 Messages. In the table below a user can see the importance CAN-IDs for a certain communication type.

10	9	8	7	6	5	4	3	2	1	0	Identity Usage	Hex Range
0	Group 1 Message ID				Source MAC ID						GROUP 1 Message	000-3ff
0	1	1	0	1	Source MAC ID						Slave's I/O Change of State or Cyclic Message	
0	1	1	1	1	Source MAC ID						Slave's I/O Poll Response or Change of State/Cyclic Acknowledge Message	
1	0	MAC ID						Group 2 Message ID			GROUP 2 Messages	400 - 5ff
1	0	Destination MAC ID						0	1	0	Master's Change of State or Cyclic Acknowledge Message	
1	0	Source MAC ID						0	1	1	Slave's Explicit/Unconnected Response Messages	
1	0	Destination MAC ID						1	0	0	Master's Explicit Request Message	
1	0	Destination MAC ID						1	0	1	Master's I/O Poll Command/Change of State/Cyclic Message	
1	0	Destination MAC ID						1	1	0	Group 2 Only Unconnected Explicit Request Message (reserved)	
1	0	Destination MAC ID						1	1	1	Duplicate MAC ID Check Messages	

9 Programmable Parameters

9.1 Encoder parameters

9.1.1 Operating Parameter

The operating parameter can be used to select the code sequence.

Attribute ID	Default value	Value range	Data Type
70 hex	1 hex	0 hex - 1hex	Boolean

The parameter code sequence (complement) defines the counting direction of the process value as seen on the shaft whether clockwise or counter clockwise. The counting direction is defined in the attribute 0b hex:

Bit 0	Code sequence	Process value
1	CW	clockwise
0	CCW	Counter clockwise

9.1.2 Resolution per revolution

The parameter resolution per revolution is used to program the encoder to set a desired number of steps per revolution. Each value between 1 and the maximum (see type shield) can be realised

Attribute ID	Default value	Value range	Data Type
71 hex	(*)	0hex - 2000hex	Unsigned Integer16

(*) see type shield, Maximum resolution:

12/24 Bit Encoder: 1,000 hex (4096)

13/25 Bit Encoder: 2,000 hex (8192)

When the value is set larger than 4096 (8192 for a 13/25 Bit encoder), the process value of the encoder will not be single stepped and values will be skipped while rotating the shaft. So, it is recommended, to keep the measuring steps per revolution below 4096 (8192) measuring steps.

9.1.3 Total resolution

This value is used to program the desired number of measuring steps over the total measuring range. This value must not exceed the total resolution of the encoder Please note the value written on the type shield.

Attribute ID	Default value	Value range	Data Type
72 hex	(*)	0h - 2,000,000h	Unsigned Integer 32

(*) see type shield

Maximum total resolution

24 Bit Encoder: 1,000,000 hex

25 Bit Encoder: 2,000,000 hex

Attention:

The following formula letters will be used:

PGA Physical total resolution of the encoder (see type shield)

PAU Physical resolution per revolution (see type shield)

GA Total resolution (customer parameter)

AU Resolution per revolution (customer parameter)

If the desired resolution per revolution is less than the physical resolution per revolution of the encoder, then the total resolution must be entered as follows:

Total resolution

GA = PGA * AU / PAU, if AU < PAU

Example: Customer requirement: AU = 2048, Encoder type shield: PGA=24 bit, PAU=12 bit

GA = 16777216 * 2048 / 4096

GA = 8388608

If the total resolution of the encoder is less than the physical total resolution, the parameter total resolution must be a multiple of the physical total resolution:

- k = PGA / GA
- k = integer

9.1.4 Preset value

The preset value is the desired position value, which should be reached at a certain physical position of the axis. The position value of the
encoder is set to the desired process value by the parameter preset. The preset value must not exceed the parameter total measuring units

Attribute ID	Default value	Value range	Data Type
73 hex	0 hex	0hex - total measuring range	Unsigned Integer 32

9.1.5 MAC ID

Each node in a Device Net network is identified using a MAC-ID (Media Access Control Identi-fier). Every device needs an explicit and unique MAC-ID. A Device Net netwok supports 64 ne-does. The MAC-ID can only be adjusted via explicit messaging. The default MAC-ID is setting on d63.

Attribute ID	Default value	Value range	Data length
6F hex	0 hex	0hex – 3Fhex	BYTE

9.1.6 Baudrate

Device Net supports three different baud rates that are being showed in the below table. The baudrate can be changed via explicit messages and stored in the EEPROM with a save com-mand. It is to insure that the selective baudrate has to be the same as the Device Net network baudrate. The default baudrate is setting 125kBaud.

Attribute ID	Default value	Value range	Data length
6E hex	0 hex	0hex - 2hex	BYTE

0x	Baudrate in kBaud
0	125
1	250
2	500

10 Operating Mode

10.1 Polled Mode

For switching the polled mode on the following telegrams are needed. Further it is assumed in the following example a master MAC ID of 0A hex and a slave MAC ID of 03 hex.

Allocate Master / Slave Connection Set

1. Allocate Polling

Byte Offset	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Frag [0]	XID	MAC ID					
1	R/R [0]	Service [4B]						
	Class ID [03]							
	Instance ID [01]							
	Allocation Choice [03]							
	0	0	Allocator MAC ID					

Definition CAN ID

10	9	8	7	6	5	4	3	2	1	0	Identity Usage	Hex Range
1	**0**	**Destination MAC ID**						**1**	**1**	**0**	**Group 2 Only Unconnected Explicit Request Message (reserved)**	

Example:

CAN-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
41E	0A	4B	03	01	03	0A

1. Setting the Expected_packet_rate of the Explicit Message Connection on 0:

Definition CAN-ID

10	9	8	7	6	5	4	3	2	1	0	Identity Usage	Hex Range
1	**0**	**Destination MAC ID**						**1**	**0**	**0**	**Master´s Explicit Request Message**	

Example:

CAN-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
41C	0A	10	05	01	09	00	00

1. Setting the Expected_packet_rate of the Polling Connection on 0:n:

Example:

CAN-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
41C	0A	10	05	02	09	00	00

Release Master / Slave Connection Set

Release Polling

Byte Offset	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Frag [0]	XID	MAC ID					
1	R/R [0]	Service [4C]						
	Class ID [03]							
	Instance ID [01]							
	Release Choice [03]							

Example:

CAN-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4
41E	0A	4C	03	01	03

10.2 Change of State Mode

The absolute rotary encoder sends data, without any request from the host, when the actual process value is changing. No telegram will occur when the position value is not changing. This results in a reduced bus loading.

Allocate Master / Slave Connection Set

Allocate COS

Byte Offset	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Frag [0]	XID	MAC ID					
1	R/R [0]	Service [4B]						
	Class ID [03]							
	Instance ID [01]							
	Allocation Choice [51]							
	0	0	Allocator MAC ID					

Example:

CAN-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
41E	0A	4B	03	01	51	0A

2. Setting Expected_packet_rate of the Explicit Message Connection on 0:

Example:

CAN-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
41C	0A	10	05	01	09	00	00

3. Setting Expected_packet_rate of the Change of State Connection on 0:

Example:

CAN-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
41C	0A	10	05	04	09	00	00

Release Master / Slave Connection Set

Release COS

Byte Offset	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Frag [0]	XID	MAC ID					
1	R/R [0]	Service [4C]						
	Class ID [03]							
	Instance ID [01]							
	Release Choice [51]							

Example:

CAN-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4
41E	0A	4C	03	01	51

10.3 Saving Parameter

The parameters of the absolute rotary encoder are saved in a non-volatile FLASH memory. Because of a limited number of writing cycles (□ 1,000), it is useful to transmit the modified parameter in the first step only in the RAM area. After adjusting and examination, those values can be saved in the FLASH memory. After successful saving of the parameter the encoder sends his MAC-ID on the bus. To get the process value a new allocation of the slave is required.

Byte Offset	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Frag [0]	XID	MAC ID					
1	R/R [0]	Service [32]						
	Class ID [23]							
	Instance ID [01]							

Example:

(MAC-ID Master: 0A hex, MAC-ID Slave: 03 hex)

CAN-ID	Byte 0	Byte 1	Byte 2	Byte 3
41C	0A	32	23	01

11 Transmission of the actual position

The process value is transmitted according to the following table.

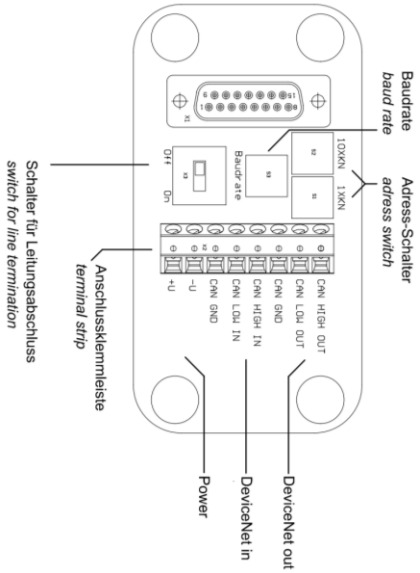
CAN-ID	process value			
11 Bit	Byte 0	Byte 1	Byte 2	Byte 3
	2^7 to 2^0	2^{15} to 2^8	2^{23} to 2^{16}	2^{31} to 2^{24}

12 Installation

12.1 Electrical connection

The rotary encoder is connected by three cables. The power supply is achieved with a two-wire connection cable through one PG 9. Each one of the twisted-pair and shielded bus lines are guided in and out through two PG 9 on the right side (as seen on clamps)

There is a resistor provided in the connection cap, which must be used as a line termination on the last device



Resistor:

The setting of the node number is achieved by 2 turn-switches in the connection cap. Possible addresses lie between 0 and 63 whereby every address can only be used once. 2 LEDs on the backside of the connection cap show the operating status of the encoder.

Clamp	Description
+U	+(12 … 30) V
-U	-U
CAN HIGH IN	Data line A
CAN LOW IN	Data line B
CAN GND	GND Bus in
CAN HIGH OUT	Data line A
CAN LOW OUT	Data line B
CAN GND	GND Bus out

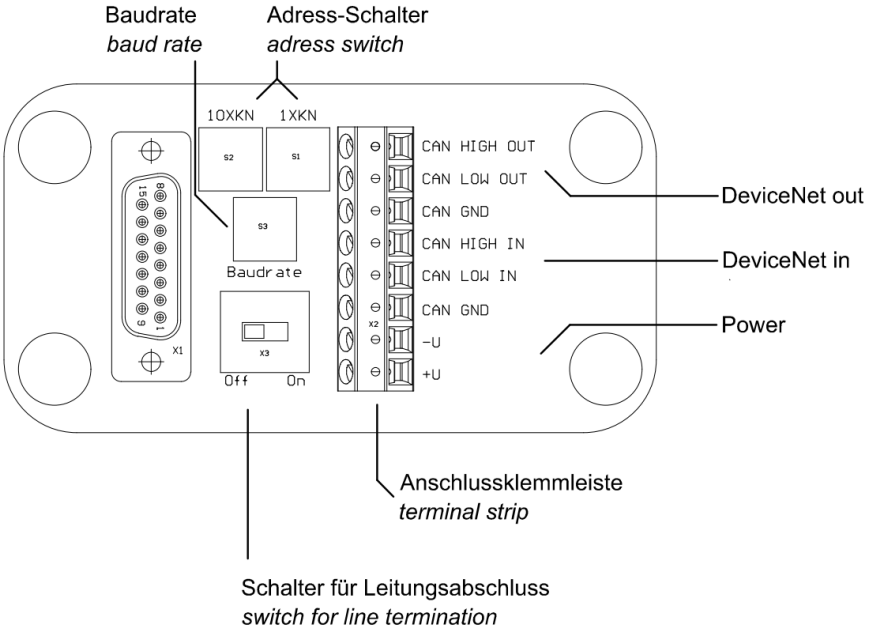
DeviceNet™ Devices BCD coded rotary switches	
x1 x10	Device adress 0...63 Setting CAN-node number
xBd	Setting of the baud-rate

12.2 Setting of the baudrate

Baudrate in kBit/s	BCD coded rotary switches
125	0
250	1
500	2
125	3
reserved	4...9

13 Connection diagram

+U	+(12...30)V	*+(12...30)V*
-U	-U	*-U*
CAN HIGH IN	Datenader A	*data line A*
CAN LOW IN	Datenader B	*data line B*
CAN GND	GND Bus In	*GND Bus In*
CAN HIGH OUT	Datenader A	*data line A*
CAN LOW OUT	Datenader B	*data line B*
CAN GND	GND Bus out	*GND Bus out*



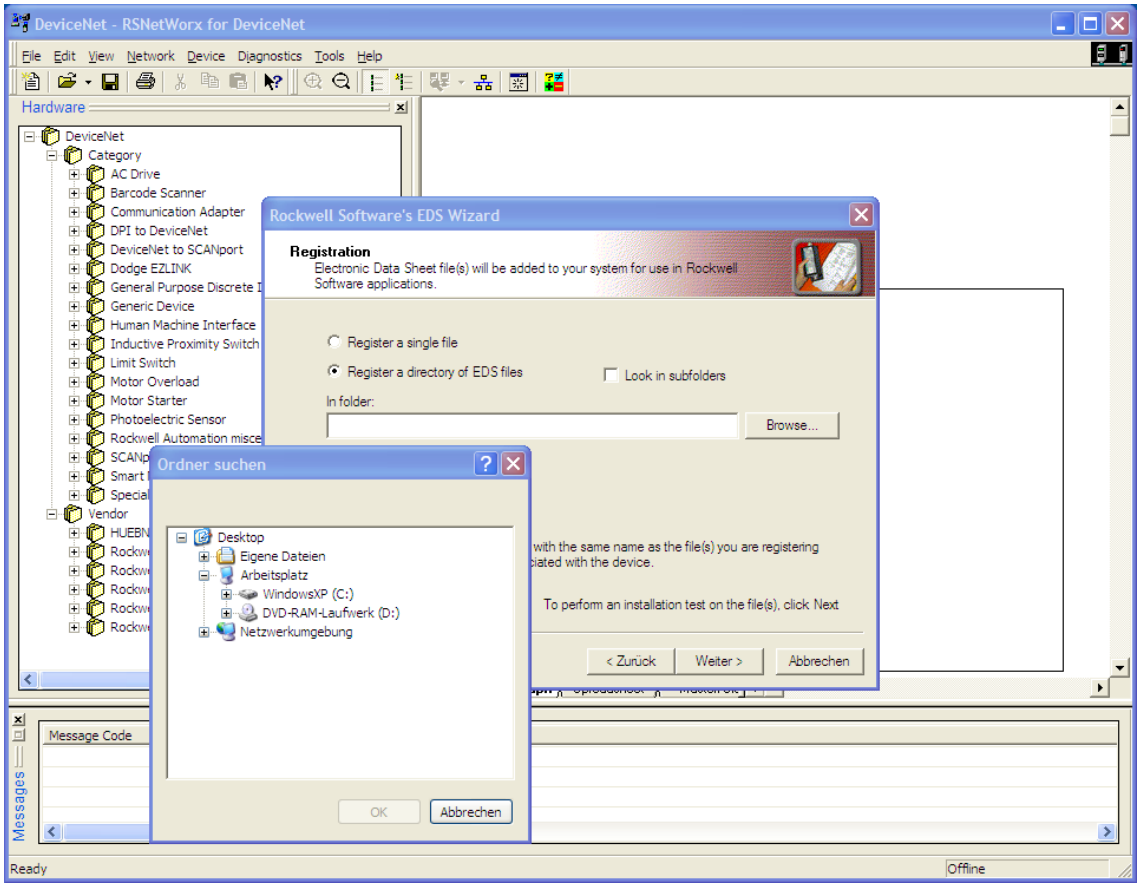
Connection diagram	AMN 40	PN 176-400

14 Power on

14.1 Operating Mode

After power on the absolute rotary encoder sends two times his MAC ID telegram on the bus.

14.2 Programming



If some parameters should not be modified you can skip over this chapter.
The following numbers are given in hexadecimal format.
In the examples, the CAN ID and MAC ID are 0A (hex) and for the slave 03 (hex).
The changeable values are written in an italics.

14.2.1 Operating Parameter

Master to absolute rotary encoder: Set-Parameter

CAN ID	MAC ID	Service Code	Class ID	Instance ID	Attribute ID	Data		
	Byte 0	Byte1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
41C	*0A*	10	23	01	70	X	-	-

X: 1 hex for CW (Default)

0 hex for CCW

Absolute Rotary Encoder to Master:Confirmation

CAN ID	MAC ID	Service Code
	Byte 0	Byte 1
41B	*0A*	90

14.2.2 Resolution per Revolution

Master to Absolute Rotary Encoder: Set-Parameter

CAN ID	MAC ID	Service Code	Class ID	Instance ID	Attribute ID	Data		
	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
41C	*0A*	10	23	01	71	X	*X*	-

X: desired resolution per revolution

Absolute rotary encoder to master: Confirmation

CAN ID	MAC ID	Service Code
	Byte0	Byte1
41B	0A	90

14.2.3 Total resolution

A fragmented transmission is needed, when the total resolution must be sent to the encoder. So here are more messages necessary.

Master to Absolute Rotary Encoder: Set-Parameter

CAN ID	MAC ID	Fragment	Service Code	Class ID	Instance ID	Attribute ID		
	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
41C	*8A*	00	10	23	01	72	X	X

Absolute Rotary Encoder to Master: Confirmation

CAN ID	MAC ID		
	Byte0	Byte 1	Byte 2
41B	8A	C0	00

Master to Absolute Rotary Encoder: Set-Parameter

CAN ID	MAC ID	Fragment						
	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
41C	8A	81	X	X	-	-	-	-

X: desired total resolution

Absolute Rotary Encoder to Master: Confirmation

CAN ID	MAC ID		
	Byte0	Byte 1	Byte 2
41B	8A	C1	00

Absolute Rotary Encoder to Master: Confirmation

CAN ID	MAC ID	Service Code
	Byte0	Byte1
41B	0A	90

14.2.4 Preset value

Master to Absolute Rotary Encoder: Set-Parameter

CAN ID	MAC ID	Fragment	Service Code	Class ID	Instance ID	Attribute ID		
	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
41C	8A	00	10	23	01	73	X	X

X: desired preset value

Absolute Rotary Encoder to Master Confirmation

CAN ID	MAC ID		
	Byte0	Byte 1	Byte 2
41B	8A	C0	00

Master to Absolute Rotary Encoder: Set-Parameter

CAN ID	MAC ID	Fragment						
	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
41C	8A	81	X	X	-	-	-	-

X: desired preset value

Absolute Rotary Encoder to Master Confirmation

CAN ID	MAC ID		
	Byte 0	Byte 1	Byte 2
41B	8A	C1	00

Absolute Rotary Encoder to Master: Confirmation

CAN ID	MAC ID	Service Code
	Byte0	Byte1
		90

14.2.5 Baudrate

Master to encoder: Set-Parameter

CAN ID	MAC ID	Service Code	Class ID	Instance ID	Attribute ID	Data		
	Byte0	Byte1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
41C	0A	10	23	01	6E	X	-	-

X: Value of the Baudrate

X	Baudrate
o	125kbaud
1	250kbaud
2	500kbaud

Encoder to Master: Confirmation

CAN ID	MAC ID	Service Code
	Byte0	Byte1
41B	0A	90

14.2.6 MAC-ID

Master to encoder: Set-Parameter

CAN ID	MAC ID	Service Code	Class ID	Instance ID	Attribute ID	Data		
	Byte0	Byte1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
41C	0A	10	23	01	6F	X	-	-

X:Value of the MAC-ID

Encoder to Master: Confirmation

CAN ID	MAC ID	Service Code
	Byte0	Byte1
41B	0A	90

14.2.7 Parameter saving

Master to Absolute Rotary Encoder: Set-Parameter

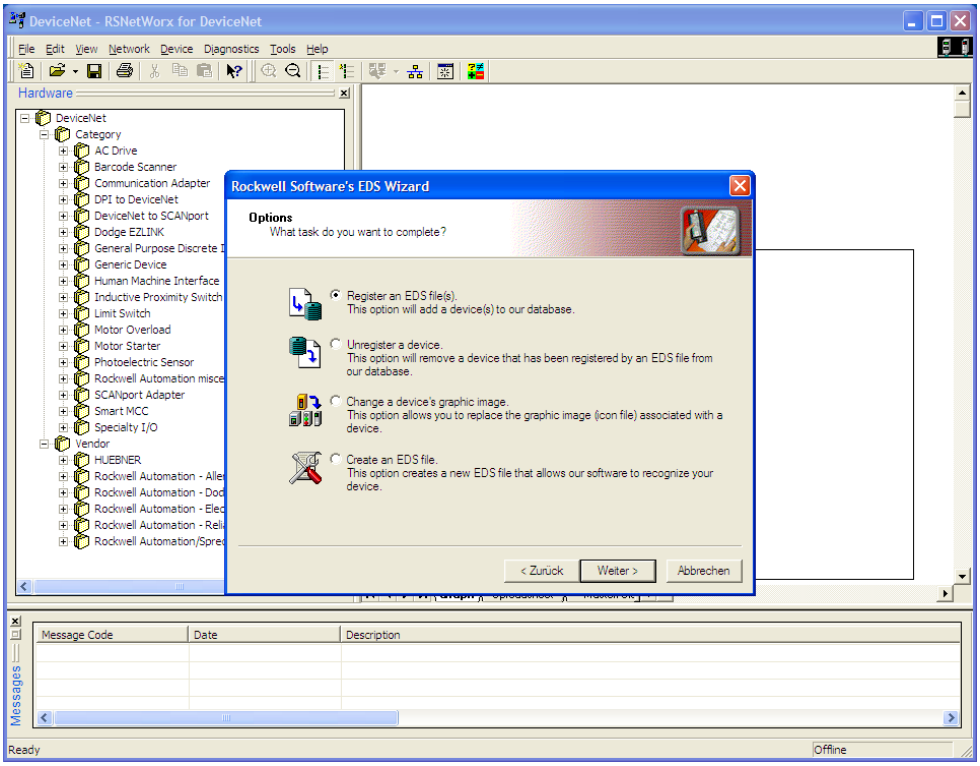
CAN ID	MAC ID	Service Code	Class ID	Instance ID
	Byte0	Byte1	Byte 2	Byte 3
		32	23	01

If the transfer has been successful, the absolute rotary encoder responds after 3-4s with the Duplicate MAC-ID. After that the master must reallocate the slave.
If the transfer is not successful, an error message will be sent. The service code used to save the parameter set is manufacturer specific.

15 RsNetworx

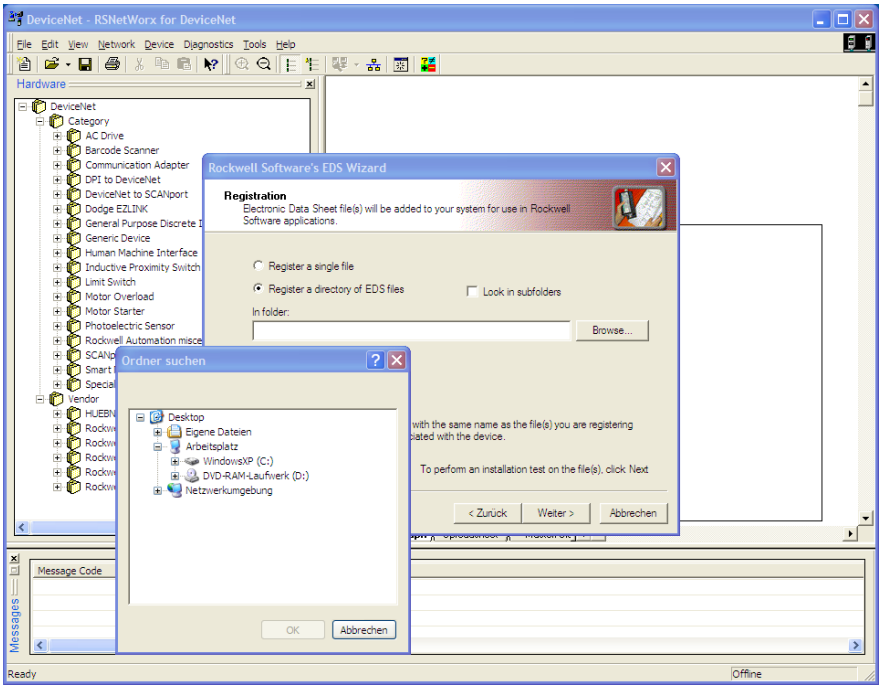
15.1 EDS Wizard

The EDS File contains information about device specific parameters as well as possible operat-ing modes of the encoder. With this file you have a data sheet in an electronic format, which can be used to configure the device in the net-work, for example with RsNetworx from Rock-well.



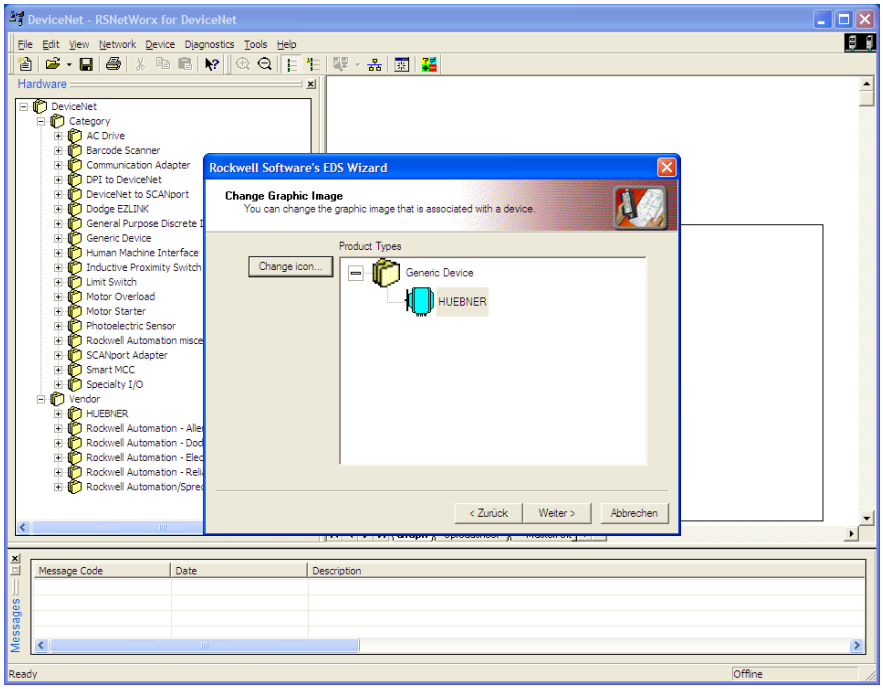
1.1 EDS Wizard

To install the EDS file the EDS Wizard has to be started, that can be done in the menu Tools/EDS Wizard. If the EDS Wizard is activated successfully the Register an EDS File(s) has to be chosen and after that the button weiter. In the next step the Register a directory of EDS files has to be chosen and with Browse the path of the EDS file(s). That is indicated in picture 1.2.



1.2 EDS Wizard

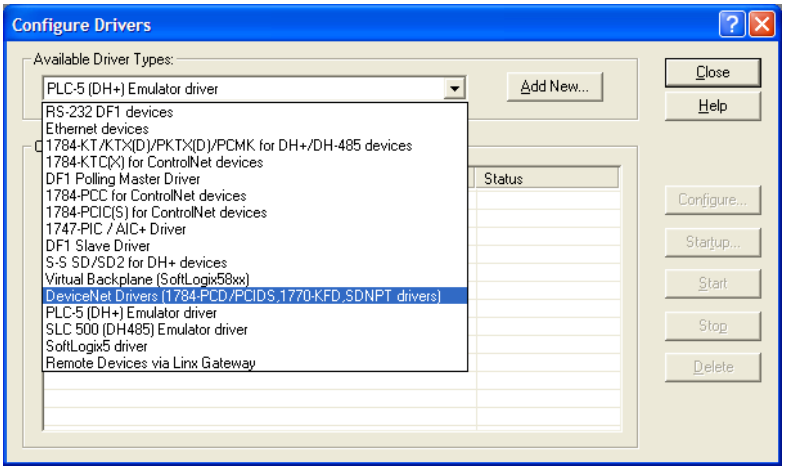
The Wizard finds all EDS files that are discarded in the choosing path and operates a test to check the EDS files on errors. In the next step (see picture 1.3) pictures can be selected for the using nodes. With the button weiter the installation can be continued and finished.



1.3 EDS Wizard

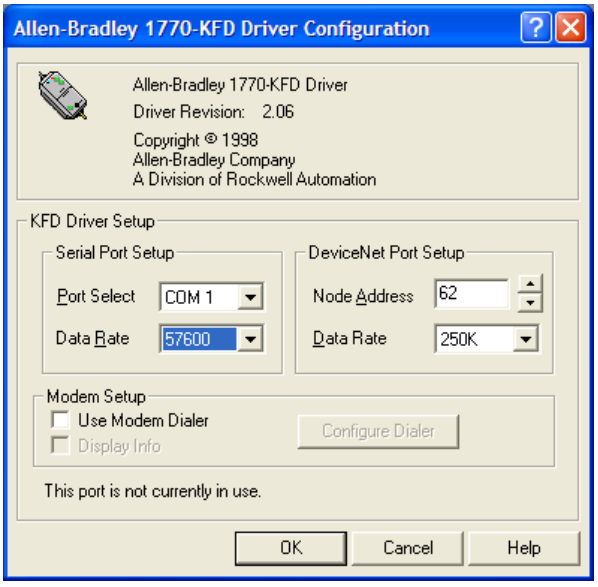
15.2 Driver Configuration

After a successful installing of the EDS file the next step is to choose the suitable driver. With Start/Programme/Rockwell Software/RSLinx in the menu the program RSLinx can be started. With this program the suitable driver can be chosen. For this example the driver type 1770-KFD is being used. In the next step the window Configure Drivers in the menu Communications/ Configure Drivers has to be started. In the drop down Menü Available Driver Types the driver type 1770-KFD has to be chosen and confirmed with the button Add New. (See picture 1.4)



1.4 Cofigure Drivers

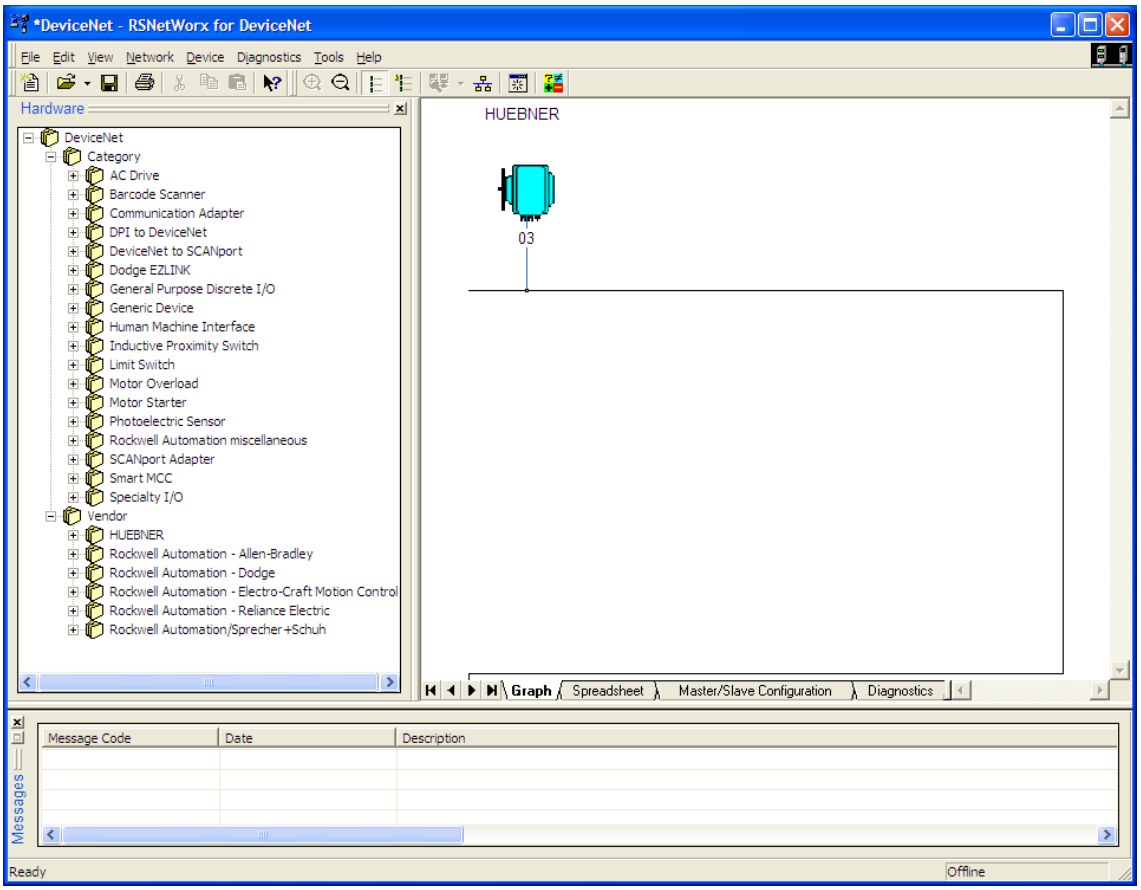
If the suitable driver is chosen it can be configured in the window Driver Configuration. In this step the correct baudrate has to be registered (picture 1.5). In the next step a requested name can be registered.



1.5 Driver Configuration

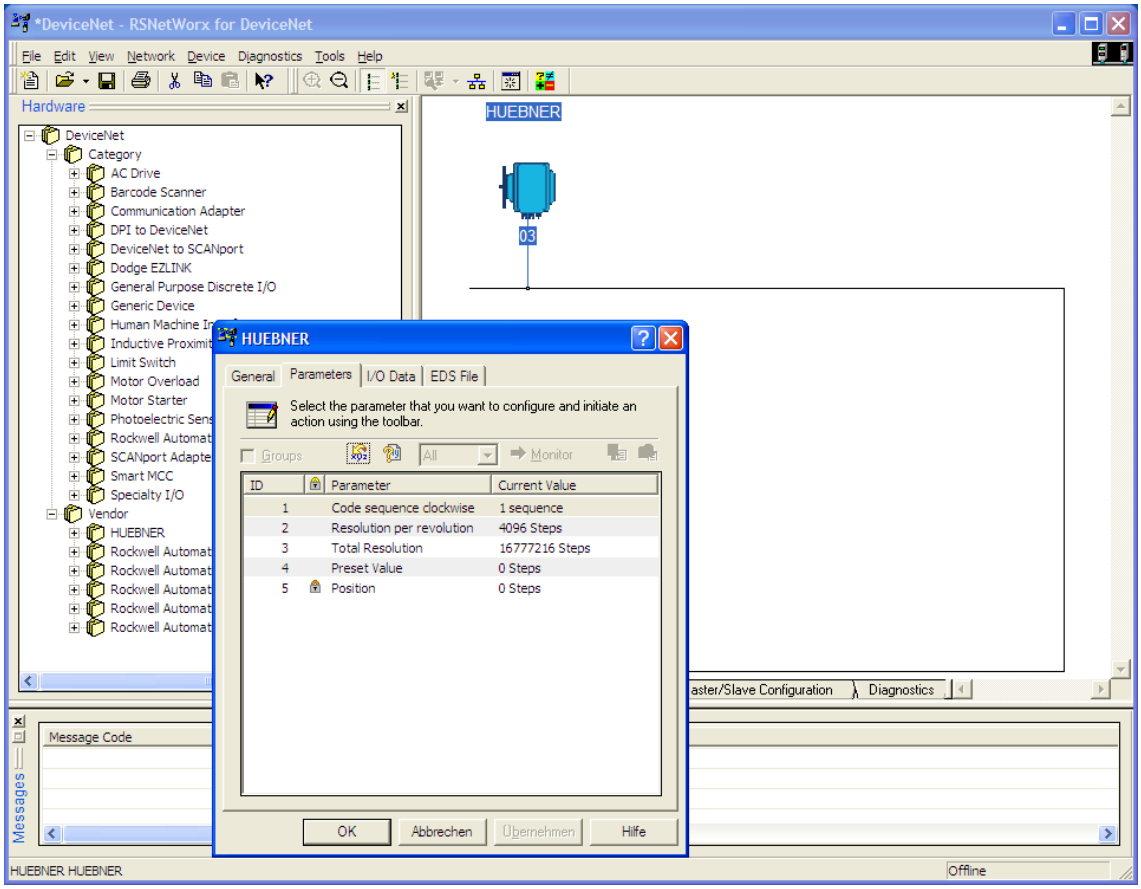
15.3 Network Connection

This chapter will explain how to switch a network online and how to parametrise a encoder. In the menu Network/ Online the window Browse for network will be opened. If the driver 1770-KFD has been chosen, this is explained in chapter 6.2, the network is online. After that RsNetworx searches in the network for connecting nodes. That is also being showed in picture 1.6.



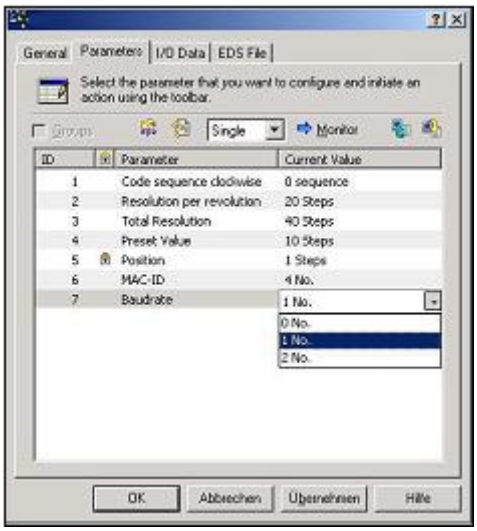
1.6 Browsing Network

To configure the encoder the configuration window in the menu Device/Properties has to be opened. By pushing Parameters an upload of the encoder parameter is realized.

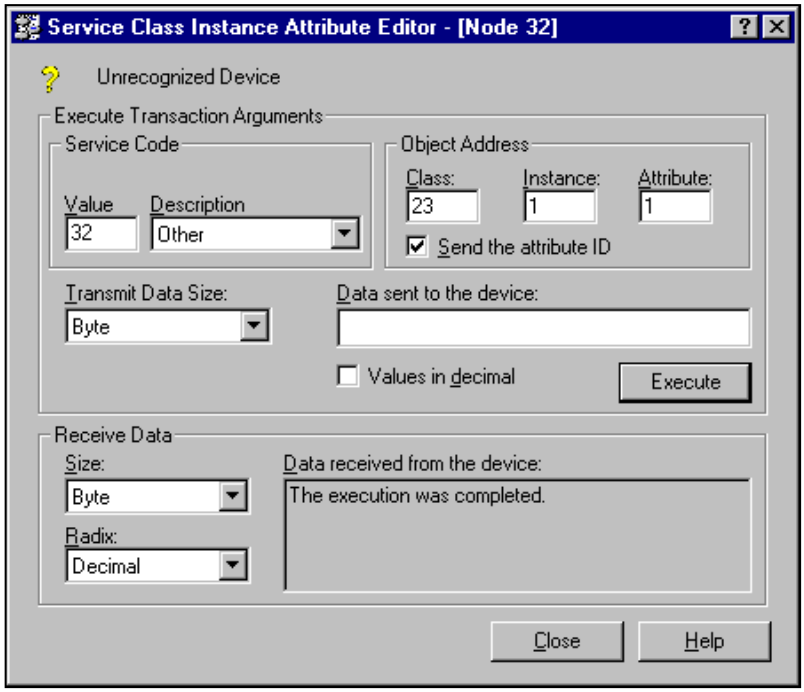


1.7 Upload Parameter

After a successful upload of the parameters, those can be configured as the picture 1.8 below shows. A download of the configured parameters can be realized with the yellow arrow that is showing down and is placed at the top right in the configuration window. An upload can be realized with the arrow beside the download arrow which is showing up. To show the position value the button Monitor has to be pushed. It should be noticed that the configuration parameters are not stored in the EEPROM. To store the parameters in the EEPROM the window in the menu Device/Class Instance Editor has to be opened. The entries that are necessary to store the parameters are being showed in the picture 1.9 below. At last the button execute has to be executed to store the parameters in the EEPROM.

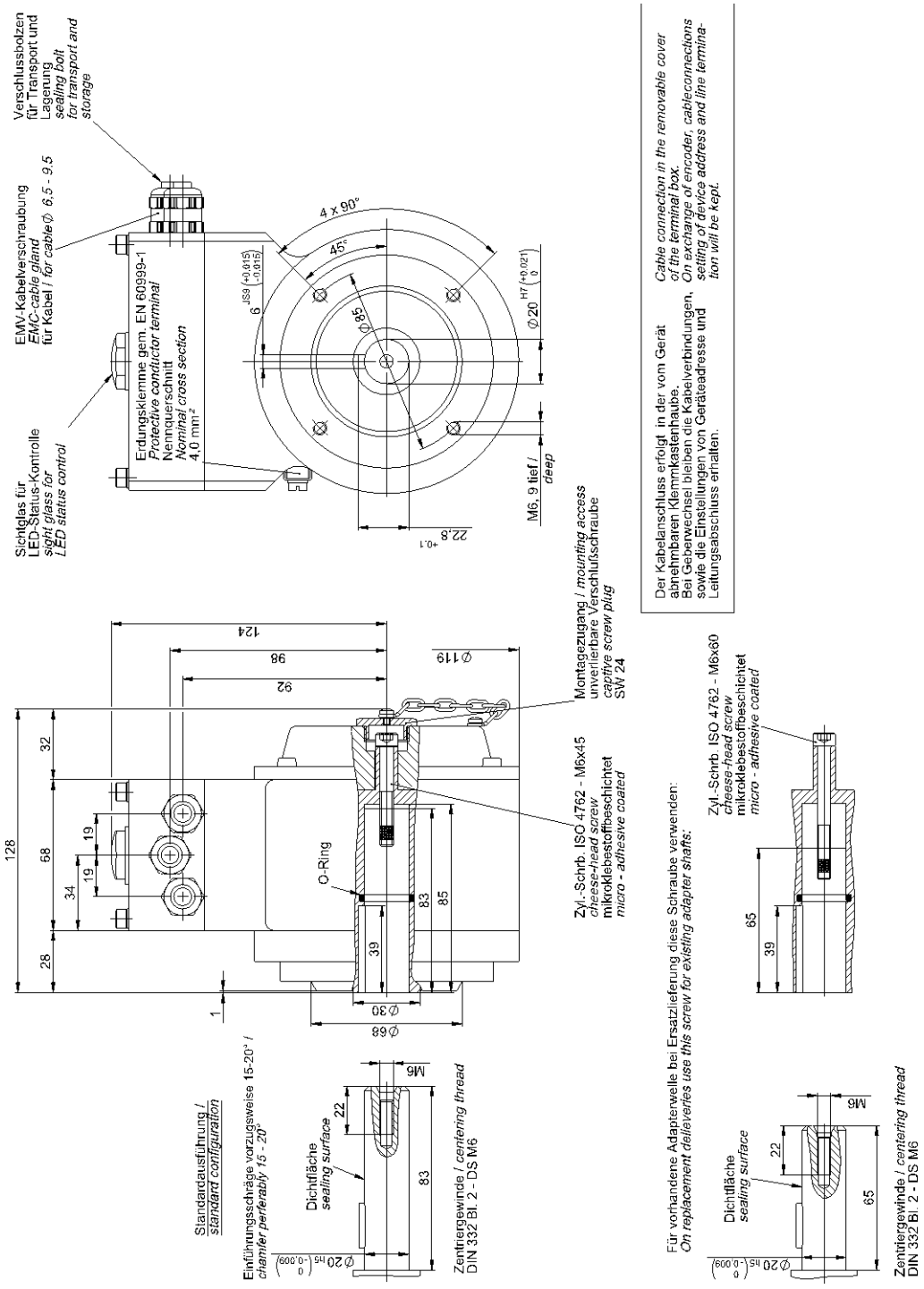


1.8 Configure Parameters



1.9 Service Class Instance Attribute Editor

16 Dimension drawing



17 EC-Declaration of Incorporation

JOHANNES HÜBNER GIESSEN

EG-Einbauerklärung

für unvollständige Maschinen
(EG-Richtlinie 2006/42/EG)

EC-Declaration of Incorporation

for partly completed machinery
(EC-Directive 2006/42/EC)

Hersteller / Manufacturer: Johannes Hübner Fabrik elektrischer Maschinen GmbH

Anschrift / Address: 35394 Giessen, Siemensstrasse 7

Produktbezeichnung / Product designation:

AMNH 40 K 1212
AMNH 40 K 1212

Die oben genannten Produkte entsprechen folgenden grundlegenden Anforderungen der Richtlinie 2006/42/EG:
1.1.2 Grundsätze für die Integration der Sicherheit
1.1.3 Materialien und Produkte
1.1.5 Konstruktion der Maschine im Hinblick auf Handhabung
1.3.2 Bruchrisiko bei Betrieb
1.3.3 Risiken durch herabfallende oder herausgeschleuderte Gegenstände
1.3.4 Risiken durch Oberflächen, Kanten und Ecken
1.5.1 Elektrische Energieversorgung
1.6.1 Wartung der Maschine
1.7.1 Informationen und Warnhinweise an der Maschine
1.7.2 Warnung vor Restrisiken
1.7.3 Kennzeichnung der Maschinen

The above mentioned products meets the following essential requirements from directive 2006/42/EC:
1.1.2 Principles of safety integration
1.1.3 Materials and products
1.1.5 Design of machinery to facilitate its handling
1.3.2 Risk of break-up during operation
1.3.3 Risks due to falling or ejected objects
1.3.4 Risks due to surfaces, edges or angles
1.5.1 Electricity supply
1.6.1 Machinery maintenance
1.7.1 Information and warnings on the machinery
1.7.2 Warning of residual risks
1.7.3 Marking of machinery

Die bezeichneten Produkte stimmen in der von uns in Verkehr gebrachten Ausführung mit den Vorschriften folgender Europäischer Richtlinien überein:
The products described above in the form as placed on the market are in conformity with the provisions of the following European Directive:

2014/30/EU (Ausgabe / Version 2014-02-26)
Richtlinie des Europäischen Parlaments und des Rates vom 26. Februar 2014 zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit

Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility

2006/42/EG: Folgende harmonisierende Normen wurden angewandt:

2006/42/EC: Following harmonised standards have been applied:

DIN EN ISO 12100 (Ausgabe / Version 2013-08)
Sicherheit von Maschinen

Safety of machinery

DIN EN 60204-1 (Ausgabe / Version 2010-05)
Sicherheit von Maschinen – Allgemeine Anforderungen

Safety of machinery – General requirements

2014/30/EU: Folgende harmonisierende Normen wurden angewandt:

2014/30/EU: Following harmonised standards have been applied:

DIN EN 55011 (Ausgabe / Version 2011-04) Industrielle, wissenschaftliche und medizinische Geräte - Funkstörungen - Grenzwerte und Messverfahren

Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement

DIN EN 61326-1 (Ausgabe / Version 2013-07)
Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 1: Allgemeine Anforderungen

Electrical equipment for measurement, control and laboratory use - EMC requirements -- Part 1: General requirements

Die Erstellung der speziellen technischen Unterlagen nach Anhang VII Teil B wird erklärt. Die Unterlagen werden vom Hersteller auf Verlangen der einzelstaatlichen Stellen zur Verfügung gestellt.

The preparation for relevant technical documents to appendix VII part B is delared. The documents will be made available from manufacturer to request by the competent national authorities.

Die Inbetriebnahme ist so lange untersagt, bis festgestellt wurde, dass - soweit zutreffend – die Maschine, in die o.a. unvollständige Maschine eingebaut werden soll, den Bestimmungen der Maschinenrichtlinie 2006/42/EG entspricht.

Startup is not permitted until it has been determined, that – as applicable - the machine into which the uncompleted machine has to be incorporated, does comply with the requirement of the machine directive (2006/42/EC).

Unterschrift:	Frank Tscherney (Geschäftsführer / General manager)	Datum: 2.9.2016