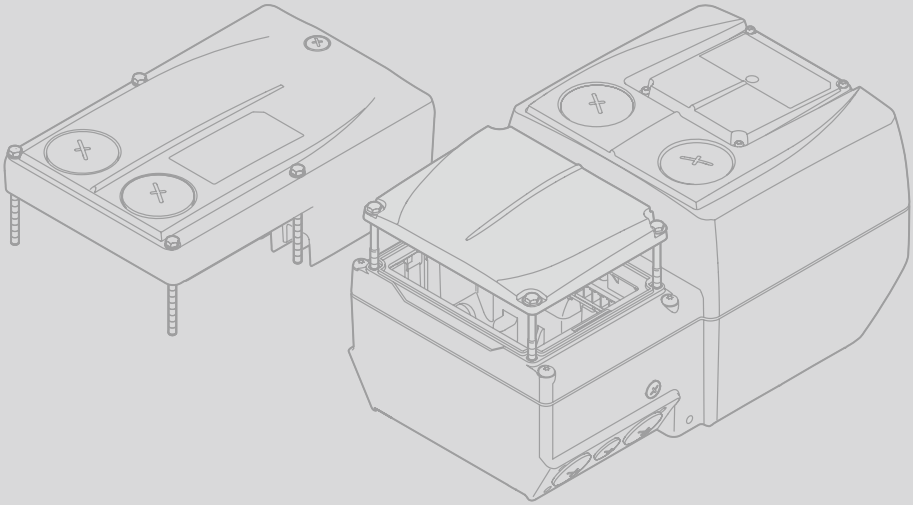
BAUER GEAR MOTOR™

A REGAL REXNORD BRAND

Operating Instruction
BA 155 EN - Edition 07/20

Decentral frequency inverter EtaK2.0



Graphic: Lenze

TRANSLATION

The operating instructions are an integral part of the product. It contains important information for your safety. Make sure that the operating instructions are always available in a legible condition and complete at the assembly or installation site. Read the operating instructions carefully and observe their contents. If you have any questions, please contact Bauer Gear Motor before putting the drive into operation. Further documentation can be found on our homepage.

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1 EU-Declaration of Conformity

EU Declaration of Conformity

BAUER GEAR MOTOR
A REGAL REXNORD BRAND

Low Voltage Directive 2014/35/EU
EMC Directive 2014/30/EU

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B 320.0790-01 Version: 07/20

Bauer Gear Motor GmbH
Eberhard-Bauer-Str. 37, 73734 Esslingen (Germany)

hereby declares on its sole responsibility conformity of the following products:

Geared motors with an attached frequency converter in the Eta-K2.0 series

with the requirements of the European Directives

DIRECTIVE 2014/35/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 the making available on the market of electrical equipment designed for use within certain voltage limits.
Published on 29 March 2014 in the Official Journal of the EU L96/357.

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.
Published on 29 March 2014 in the Official Journal of the EU L96/79.

The object of declaration as described above is in conformity with the pertinent harmonisation legislation of the Union, demonstrated by compliance with the following harmonised standards

EN 60034-1:2010 / AC:2010
EN 60034-5:2001 / A1:2007
EN 60529:1991 / A1:2000 / A2:2013
EN 61800-3:2004 / A1:2012
EN 61800-5-1:2007

Additional information:
Compliance with the directive requires correct installation of the products, observance of the specific installation instructions and the product documentation. The installer is responsible for the final EMC properties of the device, system or installation.

Esslingen 01 July 2020

Bauer Gear Motor GmbH

N. Halmuschi
(Managing Director)

P. Cagan
(Quality Director)

This declaration does not constitute a guarantee of features or performance with regard to product liability.
The technical documentation is produced and administered by Bauer Gear Motor GmbH.

CERT-EG5-KonfErkl_EMV_NSR_Eta-K2_0_B320_0790_01_EN

2 About this documentation

2.1 Target group

This documentation is directed at qualified skilled personnel according to IEC 60364. Qualified skilled personnel are persons who have the required qualifications to carry out all activities involved in installing, mounting, commissioning, and operating the product.

2.2 Validity information

These instructions are valid for EtaK2.0 controllers with the following type designation:

Type designation	From HW	From SW
K2Axxx	A	01.00

Further information on the type code can be obtained from the "Product description" chapter.

2.3 Safety instructions

The following pictographs and signal words are used in this documentation to indicate dangers and important information.

Structure of safety instructions:

Danger!
(characterises the type and severity of danger)
Note text
(describes the danger and gives information about how to prevent dangerous situations)

Pictograph and signal word	Meaning
 **Danger!**	**Danger of personal injury through dangerous electrical voltage** Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 **Danger!**	**Danger of personal injury through a general source of danger** Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 **STOP!**	**Danger of property damage** Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph and signal word	Meaning
 Note!	Important note to ensure troublefree operation
 Tip!	Useful tip for simple handling
 Info!	Reference to another documentation

2.4 Special safety instructions and application notes

Pictograph and signal word	Meaning
 Warnings!	**Safety note or application note for the operation according to UL or CSA requirements.** The measures are required to meet the requirements according to UL or CSA.
 Warnings!	

3 Safety instructions

3.1 Safety instructions

Danger!

Dangerous voltage

- The power terminals carry dangerous voltages for up to 3 minutes after mains disconnection.

Possible consequences:

- Death or severe injury if the power terminals are touched.

Protective measures:

- Switch off the mains voltage and wait at least 3 minutes before starting to work on the device.
- Check that all power terminals are deenergised.

Warning by symbols

Icon	Description
	**Long discharge time:** All power terminals remain live for up to 3 minutes after mains disconnection!
	**High leakage current:** Carry out fixed installation and PE connection in accordance with EN 61800–5–1!
	**Electrostatic sensitive devices:** Before working on the device, the staff must ensure to be free of electrostatic charge!
	**Hot surface:** Use personal protective equipment or wait until devices have cooled down!

3 Safety instructions

Please also refer to important additional information about the equipment as well as the safety technology found under: www.bauergears.com/downloads/etak20-software.

Original - English

Warnings!

- These devices are suitable for field wiring.
- Intended for use with 75 °C wire.
- Intended for use with copper conductors only.
- Suitable for use in a surrounding air temperature of 45 °C, and
  – additionally 60 °C when de–rating rules are followed.
- Hot surface. Risk of burn.
- Should this device be mounted on a motor, the combination needs to be suitable for the type rating.
- The supply terminals are to be tightened to:
  – For model suffix's 371, 551, 751, 112, 152 tighten to 4.4 – 5.3 lb–in.
  – For model suffix's 222, and 302, tighten to 7 lb–in.
- These devices are suitable for use on a circuit capable of delivering not more than 200000 rms symmetrical amperes, 480 V maximum
  – When protected by CC, R, T, or J class fuses or
  – When protected by a circuit breaker having an interrupting rating not less than 200 000 rms symmetrical amperes, 480 V maximum.
- Use fuses and circuit breakers only.
- Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.
- The opening of branch circuit protective devices may be an indication that a fault current has been interrupted. To reduce the risk of fire or electric shock, current carrying parts and other components, the controller should be examined and replaced if damaged.
- These devices provide overload protection rated for 125 % of the rated FLA.

CAUTION!

- Risk of electric shock. Please allow 3 minutes for the internal capacitors to discharge.

Original - French

Avertissements

- Ces équipements sont adaptés à un câblage à pied d'oeuvre.
- Utiliser des conducteurs 75 °C.
- Utiliser exclusivement des conducteurs en cuivre.
- Convient à une utilisation à une température ambiante maximale de 45 °C ainsi que – 60 °C en cas d'application des règles de réduction de puissance.
- Température élevée en surface. Risque de brûlure.
- En cas de montage de l'équipement sur le moteur, la combinaison doit être conforme à la qualification du type.
- Couples de serrage des bornes réseau :
  – Pour les types contenant le suffixe 371, 551, 751, 112, 152 : 0,5 à 0,6 Nm.
  – Pour les types contenant le suffixe 222 et 302 : 0,8 Nm.
- Convient aux circuits non susceptibles de délivrer plus de 200 000 ampères symétriques eff., maximum 480 V
  – Protection par des fusibles CC de calibre R, T ou J ; ou
  – Protection par disjoncteur à pouvoir de coupure nominal d'au moins 200000 ampères symétriques eff., maximum 480 V.
- Utiliser exclusivement des fusibles et des disjoncteurs.
- La protection statique intégrée n'offre pas la même protection qu'un disjoncteur. Une protection par disjoncteur externe doit être fournie, conformément au National Electrical Code et aux autres dispositions applicables au niveau local.
- Le déclenchement des dispositifs de protection du circuit de dérivation peut être dû à une coupure qui résulte d'un courant de défaut. Pour limiter le risque d'incendie ou de choc électrique, examiner les pièces porteuses de courant et les autres éléments du contrôleur ; les remplacer s'ils sont endommagés.
- Ces équipements intègrent une protection contre les surcharges conçue pour se déclencher à 125 % de l'intensité assignée à pleine charge.

ATTENTION !

- Risque de choc électrique. Patientez 3 minutes pour permettre aux condensateurs internes de se décharger.

3.2 Additional hazards for drive systems

The drive system and all the associated components for the control system and the drive have been approved for use on an industrial or commercial mains connection. Additional measures and/or a different configuration will be required if a connection to a public network is desired.

All necessary work involving these components must be carried out by suitably qualified technicians who have the supplied service manuals and product documentation, among other things, when performing any corresponding work and who must follow these consistently.

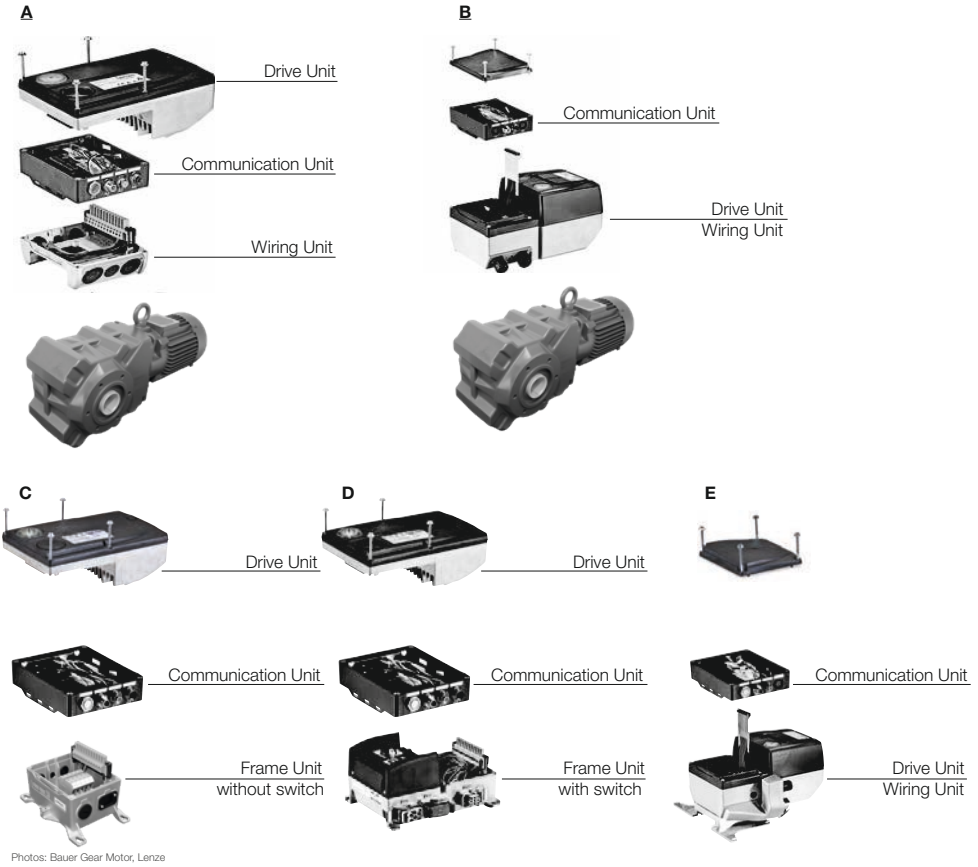
Machine manufacturers must perform a risk assessment in accordance with applicable directives (e.g. the EC Machinery Directive) to assess the residual risks originating from components such as the control system or the drive in a drive system.

1. The following situations may cause involuntary movements in driven machine parts during commissioning, operation, maintenance and repair:
   – Hardware and/or software errors in the sensors, control system, actuators, cables and connections
   – Reaction times for the control system and the drive
   – Operation and/or environmental conditions outside the specification
   – Condensation/conductive contamination
   – Parameterisation, programming, cabling and installation errors
   – Use of wireless devices/mobile phones in the immediate vicinity of the control system
   – External influences/damage

2. The following situations may cause hazardous shock voltages:
   – Component failure
   – Influence during electrostatic charging
   – Voltage induction in moving motors
   – Operation and/or environmental conditions outside the specification
   – Condensation/conductive contamination
   – External influences/damage

4 Product description

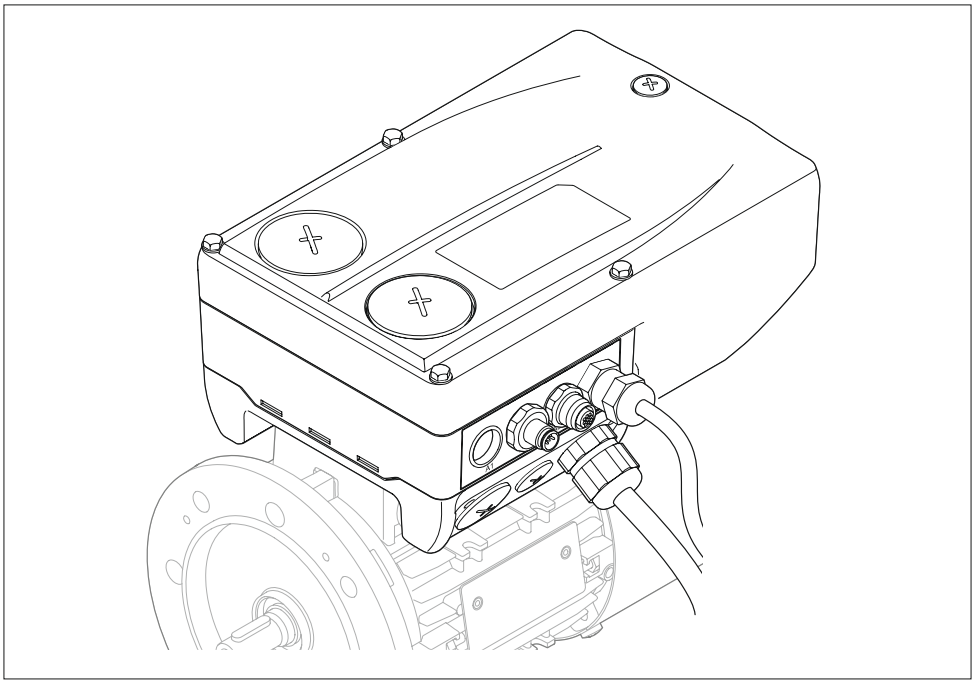
4.1 Overview of system identification



Photos: Bauer Gear Motor, Lenze

A	EtaK2.0		0.37 ... 3.0 kW
B	EtaK2.0		4.0 ... 7.5 kW
C	EtaK2.0	Field Package without switch	0.37 ... 3.0 kW
D	EtaK2.0	Field Package with switch	0.37 ... 3.0 kW
E	EtaK2.0	Field Package without switch	4.0 ... 7.5 kW

4.1.1 Inverter Assembly



Graphic Lenze

4.2 Technical data

4.2.1 General data and operating conditions

Conformity and approval			
Conformity			
CE	2006/95/EG	LowVoltage Directive	
ECA	TP TC 004/2011	On safety of low voltage equipment	Eurasian Conformity TR CU: Technical Regulation of Customs Union
ECA	TP TC 020/2011	Electromagnetic compatibility of technical means	Eurasian Conformity TR CU: Technical Regulation of Customs Union
Approval			
UR	UL508C	Power Conversion Equipment, File No. E170350	
cUR	C22.2 No 14		

Protection of persons and equipment			
Enclosure	EN 60529	IP65 optional: IP66	in ready–for–use state: Close unused bores for cable glands with blanking plugs! Close unused connectors with protection covers or blanking plugs!
	NEMA 250	Protection according to: • Type 4	
(Earth) leakage current	EN 61800-5-1	> 3.5 mA AC > 10 mA DC	Observe the regulations and safety instructions!
Total fault current		In TN systems the following earth–leakage circuit breakers can be used:	
Motor mounting		K2A003 ... K2A015	30 mA, type B
		K2A022 … 2A075	300 mA, type B
Wall mounting		K2A003 … 2A075	300 mA, type B
Additional equipotential bonding		M5 thread with terminal in the WU for connection of a 16 mm PE cable.	
Protective insulation of control circuits	EN 61800-5-1	Safe isolation from mains by double (reinforced) insulation.	
Insulation resistance	EN 61800-5-1	Site altitude	
		0…2000 m	Overvoltage category III
		2000…4000 m	Overvoltage category II
Short–circuit strength	EN 61800-5-1	Connection:	
		Motor	To a limited extent, the controller is inhibited, error acknowledgement required
		Motor holding brake, brake resistor	No
		PTC, control terminals	Full
Earth–fault strength	EN 61800-5-1	Connection:	
		Motor (at controller enable)	To a limited extent, the controller is inhibited, error acknowledgement required
		Motor (during operation)	No
		Brake resistor, PTC	No
Starting current		$\leq 2 \times I_N$	

Supply conditions			
Mains connection			
Power system			
TT, TN (with an earthed neutral)		Operation permitted without restrictions.	
IT		Implement the measure described for IT systems (remove IT screw). The machine/system manufacturer is responsible for compliance with EMC requirements for noise emission (EN 61800–3) for the machine/plant! Operation with an integrated safety system is **not** permissible.	
Motor connection			
Motors	EN 60034	Only use motors suitable for inverter operation. Insulation resistance: at least û ≥ 1.5 kV, at least du/dt 5 kV/µs	
Length of the motor cable		< 20 m motor cable shielded	

Ambient conditions			
Climatic			
Storage	IEC/EN 60721-3-1	1K3 (-30...+ 60 oC)	
Transport	IEC/EN 60721-3-2	2K3 (-30...+ 75 oC)	
Operation	IEC/EN 60721-3-3	3K3 (-30...+ 55 oC) Operation at 4 kHz: > +45 °C: Reduce the rated output current by 2.5 %/°C. Operation at 8/16 kHz: > +40 °C: Reduce the rated output current by 2.5 %/°C.	
Site altitude		< 4000 m amsl Above 1000 m amsl reduce the rated output current by 5 %/ 1000 m.	
Pollution	IEC/EN 61800-5-1	Degree of pollution 2	
Mechanical			
Vibration resistance (9.81 m/s²=1 g)			
Motor mounting	Germanischer Lloyd	General conditions: Acceleration resistant up to 2 g	
	IEC/EN 60721-3-3	3M6	
Wall mounting with E84DZMAWE1	Germanischer Lloyd	General conditions: Acceleration resistant up to 2 g	
	IEC/EN 60721-3-3	3M6	

Mounting conditions			
Mounting place			
Motor mounting		Standard	
Wall mounting		With optional wall adapter	Ensure convection cooling in the niches!
Mounting position			
Wall mounting			
K2A003…K2A030		Vertical, cooling fins at the top	Arrangement of several devices only to the sides, so that the convection cooling remains ensured!
K2A030…K2A075		Optional	

4.2.2 Rated data

4.2.2.1 Input data

Basis of the data			
Mains	**Voltage** U_{LN}[V]	**Voltage range** U_{LN}[V]	**Frequency range** f[Hz]
3/PE AC	400	320 – 0 % … 440 + 0 %	45 – 0 % … 65 + 0 %
3/PE AC	480	432 – 0 % … 528 + 0 %	45 – 0 % … 65 + 0 %

	Voltage [V]	**Frequency** [Hz]	**Rated current [A]** up to +45 °C*	up to +55 °C*	**Number of phases**
K2A003	400/480	50/60	1.3/1.1	1.0/0.8	3
K2A005	400/480	50/60	1.8/1.5	1.4/1.1	3
K2A007	400/480	50/60	2.4/2.0	1.8/1.5	3
K2A011	400/480	50/60	3.2/2.7	2.4/2.0	3
K2A015	400/480	50/60	3.8/3.1	2.9/2.3	3
K2A022	400/480	50/60	5.6/4.6	4.2/3.5	3
K2A030	400/480	50/60	7.2/5.9	5.4/4.4	3
K2A040	400/480	50/60	9.3/7.7	7.0/5.8	3
K2A055	400/480	50/60	12.8/10.6	9.6/8.0	3
K2A075	400/480	50/60	16.3/13.5	12.3/10.1	3

*Ambient temperature, switching frequency 4 kHz

4.2.2.2 Output data

	Voltage [V]	**Frequency** [Hz]	**Rated current [A]** up to +45 °C*	up to +55 °C*	**Number of phases**
K2A003	0 … 400/480	0 … 300	1.3/1.1	1.0/0.8	3
K2A005	0 … 400/480	0 … 300	1.8/1.5	1.4/1.1	3
K2A007	0 … 400/480	0 … 300	2.4/2.0	1.8/1.5	3
K2A011	0 … 400/480	0 … 300	3.2/2.7	2.4/2.0	3
K2A015	0 … 400/480	0 … 300	3.9/3.2	2.9/2.4	3
K2A022	0 … 400/480	0 … 300	5.6/4.7	4.2/3.5	3
K2A030	0 … 400/480	0 … 300	7.3/6.0	5.4/4.5	3
K2A040	0 … 400/480	0 … 300	9.5/7.9	7.1/5.9	3
K2A055	0 … 400/480	0 … 300	13.0/10.8	9.8/8.1	3
K2A075	0 … 400/480	0 … 300	16.5/13.7	12.4/10.3	3

*Ambient temperature, switching frequency 4 kHz

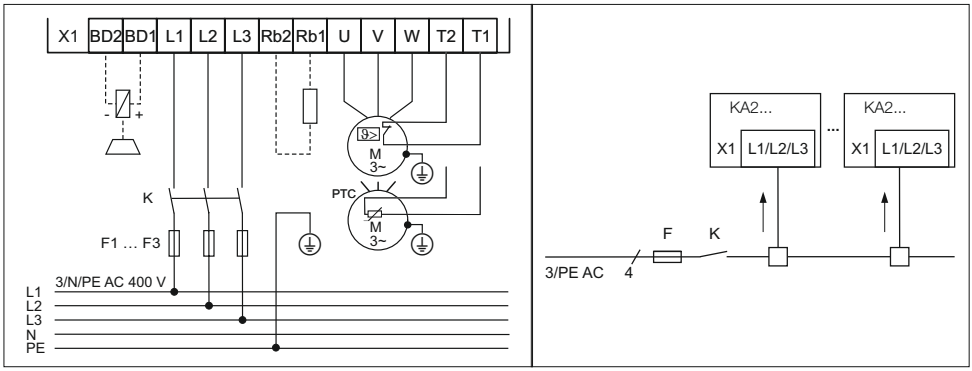
5 Installation

5.1 Mechanical installation

Please refer to the full version of the technical manual for detailed information and instructions. This is available for download at: **www.bauergears.com/downloads/etak20-software**

5.2 Mains connection

Please refer to the full version of the technical manual for detailed information and instructions. This is available for download at: **www.bauergears.com/downloads/etak20-software**



Graphic: Lenze

5.2.1 Connection Conditions

	F			L1,L2,L3/U,V,W			PE			T1,T2		
	EN60204		UL									
	[A]		[A]	[mm²] [AWG]	[mm]	[Nm] [lb-in]	[mm²] [AWG]	[mm]	[Nm] [lb-in]	[mm²] [AWG]	[mm]	[Nm] [lb-in]
K2A003 - K2A015	C16 C32	16 32	15	1…4.0 18…10	10	0.5 4.4	1…4.0 18…10	10	1.7 15	1.5 16	10	0.5 4.4
K2A022 - K2A030	C16 C32	16 32	15 25	1..6.0 18…8	10	0.8 7.0	1…16 18…8	10	1.7 15	1…6 18…8	10	0.8 7.0
K2A040 - K2A075	C20 C50	20 50	20 50	1…16.0 18…6	10	1.4 12	1…16 18…6	10	1.7 15	1…6 18…8	10	0.8 7.0

Graphic: Lenze

5.2.2 Quick On Connector

Photo: Bauer

5.2.2.1 Technical Data

General:	
Name:	QPD W 3PE2.5 9-14 M25 0.5 BK
Design:	QPD 4x2.5
Color:	black
Locking type:	Screw locking
Connection method:	QUICKON connection
Connection type:	IDC connection
Number of positions:	4
Note number of positions:	3+PE
Wrench size, union nut:	22 mm
Tightening torque, union nut:	5 Nm
Tightening torque, counter nut:	5 Nm
Wrench size, counter nut:	27 mm
Number of connections:	10
Conductor cross section flexible min.:	1 mm²
Conductor cross section flexible max.:	2.5 mm²
Conductor cross section solid min:	1 mm²
Conductor cross section solid max:	2.5 mm²
Conductor cross section AWG min:	16
Conductor cross section AWG max:	14

Cable:	
Structure of individual stranded wire in acc. with VDE 0295 / smallest wire diameter:	VDE 0295 class 1 to 6/min. 0.15 mm
Wire insulation material:	PVC/PE/TPE/rubber
Wire diameter including insulation:	2.5 mm - 3.8 mm
External cable diameter:	9 mm - 14 mm
Conductor cross section:	2.5 mm²
Position marking:	1, 2, 3, PE

Ambient conditions:	
Degree of protection:	IP66
Degree of protection:	IP68 (2 m / 24 h)
Degree of protection:	IP69K
Ambient temperature (operation):	-40 °C - 100 °C
Ambient temperature (storage/transport):	-40 °C - 80 °C
Temperature when conductor connected:	-5 °C - 50 °C

Electrical characteristics:	
Nominal current I_N:	20 A
Rated current:	20 A
Rated voltage (III/3):	690 V
Rated voltage (III/2):	1000 V
Rated voltage (II/2):	1000 V
Rated surge voltage (III/3):	6 kV
Rated surge voltage (III/2):	8 kV
Rated surge voltage (II/2):	8 kV

Mechanical characteristics:	
QUICKON connectability:	max. 10

Material data:	
Contact material:	Cu
Contact surface material:	silver-plated
Contact carrier material:	PA
Insulating material:	PA
Flammability rating according to UL 94:	V0
Overvoltage category:	III
Degree of pollution:	3

Standards and Regulations:	
Flammability rating according to UL 94:	V0

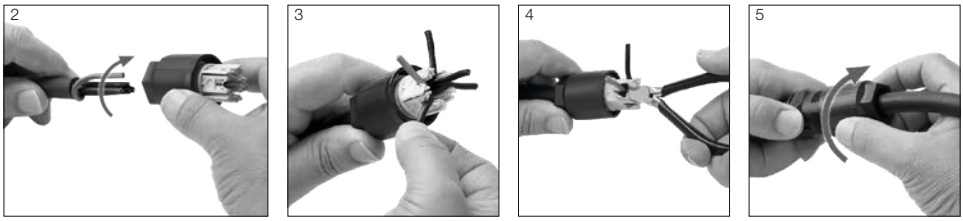
Ordering Information:	
Manufacturer:	Phoenix Contact
Type:	QPD W 3PE2,5 9-14 M25 0,5 BK
Item-no.:	1582175

5.2.2.2 Connecting the cable

WARNING:
The installation and startup must only be carried out by experts observing the country-specific regulations.

1. Strip approx. 60 mm off the cable.
2. Loop the PE wire around the live wires.
   - As a result, the protective conductor will be pulled out of the terminal block last if strong tension is exerted on the cable.
3. Insert the cable into the QUICKON nut and fix the wires in the conductor support of the splice body.
4. Cut off the wires with a diagonal cutter flush on the splice body.
5. Screw the QUICKON nut together with the QPD component (tightening torque: 5 Nm).

As a guide, numerals I, II, and III can be found on the connection. The QUICKON nut must be screwed on so tightly that it cannot be released again by hand.



Fotos: Phoenix

5.2.2.2.1 Detaching the cable

- To detach the cable, completely unscrew the QUICKON nut.
- Use a commercial bladed-type screwdriver (blade width 3 mm ... 4 mm) to remove the splice body from the connection dome.

The QUICKON connector is connected as described above. It features a capacitive PE contact. It is polarized to prevent mismatching and features touch-proof protection according to DIN EN 50274.

WARNING: Always de-energize the connector before connecting or disconnecting it.

5.2.2.3 Rewiring

The QUICKON connection with QUICKON nut and IDC terminal blocks can be rewired up to ten times with the same cable cross section. For this, the cable must be cut off and the connection has to be re-established.

5.2.2.4 Overview of connections

Connection number	Function
1	L1
2	L2
3	L3
	PE

5.2.3 M12 – Power Connector


Photo: Bauer

5.2.3.1 Technical Data

Environmental conditions:
Ambient temperature (operation): -25 °C - 85 °C (plug/bushing)
Ambient temperature (operation): -40 °C - 85 °C (no mechanical operation)
Protection code: IP67
General:

NOTE:
The electrical and mechanical data specified assume that the connector pair is correctly locked and mounted. If the connector is unlocked and if there is a danger of contamination, the connector must be sealed using a protective cap > IP54. Influences arising from stranded wires, cables or PCB assembly must also be taken into consideration.

General:	
Rated current at 40 °C:	12 A
Rated voltage:	630 V
Rated surge voltage:	6 kV
Number of positions:	4
Number of positions:	≥ 100 MOhm
Coding:	S - Power
Standards/regulations:	M12-connector
Signal type/category:	Power
Status display:	No
Overvoltage category:	III
Degree of pollution:	3
Test voltage:	6 kV
Connection method:	Individual wires
Insertion/withdrawal cycles:	> 100
Torque:	3 Nm ... 4 Nm (Installation-side)
Mounting type:	Front mounting M16 x 1.5

Material:	
Flammability rating according to UL 94:	V0
Contact material:	CuZn
Contact surface material:	Ni/Au
Contact carrier material:	PA
Material, knurls:	CuZn alloy, nickel-plated
Sealing material:	FKM

Cable:	
Cable type:	PP stranded wire
Conductor cross section:	1.5 mm²
AWG signal line:	16
Wire colors:	Black 1, black 2, black 3, green/yellow
Material conductor insulation:	PP
Conductor material:	Bare Cu stranded wires
Standards/specifications:	M12 connector
Flame resistance:	in acc. with UL FT-2
Halogen-free:	According to IEC 60754-1
Ambient temperature (operation):	-40 °C - 90 °C (cable, fixed installation)
Ambient temperature (operation):	-30 °C - 90 °C (cable, flexible installation)

Standards and Regulations:	
Standard designation:	M12-connector
Halogen-free:	According to IEC 60754-1
Flame resistance:	in acc. with UL FT-2
Flammability rating according to UL 94:	V0

Ordering Information:	
Manufacturer:	Phoenix Contact
Type:	SACC-E-M12MSS-4CON-M16/0,5 PE
Item-no.:	1424139

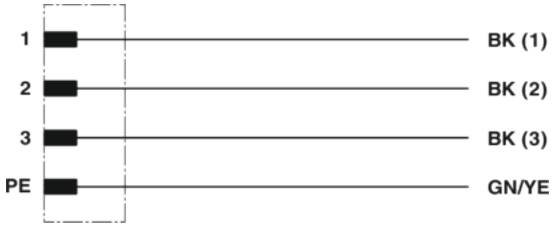
5.2.3.2 Connecting a cable

Schematic diagram

Graphic: Phoenix

Connector pin assignment of M12 plug, 4-pos., S-coded, view of pin side M12 flush-type plug.

Circuit diagram



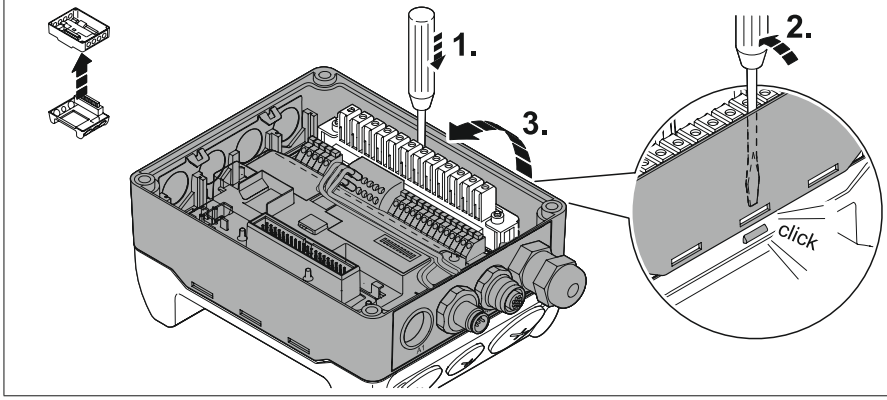
Graphic: Phoenix

Pin Number	Function
1	L1
2	L2
3	L3
PE	PE

5.3 Connection for the Communication Unit (CU)

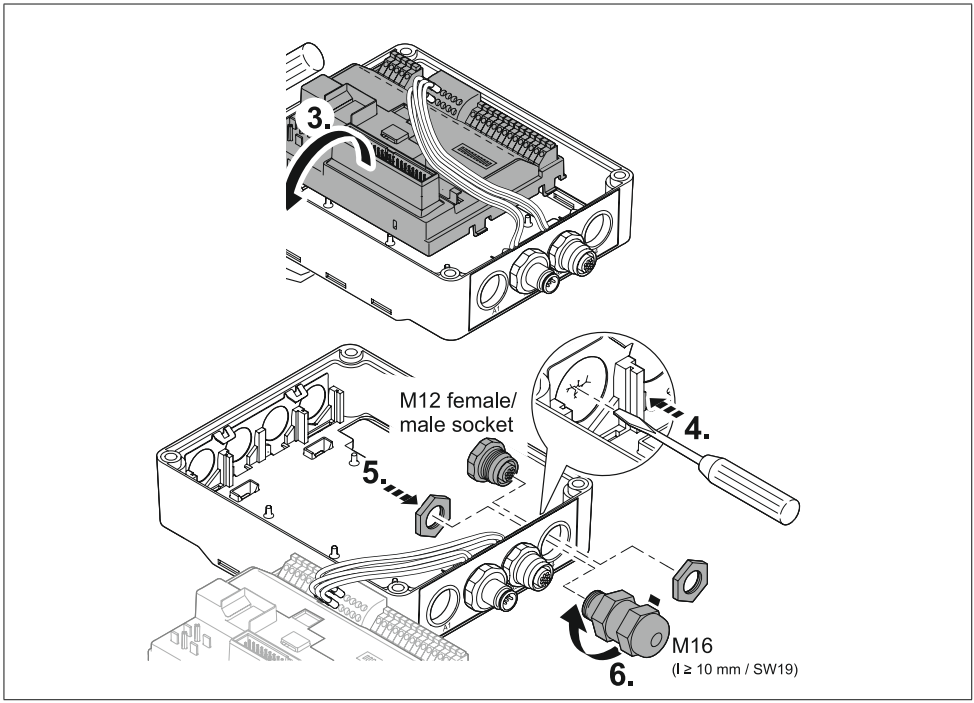
5.3.1 Removing the communication unit from the wiring unit

0.37 ... 3.0 kW



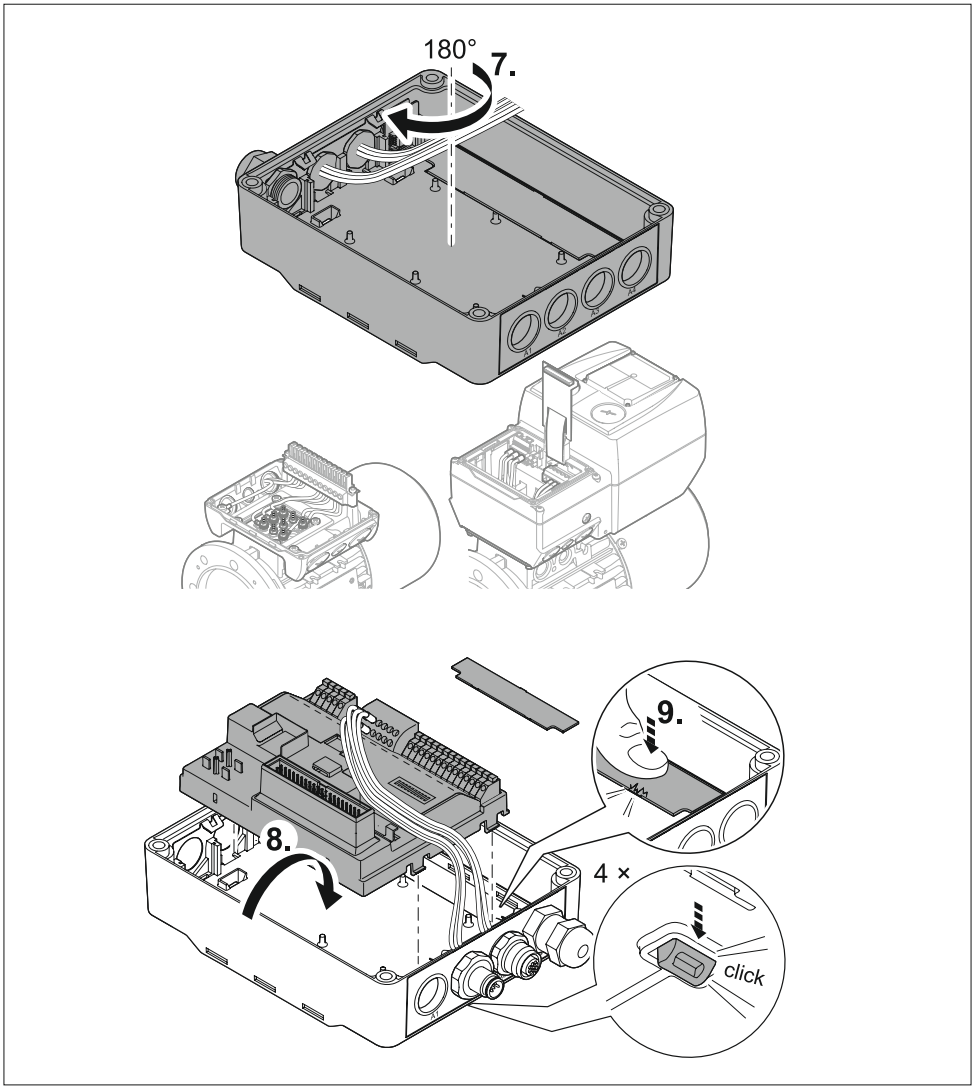
Graphic: Lenze

5.3.2 Disconnecting the circuit board & mounting the screw connection



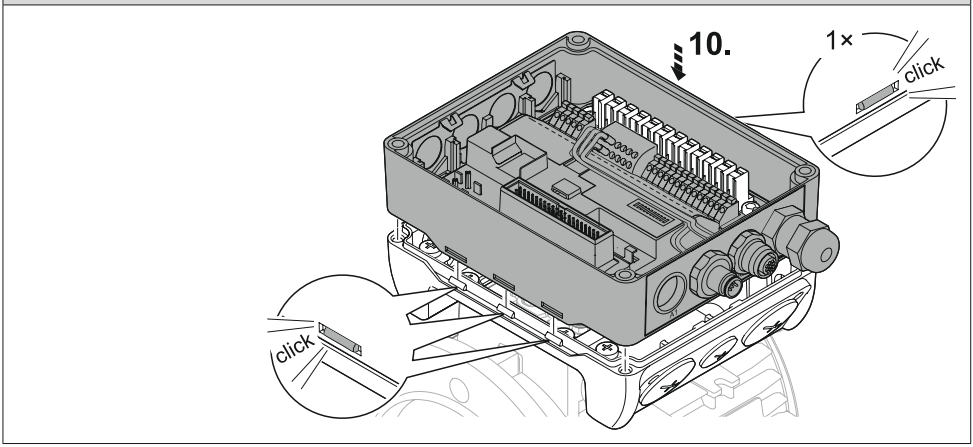
Graphic: Lenze

5.3.3 Rotating the communication unit



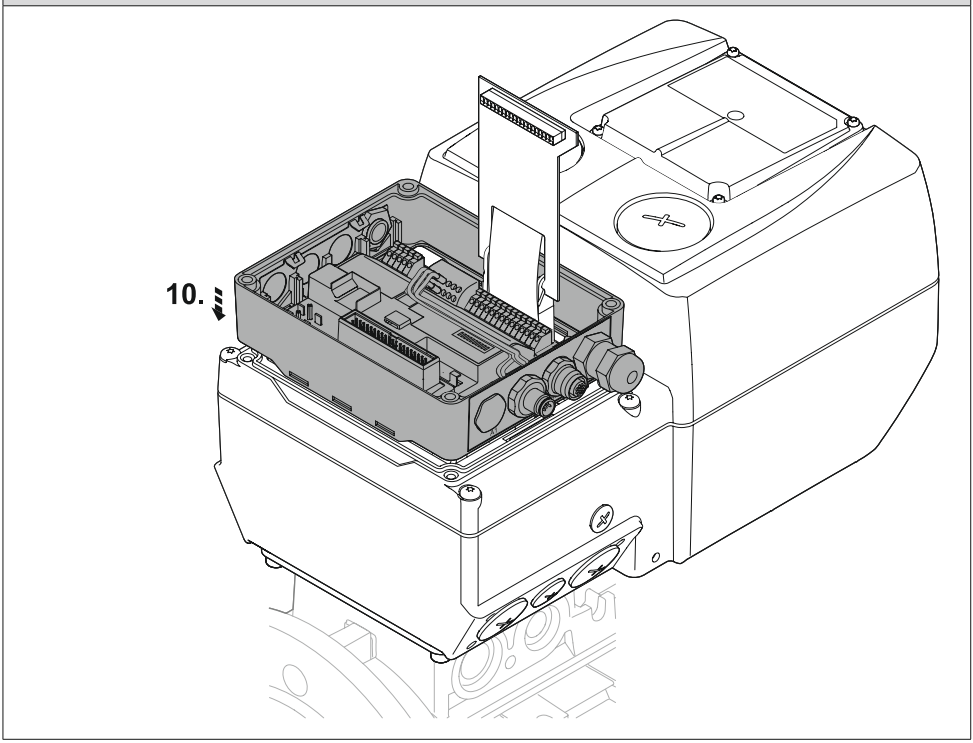
Graphic: Lenze

0.37 ... 3.0 kW



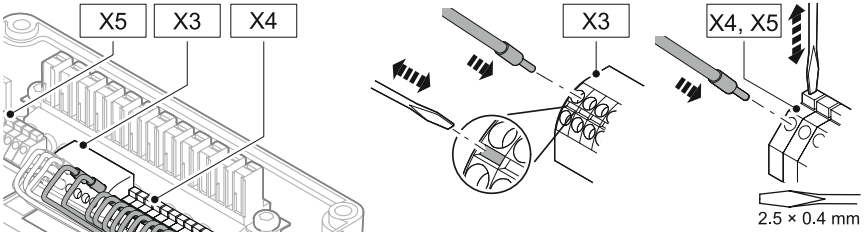
Graphic: Lenze

4.0 ... 7.5 kW

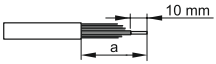
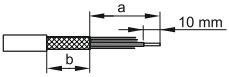


Graphic: Lenze

5.3.4 Connections for I/O



Graphic: Lenze

X4 - DIO, Relay	X4, X5 - AIO
	

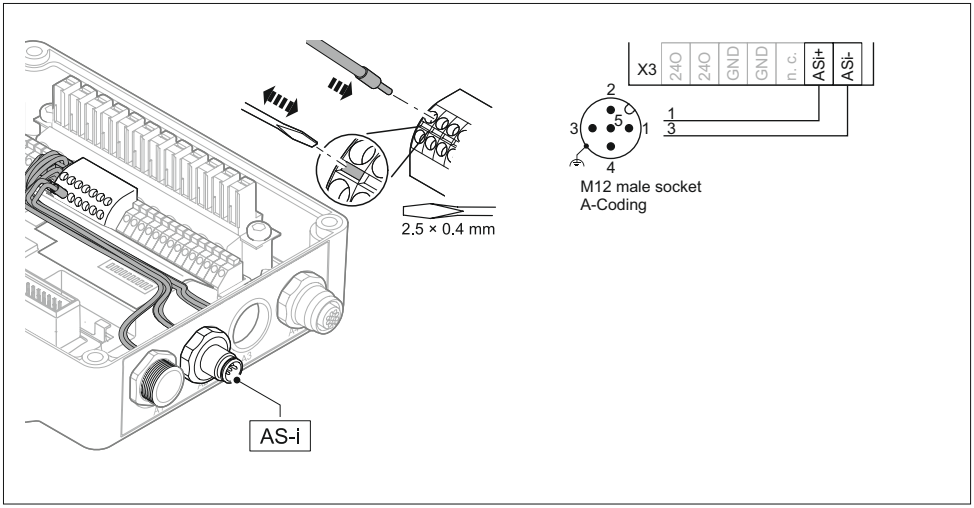
Graphic: Lenze

X4, X5	a [mm]	b [mm]		[mm²] [AWG]
DIO, Relay	90	-		0.5 ... 1.5 20 ... 16
				0.5 ... 1.0 20 ... 18
AIO	90	10		0.5 20

X3	a [mm]	b [mm]		[mm²] [AWG]
24E, GND	90	-		0.5 ... 1.5 20 ... 16
				0.5 ... 1.0 20 ... 18
				0.5 20

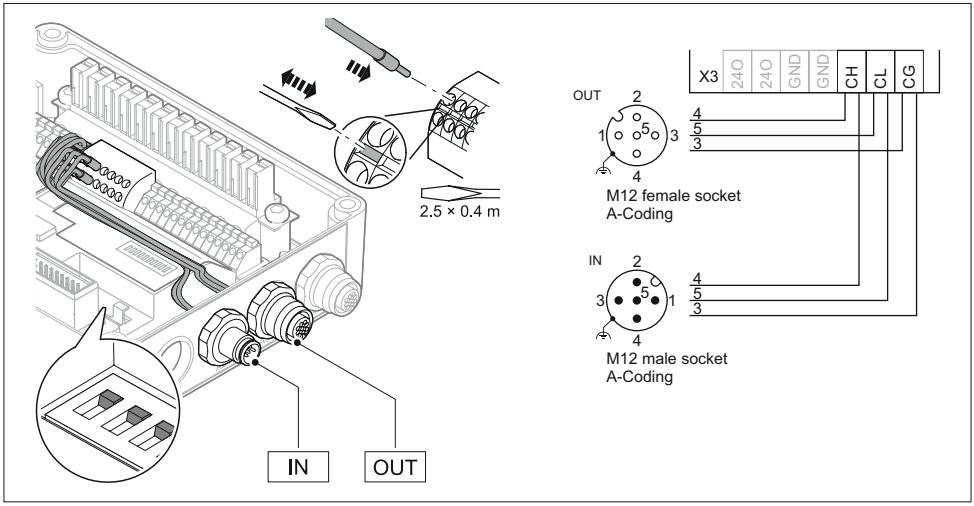
Graphics: Lenze

5.3.5 Connections for AS-i K2ADGFCAxxx

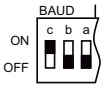


Graphic: Lenze

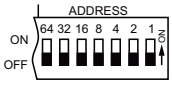
5.3.6 Connections for CAN K2ADGFCCxxx



Graphic: Lenze

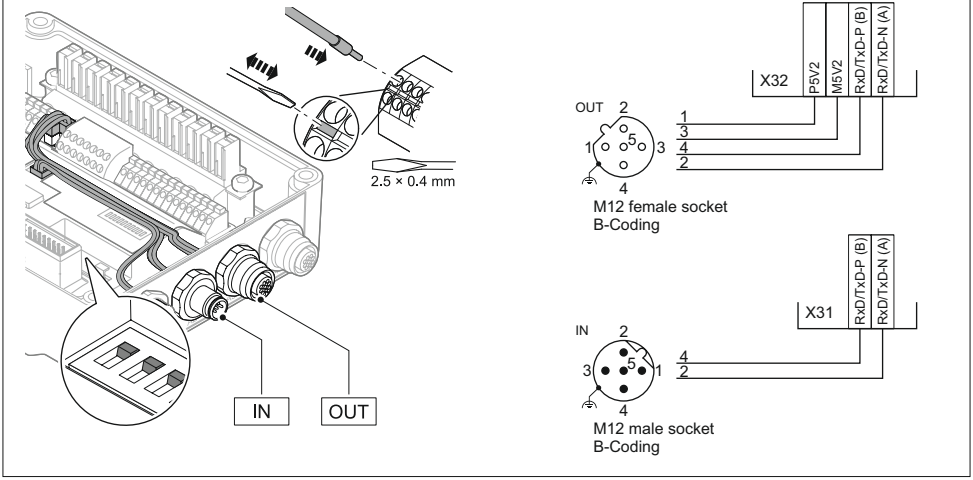
DIP	c	b	a	Baud rate
	ON	OFF	ON	20 kBit/s
	OFF	ON	ON	50 kBit/s
	OFF	ON	OFF	125 kBit/s
	OFF	OFF	ON	250 kBit/s
	OFF	OFF	OFF	500 kBit/s
	ON	ON	OFF	800 kBit/s
	ON	OFF	OFF	1000 kBit/s

Graphic: Lenze

DIP	Adress							
	64	32	16	8	4	2	1	
	OFF	OFF	OFF	OFF	OFF	OFF	OFF	→ C00350
	OFF	OFF	OFF	OFF	OFF	OFF	ON	→ 1
	OFF	...	...	...	...	...	...	...
	OFF	ON	ON	ON	ON	ON	ON	→ 63
	ON	...	...	...	...	...	...	

Graphic: Lenze

5.3.7 Connections for PROFIBUS K2ADGFCPxxx

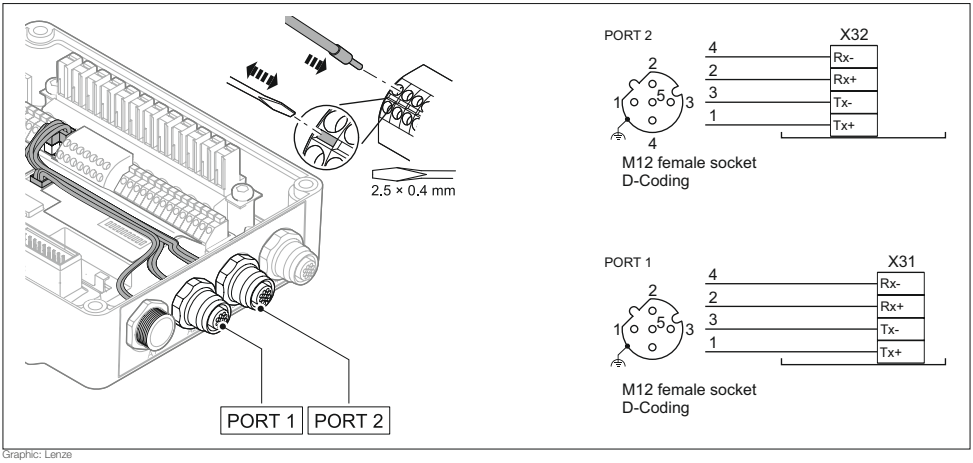


Graphic: Lenze

DIP	Set	Adress							
	S	64	32	16	8	4	2	1	
SET ADDRESS S 64 32 16 8 4 2 1 ON ON OFF	OFF	...	...	...	...	...	...	...	→ Master
	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	→ C13899
	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	→ 1
	ON	...	...	...	...	...	...	...	...
	ON	ON	ON	ON	ON	ON	ON	OFF	→ 126

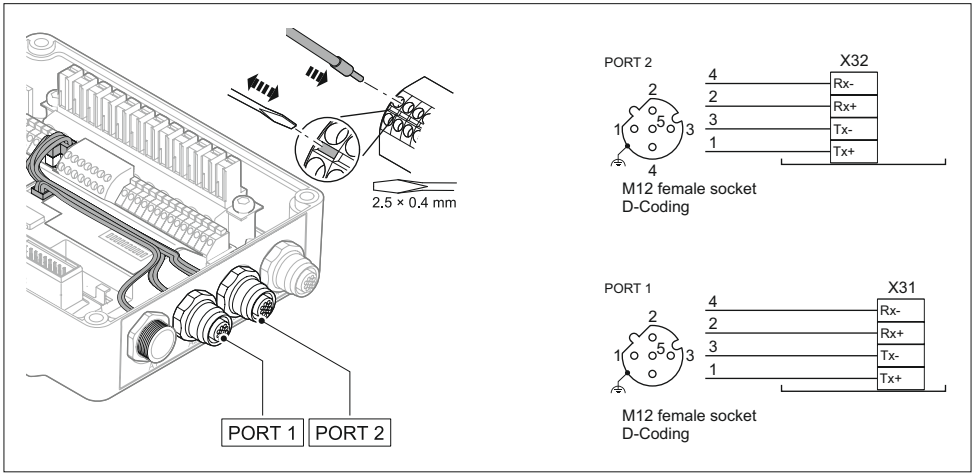
Graphic: Lenze

5.3.8 Connections for PROFINET K2ADGFCRxxx



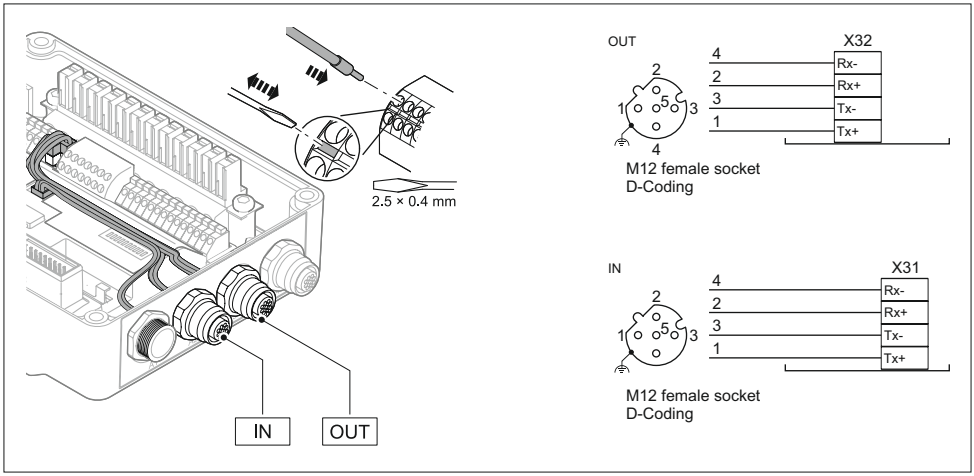
Graphic: Lenze

5.3.9 Connections for ETHERNET/IP K2ADGFCGxxx



Graphic: Lenze

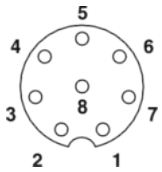
5.3.10 Connections for EtherCAT K2ADGFCTxxx



Graphic: Lenze

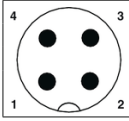
5.3.11 Connections for standard I/O

5.3.11.1 Type 1

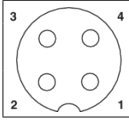


Pin No.	Description
1	AU/AI
2	RFR
3	DI1
4	DI2
5	+24V
6	AR
7	GND
8	DO1

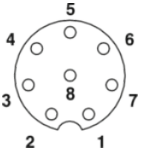
5.3.11.2 Type 2



1	NO
2	
3	
4	COM

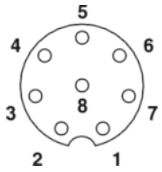


1	+24V
2	GND
3	AR
4	AU/AI



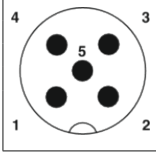
1	RFR
2	+24V
3	DI1
4	DI2
5	DI3
6	DO1
7	GND
8	DI4

5.3.11.3 Type 3



1	RFR
2	24+
3	DI1
4	DI2
5	DI3
6	DO1
7	GND
8	DI4

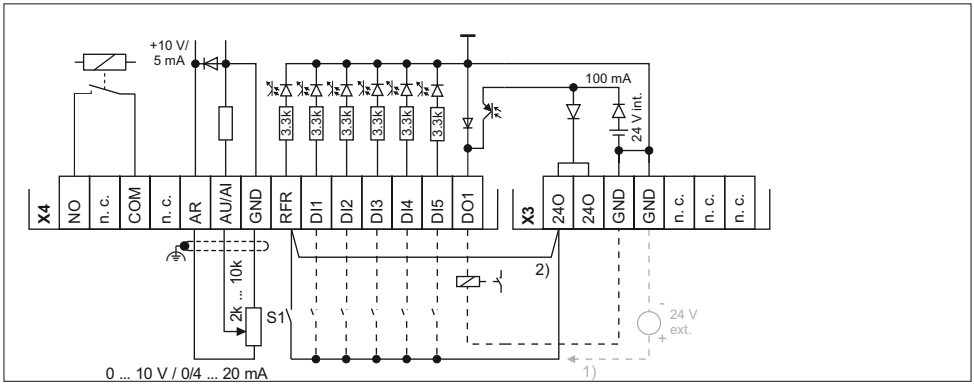
5.3.12 Connection for the safety option



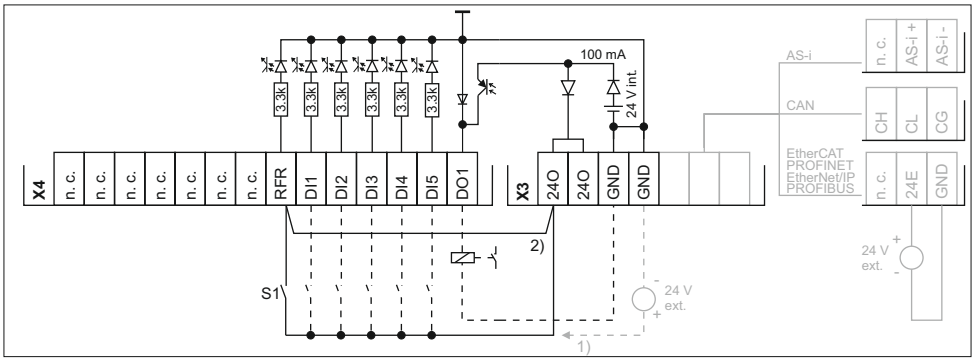
1	SIA
2	SIB
3	DO
4	+24V
5	GI

Graphics: Phoenix

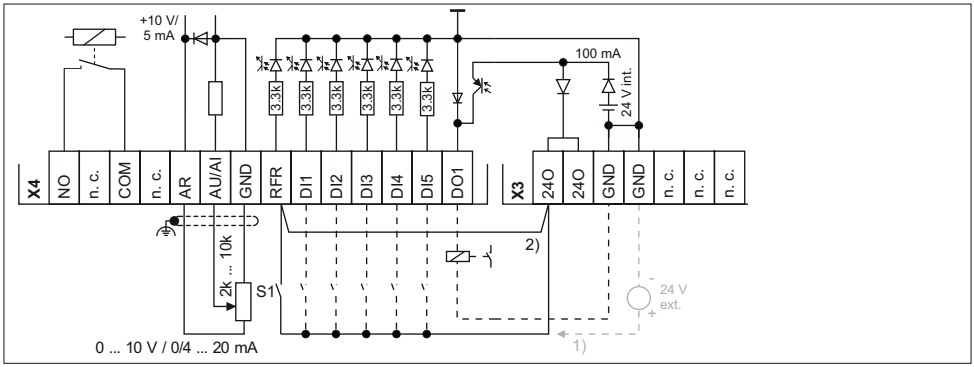
5.3.13 Wiring diagram for Standard I/O



5.3.14 Wiring diagram for AS-i, CAN, PROFIBUS, PROFINET, EtherNet/IP, EtherCAT



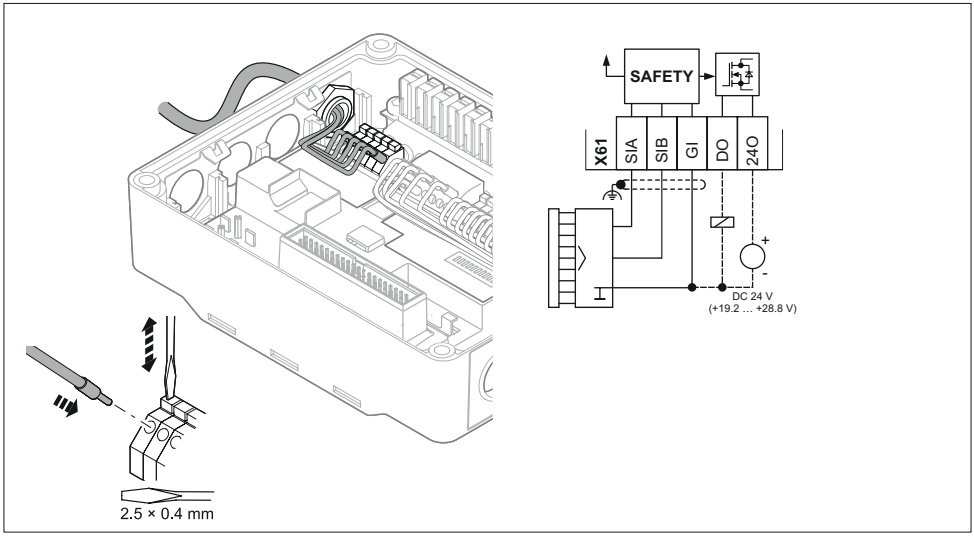
5.3.15 Wiring diagram for Safety + (AS-i, CAN, PROFIBUS, PROFINET, EtherNet/IP, EtherCAT)



Graphics: Lenze

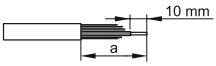
1) = alternativ

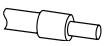
5.3.16 Wiring diagram for the safety option



Graphic: Lenze

X61



X61	a [mm]		[mm²] [AWG]
Safety	55		0.5 ... 1.5 20 ... 16
			0.5 ... 1.0 20 ... 18
			0.5 20

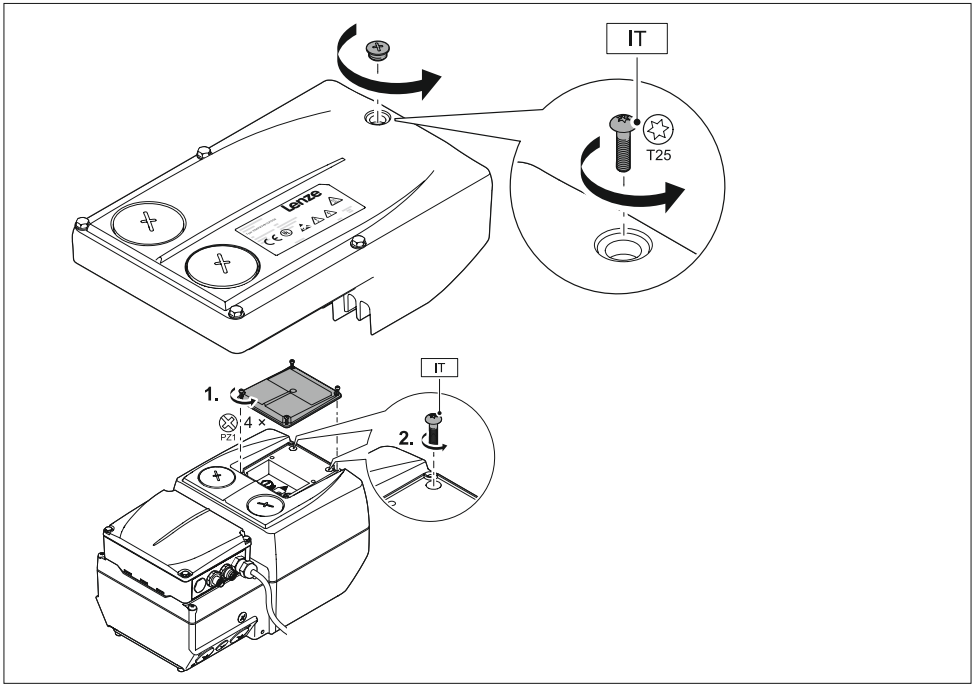
Graphics: Lenze

5.4 Measures when drive is used in IT systems

If the drive is mounted within an IT system, internal filters must be separated from the PE conductor. How to proceed:

1. If the controller has already been mounted: switch off mains voltage!
2. Make IT screw accessible.
   - Devices up to 3 kW: unscrew small cap on the top.
   - Devices from 4 kW: remove small cover on the top.
3. Unscrew and remove the screw(s).
4. Screw the cap on or fit the cover.

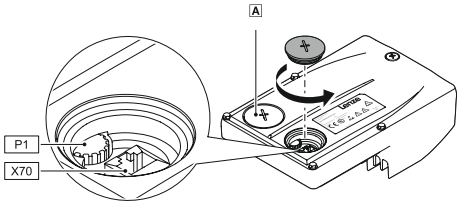
IT system



Graphic: Lenze

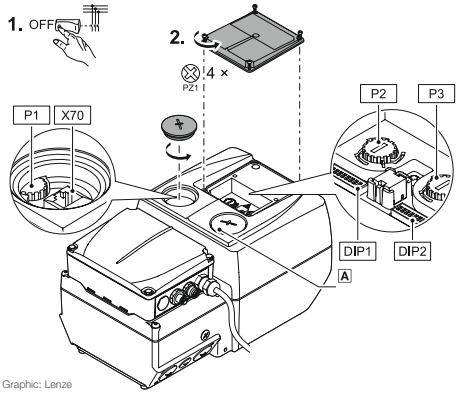
5.5 Settings

Setting elements 0.37 … 3.0 kW



Graphic: Lenze

Adjustment Elements 4.0 … 7.5 kW



Graphic: Lenze

	Description
P1	„Top cover: speed …%“ adjustment
X70	Connection for USB diagnostic adapter or hand-held terminal
A	LED status indicator

Possible settings with P1

Potentiometer P1 can be accessed after the cover has been removed. In order to ensure the degree of protection of the controller, the cover has to be screwed in again after the settings have been made. During operation, P1 can be used to steplessly set the motor speed in percent of the rated speed in C00011 if no JOG fixed setpoint P2 is active via DI1.

P1	Setting		
Description	0	…	9
Motor speed in percent of the rated speed C00011	0	…	100

6 Commissioning

This quick set-up guide only provides a rough outline of the procedures. Please refer to the full instructions for the model if you require answers over and above this.
Download the reference manual from: **www.bauergears.com/downloads/etak20-software**

6.1 Preconditions for initial switch-on

Further information can be found under: **www.bauergears.com/downloads/etak20-software**

Preconditions for initial switch-on

- ▶ The wiring unit is mounted and wired according to the instructions,
  - directly on a motor clamping flange or
  - with the wall adapter on a suitable surface near the motor.
- ▶ Connections with the mains, motor, holding brakes, etc. have been established.
- ▶ The communication unit has been mounted and wired according to the scheduled application.
  - Input and output signals
  - Safe input
  - Fieldbus

  (depending on the version, only available optionally)

Assign the digital inputs so that your application can be displayed by one of the preconfigured control modes (C00007) for terminal control:

Assignment of the digital terminals					
Control mode	**DI1**	**DI2**	**DI3**	**DI4**	**DI5**
Terminals 0	JOG 1/3	JOG 2/3	DCB	Cw/Ccw	BrkRelease
Terminals 2	JOG 1/3	JOG 2/3	QSP	Cw/Ccw	BrkRelease
Terminals 11	Cw/Ccw	DCB	MPotUp	MPotDown	BrkRelease
Terminals 16	JOG 1/3	JOG 2/3	Cw/QSP	Ccw/QSP	BrkRelease

Abbreviations used:	
JOG	Selection of fixed setpoints 1 ... 3 parameterised in C00039/1...3
DCB	Manual DC-injection braking
Cw/Ccw	CW/CCW rotation
QSP	Quick stop
MPotUp	Motor potentiometer: Increase speed
MPotDow	Motor potentiometer: Reduce speed
Cw/QSP	Fail-safe selection of the direction of rotation in connection with quick stop
Ccw/QSP	
BrkRelease	Release holding brake manually • In the standard setting, the brake control is switched off (not active). → Set operating mode in C02580.

- ▶ The drive unit has been mounted and bolted on.
- ▶ Apply the available control functions wisely, e.g.
  - Inhibit controller release
  - Set the speed setting to minimum
  - Enable the safety device
- ▶ The use of a braking resistor has been examined.
  - It is recommended that
    a braking resistor always be used for units K2A400 ... 750 (4 ... 7.5 kW)
    when there are dynamic loads or difficult control ratios.

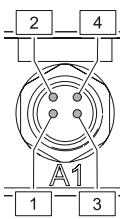
Danger!

Serious hazard potential during commissioning
Adjustments errors may result in unintended and hazardous movements in motors and equipment.

Possible consequences:
- ▶ Damage to property
- ▶ Injury to persons

Protective measures:
- ▶ Vacate the hazardous area
- ▶ Follow safety regulations and maintain safety distances

Depending on the bus system of the communication unit, statuses are indicated by means of an LED display. Detailed information can be found in the communication manual for the bus system used.

LED		1 (green)	2 (green)	3 (red)	4 (red)
	PROFIBUS	BUS STATE	MODULE STATE	BUS ERROR	MODULE ERROR
	AS–i	SLAVE 1 READY	SLAVE 2 READY	SLAVE 1 ERROR	SLAVE 2 ERROR
	EtherCAT	RUN	LINK/ACTIVITY	ERROR	LINK/ACTIVITY (green)
	PROFINET	BUS READY	LINK/ ACTIVITY 1 (yellow)	BUS ERROR	LINK/ACTIVITY 2 (yellow)
	EtherNet/ IP	MODULE STATE (red)		NETWORK STATE (green)	

Graphic: Lenze

6.2 Parameter setting

Parameterisation serves to adjust the controller optimally to different application requirements.

Parametrisation using a PC and „Engineer“
- ▶ Engineering software for cross-device parametrisation, configuration and diagnostics for individual components (such as, e.g. drive control systems, industrial PCs, motors, or I/O systems) as well as machine control units
- ▶ Possible to work offline
  - Requires software and USB diagnostic adapter

Parametrisation using a PC and „Easy Starter“
- ▶ Simple online diagnostics, parametrisation and commissioning of the drive control system
  - Requires software and USB diagnostic adapter

Parametrisation using a hand-held terminal/keypad
- ▶ Adjusting specific parameters by an expert user
  - Requires a hand-held terminal suitable for EtaK2.0

Tip!
The „EASY Starter“ and „Engineer StateLevel“ engineering tools are available free of charge on the internet: **www.bauergears.com/downloads/etak20-software**

The USB diagnostic adapter, for example, can be used for communication between a PC and the drive control unit.

Version	Features
Diagnosis terminal X400 	Keypad X400 in a robust housing, also suitable for installation into the control cabinet door. • Supports hot plugging • Graphic display with plain texts • Backlighting • Easy user guidance • 4 navigation keys, 2 context-sensitive keys • Adjustable RUN/STOP function • Incl. 2.5 m cable • Enclosure IP20; in case of front installation in control cabinet IP65 • Can be used for L-force Inverter Drives 8400 and Servo Drives 9400
USB diagnostic adapter 	For electrical isolation of your PC and the controller • Supports hot plugging • Diagnostic LED for data transfer display • plug and play • Input-side voltage supply via USB connection from PC • Output-side voltage supply via the diagnostic interface of the controller • Connecting cables can be selected in various lengths:

Photos: Bauer, Lenze

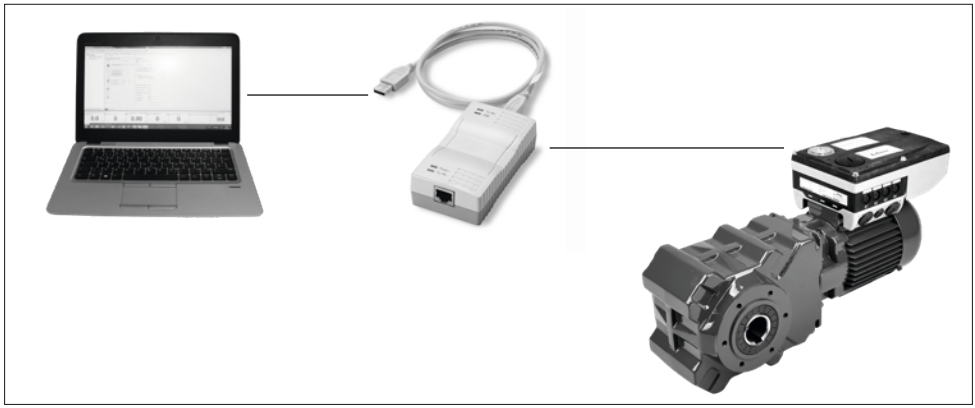
Note!

Save parameter settings safe against mains failure

In order to prevent parameter settings carried out in the device from being lost by mains switching, you have to explicitly save the parameter set with mains failure protection in the device.

6.3 Change parameter settings with PC and easy starter software

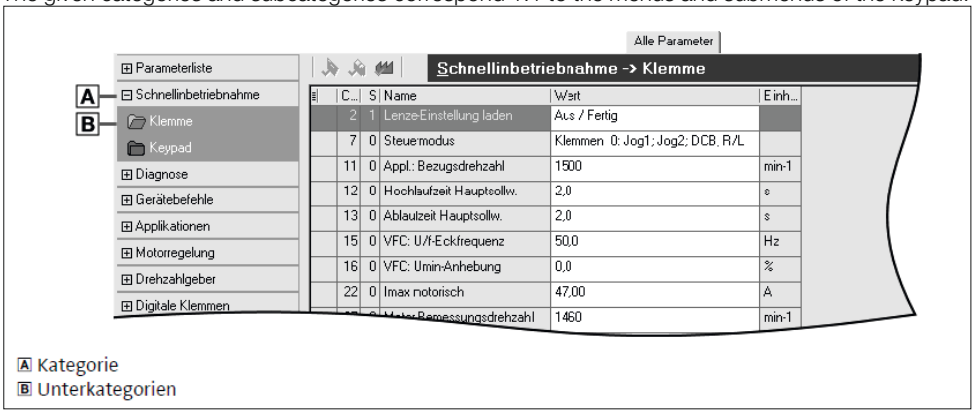
The USB diagnostic adapter, for instance, can be used for the communication between the PC (including the »EASY Starter« or »Engineer« software) and the controller (see the following illustration). The USB diagnostic adapter is the connection between the PC (free USB port) and the controller (diagnostic interface).



Photos: Bauer, Lenze

The **"all parameters"** tab in the »EASY Starter« and the »Engineer« provides a quick access to all parameters of the controller.

The given categories and subcategories correspond 1:1 to the menus and submenus of the keypad:



Moreover, the »Engineer« provides a commissioning interface on the **Application parameters** tab where you can commission the application in a few steps.

Detailed instructions for parameterising the drive are available in the reference manual.
This is available for download at: **www.bauergears.com/downloads/etak20-software**

6.4 Keypad

The keypad X401 serves to quickly and easily set parameters and display current actual values and device states by means of the corresponding display parameters. For this purpose, the keypad must be plugged onto the diagnostic interface on the top of the device.

Danger!

Uncontrolled motor movement possible
In general, changing a parameter causes an immediate response in the controller.

Possible consequences:
- This may lead to undesirable behaviour on the motor shaft if the controller has been enabled.

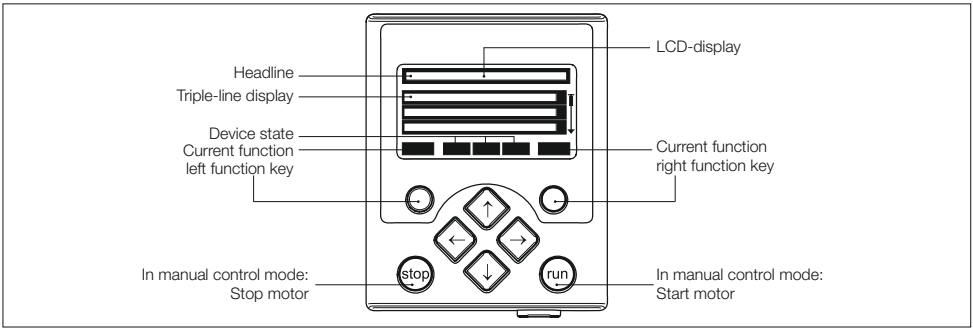
Protective measures:
- Make changes in small steps and wait for response.
- Certain device commands or settings which may cause critical states of drive behaviour constitute exceptions. Such parameter changes are only possible if the controller is inhibited. Otherwise, a corresponding error message will be issued.

Note!

The keypad can also be inserted/removed during operation.

Further information on the keypad can be found in the operating instructions supplied with the keypad.

6.4.1 Keypad display and control elements



Graphic: Lenze

LCD display			
Headline			
In the menu level: Menu name In the parameter level: Parameter name			
Three-part display			
In the menu level: List of available menus In the parameter level: Code/subcode and setting or actual value			
Device status			
RDY	Controller is switched on	IMP	Pulse inhibit active
RUN	Controller is enabled	!SFLT	System fault active
CINH	Controller is inhibited	!FLT	"Fault" device status is active
QSP	Quick stop active	!TRB	"Trouble" device status is active
Imax	Current limit exceeded	!TQSP	"TroubleQSP" device status is active
Mmax	Speed controller 1 in the limitation	WRN	A warning is indicated
Function - left function key		**Function - right function key**	
EDIT	Change parameter setting (change to editing mode)	OK	Accept change in the controller (no saving with mains failure protection → SAVE)
	Back to main menu	ESC	Abort (discard change)
CINH!!	Parameter can only be changed when the controller is inhibited		
SAVE	Save all parameter settings in the memory module safe against mains failure		

Control elements	
◯	Execute the function assigned to the function key (see LCD display)
stop	Execute the stop function set in C00469 (setting: Inhibit controller)
run	Deactivate stop function again (setting: Enable controller again)
	In the menu level: Select menu/submenu In the parameter level: Select parameter In the editing mode: Change marked digits or select list entry
	In the menu level: Select submenu/change to parameter level In the editing mode: Cursor to the right
	In the menu level: One menu level higher (if available) In the parameter level: Back to the menu level In the editing mode: Cursor to the left

6.4.2 General operation

1. Use the ⇧/ ⇩ navigation keys to select the desired menu.
   – Use the ⇦ / ⇨ navigation keys to reach a higher/lower menu level.
   – Use the ☰ function key to return to the main menu.
2. Use the ⇧ / ⇩ navigation keys to select the parameter to be set within a submenu.
3. Use the EDIT function key to switch over to the editing mode.
4. Use the navigation keys to set the desired value.
   – Use the ⇦ / ⇨ navigation keys to move the cursor to the right/left.
   – Use the ⇧ / ⇩ navigation keys to change the selected number.
5. Use the OK function key to accept the change and to leave the editing mode.
   – Use the ESC function key to leave the editing mode without accepting the change.

6.4.3 Menu structure

In the keypad, the parameters are classified into various menus and submenus.

- The **USER menu** includes a selection of frequently used parameters.
- The **Code list** contains all parameters.
- The **Go to param** function enables you to reach the corresponding parameter directly.
- The **Logbook** logs all errors and their chronological history.
- The **Diagnostics** menu contains diagnostic/display parameters for displaying device-internal process factors, current actual values and status messages

6.4.4 Overview of the commissioning steps with keypad

Note!

The following can be used at the diagnostic interface X70:

- ▶ Diagnosis terminal X401 (EZAEBK2003)
  - The described settings with the keypad X401 can also be carried out with the diagnosis terminal X401.
- ▶ USB diagnostic adapter (E94AZCUS)

Keypad control

Only some parameters must be adapted for the drive. Then the drive application can be controlled immediately in the preset control mode ”Terminals 0” via the digital and analogue inputs at the controller. Alternatively, the keypad can be used for defining the required setpoints and control signals in the ”Keypad” control mode.

Commissioning steps

1. Wiring of power terminals.
   – Make use of the mounting instructions supplied with the controller to wire the power terminals according to the requirements of your device.
2. Wiring of control terminals.
   – The preconfigured I/O connection can be changed via configuration parameters. See chapter "User-defined terminal assignment".
   – Assignment in the preset control mode "Terminals 0":

Terminal	Function		Info
A1U	Setpoint selection		10 V ≡ 1500 min-1 (with 4-pole motor) general: 10 V ≡ 100 % reference speed (C00011)
DI1	JOG 1	JOG 3	Selection of fixed setpoints 1 ... 3 • If both inputs are on LOW level, the setpoint selection via the analogue input A1U is active.
DI2	JOG 2		
DI3	DCB		Manual DC-injection braking (DCB) • For HIGH-active inputs, DC-injection braking is active as long as DI3 is at HIGH level. • After the hold time (C00107) has expired, the controller sets the pulse inhibit (CINH). DC-injection braking (▸Î 110)
DI4	R/L		LOW level: CW rotation HIGH level: CCW rotation
DI5	Holding brake		Open/close holding brake • Braking modes C02580

3. If required, carry out communication settings via the DIP switch on the Communication Unit for fieldbus communication. If required, carry out communication settings via the DIP switch on the Communication Unit for fieldbus communication. The communication settings depend on the fieldbus used.
4. Fasten the controller by means of the 4 screws.
5. Switch on voltage supply of the controller.
6. Connect keypad.
   – Remove the cover of the diagnostic interface on the top of the device and connect the keypad to the diagnostic interface.
   – After attaching the keypad or switching on the controller with keypad attached, the connection between keypad and controller is established. The process is completed when the code C00051 appears in the display.

Keypad display	Action
MCTRL: Act speed val. C00051 0 rpm	Use left function key ☰ to change to main menu.

7. Load factory setting to controller
   – For this purpose, the device command ”Load setting” is available which can be executed via code C00002/1 with the keypad:

Note!

When the factory settings are loaded, changed values are overwritten. Default settings for a specific motor, e.g. for a Drive Package, would be reset with ”Load factory settings”.

Keypad display	Action
EtaK2.0 .... Logbook Quick commissioning	A Use navigation key ⇳ to select the ”Quick commissioning” menu in themain menu. B Use navigation key ⇳ to change to the ”Quick commissioning” menu.
Part1 Quick commissioning Terminals Keypad	Use navigation key ⇳ to change to the ”Terminals” menu.
Load factory setting C00002/1	A Use the left function key EDIT to change to the editing mode for C00002/1. B Use navigation key ⇳ to select the ”1: On/Start” entry in the selection list. C Use the right function key OK to accept the executed change and quit the editing mode. - The load process may take a couple of seconds.

8. Enable controller: Set RFR to HIGH potential.
9. Select speed:
   – In the ”Terminals 0” by selecting a voltage at the analogue input or by selecting a fixed setpoint via the digital inputs DI1/DI2.
   – In the ”Keypad” control mode, the main speed setpoint and the control signals are selected via the following parameters which are available in the ”Quick commissioning → Keypad”menu level:

Parameter	Name	Info	Standard-Setting	
			Value	Unit
C00728/3	nMainSetValue_a	Main setpoint for the application 100 % ≡ reference speed (C00011)	0.00	%
C00727/3	bSetSpeedCcw	Change of direction of rotation "0": CW rotation "1": CCW rotation	0	
C00727/4	bJogSpeed1	Selection of fixed setpoint 1 "0": Main setpoint (C00728/3) active. "1": Fixed setpoint 1 (C00039/1) active	0	

10. Save parameter settings with function key SAVE against mains failure in the memory module.

Tip!

Recommendations for the following application cases:

- If the controller and motor differ greatly from each other in terms of performance: Set the Imax limit (in motor mode) in C00022 to double the rated motor current.
- If a higher starting torque is required: In idle state of the motor, set the Vmin boost in C00016 in such a way that the rated motor current flows at a field frequency of f = 3 Hz (display in C00058).
- For noise optimisation: As switching frequency in C00018, set the selection "3: 16 kHz var./drive-optimised".
- If a high torque is to be available at low speed and without a feedback: Select the "vector control (SLVC)" mode in C00006 as motor control.

6.5 Commissioning

Proceed step by step:

- ▶ Switch on the mains
- ▶ Observe status display
  - After a short initialisation time, the display must be blinking green.
- ▶ Deactivate requirements of the safety function
- ▶ Set controller enable
  - After the set starting time, the motor must rotate with the set speed.
- ▶ First check of the expected behaviour:
  - Direction of rotation?
  - Starting time?
  - Speed?
  - Speed control?
- ▶ Check of optional control functions:
  - Does the analogue setpoint selection work?
  - Do the digital control signals, e.g. limit switches, work?
  - Does the connected motor holding brake work?
  - Does the change of direction of rotation work?
  - Does the requirement of the safety function work?
  - Do the control signals over fieldbus work?
- ▶ Switch off drive
  - Reduce speed
  - Inhibit controller enable
  - Switch off mains

An LED display will indicate states, depending on the bus system for the communication unit. The communications manual for the bus system used will include detailed information.

6.5.1 User menu

The usermenu can be freely configured in C00517 and contains the following parameters in the standard setting:

Parameter	Name	Info	Standard-Setting	
			Value	Unit
C00002/19	Device command: Reset error	After resetting the current error, further errors may be pending which must be reset as well. Details of the current error are displayed in C00166.	0	-
C00007	Controlmode	Selection of how the application is to be controlled.	10	-
C00011	Appl.: Reference speed	Setting the reference speed	1500	rpm
C00012	Accel. time -main setpoint.	FB L_NSet_1: Acceleration time of the ramp generator for the main speed setpoint	2.0	s
C00013	Decel. time -main setpoint	FB L_NSet_1: Deceleration time of the ramp generator for the main speed setpoint	2.0	s
C00016	VFC: Vmin boost	Boost of the V/f voltage characteristic within the range of low speed or frequency values for the VFCplusmotor control.	2.6	%
C00022	Ilmax in motormode	Maximum current in motor mode for all motor control modes	5.8	A
C00039/1	Fixed setpoint 1 (L_NSet_1 n-Fix)	FB L_NSet_1: Fixed speed setpoints (JOG values) for the setpoint generator Fixed setpoint 1	40	%
C00039/2	Fixed setpoint 2	Fixed setpoint 2	60	%
C00105	Deceleration time - quick stop	The set deceleration time determines the ramp slope at quick stop	5.0	s
C00120	Motor overload threshold (I2xt)	Operating threshold for the errormessage "OC6: Motor overload (I2xt)"	100	%
C00129	Value brake resistor	Resistance value of the connected brake resistor	220	Ω
C00165	Error information	Display of the error numbers divided into sectors in the case of an error	-	-
C02580	Holding brake: Operating mode	Selection of the operating mode for holding brake control	0: Off	

7 Troubleshooting

7.1 Drive diagnostics via the integrated display

On the top side of the Drive Unit, a green/red LED display indicates the respective operating status of the controller. The LED shines brightly through the transparent cap.

LED status display		
Description	**green**	**red**
Mains off	off	off
Switch-on phase (initialisation) (shining yellow)	on	on
Operation ormotor data identification	on	off
Controller inhibited (RFR)	blinking	
Safety function active (Safe torque off)	flashing	
Controller is ready (initialisation completed)	flashing twice	
Operation with warning active	on blinking flashing twice	flashes every 3 s
Quick switch-off active	on	flashing
System error	off	on
Error		blinking
Message is active		flashing

	LED flashes once approx. every 3 seconds (slow flash)
	LED flashes once approx. every 1.25 seconds (flash)
	LED flashes twice approx. every 1.25 seconds (double flash)
	LED blinks every second
	LED is permanently on

7.2 Diagnostic codes

In addition to the keypad, also use the LEDs on the front of the controller for drive diagnostics:
- Two LEDs indicate the device status (DRIVE READY and DRIVE ERROR)
- Two LEDs indicate the bus status (CAN-RUN and CAN-ERROR)

The LEDs for the bus status are less important during quick commissioning.

Tip!

The handling of the keypad X401 or the diagnosis terminal X401 is described in the operating instructions. The instructions are supplied with the keypad and are also included in electronic form on the product CD ”L-force Inverter Drives 8400”.

Photos/Graphics: Bauer-Archive, PHOENIX CONTACT GmbH & Co. KG, Lenze GmbH

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