# BETRIEBSANLEITUNG

INSTRUCTION MANUAL

2

**KEB COMBIVERT S4**

**Größe D / E / G / H**
Size D / E / G / H

00.S4.01B-K140

STOP

**Erst Betriebsanleitung Teil 1 lesen!**

**Read Instruction manual part 1 first!**

KEB

03/2001

Diese Betriebsanleitung
– ist gültig für das Servosystem **KEB COMBIVERT S4**
– muß jedem Anwender zugänglich gemacht werden

***Vor jeglichen Arbeiten muß sich der Anwender mit dem Gerät vertraut machen. Darunter fällt insbesondere die Kenntnis und Beachtung der Sicherheits- und Warnhinweise. Lesen Sie deshalb unbedingt die "Technische Dokumentation Teil 1".***

Damit beim KEB COMBIVERT S4 trotz umfangreicher Programmiermöglichkeiten eine einfache Bedienung und Inbetriebnahme möglich ist, wurde eine spezielle Bedienerebene geschaffen, in der die wichtigsten Parameter zusammengefaßt sind. Sollten jedoch die von KEB vordefinierten Parameter nicht ausreichen um Ihren Einsatzfall zu lösen, können Sie gegen eine geringe Schutzgebühr ein **Applikationshandbuch** erwerben.
Es umfaßt: - Erstellen einer individuellen Bedienerebene
- Aufstellung und Beschreibung weiterer Parameter

Die in dieser Betriebsanleitung verwendeten Pictogramme entsprechen folgender Bedeutung:

**Gefahr**
**Warnung**
**Vorsicht**

Wird verwendet, wenn Leben oder Gesundheit des Benutzers gefährdet sind oder erheblicher Sachschaden auftreten kann.

**Achtung**

Unbedingt beachten! Besondere Hinweise für den sicheren und störungsfreien Betrieb.

**Information**

Hilfestellung, Tip

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# 1. Introduction

## 1.1 Application

The digital servo controller KEB COMBIVERT S4 serves exclusively for the control and regulation of the servo motors KEB COMBIVERT SM.

On delivery the servo amplifiers are synchronized to the servo motors supplied by KEB. So you receive a highly dynamic drive which is connected and ready for operation within the shortest time for standard applications.

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The operation of other motors requires an adaption of the amplifier and is to be recommended only with special knowledge of control technology.

## 1.2 Part Code Servo Controller

*Size Type Design Sub-assembly*

**A B . S 4 . C D E - F G H I**

**AB** Size / Dimension wide
see Part 3

**C** Housing design: D, E, G or H

**D** Supply voltage.
0 ... 200V class DC sub-assembly
1 ... 400V class DC sub-assembly
2 ... 200V class
3 ... 200V class with 3-phase Interference suppression
4 ... 400V class

**E** Mechanic construction of the motor.
Motor unit marking see part B

**F** Motor nominal speed.

| | | |
|---|---|---|
| 1 ... 1500 UPM | 3 ... 3000 UPM | 5 ... ------- UPM |
| 2 ... 2000 UPM | 4 ... 4000 UPM | 6 ... 6000 UPM |

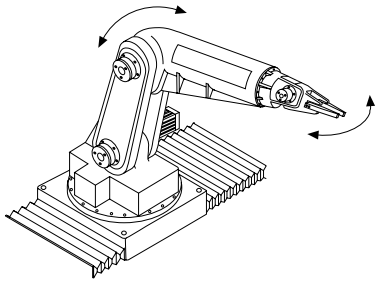
**G** 0 ... with self ventilated
1 ... with forced ventilated

**HI** 09 ... Resolver / SSI
10 ... Resolver / SSI / Interference suppression
11 ... Resolver / IG-IO / Interference suppression
12 ... Resolver / IG-IO
13 ... ERN1387 / IG-IO
14 ... ERN1387 / IG-IO / Interference suppression
15 ... ERN1188 / IG-IO
16 ... ERN1188 / IG-IO / Interference suppression

# 2. Operation Specifications

## 2.1 Moving or Rotating Parts

– Motor shaft
– Feed axis and parts connected to it

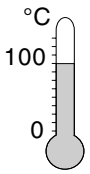


***Prior to any work on the machine (e.g. exchange of tools), disconnect the machine and secure against unintended restart!***

***Safely secure movement range of machine during operation! Danger of injury!***

## 2.2 High Operating Temperatures

– Housing of servo motor
– Braking resistors




***Motor housing and braking resistor can attain very high operating temperatures! Danger of injury!***

## 2.3 Connection Directions

A trouble-free and safe operation of the servo system is only warranted when the following connection instructions are observed.
***When deviated from, malfunctions and damages may occur in isolated cases.***

– The servo controller KEB COMBIVERT S4 is only designed for a fixed connection.
– Do not interchange power cable and motor line.
– Lay control and power lines separately (min. 10 cm distance).
– Connect control lines only to switching elements and setting devices (relay, switch, potentiometer), that are suitable for extra-low voltages.
– Use shielded/twisted control lines. Connect the shield only single-sided to PE of the servo controller.

– Use shielded motor cables. Connect shield to the Servo controller to PE and extensively connect to motor housing.
– Earth servo controller very well: star-shaped earthing, avoid earth loops, shortest connection to main earthing terminal.

***The connections on the control terminal strip and the encoder inputs show a safe seperation in accordance with VDE 0100. The person who sets up the systems or machines must ensure that the existing or newly wired circuit meets the VDE requirements for safe seperation.***



## 2.4 Interference Protection of Servo Controller

The control and power inputs of the servo controller are protected against interferences.
**An increased operational reliability and additional protection against malfunctions is achieved through following measures:**

– Use of mains filter when the mains voltage is affected by the connection of large consumers (reactive-power compensation equipment, HF-furnaces etc.)
– Protective wiring of inductive consumers (solenoid valves, relays, electromagnets) with RC elements or similar devices to absorb the energy released at switch-off.
– Separate laying of power lines as described in the connection directions to avoid inductive and capacitive coupling of interference pulses.
Paired-twisted cables protect against inductive parasitic voltages, shielding provides protection against capacitive parasitic voltages. Optimal protection is achieved with twisted and shielded cables when signal and power lines are layed separately.

## 2.5 Interference Protection of Electric Plants

The servo controller KEB COMBIVERT S4 transmits waves of high frequency. Following measures can reduce the arising interference pulses that may effect electric plants in the vicinity of the servo controller:

- Installation of the servo controller in a metal housing.
- Shielded motor cables.
  The shield must be connected to PE of the servo controller and to the housing of the motor (connect extensive shield). The shielding shall not be used as protective earthing. Only an uninterrupted shield begining as close as possible at the servo controller or servo motor ensures a safe function of the shielding.
- Good earthing (metal-powder tape or 10 $mm^2$ earth lead)
- Use of radio interference suppression filters.



## 2.6 Operating Directions

***To avoid premature ageing or destruction of the servo system KEB COMBIVERT S4 observe the following directions!***

- Install a circuit interrupter between voltage supply and servo controller to permit the independent switch-off of KEB COMBIVERT S4.
- Frequent switching between mains and servo controller is not permitted!
- The switching between motor and servo controller during operation is prohibited!
- The servo system KEB COMBIVERT S4 is to be operated under suitable conditions (see Ambient Condition).

# 3. Control Cabinet Installation

***Altitude of site max. 2000 m* — A power reduction of 1 % per 100 m must be taken into account for site altitudes of 1000 m and more above sea level, i.e. 1500mNN = 95% $P_{Nominal}$**

## 3.1 Ambient Conditions

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| Max. permissible limit values: | Servo controller KEB COMBIVERT S4 |
|---|---|
| Coolant inlet temper.- / Ambient temperature during operation | -10 °C…+45 °C |
| Storage temperature | -25 °C…+70°C |
| Transport temperature | -25 °C…+70°C |
| Relative humidity max. | max. 95 %, no condensationg (identification "F" DIN 40040) Climatic category 3K3 |

## 3.2 Installation Instructions

- Stationary installation and earthing of the servo controller KEB COMBIVERT S4.
- At the installation of the servo controller observe minimum distance to adjacing elements (see Installation Instructions).
- No moisture or water shall penetrate into the servo controller.
- Avoid penetration of dust into the servo controller. For installation in a dust-proof housing sufficient heat dissipation must be provided.
- Do ***not*** operate the servo system KEB COMBIVERT S4 in explosion-protected rooms.
- Ensure sufficient heat emmission of the servo motor.
- Protect servo controller and servo motor against aggressive gases and liquids.
- Avoid any impacts or shocks on the servo motor.
- Use suitable devices for fitting or taking off drive elements on the motor shaft (toothed wheels, belt-pulleys, clutches etc.)

If other consumers which produce electric or magnetic fields or which effect the power supply are located in the vicinity of the servo controller, they must be positioned as far away as possible from the servo controller and steps must be taken to suppress interferences.

## 3.3 Calculations

Calculation of control cabinet surface $A = \frac{P_V}{\Delta T \cdot K}$ [m²]

Rate of air flow with fan cooling: $V = \frac{3{,}1 \cdot P_V}{\Delta T}$ [m³/h]

A = Control cabinet surface [m²]

ΔT = Temperature difference [K] (Default value = 20 K)

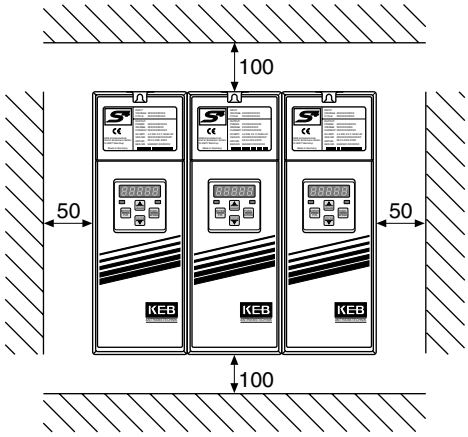
K = Heat transfer coefficient $\left[\frac{W}{m^2 \cdot K}\right]$ (Default value = 5 $\frac{W}{m^2 \cdot K}$)

$P_V$ = Heat dissipation [W]

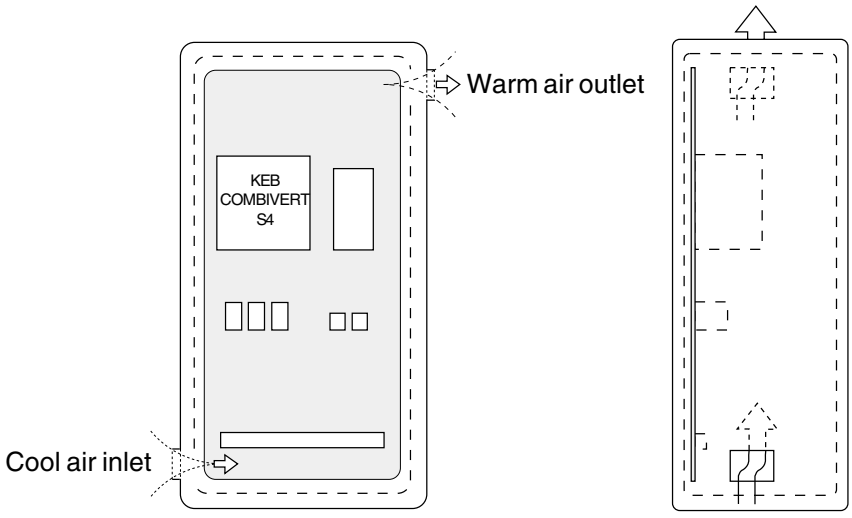
V = Air flow rate of fan [m³/h]

For detailed informaton please refer to the catalogs of the control cabinet manufacturers.

## 3.4 Installation Conditions




Minimum distance



# 4. Technical Data

| | |
|---|---|
| Operating temperature -10° | ... +45°C; Storage: -25° ... +70°C |
| Type of Protection | IP20 |

**The Type of protection is warranted only with correct installation and connection of the components.**

## 4.1 230V Class

GB

| Size | | 03 | | 05 | |
|---|---|---|---|---|---|
| **Housing** | | **D** | | **D** | |
| Mains voltage [1] | [V] | 180 . . . 264 ± 0% | | | |
| Line frequency | [Hz] | 50 / 60 Hz ± 2 Hz | | | |
| Line phases | | **1** | **3** | **1** | **3** |
| Input current | [A] | 4,8 | 2,6 | 12,8 | 7 |
| max. perm. Mains fuse [3] | [A] | 16 | 10 | 16 | 10 |
| Rated output current | [A] | 2,4 | | 6,4 | |
| Stall current $I_{do}$ | [A] | 6,4 | | 6,4 | |
| Peak current $I_{max}$ [4] | [A] | 9,7 for 1000 ms | | 16 for 500 ms | |
| Line cross section [2] | [mm²] | 1,5 | | 1,5 | |
| Heat dissipation [5] | [W] | 65 | | 75 | |

[1] In relation to 230V nominal input voltage

## 4.2 400V Class

| Size | | 07 | 10 |
|---|---|---|---|
| **Housing** | | **D** | **D** |
| Mains voltage [1] | [V] | 305 . . . 500 ± 0% | |
| Line frequency | [Hz] | 50 / 60 Hz ± 2 Hz | |
| Line phases | | 3 | 3 |
| Input current | [A] | 3 | 7 |
| max. perm. Mains fuse [3] | [A] | 10 | 10 |
| Rated output current | [A] | 2,7 | 6,4 |
| Stall current $I_{do}$ | [A] | 2,7 | 6,4 |
| Peak current $I_{max}$ [4] | [A] | 10,6 for 200 ms | 22 for 200 ms |
| Line cross section [2] | [mm²] | 1,5 | 1,5 |
| Heat dissipation [5] | [W] | 95 | 110 |

[1] In relation to 400 V nominal input voltage

[2] Recommended min. cross section of mains supply at rated power and cable length up to 30 m.

[3] Mains fuse and line cross section can also be dimensioned on the basis of the rated current of the servo motor.

[4] The peak current $I_{max}$ is a theoretical value, that leads to the operation of the current limiting. The maximum torque llimit should be adjusted 10...15% below $I_{max}$.

[5] Heat dissipation related to the static continuous current (heat dissipation control circuit ca. 20 W).

| Size | | 12 | 16 |
|---|---|---|---|
| **Housing** | | **E** | **G** |
| Mains voltage [1] | [V] | 305 . . . 500 ± 0% | |
| Line frequency | [Hz] | 50 / 60 Hz ± 2 Hz | |
| Line phases | | 3 | 3 |
| Input current | [A] | 18,2 | 36 |
| max. perm. Mains fuse [3] | [A] | 20 | 50 |
| Rated output current | [A] | 16,5 | 33 |
| Stall current $I_{do}$ | [A] | 16,5 | 21,5 |
| Peak current $I_{max}$ [4] | [A] | 38 for 200 ms | 50 for 600 ms |
| Line cross section [2] [3] | [mm²] | 2,5 | 10 |
| Heat dissipation [5] | [W] | 240 | 310 |

| Size | | 18 |
|---|---|---|
| **Housing** | | **H** |
| Mains voltage [1] | [V] | 305 . . . 500 ± 0% |
| Line frequency | [Hz] | 50 / 60 Hz ± 2 Hz |
| Line phases | | 3 |
| Input current | [A] | 55 |
| max. perm. Mains fuse [3] | [A] | 80 |
| Rated output current | [A] | 50 |
| Stall current $I_{do}$ | [A] | 45 |
| Peak current $I_{max}$ [4] | [A] | 75 für 800 ms |
| Line cross section [2] [3] | [mm²] | 25 |
| Heat dissipation [5] | [W] | 610 |

[1] In relation to 400 V nominal input voltage

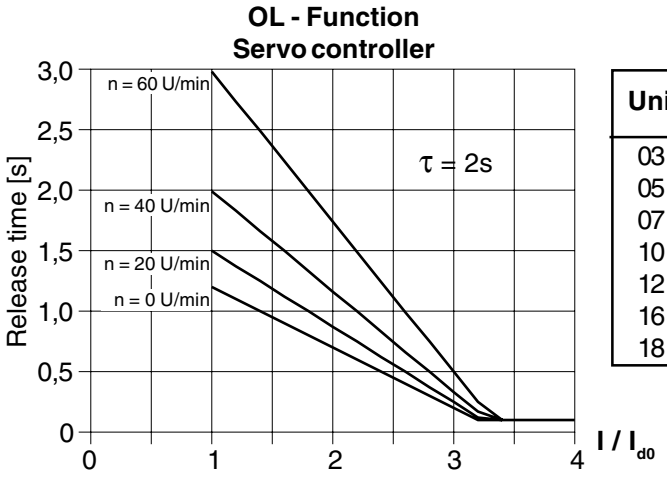
[2] Recommended min. cross section of mains supply at rated power and cable length up to 30 m.

[3] Mains fuse and line cross section can also be dimensioned on the basis of the rated current of the servo motor.

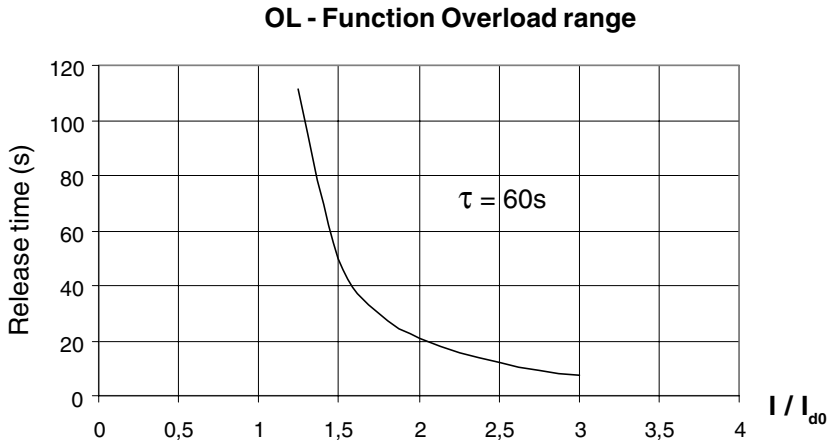
[4] The peak current $I_{max}$ is a theoretical value, that leads to the operation of the current limiting. The maximum torque llimit should be adjusted 10...15% below $I_{max}$.

[5] Heat dissipation related to the static continuous current (heat dissipation control circuit ca. 20 W).

## 4.3 Overload characteristics




| Unit | $I_{d0}$ | $\frac{I}{I_{d0}}$ max. |
|---|---|---|
| 03 | 2,4 | 1,5 |
| 05 | 6,4 | 2,5 |
| 07 | 2,7 | 3,9 |
| 10 | 6,4 | 3,4 |
| 12 | 16,5 | 2,4 |
| 16 | 21,5 | 2,3 |
| 18 | 50 | 1,7 |

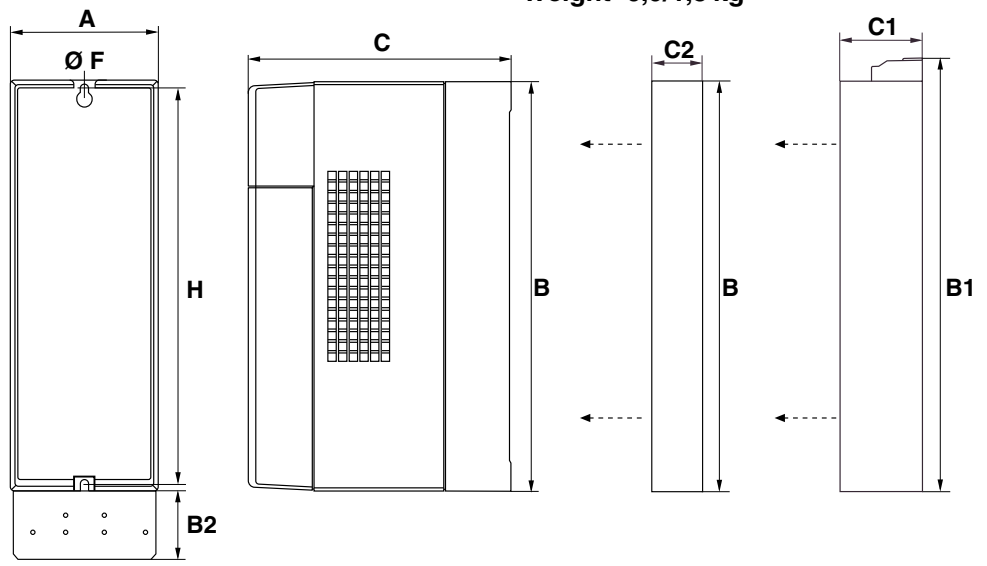


# 5. Dimensions

**Servo controller**
**Weight = 2/3,5 kg**

**Submounting braking resistor**
**Weight=0,9/1,3 kg**

**Base filter**
**Weight=0,9/1,5 kg**



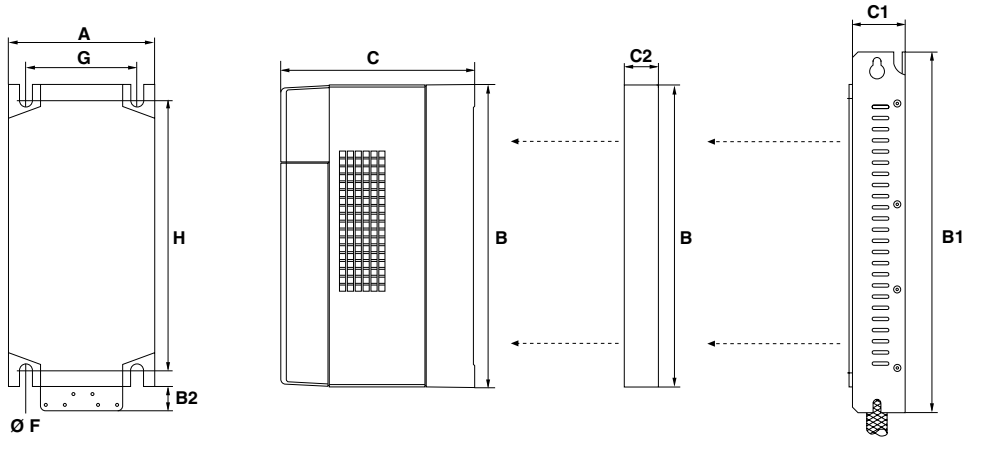

**Shield plate**

| Size | A | B | B1 | B2 | C | C1 | C2 | F | H |
|---|---|---|---|---|---|---|---|---|---|
| D | 90 | 250 | 264 | 37,5 | 160 | 50 | 30 | 5 | 240 |
| E | 130 | 290 | 352 | 37,5 | 200 | 50 | 30 | 7 | 275 |

**Servo controller**
**Weight = 10/14 kg**

**Submounting braking resistor**
**Weight=1,9 kg**

**Base filter**
**Weight=3,2/5,1 kg**




**Shield plate**

| Size | A | B | B1 | B2 | C | C1 | C2 | F | G | H |
|---|---|---|---|---|---|---|---|---|---|---|
| G | 170 | 340 | 415 | 32 | 255 | 56 | 30 | 7 | 150 | 330 |
| H | 297 | 340 | 445 | 51 | 255 | 66 | - | 7 | 250 | 330 |

# 6. Connection

## 6.1 Survey Housing sizes

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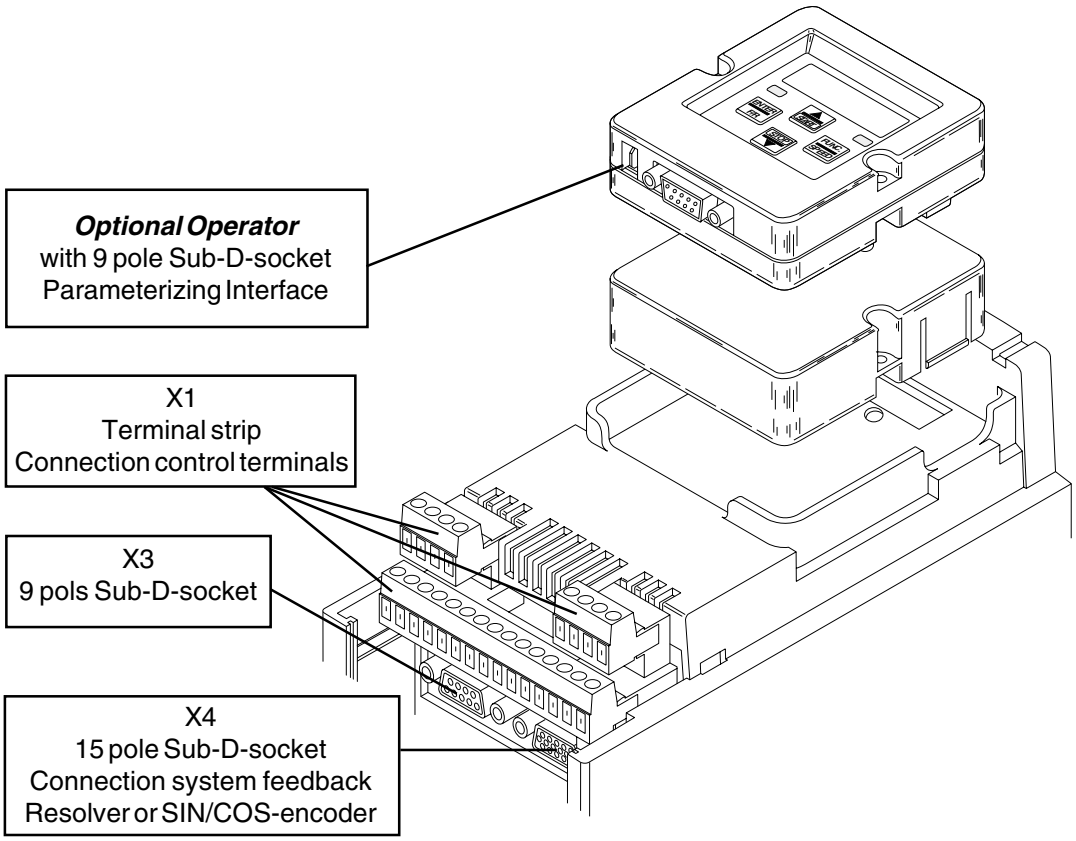
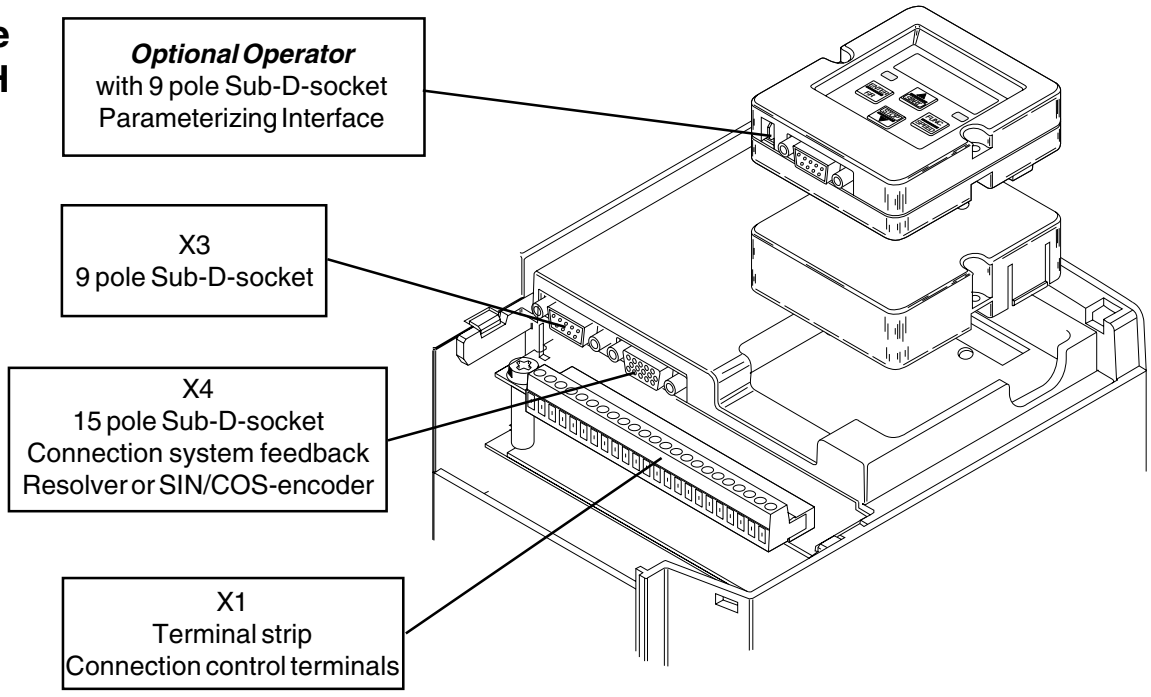
**Size D - E**




**Size G - H**

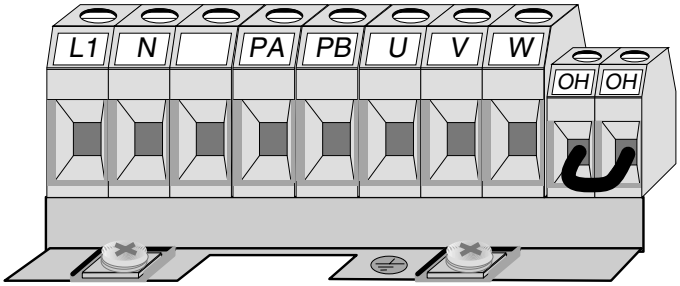


## 6.2 Power Circuit Terminals

**Size D**

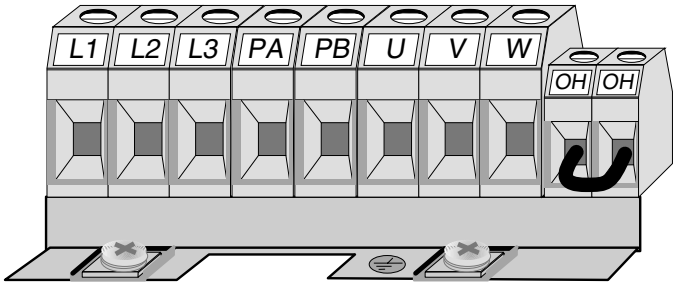
⚠ **Note input voltage, since 230V and 400V class (3 phase) is possible.**

**1-phase**



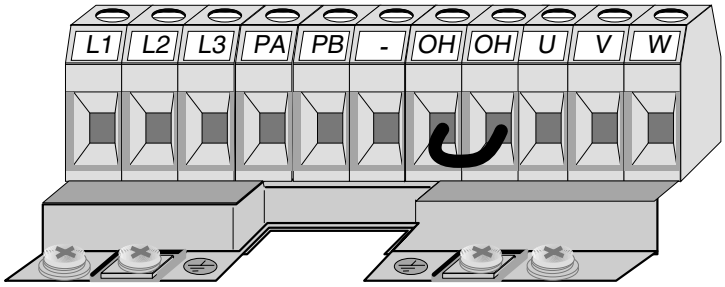

| | |
|---|---|
| **L1, N** | 1 phase mains connection |
| **L1, L2, L3** | 3 phase mains connection |
| **PA, PB** | Connection braking resistor |

**3-phase**



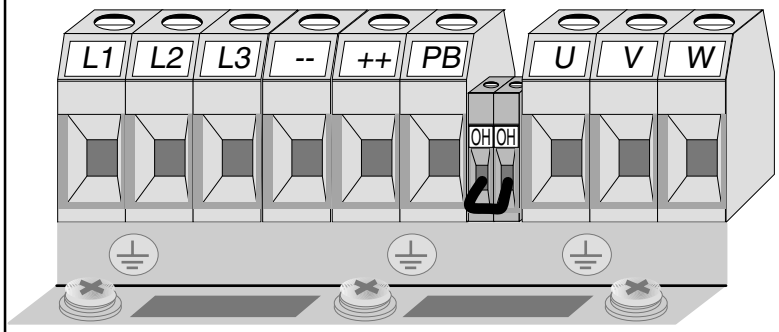

| | |
|---|---|
| **U, V, W** | Motor connection |
| **OH, OH** | Connection for temperature sensor |
| ⏚ | Connection for screening/earthing |

**Size E**




| | |
|---|---|
| **L1, L2, L3** | 3 phase mains connection |
| **PA, PB** | Connection braking resistor |
| **PA, -** | Connection for braking module and feedback unit |
| **OH, OH** | Connection for temperature sensor |
| **U, V, W** | Motor connection |
| ⏚ | Connection for screening/earthing |

**Size G**

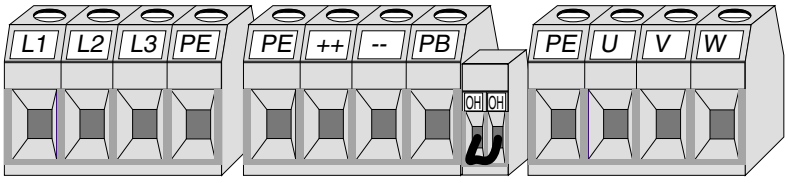



| | |
|---|---|
| **L1, L2, L3** | 3 phase mains connection |
| **++, PB** | Connection braking resistor |
| **++, --** | Connection for braking module, feedback and supply unit DC input 420...720VDC |
| **OH, OH** | Connection for temperature sensor |
| **U, V, W** | Motor connection |
| ⏚ | Connection for screening/earthing |

**Unit without DC input**

| | |
|---|---|
| **+PA, PB** | Connection braking resistor |
| **+PA, -** | Connection for braking module and feedback unit |

**Size H**




| | |
|---|---|
| **L1, L2, L3** | 3 phase mains connection |
| **++, PB** | Connection braking resistor |
| **++, --** | Connection for braking module, feedback and supply unit DC input 420...720VDC |
| **OH, OH** | Connection for temperature sensor |
| **U, V, W** | Motor connection |
| **PE** | Connection for screening/earthing |

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## 6. Connection

***Remove or plug in the power connector only at switched off unit and disconnected power supply!***

***Observe the correct phase sequence for the connection of the servo motor!***

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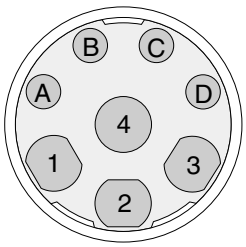
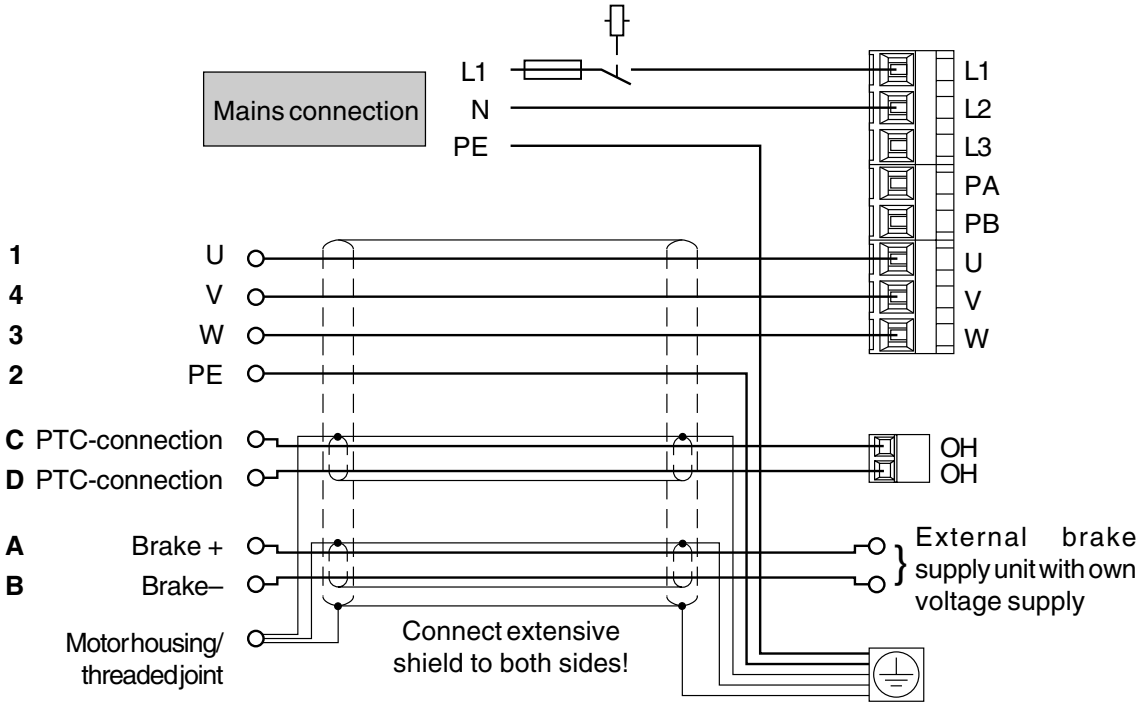
### 6.3 1-phase Connection 230 V Class

| | |
|---|---|
| PE | Protective earth conductor |
| U, V, W | Motor |
| L1, L2 | Mains connection 1-phase |
| PA, PB | Connection braking resistor |




Servo motor power connector




| Connector Contact No. | Designation | Cable Core No. |
|---|---|---|
| 1 | U | 1 |
| 4 | V | 2 |
| 3 | W | 3 |
| 2 | PE | Geen-Yellow |
| A | Brake + | 5 |
| B | Brake – | 6 |
| C | PTC-Contact | 7 |
| D | PTC-Contact | 8 |

## 6.4 3-phase Connection 230 V/400 V Class

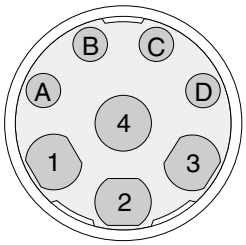
***Absolutely ensure the observance of the supply voltage of the servo controller (3 x 230 V / 3 x 400 V!***

***Remove or plug in the power connector only at switched off unit and disconnected power supply !***

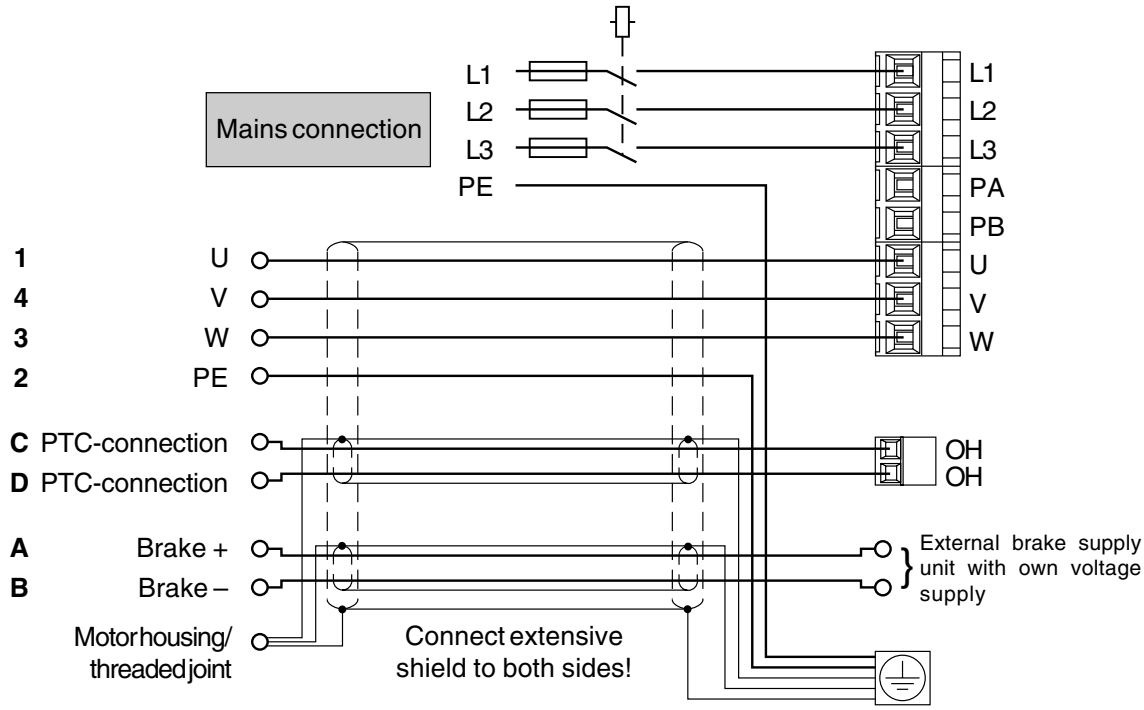
***Observe the correct phase sequence for the connection of the servo motor !***

GB

| | |
|---|---|
| PE | Protective earth conductor |
| U, V, W | Motor |
| L1, L2, L3 | Mains connection 3-phase |
| PA, PB | Connection braking resistor |




Servo motor power connector




| Connector Contact No. | Designation | Cable Core No. |
|---|---|---|
| 1 | U | 1 |
| 4 | V | 2 |
| 3 | W | 3 |
| 2 | PE | Green-Yellow |
| A | Brake + | 5 |
| B | Brake – | 6 |
| C | PTC-Contact | 7 |
| D | PTC-Contact | 8 |

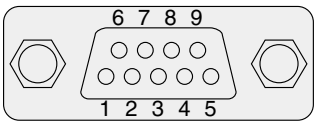
GB

## 6.5 Connection Incremental-EncodeR Simulation

The encoder interface X3 is reversible from an incremental encoder emulation to an incremental encoder input. The increments of the emulation are fixed to 1024 for units with resolver interface. For units with SIN/COS interface, the increments of the SIN/COS - encoder are used.

Max. input frequency: < 300 kHz
Signals: RS 422 / 2 trace signals and zero signal
Max. transmission link: 50 m
Released encoder types: Kübler 5800 / 5820
Heidenhain RON 425 / ROD 426
or compatible

Servo controller
Sub-D-connector X3



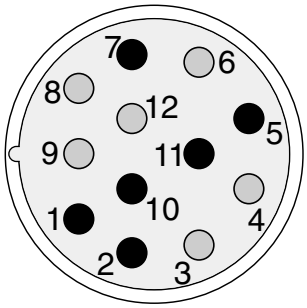

| PIN No. | Signal | Meaning |
|---|---|---|
| 1 | $U_{a1}$ | Signal channel A |
| 2 | $U_{a2}$ | Signal channel B |
| 3 | $U_{a0}$ | Signal Zero |
| 4 | +5V | max. 150 mA (1) |
| 5 | +18V | max. 100 mA (1) |
| 6 | $\overline{U}_{a1}$ | Signal channel A inverted |
| 7 | $\overline{U}_{a2}$ | Signal channel B inverted |
| 8 | $\overline{U}_{a0}$ | Signal zero inverted |
| 9 | GND | |

**(1)** Voltage supply at X3 and X4 can be loaded at the +18V with max. 100mA. Alternatively the +5V can be loaded with 300mA.

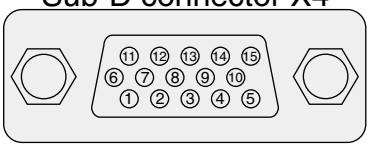
***Remove or plug in the power connector when the unit is switched off and the power supply is disconnected!***

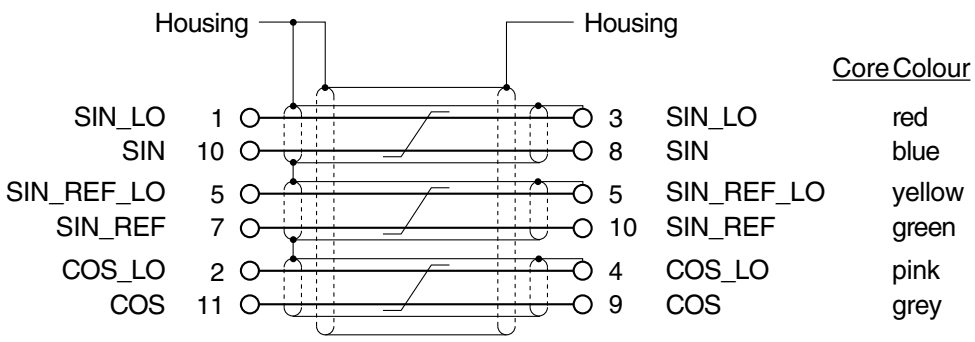
## 6.6 Connection Resolver

Servo motor
resolver connector




Servo controller
Sub-D connector X4

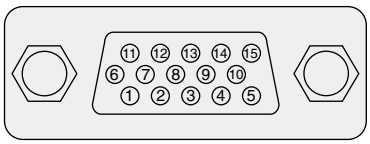


## 6.7 Connection SIN/COS-Encoder *Option*

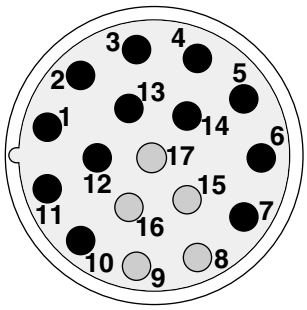
***Remove or plug in the connector only at switched off unit and disconnected power supply !***

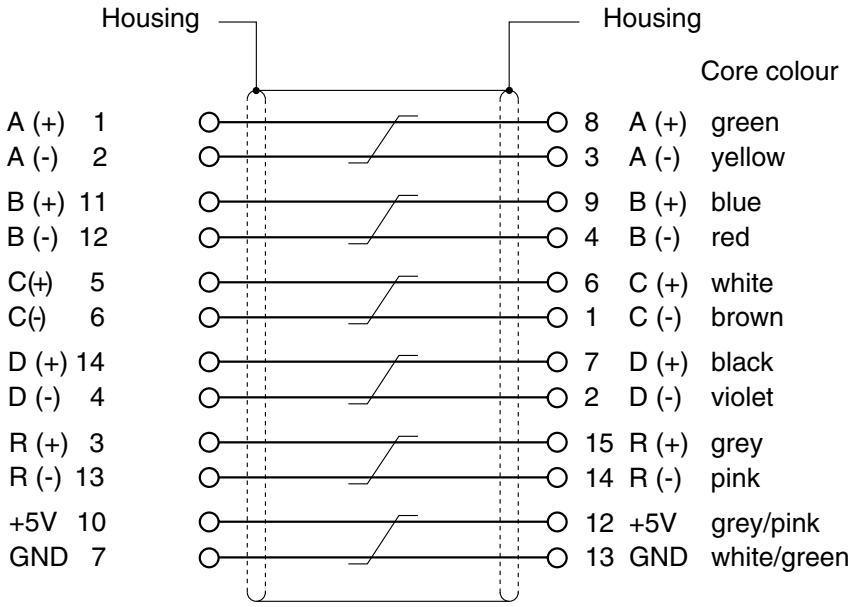
Servo Controller
Sub-D socket X4




Servo Motor

Servo motor
Encoder connector




## 6.8 Cables

For the servo system KEB COMBIVERT S4 factory-assembled motor, resolver and encoder cables are available in the lengths 5m, 10m, 15m und 20m.

**00.S4.109–0005**

Cable length
- 05 = 5 m
- 10 = 10 m
- 15 = 15 m
- 20 = 20 m

Part
- 109 = Resolver cable
- 019 = Motor cable 1,5 mm²
- 119 = Motor cable 2,5 mm²
- 209 = Encoder cable ERN1387

Type designation 00.S4

***Other cable lengths on request.***

## 6.9 Control Terminal Strip X1

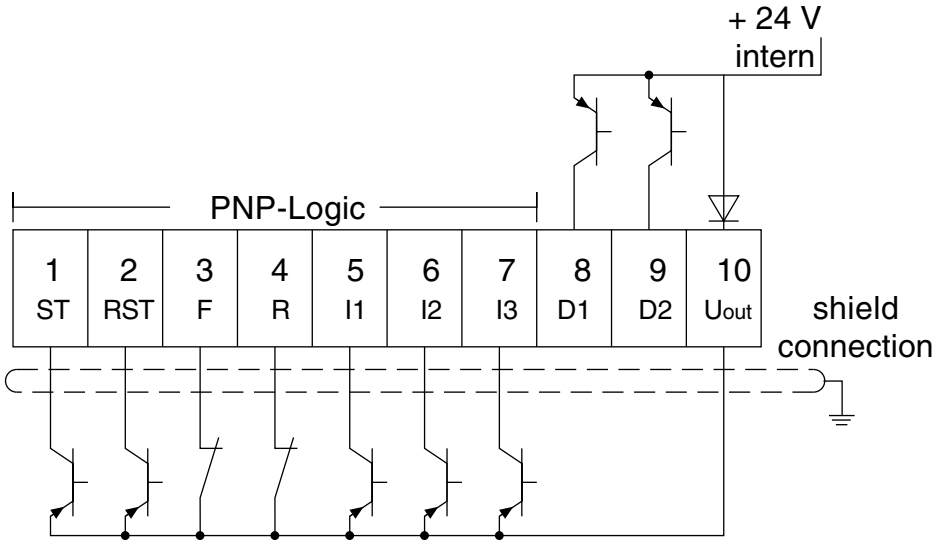
***Rotation release (terminal X2.3 / X2.4) and analog torque limitation (terminal X2.16 / X2.17) have no function in the Drive Mode. See page GB 35 "Drive Mode".***

GB

| Terminal | Designation | Function | |
|---|---|---|---|
| 1 | ST | Control release (output off circuit, if opened, no torque) | digital inputs: +12…33 V / Ri = 2,7 kΩ PNP<br>potential separated<br>* When the unit is defective there is no guarantee that the software protective function will start. |
| 2 | RST | Reset | |
| 3 | F | Release of rotation direction (limit switch*) forward | |
| 4 | R | Release of rotation direction (limit switch*) reverse | |
| 5 | I1 | Input for jogging speed forward | |
| 6 | I2 | Input for jogging speed reverse | |
| 7 | I3 | Input for external error setting | |
| 8 | D1 | Digital output signal 1 | programmable PNP - transistor outputs 16V - 30V / max. 20 mA |
| 9 | D2 | Digital output signal 2 | |
| 10 | Uout | + 24 V voltage input | 16V - 30V / max. 60 mA at ext. supply of the control approx $U_{ext.}$ |
| 11 | 0 V | Ground reference for +24 V and digital in/outputs | |
| 12 | CRF | +10 V reference voltage | +10V (+/- 3%) ; max. 4 mA |
| 13 | COM | Ground for analog inputs/outputs | |
| 14 | REF 1 + | Analog setpoint value setting | Voltage difference input - 10V… + 10V / Resolution: 12 Bit Ri = 40 kΩ |
| 15 | REF 1 – | | |
| 16 | REF 2 + | Analog torque limitation ***refer to Parameter CP.9*** | Voltage difference input 0…+10V Resolution: 12 Bit; -10V…0V ≙ 0 Nm/ +10V ≙ $M_{max.}$ / Ri = 40 kΩ |
| 17 | REF 2 – | | |
| 18 | A1 | Programmable analog output 1 | -10V…+10V / Resolution: 10 Bit Ri=100 Ω |
| 19 | A2 | Programmable analog output 2 | |
| 20 | RLA | Output relay: | 30 V DC/1 A |
| 21 | RLB | RLA / RLC: normal operating condition | |
| 22 | RLC | RLB / RLC: POWER OFF / malfunction | |
| 23 | Ex. Voltage | external supply of the control | + 24 V external voltage input |

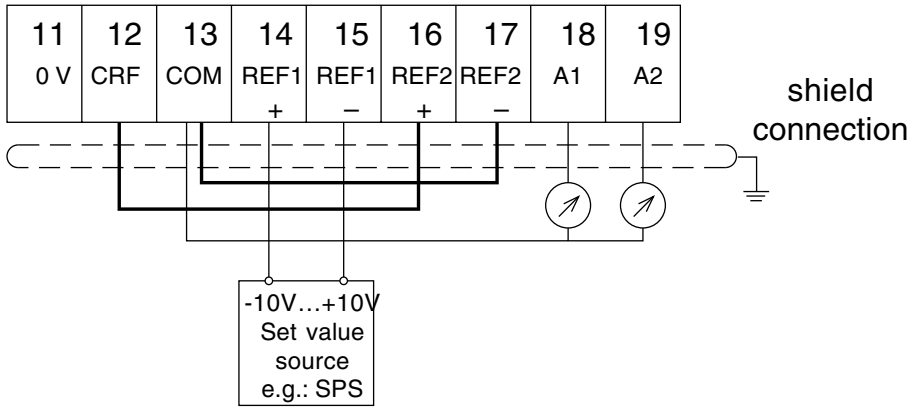
GB

### 6.9.1 Digital Inputs / Outputs

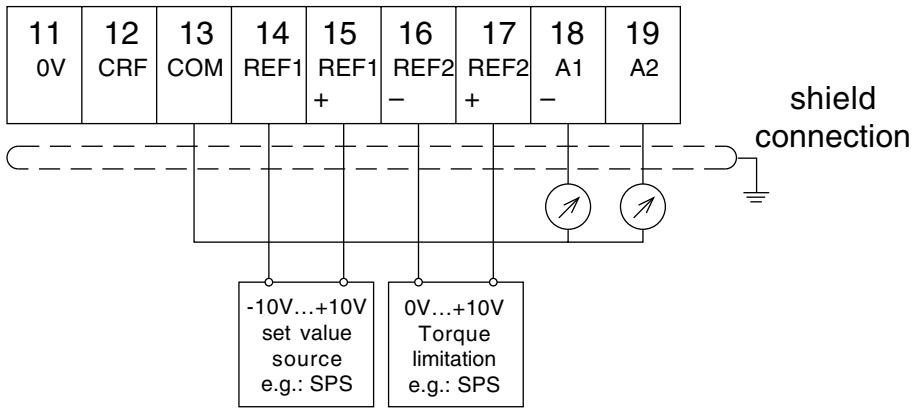



### 6.9.2 Analog Inputs / Outputs

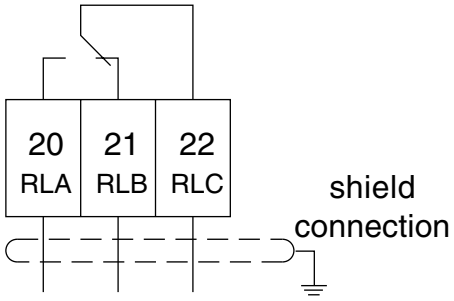
***without*** analog torque limitation



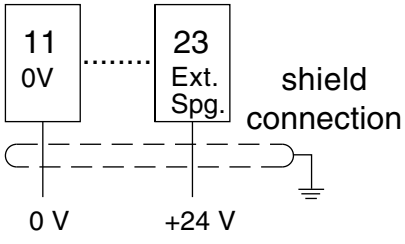

***with*** analog torque limitation




### 6.9.3 Output Relay

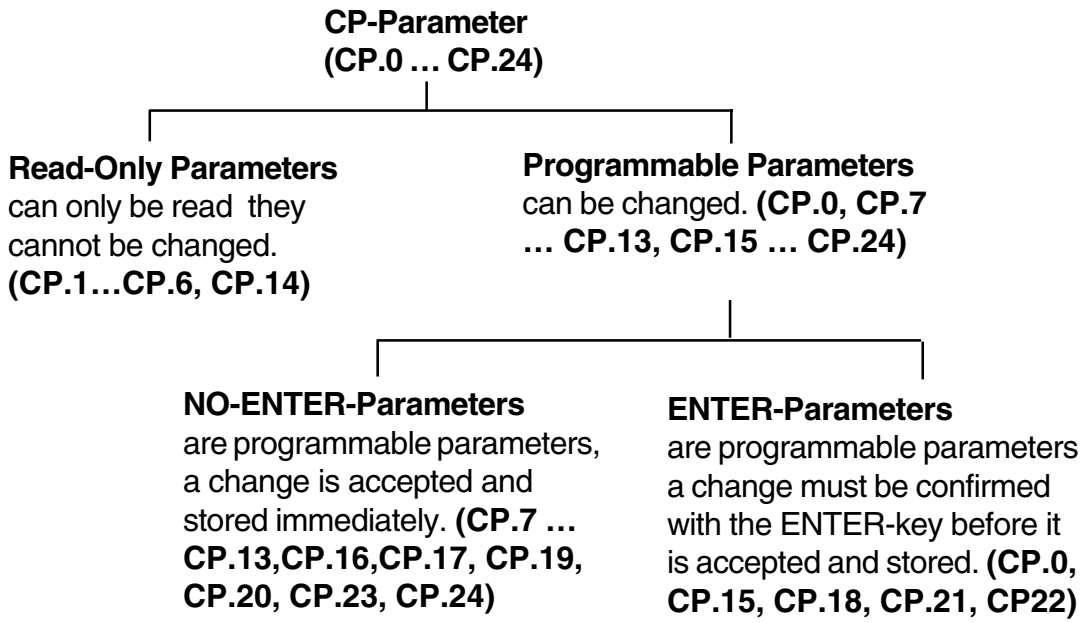



### 6.8.4 External voltage supply of the control



# 7. Operation

## 7.1 Parameter Structure




GB

## 7.2 Parameter Survey

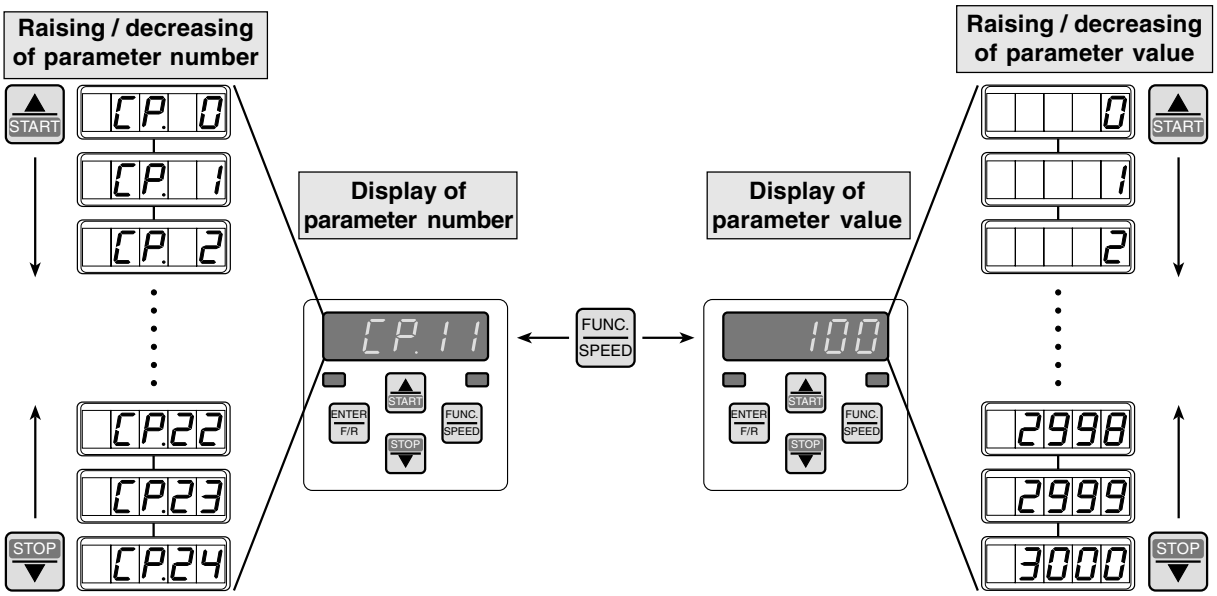
| Par.-No. | Parameter name | Setting range | Resolution | Factory setting |
|---|---|---|---|---|
| CP.0 | Password input | 0…9999 | 1 | – |
| CP.1 | Actual speed display | – | 0,5 U/min | – |
| CP.2 | Status display | – | – | – |
| * CP.3 | Apparent motor current | – | 0,1 A | – |
| * CP.4 | Max. apparent motor current | – | 0,1 A | – |
| * CP.5 | Current Torque | – | 0,1 Nm | – |
| CP.6 | Setpoint speed display | – | 0,5 U/min | – |
| CP.7 | Acceleration time | 0…320 s | 0,01 s | 0,05 s |
| CP.8 | Deceleration time | 0…320 s | 0,01 s | 0,05 s |
| CP.9 | Torque limit | 0…5 x $M_N$ | 0,1 Nm | 3 x $M_N$ |
| CP.10 | Max. setpoint speed | 0…9999 | 0,5 U/min | Rated speed |
| CP.11 | Jogging speed | 0…9999 | 0,5 U/min | 100 U/min |
| CP.12 | P-factor speed controller | 0…65535 | 1 | Motor-type dependent |
| CP.13 | I-factor speed controller | 0…65535 | 1 | Motor-type dependent |
| CP.14 | Line number incremental encoder simulation | – | – | 1024/2048 (for sin/cos) |
| CP.15 | Behaviour at external fault | 0…6 | 1 | 0 |
| CP.16 | Offset REF 1 | -100%…+100% | 0,1 % | 0 % |
| CP.17 | Zero point hysteresis REF 1 | 0…10 % | 0,1 % | 0 % |
| CP.18 | Function output A1 | 0…6 | 1 | 2 |
| CP.19 | Amplification output A1 | -20…+20 | 0,01 | 3 x $M_{Nenn}$ $\hat{=}$ +10V |
| CP.20 | Amplification output A2 | -20…+20 | 0,01 | +/–$n_{Nenn}$ $\hat{=}$ +/–10V |
| CP.21 | Switching condition output D1 | 0…20 | 1 | 20 |
| CP.22 | Switching condition output D2 | 0…20 | 1 | 18 |
| CP.23 | Torque level output D1 | 0…50 Nm | 0,1 Nm | 0,5 x $M_{Nenn}$ |
| CP.24 | Speed level output D2 | 0…16000 U/min | 0,5 U/min | 0,5 x $n_{Nenn}$ |

*With the actual values displayed, from the normal machine dispersion and temperature drifts, tolerances must be taken into account. (about ± 10% in relation to the nominal value)

GB

## 7.3 Selection and Changing of Parameters

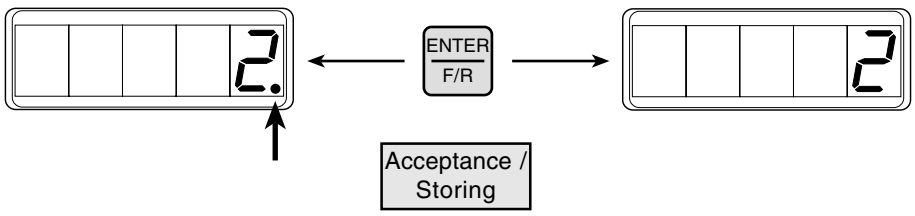
***When switching on the servo controller the display always shows the value of parameter CP.1 (Status Display).***




## 7.4 Storing Parameter Value

When changing the value of an **ENTER-Parameter** a point appears behind the last digit in the display. By pressing the ENTERkey the adjusted value is accepted and stored (point disappears).

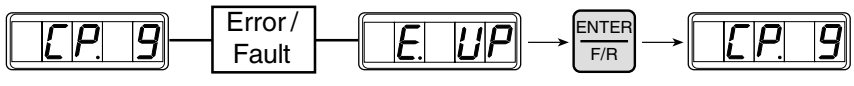
Example:




## 7.5 Error Message

If an error occurs during operation the current display is overwritten by the error message. To reset the error message press the key "ENTER".

Example:

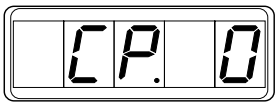



***The key ENTER only reset the error message. To reset the error itself the error cause must be eliminated first and a reset at terminal X2.2 or a cold start must be carried out.***
***! Error Massages / Error Diagnosis see page GB 43!***

## 8. Parameter Description

The servo controller is supplied ex factory without password protection, i.e. all programmable parameters can be changed. After the parameterizing the unit can be locked against unauthorized access. The adjusted mode is stored.

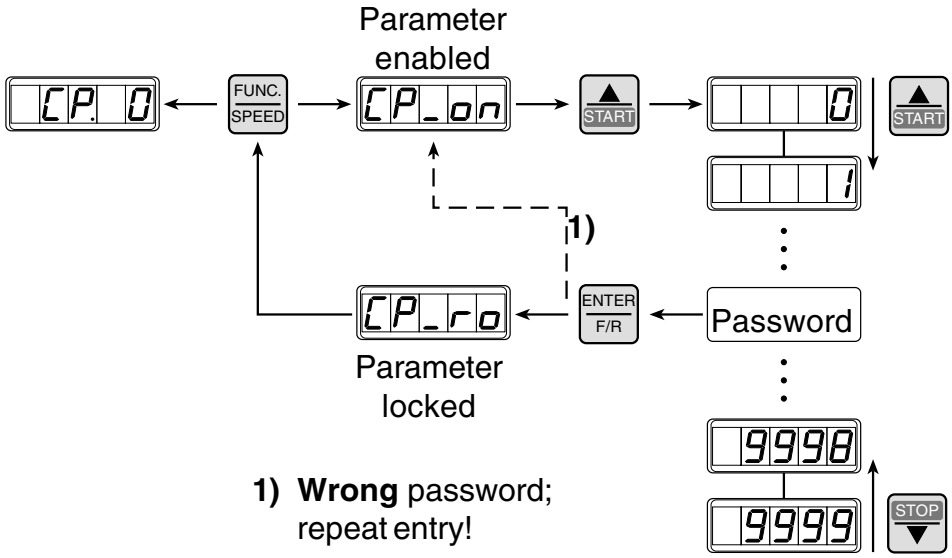
***The passwords are listed in page GB 45!***




**Passwort input**

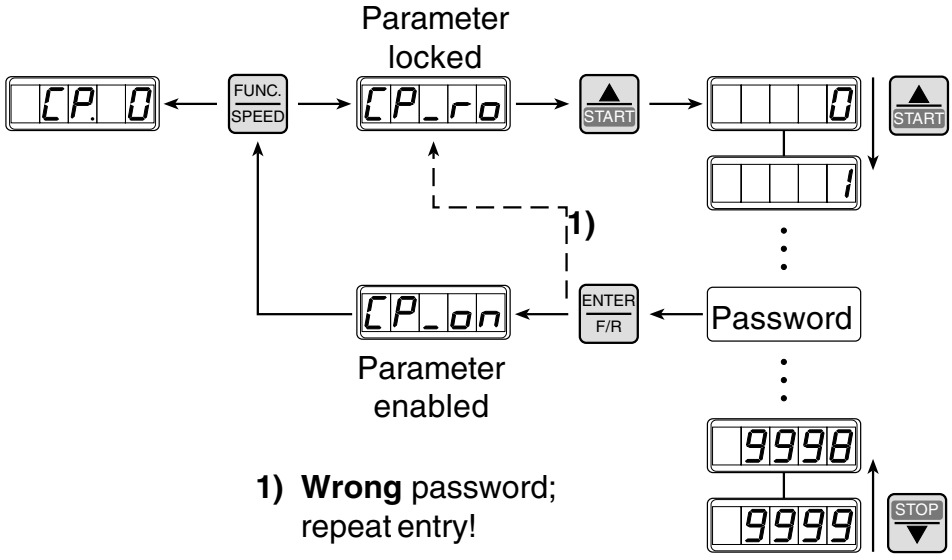
GB

**Locking of CP-Parameters:**

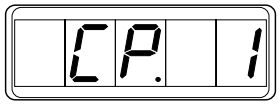



**1) Wrong** password; repeat entry!

**Enabling of CP-Parameters:**




**1) Wrong** password; repeat entry!




**Actual Speed Display**

Display of current motor speed.
Rotation "forward": Resolution 0,5 U/min.
Rotation "reverse": Represented by negative speed with a resolution of 1 U/min.

Example:


Rotation "forward"


Rotation "reverse"
Speed1837 U/min or 1837,5 U/min

**Status Display**

The status display indicates the current operating condition of the servo controller. Possible indications and their meaning are listed in the following:



**Operating State ready:**

| | | | |
|---|---|---|---|
| noP | 0 | No Operation | Control release not briged, modulation switched off, output voltage = 0, drive uncontrolled |
| LS | 70 | Low Speed | Control release briged, no rotational direction command, modulation switched off, output voltage = 0 drive uncontrolled |

**Operating State run :**

| | | | |
|---|---|---|---|
| Facc | 64 | Forward Acceleration | Drive accelerates forward |
| Fcon | 66 | Forward Constant | Drive runs with constant speed forward |
| FdEc | 65 | Forward Deceleration | Drive decelerates forward |
| rAcc | 67 | Reverse Acceleration | Drive accelerates in reverse |
| rCon | 69 | Reverse Constant | Drive runs with constant speed in reverse |
| rdEc | 68 | Reverse Deceleration | Drive decelerates in reverse |
| rFP | 79 | ready for positioning | Drive waits for the positioning to start |
| P A | 80 | positioning active | Drive executes a positioning command |
| SrA | 82 | search for reference active | Drive in reference point search |

**Operating State Abnormal Condition:**

| | | | |
|---|---|---|---|
| A.OH2 | 97 | abnormal stopping OH | Quick stop after OH-prewarning |
| A.dOH | 96 | abnormal stopping drive OH | Quick stop after motor overheating |
| A.EF | 90 | abnormal stopping EF | Quick stop after external error |
| A.PrF/ | 94 | abnormal stopping prohibited | Quick stop caused by one of the |
| A.Prr | 95 | rotation forward / reverse | software limit switches |
| A.bus | 93 | abnormal stopping bus | Quick stop after the time monitoring starts for serial communication (Watchdog) |

**Operating State Fatal Error:**

| | | | |
|---|---|---|---|
| E.OC | 4 | error overcurrent | Overcurrent |
| E.OP | 1 | error overpotential | Overvoltage |
| E.UP | 2 | error underpotential | Undervoltage |
| E.OH | 8 | error overheat | Overheat in the inverter |
| E.dOH | 9 | error drive overheat | Motor overheated |
| E.OH2 | 30 | error motor protection | Motor overloaded |
| E.OL | 16 | error overload inverter | Overload KEB COMBIVERT S4 |
| E.EF | 31 | error extern fault | External Fault |
| E.PrF/ | 46 | error prohibited rotation | Quick stop caused by one of the |
| E.Prr | 47 | forward/reverse | software limit switches |
| E.OS | 105 | error overspeed | Error overspeed |
| E.LSF | 15 | current limit resistor error | Loading shunt error |
| E.SEt | 39 | error at set selection | Set selection error set x |
| E.bus | 18 | error bus | Time monitoring for serial communication |
| E.EnC | 32 | error encoder | Error in the resolver interfacing |
| E.PuC | 49 | error power unit | Error in the power part detection |
| E.dSP | 51 | error DSP | Internal processor error |
| E.hyb | 52 | error hybrid | Internal hardware error in the hybrid detection |
| E.SLF | 110 | error software limit forward | Software limit switch F |
| E.SLr | 111 | error software limit reverse | Software limit switch R |

**A detailed error description is shown at page GB 43.**


**Apparent Motor Current**

Indication of the current apparent motor current in ampere.

Resolution: 0,1 A

GB


**Apparent Motor Current Peak Value**

Indication of the maximum apparent motor current measured during operation, in ampere.

Resolution: 0,1 A


**Current Torque**

Indication of the current torque in newtonmeter.

Resolution: 0,1 Nm

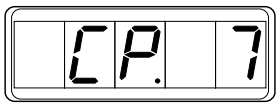

**Setpoint Speed Display**

Indication of preset setpoint speed in U/min.

Resolution: 0,5 U/min

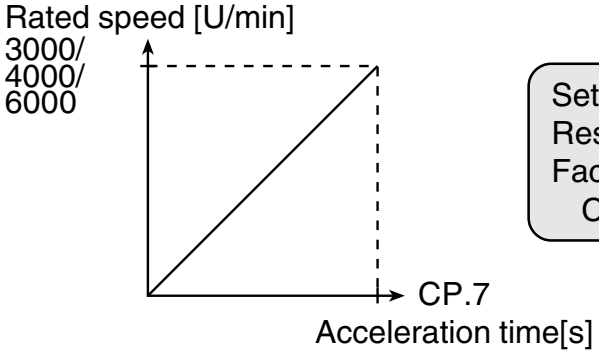
Positive speed: Rotation "forward" **or** no sense of rotation

Negative Speed: Rotation "reverse"




**Acceleration Time**

The parameter defines the time required to accelerate form 0 U/min to rated speed of the servo system (3000/4000/6000 U/min). The behaviour of the actual acceleration time is proportional to the speed change (delta n).




| | |
|---|---|
| Setting range: | 0…320 s |
| Resolution: | 0,01 s |
| Factory setting: | 0,05 s |
| Customer setting: | ____ s |

GB

$$\frac{\textbf{CP.7}}{\textbf{Rated speed}} = \frac{\textbf{actual acceleration time}}{\textbf{delta n}}$$

**Calculation Example:**

**Calculation of acceleration time to be adjusted:**

The drive shall accelerate from 100 U/min to 2500 U/min in **0,2 s** !
Rated speed of the drive: 3000 U/min

delta n = 2500 U/min – 100 U/min = 2400 U/min

$$CP.7 = \frac{\text{actual acceleration time}}{\text{delta n}} \bullet \text{Rated speed}$$

$$CP.7 = \frac{0{,}2\text{s}}{2400\ \text{U/min}} \bullet 3000\ \text{U/min} = \textbf{0,25 s}$$

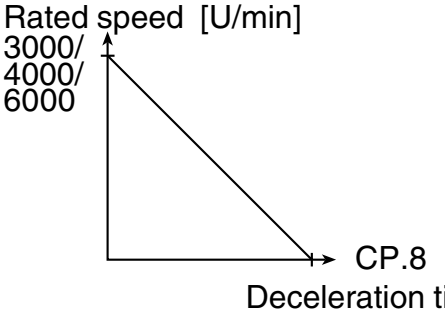
In this example the parameter CP.7 must be adjusted to 0,25 s !

***If CP.7 and CP.8 = 0.00 s***
***then CP.16 and CP.17 without function***


**Deceleration Time**

GB

The parameter defines the time required to decelerate from rated speed of the servo system (3000/4000/6000 U/min) to 0 U/min. The behaviour of the actual deceleration time is proportional to the speed change.




| | |
|---|---|
| Setting range: | 0…320 s |
| Resolution: | 0,01 s |
| Factory setting: | 0,05 s |
| Customer setting: | _____ s |

$$\frac{\text{CP.8}}{\text{Rated speed}} = \frac{\text{actual deceleration time}}{\text{delta n}}$$

**Calculation of deceleration time to be adjusted:**

The drive shall decelerate from 3000 U/min to 1000 U/min in **0,05 s**!
Rated speed of the drive: 4000 U/min

delta n = 3000 U/min – 1000 U/min = 2000 U/min

$$\text{CP.8} = \frac{\text{actual deceleration time}}{\text{delta n}} \bullet \text{Rated speed}$$

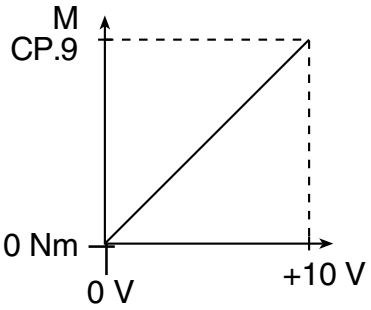
$$\text{CP.8} = \frac{0{,}05\text{s}}{2000\ \text{U/min}} \bullet 4000\ \text{U/min} = \mathbf{0{,}1\ s}$$

In this example parameter CP.8 must be adjusted to 0,1 s !

***When CP.7 and CP.8 = 0.00 s***
***then CP.16 and CP.17 without function***


**Torque Limit**

The maximum permissible torque of the drive is defined with parameter CP.9.




Analog limitation:
Terminals X2.16 / X2.17

| | |
|---|---|
| Setting range: | 0…5 x $M_N$ |
| Resolution: | 0,1 Nm |
| Factory setting: | 3 x $M_N$ |
| Customer setting: | ____ Nm |


**Maximum Setpoint Speed**

Defines the maximum output speed of the servo controller.

| | |
|---|---|
| Setting range: | 0…9999 U/min |
| Resolution: | 0,5 U/min |
| Factory setting: | Rated speed |
| Customer setting: | ____ U/min |



In case the preset speed is too high the value is limited internally to the maximum permissible value!


**Jog-Drehzahl**
**Jogging Speed**

Presetting of speed that can be activated via digital inputs I1 or I2. Depending on the assignment of the inputs the jogging speed can be activated by direction of rotation "forward" or alternatively direction of rotation "reverse" . If both directions of roation are preset at the same time then rotation "forward" has priority.

| | |
|---|---|
| Setting range: | 0…9999 U/min |
| Resolution: | 0,5 U/min |
| Factory setting: | 100 U/min |
| Customer setting: | _____U/min |

**Condition:**
The control terminals X2.1(ST), X2.3 (F) or X2.4 (R) must be connected with terminal X2.10 (+16V) .

**Function:**
- I1 or I2 active ⇨ Drive runs with adjusted jogging speed.
- I1 and I2 not active ⇨ Drive runs with original speed.

- In jogging operation the drive accelerates and decelerates at the torque limt.
- Original direction of rotation, speed, acceleration time and deceleration time are without function.
- In case the preset speed is too high the value is limited internally to the maximum permissible motor speed!


**P-Factor Speed Controller**

Proportional factor of speed_controller.

**see page 42 adjustment assistance speed controller**

| | |
|---|---|
| Setting range: | 0...65535 |
| Resolution: | 1 |
| Factory setting: | motor-type depend |
| Customer setting: | _____ |

GB


**I-Factor Speed Controller**

Integral factor of speed controller.

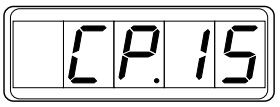
**see page 42 adjustment assistance speed controller**

| | |
|---|---|
| Setting range: | 0...65535 |
| Resolution: | 1 |
| Factory setting: | motor-type depend |
| Customer setting: | _____ |


**Line Number Incremental Encoder Simulation**

This Parameter shows the adjusted encoder (inc/r) of the incremental encoder simulation. It is dependent on the system sub-assembly.

Increments of servo system with
- Resolver (sub-assembly 009 - 012): 1024 Increments
- ERN 1387 (sub-assembly 012 - 014): 2048 Increments
- ERN 1188 (sub-assembly 015, 016): 512 Increments

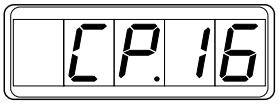



**Behaviour at External Fault**

This parameter determines the response of the drive to an external fault.

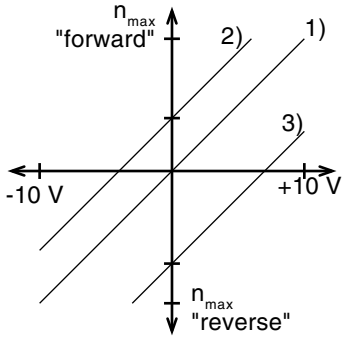
| | |
|---|---|
| Setting range: | 0…6 |
| Resolution: | 1 |
| Factory setting: | 0 |
| Remarks: | ENTER-Parameter |
| Customer setting: | _____ |

| Value | Response of Drive |
|---|---|
| 0 | Error message: **E.EF** → Immediate disconnection of inverter!<br>***!*** To restart eliminate the fault and make a ***Reset !*** |
| 1 | Status message: **A.EF** → Fast stop → Disconnection of inverter after attaining speed 0.<br>***!*** To restart eliminate the fault and make a ***Reset !*** |
| 2 | Status message: **A.EF** → Fast stop → Holding torque at speed 0.<br>***!*** To restart eliminate the fault and make a ***Reset !*** |
| 3 | Status message: **A.EF** → Immediate disconnection of inverter.<br>***!*** **Automatic** restart when fault condition no longer exists***!*** |
| 4 | Status message: **A.EF** → Fast stop → Disconnection of inverter after attaining speed 0.<br>***!*** **Automatic** restart when fault condition no longer exists***!*** |
| 5 | Status message: **A.EF** → Fast stop → Holding torque at speed 0.<br>***!*** **Automatic** restart when fault condition no longer exists ***!*** |
| 6 | Status message: **none** → No effect on the drive.<br>***!*** Fault is ignored***!*** |




**Offset REF 1**

Permits the shifting of the setpoint-speed characteristic.
***! Only at CP.7 > 0,00 s!***




***Adjustment of parameter CP.7 and CP.8 must be observed!***

| | |
|---|---|
| Setting range: | -100…+100 % |
| Resolution: | 0,1 % |
| Factory setting: | 0 % |
| Customer setting: | ____ % |

GB

**Examples:**

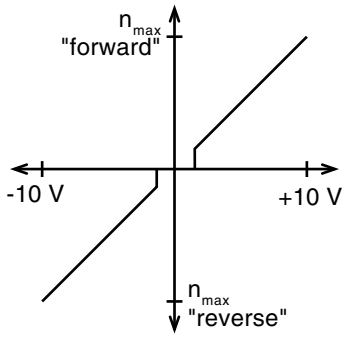
Characteristic 1: CP.16 = **0%** (standard setting)
0V = 0 U/min
Rotation "forward": $n_{max}$ is attained at +10V
Rotation "reverse": $n_{max}$ is attained at -10 V

Characteristic 2: CP.16 = **+40%**
0V = 40 % of $n_{max}$ "forward"
Rotation "forward": $n_{max}$ is attained at 60% of +10V
Rotation "reverse": maximal 60% of $n_{max}$ possible

Characteristic 3: CP.16 = **–70%**
0V = 70 % of $n_{max}$ "reverse"
Rotation "forward": maximal 30% of $n_{max}$ possible
Rotation "reverse": $n_{max}$ is attained at 30% of -10V


**Zero Point Hysteresis REF 1**

A zero point hysteresis of the analog reference input REF1 is adjusted with this parameter. Voltage fluctuations and ripple voltages around the zero point of the setpoint value do not cause any drifting of the motor.
***! Only when CP.7 or CP.8 > 0,00 s !***




***Adjustment of parameter CP.7 and CP.8 must be observed!***

| | |
|---|---|
| Setting range: | 0…10 % |
| Resolution: | 0,1 % |
| Factory setting: | 0 % |
| Customer setting: | ____ % |

0…10 % = 0…+/- 1 V

**Example:** If CP.17 is adjusted to 5 % then the drive starts only at a setpoint value of +/- 0,5 V.


**Function Output A1**

This parameter defines which variable is given out at analog output 1 (terminal X2.18).

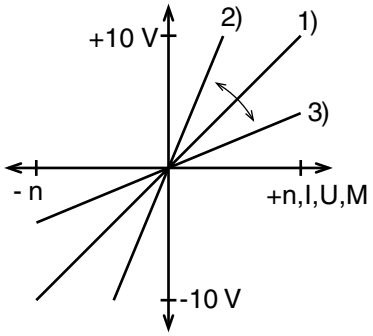
| | |
|---|---|
| Setting range: | 0…6 |
| Resolution: | 1 |
| Factory setting: | 2 |
| Remarks: | ENTER-Parameter |
| Customer setting: | _____ |

GB

| Value | Output variable | Value range at CP.19=1 |
|---|---|---|
| 0 | actual speed | -6000…+6000 U/min ≙ -10V…+10V |
| 1 | apparent motor speed | 0…25 A ≙ 0…+10V |
| 2 | actual torque | 0…25 Nm ≙ 0…+10V |
| 3 | intermediate circuit voltage | 0…1000 V ≙ 0…+10V |
| 4 | speed reference variable | -6000…+6000 U/min ≙ -10V…+10V |
| 5 | system deviation (speed control) | -6000…+6000 U/min ≙ -10V…+10V |
| 6 | setpoint torque | 0…25 Nm ≙ 0…+10V |


**Amplification Output A1**

Parameter CP.19 defines the amplifcation of the analog output signal at output A1 (terminal X2.18).




| | |
|---|---|
| Setting range: | -20…+20 |
| Resolution: | 0,01 |
| Factory setting: | 3 x $M_{Rated}$ ≙ +10 V |
| Customer setting: | _____ |

Characteristic 1: Amplification factor 1
Characteristic 2: Amplification factor 2
Characteristic 3: Amplification factor 0,5

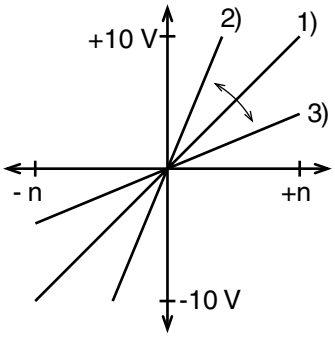
**Calculation Example:**

At 2000 U/min a measurement shall be taken at analog output A1 +10 V.

$$\textbf{CP.19} = \frac{\textbf{value at amplification 1 (s. CP.18)}}{\textbf{desired value at + 10 V}} = \frac{\textbf{6000 U/min}}{\textbf{2000 U/min}} = \textbf{3}$$


**Amplification Output A2**

The analog output A2 (terminal X2.19) outputs the current speed of the servo systems.
Parameter CP.20 defines the amplification of the analog output signal.




| | |
|---|---|
| Setting range: | -20…+20 |
| Resolution: | 0,01 |
| Factory setting: | +/– $n_{Rated}$ ^ +/–10 V |
| Customer setting: | _____ |

Characteristic 1: Amplification factor 1
Characteristic 2: Amplification factor 2
Characteristic 3: Amplification factor 0,5

Standardization at amplification 1 (CP.20=1):
0…+/– 10 V ^ -6000…+6000 U/min

**Calculation Example:**

Rated speed of the servo system: 3000 U/min
At 1000 U/min a measurement shall be taken at analog output A2 +10 V.

$$CP.20 = \frac{\text{value at amplification 1}}{\text{desired value at +10V}}$$

$$CP.20 = \frac{6000\ \text{U/min}}{1000\ \text{U/min}}$$

$$CP.20 = 6$$


**Switching Condition Output D1**

Defines the switching condition of digital output D1.

| | |
|---|---|
| Setting range: | 0…20 |
| Resolution: | 1 |
| Factory setting: | 20 |
| Remarks: | ENTER–Parameter |
| Customer setting: | _____ |

***! Refer to table Switching Conditions page GB 34 !***


**Switching Condition Output D2**

Defines the switching condition of digital output D2.

***! Refer to table below !***

| | |
|---|---|
| Setting range: | 0…20 |
| Resolution: | 1 |
| Factory setting: | 18 |
| Remarks: | ENTER–Parameter |
| Customer setting: | _____ |

**Switching Conditions**

***Digital output D1 and D2***

| Value | Switching condition |
|---|---|
| 0 | always active |
| 1 | always active |
| 2 | system switched on; no abnormal operating condition |
| 3 | ready for operation and modulation enabled |
| 4 | abnormal operating condition / Fault (CP.2 = A.xxx or E.xxx) |
| 5 | inverter blocking after fault (E.xxx) |
| 6 | prewarning level electr. protective motor relay (OH.2) exceeded |
| 7 | after triggering of motor PTC-contact |
| 8 | prewarning level OH.2 or dOH exceeded |
| 9 | current controller in limitation |
| 10 | speed controller in limitation |
| 11 | any controller in limitation |
| 12 | drive in acceleration phase |
| 13 | drive in deceleration phase |
| 14 | drive runs with constant speed |
| 15 | drive runs with constant speed except speed 0 |
| 16 | clockwise rotation – not at noP, LS, abnormal stopping or fault |
| 17 | anti-clockwise rotation-not at noP,LS,abnormal stopping or fault |

***only Digital output D1***

| | |
|---|---|
| 18 | actual speed > 0,1 x rated speed |
| 19 | apparent current > rated current |
| 20 | torque > torque level CP.23 |

***only Digital output D2***

| | |
|---|---|
| 18 | actual speed > speed level CP.24 |
| 19 | apparent current > rated current |
| 20 | torque > rated torque |
| 21 | Angle deviation > angle level |
| 22 | Reference mode completed |
| 23 | Target position reached only available in the posi mode |
| 24 | actual position > position level |
| 25 | Break control |


**Torque Level Output D1**

Defines the torque level of digital output D1.

| | |
|---|---|
| Setting range: | 0…50 Nm |
| Resolution: | 0,1 Nm |
| Factory setting: | 0,5 x $M_{Rated}$ |
| Customer setting: | _____ Nm |


**Speed Level Output D2**

Defines the speed level of digital output D2.

| | |
|---|---|
| Setting range: | 0…16000 U/min |
| Resolution: | 0,5 U/min |
| Factory setting: | 0,5 x $n_{Rated}$ |
| Customer setting: | _____ U/min |

# 9. Drive-Mode

The Drive Mode is a special operating mode of the KEB COMBIVERT. It allows an easy manual startup. To activate the Drive Mode enter the corresponding password in **CP.0**.
***The passwords are listed on page GB 45!***

## 9.1 Setting Possibilities

– Stop / Start / Run
– Setpoint value
– Direction of rotation

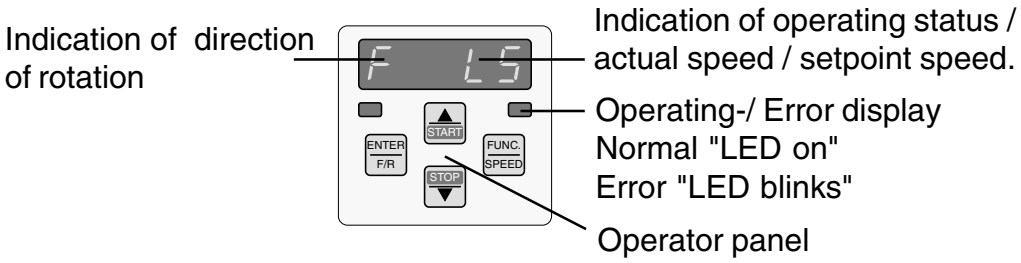


## 9.2 Condition

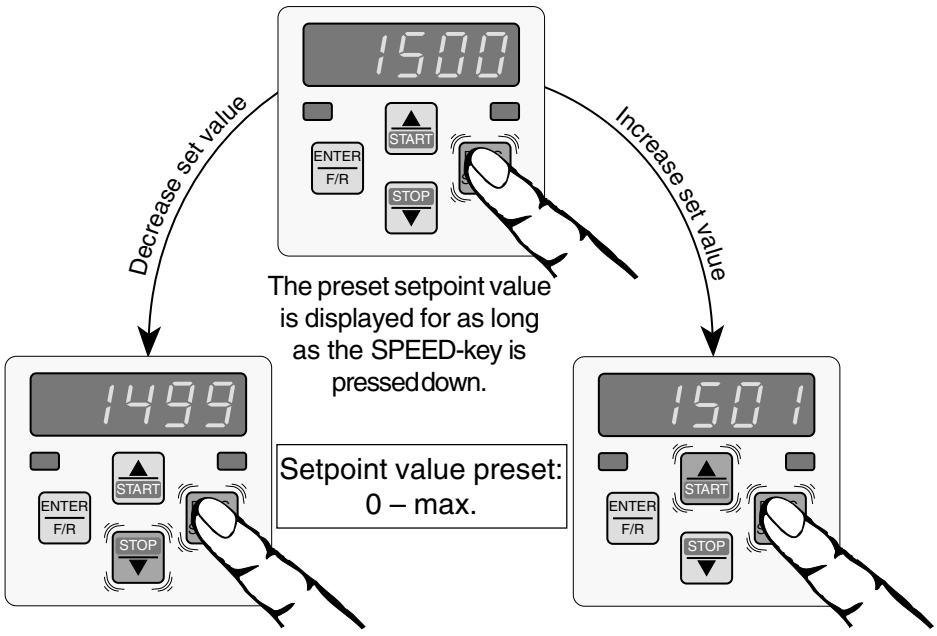
The control release must be activated (terminal stip X2).

> ⚠ Control release (terminal X2.3 / X2.4) and analog torque limitation (terminal X2.16 / X2.17) are without function in the Drive Mode.

## 9.3 Display and Keyboard




## 9.4 Setpoint Display / Setpoint Presetting



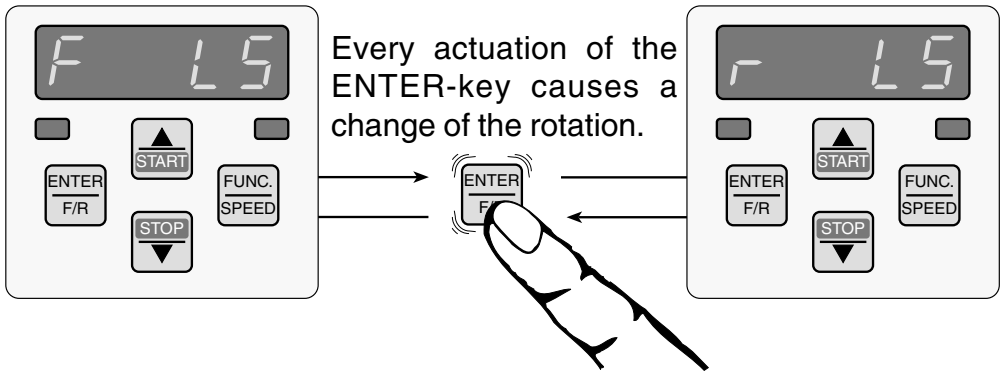

Hold the SPEED-key pressed down and decrease the indicated value with the STOP-key.

Hold the SPEED-key pressed down and increase the indicated value with the START-key.

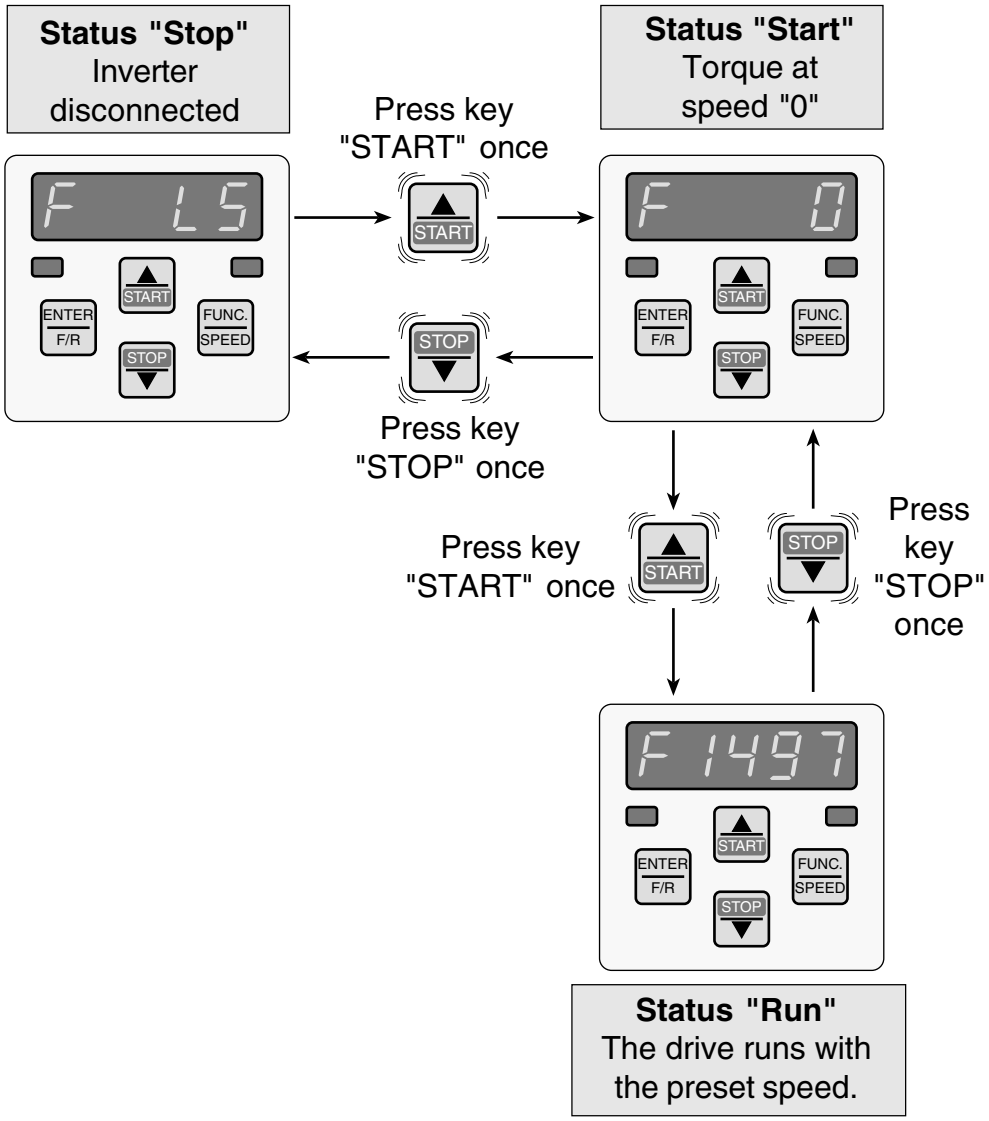
GB

## 9.5 Rotation Presetting

Presetting Possibilities: **F** = forward (clockwise rotation)
**r** = reverse (anti-clockwise rotation)




## 9.6 Start / Stop / RUN




***To change from Drive Mode to CP Mode press the keys "FUNC" and "ENTER" simultaneously and hold them for min. 3 s!***
***! Only possible in the status "Stop" !***

# 10. Accessories

## 10.1 External Braking Resistor

The braking resistor heats up during the braking operation. If the braking resistor is installed in the control cabinet sufficient cooling of the cabinet interior must be provided and a sufficient distance to the KEB COMBIVERT S4 must be kept.

***Do not mount the external braking resistor below the servo controller !***

GB

### 10.1.1 Part No.

**x x . 5 6 . 0 8 0 - x x x 8**

- 00 = 6 % ED  01 = 25 % ED  02 = 40 % ED — Voltage class
- 2 = 230 V  4 = 400V — Braking resistor
- Size

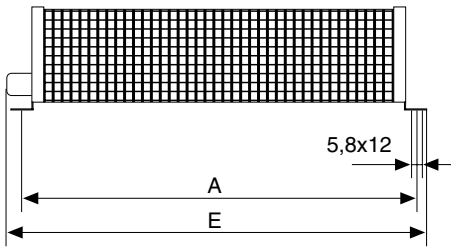
### 10.1.2 Technical Data

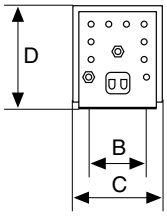
| Size | Part number | $P_R$ [2] [kW] | $R_B$ [Ohm] | $P_N$ Nominal power [1] [W] 6 % | 25 % | 40 % |
|---|---|---|---|---|---|---|
| 03, 05, 07, 10 | 14.56.080-4008 | 7,0 | 82 | 800 | 2700 | 3700 |
| | 14.56.080-4018 | | | | | |
| | 14.56.080-4028 | | | | | |
| 12 | 15.56.080-4008 | 10,3 | 56 | 1200 | 3700 | 5500 |
| | 15.56.080-4018 | | | | | |
| | 15.56.080-4028 | | | | | |
| 16 | 16.56.080-4008 | 14,8/14,4 | 39 | 1700 | 5000 | 7500 |
| | 16.56.080-4018 | | 39 | | | |
| | 16.56.080-4028 | | 40 | | | |
| 18 | 18.56.080-4008 | 26,3 | 22 | 4000 | 9000 | 13500 |
| | 18.56.080-4018 | | | | | |
| | 18.56.080-4028 | | | | | |

[1] The resistor nominal power to be selected $P_N$ dependent on the peak power and the cycle duration factor c.d.f [%].

[2] Peak power recorded for a short period $P_R$ Dimensioning inverter: Motor = 1 : 1

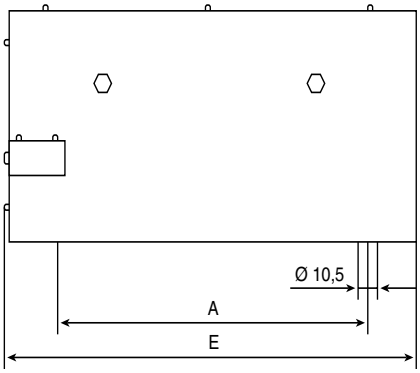
## 10.1.3 Dimensions

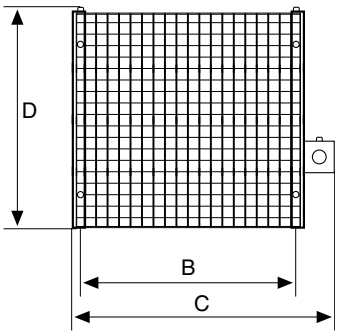



GB

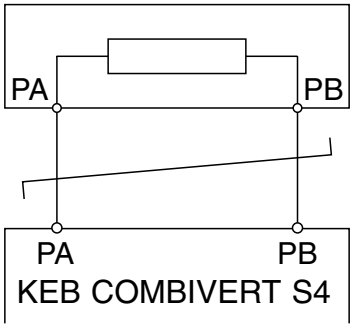
| Part number | $R_B$ [Ohm] | $P_N$ [W] | A | B | C | D | E |
|---|---|---|---|---|---|---|---|
| 14.56.080-4008 | 82 | 800 | 526 | 64 | 92 | 120 | 550 |
| 14.56.080-4018 | 82 | 2700 | 630 | 190 | 230 | 145 | 650 |
| 14.56.080-4028 | 82 | 3700 | 830 | 190 | 230 | 145 | 850 |
| 15.56.080-4008 | 56 | 1200 | 426 | 150 | 185 | 120 | 450 |
| 15.56.080-4018 | 56 | 3700 | 830 | 190 | 230 | 145 | 850 |
| 15.56.080-4028 | 56 | 5500 | 830 | 300 | 340 | 145 | 850 |
| 16.56.080-4008 | 39 | 1700 | 430 | 190 | 230 | 145 | 450 |




| Part number | $R_B$ [Ohm] | $P_N$ [W] | A | B | C | D | E |
|---|---|---|---|---|---|---|---|
| 16.58.080-4018 | 39 | 5000 | 380 | 370 | 430 | 260 | 490 |
| 16.56.080-4028 | 40 | 7500 | 380 | 570 | 630 | 260 | 490 |
| 18.56.080-4008 | 22 | 4000 | 380 | 370 | 430 | 260 | 490 |
| 18.56.080-4018 | 22 | 9000 | 380 | 570 | 630 | 260 | 490 |
| 18.56.080-4028 | 22 | 13500 | 380 | 770 | 830 | 260 | 490 |

## 10.1.4 Connection



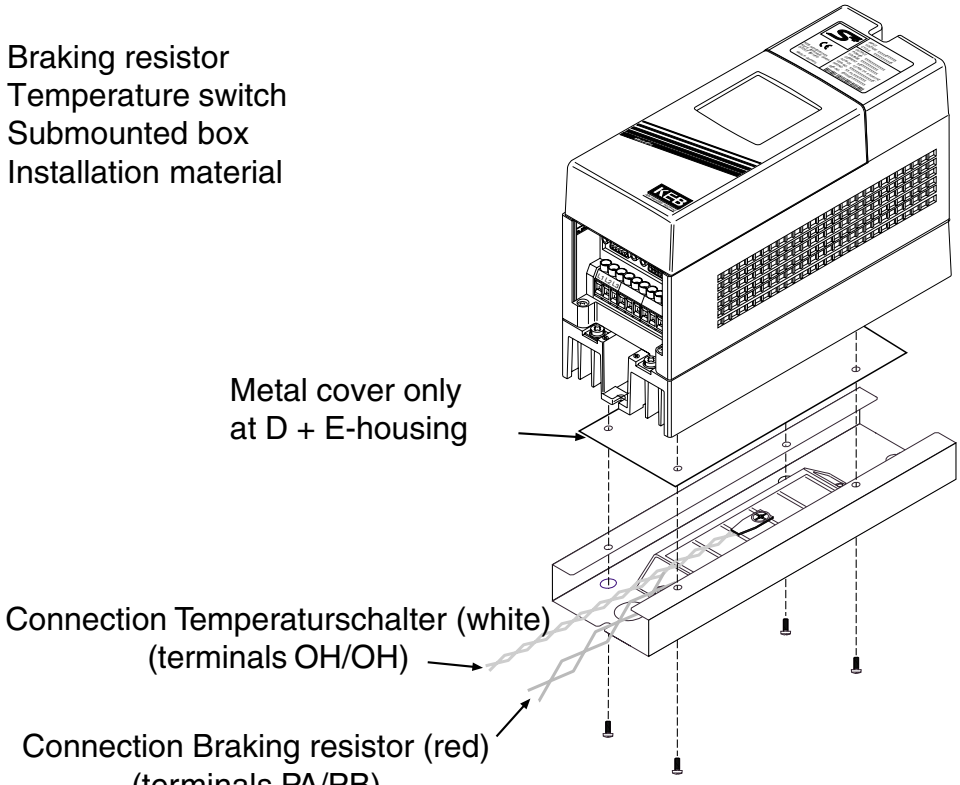

The external braking resistor is connected with the shortest possible line (twisted) to the terminals PA and PB.

GB

## 10.2 Submounted braking resistor

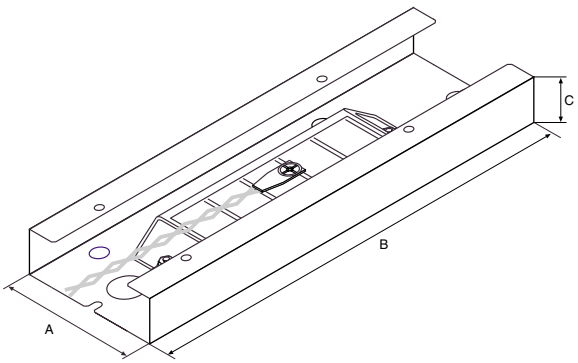
The submounting braking resistors are planned for a small volume installation directly under the frequency inverter. Mostly they are suitable for short braking cycles and clock system. The assemblies are made of:

- Braking resistor
- Temperature switch
- Submounted box
- Installation material




| Size | | 03 / 05 / 07 / 10 | 12 | 16 |
|---|---|---|---|---|
| Housing | | D | E | G |
| Braking resistor | (Ω) | 82 | 60 | 25 |
| Permanent load | [W] | 35 | 60 | 2 x 80 |
| Non-recurring load (max. 3s) | [W] | 7800 | 9600 | 23000 |
| Permissible load at 5 % ED | [W] | 700 | 1200 | 3200 |
| Permissible load at 10 % ED | [W] | 350 | 600 | 1600 |
| Permissible load at 20 % ED | [W] | 175 | 300 | 800 |
| Permissible load at 40 % ED | [W] | 90 | 150 | 400 |
| Weight | [kg] | 0,9 | 1,3 | 1,9 |
| Partnumber of the kit | | 12.F4.D50-4200 | 14.F4.E50-4200 | 16.F4.G50-4200 |

### 10.2.1 Dimensions




| Housing [mm] | D | E | G |
|---|---|---|---|
| A | 90 | 130 | 170 |
| B | 250 | 290 | 340 |
| C | 30 | 30 | 25 |

## 10.3 Radio Interference Suppression Filter

Optional the servo amplifier KEB COMBIVERT S4 is available with integrated radio interference suppression. Submounted filters are available for all unit sizes. The dimensions of the submounted filters are listed in Chapter „5 „Dimensions“.

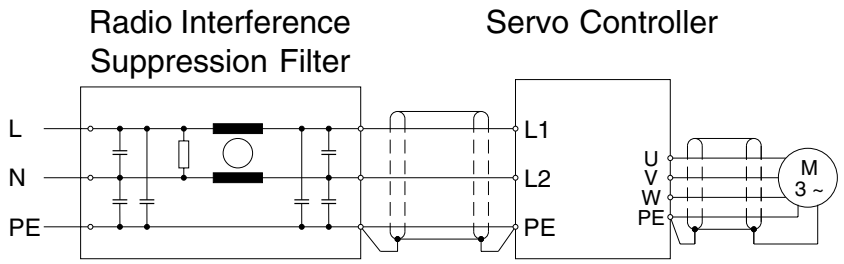
### 10.3.1 Technical Data

GB

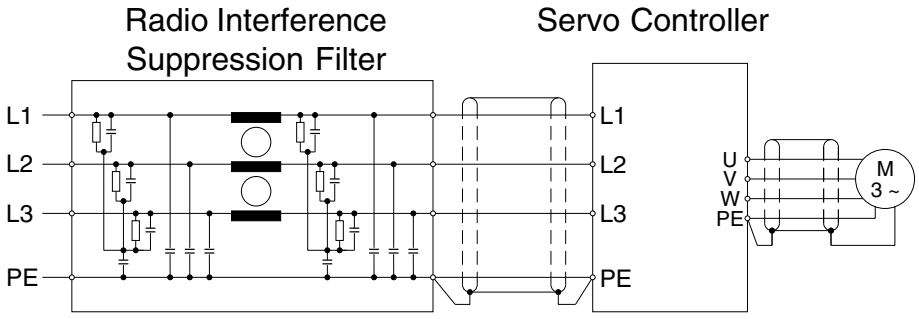
| **Servo controller** | **Part No.:** Filter-kit | **[A]** Rated current | **[mA]** Leakage current | **[V]** Rated voltage |
|---|---|---|---|---|
| 03 (D-Housing) | 09.E4.T60-0001 | 20 | 12 | 230 |
| 05 (D-Housing) | 09.E4.T60-0001 | 20 | 12 | 230 |
| 07 (D-Housing) | 10.E4.T60-1001 | 8 | 15 | 400 |
| 10 (D-Housing) | 10.E4.T60-1001 | 8 | 15 | 400 |
| 12 (E-Housing) | 14.E4.T60-1001 | 20 | 50 | 400 |
| 16 (G-Housing) | 16.E4.T60-1001 | 50 | 50 | 400 |
| 18 (H-Housing) | 18.E4.T60-1001 | 70 | 30 | 400 |

### 10.3.2 Connection

Connection 1-phase




Connection 3-phase

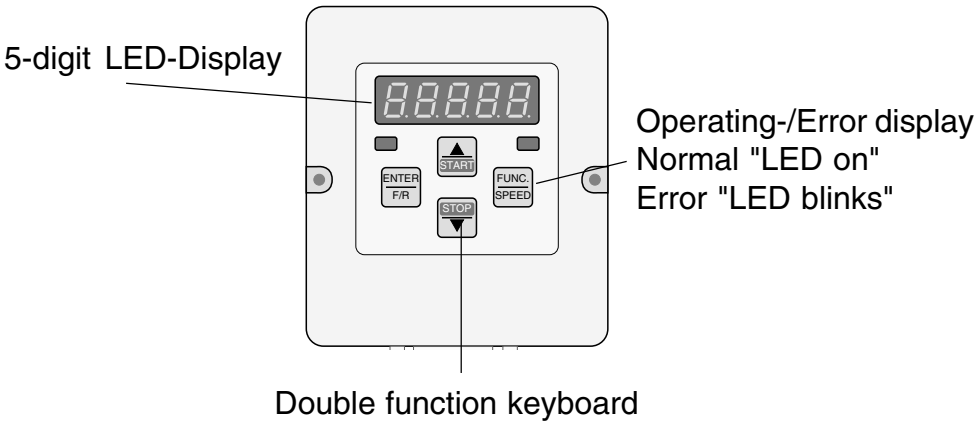


## 10.4 Operator

As an accessory to the local operation an operator is necessary. To prevent malfunctions, the Servo Controller must be brought into ***nOP*** status before connecting/disconnecting the operator (open control release terminal X2.1). When starting the Servo controller whitout an operator, it is started with the last stored values or factory setting. The operator is obtainable in different versions:

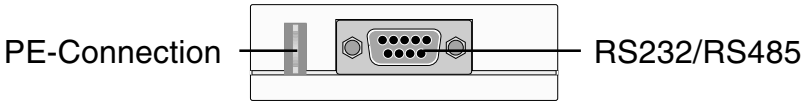
GB

**Digital-Operator**
**Part. No. 00.F4.010-2009**

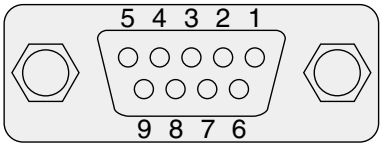



**Interface-Operator**
**Part.-No. 00.F4.010-1009**

In the Interface operator there is an additionally isolated RS232/RS485-Interface integrated. The RS232/485-parameterizing interface expands the KEB COMBIVERT S4 for communication with data communications equipment. Suitable wiring permits the physically isolated data transmission.



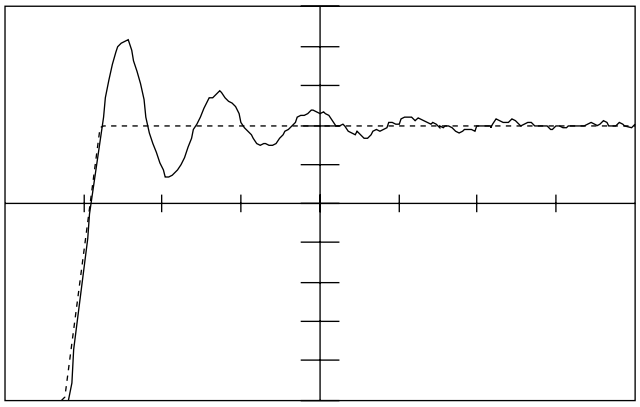

Servo controller
Parameterizing interface



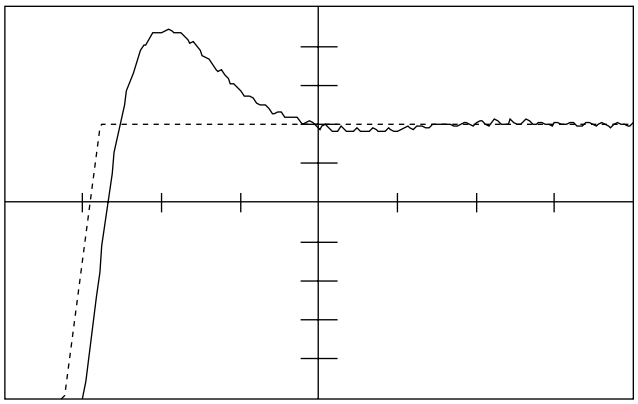

| PIN No. | RS485 / Norm | Signal | Meaning |
|---|---|---|---|
| **1** | – | – | reserved |
| **2** | – | TxD | Transmit signal / RS232 |
| **3** | – | RxD | Receive signal / RS232 |
| **4** | A' | RxD-A | Receive signal A / RS485 |
| **5** | B' | RxD-B | Receive signal B / RS485 |
| **6** | – | VP | Supply voltage<br>+5 V, $I_{max}$ = 10 mA |
| **7** | C/C' | COM | Data reference potential |
| **8** | A | TxD-A | Transmit signal A / RS485 |
| **9** | B | TxD-B | Transmit signal B / RS485 |

GB

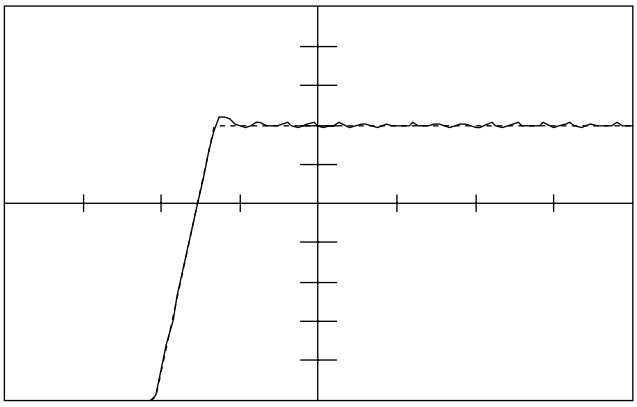
## 11. Adjustment Assistance Speed Controller



**Problem:** very long transient
**Assistance:** Increase P-component (CP.12); eventually reduce I-component (CP.13)

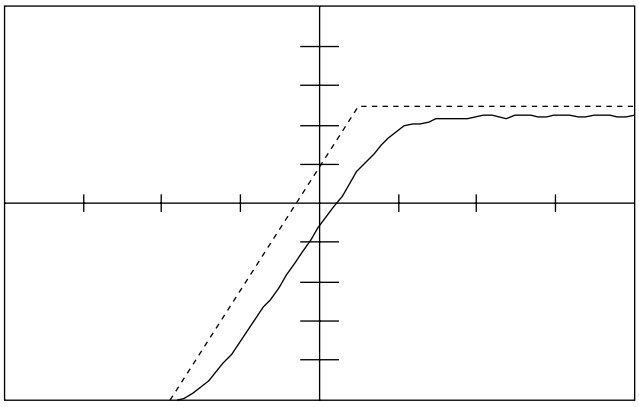


**Problem:** Speed overshoot too high
**Assistance:** Increase P-component (CP.12); eventually reduce I-component (CP.13)

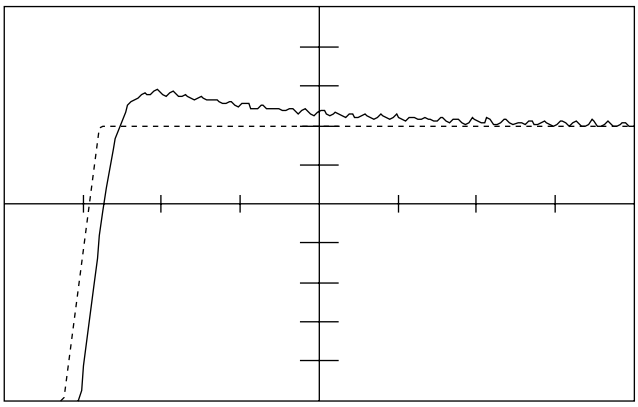


**Problem:** Maintained vibration

**Assistance:** Reduce P-component (CP.12)

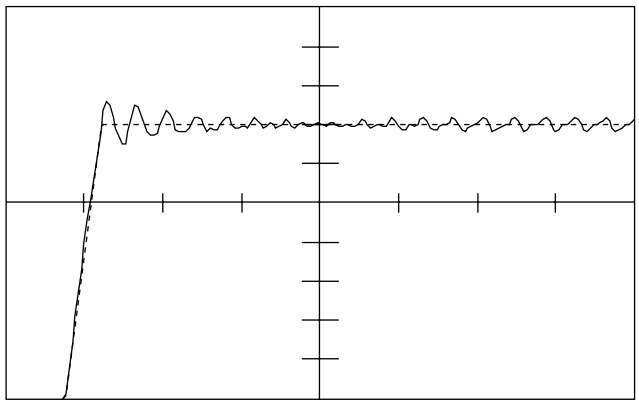


**Problem:** Transient too slow/ remaining control deviation
**Assistance:** Increase I-component (CP.13)



**Problem:** Overshoot too long

**Assistance:** Increase I-component (CP.13)



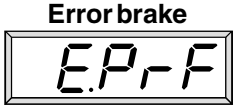
**Problem:** Maintained vibration with high amplitude
**Assistance:** Reduce I-component (CP.13)

## 12. Error Diagnosis

Error messages are always represented by an „E“ and the corresponding error in the display of KEB COMBIVERT S4. In the following the displayed indications and their causes are described.



| | |
|---|---|
| **Undervoltage**<br>  | Occurs when the DC-link voltage drops below the permissible value.<br>Causes: - input voltage too low or instable<br>- inverter rating too low<br>- voltage losses through wrong wiring<br>- supply voltage from generator/transformer breaks down at very short ramps<br>- one phase of input voltage missing (ripple detection) |
| **Overvoltage**<br>  | Occurs when the DC-link voltage rises above the permissible value.<br>Causes: - input voltage too high<br>- interference voltages at the input<br>- deceleration ramp too short<br>- braking resistor incorrectly connected<br>- braking module defective |
| **Overcurrent**<br>  | Occurs when the specified peak current is exceeded.<br>Causes: - short circuit at the output<br>- ground fault<br>- motor cable too long<br>- EMC |
| **Overload**<br>  | Occurs when a too large load is applied longer than the permissible time allows (see Technical Data).<br>Causes: - mechanical fault or overload in the application<br>- wrong dimensioned inverter<br>- wrong wired motor |
| **Overheat**<br>  | Occurs when the heat sink temperature rises above the permissible limit (see Technical Data).<br>Causes: - insufficient cooling<br>- surrounding temperature too high<br>- ventilator clogged |

| | |
|---|---|
| **ext. Overheat**<br>  | Occurs, when external temperature monitoring is triggered.<br>Causes: - resistance at terminals OH/OH >1650 Ohm<br>- motor overloaded<br>- open circuit to temperature sensor |
| **Load shunt error**<br>  | Load shunt not bridged, occurs for a short time during the switch on phase, but must be automatically reset immediately. If the error message remains, it may have following causes.<br>- load shunt defect<br>- input voltage wrong or too low<br>- high losses in the supply line<br>- wrong connected braking resistor<br>- braking module defect |
| **Set selection error**<br>  | **E**rror **SEt** occurs, when trying to select a locked parameter set. |
| **Bus error**<br>  | **E**rror **buS**; for bus operation a monitoring time (Watchdog time ud.8) can be adjusted. The error is triggered when no telegrams are received within the the adjusted time. |
| **External fault**<br>  | **E**rror **E**xternal **F**ault is triggered, when a digital input is being programmed as external error input (di. 3...di.10 = 6) and trips. |
| **Power unit code**<br>  | **E**rror **P**ower **u**nit **C**ode invalid; during the initialization phase the power unit was not identified or detected as non-permissible. |
| **Error brake**<br>  | Occurs when terminal F was not active at set direction clockwise or counter-clockwise (refer to di- and Pn-Parameter for terminal handling). |
| **Error brake**<br>  | Occurs when terminal R was not active at set direction clockwise or counter-clockwise (refer to di- and Pn-Parameter for terminal handling). |

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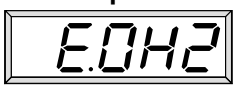
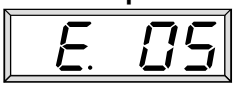
| | |
|---|---|
| **CPU-error**<br>  | Hardware error |
| **Control card defect**<br>  | Hardware error |
| **Software limit forward**<br>  | Occurs when a setpoint position outside the permissible range has been selected for the positioning (refer to Pc-Parameter). |
| **Software limit reverse**<br>  | Occurs when a setpoint position outside the permissible range has been selected for the positioning (refer to Pc-Parameter). |
| **Error incremental encoder**<br>  | Encoder not or wrong connected. |
| **Overtemperature 2**<br>  | Occurs when the motor is overloaded and is triggered by the internal motor current monitoring. Function of an electrical motor protective relay.<br>Help: – reduce the motor<br>– reduce torque limit (Parameter CP.9) |
| **Over speed**<br>  | **E**rror **O**ver **S**peed occurs when the actual speed is higher than the max.speed.<br>Causes: – resolver not connected<br>– wrong adjustment of the speed controller |

## 13. Passwords

| | |
|---|---|
| **Customer "read only" Password** | **100** |
| **Customer "on" Password** | **200** |
| **Drive Password** | **500** |

**Karl E. Brinkmann GmbH**
Försterweg 36 - 38 • D - 32683 Barntrup
Telefon 00 49 / 52 63 / 4 01 - 0 • Fax 00 49 / 52 63 / 4 01 - 1 16
Internet: www.keb.de • E-mail: info@keb.de

**KEB Antriebstechnik GmbH & Co. KG**
Wildbacher Str. 5 • **D** - 08289 Schneeberg
Telefon 0049 / 37 72 / 67 - 0 • Telefax 0049 / 37 72 /67 - 2 81
E-mail: info@keb-combidrive.de

**KEB Antriebstechnik Austria GmbH**
Ritzstraße 8 • **A** - 4614 Marchtrenk
Tel.: 0043 / 7243 / 53586 - 0 • FAX: 0043 / 7243 / 53586 - 21
Kostelni 32/1226 • **CZ** - 370 04 Ceské Budejovice
Tel.: 00420 / 38 / 731 92 23 • FAX: 00420 / 38 / 733 06 97
E-mail: info@keb.at

**KEB Antriebstechnik**
Herenveld 2 • **B** - 9500 Geraadsbergen
Tel.: 0032 / 5443 / 7860 • FAX: 0032 / 5443 / 7898
E-mail: koen.detaeye@keb.de

**KEB China**
Xianxia Road 299 • **CHN** - 200051 Shanghai
Tel.: 0086 / 21 / 62350922 • FAX: 0086 / 21 / 62350015
Internet: www.keb-cn.com • E-mail: info@keb-cn.com

**Société Française KEB**
Z.I. de la Croix St. Nicolas • 14, rue Gustave Eiffel
**F** - 94510 LA QUEUE EN BRIE
Tél.: 0033 / 1 / 49620101 • FAX: 0033 / 1 / 45767495
E-mail: sfkeb.4@wanadoo.fr

**KEB (UK) Ltd.**
6 Chieftain Buisiness Park, Morris Close
Park Farm, Wellingborough, **GB** - Northants, NN8 6 XF
Tel.: 0044 / 1933 / 402220 • FAX: 0044 / 1933 / 400724
Internet: www.keb-uk.co.uk • E-mail: info@keb-uk.co.uk

**KEB Italia S.r.l.**
Via Newton, 2 • **I** - 20019 Settimo Milanese (Milano)
Tel.: 0039 / 02 / 33500782 • FAX: 0039 / 02 / 33500790
Internet: www.keb.it • E-mail: kebitalia@keb.it

**KEB - YAMAKYU Ltd.**
15 – 16, 2 – Chome, Takanawa Minato-ku
**J** – Tokyo 108 -0074
Tel.: 0081 / 33 / 445-8515 • FAX: 0081 / 33 / 445-8215
E-mail: kebjt001@d4.dion.ne.jp

**KEB Portugal**
Lugar de Salgueiros – Pavilhao A, Mouquim
**P** - 4760 V. N. de Famalicao
Tel.: 00351 / 252 / 371 318 • FAX: 00351 / 252 / 371 320
E-mail: keb.portugal@netc.pt

**KEB Taiwan Ltd.**
1F, No.19-5, Shi Chou Rd., Tounan Town
**R.O.C.** - Yin-Lin Hsian / Taiwan
Tel.: 00886 / 5 / 5964242 • FAX: 00886 / 5 / 5964240
E-mail: keb_taiwan@mail.apol.com.tw

**KEBCO Inc.**
1335 Mendota Heights Road
**USA** - Mendota Heights, MN 55120
Tel.: 001 / 651 / 4546162 • FAX: 001 / 651 / 4546198
Internet: www.kebco.com • E-mail: info@kebco.com