COMBIVERT

Installation Guide & Operation Manual
A-Housing **B Control**
1/2 - 1 hp 230 V

00.F5.BUM-KA02

KEB

02/2006

This manual describes the KEB COMBIVERT F5 series motor control. This manual focuses attention on installation, connection as well as basic operation. Due to the various application possibilities and extensive programming capabilities with this unit, it was necessary to provide separet documentation which contains all of this detailed information. Please visit our Web site www.kebamerica.com or contact you local sales office. A list of addtional manuals is provided at the end of this book.

The icons below are used to draw draw attention to the reader. They have the following meanings:

Danger!
Warning!
Caution!

Attention!
Observe at
all costs!

Information
Hint
Tip

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1. Saftey and Operating Instructions

Safety and operating instructions for AC motor controls

(in conformity with the low-voltage directive 73/23/EEC)

1. General

AC motor controls, depending on their degree of protection, may have exposed live, uninsulated, and possibly also moving or rotating parts, as well as hot surfaces.

Removal of the protective covers, improper use, inproper installation or misoperation, can be dangerous and result in serious personal injury and or damage to property.

This document must be read in its entirety before attemping to apply votlage to the KEB COMBIVERT F5.

All functions of, installation and commissioning as well as maintenance are to be carried out by skilled or certified technical personnel (Observe IEC 364 or CENELEC HD 384 or DIN VDE 0100 and IEC 664 or DIN/VDE 0110, NEC and all national and local codes and accident prevention rules!).

For the purposes of these basic safety instructions, "skilled technical personnel" means persons who are familiar with the installation, mounting, commissioning and operation of the product and have the qualifications needed for the performance of their functions.

2. Intended use

AC motor controls are components designed for installation and operation in electrical installations or machinery.

In case of installation in machinery, commissioning of the drive converter (i.e. the starting of normal operation) is prohibited until the machinery has been proved to conform to the provisions of the directive 89/392/EEC (Machinery Safety Directive - MSD). Account is to be taken of EN 60204.

Commissioning (i.e. the starting of normal opertion) is admissible only where conformity with the EMC directive (89/336/EEC) has been established. The KEB COMBIVERT F5 motor controls meet the requirements of the low-voltage directive 73/23/EEC. They are subject to the harmonized standards of the series DIN EN 50178/ VDE 0160 in conjunction with EN 60439-1/ VDE 0660, part 500, and EN 60146/ VDE 0558.

The technical data as well as information concerning the supply conditions shall be taken from the name plate and from the documentation and shall be strictly observed.

3. Transport, storage

The instructions for transport, storage and proper use shall be complied with.

The climatic conditions shall be in conformity with EN 50178.

4. Installation

The installation and cooling of the unit shall be in accordance with the specifications contained with in this document.

The unit shall be protected against excessive force or strain. In particular, no components must be bent or isolating distances altered in the course of transportation or handling. No contact shall be made with electronic components and contacts.

Drive converters contain electrostatic sensitive components which are can be damaged through improper use or handling. Electric components must not be mechanically damaged or destroyed (potential health risks).

5. Electrical connection

RISK OF ELECTRIC SHOCK! Allways disconnect the supply voltage before installing or servicing the KEB COMIBIVERT F5 motor control! Wait five minutes for the before attempting to change any connections as the internal DC bus must first dicharge.

If it is necessary to work with the voltage supply turned on, always comply with the applicable national accident prevention rules (ex O.S.H.A.).

The electrical installation shall be carried out in accordance with the relevant requirements (NEC and local codes). For further information, see documentation.

Instructions for installation in accordance with EMC requirements, like sheilding, grounding, location of filters and wiring, are inculded in the documentation. They must always be complied with. Motor controls bearing a CE marking do not preclude adherence to proper EMC installation requirements. Observance of the allowed values required by EMC law is the responsibility of the designer or manufacturer of the installation or machine.

6. Operation

Installations which include motor controls shall be equipped with additional control and protective devices in accordance with the relevant applicable safety requirements. Changes to the motor control by means of the operating software are admissible.

After disconnection of the motor control from the supply voltage, live parts and power terminals must not be touched because DC BUS capacitors may still be energized. Alwyas follow the printed warnings on the unit.

During operation, all covers and doors shall be kept closed.

7. Maintenance and servicing

The manufacturer's documentation shall be followed.

KEEP SAFETY INSTRUCTIONS IN A SAFE PLACE!

2. Product Description

2.1 Application

The KEB COMBIVERT F5 series motor control is designed exclusively for the control and regulation of induction motors. The operation of other electric devices and loads is prohibited and can lead to the destruction of the unit.
The F5 series motor control is a component which is intended for the installation in elecric systems or machines.

2.2 Part number identification

07.F5.B0A–K900

Cooling[1)]
0: Standard

Interface type[1)]
0: none

Rated switching frequency[1)]
8 - 2 kHz
9 - 4 kHz
A - 8 kHz

Input identification
K: 230 VAC or 325 VDC

P/R/S/T[1)] Special or customer specification

Housing type A

Accessory
0: None
3: Braking transistor and integrated EMI filter

Control type
B: BASIC

Series F5

Inverter size

[1)] For special untis the last three digits are custom defined

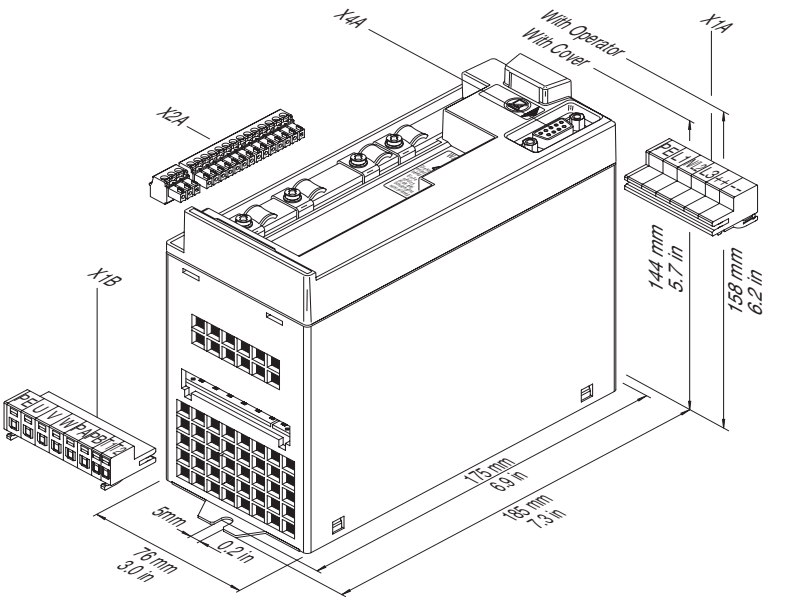
2.3 Technical Data

2.3.1 230 V-class

Inverter Size		05	07
Recommended Motor Power	**[hp]**	**1/2**	**1**
Housing size		**A**	**A**
Input Ratings			
Supply voltage	[V]	180...260 ±0 (230 V rated voltage)	
Supply voltage frequency	[Hz]	50 / 60 +/- 2	
Input phases		1	1
Rated input current	[A]	4,6	8
Maximum input fuse	[A]	10	15
Recommended wire gauge	[awg]	14	14
Output Ratings			
Rated output power	[kVA]	0,9	1.6
Rated motor power	[kW]	0.37	0.75
Rated output current	[A]	2.3	4.0
Peak current (30 seconds)	[A]	4,1	7.2
Over current fault (E.OC) trip level	[A]	5.0	8.6
Overload curve (see annex)		1	
Output voltage	[V]	3 x 0...V input	
Output frequency	[Hz]	0…400Hz	
Rated switching frequency	[kHz]	4	8
Maximum switching frequency	[kHz]	8	8
Power loss at rated operation[1)]	[W]	30	60
Stall current at 4kHz	[A]	2.3	4
Stall current at 8kHz	[A]	2.3	4
Stall current at 16kHz	[A]	–	–
Braking Circuit			
Min. braking resistance [2)]	[Ω]	100	100
Typ. braking resistance [2)]	[Ω]	180	100
Max. braking current	[A]	4.5	4.5
Installation Information			
Max. shielded motor cable length at 4 kHz [3)]	[ft]	30	30
Max. shielded motor cable length at 8 kHz [3)]	[ft]	30	30
Max. shielded motor cable length at 16kHz[3)]	[ft]	–	–
Tightening torque for terminal strip	[in lb]	Not applicable	
Environmental			
Max. heat sink temperature TOH	[°C]	100°C / 212 °F	95°C / 203°F
Storage temperature	[°C]	-25...70 °C / -13…158°F	
Operating temperature	[°C]	-10...45 °C / 14…113°F	
Housing design / protection		Chassis / IP20	
Relative humidity		max. 95% without condensation	
Approvals			
Tested in accordance with…		EN 61800-3 /UL508C	
Standards for emitted interference		EN 55011 Class B / EN 55022 Class A	
Standards for noise immunity		IEC 1000-4-2 / -3 / -4 / -5/ -6	
Climatic category		3K3 in accordance with EN 50178	

1) Rated operation means rated switching frequency, rated voltage, and rated output current.
2) Only for units with the braking circuit installed.
3) Maximum cable length is based on the the use of shield motor cables, ground current limitations, EMI levels set forth in EN55011. Contact KEB for more information.

2.4 Dimensions and terminals



Weight 1/2 kg / 1 lb

X1A Connection from the line
X1B Connection to the motor, brake resistor, temp sensor
X2A Connectin for control cables
X4A Connection for Operator/display HSP5-Servicecable
⏚ Connection for shield / ground

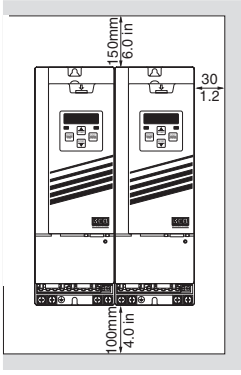
⚠ Pay attention to the input voltage, since both 230 V and 460 V units (3-phase) are possible.

3. Installation and Connection

3.1 Control Cabinet Installation

Enclosure type:	IP20 / Open Type
Operation temperature:	-10...45°C / 14...113°F
Storage temperature:	-25...70°C / -13...158°F
max. heat sink temperature:	
Size 05/230 V	100°C / 212°F
Size 07/230 V	95°C / 203°F
Climatic category:	3K3 in accordance with EN 50178
Relative humidity:	max. 95 % without condensation
Power derating for high altitude:	1 % for every 100 m/330 ft above 1000 m/3300 ft
Maximum altitude for operation:	2000 m / 6,600 ft

Dia. 3.1

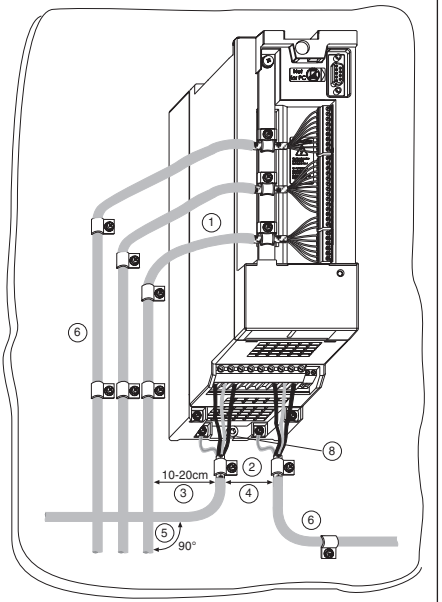


Installation requirements:

- Mount in a stationary location with low vibration. Contact KEB when mounting on a moving system.
- Adhere to minimum clearance distances in diagram 3.1. Multiple units can be mounted side by side with zero clearance.
- Most units have forced airflow from bottom to top using a thermostatically controlled variable speed fan. Leave space above and below the unit for proper air flow.
- Prevent dust or debries from entering the unit, especially during the construction of the control panel. Metal chips can cause internal shorts or malfunctions.
- Installation in a sealed enclosure requires proper cooling, be sure to over size control cabinet or provide suitable cooling device.

- Protect the unit against conductive and corrsive gases and liquids.
- Water, mist, or steam should not be allowed into the unit.
- Do not allow water to condence within the unit
- The COMBIVERT F5 must not be installed in and “Explosion Proof” environment.

3.2 Good EMC Installation Techniques



1) Mount the COMBIVERT F5 on a conductive (zinc or nickel plated not painted) sub plate. This sub plate serves as the central grounding point for the machine.
2) Always connect the shield of motor and control cables with maximum surface area, use metal cable clamp to contact cable shield on all sides. Using a single strand of the shield or the drain wire form the shield as the only connection can reduce the shield's effectiveness by 70%.
3) The distance between control and power cables should be at least 10..20 cm / 4...8 inches.
4) Keep the motor and power cable spacially separated especially if running parallel.
5) If it cannot be avoided, cross control and power cables and motor cables at a right angle.
6) Install all cables as close as possible to the mounting plate - ideally in a metal wireway.
7) Ridged metal conduit can be used as a shield for the motor cables. Always observe the following points:
   - Remove all paint from the control panel where the conduit is to be secured.
   - Securely fasten all conduit fittings.
   - Run only the motor wires through the conduit. All other wires must be pulled through a separete conduit.
   - Connect the control panel to the sub panel with a heavy ground strap.
8) If a KEB EMI (CE) filter is used, it must be mounted as close as possible and to the same subpanel as the COMBIVERT F5 motor control. The filter must have large bare surface contact with the subpanel. Use only the wires from the filter to connect to the inverter. Never add additional lengths of wire.
9) All ground connections should be as short as possible. Always avoid creating ground loops. NEC requires a ground conductor connected to every COMBIVERT F5 controller inspite of the metal on metal connection to the subplate.

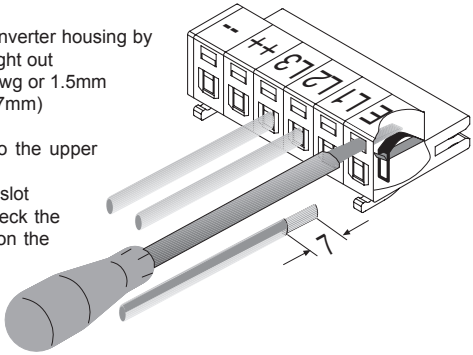
You can find further instructions regarding EMC and proper wiring considerations by contacting KEB technical support or visiting the website www.kebamerica.de.

3.3 Connection of Power Circuit

3.3.1 Wiring the connectors

Steps to wire the connectors

- Remove the connector from the inverter housing by grasping it firmly and pulling straight out
- The maximum wire gauge is 14 awg or 1.5mm
- Strip the insulation back 0.25 in (7mm)
- The use of ferrules is optional
- Press a flathead screwdriver into the upper slot
- Slide the bare wire into the lower slot
- Remove the screw driver and check the wire connection by pulling back on the wire to ensure it stays



3.3.2 Wiring instructions

RISK OF ELECTRIC SHOCK! Always disconnect supply voltage before servicing the COMBIVERT F5. Wait 5 minutes before attempting to change the connections as the DC Bus capacitors may still be charged.

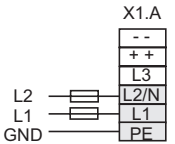
Absolutely pay attention to the nameplate voltage of the KEB COMBIVERT and the connected line voltage. A 230V-unit will be immediately destroyed on a 460V-power supply. Never exchange the line and motor cables. The unit will be destroyed.

The COMBIVERT F5 motor controls specified in this manual are suitable for use on a circuit capable of delivering not more than 10kA rms symmetrical ampers at the rated maximum voltage.

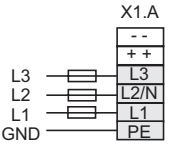
Connection of the F5 series motor control to voltage systems configured as corner grounded delta, center tap grounded delta, open delta, or ungrounded delta may defeat the internal noise suppression. With this type of voltage supply the maximum phase to ground votlage is 300VAC for 230 VACrms units. A balanced, center ground wye connection is always recommended. The three phase voltage imbalance must be less than 2% phase to phase. Greater imbalance can lead to destruction of the unit.

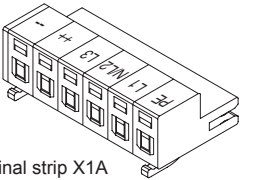
3.3.3 Line connection terminal X1.A

Line connection 230 V 1-phase



Line connection 230 V 3-phase



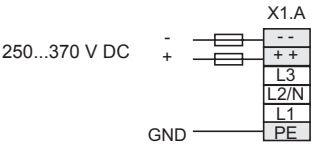


Terminal strip X1A
Provides connections for:

- 230 V AC / 1-phase (L1/L2)
- 230 V AC / 3-phase (L1, L2, L3)
- DC-Supply 250...370 V DC (++, --)

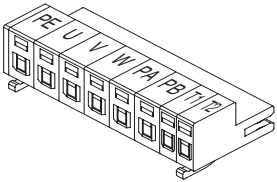
- Always note the rated voltage, select the appropriate over current protection devices, select a disconnect device, and select the proper wire size before begining the wiring process. Wire the COMBIVERT F5 according to NEC Class 1 requirements.
- Always use UL listed or CSA approved copper wire with a minimum temperature rating of 75°C. The wire gauge listed in the tables in section 2.3 is based on the maximum fuse rating, copper wire and a 75°C insulation rating (THHW or equivilant). If a lower level of overcurrent protection is used, it may be possible to reduce the size of the wire. Use 300V rated wire for 230V systems .
- A disconnect switch or contactor shall be provided as a means of turning off the supply voltage. Repetitive cycling on and off of the supply votlage more than once every 5 minutes can lead to damge of the unit.
- Class CC (Bussmann type LP-CC or equivilant) fuses or a circuit breaker with type D trip characteristic must be used to provide branch circuit protection of the COMBIVERT F5. The voltage rating of the fuse or circuit breaker shall be at least 250V for 230V units. See table in section 2.3 for over current protection amperage ratings.
- Power connection must be installed as indicated on the previous page. Always be sure to double check power connections for tightness.
- For installation requiring line side ground fault protection (GFI) consult KEB.
- Line chokes can be used to reduce harmonics, conducted high frequency noise, and can extend the lifetime of the unit. Consult KEB for more information.

DC-connection 230 V-class



For branch circuit protection use fuses rated for DC voltage. (Bussmann type FWP)

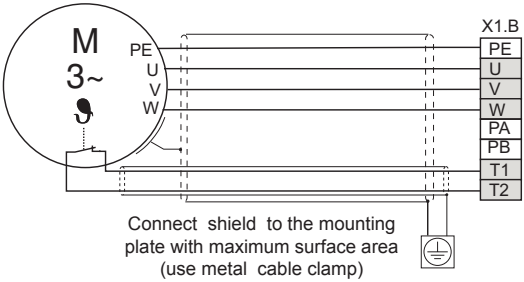
3.3.4 Motor connection



Terminal X1B provides connections for:

- ++, PB Braking resistor
- U, V, W Motor
- T1, T2 Temperature sensor

⚠ The maximum motor cable length listed in the tables in section 2.3 is based on several factors: use of shielded motor cables, ground current limitations, increased EMI noise levels, voltage peaks at the motor terminals.



3.3.5 Motor Overload Protection

The COMBIVERT F5 motor control by default provides motor overload protection at 130% of the unit's rated output current. See tables in section 2.3 for rated output current. Two additional motor overload protection systems are avaialble.

Electronic Motor Overload Protection

This software function provides speed dependent I^2t overload protection and is approaved by UL as a solid state overload protection device according to UL508C section 42 and NEC 430 Part C. The trip current is adjustable as well as whether the motor is self cooled or blower cooled. Consult the F5B/G Application instruction manual for adjustment details.

Motor Winding Temperature Sensor

- Connects to Terminals T1, T2
- Trip resistance level 1.65...4 kΩ
- Reset resistance level 0.75...1.65 kΩ
- This function can be activated or deactivated through a software parameter. The default setting is OFF!
- Do not run temperature sensor wires in the same conduit or wire way as other control cables. These sensor wires most likely are carrying high frequency noise from the motor.
- If the sensor wires are part of the motor cable they must be shielded independently from the motor wires.

3.3.6 Connection of the braking resistor

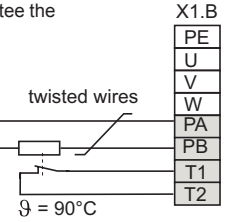
Typical braking resistors for A housing COMBIVERT F5 motor controls

F5 Size	230V Class	Ohms	PD	P6
05	07.BR.100-1180	180	44	800
07	07.BR.100-1180	180	44	800

PD = continuous power disapation in watts, P6 = peak repetitive power disapation with a 6 sec on time and 120 sec cycle time. KEB can offer many types of braking resistors, please contact your sale representative for more information.

Braking resistor connection with high temperature drive fault

- The resistor has a PTC type sensor and is connected to the T1, T2 terminal on the COMBIVERT F5. If a motor temperature sensor is used it should be placed in series with the sensor of the braking resistor. Note: if the braking transistor in the unit fails, there is no guarantee the voltage to the resistor will be shut off!



Braking resistors can develop very high surface temperatures, therefore install away from other devices, above the motor control and where people can not inadvertantly come in contact with it.

3.4 Control Circuit: F5-BASIC

3.4.1 Terminal Strip Connections

PIN	Function	Name	Description	
1	± Analog input 1	AN1	Voltage input for speed	resolution: 11 Bit, 0...±10 VDC ^ 0...±CP.11, scan time: 2 ms
5	Analog output 1	ANOUT1	Analog output of the actual output frequency	voltage range: 0...±10 VDC ^ 0...±100 Hz, Rout = 100 kΩ, resolution: 12bit
7	+10V Output	CRF	Analog supply voltage for speed ref. +10 VDC +5%, max. 4 mA	
8	Analog Common	COM	Common for analog In- and Outputs	
10	Fixed frequency 1	I 1	I1 + I2 = Fixed frequency 3;	Ri = 2.1 k Ohm scan time: 2 ms
11	Fixed frequency 2	I 2	no input = analog voltage (speed) ref.	
14	Forward	F	Preset rotation;	
15	Reverse	R	Forward has priority	
16	Control release, Reset	ST	Inverter enable, disable; Error Reset at opening	
20	24V-Output	Vout	Approx. 24V Output (max.100 mA)	
22	Digital Common	0V	Common for digital In-/Outputs	
24	Relay 1, NO contact	RLA	Relay output;	
25	Relay 1, NC contact	RLB	fault relay(default);	
26	Relay 1, switching cont.	RLC	Function can be changed with CP.31; max. 30 V DC, 1 A	
27	Relay 2, NO contact	FLA	Relay output;	
28	Relay , NC contact	FLB	frequency dependent switch (default);	
29	Relay 2, switching cont.	FLC	Function can be changed with CP.32; max. 30 V DC, 1 A	

3.4.2 Connection of the control signals

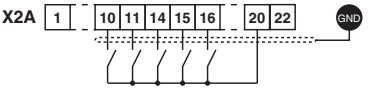
In order to prevent a malfunction caused by interference voltage on the control inputs, the following steps should be observed:

- Establish a common ground point for all ground connections.
- Use shielded cable with twisted pair wires.
- Terminate shield wires to earth ground, only at inverter.
- Separate control and power wires 8" or more apart.
- Control and power wires to cross at a right angle.

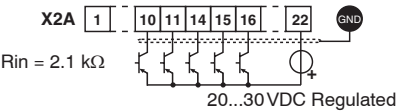
EMC

3.4.3 Digital Inputs

Use of **internal** voltage supply

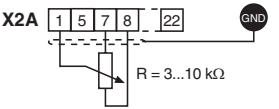


Use of **external** voltage supply

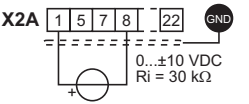


3.4.4 Analog Inputs

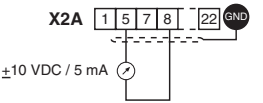
Internal analog speed ref. setting



External analog speed ref. setting

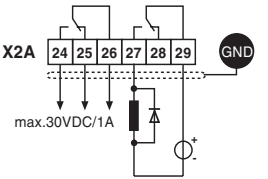


3.4.5 Analog Output



3.4.6 Relay Outputs

In case of inductive load on the relay output, protective wiring must be provided (e.g. free-wheeling diode)!

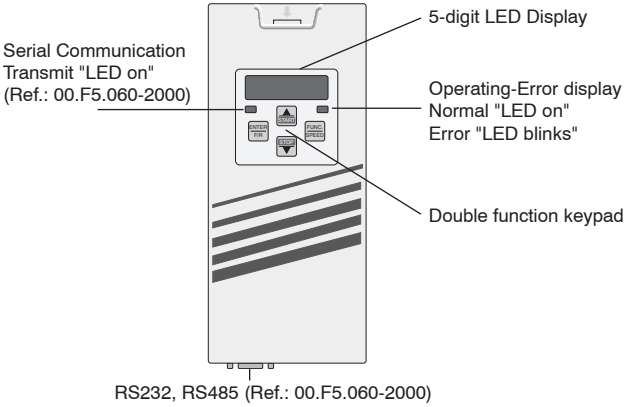


4. Operation of the inverter

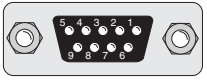
As an accessory for displaying and editing "CP" parameter values, a "digital operator" is necessary. To remotely mount the digital operator, a operator remote cable is required (option: cable 00.F5.0C0-1xxx). To prevent malfunctions, the inverter must be brought into ***nOP*** status *(remove signal from control release terminal 16)* before connecting/ disconnecting the operator. When starting the inverter without an operator, it is started with the last stored values.

4.1 Digital Operator

Standard Operator: Part No. 00.F5.060-1000
Serial Operator: Part No. 00.F5.060-2000



Only use the **operator interface** for the serial data transfer to RS232, 485. The direct connection from PC to the inverter is only valid with a **special cable (HSP5 Part No. 00.F5.0C0-0001), otherwise it will lead to the destruction of the PC-interface!**



PIN	RS485	Signal	Meaning
1	–	–	reserved
2	–	TxD	Transmitter signal, RS232
3	–	RxD	Receiver signal, RS232
4	A'	RxD-A	Receiver signal A, RS485
5	B'	RxD-B	Receiver signal B, RS485
6	–	VP	Voltage supply-Plus +5V (I_{max} = 10 mA)
7	C, C'	DGND	Data reference potential
8	A	TxD-A	Transmitter signal A, RS485
9	B	TxD-B	Transmitter signal B, RS485

4.1.1 Keypad

When switching on the KEB COMBIVERT F5, the value of parameter CP.1 appears in the operator display. (see "Drive Mode" to switch the keypad function)

The **function key** (FUNC) changes between the parameter value and parameter number.

With **UP** and **DOWN**, the value of the parameter number is increased/decreased.

Generally; when a value is changed, parameter values are immediately accepted and stored nonvolatile. However, with some parameters it is not useful that the adjusted value is accepted immediately. In these cases (CP.17, CP.18, CP.22, CP.26, CP.29, CP.31, CP.32, CP.34, CP.35) the adjusted value is accepted an stored nonvolatile by pressing **ENTER**.

If a drive fault occurs during operation, the display changes to the drive fault message. The drive fault message in the display is cleared by pressing **ENTER**.

Pressing **ENTER** only clears the fault message in the display. In the Inverter status display (CP. 3), the fault is still displayed until the inverter has been reset. In order to reset the fault itself the cause must be identified and removed, than a reset signal applied to terminal 17 {terminal 16, F5-Basic} or a power-on reset (cycle supply voltage off and then on) must occur.

4.2 Parameter Summary

Display	Parameter	Setting range	Resolution	Factory setting
CP. 0	Password input	0...9999	1	–
CP. 1	Actual frequency display	–	0.0125 Hz	–
CP. 2	Set frequency display	–	0.0125 Hz	–
CP. 3	Inverter status display	–	–	–
CP. 4	Phase current	–	0.1 A	–
CP. 5	Phase current, Peak value	–	0.1 A	–
CP. 6	Actual inverter load	–	1 %	–
CP. 7	Actual DC voltage	–	1 V	–
CP. 8	Actual DC voltage, Peak value	–	1 V	–
CP. 9	Output voltage	–	1 V	–
CP.10	Minimum frequency	0…400 Hz	0.0125 Hz	0 Hz
CP.11	Maximum frequency	0…400 Hz	0.0125 Hz	70 Hz
CP.12	Acceleration time	0.01…300.00 s	0.01 s	5.00 s
CP.13	Deceleration time(-1 see CP.12)	-1; 0.01…300.00 s	0.01 s	5.00 s
CP.14	S-curve time	0.00 (off)…5.00 s	0.01 s	0.00 s (off)
CP.15	Torque boost	0.0…25.5 %	0.1 %	2.0 %
CP.16	Rated frequency	0…400 Hz	0.0125 Hz	50 Hz
CP.17 [1)]	Voltage stabilization	1…650 V (off)	1 V	650 (off)
CP.18 [1)]	Carrier frequency	2/4/8/12/16 kHz	–	– [2)]
CP.19	Fixed frequency 1	-400...400 Hz	0.0125 Hz	5 Hz
CP.20	Fixed frequency 2	-400...400 Hz	0.0125 Hz	50 Hz
CP.21	Fixed frequency 3	-400...400 Hz	0.0125 Hz	70 Hz
CP.22 [1)]	DC-braking, Mode	0…9	1	7
CP.23	DC-braking, Time	0.00…100.00 s	0.01 s	10.00 s
CP.24	Max. ramp current	0…200 %	1 %	140 %
CP.25	Max. constant current	0…200 % (off)	1 %	200 % (off)
CP.26 [1)]	Speed search condition	0…15	1	8
CP.27	Quick stop time	0.00…300.00 s	0.01 s	2.00 s
CP.28	Response of ext. overtemperature	0…7	1	7
CP.29 [1)]	Analog output 1	0…12...20 {F5G}	1	2
CP.30	Analog output 1, Amplification	-20.00…20.00	0.01	1.00
CP.31 [1)]	Relay output 1	0…58...66 {F5B}	1	4
CP.32 [1)]	Relay output 2	0…58...66 {F5B}	1	27
CP.33	Relay output 2, Switching level	±30000.00	0.01	4.00
CP.34 [1)]	Source of rotation direction	0…9	1	2
CP.35 [1)]	AN1 interface selection	0…2	1	0
CP.36	AN1 zero point hysteresis	-10.0…10.0 %	0.1 %	0.2 %

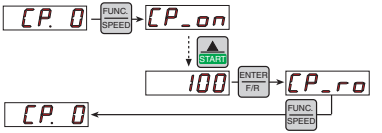
[1)] Enter-Parameter
[2)] depending on power circuit

4.3 Password Input

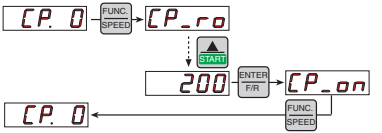
CP. 0

From the factory, the frequency inverter is supplied without password protection, this means that all parameters can be adjusted. After programming, the unit can be protected against unauthorized access thus preventing the values from being changed.

Locking the CP-Parameters (Read only)



Releasing the CP-Parameters



4.4 Operating Displays

The parameters below provide the user with the ability to monitor various operating characteristics of the drive. These parameters are very useful during commissioning and trouble shooting.

Actual frequency display

CP. 1

Display of the actual output frequency with a resolution of 0.0125 Hz. The digital operator will display "noP" or "LS" if the enable (terminal 16) or the direction of rotation (terminal 14 or 15) are not energized (see CP.3). The rotation of the motor is indicated by the sign.

Examples:

18.3 Output frequency 18.3 Hz, rotation forward

- 18.3 Output frequency 18.3 Hz, rotation reverse

Set frequency

CP. 2

Display of the actual set frequency. The indication is done in the same manner as at CP.1. For control reasons the set frequency is displayed even if control release or direction of rotation are enable. If no direction of rotation is set, the set frequency for clockwise rotation (forward) is displayed.

Inverter status display

CP. 3

The status display shows the actual working conditions of the inverter. Possible displays and their meanings are:

noP "no Operation" control release (terminal 16) signal removed, modulation off, output voltage = 0 V, drive is disabled.

LS " Low Speed " no direction signal at F or R (terminal 14 or 15), modulation off, output voltage = 0 V.

FAcc "Forward Acceleration" drive accelerates with direction of rotation forward .

FdEc "Forward Deceleration" drive decelerates with direction of rotation forward.

rAcc "Reverse Acceleration" drive accelerates with direction of rotation reverse.

rdEc "Reverse Deceleration" drive decelerates with direction of rotation reverse.

Fcon "Forward Constant" drive runs with a constant speed and direction of rotation forward.

rcon "Reverse Constant" drive runs with constant speed and direction of rotation reverse.

Other status messages; such as error(E.xxx) and malfunction (A.xx) codes, are described towards the end of this manual.

Phase current

CP. 4

Display of the actual real-time phase current in ampere, (see also CP.5).

Phase current / Peak value

CP. 5

CP.5 makes it possible to display the peak current within an operating cycle. The highest value of CP.4 is stored in CP.5. The peak value in memory can be cleared by pressing the" UP, DOWN or ENTER" key or by writing via serial communication any value you like to the address of CP.5. Switching off the inverter also clears the memory.

Actual inverter load

CP. 6

Display of the actual inverter loading in percent. 100% rate of utilization is equal to the inverter rated current. Only positive values are displayed, meaning there is no differentiation between motor and regenerative operation.

DC bus voltage

CP. 7

Display of actual DC voltage in volts.
Typical values:

V-class	Normal operation	Over volt. (E.OP)	Under volt. (E.UP)
230 V	290…330 V DC	approx. 400 V DC	approx. 216 V DC
460 V	530…700 V DC	approx. 800 V DC	approx. 240 V DC

Actual DC voltage peak value

CP. 8

This display makes it possible to recognize instantaneous voltage peaks within an operating cycle. The highest value of CP.7 is stored in CP.8.

The peak value in memory can be cleared by pressing the UP, DOWN or ENTER key or by writing any value you like to the address of CP.8. Switching off of the inverter also clears the peak value.

Output voltage

CP. 9

Display of the actual output voltage in volts rms.

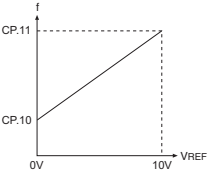
4.5 Basic Adjustment of the Drive

The following parameters determine the fundamental operating data of the drive. They should be checked and/or adjusted for the application.
The frequency the inverter outputs with 0V applied to the analog input or if the activated fixed frequency (CP.19…CP.21) is lower than this value.

Minimum frequency

CP. 10

Adjustment range:	0...400 Hz
Resolution:	0.0125 Hz
Factory setting:	0.0 Hz



Maximum frequency

CP. 11

The frequency the inverter outputs with 10V applied to the analog input or if the activated fixed frequency (CP.19…CP.21) is greater than this value.

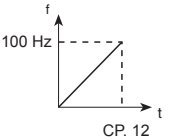
Adjustment range:	0...400 Hz
Resolution:	0.0125 Hz
Factory setting:	70 Hz

Acceleration time

CP. 12

The parameter determines the time needed to accelerate from 0 Hz to 100 Hz. The actual acceleration time is proportional to the frequency change.

$$\frac{100\ \text{Hz}}{\text{delta f}} \times \text{actual acceleration time} = \text{CP.12}$$



Adjustment range:	0.01...300.00 s
Resolution:	0.01 s
Factory setting:	5.00 s

Example: actual acceleration time = 5s; the drive should accelerate from 10 Hz to 60 Hz, delta f = 60 Hz - 10 Hz = 50 Hz

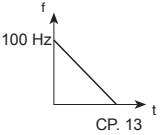
CP.12 = (100 Hz / 50 Hz) x 5 s = 10 s

Deceleration time

CP. 13

The parameter determines the time needed to decelerate from 100 Hz to 0 Hz. The actual deceleration time is proportional to the frequency change.

$$\frac{100\ \text{Hz}}{\text{delta f}} \times \text{actual deceleration time} = \text{CP.13}$$



Adjustment range:	-1; 0.01...300.00 s
Resolution:	0.01 s
Factory setting:	5.00 s

By depressing DOWN arrow key, one increment passed the 0.0, the display will show **"=Acc"**. This means the same value stored in CP.12 (Decel=Accel time)!

Example: actual deceleration time = 5s; the drive should decelerate from 60 Hz to 10 Hz. delta f = 60 Hz - 10 Hz = 50 Hz

CP.13 = (100 Hz / 50 Hz) x 5 s = 10 s

S-curve time

CP. 14

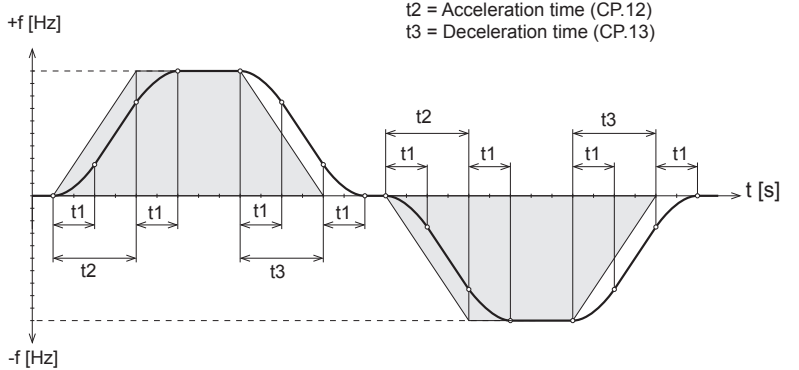
For some applications it is advantageous when the drive starts and stops jerk-free. This is achieved by modifying the acceleration and deceleration ramps. This modification time; also called S-curve time, can be adjusted with CP.14.

Adjustment range:	0.00 (off)...5.00 s
Resolution:	0.01 s
Factory setting:	0.00 s (off)

In order to define the ramps with the activated S-curve time, the acceleration and deceleration times (CP.12 and CP.13) must be adjusted higher than the S-curve time (CP.14).

Ramp adjustment with S-curves

t1 = S-curve time (CP.14)
t2 = Acceleration time (CP.12)
t3 = Deceleration time (CP.13)

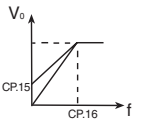


Boost

CP.15

In the lower speed range losses in the motor become greater. This parameter can be used to boost the voltage in order to overcome these losses. With proper adjustment, the torque output of the motor will remain constant even at the lowest speeds.

Adjustment range:	0.0...25.5 %
Resolution:	0.1 %
Factory setting:	2.0 %



Adjustment:

Determine the load level (CP.6) with no-load operation at the rated frequency.
Then run at about 10 Hz and adjust the torque boost, so that about the same load level (CP.6) is achieved as with the rated frequency.

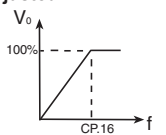
During continuous operation; if the motor operates at low speed and too much voltage, it can lead to overheating of the motor.

Rated frequency

CP.16

The inverter will output the applied input voltage or the voltage value adjusted in CP.17 at the frequency value adjusted in this parameter. This parameter is typically adjusted for the motor rated frequency. **Note: Motors can overheat when the rated frequency is incorrectly adjusted!**

Adjustment range:	0...400 Hz
Resolution:	0.0125 Hz
Factory setting:	60 Hz



4.6 Special Adjustments

The following parameters serve for the optimization of the drive and the adaptation to certain applications. These adjustments can be ignored at initial start-up.

Voltage stabilization

CP.17

This parameter can be used to regulate the output voltage in relation to the rated frequency. With this function active, voltage variations at the input as well as on the DC bus will have only a small influence on the output voltage (V/Hz-characteristic). This function can be used to adapt the output voltage for special motors and can also prevent damage to the motor resulting from over or under voltage supply.

Adjustment range:	1...650 V (off)
Resolution:	1 V
Factory setting:	650 V (off)
Note:	Enter-Parameter

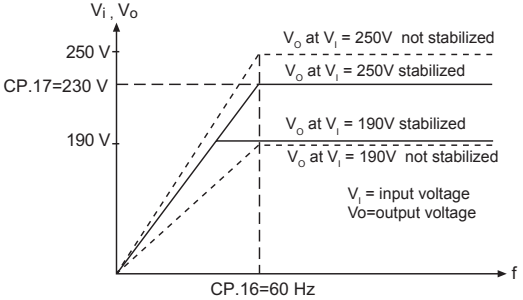
In the example below using a motor rated at 230 V / 60Hz, the output voltage is too high due to our supply being 250 V and CP.17 off. By setting CP.17 to the correct rated motor voltage of 230 V, the voltage is clamped thereby giving the motor the correct voltage.

If the supply voltage drops to190 V and CP.17=230 V, the inverter will still provide rated voltage to the motor up until 190V. The output voltage can not be increased further beyond the input therefore the motor will operate in field weakening. To calculate at which frequency this will occur use the following formula:

$$f = (60Hz/\ 230\ V)*190\ V = 50\ Hz$$

CP.17 = 230V V_{supply} = 190V

* Both scenarios above, it is assumed no boost (CP.15=0%).



Carrier frequency

CP.18

The frequency with which the power modules are switched can be changed depending on the application. The employed power stage determines the maximum switching frequency as well as the factory setting. Generally, the inverter can operate at frequencies higher than the rated value but not under continuous load.

Low Switching Frequency	High Switching Frequency
Lower inverter heating Lower High Freq. ground current Reduced power loss Lower radio interferences Reduced cogging at low speed	Less audible noise produced Improved sine-wave simulation Less motor losses

Adjustment range :	2/4/8/12/16 kHz
Resolution:	1
Factory setting: (depending on power circuit)	_
Note:	Enter-Parameter

At switching frequencies above 4 kHz pay absolute attention to the max. motor cable length especially when using shielded cables.

Fixed frequencies 1...3

Input I1

CP.19

Input I2

CP.20

Input I1 and I2

CP.21

Three fixed frequencies can be adjusted. The fixed frequencies are selected with the inputs I1 (terminal 10), I2 (terminal 11) and I1 + I2.

Adjustment range:	-400...400 Hz
Resolution:	0.0125 Hz
Factory setting, CP.19:	5 Hz
Factory setting, CP.20:	50 Hz
Factory setting, CP.21:	70 Hz

If the adjusted values are outside of the fixed limits of CP.10 and CP.11, then the actual run frequency is internally limited to the values of CP.10 and CP.11. The negative rotation values (i.e. -50Hz) are only available in the "application mode". The rotation source of the fixed frequencies is not changed by CP.34, it always corresponds to CP.34 = 2 (Fwd/Rev direction selectable by terminal 14 or 15).

DC-braking Mode

CP.22

During DC-braking, the motor is not decelerated by a controlled ramp. Quick braking without regen voltage can be achieved by applying a DC voltage to the motor winding. Parameter values listed below, determine how the DC-braking is triggered.

Value	DC-Braking Activation
0	Deactivated
1	Activates when direction signal is removed and the output frequency has reached 0Hz. The braking time is dependent on CP.23 or until the next direction of rotation.
2*	Activates as soon as the direction signal is removed.
3*	Activates as soon as the direction signal is removed or changed.
4*	Activates as soon as the direction signal is removed and if the real frequency goes below 4 Hz.
5*	Activates when the real frequency goes below 4 Hz.
6*	Activates as soon as the set value goes below 4 Hz.
7*	Activates when input I4(terminal 13) is switched.
8	Activates as long as input I4 is switched.
9	Activates before the acceleration ramp when a direction signal is given. The time is dependent on CP.23.

* Braking time depends on the actual frequency.

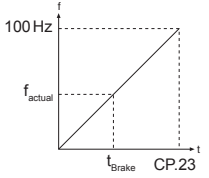
Adjustment range:	0...9
Resolution:	1
Factory setting:	7
Note:	Enter-Parameter

DC-braking Time

CP.23

If the braking time depends on the actual frequency (CP.22 = 2...7), it is calculated as follows:

$$t_{Brake} = \frac{CP.23 \times f_{real}}{100\ Hz}$$



Otherwise the braking time corresponds to CP.23.

Adjustment range:	0.00...100.00 s
Resolution:	0.01 s
Factory setting:	10.00 s

Max. ramp current

CP.24

This function acts as an adjustable current limit during acceleration or deceleration. It can be used to prevent the load current from exceeding the inverter's peak current rating, thereby preventing shut down with an E.OC fault. When the load level reaches the adjusted value, the acceleration or deceleration is stopped until the load drops below the adjusted value. Note: if this parameter is adjusted too low, the motor may not be able to accelerate to full speed. The motor will run at a low speed. CP.3 displays "LAS" when the function is active.

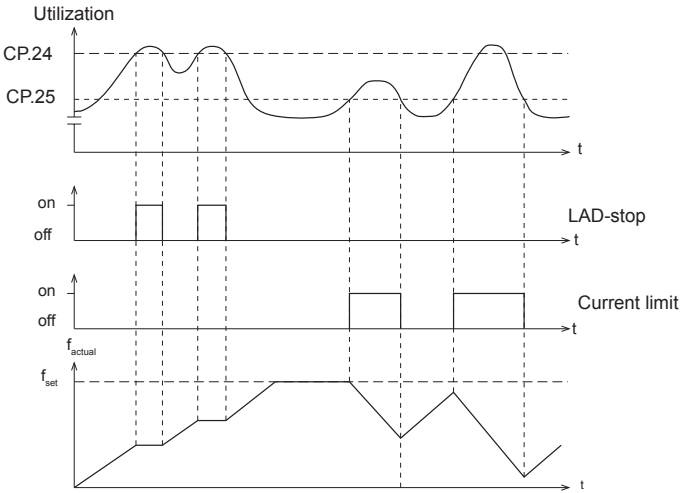
Adjustment range:	0...200 %
Resolution:	1 %
Factory setting:	140 %

Max. constant current

CP.25

This function acts as an adjustable current limit when operating at a constant speed. It can be used to prevent the load current from exceeding the inverter's over current level, thereby preventing shut down of the inverter with an E.OC fault. When the load level reaches the adjusted value, the output frequency is reduced until the load drops below the adjusted value, after which the frequency is increased again to the previous value. Setting the value too low may prevent the motor from running at the desired speed. CP. 3 displays "SSL" when the function is active.

Adjustment range:	0...200 % (off)
Resolution:	1 %
Factory Setting:	200 % (off)



Speed search condition

CP.26

When starting the frequency inverter into a spinning motor, an E.OC fault can be triggered because of the difference between the actual motor speed and the inverter set speed. By activating speed search, the inverter searches for the actual motor speed, adjusts its output frequency to match. It will then accelerate with the adjusted ramp time to the given set value. During speed search CP.3 displays "SSF". This parameter determines under which conditions the function will operate. Parameter values can be selected individually or any combinations.

Example: CP.26=12 means after reset **or** after auto-restart (E.UP).

Value	Condition
0	Function off
1	Control release enabled (terminal 16)
2	Power on
4	After fault reset
8	After auto-restart (reset) E.UP

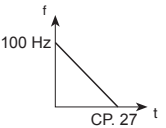
Adjustment range:	0...15
Resolution:	1
Factory setting:	8
Note:	Enter-Parameter

Quick stop time

CP.27

The quick-stop function is activated depending on CP.28. This parameter determines the time needed to decelerate from 100 Hz to 0 Hz. The actual deceleration time is proportional to the frequency change. The response to overtemperature (CP.28) is disabled in the factory default setting. If it is activated, the modulation switches off automatically after 10 s if the motor is still too hot.

$$\frac{100\ \text{Hz}}{\text{delta f}} \times \text{actual deceleration time} = \text{CP.27}$$



Adjustment range:	0.00...300.00 s
Resolution:	0.01 s
Factory setting:	2.00 s

Example: actual deceleration time = 5s; the drive should decelerate from 50 Hz to 0 Hz. delta f = 50 Hz - 0 Hz = 50 Hz

CP.27 = (100 Hz / 50 Hz) x 5 s = 10 s

Response to external overtemperature

CP.28

This parameter determines the response of the drive to the external temperature monitoring circuit. In order to activate this function the power circuit terminals T1, T2 must be connected in accordance with the instruction manual, see page 14. After that the response can be adjusted according to following table:

Factory setting = off

If overheat no longer exists, the message E.ndOH (or A.ndOH) is displayed. Only then can the error be reset or the automatic restart initiated.

CP.28	Display	Response	Restart
0	**E.dOH**	Immediate disabling of modulation	Remove fault; Activate reset input.
1*	**A.dOH**	Quick stop, disabling modulation after reaching speed 0	
2*	**A.dOH**	Quick stop, holding torque at speed 0	
3	**A.dOH**	Immediate disabling of modulation	Automatic reset, if the fault is no longer present
4*	**A.dOH**	Quick stop, disabling modulation after reaching speed 0	
5*	**A.dOH**	Quick stopping, holding torque at speed 0	
6*	**none**	No effect on the drive; With CP.31, 32=9 an external module can be controlled (e.g. fan)	- No reset allowed -
7	**none**	**No effect on the drive; External temperature monitoring (T1, T2) is not activated!**	

*) If the motor is still too hot after 10 seconds, the error E.dOH is triggered and the modulation is switched off!

Adjustment range:	0...7
Resolution:	1
Setting range:	7

Analog output 1

CP.29

CP.29 defines the function of analog output 1.

Value	Function	
0	Absolute actual frequency (CP.1)	100Hz= 100%
1	Absolute set frequency (CP.2)	100Hz= 100%
2	Actual frequency (CP.1)	±100Hz= 100%
3	Set frequency (CP.2)	±100Hz= 100%
4	Output voltage (CP.9)	500V= 100%
5	Actual DC voltage (CP.7)	1000V= 100%
6	Phase current (CP.4)	2 x rated current= 100%
7	Active current	± 2 x rated current= 100%
8	Digital	±100Hz= 100%
9	External PID output	±100Hz= 100%
10	Absolute external PID output	100Hz= 100%
11	Absolute active current	2 x rated current= 100%
12	Power module temperature	100 °C= 100%
13	Motor temperature {F5G}	150 °C= 100%
14	Reserved{F5M}	
15	Reserved{F5M}	
16	Reserved{F5M}	
17	Reserved{F5M}	
18	Reserved{F5M}	
19	Reference frequency {F5G}	±140Hz= 100%
20	Absolute reference frequency {F5G}	140Hz= 100%

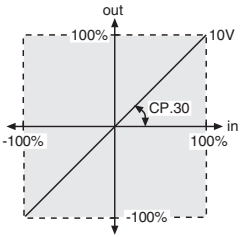
Adjustment range:	0...20
Resolution:	1
Factory setting:	2
Note:	Enter-Parameter

Analog output 1 Amplification

CP.30

With the amplification (gain), the output voltage of the analog output can be tuned with respect to the signal. An amplification of 1 corresponds to ±100 % = ±10 V.

Adjustment range:	-20.00...20.00
Resolution:	0.01
Factory setting:	1.00



Adjustment example :
The analog output shall give +10 V at 70 Hz instead of at 100 Hz: CP.30 = 1.43

$$CP.30 = \frac{100\,Hz}{70\,Hz} = 1.43$$

Relay output 1

CP.31

Relay output 2

CP.32

CP.31 and CP.32 determine the function of the two outputs.
CP.31 for relay output 1 (terminal X2A.24...X2A.26)
CP.32 for relay output 2 (terminal X2A.27...X2A.29)

The switching level of CP.32 is CP.33!

Value	Function
0	No function
1	On; active when unit has voltage applied to it
2	Run signal; also by DC-braking
3	Ready signal (no error)
4	Fault relay
5	Fault relay (no auto-reset)
6	Warning or error message at abnormal stopping
7	Overload alert signal
8	Overtemperature alert signal power modules
9	External Overtemperature alert signal motor
10	Motor thermal relay tripped (OH2)
11	Overtemperature alert signal interior (OHI)
12	Cable breakage on analog input 1 (4...20 mA)
13	Cable breakage on analog input 2 (4...20 mA) {F5G only}
14	Max. constant current (stall, CP.25) exceeded
15	Max. ramp current (LA-Stop CP.24) exceeded
16	DC-braking active
17	Power off
18	Motor brake control
19	PID control difference > switching level {F5G only}
20	Actual value= set value (CP.3= Fcon, rcon; not at noP, LS error,SSF)
21	Accelerate (CP.3 = FAcc, rAcc, LAS)
22	Decelerate (CP.3 = FdEc, rdEc, LdS)
23	Real direction of rotation = set direction of rotation
24	Actual load utilization (CP.6) > 100%
25	Active current > switching level
26	Actual DC voltage (CP.7)>switching level
27	Actual frequency (CP.1) > switching level
28	Set frequency (CP.2) > switching level
29	Ref. point run complete {F5G only}
30	Actual torque > level {F5G only}
31	Absolute speed on AN1 > switching level
32	Absolute speed on AN2 > switching level {F5G only}
33	Absolute. speed on AN3 > switching level {F5G only}
34	Set value on AN1 > switching level
35	Set value on AN2 > switching level {F5G only}

Value	Function
36	Set value on AN3 > switching level {F5G only}
37	Timer 1 > switching level
38	Timer 2 > switching level
39	Reserved {F5M}
40	Hardware current limit active
41	Modulation on-signal
42	ANOUT3 PWM
43	ANOUT4 PWM {F5G only}
44	Inverter status (ru.0) = switching level
45	Power transistor temperature > switching level
46	Motor temperature > switching level
47	Ramp output > switching level
48	Phase current > switching level
49	Rotation forward
50	Rotation reverse
51	OL2 warning {F5G only}
52…58	Reserved {F5M}
59	Digital input (ru.22} "AND" > switching level {F5B only*}
60	Digital input (ru.22} "OR" > switching level {F5B only*}
61	Digital input (ru.22} "NAND" > switching level {F5B only*}
62	Digital input (ru.22} "NOR" > switching level {F5B only*}
63	Absolute value ANOUT1 > switching level {F5B only*}
64	Reserved {F5B only*}
65	Absolute speed on ANOUT1 > switching level {F5B only*}
66	Reserved {F5B only*}
67…69	Reserved {F5M}
70	Driver voltage aktiv (safety relais)
71…72	Reserved {F5M}
73	Absolute value active power > switching level
74	active power > switching level
75…79	Reserved {F5M}
80	Active current > switching level
81	Real value channel 1 > switching level
82	Real value channel 2 > switching level
83	HSP5 bus synchronized
84	Reserved {F5M}

Factory setting CP.31:	4
Factory setting CP.32:	27
Note:	Enter-Parameter

*these functions are currently not supported by the F5G in the B housing.

Relay output 2 Switching level

CP.33

This parameter determines the switching point for the relay output 2 (CP.32). After the switching of the relay, this value can move within a 0.5 Hz window (hysteresis), without the relay changing states. Since the operator display can only view 5 characters, the last digits are not displayed for the higher values.

Adjustment range:	-30000.00...30000.00
Resolution:	0.01
Factory setting:	4.00
Hysteresis Levels	
Frequency:	0.5 Hz
Actual DC voltage:	1 V
Analog set value:	0.5 %
Active current:	0.5 A

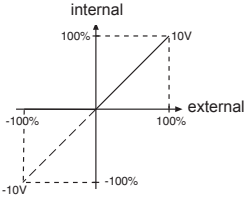
Source of rotation direction

CP.34

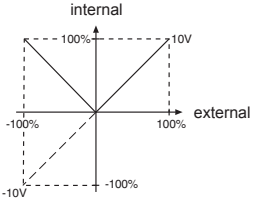
The source of the direction command is defined with this parameter. With CP.34 one does not modify the direction command of the fixed frequencies (CP.19... 21). This parameter is an "Enter" parameter.

Value	Function
0	Digital selection (op.2); negative set values are set to zero
1	Digital selection (op.2); the sign of the value has no effect on the direction of rotation
2	Setting by way of terminal strip forward/ reverse; negative set values are set to zero (factory setting)
3	Setting by way of terminal strip forward/ reverse; the sign of the set value has no effect on the direction of rotation; the speed is the absolute value of the set value
4	Setting by way of terminal strip run, stop (X2A.14) and forward, reverse (X2A.15); negative values are set to zero
5	Setting by way of terminal strip run, stop (X2A.14) and forward, reverse; the signs of the set value has no effect on the direction of rotation; speed is the absolute value
6	Set value dependent, positive value - clockwise rotation; negative value- counterclockwise rotation; with set value "0" the unit is switched into status "Low speed" (LS)
7	Set value dependent, positive value - clockwise; negative values - counterclockwise, however no (LS) at zero
8	Control word (sy.50); negative set values are set to zero
9	Control word (sy.50); the sign of the set value has no effect on the direction of rotation

Set value
0-limited
(Value 2 and 4)



Set value
absolute
(Value 3 and 5)



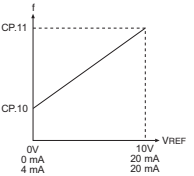
Adjustment range:	0...9
Resolution:	1
Factory setting:	2
Note:	Enter-Parameter

AN1 Interface selection

CP.35

The analog input 1 (AN1) can accept different types of signals. In order to correctly evaluate the signal, this parameter must be adjusted to match the signal source.

Value	Analog reference signal
0	0...±10 V DC, Rin=56 kOhm
1	0...± 20 mA DC, Rin=250 Ohm
2	4...20 mA DC, Rin=250 Ohm



Adjustment range:	0...2
Resolution:	1
Factory setting:	0
Note:	Enter-Parameter

AN1 Zero point hysteresis

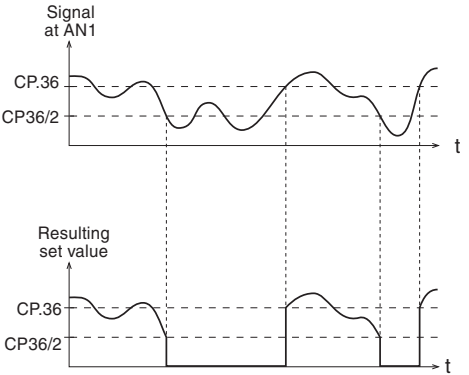
CP.36

Noise coupled capacitively or inductively into the analog signal wires can cause the motor to drift in spite of the filtering of the analog input. The zero point hysteresis can be used to suppress this noise and therefore prevent the motor from drifting.

With parameter CP.36 the analog signal AN1 (X2.1,X2.2) can be masked in the range of 0...±10.0% (0...±1.00V). The adjusted value is valid for both directions of rotation.

If a negative percentage value is adjusted then the hysteresis is not only effective at the zero point but also around the actual set value. This means changes to the set value during constant operation are accepted only when the change is larger than the adjusted hysteresis.

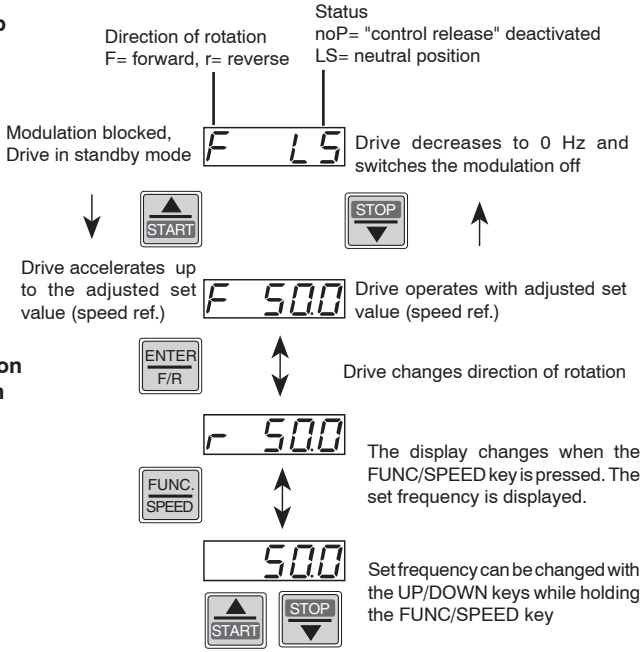
Adjustment range:	-10.0...10.0 %
Resolution:	0.1 %
Factory setting:	0.2 %



4.7 The "Drive Mode"

The Drive Mode is a operating mode of KEB COMBIVERT that permits the manual starting of the through the keypad display unit. After applying a signal to the control release terminal 16, the set value (speed ref.) and rotation setting are effected exclusively over the keypad. In order to activate the Drive Mode the corresponding **password** (500) must be entered **in CP.0**. The display switches over as follows.

4.7.1 Start / Stop Drive



4.7.2 Changing the Direction of Rotation

4.7.3 Speed setting

4.7.4 Leaving the "Drive Mode"

To exit the Drive Mode the inverter must be in status “stop” (Display noP or LS). Press the FUNC and ENTER keys simultaneously for about 3 seconds to leave the Drive Mode. The CP-parameters appear in the display.

5. Error Diagnosis

KEB COMBIVERT **Error messages** are always represented with an "E.xx" and the appropriate error code in the display. Errors cause the immediate turn off of the output to the motor. Restart is possible, only after reset.
Malfunctions are represented with an "A.xx" and the appropriate code. Responses to malfunctions can vary depending on the programmed condition.
In the following table the error codes and their causes are described.

Display	Description	Value	Meaning
E. OP	ERROR over voltage	1	Error: Overvoltage (DC-bus circuit) Occurs, if DC-bus voltage rises above the permissible value. Causes: • poor control adjustment (overshooting) • input voltage too high • interference voltages at the input • deceleration ramps too short • braking resistor damaged or undersized
E. UP	ERROR under voltage	2	Error: Under voltage (DC-bus circuit). Occurs, if DC-bus voltage falls below the permissible value. Causes: • input voltage too low or instable • inverter rating too small • voltage losses through wrong cabling • the supply voltage through generator / transformer breaks down at very short ramps • one phase of the input voltage is missing (ripple-detection) • with separate supply and switched off power circuit
E. OC	ERROR over current	4	Error: Over current Occurs, if the specified peak current is exceeded. Causes: • acceleration ramps too short • the load is too big at turned off acceleration stop and turned off constant current limit • short-circuit at the output • ground fault • deceleration ramp too short • motor cable too long • EMC
E.OHI	ERROR overheat internal	6	Error: Overheating in the interior: error can only be reset once the drive displays E.nOHI; this means the interior temperature has fallen by at least 3°C
E.nOHI	no ERROR overheat int.	7	No longer overheating in the interior E.OHI, interior temperature has fallen by at least 3°C
E. OH	ERROR overheat pow.mod.	8	Error: Overtemperature of power module. Error can only be reset at E.nOH. Causes: • insufficient air flow at the heat sink (soiled) • ambient temperature too high • fan clogged
E.dOH	ERROR drive overheat	9	Error: Overtemperature signal from motor temperature sensor. Error can only be reset at E.ndOH, when sensor resistance decreases. Causes: • resistor at the terminals T1, T2 >1650 Ohm

			• motor overloaded • line breakage to the temperature sensor
E.nEd	no ERROR detected	10	No defined error recognized (should not occur)
E.ndOH	no ERROR drive overheat	11	No longer overtemperature of motor Temperature SENSOR, SENSOR is again low-resistance.
E. PU	ERROR power unit	12	Error: General power circuit fault
NO.PU	power unit not ready	13	Power circuit not ready
E.PUIN	ERROR power unit invalid	14	Error: Software version for power circuit and control card are different. Error cannot be reset.
E.LSF	ERROR load shunt fault	15	Error: charging relay does not close after the DC bus voltage reaches its normal operating level. Occurs for a short time during the switch-on phase, but must automatically be reset immediately (after 10 sec's E.UP). If the error message remains, the following causes may be applicable: • load-shunt defective • input voltage incorrect or too low • high losses in the supply cable • braking resistor incorrectly connected or damaged • braking module defective
E. OL	ERROR overload	16	Error: Overload error can only be reset at E.nOL, if OL-counter has again reached 0%. Occurs, if an excessive load is applied longer than the permissible time (see technical data). Causes: • poor control adjustment (overshooting) • mechanical fault or overload in the application • inverter not correctly sized for application • motor incorrectly wired
E.nOL	no ERROR overload	17	No more overload, OL-counter has reached 0%; after the error E.OL a cooling phase must elapse. This message appears upon completion of the cooling phase. The error can be reset. The inverter must remain switched on during the cooling phase.
E.buS	ERROR bus	18	Error: Adjusted time (Watchdog) of communication between operator and communication bus has been exceeded.
E.OL2	ERROR overload 2	19	Error: Overload while running below 3 Hz. Can only be reset at E.nOL2, if cool-down time has elapsed.
E.nOL2	no ERROR overload 2	20	No more overload, the cool-down time is terminated.
E.EEP	E. EEPROM defective	21	Error: EEPROM defective. After reset the error is repeated. (parameter values changed are erased in the EEPROM)
E.PUCO	E. power unit common.	22	Error: Parameter value could not be written to the power circuit. Acknowledgment from PC <> OK
E.OH2	ERROR motor protection	30	Error: Electronic motor protective relay has tripped.
E. EF	ERROR external fault	31	Error: External error is triggered when a digital input is being programmed as an external error input.
E.ENC	ERROR encoder	32	Error: Encoder cable and/or connection wiring
E.nOH	no E. over heat pow. mod.	36	Internal or external temperature has dropped to a safe level.
E.SET	ERROR set	39	Error: Set selection: It has been attempted to select a locked parameter set.
E.PRF	ERROR prot. rot. for.	46	Error: Locked direction of rotation clockwise
E.PRR	ERROR prot. rot. rev.	47	Error: Locked direction of rotation counterclockwise
E.PUCI	E. power unit code inv.	49	Error: during the initialization the power circuit could not be recognized or was identified as invalid.
E.PUCH	E. power unit changed	50	Error: Power circuit identification was changed; with a valid power circuit this error can be reset by writing to SY.3 (application mode).
E.DRI	ERROR driver relay	51	Error: Driver relay. Relay for driver voltage on power circuit has not picked up although control release was given.
E.HYB	ERROR hybrid	52	Error: Invalid encoder interface identifier

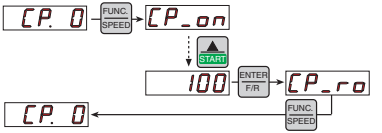
E.CO1	ERROR counter overrun 1	54	Error: Counter overflow encoder channel 1
E.CO2	ERROR counter overrun 2	55	Error: Counter overflow encoder channel 2
E. BR	ERROR brake	56	Error: This error can occur in the case of switched on brake control, if the load is below the minimum load level Pn.58 (application mode) at start up.
E.INI	ERROR initialization MFC	57	Error: MFC not booted
E.HYBc	ERROR hybrid changed	59	Error: Encoder interface identifier has changed, it must be confirmed over ec.0 or ec.10 (application mode).
E.ccd	ERROR calculation drive	60	Error: during the automatic motor stator resistance measurement
E.OS	ERROR over speed	105	Error: Real frequency is bigger than the max. Output frequency
A.OHI	ABN.STOP overheat int.	87	Warning: overtemperature in the interior
A.nOH	no A. overheat pow.mod.	88	Warning: no more overtemperature of power module
A. OH	A.STOP overheat pow.mod	89	Warning: Overtemperature of power module
A. EF	ABN.STOP external fault	90	Warning: external error
A.ndOH	no A. drive overheat	91	Warning: no more overtemperature of motor TEMPERATURE SENSOR. Motor SENSOR is low-resistance again.
A.nOHI	no A.STOP overheat int.	92	Warning: no more overtemperature in the interior
A.buS	ABN.STOP bus	93	Warning: Watchdog for communication between operator/control card has responded
A.PRF	ABN.STOP prot. rot. for.	94	Warning: locked direction of rotation clockwise
A.PRR	ABN.STOP prot. rot. rev.	95	Warning: locked direction of rotation counterclockwise
A.dOH	ABN.STOP drive over heat	96	Warning: overtemperature of motor TEMPERATURE SENSOR
A.OH2	ABN.STOP motor protect.	97	Warning: electronic motor protective relay has tripped
A.nOL	no ABN.STOP overload	98	Warning: no more overload, OL counter has reached 0 %.
A. OL	ABN.STOP overload	99	Warning: Overload can only be reset at A.nOL, if OL counter has again reached 0 %
A.OL2	ABN.STOP overload 2	100	Warning: Overload can only be reset at A.nOL2, if cool-down time has elapsed
A.nOL2	no ABN.STOP overload 2	101	Warning: no more overload, the cool-down time has elapsed.
A.SET	ABN.STOP set	102	Warning: set selection: It has been attempted to select a locked parameter set.

Display	Parameter	Adjust. range	Resolution	Cust. setting
CP. 0	Password input	0...9999	1	read only
CP. 1	Actual frequency display	–	0.0125 Hz	read only
CP. 2	Set frequency display	–	0.0125 Hz	read only
CP. 3	Inverter status display	–	–	read only
CP. 4	Phase current	–	0.1 A	read only
CP. 5	Phase current, Peak value	–	0.1 A	read only
CP. 6	Actual load	–	1 %	read only
CP. 7	Actual DC voltage	–	1 V	read only
CP. 8	Actual DC voltage, Peak value	–	1 V	read only
CP. 9	Output voltage	–	1 V	read only
CP.10	Minimum frequency	0…400 Hz	0.0125 Hz	_____
CP.11	Maximum frequency	0…400 Hz	0.0125 Hz	_____
CP.12	Acceleration time	0.01…300.00 s	0.01 s	_____
CP.13	Deceleration time(-1 see CP.12)	-1; 0.01…300.00 s	0.01 s	_____
CP.14	S-curve time	0.00 (off)…5.00 s	0.01 s	_____
CP.15	Torque boost	0.0…25.5 %	0.1 %	_____
CP.16	Rated frequency	0…400 Hz	0.0125 Hz	_____
CP.17 [1)]	Voltage stabilization	1…650 V (off)	1 V	_____
CP.18 [1)]	Carrier frequency	2/4/8/12/16 kHz	–	_____
CP.19	Fixed frequency 1	-400...400 Hz	0.0125 Hz	_____
CP.20	Fixed frequency 2	-400...400 Hz	0.0125 Hz	_____
CP.21	Fixed frequency 3	-400...400 Hz	0.0125 Hz	_____
CP.22 [1)]	DC-braking, Mode	0…9	1	_____
CP.23	DC-braking, Time	0.00…100.00 s	0.01 s	_____
CP.24	Max. ramp current	0…200 %	1 %	_____
CP.25	Max. constant current	0…200 % (off)	1 %	_____
CP.26 [1)]	Speed search condition	0…15	1	_____
CP.27	Quick stop time	0.00…300.00 s	0.01 s	_____
CP.28	Response of ext. overtemperature	0…7	1	_____
CP.29 [1)]	Analog output 1	0…12...20 {F5G}	1	_____
CP.30	Analog output 1, Amplification	-20.00…20.00	0.01	_____
CP.31 [1)]	Relay output 1	0…58...66 {F5B}	1	_____
CP.32 [1)]	Relay output 2	0…58...66 {F5B}	1	_____
CP.33	Relay output 2, Switching level	±30000.00	0.01	_____
CP.34 [1)]	Source of rotation direction	0…9	1	_____
CP.35 [1)]	AN1 interface selection	0…2	1	_____
CP.36	AN1 zero point hysteresis	-10.0…10.0 %	0.1 %	_____

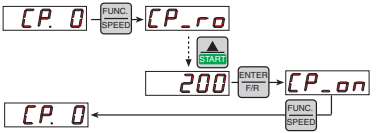
Password Input

From the factory, the frequency inverter is supplied without password protection, this means that all parameters can be adjusted. After programming, the unit can be protected against unauthorized access thus preventing the values from being changed.

Locking the CP-Parameters (Read only)



Releasing the CP-Parameters

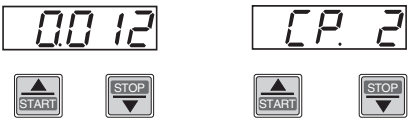


Parameter Display

When switching on the KEB COMBIVERT F5, the value of parameter CP.1 appears in the operator display. (see "Drive Mode" to switch the keypad function)

The **function key** (FUNC) changes between the parameter value and parameter number.

With **UP** and **DOWN,** the value of the parameter number is increased/decreased.



You can find supplementary manuals and intructions which can be downloaded from

www.kebamerica.com

General instructions

- Part 1 EMC-and safety instructions for CE instalations (Must be supplied when unit is shipped to Europe)

Unit-specific instructions

- Part 2 Power Circuit for complete power range
- Part 3 Control Circuit for B/G, M, or S version

Service notes

- Up/Download of parameter lists with KEB COMBIVERT
- Error messages

Detailed Instructions and information for application design and development

- Application Manual
- Preparation of a user-defined parameter menu
- Programming of the digital inputs

All documents are also available in printed version, please contact your local sales office. Some of the above doucmentation is free while some of it must be purchased.

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