

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Visit our website - *Click HERE*

COMBIVERT

F4-S



c UL us LISTED

CE

INSTRUCTION MANUAL **SIMPLE CONTROL**

Important Note: The user should read this manual completely prior to operating the inverter

KEBCO
POWER TRANSMISSION

01/00

This instruction manual must be made available to all users. Before working with this unit the user must be familiar with it. This is especially true for the attention, safety and warning guides. The meaning of the icons used in this manual are:



Danger
Warning
Caution



Attention, observe at all costs



Information
Help
Tip

KEBCO POWER TRANSMISSION

F4-S
Instruction Manual

Table of Contents

1. Installation and connection 2
1.1 Definition of terminal strip X1 2
1.2 Connection of the control signals 2
1.2.1 Digital inputs 2
1.2.2 Analog inputs 2
1.2.3 Outputs 3

2. Operation of the inverter.....3
2.1 Digital operator 3
2.1.1 Interface operator 3
2.1.2 Keyboard 4
2.2 Parameter summary 5
2.3 Password input 5
2.4 Operating display 6
2.5 Basic adjustment of the drive 7
2.6 Special adjustments 9
2.7 The "Drive Mode" 14
2.7.1 Start / Stop "Drive Mode" 14
2.7.2 Changing direction of rotation 14
2.7.3 Speed setting 14
2.7.4 Leaving "Drive Mode" 14

3. Error diagnosis 15

4. Glossary 17

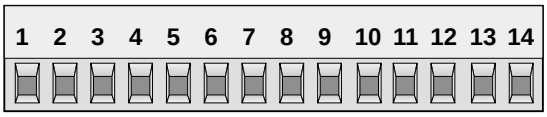
5. Index 18

6. Quick reference 19

7. Passwords 20

1. Installation and connection

Size 05...15



1.1 Definition of terminal strip X1

PIN	Function	Description
1 **2** **3**	NO contact NC contact Switch contact	Relay output Function see parameter CP.22 (factory setting: fault indication)
4 **5**	Fixed frequency 1 Fixed frequency 2	A signal at 4 and 5 give fixed frequency 3, no signal and the speed reference becomes the analog input
6	Digital common	Common terminal for digital inputs and outputs
7 **8** **9**	+10V Speed reference Analog common	Supply voltage for speed reference potentiometer (max. 4mA) 0...10VDC for analog speed setting Common for analog inputs and outputs
10	Analog output	Analog output of actual frequency 0...10VDC = 0...102.4Hz
11	15V	Voltage supply for digital inputs and outputs (max. 100mA)
12 **13**	Reverse Forward	Rotation direction; forward has priority
14	Control release	Output voltage enabled; drive faults reset when signal removed

1.2 Connection of the control signals

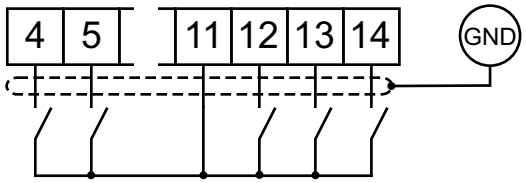
In order to prevent a malfunction caused by interference voltages on the control inputs, the following steps should be observed:



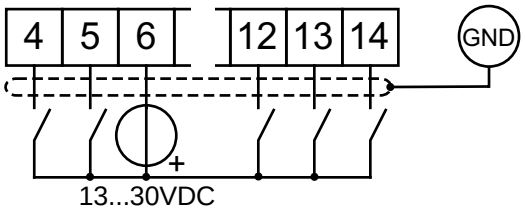
- Use shielded/twisted cables
- Connect shields to earth ground only at the inverter
- Lay control and power wires **separately** (about 8 inches apart)
- Control and power wires should cross at a right angle

1.2.1 Digital input

Internal voltage supply

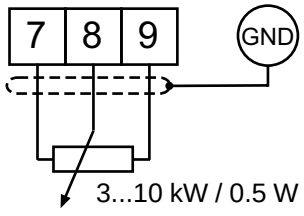


External voltage supply

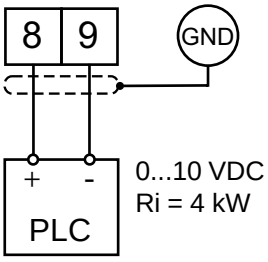


1.2.2 Analog input

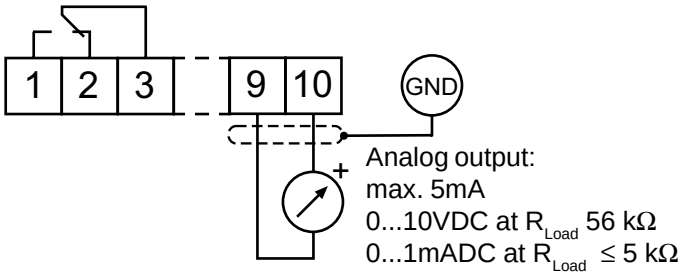
Analog speed reference using potentiometer



Analog speed setting using 0...10V



1.2.3 Outputs



2. Operation of the inverter

When running the inverter without an operator, it runs with the last stored values or factory setting. The red LED remains on constantly when the unit is connected to supply voltage and functioning normally. The LED will begin to flash in the event of an error condition. To facilitate parameter adjustment and inverter monitoring, a keypad/display operator is required. To prevent malfunctions, the inverter must be brought into ***nOP*** status before connecting/disconnecting the operator (remove the signal at the control release terminal 14). The operator is available in different versions:

2.1 Digital operator

Part Number 00.F4.010-2009

5-digit LED Display with double function keypad

Interface control
Transmit LED flickers during active serial communication



Operating-/Error display
Normal - "LED on"
Error - "LED blinks"

2.1.1 Interface operator

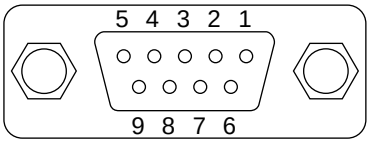
Part Number 00.F4.010-1009

The Interface operator contains an additional isolated RS232/RS485-communication port for serial communication to and from the inverter.

Ground-Connection



RS232/RS485



PIN	RS485	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	Voltage supply-Plus +5V (I_{max} = 10 mA)
7	C/C'	0V	Data reference potential
8	A	TxD-A	Transmit signal A/RS485
9	B	TxD-B	Transmit signal B/RS485

For information about other operator versions contact KEBCO!

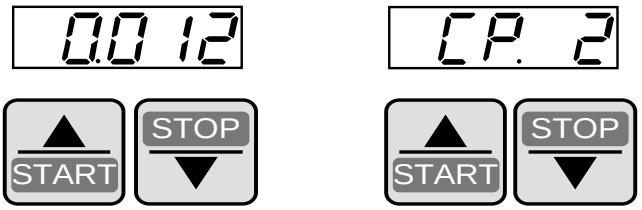
2.1.2 Keypad

When switching on the inverter, the value of parameter CP.1 appears. (See Drive mode to switch the keyboard function)

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



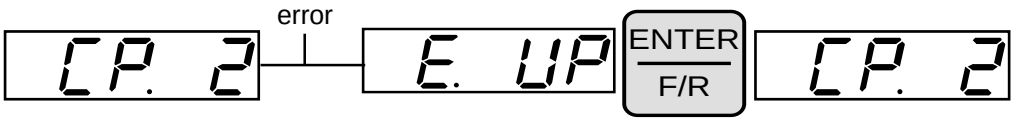
With **UP** (▲) and **DOWN** (▼) the value of the parameter number is increased / decreased .



Generally, when a value is changed, parameter values are immediately accepted and stored nonvolatile. With some parameters it is necessary to press **ENTER** after changing the value in order for the new value to be stored nonvolatile. When this type of parameter is changed, a decimal point appears behind the last digit.



If a drive fault occurs during operation, the current display changes to the fault message, E.XXX. The faultmessage in the display is reset by pressing **ENTER**.

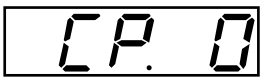


Pressing **ENTER** only resets the error message in the display. In order to reset the fault itself, the cause must be identified and removed and a reset signal given on terminal 14 or a power-on reset (cycle supply voltage off and then on) must occur. In the Inverter status display (CP. 2) the fault is still displayed until the inverter has been reset through the steps listed above.

2.2 Parameter summary

Display	Parameter	Adjust. range	Resolution	Factory setting
CP. 0	Password input	0...9999	1	-
CP. 1	Actual frequency display	read only	0.1 Hz	-
CP. 2	Inverter status display	read only	-	-
CP. 3	Actual load	read only	1 %	-
CP. 4	Peak load	read only	1 %	-
CP. 5	Rated frequency	0...409.58 Hz	0.0125 Hz	50.0 Hz
CP. 6	Boost	0...25.5 %	0.1 %	2 %
CP. 7	Acceleration time	0.01...300 s	0.01 s	10 s
CP. 8	Deceleration time	0.01...300 s	0.01 s	10 s
CP. 9	Minimum frequency	0...409.58 Hz	0.0125 Hz	0 Hz
CP.10	Maximum frequency	0...409.58 Hz	0.0125 Hz	70 Hz
CP.11	Fixed frequency 1	0...409.58 Hz	0.0125 Hz	5 Hz
CP.12	Fixed frequency 2	0...409.58 Hz	0.0125 Hz	50 Hz
CP.13	Fixed frequency 3	0...409.58 Hz	0.0125 Hz	70 Hz
CP.14	Max. ramp current	10...200 %	1 %	140 %
CP.15	Max. constant current	10...200 %	1 %	200 %
CP.16	Speed search	0...7	1	0
CP.17	Voltage stabilization	150...649 V,oFF	1 V	oFF
CP.18	Slip compensation	-2.50...2.50	0.01	0=oFF
CP.19	Autoboost	-2.50...2.50	0.01	0=oFF
CP.20	DC-braking	0...9	1	0
CP.21	Braking time	0...100 s	0.01 s	10 s
CP.22	Relay output	0...25	1	2
CP.23	Frequency level	0...409.58 Hz	0.0125 Hz	4 Hz

2.3 Password input

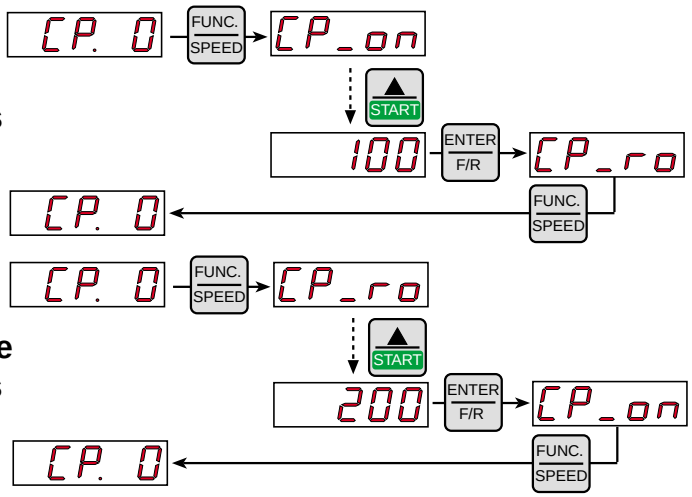


From the factory, the frequency inverter is supplied without password protection, this means that all parameters can be adjusted. After programming, the unit can be protected against unauthorized access thus preventing the values from being changed.

Locking the CP-Parameters (Read only)

See the last page for the actual password values.

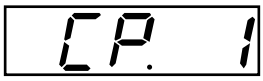
Releasing the CP-Parameters



2.4 Operating display

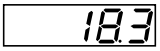
The 4 parameters below can be used to monitor the frequency inverter's operation.

Actual frequency display

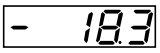


Display of the actual output frequency with a resolution of 0.0125 Hz. The rotation of the inverter is indicated by the sign.

Examples:

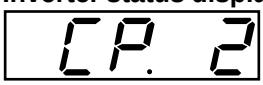


Output frequency 18.3 Hz, rotation forward

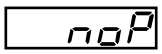


Output frequency 18.3 Hz, rotation reverse

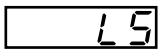
Inverter status display



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



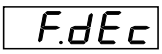
" no Operation " control release (terminal 14) not connected, modulation switched off, output voltage = 0 V, drive is disabled.



" Low Speed " no rotation signal F or R (terminal 12 or 13), modulation switched off, output voltage = 0 V.



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



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



" Reverse Acceleration " drives accelerates with a reverse direction of rotation.



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



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



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

Other status messages are described with the parameters which are related to them.

Actual load



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

Peak load



This display makes it possible to recognize instantaneous load levels by storing the highest value that occurred. The display occurs in percent (100% = inverter rated current).

With the UP or DOWN key the peak value can be reset. Switching off the unit deletes the peak value.

2.5 Basic adjustment of the drive

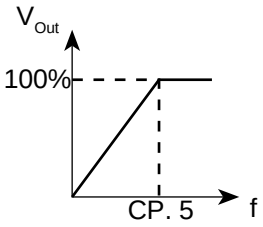
The following parameters determine the fundamental operating data of the drive. They should be checked and/or adjusted for the application.

Rated frequency

CP. 5

The inverter produces maximum voltage to the motor at the frequency set 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...409.58 Hz
Resolution:	0.0125 Hz
Factory setting:	**50.0 Hz**
Customer adjustment:	_____ Hz

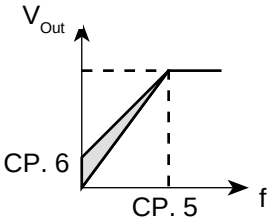


Boost

CP. 6

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

Adjustment range:	0...25.5 %
Resolution:	0.1 %
Factory setting:	2.0 %
Customer adjustment:	_____ %



Adjustment:
- Using CP.3, determine the load level during no-load operation at the rated frequency
- Run the motor at 10 Hz and adjust the boost, so that the same load level occurs as at the rated frequency.
- When the motor runs at low speeds continuously with too much boost, overheating of the motor can result.

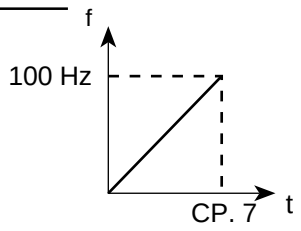
Acceleration time

CP. 7

This parameter determines the time required to accelerate from 0 to 100 Hz. The actual acceleration time is proportional to the change in frequency. See below.

$$\text{actual acceleration time} = \frac{\text{change in frequency x CP.7}}{\text{100 Hz}}$$

Adjustment range:	0.01...300 s
Resolution:	0.01 s
Factory setting:	10 s
Customer adjustment:	_____ s



Example: CP. 7 = 10 s ; the drive accelerates from 10 Hz to 60 Hz
change in frequency = 60 Hz - 10 Hz = 50 Hz
actual acceleration time = (50 Hz / 100 Hz) x 10s = 5 s

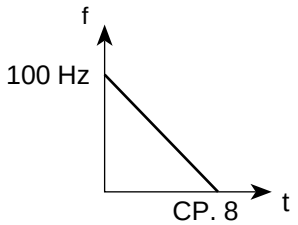
Deceleration time

CP. 8

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

$$\text{actual deceleration time} = \frac{\text{change in frequency x CP.8}}{\text{100 Hz}}$$

Adjustment range:	0.01...300 s
Resolution:	0.01 s
Factory setting:	10 s
Customer adjustment:	_____ s



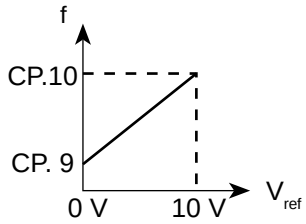
Example: CP. 8 = 10 s ; the drive should decelerate from 60 Hz to 10 Hz
change in frequency = 60 Hz - 10 Hz = 50 Hz
actual deceleration time = (50 Hz / 100 Hz) x 10s = 5 s

Minimum frequency

CP. 9

The frequency the inverter outputs with 0V applied to the analog input or if the activated fixed frequency (CP.11…CP.13) is lower than this value.

Adjustment range:	0.0...409.58 Hz
Resolution:	0.0125 Hz
Factory setting:	0.0 Hz
Customer adjustment:	_____ Hz



Maximum frequency

CP. 10

The frequency the inverter outputs with 10V applied to the analog input or if the activated fixed frequency (CP.11…CP.13) is greater than this value.

Adjustment range:	0.0...409.58 Hz
Resolution:	0.0125 Hz
Factory setting:	70 Hz
Customer adjustment:	_____ Hz

Fixed frequency 1...3

Three fixed frequencies can be adjusted. The selection of the fixed frequencies is made with the terminals 4 and 5.

terminal 4

CP. 11

terminal 5

CP. 12

terminals 4 + 5

CP. 13

Adjustment range:	0.0...409.58 Hz
Resolution:	0.0125 Hz
Factory setting:	5/50/70 Hz
Customer adjustment 1:	_____ Hz
Customer adjustment 2:	_____ Hz
Customer adjustment 3:	_____ Hz

If the adjusted values are outside of the fixed limits of CP.9 and CP.10, then the actual run frequency will be either CP.9 or CP.10.

2.6 Special adjustments

The following parameters serve to optimize the inverter for the application. These adjustments can be ignored at initial start-up.

Max. ramp current

CP. 14

This function acts as an adjustable current limit during acceleration or deceleration. It can be used to prevent the load current from exceeding the inverters peak current rating, thereby preventing shut down of the inverter 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. CP.2 displays "LAS" when the function is active.

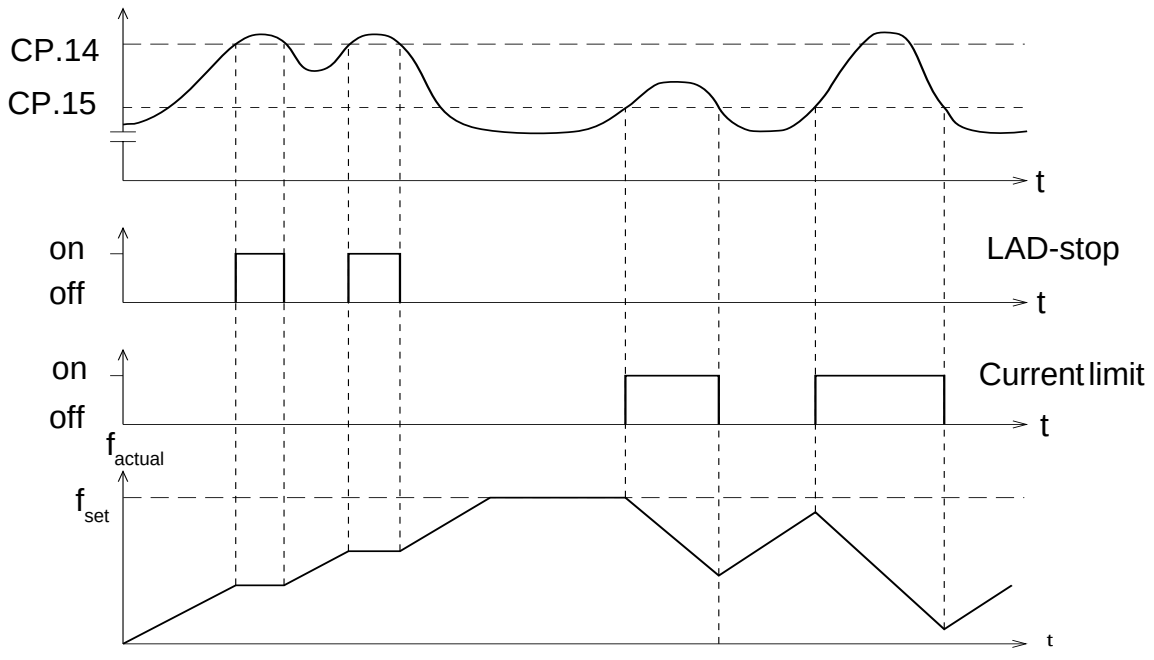
Adjustment range:	10...200%, 200% = off
Resolution:	1 %
Factory setting:	140 %
Customer adjustment:	_____ %

Max. constant current

CP. 15

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 inverters 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. CP. 2 displays "SLL" when the function is active.

Adjustment range:	10...200%, 200% = off
Resolution:	1 %
Factory Setting:	200 %
Customer adjustment:	_____ %



Speed search

CP.16

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.2 displays "SSF". This parameter determines under which conditions the function will operate.

Adjustment range:	0...7
Resolution:	1
Factory setting:	0
Customer adjustment:	_____

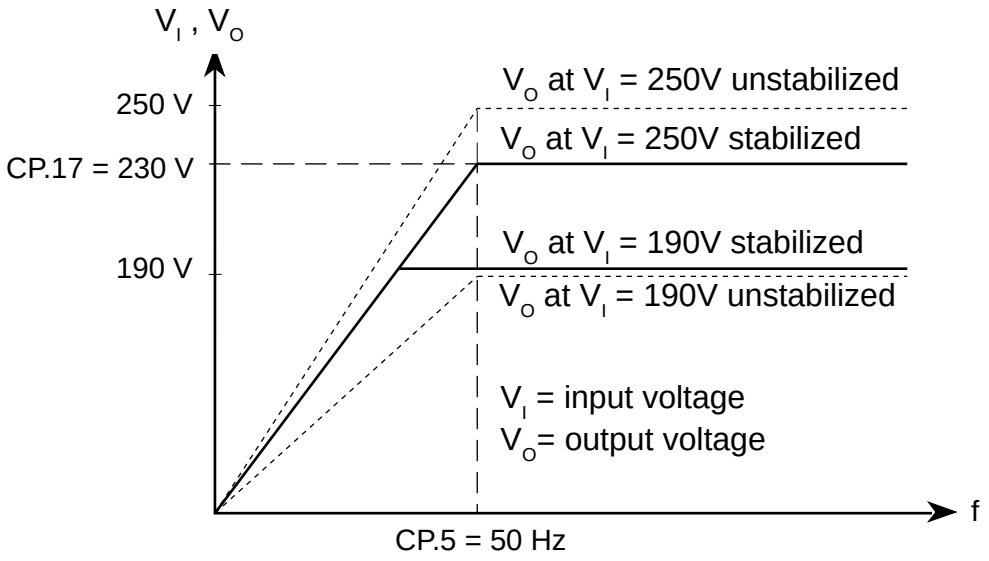
Value	Condition
0	function off
1	control release turned on
2	power on
3	control release & power on
4	after fault reset
5	after reset & control release
6	after reset & power on
7	all the above

Voltage stabilization

CP.17

This parameter can be used to regulate the output voltage in relation to the rated frequency. Voltage variations at the input as well as in the DC bus will have only a small influence on the output voltage (V/Hz-characteristic). The function can be used to adapt the output voltage for special motors. In the example below the output voltage is stabilized at 230 V (The graph shows 0% boost).

Adjustment range:	150...649 V, off
Resolution:	1 V
Factory setting:	off
Customer adjustment:	_____ V



Slip compensation

CP.18

Slip compensation reduces speed variations caused by changes in the load. The function will increase the output frequency, as the load current of the motor increases, to maintain the same motor speed. To activate the function, set the value at 1.00 and optimize as directed in the diagram below

Adjustment range:	-2.50...2.50
Resolution:	0.01
Factory setting:	0.00 (= off)
Customer adjustment:	_____

Autoboost

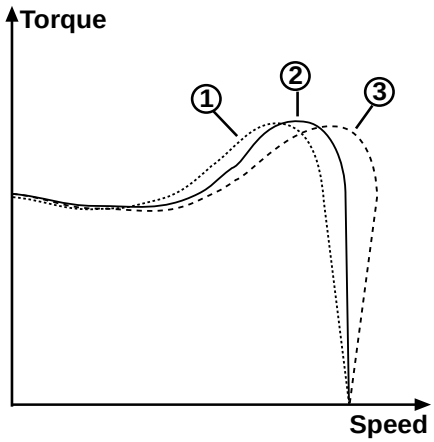
CP.19

Autoboost gives automatic I*R-compensation. When the load torque increases, the additional resistive losses reduce the magnetizing current in the motor, leading to a reduction in motor speed. To compensate, auto boost can be used to automatically increase the applied motor voltage as the motor load increases. To activate the function set the value to 1.00 and optimize as directed below. After making an adjustment, check the response by monitoring the motor voltage. When the load is removed, the voltage should drop to a lower level. If it does not, reduce the value of CP.19.

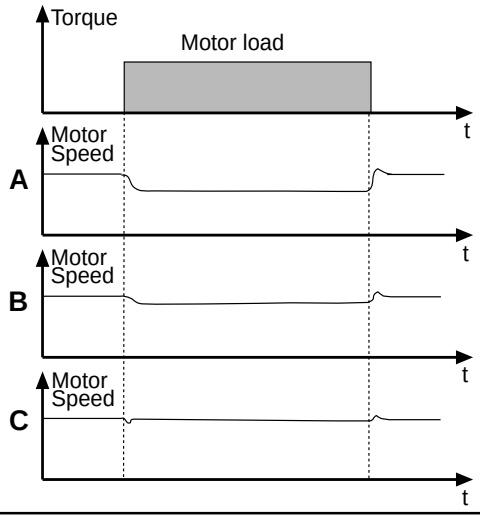
Adjustment range:	-2.50...2.50
Resolution:	0.01
Factory setting:	0.00 (= off)
Customer adjustment:	_____

Slip compensation and autoboost functions use a model of a standard motor equal in power to the inverter rating. When using a special motor or in case of inverter oversizing, both functions should be deactivated.

Example



1) No compensation Standard motor curve,speed decreases with increasing torque
2) Good compensation speed remains stable with increasing torque
3) Over compensation speed is increased too much



Slip compensation and autoboost adjustment steps see curves A,B,C above.

1. Measure "no load" speed with tachometer. Apply the load to the motor and the speed will drop as in curve A.
2. To begin compensation, set CP.18 and CP.19 to 1.00. Motor speed should increase.
3. If speed is still below "no load" value, increase CP.19. until speed does not change with further increase in CP.19. See curve B.
4. Increase CP.18 to compensate for the remaining speed difference. See curve C.
5. Verify output voltage drops when load is removed.

DC-braking

CP.20

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. This parameter determines how the DC-braking is triggered.

Value	Mode of Activation
0	DC-braking deactivated
1	DC-braking activates when direction signal is removed and the output frequency has reached 0Hz. Braking time is dependent on CP.21 or until a direction of rotation signal is given.
2	DC-braking activates as soon as the direction signal is removed. Braking time dependent on the actual frequency.
3	DC-braking, activates as soon as the direction of rotation changes. Braking time dependent on the actual frequency.
4	DC-braking activates when rotation signals are removed and the actual frequency goes below 4 Hz.
5	DC-braking, when the actual frequency goes below 4 Hz.
6	DC-braking, activates when the set value goes below 4 Hz.
7	DC-braking deactivated
8	DC-braking deactivated
9	DC-braking before the acceleration ramp when a direction signal is given. The time is dependent on CP.21.

Factory setting: 0
Note: Enter-Parameter
Customer adjustment: _____

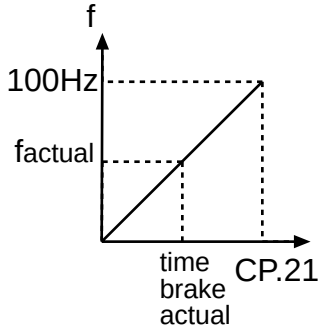
Braking time

CP.21

The actual braking time is calculated using one of the two methods listed below. The value of CP.20 determines which one is used.

- entered time = braking time
- entered time relates to 100 Hz and increases/decreases proportionally to the actual frequency.

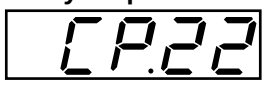
Adjustment range: 0.00...100 s
Resolution: 0.01 s
Factory setting: 10 s
Customer adjustment: _____



Calculation of the braking time:

$$tbrake_{actual} = \frac{CP.21 \times f_{actual}}{100\ Hz}$$

Relay output

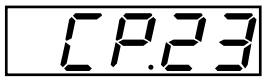


The relay output (terminals 1,2,3) is adjusted as a fault relay at the factory. This parameter can adjust the function of the output to any function listed in the table below.

Value	Function
0	No function
1	On when unit has voltage applied to it
2	Fault relay
3	No function
4	Overload alert signal (10s before inverter switch off)
5	Over temperature inverter alert signal
6	Over temperature motor alert signal (10s before switch off)
7	No function
8	Stall load level (CP.15) exceeded
9	LA-/LD-Stop load level (CP.14) exceeded
10	DC-braking active
11	No function
12	Load level (CP.3) > 100%
13	No function
14	Actual value=set value (CP.2 = Fcon or rcon only; not during noP, LS, error, SSF)
15	Acceleration (CP.2 = FAcc, rAcc, LAS)
16	Deceleration (CP.2 = FdEc, rdEc, LdS)
17	Forward rotation (not during noP, LS error)
18	Reverse rotation (not during noP, LS error)
19	Actual direction of rotation = set direction of rotation
20	Actual frequency > frequency level CP.23
21	Set frequency > frequency level CP.23
22	No function
23	Operating signal (active after initialization; off when fault occurs)
24	Run signal
25	No function

Factory setting: 2
Note: Enter-Parameter
Customer adjustment: _____

Frequency level



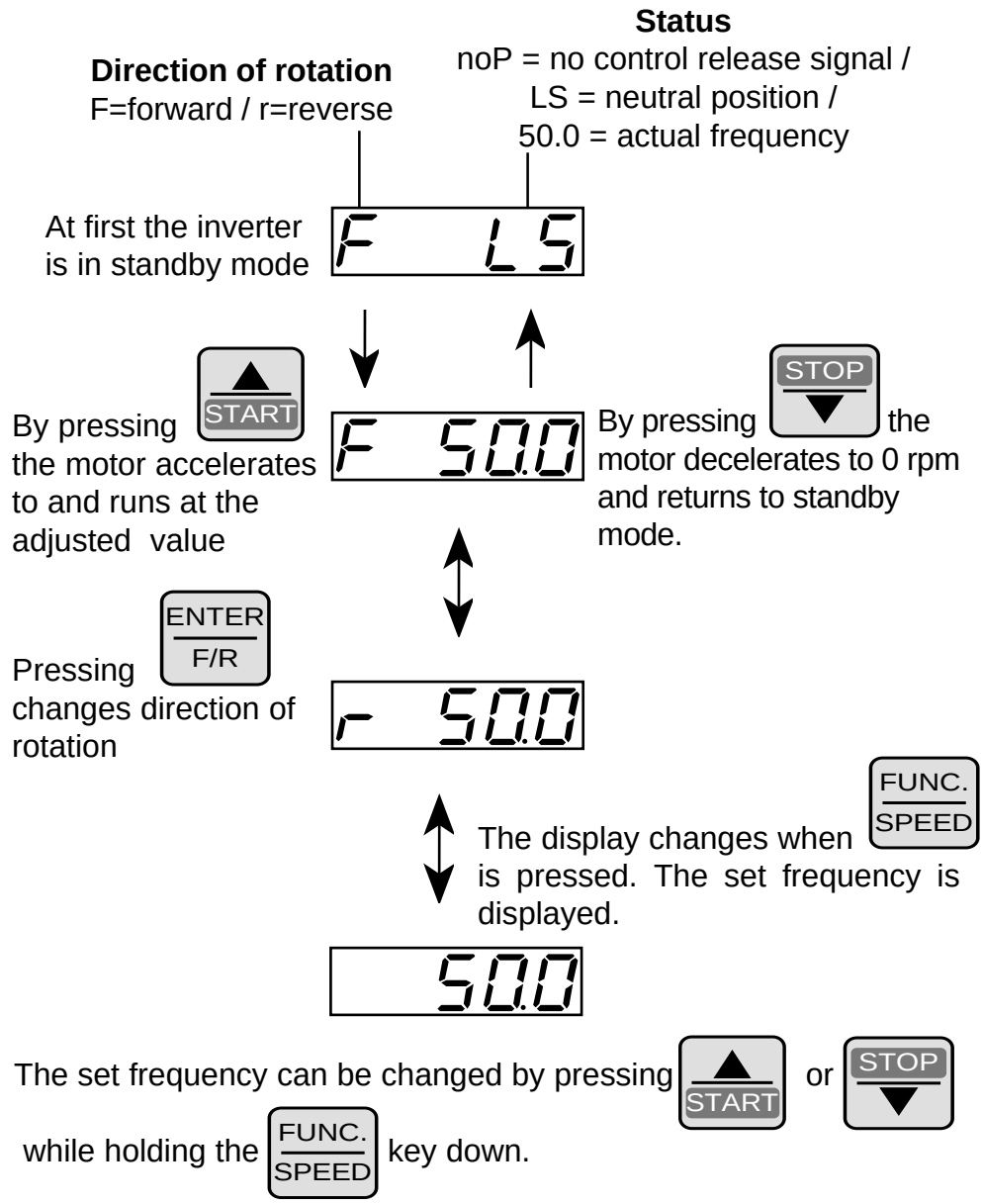
This parameter determines the switching point for the relay output terminals 1,2,3 when CP.22 = "20" or "21"

After the switching of the relay, the frequency can move within a 0.5 Hz window, without the relay changing states.

Adjustment range: 0.0...409.58 Hz
Resolution: 0.0125 Hz
Factory setting: 4 Hz
Customer adjustment: _____

2.7 The "Drive Mode"

The drive mode is an operating mode of the F4-S inverter used to start the drive manually through the digital operator. After applying a signal to the control release terminal 14, the set frequency and rotation direction can be adjusted by the buttons on the digital operator. In order to activate the drive mode, a **password in CP.0** must be entered. Refer to page 20 for password information. The display changes as follows.



2.7.1 Start / Stop "Drive Mode"

At first the inverter is in standby mode

By pressing START the motor accelerates to and runs at the adjusted value

By pressing STOP the motor decelerates to 0 rpm and returns to standby mode.

2.7.2 Changing Direction of Rotation

Pressing ENTER F/R changes direction of rotation

2.7.3 Speed Setting

The display changes when FUNC. SPEED is pressed. The set frequency is displayed.

The set frequency can be changed by pressing START or STOP while holding the FUNC. SPEED key down.

2.7.4 Leaving "Drive Mode"

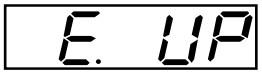
To exit the drive mode the inverter must be in standby (display shows noP or LS). Press the FUNC and ENTER keys simultaneously for about 3 seconds in order to leave the drive mode. The CP-parameters appear in the display.

FUNC. SPEED + ENTER F/R for 3 seconds

3. Error diagnosis

Error messages are represented with an "E. " followed by a code that defines the type of error. When an error occurs, inverter operation stops and the motor is no longer controlled by the inverter. The errors and their causes are described below.

Undervoltage



Occurs, when the DC bus voltage falls below the permissible value.
(for 230V units 255VDC, for 460V units 425VDC)

Possible Causes	Possible solutions
- input voltage too low or unstable	- install boosting transformer to increase voltage
- inverter sized too small for given load	- step up to next larger sized inverter
- missing input phase or input not connected properly	- check protective fusing for blown fuses, verify connections
- connection to an unbalanced supply (i.e. corner ground delta)	- install Δ to Y isolation transformer between inverter and main supply voltage

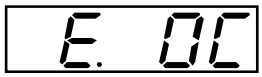
Overvoltage



Occurs, when the DC bus voltage rises above the permissible value.
(for 230V units 400VDC, for 460V units 800VDC)

Possible Causes	Possible solutions
- input voltage too high	- install buck transformer to decrease voltage
- voltage spikes on supply voltage	- install line choke on input to inverter
- PF correction capacitor switching at sub-station	- install buck transformer or choke on inverter input
- deceleration time too short and or braking resistor not connected.	- lengthen decel time or add/connect braking resistor

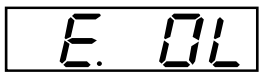
Overcurrent



Occurs, when the peak current level of the inverter has been exceeded or during a ground fault condition. For specific current levels consult the power stage instruction manual and refer to the technical data section.

Possible causes	Possible solutions
- motor larger than recommended for inverter size	- increase size of inverter, consult inverter specifications
- acceleration or deceleration times too short	- lengthen times and/or activate LAD stop function (CP.14)
- voltage boost (CP.6) set too high	- lower adjusted value
- rated frequency (CP.5) of inverter is not adjusted correctly	- check motor rated frequency and adjust inverter rated frequency the same except in case listed below
- 50 Hz 400V motor running on inverter connected to 480V	- change rated frequency from 50Hz to 60 Hz when input voltage is 460V or greater

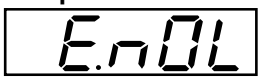
Overload



Occurs when inverter load is greater than 105% for longer than the allowable time. Consult inverter specifications. See also E.nOL .

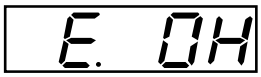
Possible causes	Possible solutions
- motor larger than recommended for inverter size	- increase size of inverter, consult inverter specifications
- increased friction or jam in the mechanical system	- check machine for wear, clear obstructions
- motor incorrectly wired	- verify motor connection
- rated frequency (CP.5) of inverter is not adjusted correctly	- check motor rated frequency and adjust inverter rated frequency the same except in case listed below
- 50 Hz 400V motor running on inverter connected to 480V	- change rated frequency from 50Hz to 60 Hz when input voltage is 460V or greater

Cooling down phase completed



After an E.OL error you must wait for the inverter to cool down. This message appears after the cooling down phase is completed. The E.OL error can only be reset after this message is displayed. Removing the supply voltage will not defeat the cool down period; leave supply voltage on until message is displayed.

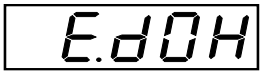
Overheat



Occurs, when the inverter heat sink temperature is greater than 158°F.

Possible Causes	Possible solutions
- insufficient cooling	- observe proper mounting clearances
- insufficient cooling	- clear heatsink of all dirt and debris
- ambient temperature too high	- install cooling device to reduce air temp below 113°F
- cooling fan (when installed) not functioning	- check for fan obstructions, blades should spin freely.

External Overheat



Occurs when resistance between "OH terminals becomes greater than 1650 ohms.

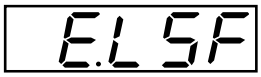
Possible Causes	Possible solutions
- factory jumper loose (not using this function)	- tighten black jumper wire between OH terminals
- ambient temperature around motor too high	- install cooling device to reduce air temp
- motor overload, see E.OC and E.OL causes	- see E.OC and E.OL solutions
- Motor temperature sensor cable broken	- repair cable

Overheat cleared



Internal or external temperature has dropped to a safe level. Error "E. OH" can be reset.

Charging relay error



Occurs when the charging relay does not close after the DC bus voltage reaches its normal operating level.

Possible Causes	Possible solutions
- see causes listed under E.UP	- see solutions listed under E.UP
- charge relay or charge resistor has failed	- replace unit with new unit and return old unit for repair

4. Glossary

Analog/Digital Common The F4-S inverter has potential separated (galvanically isolated) digital inputs and power supply. With this design, electrical noise and leakage currents are greatly reduced. As a result, the digital common (6) serves as a reference for the power supply and all digital inputs. The analog common (9) serves only as a common for the analog signals. For best results, it is important to avoid connecting these two commons together.

EMC **Electro- m**agnetic **c**ompatibility, guidelines for reducing high frequency interference caused by the inverter.

Energy-Saving Function When motors are running under "no-load" conditions, the voltage can be reduced, and as a result energy can be saved.

Frequency-dependent Switch Relay or transistor output that activates at a preset frequency.

Actual Value A value that is measured by sensors in the inverter or a value that is calculated from a measured value and a preexisting condition.

LA-Stop Acceleration stop, prevents over current errors during acceleration by stopping the ramp. The current level is specified by the max. ramp current (CP.14).

RS232/485 RS232, is the standard serial interface for connection between an inverter and computer or PLC with a cable length of 45 feet maximum . RS485, is the standard serial interface for multiple inverters connected to a computer or PLC . Maximum cable length is 3000 feet.

Set Value The preset analog or digital value with which the frequency inverter shall operate.

Speed Search Speed search prevents an over current error when starting the inverter into a running motor. The motor speed is determined and the inverter begins to accelerate the motor at this frequency.

Stall The Stall-function protects the inverter against an E.OC error while running at a constant speed. When exceeding the level adjusted with CP.15, the output frequency is reduced until the load level drops below the level in CP.15.

5. Index

A

Acceleration stop 17
Acceleration time 5, 7, 19
Actual frequency display 5, 6, 19
Actual load 5, 6, 19
Actual Value 17
Analog inputs 2
Analog output 2
Autoboost 5, 11, 19

B

Basic adjustment 7
Boost 5, 7, 19
Braking time 5, 19

C

Change direction 14
Common 2
Control release 2
Cooling down phase 16
Current limit 9
Current limit resistor error 16

D

DC-braking 5, 12, 19
Deceleration time 5, 8, 19
Digital inputs 2
Digital common 2
Drive Mode 14

E

EMC 17
Energy-Saving Function 17
Error diagnosis 15

F

Fixed frequency 2, 5, 8, 19
Forward 2
Frequency value 5, 13, 19
Frequency-dependent switch 17

I

I*R - compensation 11
Interface operator 3
Interference voltage 2
Inverter status display 5, 6, 19

K

Keyboard 3, 4

L

LAD -stop 9, 17
LED 3

M

Max. constant current 5, 9, 19
Max. ramp current 5, 9, 19
Maximum frequency 5, 8, 19
Minimum frequency 5, 8, 19
Modulation 6, 14

O

Operating Display 6
Optimize 11
Overcurrent 15
Overheat 16
Overload 15
Overvoltage 15

P

Password input 5, 19, 20
Peak load 5, 6, 19
Peak value 6

R

Rated frequency 5, 7, 19
Relay output 2, 5, 13, 19
Releasing 5
RS232/485 3, 17

S

Set value input 2
Set-point value 17
Slip compensation 5, 11, 19
Special adjustments 9
Speed search 5, 10, 17, 19
Stall-function 17
Start / Stop 14

U

Undervoltage 15

V

Voltage stabilization 5, 10, 19

X

X1 2

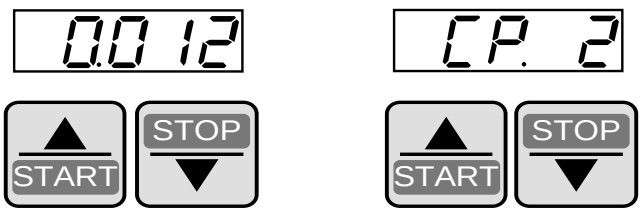
6. Quick reference

Display	Parameter	Adjust. range	Resolution	Customer setting
CP. 0	Password input	0...9999	1	-
CP. 1	Actual frequency display	Read only	0.1 Hz	-
CP. 2	Inverter status display	Read only	-	-
CP. 3	Actual load	Read only	1 %	-
CP. 4	Peak load	Read only	1 %	-
CP. 5	Rated frequency	0...409.58 Hz	0.0125 Hz	_____
CP. 6	Boost	0...25.5 %	0.1 %	_____
CP. 7	Acceleration time	0.01...300 s	0.01 s	_____
CP. 8	Deceleration time	0.01...300 s	0.01 s	_____
CP. 9	Minimum frequency	0...409.58 Hz	0.0125 Hz	_____
CP.10	Maximum frequency	0...409.58 Hz	0.0125 Hz	_____
CP.11	Fixed frequency 1	0...409.58 Hz	0.0125 Hz	_____
CP.12	Fixed frequency 2	0...409.58 Hz	0.0125 Hz	_____
CP.13	Fixed frequency 3	0...409.58 Hz	0.0125 Hz	_____
CP.14	Max. ramp current	10...200 %	1 %	_____
CP.15	Max. constant current	10...200 %	1 %	_____
CP.16	Speed search	0...7	1	_____
CP.17	Voltage stabilization	150...649 V,oFF	1 V	_____
CP.18	Slip compensation	-2.50...2.50	0.01	_____
CP.19	Autoboost	-2.50...2.50	0.01	_____
CP.20	DC-braking	0...9	1	_____
CP.21	Braking time	0...100 s	0.01 s	_____
CP.22	Relay output	0...25	1	_____
CP.23	Frequency level	0...409.58 Hz	0.0125 Hz	_____

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

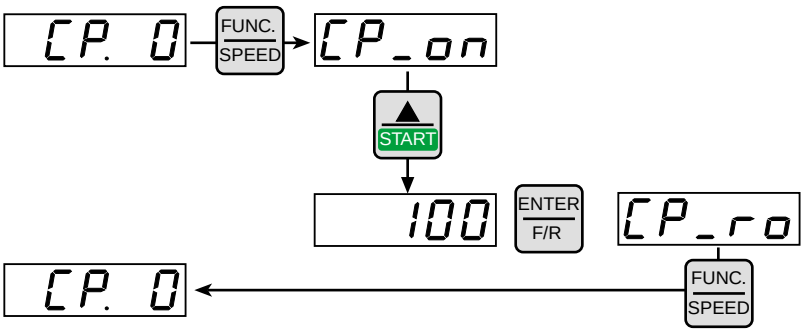


With **UP** (▲) and **DOWN** (▼), the value of the parameter or the parameter number is increased/ decreased. The values of "Read Only Parameters" can not be changed.

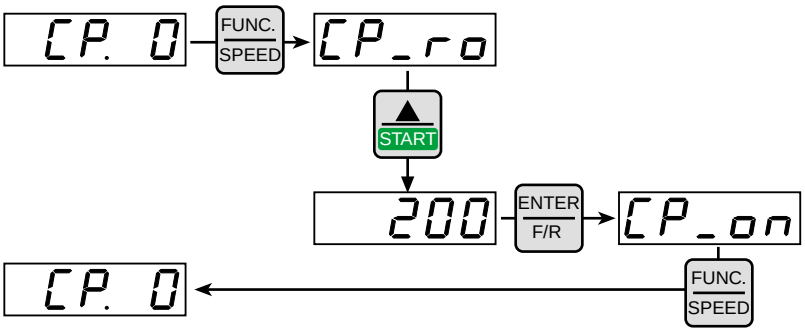


7. Passwords

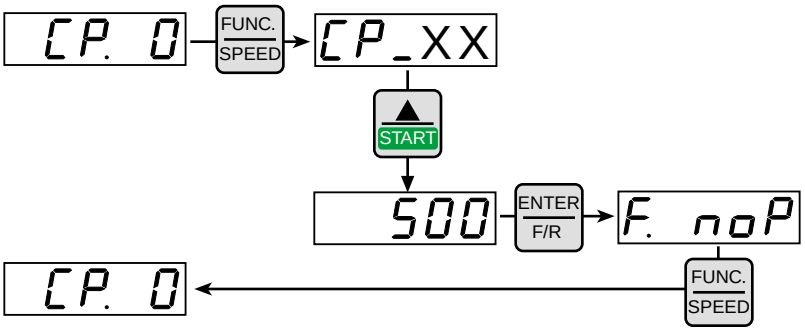
A - Locking the CP-Parameters from change (read only)



B - Releasing the CP-Parameters, allowing changes



C - Activating "Drive Mode"



D - Leaving "Drive Mode"

FUNC. SPEED + ENTER F/R for 3 seconds

KEBCO
POWER TRANSMISSION

Special Notice to Customer

Prior to delivery all products pass several quality and performance inspections in order to guarantee the product is free from defects in manufacturing. When used in accordance with the operating instructions, failure of the unit is not likely. However, if you have reason for concern please contact KEBCO at 800-899-3226 and ask for inverter technical support. From this point our technical support engineers can help you determine the cause of the problems and also the proper solution.

Listed values in this manual are standard values only and do not pertain to special units. We reserve the right to make technical changes without notification.

KEBCO Limited Warranty

KEBCO will repair or replace, at KEBCO's discretion, any inverter which shows signs of defect in material, workmanship or fails to meet factory specifications with in one year from original date of shipment from KEBCO in St. Paul. The serial number will be used to track the shipping date. Operation of the inverter outside the rated specifications printed in the instruction manuals will void the warranty.

KEBCO does not assume any liability (cost of removal, cost of installation, down time, production delays, or damage to other items associated with the inverter) for failures which occur during or after the warranty period.

To make a warranty claim contact the Electronic repair department at the number listed above, and request a Return Goods Authorization (RGA) number. The inverter is to be shipped prepaid to the address listed below. Suitable packaging must be provided to prevent the inverter from incurring damages during shipping as damages of this nature will void the warranty.

KEBCO will inspect the inverter to determine the cause of the problems in the inverter and will repair or replace the inverter at its discretion.

KEBCO Inc.
Attn. ELECTRONIC REPAIR (RGA#)
1335 Mendota Heights Road
St. Paul, MN 55120

KEBCO

POWER TRANSMISSION

KEBCO Inc. • USA Headquarters
1335 Mendota Heights Road
St. Paul, MN 55120
PH:800-899-3226 / 651-454-6162
FAX:651-454-6198
WEB:www.kebco.com

With Sales Offices in:
Atlanta, Georgia
Columbus, Ohio
Dallas, Texas

KEBCO 0S.F4.0EB-K120 01/00

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP