VISTA IV

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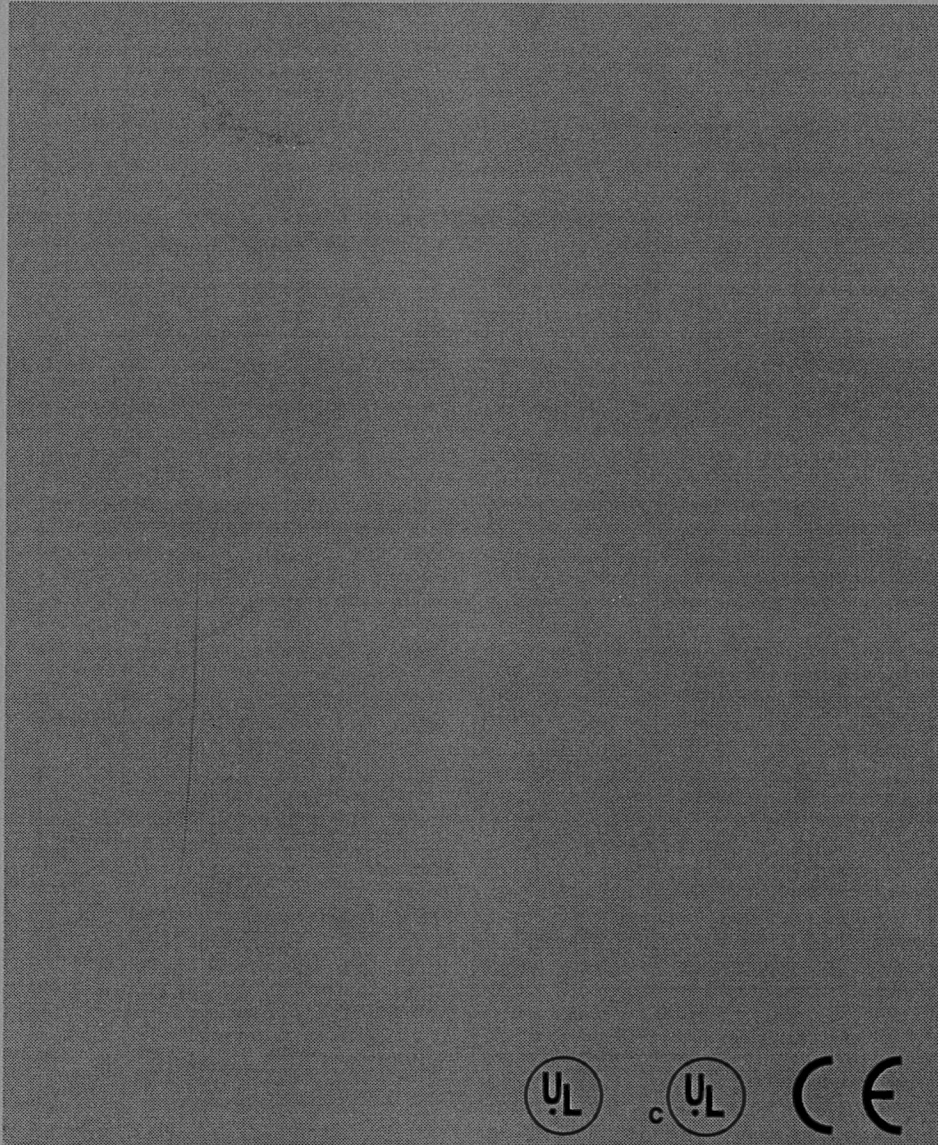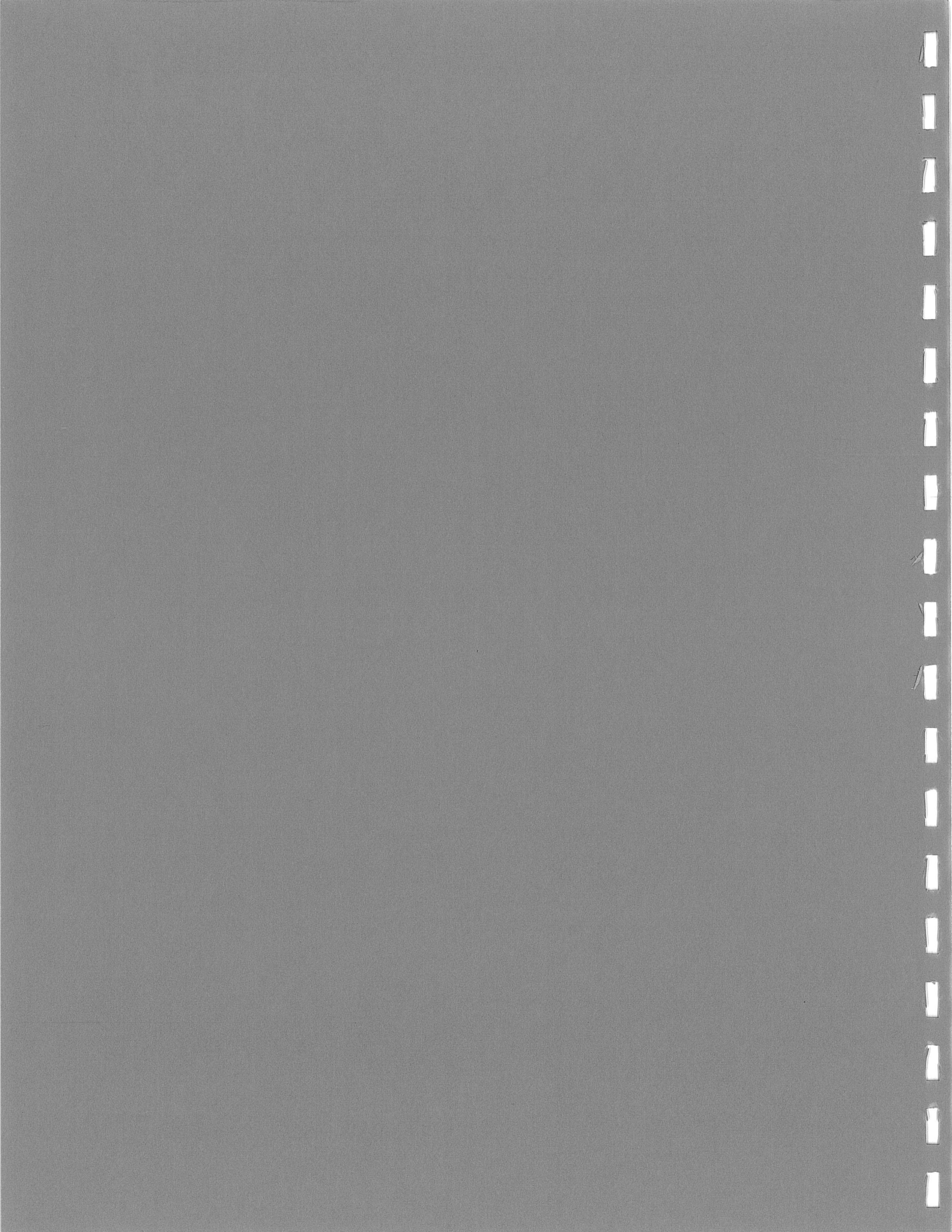## INSTRUCTION MANUAL   FLUX VECTOR CONTROL

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

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This manual
- is valid for the Vista IV frequency inverter
- must be made available to all user

Before working with this unit you must familiarize yourself with it. Pay special attention to the safety and warning guides. Make sure to read the "Power Stage" instruction manual before starting the unit!

The Carotron Vista IV has very extensive programming capabilities. To make the operation and start-up simpler for the user, a special operator level was created in which the most important parameters are found. However, if the parameters predefined by Carotron are not sufficient for your application an **application manual** is available for in depth programming. Consult Carotron for more information.

The icons used in this manual are defined as follows:

**Danger
Warning
Caution**

Used when the life or health of the user is at risk or when considerable damage to property can occur.

Attention

Must be observed!
Special instructions for safe and trouble-free operation.

Information

Helpful hint. Programming tip.

1.0 Operating Specifications

1.1 Application

The Vista IV frequency inverter is a drive component, which is intended for installation in electrical systems or machines. The frequency inverter is designed exclusively for smooth speed control/ regulation of three-phase induction motors. The operation of other electrical loads (i.e. heaters, lighting, electronics) is not permitted and can lead to the destruction of the unit.

1.2 Moving or Rotating Parts
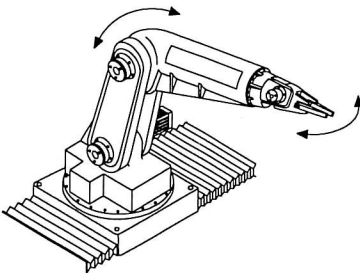
- Motor shaft
- Feed axis and parts connected to it

> ⚡ **Prior to doing any work on the machine disconnect it from the main voltage supply and secure it against unintended restart!**

> ⚡ **Be aware of the range of movement of the machine during operation! Bodily injury can result!**

1.3 High Operating Temperatures
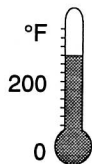
- Housing of the motor
- Braking resistors

°F
200
0

> ⚡ **Motor housing and braking resistor can attain very high temperatures! Bodily injury can result!**

1.4 Operating Instructions

> ⚠ **To avoid premature ageing and/or destruction of the Carotron Vista IV, observe the following instructions!**

–   Install a switch between the voltage supply and inverter, so that the Vista IV inverter can be shut off independently.
–   Frequent switching on and off of the supply voltage is not permitted!
–   Switching between motor and inverter during operation is prohibited!
–   The Carotron Vista IV is to be operated under suitable conditions (see Ambient Conditions in Part 2).

1.5 Connection Instructions

Trouble-free and safe operation of the frequency inverter is only guaranteed when the following connection instructions are observed.
When deviated from, malfunctions and damages may occur in isolated cases.

- The Vista IV frequency inverter is only designed for stationary connection.
- Do not interchange voltage supply wires and motor wires.
- Install control and supply lines separately (min. 4 inch distance).
- Connect control terminals only to devices (relay, switch, potentiometer), that are suitable for low voltage operation.
- Use shielded/twisted control lines. Connect the shield only to the ground terminals on the inverter. Do not connect the other end.
- Use shielded motor cables. Connect shield to the ground terminal of the inverter and terminate the other end to the motor housing. Make sure the connection is good any increase in resistance can lead to interference problems.
- Ground the frequency inverter very well using a heavy gauge ground strap or mount the inverter to a bare metal panel for best results. Always keep ground wires as short as possible and avoid ground loops.

> **The connections on the control terminal strip and encoder inputs are electrically isolated in accordance with VDE 0100. Make sure these control connections are not connected or grounded to the high voltage supply.**

1.6 Interference Protection of Electric Systems

The Vista IV inverter generates high frequency electromagnetic interference. To reduce interference, that may effect electric systems in the vicinity of the frequency inverter, do the following:

- Install the frequency inverter in metal enclosure
- Shield motor cables.
  The shield must be connected to ground terminal of the frequency inverter and to the housing of the motor. The shielding shall not be used as a protective ground. A separate ground wire is required for this. Only a continuous shield without breaks or splices should be used.
- Ground the inverter to the machine ground with a heavy gauge ground strap.
- Use radio interference suppression filters.

1.7 Interference Protection of the Frequency Inverter

The control and power inputs of the frequency inverter are protected against external interference.

⚠ **For additional operational reliability and protection against malfunctions due to external interference follow these measures:**

— Use a line reactor or choke, when the mains voltage is affected by the connection of large loads (i.e. ≥100 hp), reactive-power compensation equipment, HF-furnaces etc.

— Suppress all inductive loads (solenoid valves, relays, electromagnets) with RC elements or similar devices to absorb the energy released when the unit is switched off.

— Install control wires, to avoid inductive and capacitive coupling of electromagnetic interference.
Twisted pair cables protect against inductive interference voltage, shielding provides protection against capacitive interference voltage. Optimal protection is achieved by using twisted and shielded cables keeping a minimum of 4 inches between them and cables carrying high voltage.

2. Control connections

2.1 Hardware Layout
Housing Sizes
D - E

Optional Operator
Basic operator with keypad and display for simple parameter adjustment
Serial interface operator for connection to PC and COMBIVIS for advanced programming

X2
Control Terminals 1-23
(removable)

Earth ground connection for shielding control lines (use tab connectors)

X5
9-pole Sub-D Socket for options

X4
15-pole Sub-D Socket Incremental Encoder connection from motor

**Housing Sizes
G - L**

Optional Operator
Basic operator with keypad and display for simple parameter adjustment
Serial interface operator for connection to PC and COMBIVIS for advanced programming

X5
9-pole Sub-D Socket for options

Earth ground connection for shielding control lines (use ring connectors)

X4
15-pole Sub-D Socket Incremental Encoder connection from motor

X2
Control Terminals 1-23
(removable)

2.2. Digital Inputs and Outputs

18 V internal

PNP-Logic

1	2	3	4	5	6	7	8	9	10	11		23
ST	RST	F	R	I1	I2	I3	D1	D2	Vout	0 V		Ext. Volt.

Control lines should be shielded for best results. Use ground connections highlighted on previous page.

⚠ The digital signals and supply voltage on terminals 1-11,23 are electrically isolated from the analog signals on terminals 12-19

Terminal	Name	Function	
1	ST	Control release	**Digital Inputs**
2	RST	Reset	Noise immunity: 2 kV
3	F	Forward direction of rotation enable Software limit switch forward *	Input is active when applied voltage is 12...30 VDC with respect to terminal 11.
4	R	Reverse direction of rotation enable Software limit switch reverse *	Internal input resistance: approx. 2 kΩ
5	I1	Input for jog speed forward see parameter CP.11	PNP-Logic
6	I2	Input for jog speed reverse see parameter CP.11	* The function must be activated with **CP.35**. If the unit is defective there is no guarantee that the software protective function will work.
7	I3	Input for external fault stopping mode see parameter CP.15	
8	D1	digital output signal 1 see parameter CP.21	programmable PNP - transistor outputs approx. Vout - 3 V (+/- 20%) ; max. 20 mA each
9	D2	digital output signal 2 see parameter CP.22	
10	Vout	+ 18 V Voltage output	+18V (+/- 20%) ; max. 20 mA *When external voltage is connected to terminal 23 Vout = external voltage (see wiring diagram) !*
11	0 V	Common for Vout and digital I/O	
23	Ext. Volt.	External voltage supply	+ 24 ... + 30 V external voltage input Common: 0V (terminal 11)

2.3 Analog Inputs / Outputs
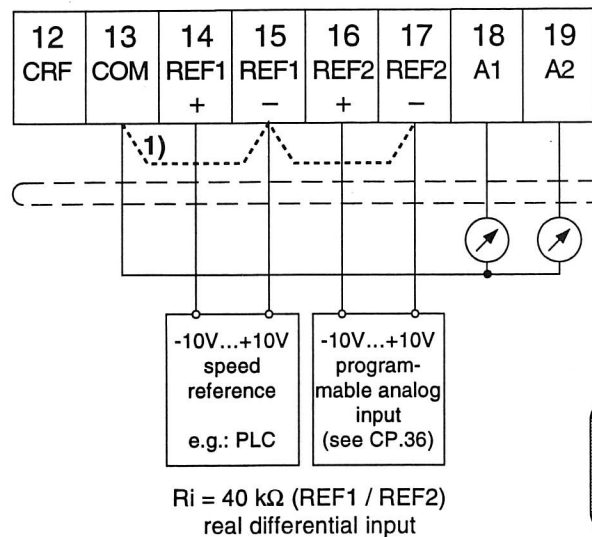
Output Relay
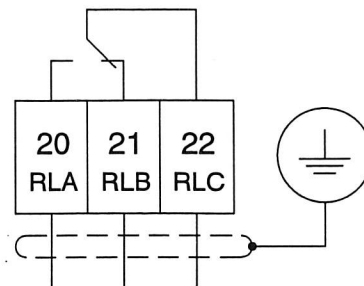
| 12 CRF | 13 COM | 14 REF1 + | 15 REF1 − | 16 REF2 + | 17 REF2 − | 18 A1 | 19 A2 |

1)

-10V...+10V speed reference e.g.: PLC

-10V...+10V programmable analog input (see CP.36)

Ri = 40 kΩ (REF1 / REF2) real differential input

1) differential input with internal common Ri = 24 kΩ (REF1 / REF2)

| 20 RLA | 21 RLB | 22 RLC |

⚠ The digital signals and supply voltage on terminals 1-11,23 are electrically isolated from the analog signals on terminals 12-19

Terminal	Name	Function	
12	CRF	+10 V reference voltage	+10V (+/- 3%) ; max. 4 mA Lies on the same potential as the supply voltage for incremental encoder (sub-D-socket X4)
13	COM	Common for analog I/Os	
14	REF 1 +	Analog speed reference	Full differential input Range: - 10 V... + 10 V / resolution: +/- 11 Bit Resolution: +/- 11 Bit Ri = 24 kΩ from REF+ or REF- to common (13) 40 kΩ from REF+ to REF - averaging time: 1 ms response time: 1...3 ms
15	REF 1 −	see parameters CP.16 + CP.17	
16	REF 2 +	programmable analog input	
17	REF 2 −	see parameter CP.36	
18	A1	programmable analog output see parameters CP.18 & CP.19	-10V...+10V / resolution: +/- 9 Bit Ri = 100 Ω short-circuit proof for less than 1 min
19	A2	Analog output proportional to actual speed see parameter CP.20	
20	RLA	Inverter fault output relay:	
21	RLB	RLA / RLC : Normally open contact	Contact rating: 30 VDC / 1 A
22	RLC	RLB / RLC : Normally closed contact	

2.4 Operator Interface
Optional accessory

An operator is an optional accessory for monitoring and adjusting the parameters in the Vista IV inverter. To prevent an interruption of operation, the inverter must be brought into the *nOp* status (i.e. remove signal to control release terminal 1) before removing or inserting the operator.

The operator is available in several versions. The two most common are listed below.

Basic Operator

5-digit LED display

Interface control:
LED flickers, when the inverter is sending data. *Only on the interface operator.*

Operation / Fault display
Normal: LED on
Fault: LED blinks
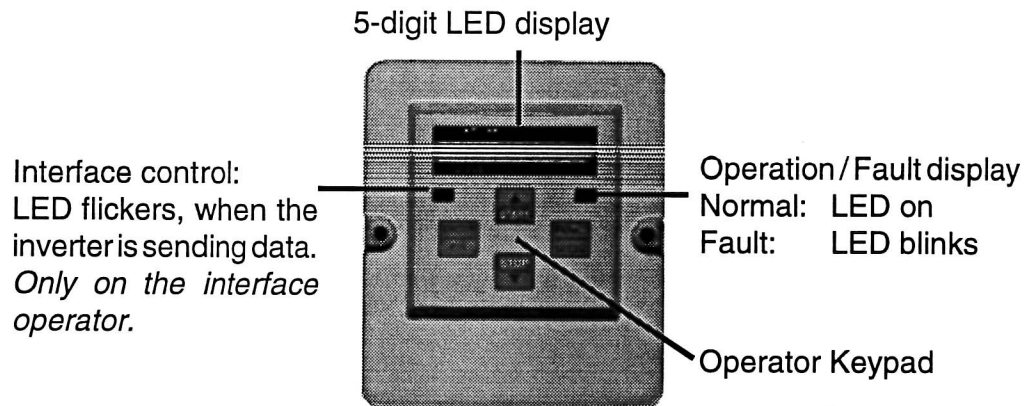
Operator Keypad

Interface Operator

An electrically isolated interface RS232/RS485 is integrated into the Interface Operator. The LED display and keypad are the same as the basic operator.

GND-Connection connect to earth ground of inverter

RS232/RS485
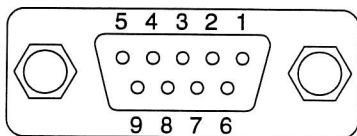
PIN	RS485	Signal	Description
1	–	–	reserved
2	–	TxD	transmit data / RS232
3	–	RxD	receive data / RS232
4	A'	RxD-A	receive data A / RS485
5	B'	RxD-B	receive data B / RS485
6	–	VP	supply voltage +5V (I_{max}=10 mA)
7	C/C'	DGND	data common
8	A	TxD-A	transmit data A / RS485
9	B	TxD-B	transmit data B / RS485

Contact Carotron for information about other operators.

2.5 Connection X4 Incremental Encoder

The incremental encoder of the motor is connected to the 15-pin sub-D-socket on the inverter.
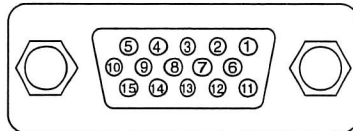
Signal	PIN-No.
+ 15 V	11
+ 5 V	12
common	13
A +	8
A -	3
B +	9
B -	4
N +	15
N -	14
shield	housing

N is the 360° marker pulse

⚠ The plug may only be connected / disconnected when the inverter is turned off, otherwise damage to the encoder or inverter may result.

Example of internal signal processing

A + or B +

A - or B -

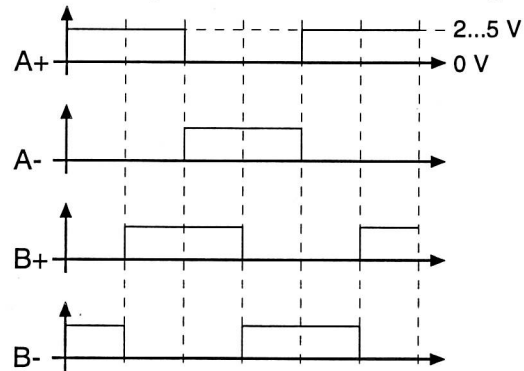121 Ω

10 nF

10 kΩ

10 kΩ
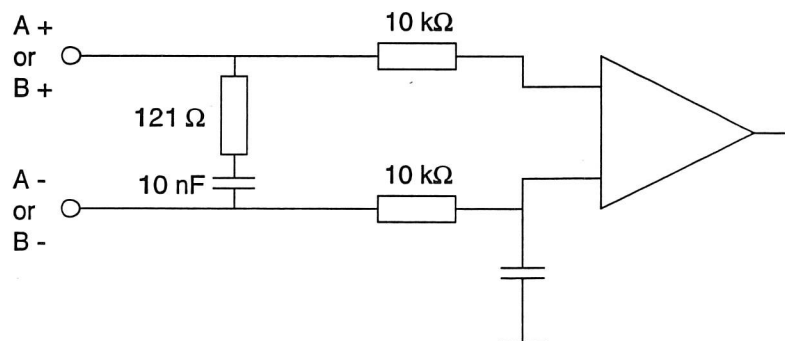
Encoder Specifications:

1- Voltage Supply: + 5 V (+/-10 %) max. 110 mA
or
+15 V (+/-10 %) max. 110 mA

Encoder Specifications Continued:
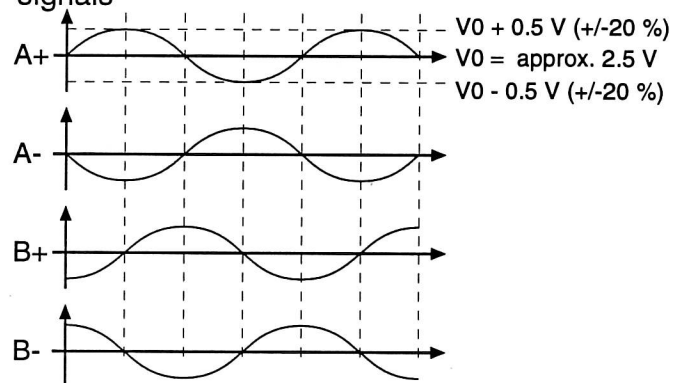
2- Output signals: <u>Rectangular Signal</u>

Two square-wave pulses that are electrically out of phase by 90° and their inverse signals

A+ — 2...5 V / 0 V
A-
B+
B-

or <u>Sinusoidal Signal</u>

Two sinusoidal incremental signals that are electrically out of phase by 90° and their inverse signals

A+ — V0 + 0.5 V (+/-20 %) / V0 = approx. 2.5 V / V0 - 0.5 V (+/-20 %)
A-
B+
B-

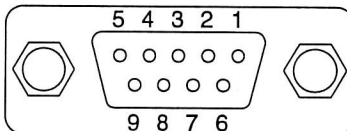3- Increments: 256 - 10000 increments per revolution (recommended: 2500 inc.)

Observe the maximum frequency of the encoder:

$$f_{limit} > \frac{increments \cdot n_{max}}{60} \ rpm$$

2.6 Connection X4 for options

The 9-pole sub-D-socket is used for options.
For connection and start-up see the Application Manual!

5 4 3 2 1
9 8 7 6

| Signal	PIN-No.
- dependent on the option -	

13

3. Operation

3.1 Keyboard

When the **Carotron Vista IV** is started, the value of parameter CP.1 (actual speed) is displayed.

Use the **function-key** to change between parameter value and parameter number.

Use the **function-key** to change between parameter value and parameter number.

| 0.0 | FUNC. SPEED | [P. 1 |

| ▲ START | STOP ▼ |

| [P. 2 |
| ⋮ |
| [P. 7 |

With **UP** (▲) and **DOWN** (▼) the parameter number, or with **adjustable** parameters, the value is increased/decreased.

| 0.01 | FUNC. SPEED | [P. 7 |

| ▲ START | STOP ▼ |

| 0.02 |
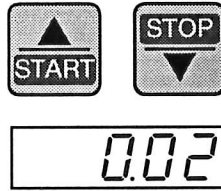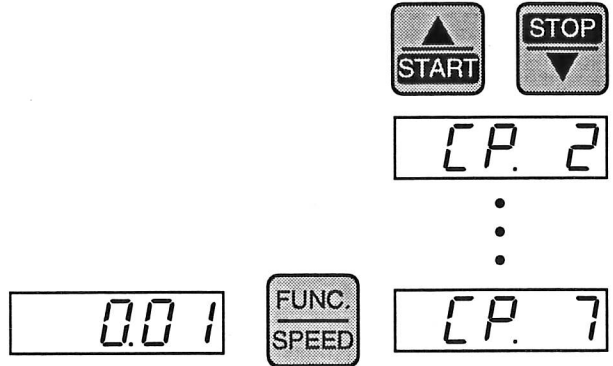
With some parameters the adjusted value is not immediately accepted. When this type of parameter is changed, a point appears behind the last digit. The adjusted parameter is accepted and permanently stored when **ENTER** is pressed (point is turned off).

| 2. | ENTER F/R | 2 |

| Error |

| [P. 2 | E. UP | ENTER F/R | [P. 2 |
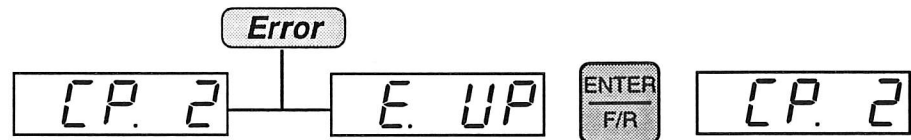
If a fault occurs during operation, the actual display is overwritten with the error message. Press **ENTER** to clear the error message and return to the previous display.

i

Parameter CP.2 (status display) will continue to display the error message even after enter is pressed.
To reset the error, remove the cause of the error and give a reset signal on terminal 2 or cycle the power off and then on to clear the error.

3.2. Parameter Summary

Parameter Number	Parameter Description	Adjustment Range	Resolution	Factory Setting
CP.0	Password Input	0…9999	1	–
CP.1	Actual motor speed display[1]	–	0,5 rpm	–
CP.2	Status display	–	–	–
CP.3	Motor phase current display[1]	–	0,1 A	–
CP.4	Max. motor phase current display[1]	–	0,1 A	–
CP.5	Actual motor torque display[1]	–	0,1 Nm	–
CP.6	Speed reference display[1]	–	0,5 rpm	–
CP.7	Acceleration time	0…320 s	0,01 s	2,0 s
CP.8	Deceleration time	0…320 s	0,01 s	2,0 s
CP.9	Torque limit[2]	0…5 x M_N Nm	0,1 Nm	dependent on size
CP.10	Maximum run speed	0…6000 rpm	0,5 rpm	2100 rpm
CP.11	Jog speed	0…6000 rpm	0,5 rpm	100 rpm
CP.12	P-factor speed controller	0…65535	1	400
CP.13	I-factor speed controller	0…65535	1	200
CP.14	Encoder 1 (inc/r)	256…10000	1	2500
CP.15	External fault stopping mode	0…6	1	0
CP.16	Offset REF 1	-100…+100 %	0,1 %	0 %
CP.17	Zero volt noise filter REF 1	0…10 %	0,1 %	0,2 %
CP.18	Function analog output A1	0…6	1	1
CP.19	Gain analog output A1	-20…+20	0,01	1
CP.20	Gain analog output A2	-20…+20	0,01	1
CP.21	Digital output D1 switching condition	0…20	1	20
CP.22	Digital output D2 switching condition	0…20	1	18
CP.23	Torque level for D1[1]	0…50 Nm	0,1 Nm	0 Nm
CP.24	Speed level for D2[1]	0…9999,5 rpm	0,5 rpm	0 rpm
CP.25	Rated motor power	0,01…75 kW	0,01 kW	dependent on size
CP.26	Rated motor speed	100…6000 rpm	1 rpm	see page 35
CP.27	Rated motor current	0,1…50 A	0,1 A	dependent on size
CP.28	Rated motor frequency	20…300 Hz	1 Hz	see page 35
CP.29	Rated motor power factor	0,05…1	0,01	dependent on size
CP.30	Rated motor voltage	100…400 V	1 V	400 V
CP.31	Load default motor parameters	0…1	1	0
CP.32	Speed control on/off	0…1	1	0
CP.33	Boost	0…25 %	0,1 %	2 %
CP.34	Change encoder 1 rotation	0…1	1	0
CP.35	Reaction to limit switch	0…6	1	6
CP.36	Aux function	0…5	1	0

[1] Resolution refers to the internal parameter resolution in the inverter's program.
The accuracy of the measurement or calculation of the parameter values may be worse than the stated resolution.

⚠️ Due to calculation and measurement accuracies, tolerances with the current and torque displays as well as with the switching levels, must be taken into consideration. The given tolerances (see parameter description) refer to the respective maximum values when dimensioning the Vista IV : Motor = 1:1.
Dependent on the data from the motor manufacturer, larger tolerances are possible, due to the usual variations in the machine parameters and temperature drifts.

4. Parameter Description

```
CP. 0
```

Password Input

The inverters are delivered from the factory without password protection, i.e. all adjustable parameters can be altered. After programming the unit can be protected against unauthorized access.

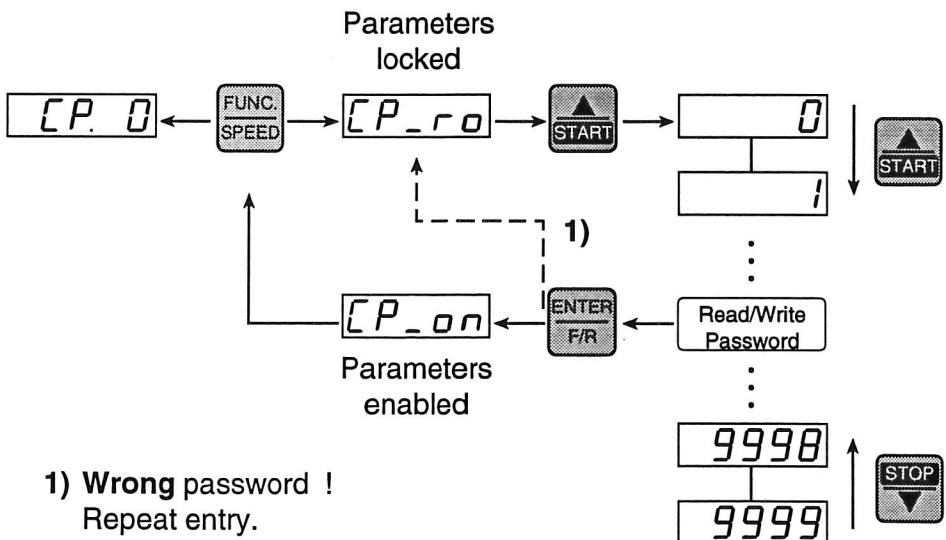The passwords use in the proceedure listed below are found on page 43 !

Locking CP-Parameters
Prevents parameter changes

1) Wrong password !
Repeat entry.
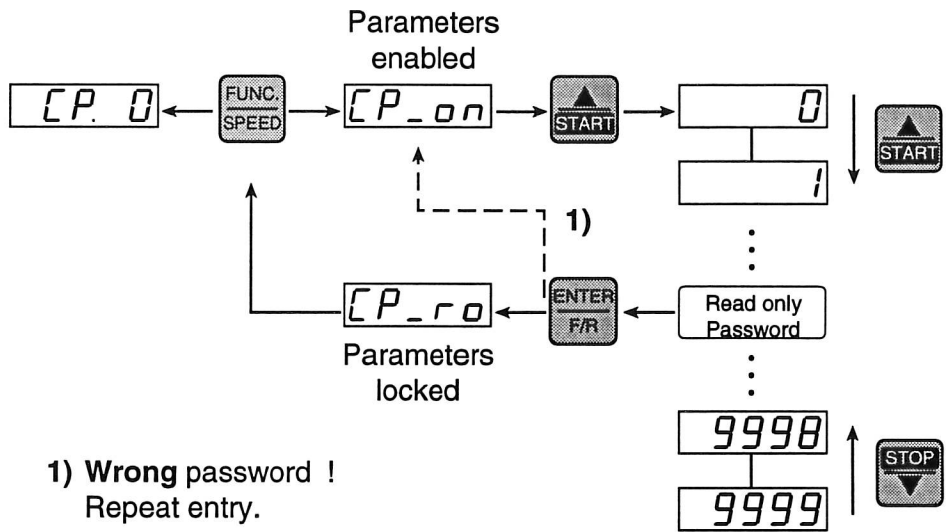
Enabling CP-Parameters
Allows changes to be made to parameter values

1) Wrong password !
Repeat entry.

CP. 1

Actual Motor Speed

Display of the actual motor speed measured by the (incremental encoder).

For a correct display value, observe the adjustment of encoder resolution in (CP.14) and verify the encoder rotation. Change (CP.34) if the sign is wrong (i.e. set speed is forward/positive and measured speed is reverse/negative).

Example:

Display	Direction of Rotation	Actual Motor Speed	Resolution of Display
1837.5	"forward"	1837.5 rpm	0,5 rpm
-1837	"reverse"	1837.0 rpm or 1837.5 rpm	1 rpm (The internal resolution of the speed is 0.5 rpm)

CP. 2

Status Display

Shows the actual operating state of the inverter. Possible displays and their meaning are:

nOP	**no Operation**	– Control release (terminal 1) not activated – Modulation off – Output voltage = 0 V/ motor is not controlled
F.Acc	**Forward Acceleration**	– Drive accelerates forward
F.dEc	**Forward deceleration**	– Drive decelerates forward
r.Acc	**reverse Acceleration**	– Drive accelerates in reverse
r.dEc	**reverse deceleration**	– Drive decelerates in reverse
F.con	**Forward constant**	– Drive runs with constant speed and forward
r.con	**reverse constant**	– Drive runs with constant speed and reverse

`bbL`	**Base-Block Time**	– The Base-Block-Time -Transistors are turned off to allow magnetic field in motor drop out. Automatically triggers before DC braking and when a fault condition shuts down the inverter.
`A. EF`	**external fault**	– The external fault is triggered on (terminal 7). **The response to external errors is adjusted in parameter CP.15.**
`A.PrF`	**Prohibited rotation forward**	– Rotation signal on terminal 3 is missing: Drive does not start with forward rotation and/or decelerates to a standstill. **See also parameter CP.35**
`A.Prr`	**Prohibited rotation reverse**	– Rotation signal on terminal 4 missing: Drive does not start with reverse rotation and/or decelerates until standstill. **See also parameter CP.35**

(A b n o r m a l S t o p p i n g)

`CP. 3`

Motor Phase Current

Displays the actual phase current in amps.
Resolution: 0.1 A
max. tolerance: approx. ±10 %

`CP. 4`

Max. Motor Phase Current

Displays the maximum motor phase current, which is measured during operation. The display is in amps.
During operation use **UP** or **DOWN** to clear the peak value. The peak value is also cleared when the unit is shut off.
Resolution: 0.1 A
max. tolerance: approx. ±10 %

`CP. 5`

Actual Motor Torque

Displays the actual torque in newtonmeters.
Resolution: 0.1 Nm
To convert to (lb ft) multiply by 0.738
max. tolerance: approx. ±20 % in base speed range
(in the field weakening range larger tolerances are possible)

During open-loop operation (CP.32 = 0) 0 is always displayed.
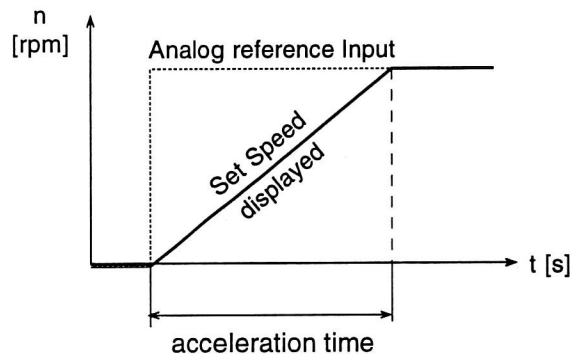
`CP. 6`

Speed Reference Display

Displays the speed reference value at the output of the internal ramp generator.
When the modulation is switched off (noP) the value 0 rpm is displayed.
Resolution: 0.5 rpm
positive speed: direction of rotation "forward"
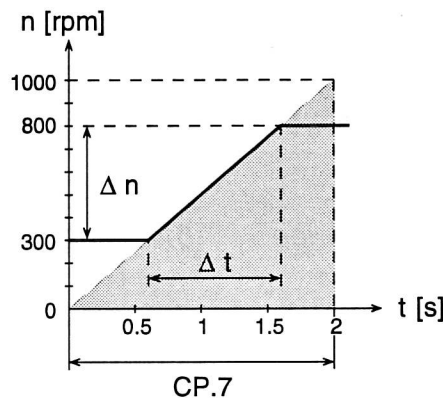negative speed: direction of rotation "reverse"

`CP. 7`

Acceleration Time

Defines the time needed to accelerate from 0 to 1000 rpm. The actual acceleration time is proportional to the speed change (Δn).

Adjustment Range: 0...320 s
Resolution: 0.01 s
Factory setting: 2.0 s

Δn speed change
Δt acceleration time for Δn

$$CP.7 = \frac{\Delta t}{\Delta n} \times 1000 \text{ rpm}$$

Example:
The drive should accelerate from 300 rpm to 800 rpm in **1 s.**

Δn = 800 rpm - 300 rpm = **500 rpm**
Δt = **1 s**

$$\textbf{CP.7} = \frac{\Delta t}{\Delta n} \times 1000 \text{ rpm} = \frac{1 \text{ s}}{500 \text{ rpm}} \times 1000 \text{ rpm} = \textbf{2 s}$$
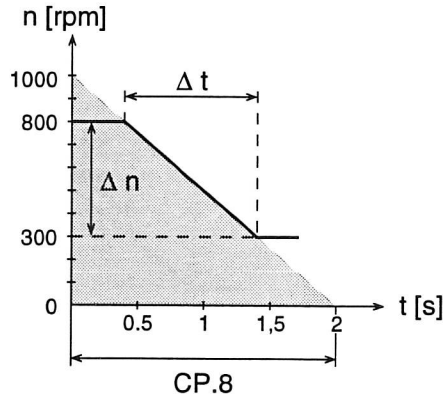
19

```
[ CP.  8 ]
```

Deceleration Time

Defines the time needed to decelerate from 1000 to 0 rpm. The actual deceleration time is proportional to the speed change (Δn).

Adjustment Range: 0...320 s
Resolution: 0.01 s
Factory setting: 2.0 s

n [rpm]

Δn speed change
Δt deceleration for Δn

$$CP.8 = \frac{\Delta t}{\Delta n} \times 1000 \text{ rpm}$$

Example:
The drive should decelerate from 800 rpm to 300 rpm in **1 s.**

Δn = 800 rpm - 300 rpm = **500 rpm**
Δt = **1 s**

$$CP.8 = \frac{\Delta t}{\Delta n} \times 1000 \text{ rpm} = \frac{1 \text{ s}}{500 \text{ rpm}} \times 1000 \text{ rpm} = \textbf{2 s}$$

```
[ CP.  9 ]
```

Torque Limit

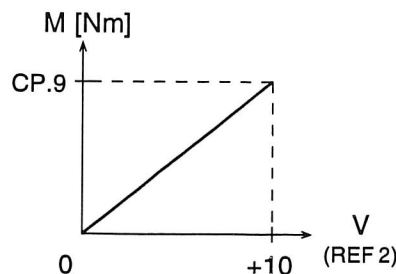Adjusts the maximum permissible torque produced by the motor. The parameter can be influenced by the auxilary analog input. **During openloop operation (CP.32=0) this parameter has no function.**

Adjustment Range: 0...5 x M_N Nm
Resolution: 0.1   Nm
Factory setting: dependent on size

To convert to (lb ft) multiply by 0.738

M [Nm]

Analog Adjustable Torque Limit
Terminals 16 and 17
! only when CP.36 = 5 !

CAROTRON

ℹ️ **The maximum torque of the drive is limited by the following:**

— *Dimensioning   KEBCO COMBIVERT to the Motor*

If the KEBCO COMIBVERT is dimensioned too smal,l the necessary torque is automatically limited due to the current limit of the inverter.

— *Programming the Motor Parameters CP.25 - CP.30*

When the motor data is entered, a speed-dependent torque limit curve (see below) is established. The calculated value of the maximum torque is automatically written in parameter CP.9.
Parameter CP.31 (Load motor parameters) activates the motor data and the respective limit curve.
See table on page 35 for the factory setting of the motor parameters!
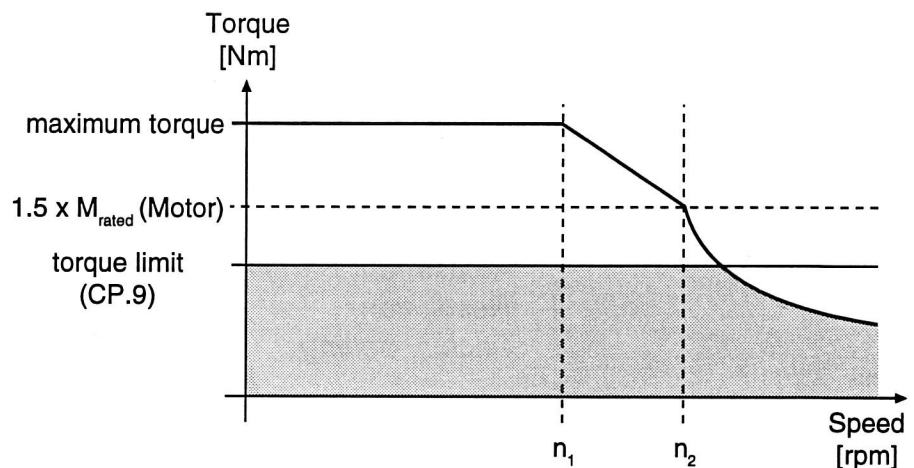
$$n_1 = 0.6 \times n_{fn} \times \frac{V_{rated}}{CP.30} \qquad n_2 = 0.86 \times n_{fn} \times \frac{V_{rated}}{CP.30}$$

n_{fn} Nominal-Rotating Field Speed (1500 rpm for a 4 pole motor at 50Hz

or 1800 rpm for a 4 pole motor at 60Hz)

V_{rated} Inverter Operating Voltage

$CP.30$ Motor Rated Voltage
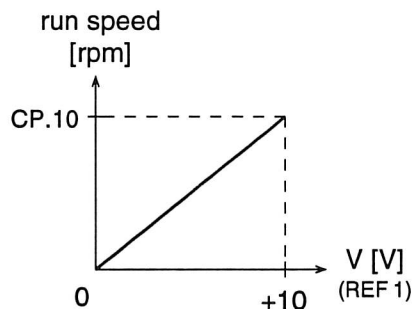
```
[ C P. 10 ]
```

Maximum Run Speed

Defines the maximum run speed.

Adjustment Range: 0...6000 rpm
Resolution: 0.5 rpm
Factory setting: 2100 rpm

run speed
[rpm]

CP.10 ┆- - - - - -
      ┆   ╱┆
      ┆   ╱ ┆
      ┆   ╱   ┆
      ┆   ╱   ┆
      ┆ ╱   ┆
      ┆╱_____┆___→ V [V]
     0   +10   (REF 1)

Analog speed reference: REF 1
terminals 14 & 15

! see also parameter CP.36 !

⚠ **Only the reference speed is limited by this parameter. The actual speed can exceed this value because of oscillations cause by the speed controller or an error in the speed measurent system.**

```
[ C P. 11 ]
```

Jog-Speed

Specifies a jog speed (fixed speed), which can be activated by a signal at terminals 5   (forward) or 6 (reverse). If both signals are simultaneously preset, 'forward' has priority.

Adjustment Range: 0...6000 rpm
Resolution: 0.5 rpm
Factory setting: 100 rpm

Function:

• 5 or 6 active; The drive runs with the adjusted jog speed.
  - The original direction of rotation, speed, acceleration and decleration times do not have a function!
  - ACC and DEC times only have limited functions (see the following table)!
  - If the jog speed entered is too high, the adjusted value is internally limited to the maximum run speed!
  - The software limit switches (see CP.35) remain active!

• 5 and 6 not active ;   The drive runs according to the analog speed reference.

Input 5/6	Speed Relation	Acceleration/ Deceleration Performance
is activated	Actual speed dis. (CP.1) is less than Jog speed (CP.11)	drive accelerates at the torque limit
is activated	Actual speed dis. (CP.1) is greater than Jog speed (CP.11)	drive decelerates in accord. with the adjusted ramp
is deactivated	Speed reference dis. (CP.6) is less than Jog speed (CP.11)	drive decelerates at the torque limit
is deactivated	Speed reference dis. (CP.6) is greater than Jog speed (CP.11)	drive accelerates in accord. with the adjusted ramp

CP.12

P-Factor Speed Controller

Proportional factor of the speed controller.
Adjustment assistance found in chapter *"Startup"* page 40 / 41.

Adjustment Range: 0...65535
Resolution: 1
Factory setting: 400

! see also parameter CP.36 !

CP.13

I-Factor Speed Controller

Integral factor of the speed controller.
Adjustment assistance found in chapter *"Startup"* page 40 / 41.

Adjustment Range: 0...65535
Resolution: 1
Factory setting: 200

! see also parameter CP.36 !

CP.14

Encoder 1 (inc/r)

Sets the resolution of the incremental encoder. Check the set and actual speed displays during open-loop operation (CP.31=off) and compare.
The correct setting is when:
actual speed(CP.1) = set speed(CP.6) - slip

Adjustment Range: 256...10000
Resolution: 1
Factory setting: 2500

```
 CP. 15
```

External Fault Stopping Mode

This parameter determines how the drive reacts to an externaly triggered fault (terminal 7 or I3).

Adjustment Range: 0...6
Resolution: 1
Factory setting: 0
Note: **ENTER-Parameter**

Value	Error / Status massage	Response of the drive
0	**E.EF**	modulation immediately switched off *!* To restart remove error and **activate reset (terminal 2)!**
1	**A.EF**	quick stop / modulation switched off after speed 0 is reached *!* To restart remove error and **activate reset (terminal 2)!**
2	**A.EF**	quick stop / holding tourqe at speed 0 *!* To restart remove error and **activate reset (terminal 2)!**
3	**A.EF**	modulation immediately switched off *!* **Automatic** *restart*, when error is no longer present *!*
4	**A.EF**	quick stop / modulation switched off after speed 0 is reached *!* **Automatic** *restart*, when error is no longer present *!*
5	**A.EF**	quick stop / holding tourqe at speed 0 *!* **Automatic** *restart*, when error is no longer present *!*
6	**none**	no effect on the drive *!* **Fault is ignored** *!*

i   *Quick stop*   =   deceleration at the torque limit (CP.9)
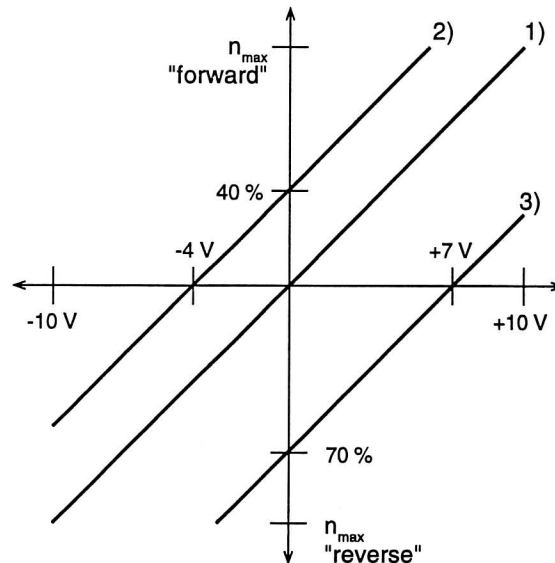
```
 CP. 16
```

Offset REF 1

Makes it possible to shift the analog refference voltage vs speed curve.

Adjustment Range: -100...+100 %
Resolution: 0,1 %
Factory setting: 0 %

n_{max} =maximum run speed (CP.10)

Examples:

Curve 1: CP.16 = **0%** (Standard adjustment)

0V = 0 rpm

Direction of rotation "forward": n_{max} is reached at +10V

Direction of rotation "reverse": n_{max} is reached at -10 V

Curve 2: CP.16 = **-40%**

0V = 40 % of n_{max} "forward"

Direction of rotation "forward": +6V = n_{max} "forward"

Direction of rotation "reverse": -10V = 60% of n_{max} "reverse"

Curve 3: CP.16 = **+70%**

0V = 70 % of n_{max} "reverse"

Direction of rotation "forward": +10V = 30% of n_{max} "forward"

Direction of rotation "reverse": -3V = n_{max} "reverse"
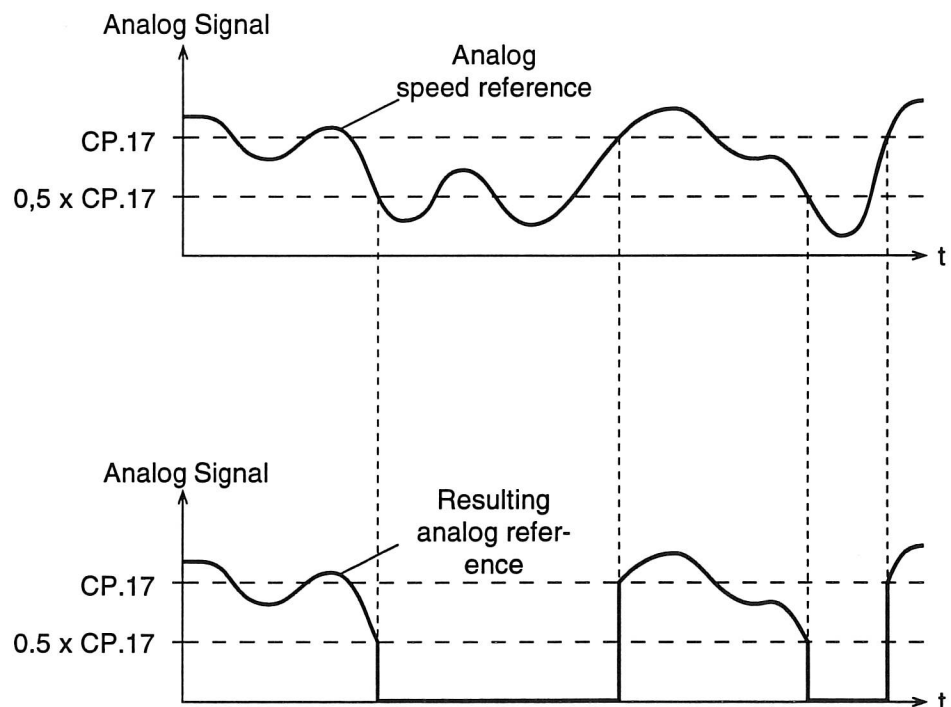
```
CP.17
```

Zero volt noise filter REF 1

CP.17 adjusts a dead band arround 0V for the analog speed input REF1. Noise voltage lower than the threshold level set by CP.17 is ignored. This prevents the motor from creeping when it should be standing still.

Adjustment Range: *0...10 %*
Resolution: *0.1 %*
Factory setting: *0 %*

This function has a switching hysteresis of 50%. If the analog signal is larger than the adjusted hysteresis value (CP.17), then the analog value is active. If the analog signal goes below 50% of the adjusted hysteresis value (0.5 x CP.17), then the analog signal is ignored. See graph below.

Analog Signal

Analog speed reference

CP.17

0,5 x CP.17

t

Analog Signal

Resulting analog reference

CP.17

0.5 x CP.17

t

> **for CP.17 the following is valid:**
> $0...10 \% \mathrel{\hat{=}} 0...\pm 1 \text{ V}$

$CP.18$

Function Output A1

Defines which variable analog output 1 (terminal 18) is proportional to.

Adjustment Range: 0...6
Resolution: 1
Factory setting: 2
Note: **ENTER-Parameter**

Value	Output Variable	Value Range when CP.19 = 1		
0	Actual speed	$-2 \cdot n_{fn} \ldots +2 \cdot n_{fn}$	$\triangleq$	$-10V \ldots +10V$
1	Motor phase current	$0 \ldots 2 \cdot I_{ph}$	$\triangleq$	$0 \ldots +10V$
2	Actual torque	$-2 \cdot M_N \ldots +2 \cdot M_N$	$\triangleq$	$-10V \ldots +10V$
3	DC-bus voltage	$0 \ldots 1000 V$	$\triangleq$	$0 \ldots +10V$
4	Speed reference (CP.6)	$-2 \cdot n_{fn} \ldots +2 \cdot n_{fn}$	$\triangleq$	$-10V \ldots +10V$
5	Control difference (speed controller)	$-2 \cdot n_{fn} \ldots +2 \cdot n_{fn}$	$\triangleq$	$-10V \ldots +10V$
6	Set torque	$-2 \cdot M_N \ldots +2 \cdot M_N$	$\triangleq$	$-10V \ldots +10V$

n_{fn}: Rated-Rotating Field Speed i.e. 1800 rpm for a 4 pole motor running at 60Hz
1500 rpm for a 4 pole motor running at 50Hz

M_N: Rated Torque

I_{PH}: Rated-Motor Phase Current

i **During open-loop operation (CP.32 = 0) the analog output A1 has no function with the values 2,5, and 6.**

CP.19

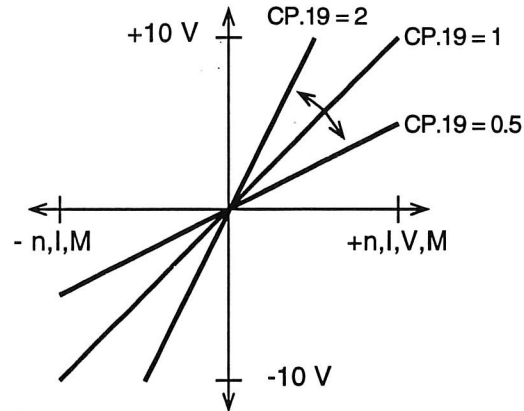**Gain Analog Output A1**

The parameter CP.19 can be used to adjust the gain of the analog output signal on output A1 (terminal 18).

Adjustment Range: -20...+20
Resolution: 0.01
Factory setting: 1

Calculation example:

When the motor torque reaches 1.5 x M_{rated}, +10 V should be measured on analog output A1.

$$CP.19 = \frac{\text{value when gain is 1 (see CP.18)}}{\text{desired value at +10V}} = \frac{2 \times M_{rated}}{1.5 \times M_{rated}} = 1.33$$
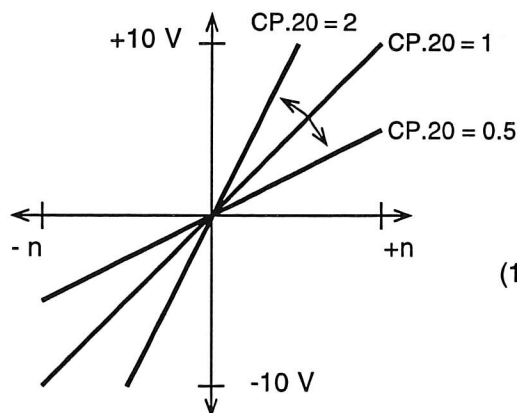
CP.20

Gain Analog Output A2

Determines the gain of the analog output signal A2 (terminal 19). The analog output A2 is proportional to the actual speed of the motor.

Adjustment Range: -20...+20
Resolution: 0.01
Factory setting: 1

**for gain 1
the following is valid:**
$$\pm(2 \cdot n_{fn}) \stackrel{\wedge}{=} \pm 10 \text{ V}$$

n_{fn}: Rated-Rotating Field Speed
(1800 rpm for 4 pole motor at 60Hz)

**See CP.19 for
calculation example**

28

```
CP.21
```

Digital Output D1 Switching Condition

Parameter CP.21 determines the switching condition of the digital output D1 (terminal 8). *! see table below !*

Adjustment Range:	*0...28*
Resolution:	*1*
Factory setting:	*20*

```
CP.22
```

Digital Output D2 Switching Condition

Parameter CP.22 determines the switching condition of the digital output D2 (terminal 9). *! see table below !*

Adjustment Range:	*0...28*
Resolution:	*1*
Factory setting:	*18*

Value	D1 and D2 Switching conditions	
0	always off	
1	always on	
2	ready for operation; no faults (operating state: ready)	
3	ready for operation; control release signal on (terminal1) given; modulation enabled (operating state: run)	
4	abnormal operating state or inverter fault (status A.xx or E.xx)	
5	inverter fault only (status E.xx)	
6	- reserved -	
7	after the motor temperature senser is triggered	
8	after the motor temperature senser is triggered	
9	current controller restricted	
10	speed controller restricted	
11	any controller restricted	
12	motor accelerating	
13	motor decelerating	
14	motor runs with constant speed	
15	motor runs with contstant speed > speed 0	
16	forward – not with noP, LS, Abnormal Stopping or error	
17	reverse – not with noP, LS, Abnormal Stopping or error	
	Conditions for D1 only	**Conditions for D2 only**
18	- reserved -	actual speed > speed level CP.24
19	- reserved -	- reserved -
20	torque > torque level [1] CP.23	- reserved -
21	- reserved -	
22	- reserved -	
23	- reserved -	
24	overload prewarning: overload counter > 80 %	
25	overload prewarning: overload counter > 40 %	
26	prewarning: "heat sink temperature"	
27	- reserved -	speed reference displ. > speed level
28	- reserved -	system deviation > speed level [1]

[1] **Only during closed-loop operation (CP.32 = 1) !**

Hysteresis
of the torque level : 5% of M_N motor adjusted in the factory (see page 35)
of the speed level : 10 rpm

$CP.23$
Torque Level for Output D1

Defines the torque trigger level for the digital output D1.

Adjustment Range: 0...1000 Nm
Resolution: 0.1 Nm
Factory setting: 0 Nm

max. Tolerance approx. ±20 % in the base speed range
(in the field weakening range larger tolerances are possible)

During open-loop operation (CP.32 = 0) the value for the motor torque is set at 0.

$CP.24$
Speed Level for Output D2

Defines the speed trigger level for the digital output D2.

Adjustment Range: 0...9999.5 rpm
Resolution: 0.5 rpm
Factory setting: 0 rpm

$CP.25$
Rated Motor Power

The rated motor power of the connected motor must be adjusted in CP.25. To convert horse power to kW multiply hp x 0.75

Adjustment Range: 0.01...75 kW
Resolution: 0.01 kW
Factory setting: dependent on size

$CP.26$
Rated Motor Speed

The rated motor speed of the connected motor must be adjusted in CP.26.

Adjustment Range: 100...6000 rpm
Resolution: 1 rpm
Factory setting: dependent on size

$CP.27$
Rated Motor Current

The rated current of the connected motor must be adjusted in CP.27.

Adjustment Range: depend. on size
Resolution: 0.1 A
Factory setting: dependent on size

$CP.28$
Rated Motor Frequency

The rated frequency of the connected motor must be adjusted in CP.28.
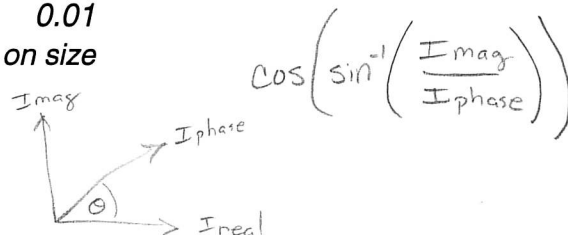
Adjustment Range: 20...300 Hz
Resolution: 1 Hz
Factory setting: dependent on size

```
CP.29
```

Rated Motor Power Factor

The rated power factor of the connected motor must be adjusted in CP.29.

Adjustment Range: 0.05...1
Resolution: 0.01
Factory setting: dependent on size

$$\cos\left(\sin^{-1}\left(\frac{I_{mag}}{I_{phase}}\right)\right)$$

```
CP.30
```

Rated Motor Voltage

The rated voltage of the connected motor must be adjusted in CP.30.

Adjustment Range: 100...500   V
Resolution: 1   V
Factory setting: 400   V

```
CP.31
```

Load motor dependent parameter

The internal settings of the inverter are based on the size of the inverter and the size of the connected motor. The inverter comes from the factory with the motor parameters adjusted for 1:1 dimension between a Carotron motor and inverter. These standard values are listed on page 35.
Since any motor can be used with the Carotron Vista IV, the user must make the necessary changes to the data in the motor parameters CP.25...30 when a motor other than a Carotron motor is used or when the dimensioning is not 1:1. After making the changes CP.31 must be activated once (i.e set CP.31 equal to 1 and then to 0). This re-adjusts the current controller, torque curve and torque limit providing optimum performance from the inverter and motor.

Adjustment Range: 0...1
Resolution: 1
Factory setting: 0

⚠ **The motor parameters will only be loaded when the inverter is in the noP state, no signal at terminal 1.**

CP.32

Flux Vector Control on/off

In CP.32 you can select whether the inverter operates open-loop, (standard inverter) or closed loop (flux vector control).

Adjustment Range: 0...1
Resolution: 1
Factory setting: 0

0 = open-loop   (V/f-curve)
1 = closed-loop   (field-oriented control)

During open-loop operation the torque limits, levels and displays do not have a function. All parameters, that access these values, either do not have a function or have a restricted function. This is described in the individual parameters.

> **Caution !   Only turn on flux vector controller when control release is open(no signal at terminal 1) ! Eradic behavior of the motor may occur if not observed.**

CP.33

Boost

Volt boost is an increase in motor voltage at the lower speed. This results in higher motor torque at these speeds. **During closed-loop operation this parameter does not have a function!**

Adjustment Range: 0...25 %
Resolution: 0.1 %
Factory setting: 2 %
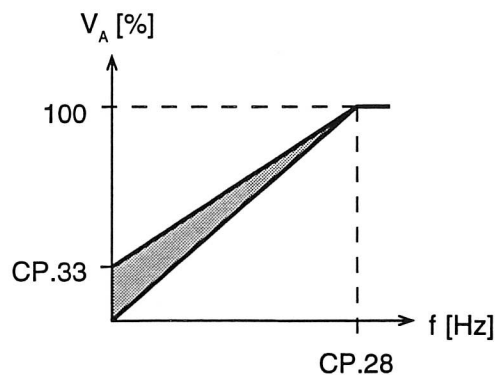
> **When the motor is running continuously   at a slow speed and the boost is too high, the motor may overheat!**

⌐ P. 34

Change Encoder 1 Rotation

This parameter can be used to reverse the measured direction of rotation.

Adjustment Range:	*0...1*
Resolution:	*1*
Factory setting:	*0*

0 = chanels A and B **not** exchanged
1 = chanels A and B exchanged

⌐ P. 35

Reaction to Limit Switch

This parameter determines the reaction of the drive, to a signal on terminal 3 (**F**) and/or 4 (**R**). These terminals can be programmed as software limit switches. The reaction of the drive is shown in the table below.

Adjustment Range:	*0...6*
Resolution:	*1*
Factory setting:	*6*

Value	Error / Status massage	Response of the drive
0	**E.PrF** **E.Prr**	modulation immediately switched off *!* To restart remove error and **activate** ***Reset !***
1	**A.PrF** **A.Prr**	quick stop / modulation switched off after speed 0 is reached *!* To restart remove error and **activate** ***Reset !***
2	**A.PrF** **A.Prr**	quick stop / holding tourqe at speed 0 *!* To restart remove error and **activate** ***Reset !***
3	**A.PrF** **A.Prr**	modulation immediately switched off *!* **Automatic *restart***, when error is no longer present *!*
4	**A.PrF** **A.Prr**	quick stop / modulation switched off after speed 0 is reached *!* **Automatic *restart***, when error is no longer present *!*
5	**A.PrF** **A.Prr**	quick stop / holding tourqe at speed 0 *!* **Automatic *restart***, when error is no longer present *!*
6	**none**	no effect on the drive *!* **Fault is ignored** *!*

i   *Quick stop*   =   deceleration at the torque limit (CP.9)

```
CP.36
```

**Aux Analog Input
Function**

In CP.36 you can adjust which parameter the auxilary analog input REF2 (16/17) should influence. **During open-loop operation values 2; 3; 4 and 5 do not have a function !**

Adjustment range: 0...5
Resolution: 1
Factory setting: 0

n [rpm]

Factor 1 or CP.10
(see table)

0   +10   V [V] (REF 2)
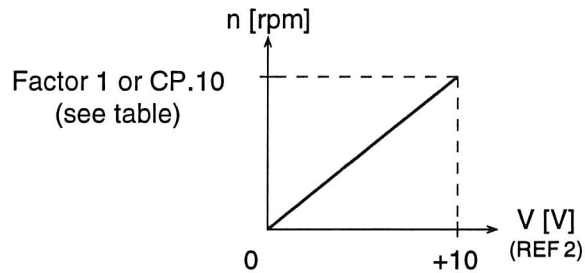
Value	Function Analog Input REF2
0	no function
1	adds to the speed reference (has no influence on the Jog speeds) 10 V = CP.10
2	works as a multiplier for parameter CP.12 (P-factor of the speed controller) 10 V = multiplier factor of 1
3	works as a multiplier for parameter CP.13 (I-factor of the speed controller) 10 V = multiplier factor of 1
4	works as a multiplier for parameter CP.12 + CP.13 (total gain of the speed cotnroller) 10 V = multiplier factor of 1
5	works as a multiplier for parameter CP.9 (torque limit) 10 V = multiplier factor of 1

CAROTRON

The table below lists the factory settings for the inverter size-dependent parameter values. These values are valid only when using Carotron motors.

Unit size	CP.25 [kW / hp] Rated motor power	CP.26 [rpm] Rated motor speed	CP.27 [A] Rated motor current	CP.28 [Hz] Rated motor frequency	CP.29 cos Phi Rated motor cos (Phi)	CP.30 [V] Rated motor voltage	[Nm] Rated motor torque	CP.9 [Nm] Maximum torque
07	0.55/.75	1400	2.8	50	0.72	230	3.7	10.5
13	4/ 5	1435	15.3	50	0.78	230	26.6	68.5
14	5.5 / 7.5	1440	18.5	50	0.89	230	36.4	100.2
15	7.5 / 10	1440	26.0	50	0.84	230	49.2	148.9
10	1.5 / 2	1400	3.4	50	0.83	400	10.2	32.5
12	3.0 / 4	1435	6.7	50	0.79	400	19.9	53.9
13 - E	4 / 5	1435	8.8	50	0.78	400	26.6	69.9
13 - G	4 / 5	1435	8.8	50	0.78	400	26.6	59.0
14 - E	5.5 / 7.5	1440	10.5	50	0.89	400	36.4	103.5
14 - G	5.5 / 7.5	1440	10.5	50	0.89	400	36.4	88.0
15	7.5 / 10	1440	15.0	50	0.84	400	49.7	125.8
16	11 / 15	1440	21.5	50	0.85	400	72.9	175.2
17	15 / 20	1455	28.5	50	0.86	400	98.5	224.6
18	18.5 / 25	1455	35.0	50	0.86	400	121.4	268.4
19	22 / 30	1470	42.0	50	0.84	400	142.9	321.5
20	30 / 40	1465	55.5	50	0.85	400	195.5	411.4
21	37 / 50	1470	67.0	50	0.86	400	240.3	498.3
22	45 / 60	1470	81	50	0.86	400	292.3	646.3
23	55 / 70	1475	98.5	50	0.86	400	356.0	840.9

1) Motor is paired one size smaller with inverter to allow operation up to the motor's breakdown torque limit.
2) To convert Nm to lb ft, multiply by 0.738

5. Drive-Mode

The Drive-Mode is a special operating mode in the Vista IV inverter. It allows the speed and direction of the motor to be controlled directly from the keypad on the inverter. To activate the Drive-Mode enter the respective password in **CP.0**.
The passwords are found on page 43 !

5.1 Adjustment Possibilities

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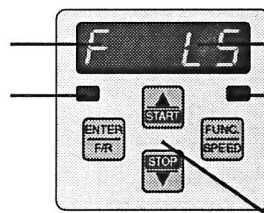– Direction of rotation

5.2 Condition

Control release must be activated (terminal 1)

⚠ The functions rotation release (terminal 3 / 4) and analog torque control (terminal 16 / 17) do not have any function in the Drive-Mode.

5.3 Display and Keyboard

Rotation Indicator

Interface control LED "flickers" when the inverter sends data through the serial port.
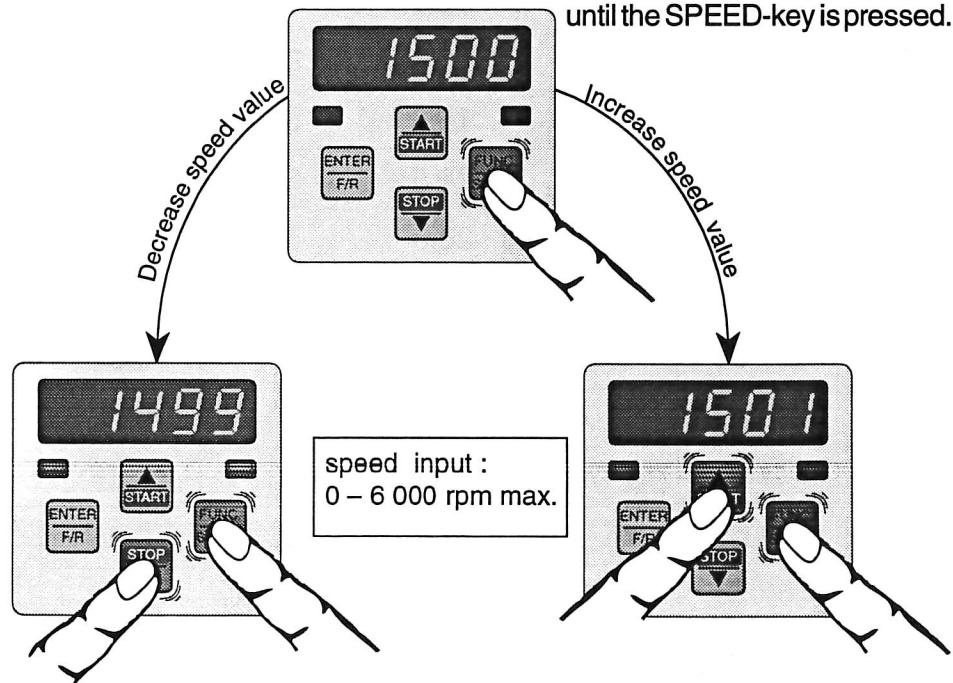
Displays Operating Mode / Actual speed / set speed

Operation / Error display
No error: "LED on"
Error: "LED blinks"

Operator Panel

5.4 Speed Display / Speed adjustment

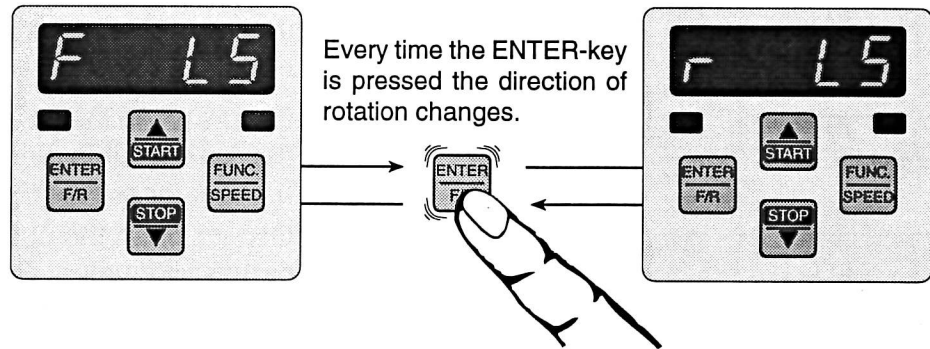The speed setting is displayed until the SPEED-key is pressed.

Decrease speed value

Increase speed value

speed input :
0 – 6 000 rpm max.

Hold the SPEED-key pressed down and decrease the run speed with the STOP-key.
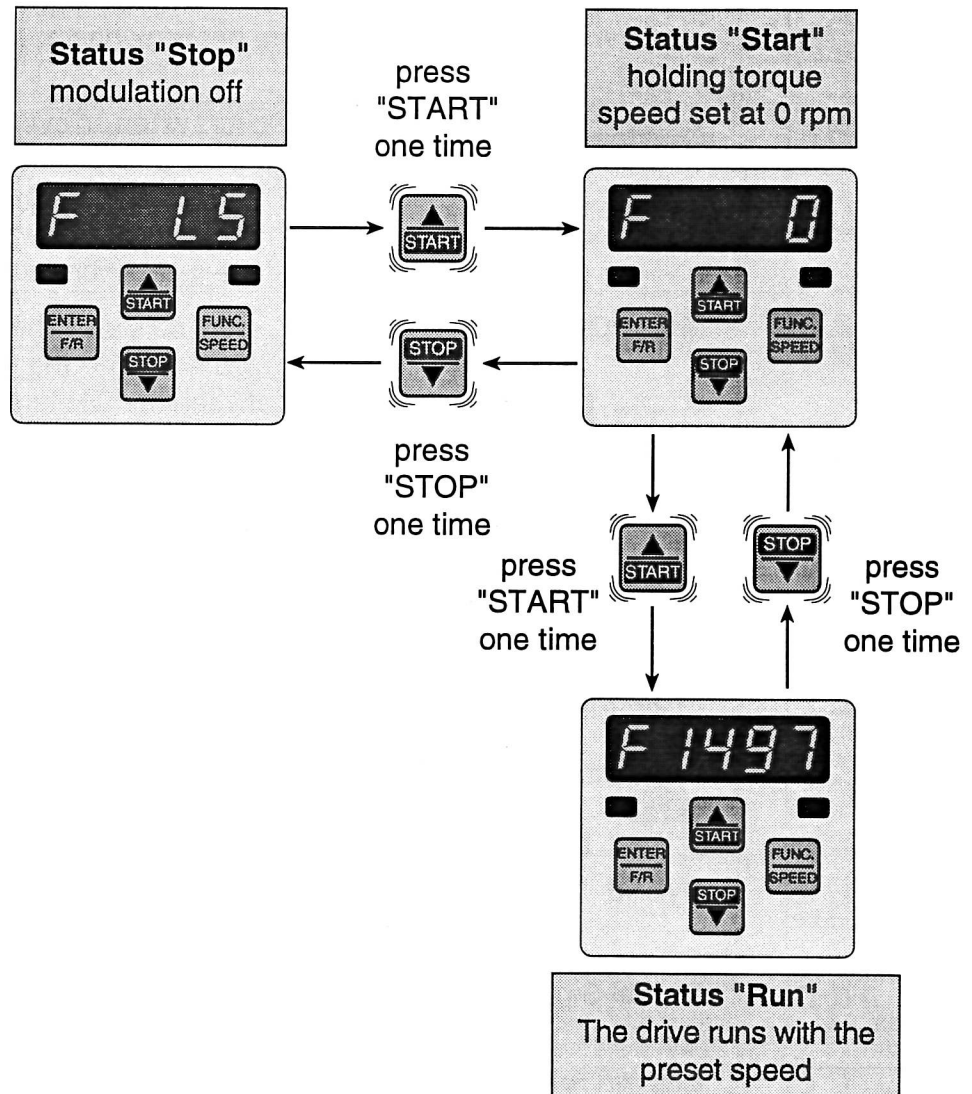
Hold the SPEED-key pressed down and increase the irun speed with the START-key.

5.5   Rotation Setting   Adjustment possibilities: **F** =   forward
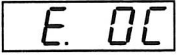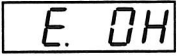   **r** =   reverse

Every time the ENTER-key is pressed the direction of rotation changes.

5.6   Start / Stop / RUN

Status "Stop"
modulation off

press "START" one time

Status "Start"
holding torque
speed set at 0 rpm

press "STOP" one time

press "START" one time

press "STOP" one time

Status "Run"
The drive runs with the preset speed
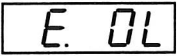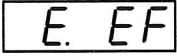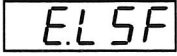
i   To change from the Drive-Mode to the CP-Mode, press the "FUNC."
and "ENTER"- keys simultaneously and hold for at least 3 sec!
! Only possible in status "Stop" !

6. Fault Diagnosis

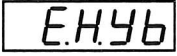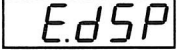| Display	Fault	Description
E. UP	Under voltage	Occurs when the DC-bus voltage drops below the permissible value. *See power stage manual for acceptable operating voltages.*
E. OP	Over voltage	Occurs when the DC-bus voltage rises above the permissible value. See *power stage manual for acceptable operating voltages.*
E. OC	Over current	Occurs when the output current exceeds the permissible value. *See power stage manual for peak current levels*
E. OH EnOH	Over heat no Overheat	Occurs when the heat sink temperature is > 90°C. The message E.nOH appears, when the heatsink has cooled to a safe level
E. OL EnOL	Overload no Overload	Occurs when an overload is present for longer than the permissible time. The message E.nOL appears after the cooling phase. *See overload curves in the power stage instruction manual*
E.dOH	Motor Overheat	Occurs 60 s after the motor thermal sensor is triggered. The trigger resistance is 1500W between the OH terminals.
E. EF	External Fault	Occurs when parameter CP.15 = 0 the digital input I3 is activated.
E.PuC	Power Unit Code	——
E.PrF E.Prr	Prohibited rotation forward Prohibited rotation reverse	Occurs when the rotation release on terminal 3 and/or 4 is not present and parameter CP.35 = 0.
E.HYb	Hybrid	Speed measurement card missing or defective.
E.dSP	Digital Signal Processor	Processor - fault
E.LSF	Charge relay fault	Occurs when charge relay fails to close after proper voltage has been applied. Not all size units support this function.

Possible Cause	Fault Remedy
-Input voltage too low or unstable -Voltage losses due to incorrect wiring	-Check voltage supply -Check wiring
-Input voltage too high or interference present -Deceleration rate too high	-Check voltage supply, look for voltage spikes -Connect braking resistor
-Short-circuit or ground fault at the output	-Test motor lines for short-circuit or earth-fault
-Insufficient cooling -Ambient temperature too high -Fan clogged	-Increase airflow -Install air conditioner
-Inverter overloaded - Motor windings bad - Motor data incorrect	-Monitor current using CP.3, It must be less or equal to inverter rated current -Reduce torque limit (Parameter CP.9) - Check motor winding and verify motor data
- PTC - triggering - PTC- line defective (PTC = positive temperature coefficient) Motor thermal sensor	-Let motor cool down -Check PTC - wiring
- external entry fault ! Only when Parameter CP.15 = 0 !	-Remove external fault and give reset on terminal 2
———	-Fault correction can only be done at factory!
- Signal on terminal 3 and/or 4 missing ! Only when Parameter CP.35 = 0 !	-Check wiring at the inputs
———	-Fault correction can only be done at factory!
———	-Fault correction can only be done at factory!
- Input voltage too low - charge relay circuit defective	-Check voltage supply -Fault correction can only be done at factory!

7. Start-up

To initially start up the Carotron Vista IV do the following:

1. Switch off control release signal (terminal 1) =   Inverter in status „noP"
2. Turn flux vector controller off   =   Parameter CS.32 = 0
3. Enter motor data   =   Parameter CP.25...CP.30 see page 35 and
                                                           motor nameplate
4. Load motor parameters   =   Parameter CP.31 =1 then 0
5. Enter necessary boost   =   Parameter CP.33 (2% at start, increase if
                                                           motor does not spin. Max 10%)
6. Enter encoder resolution   =   Parameter CP.14 (typ values 2500 or 1024)
7. Verify maximum frequency of encoder   =   See page 13
8. Start-up in open loop operation   =   See diagram below

```
                    ┌──────────────────────────┐
                    │          Start           │
                    └──────────────────────────┘
                                 │
              ┌──────────────────────────────┐      ┌──────────────────────────┐
              │ Give positive speed reference │◄─────│  Remove cause of error   │◄──┐
              │  REF1 (terminals 14/15)       │      └──────────────────────────┘   │
              └──────────────────────────────┘                                      │
                                 │                                                  │
              ┌──────────────────────────────┐                                      │
              │  Activate control release     │                                      │
              │     (terminal .1)             │                                      │
              └──────────────────────────────┘                                      │
                                 │◄─────────────────────────┐                        │
                          ╱──────────────╲                  │                        │
                         ╱  Is the         ╲   NO   ┌─────────────────────────┐       │
                        ╱ direction of motor ╲─────►│ Exchange motor phases   │       │
                        ╲ rotation correct   ╱      └─────────────────────────┘       │
                         ╲ (forward) ?      ╱                                         │
                          ╲──────────────╱                                           │
                             │ YES                                                    │
                             │◄────────────────────────────┐                          │
                          ╱──────────────╲                 │                          │
                         ╱  Is the         ╲   NO   ┌──────────────────────────┐      │
                        ╱ sign of the actual╲──────►│ Exchange encoder channels│      │
                        ╲ speed (CP.1)      ╱       │   (Parameter  CP.34)     │      │
                         ╲ positive ?      ╱        └──────────────────────────┘      │
                          ╲──────────────╱                                           │
                             │ YES                                                    │
                          ╱──────────────╲                                           │
                         ╱   Actual        ╲  NO    ┌──────────────────────────────┐  │
                        ╱ speed (CP.1) = set ╲──────►│ Possible causes: encoder     │──┘
                        ╲ speed (CP.6)       ╱      │ defective, interface          │
                         ╲ minus slip ?     ╱       │ defective, EMC-problems, max. │
                          ╲──────────────╱          │ frequency of the encoder is   │
                             │ YES                  │ too low                       │
                    ┌──────────────────────────┐    └──────────────────────────────┘
                    │ Initial start-up successful! │
                    └──────────────────────────┘
```

After the initial start-up the adjustments for closed-loop operation must be made as follows:

1. Switch off control release (terminal 1)   »   Inverter in status *"noP"*
2. Select closed-loop operation   »   Parameter CP.32 =1
3. Adjust speed controller   »   See adjustment tips below


The P and I gains are preset according to the motor size, inverter size, and typical load charac-teristics. In most cases it is <u>not</u> necessary to readjust the regulators. However, when using a motor other than a Carotron motor or when the dimensioning is not 1:1 the performance of the regulators should be checked.

1. To verify and adjust the gains the motor should not be connected to the load.
2. Set the run speed close to the motor's rated speed.
3. Reduce the acceleration time to the minimum.
4. Put the invert in LS mode, (remove signal to the F and R terminals (3,4).
5. Activate control release, terminal 1.

The speed response curve can be monitored using the COMBISCOPE program supplied with COMBIVIS. Start the program and set it up according to the instructions provided. The param-eters to monitor are ru.1 actual speed and ru.4 set speed. When the set -up of COMBISCOPE is complete, proceed to step 6.


6. Start the monitoring process in the COMBISCOPE program (press F5)
7. Set forward direction terminal 3). The motor will quickly accelerate on the torque limit. The set speed and actual speed curves should be traced out on the screen.
8. Turn off the forward signal. The motor will decelerate to a stop.
9. Press F6 twice to stop the data logging.
10. Compare the response of the actual speed to the set speed. Then compare your curves with the curves on the following page. Find the one which resembles your curve and follow the adjustment tips list beneath the graph.   Steps 6 through 10 may need to be repeated several times to optimize the settings. For additional information or help making these adjustments con-tact Carotron.
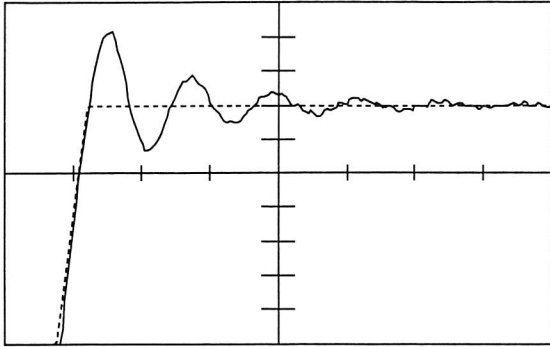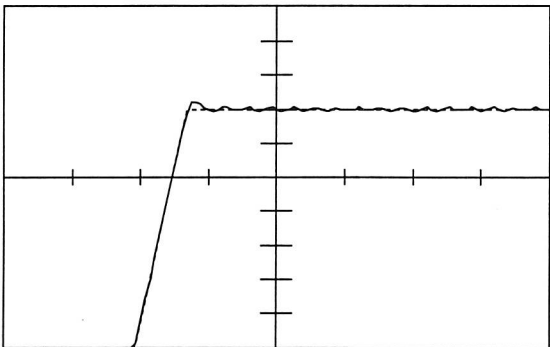
Problem: Very long transient process

Solution: Increase P-gain(CP.12); afterward reduce I-gain (CP.13)
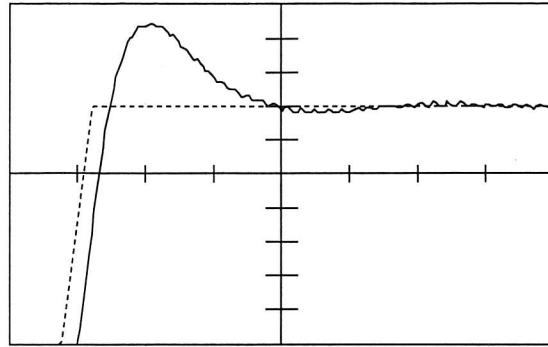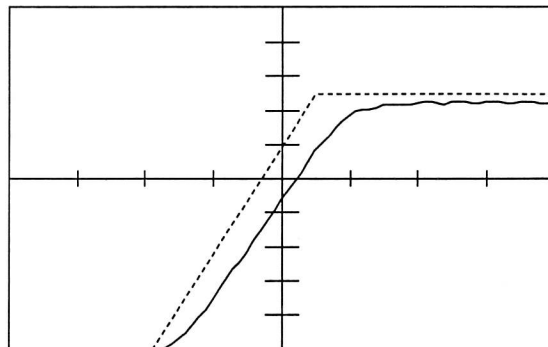
Problem: Speed overshoot too high

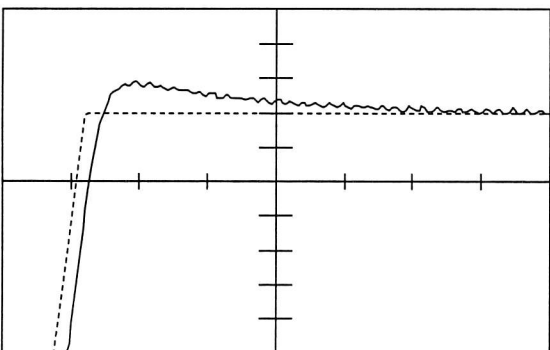**Solution:** Increase P-gain (CP.12); afterward reduce I-fraction (CP.13)

Problem: Sustained oscillation during constant run
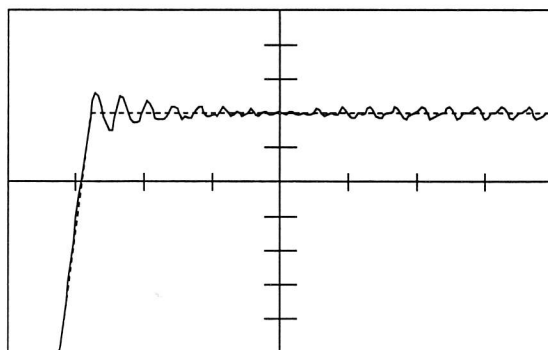**Solution:** Decrease P-gain (CP.12)

Problem: Response too slow actual speed never reaches set speed.
Solution: Increase I-gain (CP.13)

Problem: Overshoot too long

Solution: Increase I-gain (CP.13)

Problem: Sustained oscillation with high amplitude
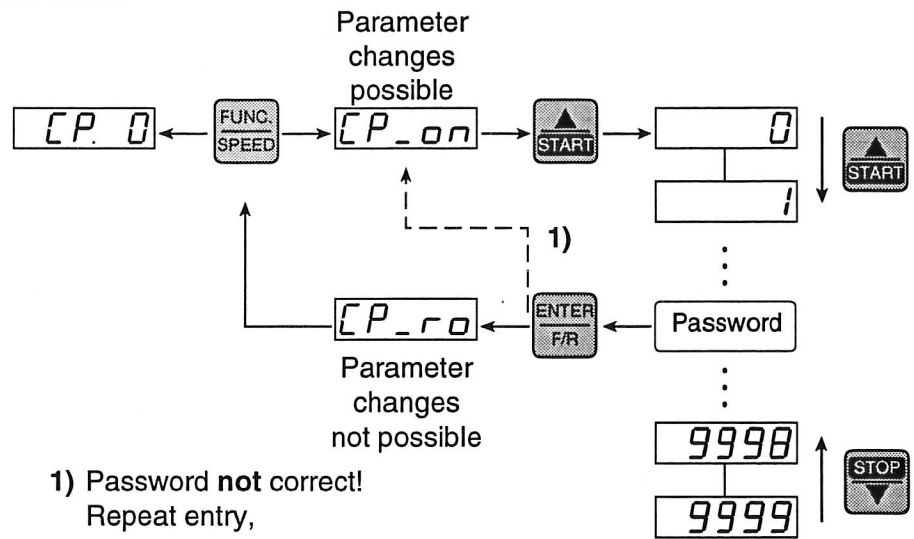
Solution: Reduce I-gain (CP.13)

Parameter number	Name	Adjustment range		Resolution		Customer setting	
CP.0	Password input	0…9999		1			–
CP.1	Actual speed display	–		0.5	rpm		–
CP.2	Status display	–		–			–
CP.3	Motor phase current	–		0.1	A		–
CP.4	Peak motor phase current	–		0.1	A		–
CP.5	Actual torque display	–		0.1	Nm		–
CP.6	Speed reference display	–		0.5	rpm		–
CP.7	Acceleration time	0…320	s	0.01	s	_____	s
CP.8	Deceleration time	0…320	s	0.01	s	_____	s
CP.9	Torque limit	0…5 x M_N	Nm	0.1	Nm	_____	Nm
CP.10	Maximum run speed	0…6000	rpm	0.5	rpm	_____	rpm
CP.11	Jog speed	0…6000	rpm	0.5	rpm	_____	rpm
CP.12	P-factor speed controller	0…65535		1		_____	
CP.13	I-factor speed controller	0…65535		1		_____	
CP.14	Encoder 1 resolution	256…10000		1		_____	
CP.15	Behavior at external fault	0…6		1		_____	
CP.16	Offset REF 1	-100…+100	%	0.1	%	_____	%
CP.17	Zero volt analog noise filter REF 1	0…10	%	0.1	%	_____	%
CP.18	Function analog output A1	0…6		1		_____	
CP.19	Gain analog output A1	-20…+20		0.01		_____	
CP.20	Gain analog output A2	-20…+20		0.01		_____	
CP.21	Output condition digital OUT D1	0…20		1		_____	
CP.22	Output condition digital OUT D2	0…20		1		_____	
CP.23	Torque level OUT D1	0…50	Nm	0.1	Nm	_____	Nm
CP.24	Speed level OUT D2	0…9999.5	rpm	0.5	rpm	_____	rpm
CP.25	Rated motor power	0.01…75	kW	0.01	kW	_____	kW
CP.26	Rated motor speed	100…6000	rpm	1	rpm	_____	rpm
CP.27	Rated motor current	0.1…50	A	0.1	A	_____	A
CP.28	Rated motor frequency	20…300	Hz	1	Hz	_____	Hz
CP.29	Rated motor cos (Phi)	0.05…1		0.01		_____	
CP.30	Rated motor voltage	100…400	V	1	V	_____	V
CP.31	Load motor parameters	0…1		1		_____	
CP.32	Flux vector control on/off	0…1		1		_____	
CP.33	Boost	0…25	%	0.1	%	_____	%
CP.34	Change encoder 1 channels	0…1		1		_____	
CP.35	Reaction to limit switch	0…6		1		_____	
CP.36	AUX analog input function	0…5		1		_____	

9. Entering the Password

Parameter
changes
possible

$\boxed{CP.\ 0}\ \longleftarrow\ \boxed{\substack{\text{FUNC.}\\\text{SPEED}}}\ \longrightarrow\ \boxed{CP\_on}\ \longrightarrow\ \boxed{\substack{\blacktriangle\\\text{START}}}\ \longrightarrow\ \boxed{0}$

1)

$\boxed{CP\_ro}\ \longleftarrow\ \boxed{\substack{\text{ENTER}\\\text{F/R}}}\ \longleftarrow\ \boxed{\text{Password}}$

Parameter
changes
not possible

1) Password **not** correct!
Repeat entry,

$\boxed{0}$

$\boxed{1}$

$\boxed{9998}$

$\boxed{9999}$

100 Read Only	200 Read / Write	500 Drive-Mode

CAROTRON