# J300 Series Inverter Manual


HYUNDAI
HEAVY INDUSTRIES CO., LTD.

# Operating & Service instruction

## Hydrive J300

### 5.5(7.5) to 15(22) kW, 3 AC 380 to 460 V



This documentation covers themes on operating, parameter setting and service. Themes on projecting, mounting and connecting can be read in the projecting, mounting & connecting instructions starting on page 27.

Regulations for the observance of the CE-directive and the new Power-Drive-Standard (EN 61800-3) are described in the instruction manual „Additional installation regulations Hydrive J300

In case of damage or incomplete delivery, please inform the supplier or the insurance company. The manufacturer declines responsibility for faults occurring during transport or unpacking.

# Operation via the built in operator panel

## Example for the input of data

LED Display:
Shows frequency, motor current, DC-link voltage, motor rotation direction and type

FUNC-key:
Selects a basic parameter or saves a changed parameter value.

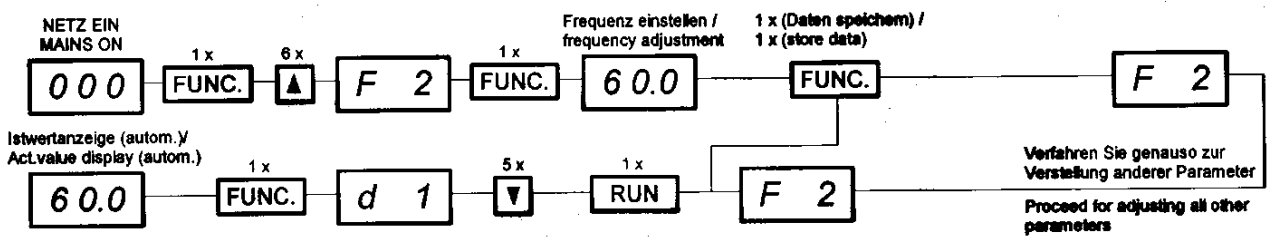

POWER-LED:
Shows if the electronic is working; Attention: Use the charging LED (right-sided to the connection terminals) to check the charging condition of the DC-link.

UP/DOWN-key:
Changing of parameter values or. increasing/decreasing of the output frequency.

RUN-key:
Starts the inverter (only in the keypad mode); not functional if the RUN-terminal is activated.

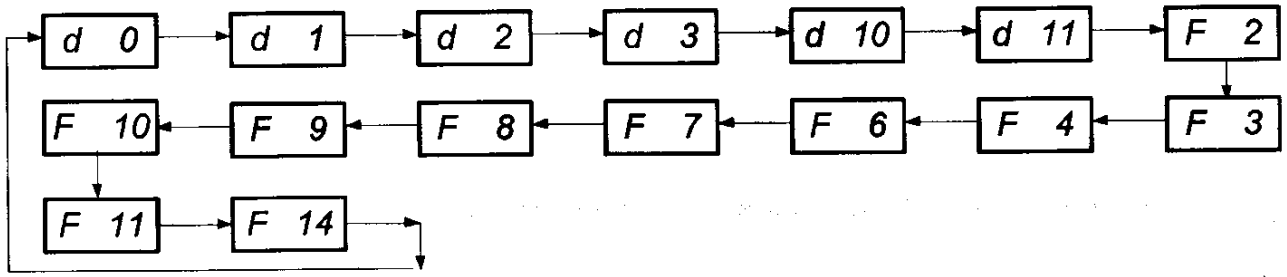
STOP/RESET-key:
Stops the inverter or resets an existing trip. Operates in the manual and in the terminal mode but does not operate if parameters in the 2nd level of operation are selected.

## Programming example for adjusting the frequency and starting of the inverter




There are 3 levels of operating the inverter:
1. The level of display of values is used to display operating parameters like e.g. actual-frequency and motor current
2. In the 1st level of operation the frequency inverter can be programmed by usage of a few selected parameters.
3. The 2nd level of operation offers a lot of additional parameters which altogether can be modified only during standstill.

## Overview of the actual value display and the 1st level of operation




## Selecting and changing parameters in the 1st level of operation

Assuming that parameter d0 is selected (after mains-on often 0.00):

1) Switch to the parameter mode by pressing the FUNC-key.
2) Go through the parameter list by using the UP/DOWN-keys.
3) Select the parameter by pressing the FUNC-key.
4) Change it's value by using the UP/DOWN-keys.
5) Confirm the change by pressing the FUNC-key.

## Selecting and changing parameters in the 2nd level of operation

Assuming that parameter d0 is selected (after mains-on often 0.00):

1) Switch to the parameter mode by pressing the FUNC-key.
2) Select parameter F14 using the UP/DOWN-keys.
3) Select the 2nd level of operation by pressing the FUNC-key.
4) Go through the parameter list by using the UP/DOWN-keys.
5) Select the parameter by pressing the FUNC-key.
6) Change it´s value by using the UP/DOWN-keys..
6) Confirm the change by pressing the FUNC-key.
7) Go back to the 1st level of operation (F14) by pressing the FUNC-key once more.

**Remark:**
After switching on the mains the parameter which was activated before switching off is displayed again..

# Parameter

## Overview of the actual value display and the 1st level of operation

| Parameter name | No. | Range | FD (Factory default) | see page |
|---|---|---|---|---|
| Display of the output frequency | d0 | read only | read only | 8 |
| Display of the motor speed x 100 | d1 | read only | read only | 8 |
| Display of the motor current | d2 | read only | read only | 8 |
| Display of the converted frequency | d3 | read only | read only | 8 |
| Display of the last trip message | d10 | read only | read only | 8 |
| Display of the trip memory | d11 | read only | read only | 8 |
| Frequency reference & preset speeds | F2 | 00.0- A63 Hz | 0.00 | 9 |
| Running direction selection | F4 | F or r | F | 9 |
| Acceleration time | F6 | 0.01-999 s | 30 | 10 |
| Deceleration time | F7 | 0.01-999 s | 30 | 10 |
| Voltage boost | F8 | 00-99 | 11 | 10 |
| Operating mode (reference, start/stop) | F9 | 00-15 | 03 | 10 |
| Analogue meter adjustment | F10 | 00-250 | 172 | 10 |
| Nominal motor voltage | F11 | 380,400,415,440,460 V | 400 | 11 |
| 2nd level of operation | F14 | all parameters of the 2nd level of operation | *) | 11 |

*) Only in the factory default setting (FD) and only if selected the first time, F14 will show A0.
In all other cases the last adjusted parameter is displayed under F14.

## Overview of the 2nd level of operation

| Parameter name | No. | Range | FD | see page |
|---|---|---|---|---|
| Operating methode | A0 | 0-5 | 0 | 12 |
| Motor capacity setting | A1 | 4.0- 160 kW | Nominal power | 13 |
| Pole number | A2 | 2, 4, 6, 8 poled | 4 | 13 |
| Speed response | A3 | 0.00-100 | 2.00 | 13 |
| Starting frequency | A4 | 0.10-9.99 Hz | 0.50 | 13 |
| f-MAX limitation | A5 | 00.0- A63 Hz | 0.0 | 14 |
| f-MIN limitation | A6 | 00.0- A63 Hz | 0.0 | 14 |
| Skip frequency 1 | A7 | 00.0- 400 Hz | 0.0 | 15 |
| Skip frequency 2 | A8 | 00.0- 400 Hz | 0.0 | 15 |
| Skip frequency 3 | A9 | 00.0- 400 Hz | 0.0 | 15 |
| Carrier frequency | A10 | 2.0-16.0 kHz | 16 8) | 15 |
| Frequency command sampling | A11 | 1-8 | 8 | 15 |
| Preset speed 1 | A12 | 00.0- A63 Hz | 0.0 | 15 |
| Preset speed 2 | A13 | 00.0- A63 Hz | 0.0 | 15 |
| Preset speed 3 | A14 | 00.0- A63 Hz | 0.0 | 15 |
| Elektronic motor protection | A23 | 20-120% | 100 | 16 |
| Motor protection characteristic | A24 | 0, 1, 2 | 0 | 16 |
| Motor pole number for d1 | A25 | 02, 04, 06, 08, 10, 12...48 | 04 | 16 |
| Ext. f-ref limitation: start value | A26 | 00.0- A63 Hz | 0.0 | 17 |
| Ext. f-ref limitation: end value | A27 | 00.0- A63 Hz | 0.0 | 17 |
| Restart selection | A34 | 0-3 | 0 | 17 |
| Braking unit: usage ratio | A38 | 0.0-100% | 1.5 | 18 |
| Signal „Frequency arrival": On-level | A39 | 00.0- A63 Hz | 0.0 | 18 |
| Signal „Frequency arrival": Off-level | A40 | 00.0- A63 Hz | 0.0 | 18 |
| Analogue output f/I/T | A44 | 0-3 | 0 | 18 |
| Calculation factor n | A47 | 0.0 - 99.9 | 1.0 | 18 |
| Frequency reference selection | A48 | 0, 1 | 1 | 18 |
| „Frequency arrival" characteristic | A49 | 0, 1, 2 | 0 | 19 |
| Speed search function | A54 | 0, 1 | 1 | 19 |
| Start with reduced voltage | A58 | 0-06 | 6 | 19 |
| Mode of operation | A59 | 0, 1, 2 | 0 | 19 |
| JOG-frequency | A61 | 0.00-9.99 Hz | 1.00 | 21 |
| Base frequency | A62 | 30- A63 Hz | 50 | 21 |
| End frequency | A63 | 30-120(400)Hz | 50 | 21 |
| Maximum frequency | A64 | 120, 400 Hz | 120 | 21 |
| Calibration of f-reference. voltage | A80 | 0...255 | pre-adjusted !! | 22 |
| Calibration of f-reference. current | A81 | 0...255 | pre-adjusted !! | 22 |
| Reset input performance | A86 | 0, 1 | 0 | 22 |
| PID-controller: P-gain | A90 | 0.1 - 5.0 | 1.0 | 22 |
| PID-controller: I-gain | A91 | 0.0 - 15.0 s | 1.0 | 22 |
| PID-controller: D-gain | A92 | 0.0 - 100.0 | 0.0 | 22 |
| PID-controller: selection | A94 | 0 - 4 | 0 | 22 |
| PID-controller. reference | A95 | 0, 1 | 0 | 22 |
| PID-controller: internal reference | A96 | 0.0 - 200 % | 0.0 | 22 |
| Auto-Tuning | A97 | 0 - 2 | 0 | 23 |
| Motor data selection | A98 | 0 - 2 | 0 | 24 |
| Input phase supervision | A99 | 0, 1 | 0 = ON | 24 |
| Setting for input 1 | C0 | 0...28 | 18 | 24 |
| Setting for input 2 | C1 | 0...28 | 16 | 24 |
| Setting for input 3 | C2 | 0...28 | 5 | 24 |
| Setting for input 4 | C3 | 0...28 | 11 | 24 |
| Setting for input 5 | C4 | 0...28 | 9 | 24 |
| Setting for input 6 | C5 | 0...28 | 2 | 24 |
| Setting for input 7 | C6 | 0...28 | 1 | 24 |
| Setting for input 8 | C7 | 0...28 | 0 | 24 |
| Setting for output terminal 11 | C10 | 0-2 | 0 | 25 |
| Setting for output terminal 12 | C11 | 0-2 | 1 | 25 |
| Inputs 1-4: Inversion | C20 | 00-09, 0A-FF | 08 | 25 |
| Outputs 11,12 & relay: inversion | C21 | 00-07 | 04 | 25 |

# Commissioning

Before start of commissioning please notice the following items:

1. Check the correct connection of mains- and motorlines.
2. Check if the control lines are connected with the correct terminals.
3. Check it the frequency inverter is correcly grounded according to regulations and mounted vertically to a wall.
4. Remove all stray pieces of wire, solderless terminals or other objects left from wiring work.
5. Check if all screws and terminals are fixed.
6. Check if the motor is specified for the defined frequency range in particular for the maximum speed.
7. For optimum adaptation of the frequency to the motor see parameter A97, Auto-Tuning.

## Factory default setting (Initialisation)

At delivery all frequency inverters of the Hydrive J300 ( are preset to factory default. The devices at any time can be reset to this basic setting.

To do so, proceed the following steps:

1. Switch the power on (display 0 0 0) and press the FUNC-key once (display d 0).
2. Select parameter F14 by repeatedly pressing the arrow keys.
3. Press the FUNC-key once. Parameter A0 is displayed.
4. Select one of the parameters C0 - C7 (corresponding to the terminals 1- 8, e.g. C1 = input 2) via repeatedly pressing the arrow keys and press key FUNC once.
5. Put in parameter 7 under this parameter by usage of the arrow keys (terminal function STN = factory default setting) and store the input via pressing the FUNC-key once.
6. The terminal which is selected by this procedure is now used to activate setting to factory default. Connect this terminal to terminal P24 and switch off power. Wait as long as the LED which monitors the link voltage is switched off.
7. Switch on power again and wait for appr. 6 sec.
8. Disconnect the link between the terminal for factory default setting and terminal P24.
9. Switch off power again and wait until the LED which monitors the link voltage is switched off.

## Commissioning via built-in keypad

Remark:
The inverter needs "Pulse unlocked", to rotate the motor. Terminal 4 is from manufacturing preset with "Pulse unlocked" and therefore has to be connected with P24 via a linking wire. Additionally a wire to link PLC with CM1 is required.

1. Switch on the power; the power-LED on the operator panel is then on (display shows value of d 0).
2. Select parameter F4 by repeatedly pressing the arrow keys. Press the FUNC-key. Now you can select the required direction of rotation by usage of the arrow keys (F = forward, r = reverse). Store the input by pressing the key FUNC.
3. Select parameter F9 via pressing the arrow keys and put in 00 on this parameter position (see parameter F9).
4. Selecet now parameter F2 and adjust the set frequency by usage of the arrow keys.
5. Start the inverter via the RUN key.

## Description of the actual value display area

The level of "Display of the actual values" offers the user important operating data (e.g. motor current, link voltage, ...). In addition it supports the analysis in case of a failure.

| d 0 | Output frequency | Hz | read only |
|---|---|---|---|

The parameter shows the actual output frequency in Hz. Display during stand-still: 0.00
In the range from 0,01to 9,99 Hz the display cycles in 0,01 Hz steps, between 10 and 99,9 Hz in 0,1 Hz steps and from 100 Hz to 400 Hz in 1 Hz steps.

| d 1 | Motor speed x 100 | rpm | read only |
|---|---|---|---|

The parameter shows the calculated motor speed. As the frequency inverter cannot measure the actual speed of the slipping motor, if no speed feedback is used, this value is theoretical.
Display during stand-still: 0.00. **Pay attention to the adjustment of parameter A25 „Motor pole number for d1" !**

| Speed range | Display | Steps |
|---|---|---|
| 1 to 999 rpm | 0,01 to 9,99 | 0,01 rpm |
| 1000 to 9990 rpm | 10,0 to 99,9 | 0,1 (10 rpm) |
| 10000 to 60000 rpm | 100 to 600 | 1 (100 rpm) |

| d 2 | Motor current | A | read only |
|---|---|---|---|

The parameter shows the output current of the inverter (=motor current) with an accuracy of +/- 10% according to the upper limit value. Display during stand-still: 0.0
From 0,1 to 99,9 A the display cycles in 0,1 A steps and from 100 to 999 A in 1 A steps.

| d 3 | Converted frequency | | read only |
|---|---|---|---|

The parameter shows the result of the output frequency d0 multiplied by the value of A47.

| Anzeige | Werte |
|---|---|
| 0.0 - 9.99 | 0.0 - 9.99 |
| 10.0 - 99.9 | 10.00 - 99.99 |
| 100. - 999. | 100.00 - 999.99 |
| 100 - 999 | 1000.00 - 9999.99 |
| Γ10 - Γ39 | 10000.00 - 39960.00 |

| d10 | Last trip message | | read only |
|---|---|---|---|

The last trip, the relevant output current and the link voltage(x10) are stored under this parameter and can be read out with the FUNC-key.

Display:_ _ _ Up to now no trips have occurred and the trip memory is erased.

Display: 0.00 Display after reset

| d11 | Trip memory | | read only |
|---|---|---|---|

The 2nd and 3rd last trip message are stored under this parameter. With pressing the FUNC-key they can be displayed in turn. The trip memory can be erased with the external control unit BE-4.
Display :_ _ _ In this storage position no trip message is stored.

# Description of the 1st level of operation

| F2 | Frequency ref. value, Preset speeds | 00.0 - A63 Hz | FD: 00.0 Hz |
|---|---|---|---|

Parameter F2 at any time displays the frequency set value as an actual value which is adjustable, if F9 is programmed in a suitable way, via the keys of the operator panel.

The inverters of the Hydrive J300 offer the following choices to define a frequency reference value:

- Set value definition via the keys of the built in operator panel.
- Adjustment of this set-value by the use of motorpotentiometer up or motorpotentiometer down dig. inputs
- Manual set value vie the analogue input 0 ...10 V
- Automatic set value via analogue input 4 ... 20 m A
- 3 or 7 preset speeds
- (Set value definition via the key of the external control unit BE-4)
- (Analogue or digital definition of set-value via one of the option boards)

## Frequency reference value via keypad (F9 and F2)

For the definition of the frequency set value via the keys of the built in operator panel under parameter F9 = 00 or 02 has to be set.

| Frequency range | Steps |
|---|---|
| 0,01 to 9,99 Hz | 0,01 Hz |
| 10 to 99,9 Hz | 0,1 Hz |
| 100 to 400 Hz | 1 Hz |

Permanently pressing one of the arrow keys results in continuous increase or decrease of the set value.

## Preset speeds (C0 to C7; as an alternative for adjusting A12, A13 and A14)

In factory setting the digital inputs 6 and 7 (dedicated to the terminal functions CF1 and CF2) are defined to select the pre-set speeds 1 - 3. (For the pre-set speeds 4 - 7 the terminal function CF3 is required; for programming of this please see parameter C0 - C7.)

| Function | CF1 | CF2 | CF3 |
|---|---|---|---|
| 1. preset speed | ON | OFF | OFF |
| 2. preset speed | OFF | ON | OFF |
| 3. preset speed | ON | ON | OFF |
| 4. preset speed | ON | OFF | ON |
| 5. preset speed | OFF | ON | ON |
| 6. preset speed | ON | ON | ON |
| 7. preset speed | OFF | OFF | ON |

Adjustment of the preset speeds during operation:

After selection of the relevant preset speed by use of the terminal function CF1-CF3 the desired frequency can be adjusted via the UP/DOWN-keys (factory default setting 000).
Store the frequency which was set by pressing the FUNC-key.

Alternatively the pre-set speeds 1 - 3 also can by defined via the use of the parameters A12, A13 and A14.

Remark:
Frequencies above 120 Hz can only be adjusted if the parameter A64 „Maximum frequency" is set to 400 Hz !!

| F 4 | Running direction select. | F (FWD) , r (REV) | FD: F |
|---|---|---|---|

After pressing the RUN key the motor starts with the direction of rotation which is defined by this parameter. This parameter does not influence the control inputs.

| | | | |
|---|---|---|---|
| **F 6**<br>**F 7** | **Acceleration time**<br>**Deceleration time** | **0.01 - 999 s**<br>**0.01 - 999 s** | **FD: 30**<br>**FD: 30** |

The acceleration- or deceleration time references to the defined end frequency (parameter A63).

**Remarks:**

- The 2nd acceleration and deceleration time is set by F6 and F7, if the function CH1 (2nd ramps) is selected and activated via a digital input.
- The acceleration and deceleration time for the 2nd set of parameters is set by F6 and F7, if the function SET (2nd set of parameters) is programmed and selected.

  Means that behind the parameters F6 and F7 three independently adjustable ramp times are hidden.

| | | | |
|---|---|---|---|
| **F 8** | **Voltage boost** | **00 - 99** | **FD: 11** |

In the case of V/f-characteristics voltage is increased in the range of low frequencies and as a result of this torque is boosted. Care has to be taken that the motor is not overloaded. A voltage boost which is adjusted to a too great level may cause a trip (overcurrent) of the inverter.

**Remark:**
Voltage boost does not operate in SVC-mode (A0 set to 4 or 5) !!

| | | | |
|---|---|---|---|
| **F9** | **Operating mode (reference, start, stop)** | **00 - 15** | **FD: 03** |

This parameter defines in which way the set value or the start/stop-signal is presented to the inverter.

| Value | Start/Stop-Signal | Reference |
|---|---|---|
| 00 | Keypad | Keypad*) |
| 01 | Keypad | Terminals |
| 02 | Terminals | Keypad*) |
| **03** | **Terminals** | **Terminals** |
| 04 | Keypad | Option1 |
| 05 | Option1 | Keypad*) |
| 06 | Option1 | Option1 |
| 07 | Keypad | Option2 |
| 08 | Option2 | Keypad*) |
| 09 | Option2 | Option2 |
| 10 | Terminals | Option1 |
| 11 | Option1 | Terminals |
| 12 | Terminals | Option2 |
| 13 | Option2 | Terminals |
| 14 | Option1 | Option2 |
| 15 | Option2 | Option1 |

*) One of these adjustments must be selected to use the motorpotentiometer function !!!

| | | | |
|---|---|---|---|
| **F10** | **Analogue meter adjust.** | **00 - 250** | **FD: 172** |

Adjustment of the analogue signal on terminal FM (frequency set-value, output current, torque).
An adjustment of the pulse signal (frequency actual value) is not possible).
The value which is put in by this parameter is maintained during reset to factory defaults (terminal function STN).
The max. output voltage (10 V) of the terminal means:
- at display of the frequency the end frequency (parameter A63)
- at display of the current 200% of the inverter's nominal current
- at display of the torque 200 % of the motor's nominal torque

| F11 | Nominal motor voltage | 380/400/415/440/460 V | FD: 380 |
|---|---|---|---|

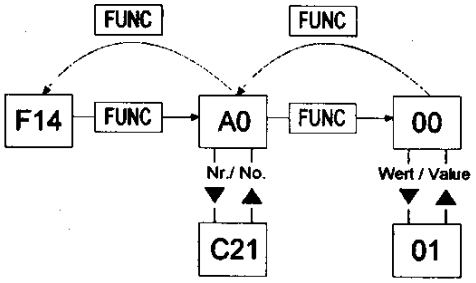
Select the nominal voltage of the connected motor.

| F14 | 2nd level of operation | Parameters of the 2nd level | FD: A0 *) |
|---|---|---|---|

If the application requires more advanced parameters F 2 - F11 then by the use of F14 the 2nd level of operation can be selected. The 2nd level of operation offers a range of further parameters (A0 - A 65) and also the choice to program inputs and outputs according to the requirements (C 0 - C21).With the key FUNC you may return from every parameter of the 2nd level of operation to F14. After input of data has been completed pressing of key FUNC once stores the new data and another function can be selected.

**Remark:**
All parameter changes in the 2nd level of operation can only be performed during stand-still after releasing a stop command.

**Scheme:**




*) Only in the factory default setting and only if selected the first time, F14 will show A0.
In all other cases the last adjusted parameter is displayed under F14.

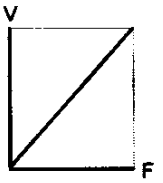
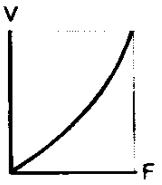
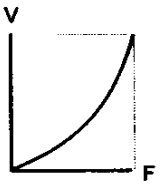
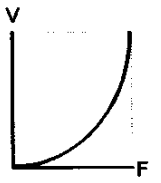
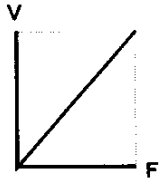
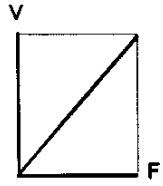
# Description of the 2nd level of operation:

| A0 | Operating methode | 0 - 5 | FD: 0 |
|---|---|---|---|

Frequency inverters of the Hydrive J300 offer three different control methods:

- O V/f-characteristics for standard torque requirements and multi motor operation.
- O Sensorless Vector Control (SVC) for great torque especially at low frequencies (<5 Hz) and dynamic compensation of slip with the usage of speed feedback. Using the operating data (output current, cos φ) the frequency inverter for every load condition calculates the optimum output voltage or output frequency.
- O Vector Control (V2) with speed feedback using a pulse sensor or an incremental sensor for applications which demand absolute accuracy of speed and angle (only with option board).

**Remark:**
At the choice of 1,2 or 3 the inverter automatically is switched to increased output power "P".

| Value | Parameter | V/f-characteristic |
|---|---|---|
| **0** | V/f -characteristic, constant torque<br>„C" |  |
| 1 | V/f-characteristick reduced torque V/f VP1, $M = n^{1,5}$<br>„P" for fans, pumps, ... |  |
| (2) | V/f-characteristic reduced torque V/f VP2, $M = n^{1,7}$<br>„P" |  |
| (3) | V/f-characteristic reduced torque V/f VP3, $M = n^2$<br>„P" |  |
| 4 | Sensorless Vector Control SVC<br>„C" for conveyors, chassis drives,... |  |
| 5 | Vector Control with feedback V2 (with optinal PCB only<br>„C" |  |

For pos. 4 and 5 the correct adjustment of A1, A2 and A3 is essential
The frequency inverter should be adapted optimally to the motor independent of the selected control method.
See parameters F11, A1, A2, A10, A97, A62, A64.

| | | | |
|---|---|---|---|
| **A 1**<br>**A 2** | **Motor capacity setting**<br>**Pole number** | **4.00 - 160 kW**<br>**2, 4, 6, 8 pole** | **FD: Nom. „C"**<br>**FD: 4** |

Put in the nominal power and number of poles of the motor to achieve great motor efficiency. If the data stored under this parameters do not comply with the actual motor data then especially in the case of the control method SVC the drive cannot be utilised optimally.

**Remarks:**
- About optimum adaptation to the motor see parameter A64
- To show the correct speed in d1 it is necessary to set parameter A25 to the correct value II

| | | | |
|---|---|---|---|
| **A 3** | **Speed response** | **0.00 - 100** | **FD: 2.00** |

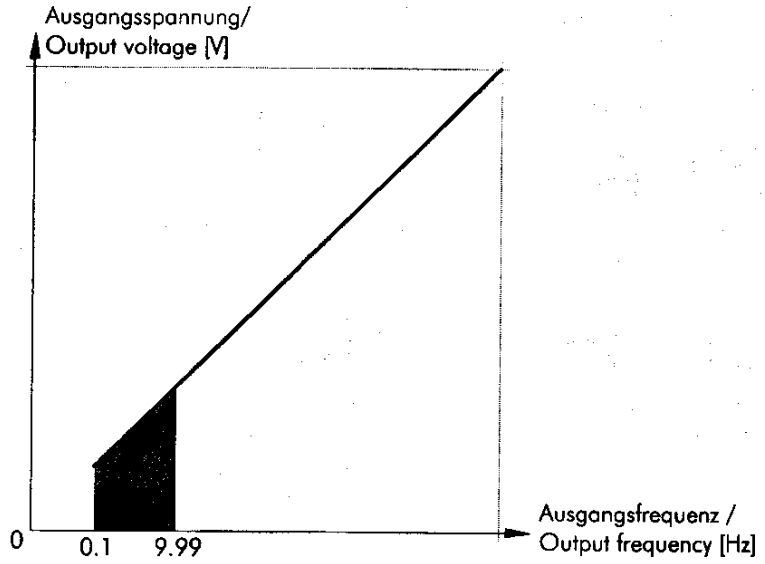
This parameter only is valid for the control method SVC. It caters for the dynamic stabilisation this means that speed remains constant even during changing of motor load.
An increase of the parameter value causes increased time to react, decreasing it reduces the time to react on changes of the slip or load.

| | | | |
|---|---|---|---|
| **A 4** | **Starting frequency** | **0.10 - 9.99 Hz** | **FD: 0.50** |

The start frequency can be adjusted between 0.12 Hz and 9.99 Hz in Steps of 0.01 Hz.

An increase of the start frequency results in a decrease of the acceleration- or deceleration time.
An increase of the start frequency may be required e.g. to overcome remarkable friction of the drive or of the attached machine.

**Remark:**
Too great setting of start frequency may cause overcurrent trips.

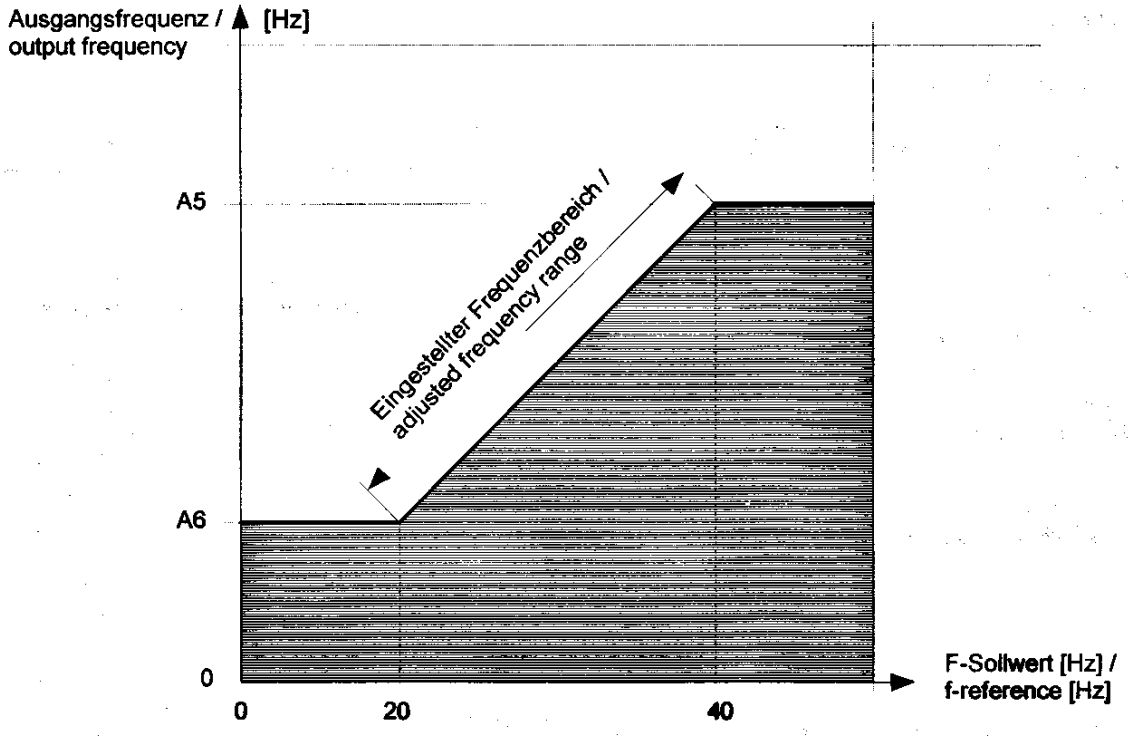


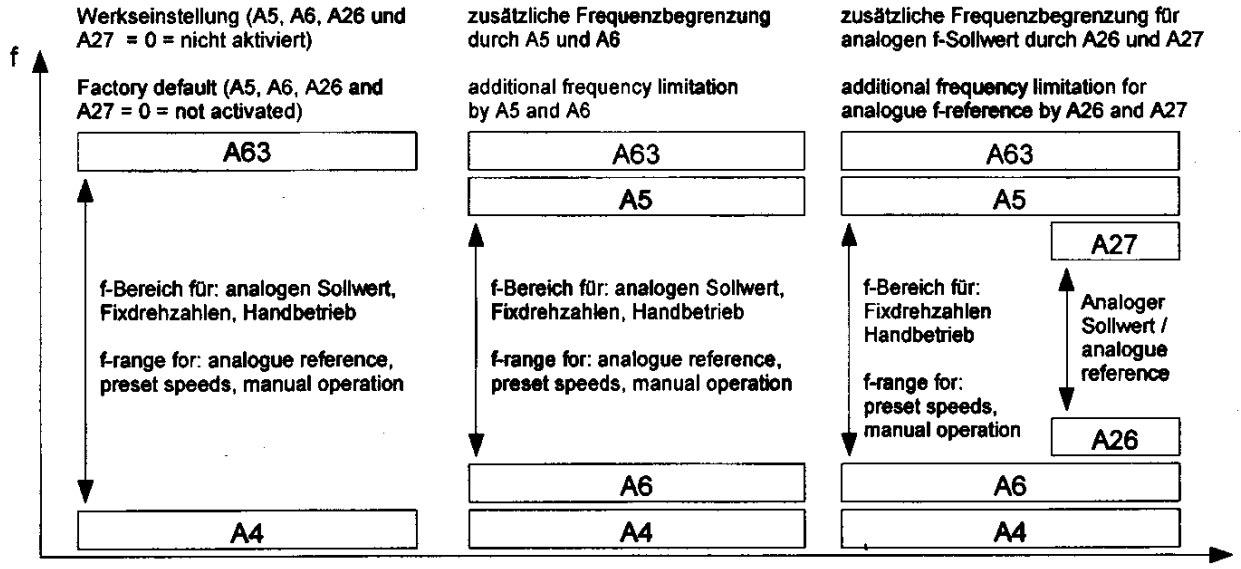
| | | | |
|---|---|---|---|
| **A 5** | **f-MAX limitation** | **0.0 - A63 Hz** | **FD: 0.0** |
| **A 6** | **f-MIN limitation** | **0.0 - A63 Hz** | **FD: 0.0** |

The frequency range which is defined by the values stored under parameter A4 (start frequency) and A63 (end frequency) can be reduced via the parameters A5 and A6. The frequency inverter in this case only accepts set values via the set value inputs or via the built in operator panel or the external control unit BE-4 which are within this frequency range. As soon as the inverter gets a start command it runs to the frequency which is set via A6.

**Remarks:**

- At input of 0 Hz for A5 and A6 or A5 < A6 the relevant parameter is not active.
- Frequencies > 120 Hz kcan only be adjusted if parameter A64 „Maximum frequency" is set to 400 Hz !!



| | | | |
|---|---|---|---|
| **A 7** | **Skip frequency 1** | **0.0 - 400 Hz** | **FD: 0.0** |
| **A 8** | **Skip frequency 2** | **0.0 - 400 Hz** | **FD: 0.0** |
| **A 9** | **Skip frequency 3** | **0.0 - 400 Hz** | **FD: 0.0** |

To avoid resonances eventually occurring in the drive system there is the possibility to program 3 lock out frequencies.

**Remarks:**

- Locked out ranges are not skipped but crossed following the ramps.
- Frequencies > 120 Hz kcan only be adjusted if parameter A64 „Maximum frequency" is set to 400 Hz !!
- The lock out width (+/- 0.5 Hz) can be varied with the external control unit BE-4 within 0.5 Hz to 9.9 Hz.

| | | | |
|---|---|---|---|
| **A10** | **Carrier frequency** | **2.0 - 16.0 kHz** | **FD:16(8) *)** |

Adjusts the switching frequency in steps of 0,1 kHz in the range of 2 kHz up to 16 kHz.

*) 16 kHz at „C"-applications (A0=0, 4 or 5)
8 kHz at „P"-applications (A0=1, 2 or 3)

The parameter is automatically set to the lower value but will not be set back to the higher value if A0 is changed. This must be done manually.

**Remarks:**

- With lower switching frequencies in the control method SVC - especially in the case of frequencies <5Hz - a greater speed accuracy of the motor can be achieved than with great switching frequencies!
- Great switching frequencies cause less motor noise and decreased losses in the motor.
- To decrease the interferences which are caused by the motor cables, the switching frequency should be kept as low as possible.

| | | | |
|---|---|---|---|
| **A11** | **Freq. command sampling** | **1 - 8** | **FD: 8** |

Via the usage of the parameter A11 the sample rate of the set frequency inputs can be adjusted.
(Presentation as voltage input via terminals O-L, presentation by current value via OI-L).
The parameter may be varied between 1 and 8.

1 means a short time constant (great sample rate) which of course is coupled with quick variations of the signal which may be not acceptable. The maximum value 8 in contrary means slow speed of reaction but on the other hand a stable output frequency.

| | | | |
|---|---|---|---|
| **A12** | **Preset speed 1** | **0.0 - A63 Hz** | **FD: 0.0** |
| **A13** | **Preset speed 2** | **0.0 - A63 Hz** | **FD: 0.0** |
| **A14** | **Preset speed 3** | **0.0 - A63 Hz** | **FD: 0.0** |

Adjustment of up to 7 preset speeds (alternatively to F2).
Each of them can be seperately activated by linking one of the terminals CF1 to CF3 with P24:

| Preset | CF1 | CF2 | CF3 |
|---|---|---|---|
| 1 | ON | OFF | OFF |
| 2 | OFF | ON | OFF |
| 3 | ON | ON | OFF |
| 4 | ON | OFF | ON |
| 5 | OFF | ON | ON |
| 6 | ON | ON | ON |
| 7 | OFF | OFF | ON |

**Remarks:**

- To use the preset speeds 4 to 7 it is necessary to assign the function CF3 to one of the programmable digital inputs 1-8.
- The values for the preset speeds 4-7 Can only be adjusted via the operating unit BE-4 (parameter F-11).
- Preset speeds will always overrule the actual reference value independent of the adjustment of F9.

| A23 | Electron. motor protection | 20 - 120 % IN | FD: 100 |
|---|---|---|---|

The frequency inverters of the Hydrive J300 can monitor the connected motor thermally via the usage of an electronic model. The electronic motor protection is adjusted according to the nominal current of the motor. (See also parameter A 24).

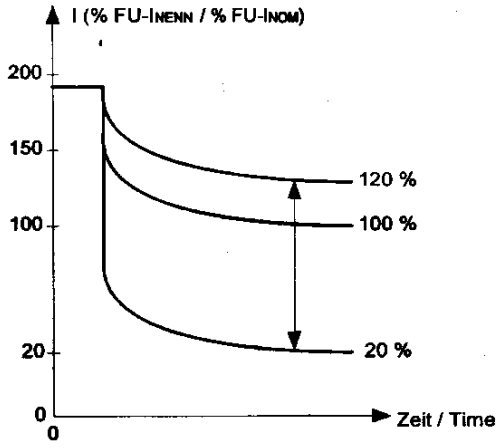
If the parameter A0 is set to 1, 2 or 3 (means higher continuous power „P"), the maximum adjustable value is 113 % !!

The input value is calculated as follows:

$$\frac{\text{Motor nom. current}}{\text{Inverter nom. current}} \times 100$$

For the inverter's nominal current according to the setting of A0 the "C" or the "P"-nominal current has to be used.

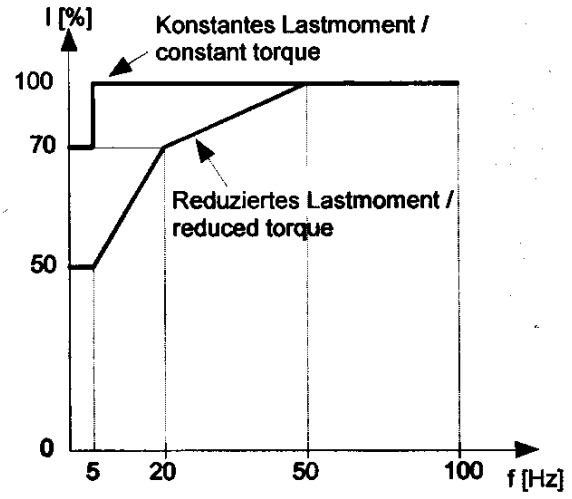
**Remark:**
The electronic motor protection will be reset in case of mains switch-off.




| A24 | Motor protec. charact. | 0 - 2 | FD: 0 |
|---|---|---|---|

For the improvement of the thermal monitoring of the motor in the lower speed range the electronic motor protection can be adapted to the reduced cooling of the motor. The external control unit BE-4 offers the possibility to program the protection characteristic on demand.

| | |
|---|---|
| **0** | Constant motor protection within the whole frequency range for motors with forced cooling |
| 1 | Reduced loading at low speeds for motors with built in fan |
| 2 | protection characteristic free programmable (with optional external control unit BE-4) |

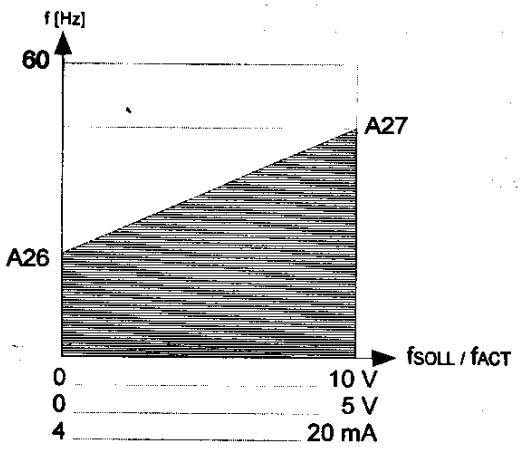



| A25 | Motor pole number for d1 | 02, 04, 06, 08, 10 ... 48 | FD: 04 |
|---|---|---|---|

Adjustment of the number of motor poles for the correct calculation of d1.

| | | | |
|---|---|---|---|
| **A26** | **Ext. f-ref limit: start value** | **0.0 - A63 Hz** | **FD: 0.0** |
| **A27** | **Ext. f-ref limit: end value** | **0.0 - A63 Hz** | **FD: 0.0** |

By the usage of the parameters A26 and A27 an additional individual adaptation of the external set-value (0...5V, 0....10 V, 4...20 mA) is possible. Associated with the minimum and maximum set value (e.g. 0 V or 10 V) there is a minimum and maximum frequency value which means that the whole set value range (0...5 V, 0...10 V, 4...20 mA) corresponds with an individually selectable frequency range.




Example: A26 = 30 Hz, A27 = 50 Hz
0 - (5)10 V corresponds to 30 - 50 Hz,
4 - 20 mA corresponds to 30 - 50 Hz

**Remarks:**

- Deactivated via A26 and A27 = 0.
- In the case of special applications it might be required at minimum set value (e.g. 0 V) to drive maximum frequency or at maximum set value (e.g. 10 V) to drive minimum frequency. To achieve this via A26 maximum frequency and via A27 minimum frequency has to be put in.
- If the V/f-relation (A0) is changed after adjusting A26 and A27 both parameters A26 and A27 must be adjusted once more.

| | | | |
|---|---|---|---|
| **A34** | **Restart selection** | **0 - 3** | **FD: 0** |

Influences the reaction of the frequency inverter in case of a trip occuring:

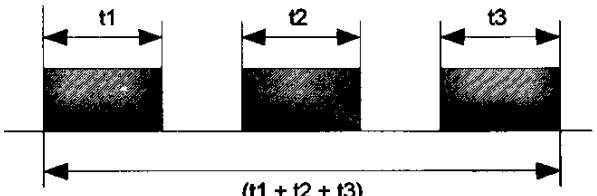
| **Trip** | **Reaction** |
|---|---|
| Overcurrent | 3 times autoreset in 10 minutes |
| Overvoltage | 3 times autoreset in 10 minutes |
| Undervoltage | 3 times autoreset in 10 minutes |
| Short mains interruption | 16 times autoreset in 10 minutes |

| | |
|---|---|
| **0** | After every trip the inverter stops operation and displays the trip message. |
| 1 | Autoreset, at the occurence of one of the mentioned trips , the inverter catches the rotating motor and stops it in accordance with the defined deceleration time. |
| 2 | Autoreset, at the occurence of one of the mentioned trips , the inverter catches the rotating motor and drives it to the set value using the defined acceleration time. |
| 3 | Autoreset, at the occurence of one of the mentioned trips , the inverter restarts after the defined timeout (factory default setting 1.0 s, adjustable via an external control unit BE-4). |

**Remark:**
Attention! Synchronisation to the motor speed is only possible if the speed is not less than 40% of the nominal speed and if the remanent motor voltage has not decreased too much (app. 2-3 sec).

| A38 | Braking unit: Usage ratio | 0.0 - 100 % | FD: 1.5 |
|---|---|---|---|

The mentioned types of the ~~ELVOvert SX~~ series are equipped with a built in braking unit and a braking resistor (80 Ω; 120 W). The usage ratio should not exceed 1.5% if the internal braking resistor is used.




$$A38 = \frac{(t1 + t2 + t3)}{100\ sec} \times 100$$

At the usage of an external braking resistor (minimum 70 Ω) in connection with the built in braking unit the usage ratio can be increased according to the power dissipation of the resistor.

The usage ratio of the built in braking unit, with reference to 100 sec can be adjusted in the range of 0% to 100%. If this usage ratio is exceeded the braking unit is switched off and the inverter trips.

At the usage of an external braking unit the input value has to be set to 0.0 and the internal and also the external braking resistors of the built in braking unit have to be disconnected.

**Remarks:**

- This parameter is only used at the J300 -5.5 kW and 7.5 kW. In case of the inverter types 11kW and above this parameter is set to 0.0 %
- The frequency inverters Hydrive J300 11kW and above do not have a built in braking unit.

| A39 | Signal „Frequency arrival" On level | 0.0 - A63 Hz | FD: 0.0 |
|---|---|---|---|
| A40 | Signal „Frequency arrival" Off level | 0.0 - A63 Hz | FD: 0.0 |

Via the parameter A49 the characteristic of the "Frequency arrival"-signal can be programmed. The relevant frequencies (for the settings 1 and 2 at A49 ) are put in by the parameters A39 and A40 .

**Remarks:**

- The frequency can be adjusted in 0.1 Hz steps up to 100 Hz, above in 1 Hz steps.
- Frequencies > 120 Hz are only possible if A64 is set to 400 Hz.

| A44 | Analogue output f/I/T | 0 - 3 | FD: 0 |
|---|---|---|---|

The terminal FM can be programmed to display different operating data.

| | |
|---|---|
| **0** | Output frequency, analogue 0...10 V (10 V at arrival at the maximum voltage frequency) |
| 1 | Output current, analogue 0...10 V (10 V at 200 % of nominal current) |
| 2 | Torque, analogue 0...10 V (use only with SVC; with V/f only an estimated value with an accuracy of +/- 20 % is available). (10 V at 200% of the nominal torque). |
| 3 | Output frequency as pulse signal |

| A47 | Calculation factor n | 0.0 - 99.9 | FD: 1.0 |
|---|---|---|---|

Adjustment of a factor for calculating the drive speed d3.

| A48 | Frequency ref. selection | 0 / 1 | FD: 1 |
|---|---|---|---|

Program the set value input (terminal 0 - L ) for 0...5 V (input 0) or 0...10 V (input 1).
If the set value is adjusted by the use of a potentiometer and the internal reference voltage (terminal H - L, 10 V) the set value input has to be put to 10 V.

**Remark:**

The switching of the set value definition to 4...20 mA is by a digital control input according to the "MANUAL/AUTOMATIC" switching (Control input 2 = 16 "Automatic-set value").

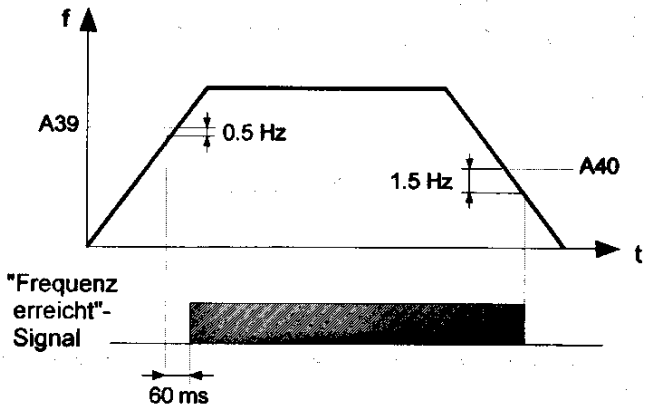
| A49 | „Frequency-arrival"-signal characteristic | 0 - 2 | FD: 0 |
|---|---|---|---|

Three different characteristics of the "Frequency-arrived" signal are programmable on output FA1 - CM2. The relevant frequencies for the settings 1 and 2 are set by A39 or A40.

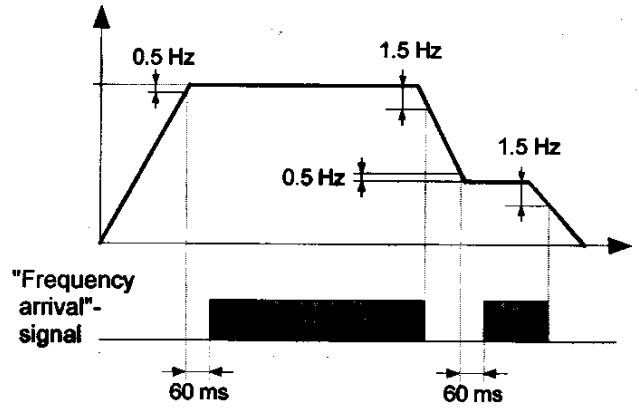
**Remark:**
With the use of parameters C10 or C11 there is the choice to invert the output logic.

| | |
|---|---|
| **0** | Signal at arrival at the set value.<br>„f ACT = f REF" |
| 1 | Signal at frequency greater then those which are set by A39 or A40.<br>„f > A39 / A40" |
| 2 | Signal at arrival at the frequencies which are set by A39 or A40 .<br>„f = A39 / A40" |

Einstellung: A49 = 1; Signal bei f ≥ fLIMIT (entspr. A39/A40) /
Adjustment: **A49 = 1; signal at f ≥ fLIMIT (corresp. to A39/A40)**




Einstellung: A49 = 2; Signal bei f = fSOLL = F2 /
**Adjustment: A49 = 2; signal at f = fSOLL = F2**




| A54 | Speed search function | 0 / 1 | FD: 1 |
|---|---|---|---|

Adjustment of the speed search function after a coast to a halt.

| | |
|---|---|
| 0 | Speed search activated |
| **1** | Speed search inactivated, inverter start at 0 Hz |

| A58 | Start with reduced vltg. | 0 - 6 | FD: 6 |
|---|---|---|---|

By the usage of this parameter the voltage during start can be reduced. At setting 0 the effect is not valid at 6 the voltage reduction and as a result of this the reduction of the starting current is maximum.

**Remark.**
The starting torque is reduced and the reaction time of the motor is increased.

| A59 | Mode of operation | 0 - 2 | FD: 0 |
|---|---|---|---|

Three different modes of running are possible:

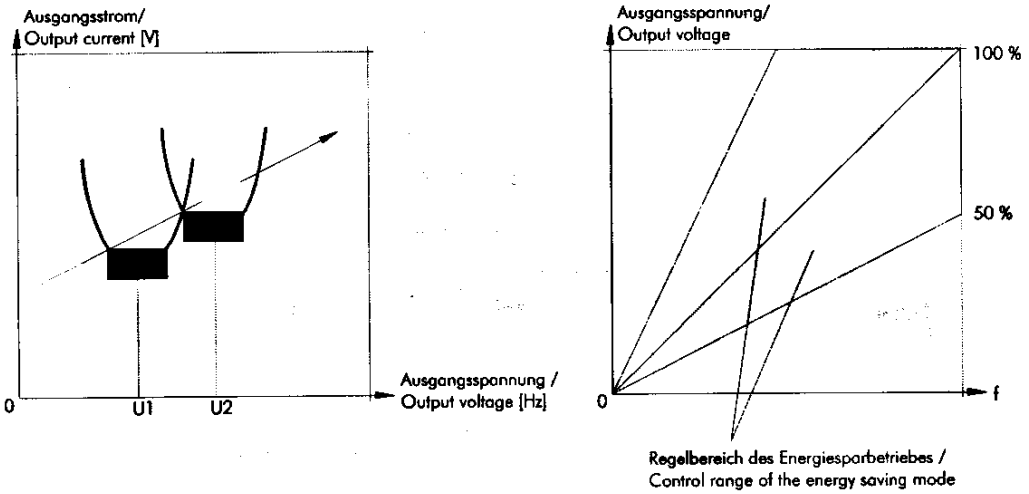
| | |
|---|---|
| **0** | Normal-run (factory default) |
| 1 | Economy mode |
| 2 | Minimum possible acceleration and deceleration ramps as a result of Fuzzy Logic |

**Remark:**
The running modes 1 and 2 are only possible with the V/f method of control.

## Economy mode (setting 1)

In this mode of operation which was developed especially for pump and fan applications with reduced torque characteristic the output voltage is automatically adapted to the motor load. In this way waste of power is prevented.

If an AC-motor is operated at constant load there is a voltage at which the current and as a result of this the power is a minimum. Hydrive J300 calculates this point of operation.
The voltage can have values in a range of +/- 50% of the voltage for constant torque (range of control).




As the control is relatively slow the motor could stall if load is increased suddenly if a point of operation with very low voltage or if low current is adjusted.

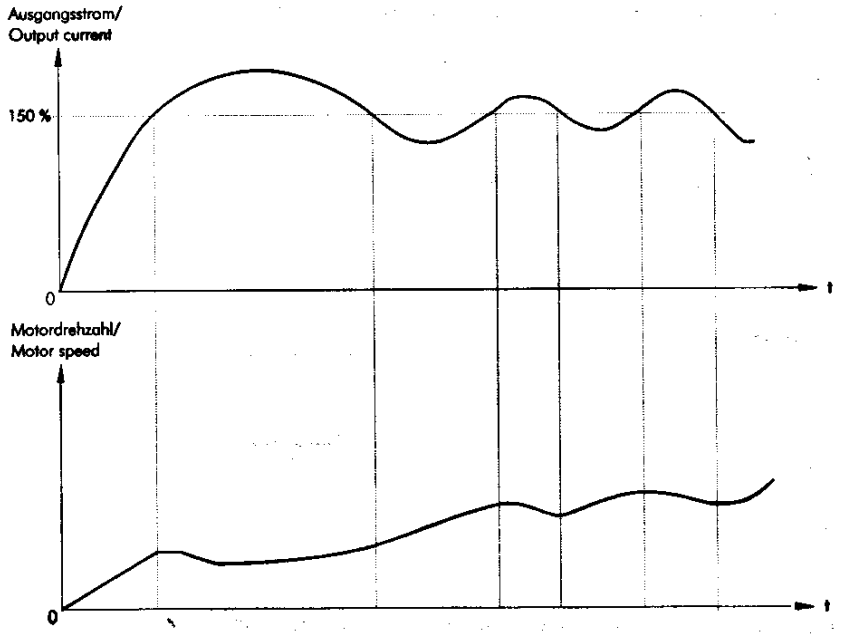
**Remark:**
This parameter is available only in the V/f control mode.

## Shortest possible acceleration- and deceleration ramps via Fuzzy Logic (setting 2)

In this mode the frequency inverter achieves shortest possible ramps via the use of the Fuzzy Logic principle independently from the programmed acceleration and deceleration times.

The following criteria have to be taken into consideration:

- During acceleration 150 % of inverter nominal current must not be exceeded.
- During deceleration 150 % of inverter nominal current and at the same time 770 V link voltage must not be exceeded.
- In case of load variations (e.g. changes of the inertial load) the inverter reacts in real time and optimizes the actual acceleration or deceleration time.



**Remarks:**

- This function is not for applications which require a defined (constant) acceleration or deceleration time as the ramps may vary depending on the load.
- A failure may occur if the inertial load of the connected load exceeds 20 times of the inertial load of the motor shaft.

- This function is available only in the V/f control mode.
- Jogging is not possible under this function.
- During the use of an internal or external braking unit the function is not active.

| | | | |
|---|---|---|---|
| **A61** | **JOG frequency** | **0.00 - 9.99 Hz** | **FD: 1.00** |

Jogging is used for example to adjust a machine in manual operation. As the acceleration and deceleration ramps are not active in jogging operation a trip (overcurrent) is possible if the jogging frequency is too great.

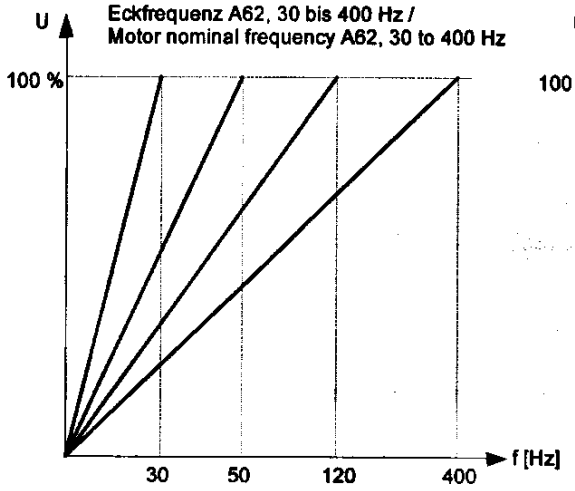
**Remarks:**

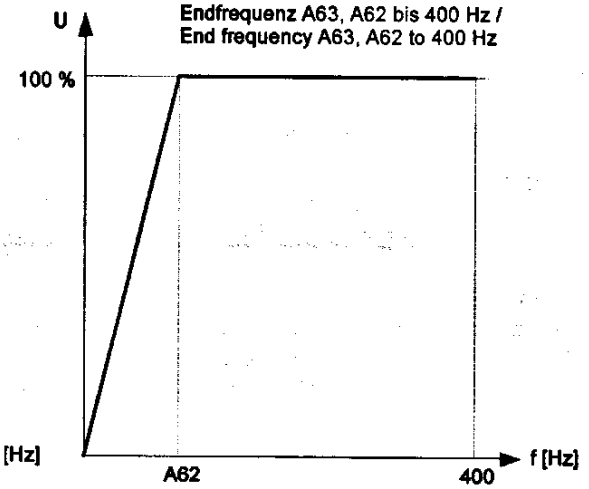
- Jogging operation is started via the control terminals (parameter F9 setting 02 or 03).
- Jogging operation is not working if the adjusted frequency is lower than the starting frequency set by A4.
- The JOG command should be released appr. 20 ms after releasing a start command. Otherwards it may happen that the jogging command will not be recognized and the drive will accelerate normal.

| | | | |
|---|---|---|---|
| **A62** | **Base frequency** | **30 - A63 Hz** | **FD: 50** |
| **A63** | **End frequency** | **30 - 120 (400) Hz** | **FD: 50** |

Via the parameter A62 the output frequency at which the output voltage achieves the maximum can be set in the range of 30 - 120 Hz ( if the maximum frequency was set with an external control unit BE-4 to 400 Hz the range is 30 - 400 Hz). Normally the nominal frequency of the motor is set here. The relevant information can be taken from the motor's type plate.
If in the range above the motor frequency (nominal motor voltage) a frequency range with constant voltage follows (field weakening range). It is defined by the frequency which is set at A63 (maximum frequency).

**Remark:**
Values >120 Hz are only possible if parameter A64 is set to „400".




| | | | |
|---|---|---|---|
| **A64** | **Maximum frequency** | **120 / 400 Hz** | **FD: 120** |

Sets the maximum frequency for parameter A63. This will also influence a lot of other parameters in their upper limit setting. Factory default setting is 120 Hz.

| | | | |
|---|---|---|---|
| **A80** | **f-ref calibration: voltage** | **0 - 255** | **FD: pre-adjusted !!** |
| **A81** | **f-ref calibration current** | **0 - 255** | **FD: pre-adjusted !!** |

With these parameters the ratio between the set signal of voltage (O-L) or current (OI-L) and the output frequency of the inverter is calibrated.
**This calibration is performed in the factory and should only be changed if the inverter frequency does not comply with the input values.**

| | | | |
|---|---|---|---|
| **A86** | **Reset signal trigger** | **0 / 1** | **FD: 0** |

Determines wheter an existing trip message will be resetted with the reset signal´s ON- or OFF trigger level.

| | |
|---|---|
| **0** | Reset with ON-trigger |
| 1 | Reset with OFF-trigger |

| | | | |
|---|---|---|---|
| **A90** | **PID-controller: P-gain** | **0.1 - 5.0** | **FD: 1.0** |
| **A91** | **PID-controller: I-gain** | **0.0 - 15.0 s** | **FD: 1.0** |
| **A92** | **PID-controller: D-gain** | **0.0 - 100.0** | **FD: 0.0** |

Adjustment of the values for the built-in PID-controller. See mounting- and connecting instruction, page 43.

| | | | |
|---|---|---|---|
| **A94** | **PID-controller: selection** | **0 - 4** | **FD: 0** |

This parameter activates / deactivates the PID controller. Also it selects the kind of feedback signal and the value of the I-part (independent of A91).

| **Adjustment** | **Feedback signal** | **I-part** |
|---|---|---|
| **0** | Built-in controller deactivated | |
| 1 | Current signal at OI and L | 1 |
| 2 | Voltage signal at O and L | 1 |
| 3 | Current signal at OI and L | 10 |
| 4 | Voltage signal at O and L | 10 |

**Remarks:**
- For using the optional PID-controller card it is necessary to adjust „0".
- Pay attention not to connect feedback and reference signal to the same inputs.

| | | | |
|---|---|---|---|
| **A95** | **PID-controller: reference** | **0 / 1** | **FD: 0** |

Adjustment of the source of the reference siganl for the built-in PID-controller.

| | |
|---|---|
| **0** | The reference signal equals to the adjustment of parameter A96 |
| 1 | The reference signal works according to the adjustment of parameter F9 |

**Remarks:**
- Select „1" for using the optional PID-controller card.
  Terminal OS is then the reference.
- In case of adjustment „1" and no optional card the reference value must be one of the signals on the termials O - L, OI - L or the adjustment of parameter F2 or one of the preset speed inputs.

| | | | |
|---|---|---|---|
| **A96** | **PID-controller: Int. ref.** | **0.00 - 200 %** | **FD: 0.00** |

Adjustment of the internal reference value for the built-in PID-controller.
For correct function of A96 it is necessary to set parameter A95 to „0".

**Remark:**
An external voltage reference of 0-10 V (used as feedback-signal) will be the same as 0-200 % of the internal reference. In other words, if an external 5 V feedback-signal should be replaced by the internal reference then 100 % have to be adjusted for A96.

| A97 | Auto-Tuning | 0 - 2 | FD: 0 |
|---|---|---|---|

The parameter A 97 determines how the auto-tuning function will be performed.

| | |
|---|---|
| **0** | no auto-tuning |
| 1 | normal auto-tuning (the motor will rotate) |
| 2 | auto-tuning via resistance and inductance measurement (the motor does not rotate) |

Adjustment „1" is used for applications where it is no problem if the motor rotates. Adjustment „2" must be used for applications where the motor is not allwowed to rotate due to mechanical circumstances or any kind of danger to persons working with the equipment.

**Remark:**
Before starting the auto-tuning function pay attention that
- the DC-braking function is not active (factory default is: not active) and
- that a frequency reference value is present.

**Auto-tuning process (I only for adjustment „1" I)**

The function is performed in four steps (one after another - automatically).

Static auto-tuning
1. The motor is applied with DC voltage
2. One phase of the motor is applied with AC voltage

Dynamic auto-tuning
3. Motor operation at 80 % of the adjusted motor nominal frequency
4. Motor operation at 40% of the adjusted motor nominal frequency

Auto-tuning can be performed with loaded or unloaded motor. Check if the connected machine is suitable for the frequency range used during auto-tuning (dynamic auto-tuning). The acceleration and deceleration times depend on the inertia torque of the connected motor.
By use of an external operating unit BE-4 the readed motor data can be displayed and changed manually.

a.) Connect the motor
b.) Adjust the following parameters:
Parameter A0: mode of operation
Parameter A1: motor nominal power
Parameter A2: motor poles
Parameter A62: motor nominal frequency
c.) Programm auto-tuning
Parameter A97, adjustment 1 or 2
d.) Adjust the reference value via the built-in keypad or the reference input, parameter F2.
e.) Give a start command using either the RUN-key or the control terminals FWD or REV (see parameter F9)
f.) Auto-tuning is performed in 4 steps (see above)
i.) Select in parameter A98 if the frequency inverter should use the standard motor data (adjustment „0" ), the motor data for motors of newer generation (adjustment „1") or the readed motor data (adjustment „2").

**Remark:**
If the auto-tuning works longer than 5 min the process should be stopped with the STOP/RESET-key and performed once more with a reduced boost adjustment (parameter F8).
Also the boost should be reduced if the motor cannot reach 80% of the adjusted motor nominal frequency. This may be caused by a too high current during auto-tuning.. If the inverter reports one of the error codes E3, E5 or E33 during auto-tuning then try it once more but this time with unloaded motor.

| A98 | Motor data selection | 0 - 2 | FD: 0 |
|---|---|---|---|

Selects which motor data are used for the operation after performing auto-tuning.

| | |
|---|---|
| **0** | Standard data |
| 1 | Data for motors of newer generation |
| 2 | Auto-tuning data |

| A99 | Input phase supervision | 0 / 1 | FD: 0 |
|---|---|---|---|

Selects if the input phase supervision is active or not.

| | |
|---|---|
| **0** | Supervision active (E24 will be displayed in case of failure) |
| 1 | Supervision not active (E24 will not be displayed in case of failure) |

**Attention: Not included in all software versions !!**

| C0 - C7 | Control inputs te.1-8 | 0 - 28 | FD: see table |
|---|---|---|---|

Determines the function of each control input according to the table below.

| Parameter | Input | Factory default |
|---|---|---|
| C7 | 8 | **0** (REV run) |
| C6 | 7 | **1** (CF1 preset 1) |
| C5 | 6 | **2** (CF2 preset 2) |
| C4 | 5 | **9** (CH1 2nd acc/dec ramp) |
| C3 | 4 | **11** (FRS pulse inhibit) |
| C2 | 3 | **5** (JG jog-mode) |
| C1 | 2 | **16** (AT automatic ref.val) |
| C0 | 1 | **18** (RS reset) |

**Remark:**
Every control terminal can be defined for every function. A function cannot be programmed twice to one control input simultaneously.

**Overview of the functions**

| Adjustment | Function | Description | Adjustment | Function | Description |
|---|---|---|---|---|---|
| 0 | REV | reverse run | 11 | FRS | pulse inhibit |
| 1 | CF1 | preset speeds | 12 | EXT | external trip |
| 2 | CF2 | (see description of the | 13 | USP | restart inhibit |
| 3 | CF3 | control inputs) | 14 | CS | bypass signal |
| 5 | JG | JOG-mode | 15 | SFT | software lock |
| 6 | DB | Start of DC braking | 16 | AT | automatic reference |
| 7 | STN | Factory default (FD) | 18 | RS | reset |
| 8 | SET | 2nd set of parameters | 27 | UP | motorpoti up |
| 9 | CH1 | 2nd accel/decel time | 28 | DWN | motorpoti down |

**Remark for the motorpotentiometer function:**
This function applies the operation of the UP, DOWN-keys to the digital inputs on the terminals. In other words: the motorpotentiometer function is only available if under parameter F9 „reference via the keypad" is selected. A switch-over to another reference value during operation is not possible.

**Remark for the external reset function:**
The inverter allows no use of a continuous reset signal. An unit which operates whithout any failure will decelerate to 0 Hz if an reset signal is released. Pay attention to this if the unit is used in plants, where all units are resetted by a single signal.
Remedy: see wiring example „summation reset"

| C10, C11 | Outputs te.11, 12 | 0 - 2 | FD: see table |
|---|---|---|---|

| Parameter | Output | Factory default |
|---|---|---|
| C11 | 12 | **1** (RUN message) |
| C10 | 11 | **0** (FA1 frequency arrival) |

**Overview of the functions**

| Adjustment | Function | Description | Remark |
|---|---|---|---|
| 0 | FA1 | Frequency arrival | (signal characteristic see A39, 40 and A49) |
| 1 | RUN | RUN message | (output is closed if pulses are released) |
| 2 | OTQ | Torque alarm | (output is closed if $T_{act} > T_{Level}$ |

**Remark:**
Every control terminal can be defined for every function. A function cannot be programmed twice to one control input simultaneously.
The torque alarm signal is only available in the SVC mode. Factory default for the torque alarm is 100 %. With an external operating unit BE-4 this limit can be programmed from 0 - 250 % of the nominal torque.

| C20 | Control inputs 1-4 Inversion | 00 - 09, 0A - FF | FD: 08 |
|---|---|---|---|

With this parameter the control terminals 1-4 can be inverted.

| | Adjustment | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Input | 0F | 0E | 0D | 0C | 0B | 0A | 09 | **08** | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
| 4 | O | O | O | O | O | O | O | **O** | C | C | C | C | C | C | C | C |
| 3 | O | O | O | O | C | C | C | **C** | O | O | O | O | C | C | C | C |
| 2 | O | O | C | C | O | O | C | **C** | O | O | C | C | O | O | C | C |
| 1 | O | C | O | C | O | C | O | **C** | O | C | O | C | O | C | O | C |

C: normal, means: control function is executed in case of 1-signal;
e.g. reset, if the external contact is closed.

O: inverted, means: control function is executed in case of 0-signal (= no current through the optocoupler)
e.g. pulse lock (terminal 4) if the digital output is opened.

**Remark:**
A terminal which was programmed to RS (reset) can only have a „C"-state.
Even in case of selecting „O"-state, the terminal will be switched back to the „C"-state.

| C21 | Te. 11, 12 and relay Inversion | 00 - 07 | FD: 04 |
|---|---|---|---|

| | Adjustment | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Output | 07 | 06 | 05 | **04** | 03 | 02 | 01 | 00 |
| 11 | i | n | i | **n** | i | n | i | n |
| 12 | i | i | n | **n** | i | i | n | n |
| Relay | n | n | n | **n** | i | i | i | i |

**n = normal** means: the open collector output is cutted through respect. the relay is energyzed if the expected condition occurs;
e.g. output 11 is closed if $f_{act} = f_{ref}$.

**i = inverted** means: the open collector output is opened respect. the relay is de-energized if the expected condition occurs;
**e.g. output 11 is always closed (if mains-on) and opens if $f_{act} = f_{ref}$.**

## Notes

# Projecting, Mounting, & Connecting instruction

## Hydrive J300

### 5,5(7,5) to 15(22) kW, 3 AC 380 to 460 V



This documentation covers information on mounting, connecting and projecting.
Details on operation and service can be read in the operating and service instructions.

Regulations for the observance of the CE-directive and the new Power-Drive-Standard (EN 61800-3) are described in the instruction manual „Additional installation regulations J300' (Cat.no. 8074578).

In case of damage or incomplete delivery, please inform the supplier or the insurance company.
The manufacturer declines responsibility for faults occurring during transport or unpacking.

# Mounting

## General

Pay attention, that the mains voltage is within 3 AC 380 V - 415 V, ±10 %, 50 Hz ±5 % or 3 AC 400 V - 460V, ±10 %, 60 Hz ±5 %. Ambient conditions like high temperatures, high humidity, dust, dirt and aggressive gases should be avoided. The mounting place should be well ventilated and not be exposed to direct sunlight. Be sure that the unit is mounted on a perpendicular wall, which is not subjected to vibrations. Also the wall should be made of non-flammable material.

Attention! Do not connect mains potential to the motor terminals U, V, W.

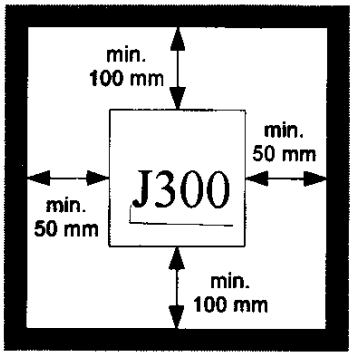
When operating a general-purpose motor at a high frequency exceeding 60 Hz, be sure to verify with the manufacturers the maximum rpm of the motor and machine.

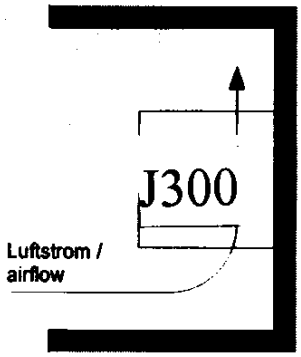
Withstand voltage tests and insulation resistance tests (megger tests) are executed for all frequency inverters before despatch. When conducting megger tests as a part of daily inspection, be sure that these tests are only executed between the main circuit and the ground. Do not execute megger tests on the control terminals.

Starting and stopping the inverter equipment should always be done via the control terminals and not by switching off main circuit breakers on the primary or secondary sides of the inverter. Do not insert leading power factor capacitors or surge absorbers between the motor terminals U, V, W and the motor.

## Distances to other units or against the wall

For cooling purposes, be sure that the frequency inverters J300 are mounted vertically. In addition, be sure that it is separated from other components and walls. Pay attention that no foreign matter can enter the equipment to avoid damage to the frequency inverter.




During wiring or other work on the equipment, do not allow any wire scraps, welding fragments, iron scraps, dust, etc. to enter into the inverter, therefore be sure to cover the top of the unit before working.

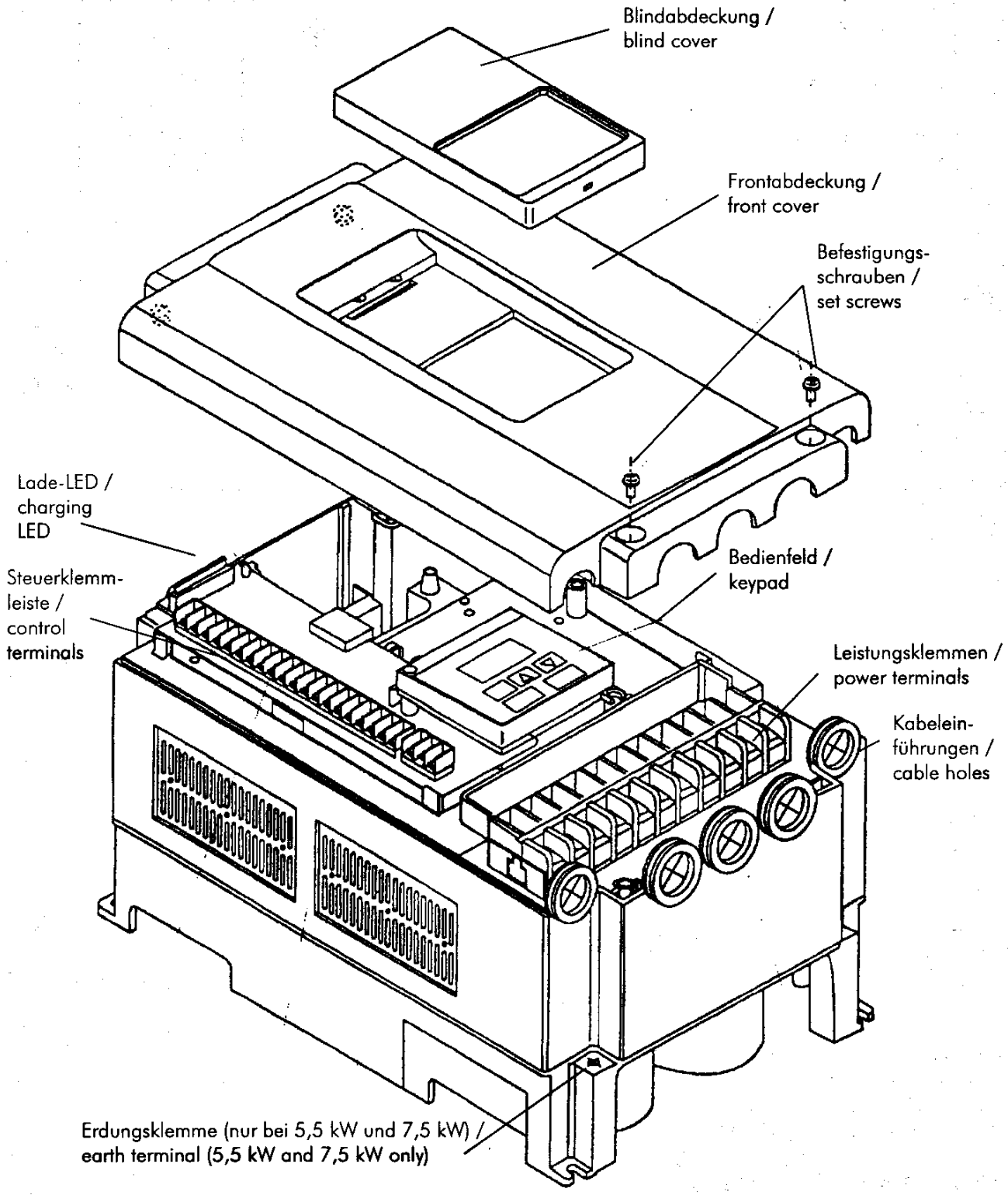
Pay attention that the allowed temperature range (-10°C to +50°C at high overload "C" or up to +40°C at high continuous load "P") is not fallen short off or exceeded. A high ambient temperature may cause a shorter lifetime of the frequency inverter.

Avoid to install heat generating units near the inverter.

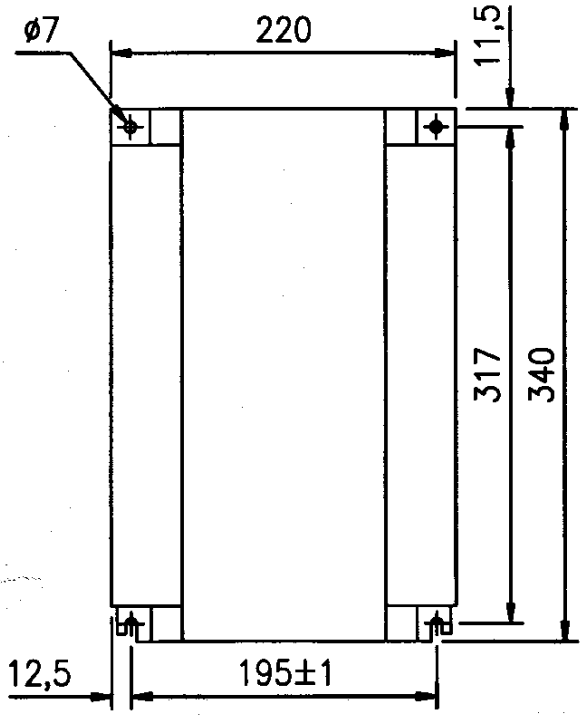
Also, when mounting the inverter in a cubicle, be sure to carefully consider ventilation and the dimensions.

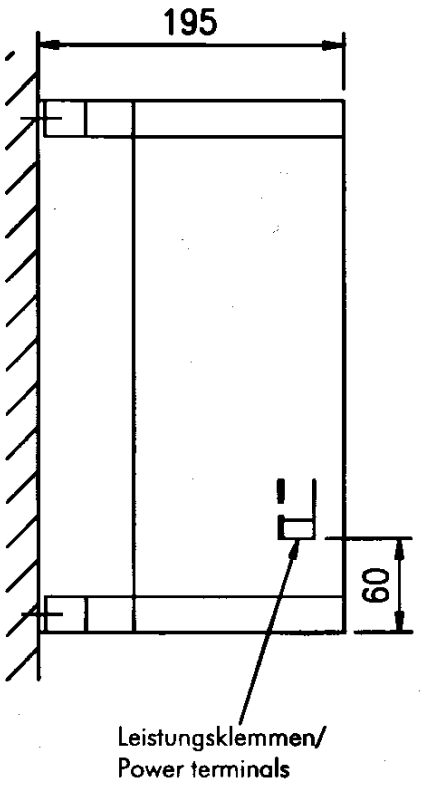
# Mechanical built-up

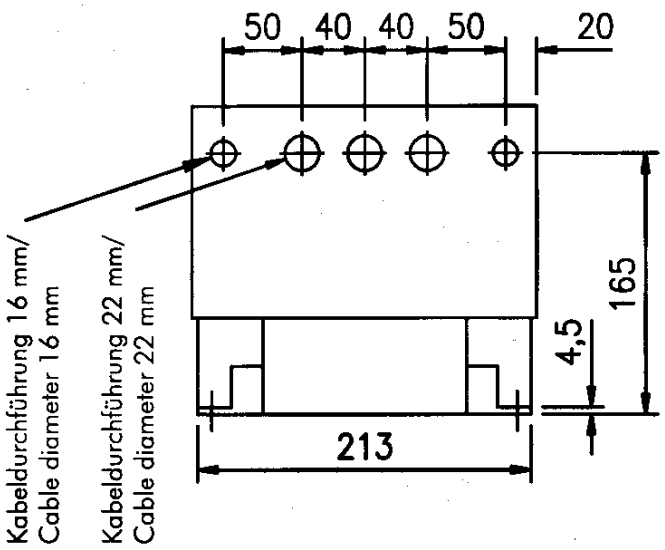
## Description of components



**Dimensions** Hydrive J300 J300-055HF | J300-075HF

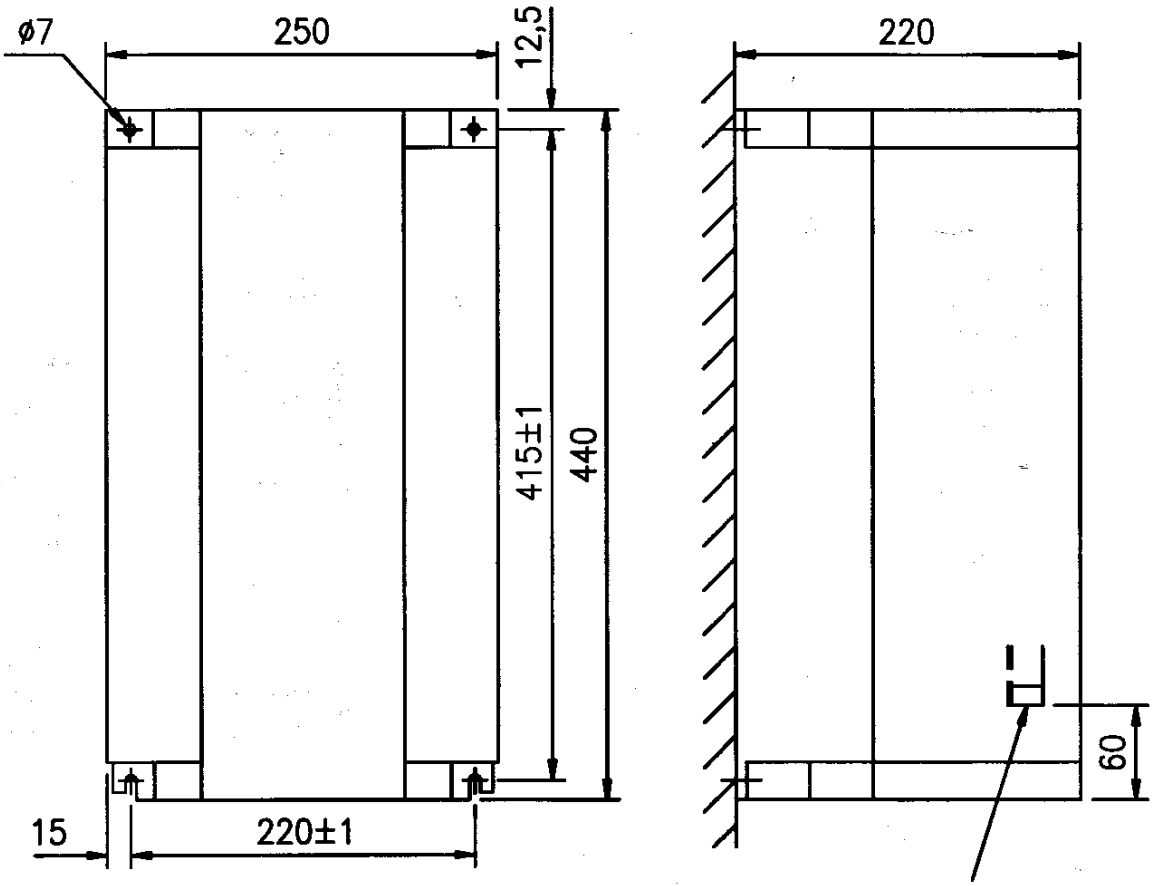


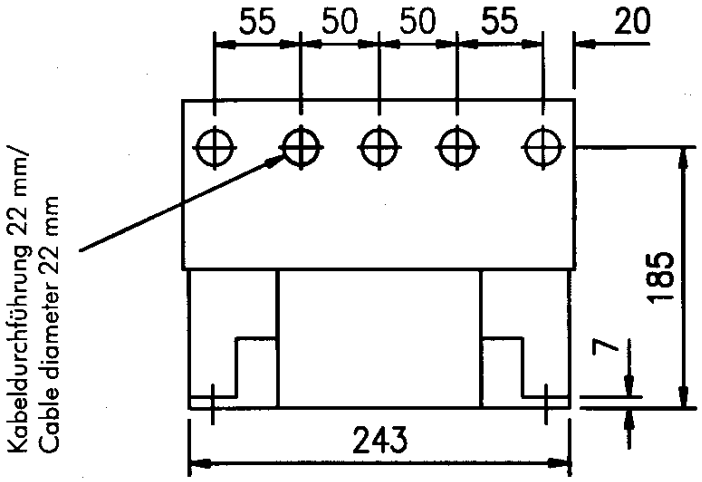




| **Losses:** | J300-055HF | J300-075HF |
|---|---|---|
| 16 kHz, 100 % load | 370 W | 450 W |
| 8 kHz, 100 % load | 310 W | 380 W |
| 4 kHz, 100 % load | 280 W | 340 W |
| **Weight, app.:** | 7,5 kg | 7,5 kg |

**Dimensions** Hydrive J300 J300-110HF J300-150HF




| **Losses:** | J300-110HF | J300-150HF |
|---|---|---|
| 16 kHz, 100 % load | 610 W | 810 W |
| 8 kHz, 100 % load | 490 W | 680 W |
| 4 kHz, 100 % load | 430 W | 620 W |
| **Weight, app.:** | 13 kg | 13 kg |

# Power connections

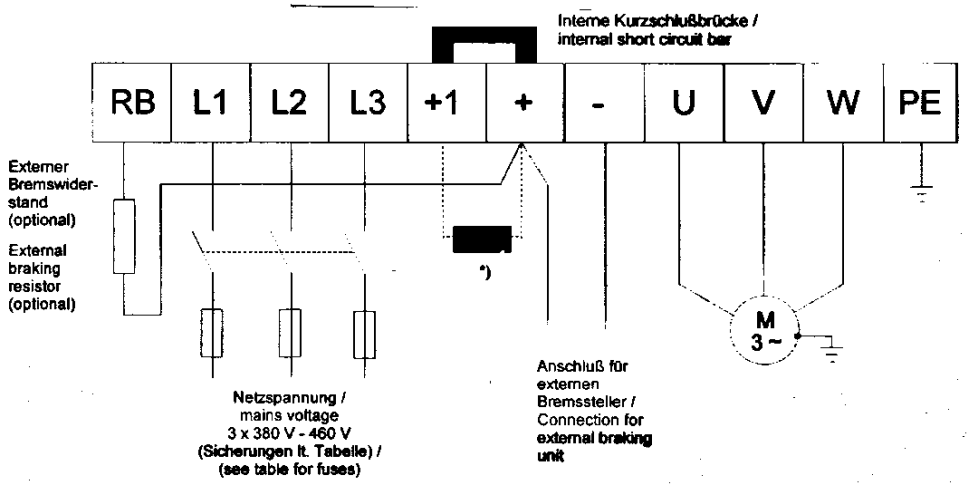
For connecting power and control terminals the front cover has to be removed. Be sure that no mains potential is connected to the motor terminals U, V, W, because this may damage the unit.

If it is necessary to connect more than one motor to a single inverter, be sure that each motor is protected.

## Hydrive J300

*) Connection for an external single-phase DC-reactor instead of a three-phase mains reactor.
Attention ! The internal link must be removed if an external DC-reactor is used !

The RB terminal is only available at J300-055HF and J300-075HF The other types need an external braking unit and resistor.




| Terminal | Function | Description |
|---|---|---|
| L1, L2, L3 | Mains terminals | 3 AC 380-460 V ±10 %, 50/60 Hz ±5 % |
| U, V, W | Motor terminals | 3 AC 380-460 V |
| +, RB | Braking resistor (optional) | Allowed resistor values: Minimum 70 Ohm. The RB terminal is only available at J300-055HF and J300-075HF The other types need an external braking unit and resistor |
| +, - | DC voltage connection | Connection for external braking unit |
| +1, + | Connection for DC-reactor | !! FD: internal linked !! Used for connecting a single-phase DC-reactor instead of a three-phase mains reactor |
| ⏚ | Earth connection | Use cable with min. 10mm² !! |

## Remarks for using earth leakage circuit breakers in the mains supply:

Frequency inverters with CE-filters (RFI-filter) and screened motor cables have a higher leakage current against earth. Especially in the moment of switching on this can cause unintentional triggerings of earth leakage circuit breakers. Because of the rectifier on the input side of the inverter there is the possibility to stall the switch-off function through amounts of DC-current. The following should be observed:

- Only short time-invariant and puls current-sensitive earth leakage circuit breakers with higher trigger current should be used.
- Other components should be secured with seperate earth leakage circuit breakers.
- Earth leakage circuit breakers in front of an inverter are not an absolut protection against direct touching.
- The J300 units have no current-limiting function (in case of fault currents). Therefore they don't violate the earthing.

**Remarks:**

1.) The motor cables should be separated from other lines and/or an option for reduction of the slew rate (du/dt) - has to be installed (Option AMF (MDR)).
Pay attention to have a correct potential balance.

2.) Be sure that the specified grounding is carried out correctly. Avoid common grounding poles for several inverters.

3.) In case of the following operation conditions a mains reactor ($U_K$ app. 3 %) must be connected to the input side of the frequency inverter. If not, this may damage the equipment:
- ❍ The unbalance factor of the power supply is 3 % or higher
- ❍ The mains capacity is at least 10 times greater than the inverter capacity or is 500 kVA or higher
- ❍ Abrupt power supply changes are expected
- ❍ The frequency inverter is used on a generator
- ❍ The frequency inverter is used in domestic premises (first enviroment)

e.g. Several inverters are interconnected via a short bus,
An installed phase advance capacitor opens and closes

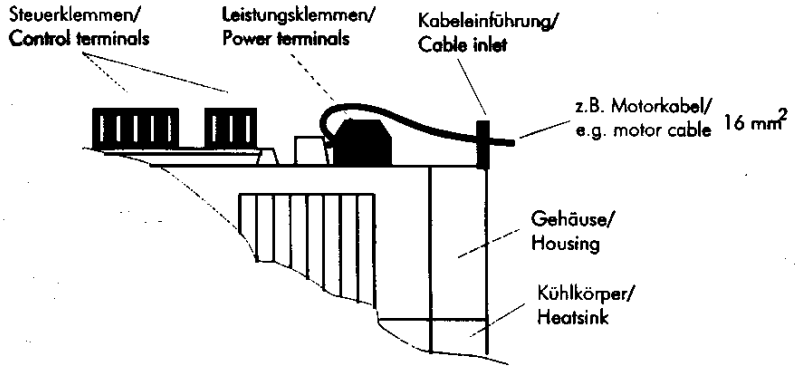
4.) **Attention !** The earth leakage safety is only a inverter protection and no protection for human life.

5.) For mains fuses and cable diameters we recommend the following typical values:

| Inverter type | Mains fuse without NDR | Power cable 4pole | Power cable single wire | Control cable |
|---|---|---|---|---|
| J300-055HF | 25 A sluggish | 4 mm$^2$ | 4 mm$^2$ | 0,75 mm$^2$ |
| J300-075HF | 32 A sluggish | 6 mm$^2$ | 6 mm$^2$ | 0,75 mm$^2$ |
| J300-110HF | 50 A sluggish | 16 mm$^2$ | 10 mm$^2$ | 0,75 mm$^2$ |
| J300-150HF | 63 A sluggish | **Remark** | 16 mm$^2$ | 0,75 mm$^2$ |

| Inverter type | Mains fuse without NDR | Power cable 4pole | Power cable single wire | Control cable |
|---|---|---|---|---|
| J300-055HF | 20 A sluggish | 2,5 mm$^2$ | 2,5 mm$^2$ | 0,75 mm$^2$ |
| J300-075HF | 25 A sluggish | 4 mm$^2$ | 4 mm$^2$ | 0,75 mm$^2$ |
| J300-110HF | 40 A sluggish | 10 mm$^2$ | 6 mm$^2$ | 0,75 mm$^2$ |
| J300-150HF | 50 A sluggish | 16 mm$^2$ | 10 mm$^2$ | 0,75 mm$^2$ |

**Remark:** The use of a 4pole 16 mm$^2$ cable is possible if the connection is done on the upper side of the terminal block (see sketch) !



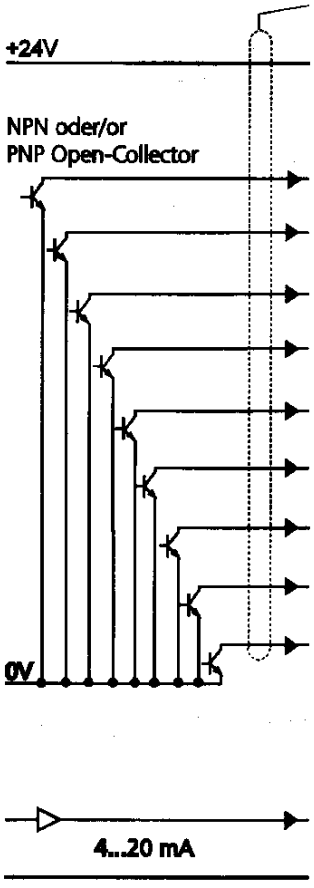

We recommend normal sluggish line-protection fuses or line-protection switches with „C"-characteristic. (Trigger value: 5 - 10 x INom)

Regulations for the observance of the CE-directive and the new Power-Drive-Standard (EN 61800-3) are described in the instruction manual „Additional installation regulations J300 (Cat.no. 8074578).

# Control connections

Be sure to separate the control cables from the power supply and motor cables. Also the length should not exceed 20 m and must be shielded. If a crossing of control and power cables can not be avoided, be sure that they cross at a right angle.

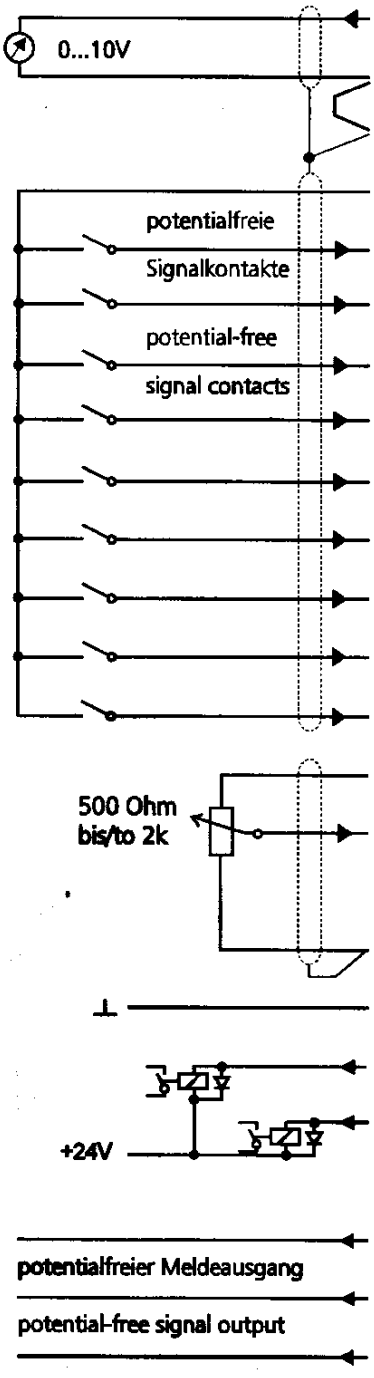
Externe Verdrahtung
External wiring



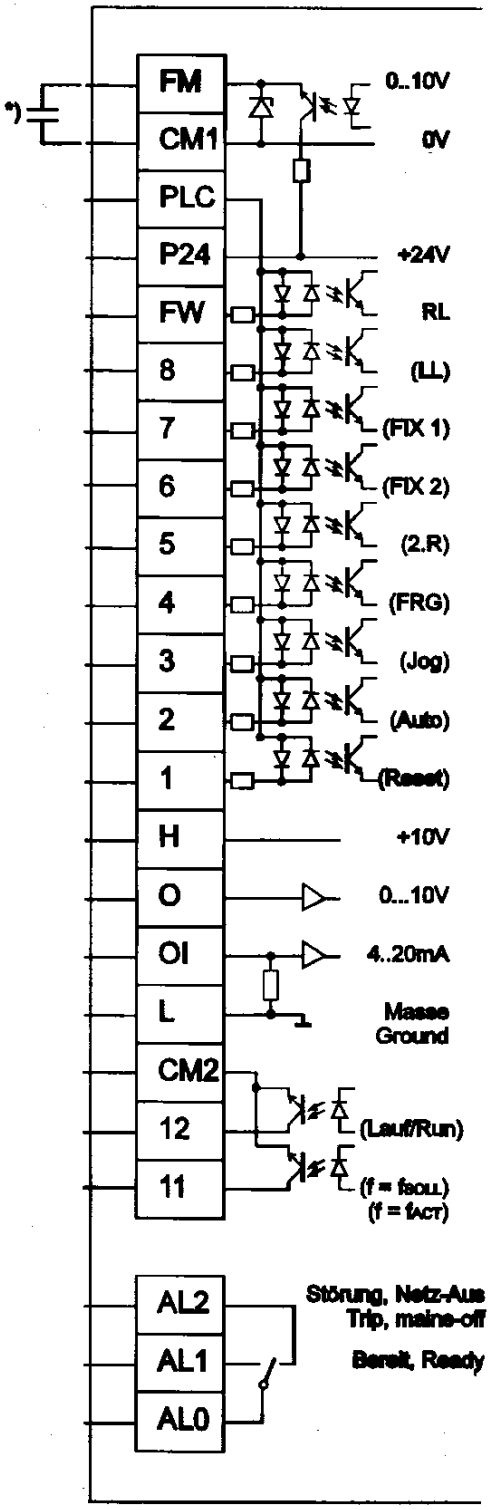

*) Keramikkondensator
2,2 bis 100 nF

Ceramic capacitor
2,2 to 100 nF

Externe Verdrahtung
External wiring




Interne Verdrahtung der Steuerklemmen
Internal wiring of control terminals



## Specification of the control terminals

**1 - 8:** Programmable digital inputs can be programmed with the parameters C0 - C7 as follows:

| Setting | Short name | Description |
|---|---|---|
| 0 | REV | Start reverse run. REV and FW closed = STOP. |
| 1, 2, 3 | CF1, CF2, CF3 | Starts the inverter with the corresponding preset speed. |
| 5 | JG | Activates the JOG function. A61 sets the frequency. |
| 6 | DB | Enables the DC brake, if the contact is interconnected with P24. |
| 7 | STN | All parameters are set back to their factory defaults. |
| 8 | SET | Activates the 2nd set of parameters. |
| 9 | CH1 | Activates the 2nd accel. and decel. time independent of SET. |
| 11 | FRS | Releases a coast to stop by interconnecting with P24. |
| 12 | EXT | Releases an external trip „E12" by interconnecting with P24. |
| 13 | USP | Avoids a automatic start after an undervoltage trip. |
| 14 | CS | Commercial power source switching. |
| 15 | SFT | Avoids the unauthorised change of parameters (software lock). |
| 16 | AT | Activates the input OI (4...20 mA). |
| 18 | RS | Resets a trip. |
| 19-26 | Processes | Not in use !! |
| 27 | UP | Motorpotentiometer up. |
| 28 | DWN | Motorpotentiometer down. |

**FW:** Input for forward rotation. Starts the inverter with clockwise rotation. FW and REV closed = STOP.

**P24:** 24 V potential for digital inputs 1-8 and FW, max. 150 mA, short circuit protected

**CM1:** 0 V potential for digital inputs 1-8, FW and FM.

**PLC:** Summation point for digital inputs 1-8 and FW.

**H:** 10 V reference voltage for voltage reference value. A48 can set this value to 5 V.

**O:** Voltage reference input: 0 - 10 V, input impedance: 30 kW

**OI:** Current reference input: 4 - 20 mA, input impedance: 250 W

**L:** 0 V potential for reference value inputs.

**FM:** Programmable output for: (couplings on to the signal lines may cause non-linearity. Switch a capacitor 2,2 to 100 nF between the terminals FM and CM1)

| | | |
|---|---|---|
| 1.) | Analogue frequency act. value: | output signal proportional to the output frequency related to $f_{MAX}$ Accuracy: +/- 5%. 0 - 10 V, 1 mA, pulse modulated |
| 2.) | Digital frequency actual value: | digital frequency signal corresponding to the output frequency 10 V - pulses in 1:1 ratio. |
| 3.) | Analogue motor current: | output signal prop. to the output current related to 200% $I_{NOM}$. 0 - 10 V, 1 mA, pulse modulated |
| 4.) | Analogue torque act. value: | output signal prop. to the output torque related to 200% $M_{NOM}$. 0 - 10 V, 1 mA, pulse modulated |

**CM2:** 0 V potential for programmable outputs 11 and 12.

**11:** Programmable digital output (transistor output max. 27 VDC, 50 mA) for: "Frequency reached" signal, RUN signal or "Torque > 100 %" signal

**12:** 2nd programmable digital output. Identical with terminal 11.

**AL0:** Potential for relay output
(minimum: 100 VAC / 10 mA or 5 VDC / 100 mA, maximum: 250 VAC/ 2,5 A or 30 VDC / 3 A)

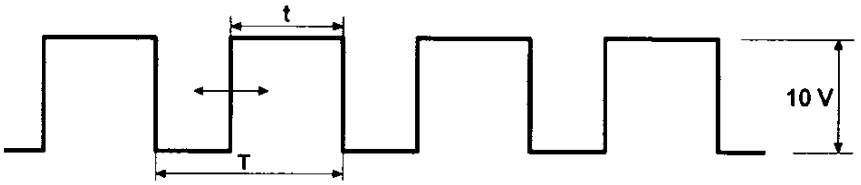
**AL1:** Closing contact
**AL2:** Opening contact

## Adjustments and functions

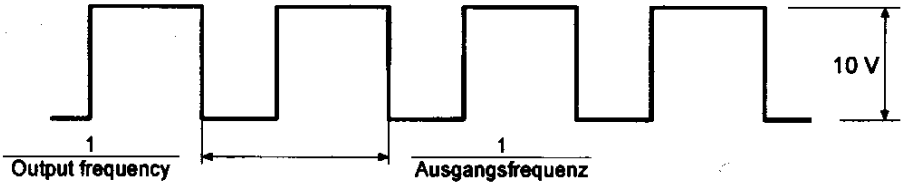
### Terminal: FM — Affected parameter: A44 and F10

The output can be programmed as follows (parameter A44):

1.) Analogue frequency act. value: (A44=0)
Supplies a pulse width modulated signal, which is proportional to the output frequency related to the end frequency A63.
The accuracy is app. ± 5 %, the output supplies 0-10 V, 1 mA.
(see page 18)




2.) Digital frequency actual value: (A44=3)
Supplies a digital frequency signal corresponding to the output frequency
The output supplies 10 V pulses in 1:1 ratio.




3.) Analogue motor curr. act. value (A44=1)
Supplies a pulse width modulated signal proportional to the output current related to 200 % $I_{NOM}$.
The output supplies 0-10 V, 1 mA.
(see page 18)

4.) Analogue torque actual value (A44=2)
Supplies a pulse width modulated signal proportional to the output torque related to 200 % $M_{NOM}$.
The output supplies 0-10 V, 1 mA.
(see page 18)

**Remarks:**
Parameter F10 gives the possibility to adjust the output in a way, so that a connected measuring instrument shows the maximum value at full scale. Only valid for settings A44=0 to 2. Couplings on to the signal lines may cause non-linearity. Switch a capacitor 2,2 to 100 nF between the terminals FM and CM1.

### Functions: CF1, CF2, CF3 — Affected parameters: C0 - C7, F2, A12 - A14

There are 2 possibilities to select up to 7 preset speeds. Before this the functions CF1 - CF3 have to be assigned to the programmable inputs 1-8. This is done with the parameters C0 - C7.
From the factory, the functions CF1 and CF2 are already assigned so that a number of 3 preset speeds can be selected.

1.) In case of the factory default parameter F2 in the 1st level of operation can select up to max. 3 preset speeds (see page 9) or you use the parameters A12, A13 and A14 in the 2nd level of operation (see page 15).
2.) If you wish to use all 7 preset speeds you have only the possibility of parameter F2 in the 1st level of operation (see 9).

**Remark:**
Preset speeds always superimpose the actual speed reference, independent of the adjustment of parameter F9.

## Function: STN (factory default) — Affected parameters: C0 - C7

If the frequency inverter should be set back to its factory default setting, the following procedure must be done:

1.) Programm one of the inputs 1-8 with the parameters C0 - C7 to STN (setting: 07).
2.) Interconnect the programmed input with P24 (either with a switch or with a wire bridge).
3.) Switch off the power supply.
4.) Wait until the charge control goes out and switch on the power supply afterwards.
5.) Wait for app. 6 s after switching on the power supply and then open the interconnection between STN and P24.

**Remarks:**
Instead of mains OFF/ON it is possible to release a reset to do the factory default setting.
Therefore a second input must be programmed to the function RS (setting: 18)
In both cases (mains OFF/ON or reset) you have to wait for at least 6 s. Elsewhere the inverter will not be initialised correctly.
If the software lock function is activated it is not possible to release a factory default setting.

## Function: SET (2nd set of parameters) — Affected parameter: C0 - C7, A0 - A3, A23, A24, A62, A63, A98, F2, F6 - F8

With this function it is possible to program a 2nd independent set of parameters which includes the following:

| | | | |
|---|---|---|---|
| F2 | frequency reference value | A0 | control method |
| F6 | 1st acceleration time | A1 | Motor nominal power |
| F7 | 1st deceleration time | A2 | Number of motor poles |
| F8 | voltage boost | A3 | ASR constant |
| | | A23 | Electronic motor protection |
| | | A24 | Motor protection characteristik |
| | | A62 | Motor voltage frequency |
| | | A63 | Maximum frequency |
| | | A98 | Motor data selection |

Programming the 2nd value

1.) Programm one of the inputs 1-8 to the function SET (setting: 08)
2.) Interconnect the programmed input with P24.
3.) Select one of the above listed parameters. It will show its factory default value.
4.) Adjust a new (second) value and store it by pressing the FUNC key.
5.) Repeat the steps 3 and 4 for all other parameters you want to adjust.

Procedure

By interconnecting the programmed input with P24 the 2nd set of parameters can be activated, opening the interconnection the 1st set is activated.

**Remark**
The frequency inverter has the possibility of a 2nd set of ramps (CH1) independent of the 2nd set of parameters (SET). In other words, the unit has 3 acceleration times and 3 deceleration times!!
If you change from the 1st to the 2nd set of parameters before the new value is stored by pressing the FUNC key, it might be possible that the new value is stored for both 1st and 2nd set. Therefore never change the set of parameters if you adjust a value!!
Switching form one to another step can only be performed during STOP (pulse inhibit).
Switch the SET input before the start command (FW or REV). If both contacts are closed simultaneously, it might be possible that the 2nd set of parameters cannot be activated.

## Function: CH1 (2nd set of ramps) — Affected parameter: C0 - C7, F6, F7

As described at the function SET, the frequency inverter has a 2nd set of ramps. It can be activated independent of the 2nd set of parameters. That means the unit has 3 acceleration times and 3 deceleration times.

Programming the 2nd value

1.) Programm one of the inputs 1-8 to the function CH1 (setting: 09)
2.) Interconnect the programmed input with P24.
3.) Adjust for F6 (acceleration time) and/or F7 (deceleration time) another value.

Procedure

By interconnecting the programmed input with P24 the 2nd set of ramps can be activated, which means that the 2nd value of F6 and F7 are used. Opening the interconnection activates the 1st value again.

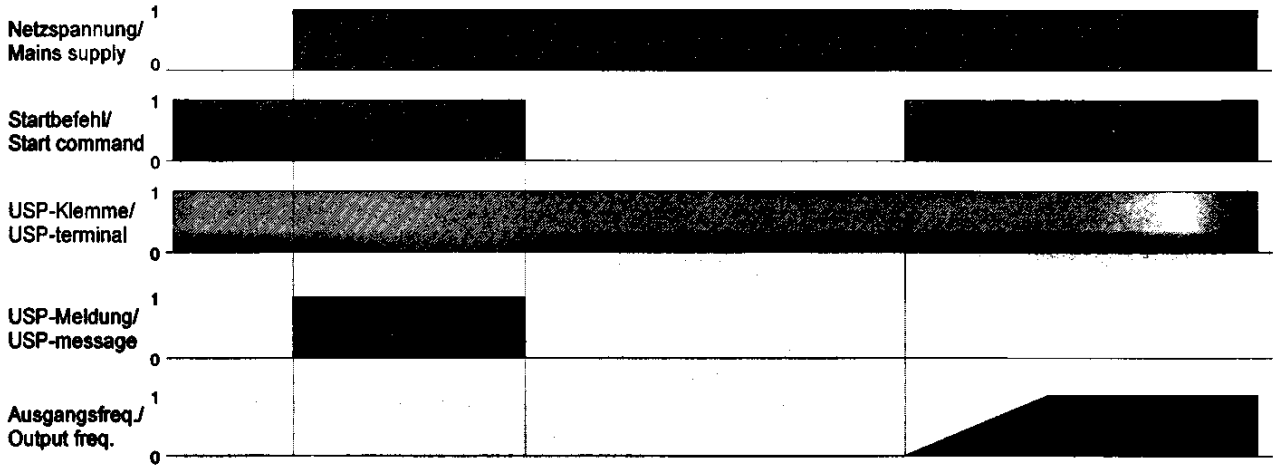
**Remarks**
By switching to the 2nd set of ramps the 3rd acceleration and deceleration time can be activated.
It is not possible to use all 3 values at the same time. They have to be selected by SET or CH1.

## Function: USP (restart lock) — Affected parameter: C0 - C7

If the power supply is turned on or comes again after an undervoltage trip and the start command is active at the same time, the inverter will start immediately.
This can be avoided with the function USP. To do that, be sure that the function is assigned to one of the inputs 1-8 (parameter C0 - C7, setting: 13).

**Remarks**
If the USP function is activated and the power supply comes back during a start command is released, the inverter trips with E13.
If the start command is now switched off, the display will show „Err"; that does not mean that the error is cleared.
The USP function is also executed after an undervoltage trip E9.

The following diagram shows the coherences:



## Function: RS (reset) — Affected parameter: C0 - C7

Interconnecting the programmed input with P24

1.) resets a fault
2.) leads to a factory default, if the function STN is programmed and interconnected too (see pages 7 & 37)

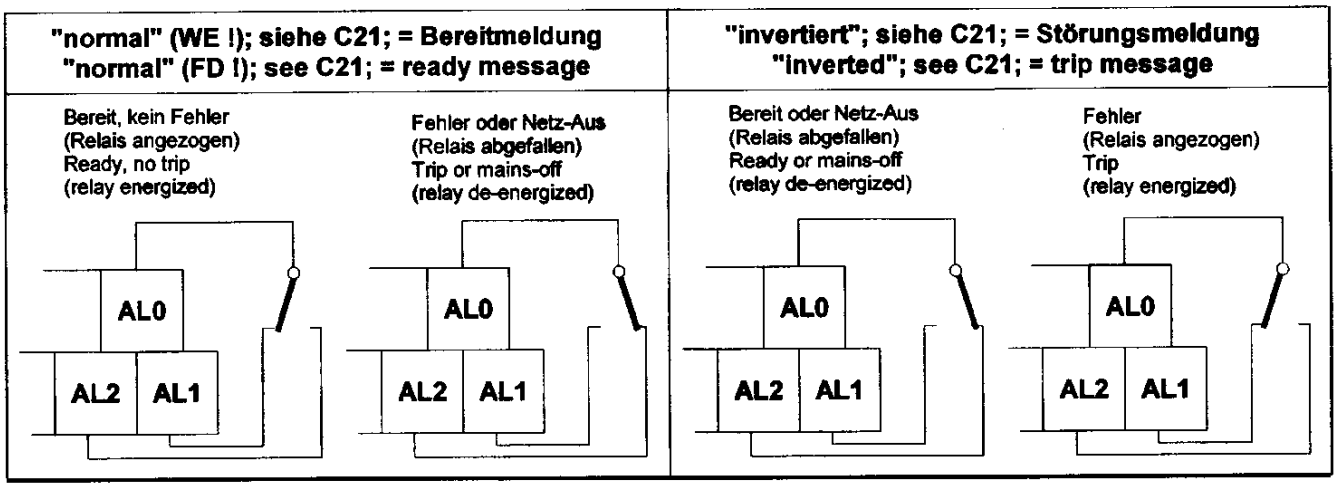
**Remarks**
If the RS contact is closed for more than 4 seconds, the inverter shows „- - -". Open the RS contact and press one of the arrow keys to set the unit back to normal operation.
The STOP/RESET key can only reset a trip and has no function 2 (see list above).
Switching OFF/ON the power supply has the same effect as a reset.
The inverter allows no use of a continuous reset signal. An inverter which operates without any failure will decelerate to 0 Hz if a reset signal is released. Pay attention to this, if the unit is used in plants, where all units are resetted by a single signal.

## Function: SFT (software lock) — Affected parameter: C0 - C7

If SFT is programmed to one of the inputs 1-8 and interconnected with P24, all parameters are secured against unauthorised change. This does not include the frequency reference value F2.

## Terminals: AL0, AL1, AL2 — Affected parameter: C21

In case of a trip the inverter shows an error code "E..." and the relay switches as follows:




| Function | Mains | Cond. | Relay | AL0-AL1 | AL0-AL2 |
|---|---|---|---|---|---|
| „normal" | ON | Ready | energized | closed | open |
| (Factory | ON | Trip | de-energ. | open | closed |
| default) | OFF | ----- | de-energ. | open | closed |

| Function | Mains | Cond. | Relay | AL0-AL1 | AL0-AL2 |
|---|---|---|---|---|---|
| „inverted" | ON | Ready | de-energ. | open | closed |
| | ON | Trip | energized | closed | open |
| | OFF | ----- | de-energ. | open | closed |

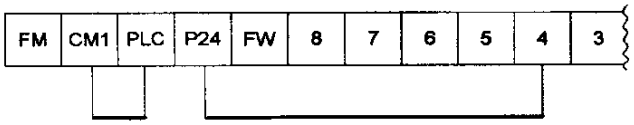
# Wiring examples

## Manual control via the built-in keypad

Adjust he following parameters:
(Assuming a factory default setting!)

F9 = 00,
F2 = frequency reference value,
F4 = pre-selection of rotation direction,
F6 = acceleration time,
F7 = deceleration time

Wiring of the control terminals:




After the above mentioned parameters have been adjusted, the frequency inverter can be started with the RUN key. The STOP key stops the equipment or resets a trip. Of course, it is possible to adjust any other parameter.

The last adjusted speed reference value (F2) is stored even after mains OFF!!

## Reference value from a potentiometer & summation reset

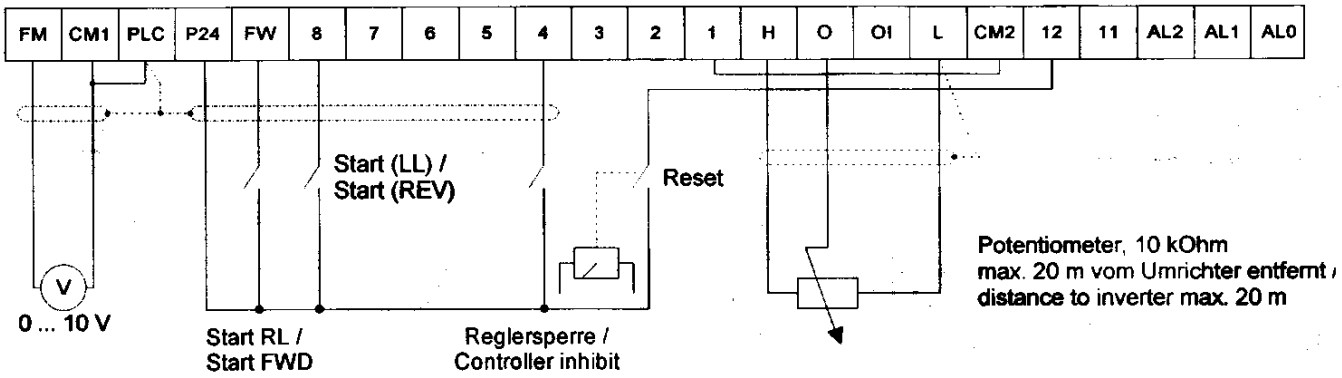
Adjust the following parameters:

F9 = 03 (FD !),
A0 = U/f or SVC,
F6 = acceleration time,
F7 = deceleration time, C7 = 0 (FD !)

Additional for summation reset:

C0 = 18 (FD !), C11 = 1 (FD !) C21 = 06 (inversion of terminal 12)

Wiring of the control terminals:

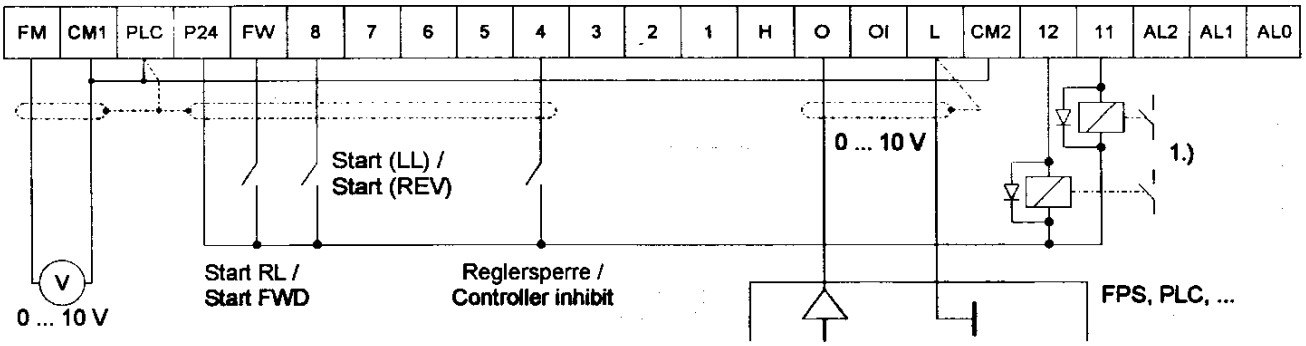



After the above mentioned parameters have been adjusted, the frequency inverter can be started via the input FW in clock-wise direction. Input 8 (= REV) will start the equipment in anti-clockwise direction. Closing FW and REV at the same time will cause to stop the inverter.
By using the terminal 12 in combination with the reset signal a general reset will have no effect to a running inverter.
Pay attention that the digital outputs 11 and 12 cannot be used for other purposes !!

## Reference value from a 0 ..... 10 V analogue signal & supply via the internal 24 V

Adjust the following parameters: F9 = 03 (FD !), A0 = U/f or SVC, F6 = acceleration time, F7 = deceleration time, A48 = 1 for 10 V, C7 = 0 (FD !)

Wiring of the control terminals:



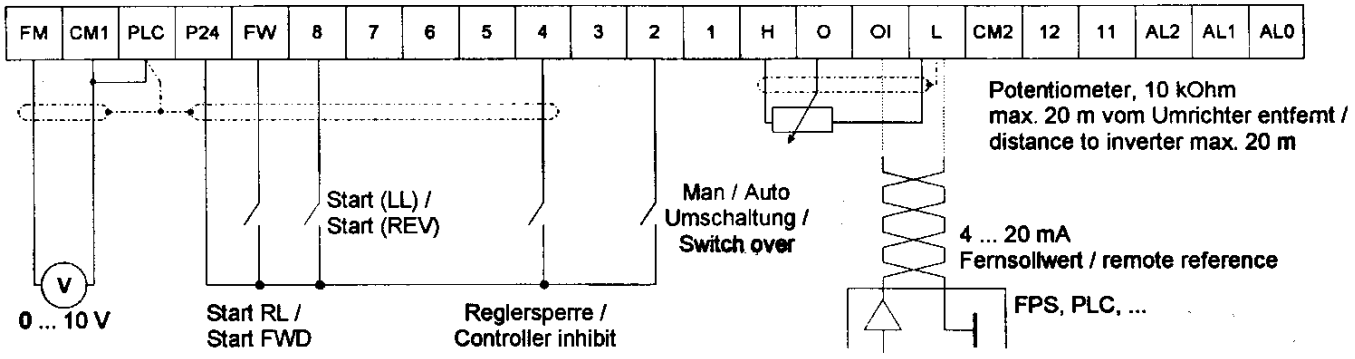

After the above mentioned parameters have been adjusted, the frequency inverter can be started via the input FW in clockwise direction. Input 8 (= REV) will start the equipment in anti-clockwise direction. Closing FW and REV at the same time will cause to stop the inverter.

1.) Use a relay with max. 50 mA charging rate at 24 V !!

## Reference value from a 4 ..... 20 mA analogue signal & local/remote switch-over

Adjust the following parameters: F9 = 03 (FD !), A0 = U/f or SVC, F6 = acceleration time, F7 = deceleration time, C7 = 0 (FD !), C1 = 16 (FD !)

Wiring of the control terminals:

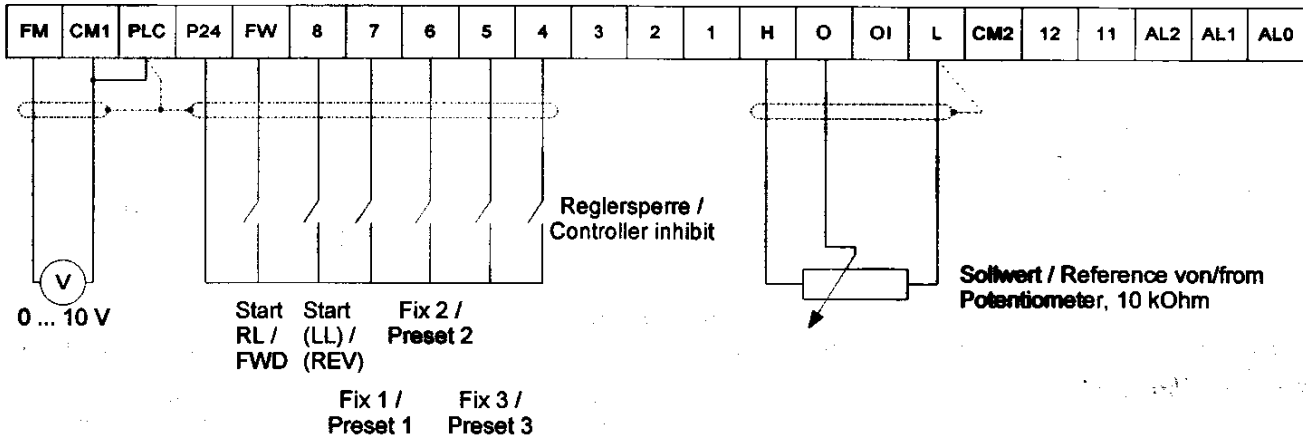



After the above mentioned parameters have been adjusted, the frequency inverter can be started via the input FW in clockwise direction. Input 8 (= REV) will start the equipment in anti-clockwise direction. Closing FW and REV at the same time will cause to stop the inverter.
The current reference input is activated if the input 2 is interconnected with P24.
If you wish to use both voltage and current reference value, the input 2 is like a local/remote switch.

## Preset speeds (max. 7) + reference value (corresp. "FIX 8")

Adjust the following parameters: F9 = 03 (FD !), A0 = U/f or SVC, F6 = acceleration time,
F7 = deceleration time, C6 = 1, C5 = 2, C4 = 3, C7 = 0 (FD !),
A12 = preset speeds 1, A13 = preset speeds 2, A14 = preset speed 3 or
F2 for adjusting the preset speeds 4 - 7,
F2 = reference value (or potentiometer, or 0 ... 10 V, a.s.o.)

Wiring of the control terminals:

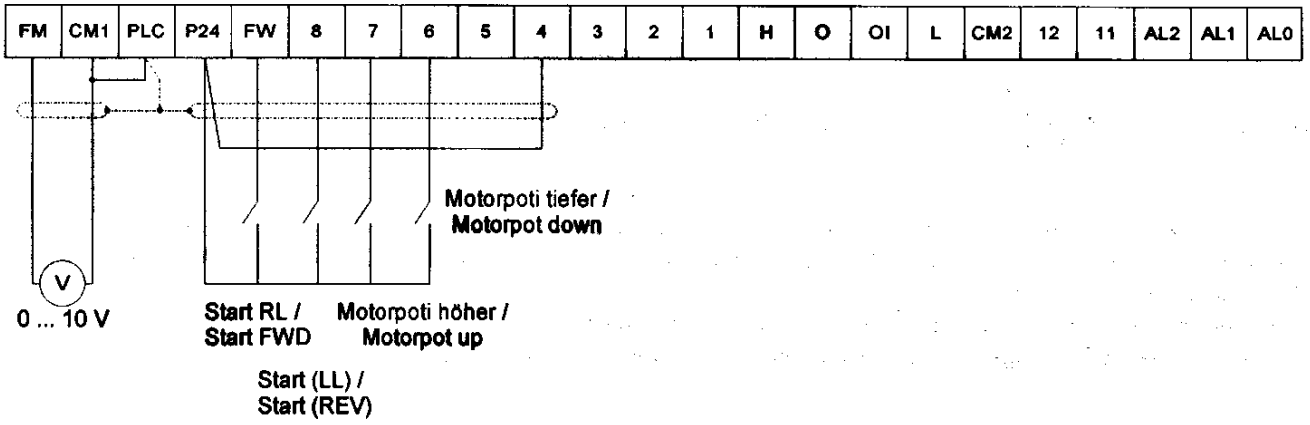



After the above mentioned parameters have been adjusted, the frequency inverter can be started via the input FW in clockwise direction. Input 8 (= REV) will start the equipment in anti-clockwise direction. Closing FW and REV at the same time will cause to stop the inverter.
If one of the preset speed inputs is interconnected with P24 the actual reference value is superimposed. The frequency inverter accelerates or decelerates the motor to the new speed value. The combination of the preset speed inputs can be read at the description of parameters F2 or A12 - A14.

## Motorpotentiometer-Function

Adjust the following parameters: F9 = 00 or 02, A0 = U/f or SVC, F6 = acceleration time,
F7 = deceleration time, F2 = frequency reference, C6 = 27, C5 = 28, C7 = 0 (FD !),

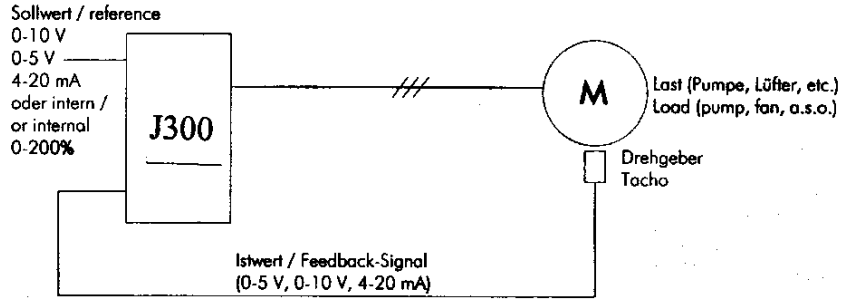
Wiring of the control terminals:




After the above mentioned parameter have been adjusted, the frequency inverter can be started via the input FW in clockwise direction. Input 8 (= REV) will start the equipment in anti-clockwise direction. Closing FW and REV at the same time will cause to stop the inverter. Interconnecting terminal 7 with P24 will cause the inverter to accelerate on to the with F2 adjusted frequency value. Terminal 7 will do the same but the inverter decelerates.

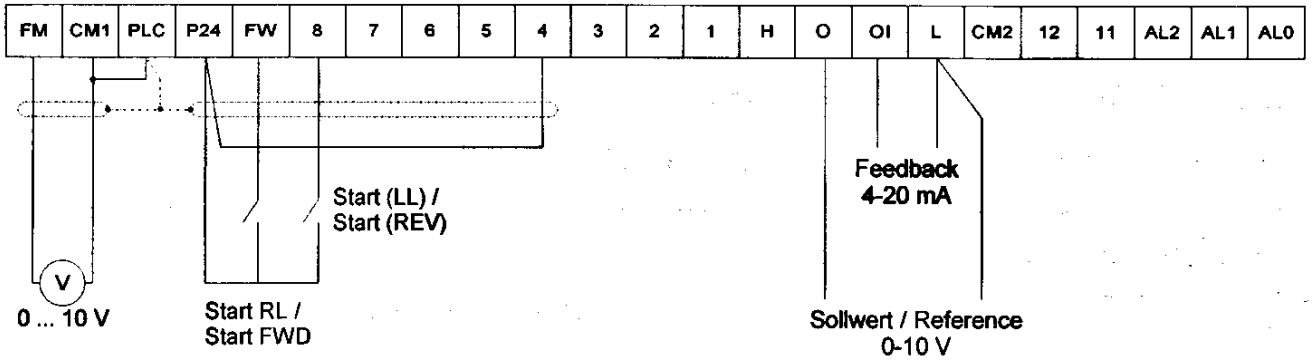
## PID-controller-Function

Scheme




Adjust the following parameters: F9 = 03 (FD I), A0 = U/f or SVC, F6 = acceleration time, F7 = deceleration time, F2 = reference value, C7 = 0 (FD I), A94 = 1, A95 = 1, A90, 91 and 92 according to the requirements

Wiring of the control terminals:




After above mentioned parameters have been adjusted, the frequency inverter can be started via the terminal FW. Due to the adjustment F9 = 03 the controller expects the reference as 0 - 10 V signal on terminals O and L. Parameter 94 = 1 activates the controller and determines 4 - 20 mA as feedback-signal on terminals OI and L.

**Remarks for optimizing the controller:**

If the response is not stabilized in a PID control operation, adjust the gains as follows according to the symptom:

| | |
|---|---|
| a.) The change of controlled variable is slow even when the target value is changed | Increase the P gain |
| b.) The change of controlled variable is fast, but not stable | Decrease the P gain |
| c.) It is difficult to make the target value match with the controlled variable | Decrease the I gain |
| d.) Both the target value and the controlled variable are not stable and match after oscillation | Increase the I gain |
| e.) The response is slow even when the P gain is increased | Increase the D gain |
| f.) The response it not stabilized due to oscillation even when the P gain is increased | Decrease the D gain |

**General remarks:**

- Independent of the built-in PID function even the external PID option can be used. Therefore the parameter A94 must be set to „0".
- The following reference sources are possible: 0-5 V, 0-10 V, 4-20 mA, internal (A96) and preset speeds. If the target value signal is to be entered to an external terminal, the signal should not be assigned to the terminal used by the feed-back signal input. If assigned, no PID operation is possible.
- The internal reference value A96 (0-200 %) corresponds to 0-10 V of analogue voltage input. In other words, if the target value input of 5 V is converted to an internal level, set 100 % for A96.
- If 4-20 mA are entered as target value, one digital input has to be programmed to AT (setting 16) and must be interconnected to P24.

# Technical data Hydrive J300

## General

| Size / Type | Hydrive J300 | 1<br>5,5C7,5P | | 2<br>11C15P | 15C22P |
|---|---|---|---|---|---|

## Drives with high overload "C"

| | | | | | |
|---|---|---|---|---|---|
| Motor rating "C" | typical at 400 V | 5,5 kW | 7,5 kW | 11 kW | 15 kW |
| Output power | at 400 V | 9,0 kVA | 11 kVA | 16 kVA | 22 kVA |
| Nominal output current | "C" | 13 A | 16 A | 23 A | 32 A |
| Maximum current | | 150 % IN "C" for 60 s in 10 min | | | |
| Maximum ambient temperature | | 50°C | | | |

## Drives with high continuous load "P"

| | | | | | |
|---|---|---|---|---|---|
| Motor rating "P" | typical at 400 V | 7,5 kW | 11 kW | 15 kW | 22 kW |
| Output power | at 400 V | 11 kVA | 16 kVA | 22 kVA | 30 kVA |
| Nominal output current | "P" | 16 A | 23 A | 32 A | 44 A |
| Maximum current | | 115 % IN "P" for 30 s in 10 min ( 15 s for Hydrive J300 11kW and above | | | |
| Maximum ambient temperature | | 40°C | | | |

## Mechanical data

| | | | |
|---|---|---|---|
| Mechanical construction | | Built-in unit for vertical mounting,, IP 20 | |
| Cooling | | forced | |
| Dimensions | H x W x D | 340 x 220 x 195 mm | 440 x 250 x 220 mm |
| Weight | app. | 7,5 kg | 13 kg |

## Frequency inverter

| | | | |
|---|---|---|---|
| Input | - Voltage | 3 AC, 380 - 415 V ± 10 % at 50 Hz or 400 - 460 V ± 10 % at 60 Hz | |
| | - Frequency | 50 / 60 Hz ± 5 % | |
| Output | - Voltage | 3 AC, 0 ... 380 - 460 V | |
| | - Frequency | 0,1 ... 120 (400) Hz | |
| | - Max. voltage frequency | 30 ... 120 (400) Hz | |
| | - Min. load, overload | no load proof, short circuit and earth fault protected by overcurrent trip | |
| Braking unit | | built-in for 50 - 60 % MB | external option |
| Braking resistor | internal | built-in for 1,5 % ED | - |
| | external | > 70 W for ED to 30 % | corresponding to the braking option |
| Frequency resolution | | digital 0,01 Hz / 50 Hz, analogue inputs 0,05 Hz / 50 Hz | |
| Frequency accuracy | | digital ± 0,01 % / 50 Hz; analogue ± 0, 1 % / 50 Hz | |
| Ambient-conditions | - Operating temperature | - 10,...+ 50°C at usage of high overload „C" or<br>- 10....+ 40°C at usage of high continuous load „P" | |
| | - Air humidity | 20 - 90 %, no condensing | |
| | - Height | up to 1000 m, above with derating 1 % per 100 m | |

## Drive modulation and control

| | | |
|---|---|---|
| Procedure | - Control | V/f control, switchable to SVC (Sensorless-Vector-Control) |
| | - Switching frequency | 16 kHz „C" or 8 kHz „P", reduceable to 2 kHz in fine steps |
| Control | - manual | via built-in keypad |
| | - 2 analogue inputs | 0...+ (5)10 V or 4 ... 20 mA related to 0V, Ri = 30 kΩ or 250 Ω |
| | - 9 digital inputs | 8 programmable, + 24 V positive or negative logic, galvanically isolated |
| | - 1 analogue output | 0 - 10 V, 1 mA, pulse width modulated, programmable, related to 0V |
| | - 2 digital outputs | open-collector-transistor output, 27 V DC, 50 mA, isolated, programmable |
| | - 1 dig. relay output | 1 change over, 250 V AC, 1 A or 30 V DC, 1 A |
| Auxiliary-voltages | - reference voltage | +10 V, max. 20 mA, short circuit protected |
| | - auxiliary voltage | +24 V, max. 150 mA, short circuit protected via fuse |
| Protection | - Limits | for current, overvoltage, max. and min. frequency, maximum speed, ... |
| | - Trips | for overcurr., over & undervoltage, earth fault, overtemp., overspeed,... |

# Trip messages

The frequency inverters are equipped with protection functions against overcurrent, overvoltage, undervoltage a.s.o.
If a protection function is engaged, the output voltage is shut down, motor coast to a halt and the inverter holds this condition until it is reset.

| Trip message | Description | Cause | Remedy |
|---|---|---|---|
| E1, E31 | Overcurrent or overtemperature in the power module in a static condition | Is the nom. motor current higher than the nom. inverter current ? | Select a bigger frequency inverter. |
| | | Was there a sudden load increase or is the motor stalled ? | Avoid sudden overloads or select a bigger frequency inverter and motor. |
| | | Are the motor terminals U, V, W short circuited ? | Check if motor cables and/or the motor are short circuited. |
| E3 , E33 | Overcurrent or overtemperature in in the power module during acceleration | Is the acceleration time adjusted too short ? | Increase the acceleration time. |
| | | Are the motor terminals U, V, W short circuited ? | Check if motor cables and/or the motor are short circuited. |
| | | Is the voltage boost F8 adjusted too high ? | Decrease F8. |
| | | Is the motor stalled ? | Check motor load and the starting torque. |
| E2, E32 | Overcurrent or overtemperature in the power module during deceleration | Is the deceleration time adjusted too short ? | Increase deceleration time. |
| | | Are the motor terminals U, V, W short circuited ? | Check if motor cables and/or the motor are short circuited. |
| | | Is the braking unit damaged ? | Check the braking unit. |
| E4, E34 | Overcurrent or overtemperature in in the power module during stand still | Is the allowed ambient temperature exceeded ? | Check the ambient temperature. |
| E5 | Internal motor protection is engaged | The internal electronic motor protection has engeged due to an overload of the connected motor | Select a bigger frequency inverter and motor or check the adjustment of the electronic motor protection. |
| | The frequency inverter is in an overload condition | The output current is higher than the nom. inverter current | Select a bigger frequency inverter. |
| E6 | The braking duty (adjusted via A38) is exceeded (ELVOvert SX 5,5 kW and 7,5 kW only) | Is the deceleration time adjusted too short ? | Increase deceleration time. |
| | | Is the duty time adjusted too low ? | Increase the duty time. |
| E7 | DC-link overvoltage | The motor was operated regenerative | Tieflaufzeit verlängern |
| | | Deceleration time ? | Use a braking unit and/or braking resistors. |

| Trip message | Description | Cause | Remedy |
|---|---|---|---|
| E8 | EEPROM fault | Are the data changed often ? | The EEPROM´s life time is about 10000 storages (related to 10 years and some storages per day). |
| E9 | Mains undervoltage | Is the mains voltage within the allowed limits ?<br><br>Are there instantaneous power failures ? | Check the mains voltage. |
| E10 | Defective current transformers | Defective current transformer | Change the current transformer. |
| E11 | CPU error | Is there a large electromagn. noise source near the frequency inverter ?<br><br>Is the frequency inverter defective ? | Check the surrounding of the frequency inverter on possible trip causes, like external wiring.<br><br>The inverter must be repaired. Call the supplier of the unit. |
| E12 | External trip | External trip message on the terminal EXT<br><br>Was the input EXT inverted ? | Correct the external wiring.<br><br>Check the adjustment of parameter C20. |
| E13 | Trip is caused by engaged USP function | Was the mains voltage switched on during engaged USP function ?<br><br>Was there an instananeous power failure during operation and activated USP function ? | Activate the USP function after switching on the mains voltage.<br><br>Check the mains voltage. |
| E14 | Earth fault on the motor terminals | Is there an earth fault between U, V, W and ground ? | Correct the earth fault and check the motor. |
| E15 | Overvoltage on the input terminals | Is the input voltage higher than the with F11 specified value or 500...530 V, then the frequency inverter will trip after appr. 5 s | Check the input voltage. |
| E16 | Instantaneous power failure | Are there instananeous power failures for more than 15 ms ? | Check the input voltage. |
| E17 | Bad connection on optinal connector 1 | A data transmission error between frequency inverter and optional connector 1 has occured | Check the coonection of the optional card. |
| E18 | Bad connection on optinal connector 2 | A data transmission error between frequency inverter and optional connector 2 has occured | Check the coonection of the optional card. |

| Trip message | Description | Cause | Remedy |
|---|---|---|---|
| E19 | Error on the optional card 1 | A trip has occured on the optional card 1 | Reset. |
| E20 | Error on the optional card 2 | A trip has occured on the optional card 2 | Reset. |
| E24 | Phase failure | One phase of the input voltage is missing or the input voltage was shut off during deceleration | Check the input voltage. |
| No display | Inverter keypad display does not appear and power charge lamp does not light after power ON | Due to a malfunction of the MOSFET on the power supply PCB the fuse DP12 (glass tube, 250 V, 2 A) has been damaged or is blown. | Check the fuse DP12 on the power supply PCB and replace it if necessary. |

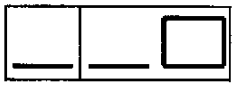
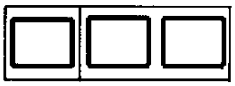
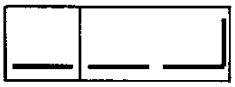
Trip messages can be reset. There are the following possibilities:

- Reset via input RS
- Reset via the STOP/RESET key on the keypad
- Mains switch-off

Remark: An inverter which operates without any failure will decelerate to 0 Hz, if an reset signal is released !!

If the failure message remains after performing a reset,
please call a technician or the supplier of the unit.service

## Other displays

| Display | Description |
|---|---|
|  | The reset signal is executed for more than 6 s.<br>Press either the UP- or DOWN key or switch off the mains voltage. |
|  | The adjusted value has more than 3 digits in length. |
|  | It is displayed when power is turned off. |
|  | The auto-tuning operation terminates normally. |
|  | This is not an abnormal operation because the instantaneous stop restart function is being performed (when 1 to 3 is selected by parameter A34). |
|  | The auto-tuning operation terminates abnormally. |
|  | The frequency inverter is waiting due to insufficient voltage.<br>After recovery, the original display appears. |
|  | There is no trip history available. |