VA TECH ELIN EBG Elektronik

Operating and Mounting instructions

>pDRIVE< CX profi

The Power Drives Company

ELIN EBG Elektronik

Safety instructions

General information, note exactly !

The requirements for a successfull commissioning are a correct selection of the unit, projection and mounting. In case of further questions, please contact the supplier or call the manufacturer of the unit directly.

Capacitor discharge !

Before any work on or in the unit, disconnect from the mains and wait at least 5 minutes until the D.C.link capacitors have been fully discharged. Check that the device is no longer alive by measuring the voltage at the D.C.link capacitor.

Automatic restart !

In case of certain parameter adjustments it may happen that the frequency inverter starts up automatically after switching on the mains again. You have to guarantee, that no person and no other equipment is in danger.

Commissioning and service !

Works on or in the unit must only be undertaken by properly qualified staff in full compliance of the appropriate instructions and pertinent regulations. Note that a fault may cause potential-free contacts and/or PCBs to carry mains potential. To avoid any risk to humans, obey the regulations concering "Work on Live Equipment" explicitly.

Delivery conditions:

Our deliveries and services are based on the "General Terms of Delivery of the Austrian Electrical Industries" latest edition.

Specifications in this instruction:

We are constantly striving to improve our products and adapt them to the latest state of technical development. We therefore reserve the right to modify the specifications given in this instruction at any time, particulary those refering to measures and dimensions. All planning hints and connecting samples are non-binding suggestions, for which we are unable to assume any liability, particulary since the regulations to be complied with depend on the type and location of the plant and on the use of the instruments.

Regulations:

It is the users responsibility to ensure that the instrument and its component parts are used in compliance with applicable regulations. It is not permitted to use these instruments in residential areas without special measures to supress radio frequency interferences.

Patent and Trade Marks:

Please note that we do not guarantee any connections, instruments or processes described herein to be free from patent or trademark right of third parties.

Keep this instruction near the unit to hand !

Operating and Mounting the Frequency inverter

>*pDRIVE*< CX *profi*

11...37 kW, 3 AC 380...480 V

This manual includes the topics operating, description of parameters and displays, projecting, mounting, connection and options.

Regulations for the observance of the CE-directive and the new Power-Drive-Standard (EN 61800-3) are described in chapter “CE Marking”.

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

Operating using the control panel built-in

Description of the control panel

Configurable
LED display

RUN button
starts the inverter when it is not controlled via the terminal strip

POTENTIOMETER
to adjust the frequency. The LED lights up as soon as the frequency can be set using the potentiometer

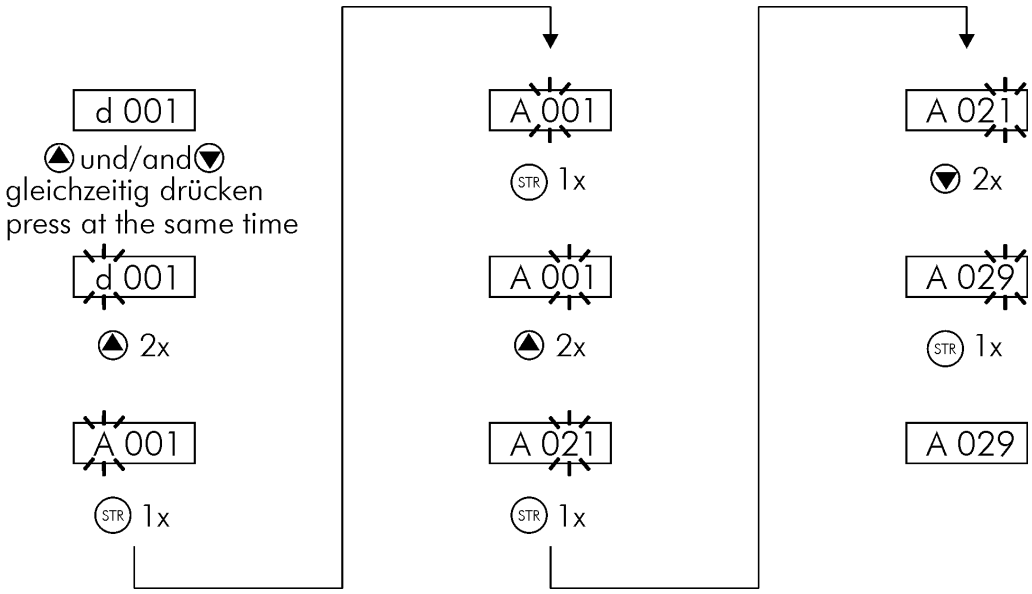
STOP/RESET button
to stop the motor or confirm error

FUNC button
to switch between display level, 1st and 2nd control level

UP/DOWN buttons
for editing data and for parametrization

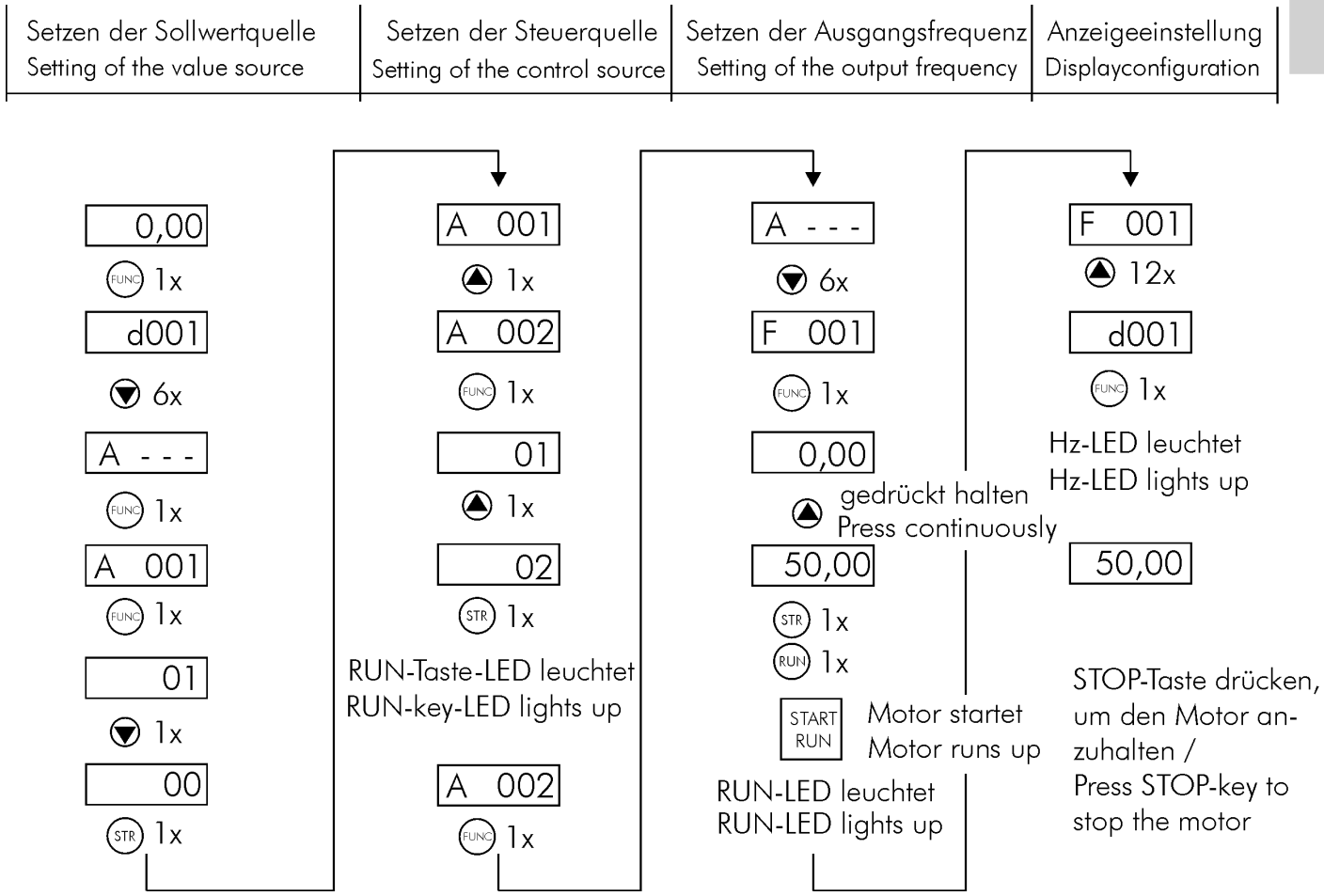
STR button
to save new data and parameter settings

Quick navigation and adjustment of parameters

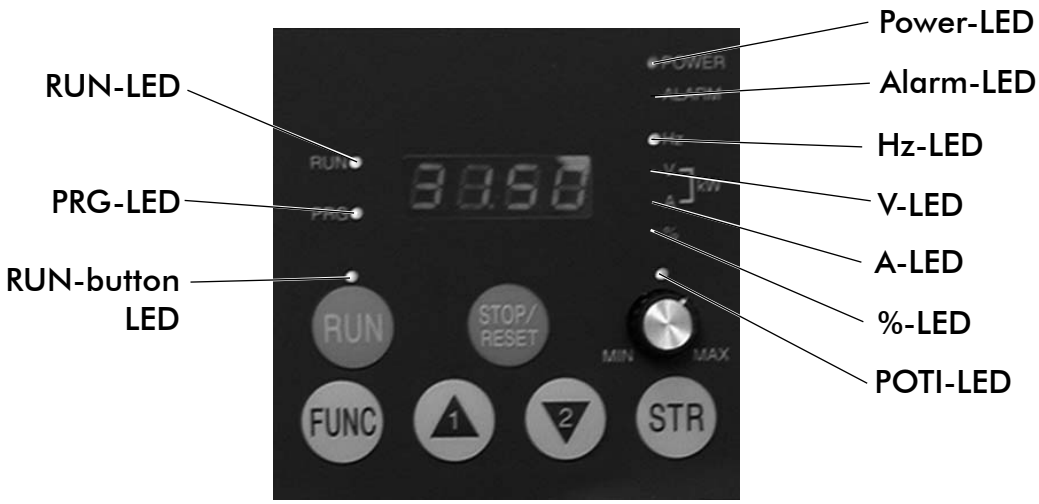


The method described above is used for quick selection of parameters. Also the adjustmend of parameters can be handled in this way.

Example of programming to set the frequency and to start the inverter



LEDs on the control panel



Power-LED:
lights up when the inverter is connected to mains supply, that means there is a voltage.

Alarm-LED:
lights up in case of a trip at the inverter.

Hz-LED:
indicates that the value of the display shows frequency in hertz.

V-LED:
lights up if the value of the display is the voltage in volts or the power in kW.

A-LED:
indicates that the value of the display shows motor current in amperes or the power in kW.

%-LED:
lights up if the value of the display shows an parameter in %.

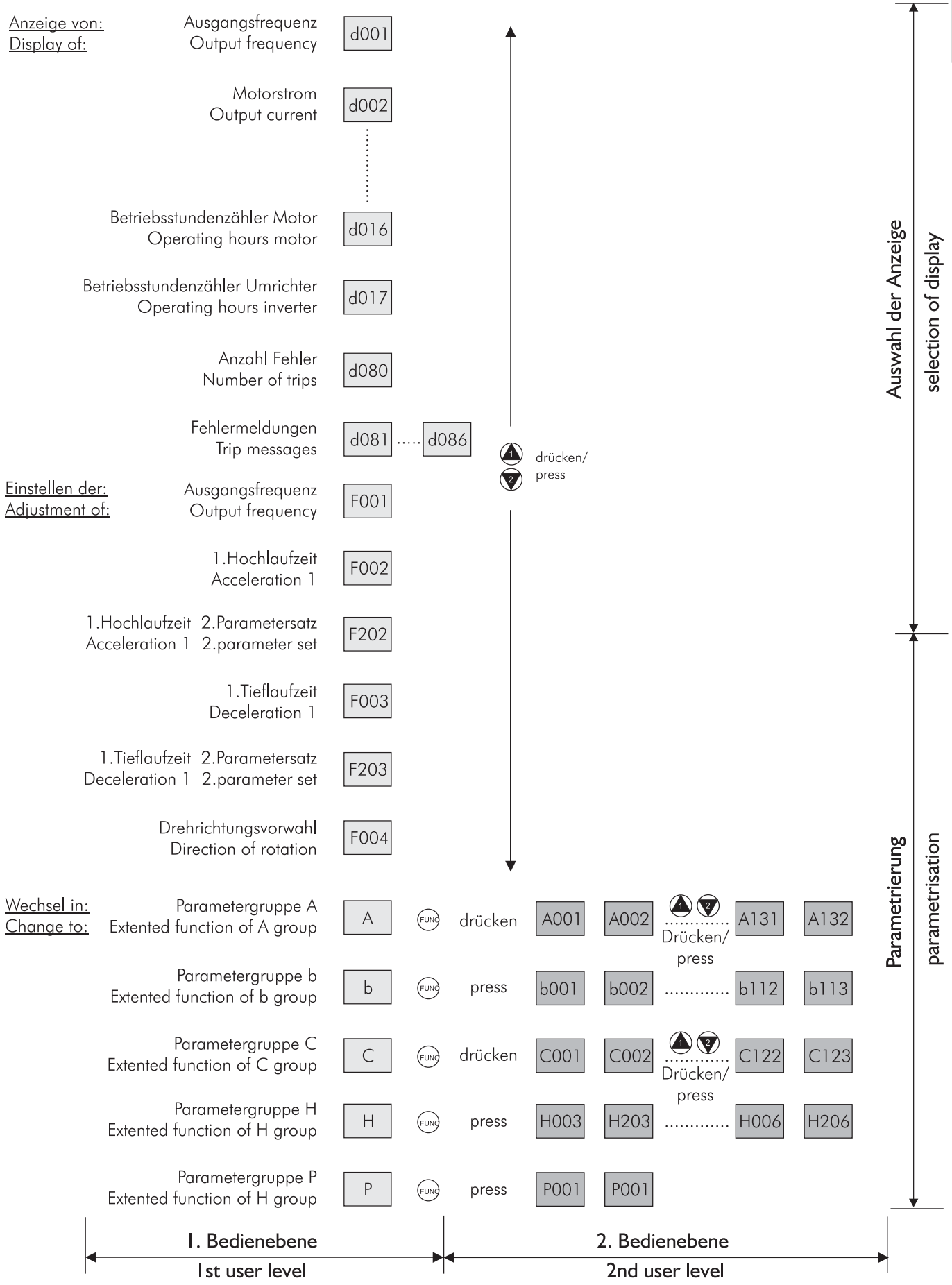
POTENTIOMETER-LED:
lights up if parameter A001 is set to 00; that means the frequency reference value is defined on the control panel by the potentiometer.

RUN-button-LED:
indicates that the motor can be started at any time by pressing the RUN button.
Flashes as soon as parameter A002 is set to 02.

PRG-LED:
lights up as soon as a parameter of the 2nd control level or one of parameters d001 or F001 to F004 is called.
Lights up if you try to change a parameter during an alarm message.

RUN-LED:
lights up as soon as the motor exceeds the start-up frequency or runs up.

Overview of control levels



Changing the indication of the LED display:

1.) Switch to the 1st user level using the FUNC button.
2.) Use the UP/DOWN buttons to select the required display.
3.) Press the STR button to confirm the selection and to return to the display level.

Changing parameter settings on the 1st control level:

1.) Switch to the 1st control level using the FUNC button.
2.) Use the UP/DOWN buttons to select the required parameter.
3.) Press the FUNC button to switch to setting mode.
4.) Use the UP/DOWN buttons to enter the new setting.
5.) Press the STR button to confirm, save and return to 1st control level. Press the FUNC button to return to the 1st control level without saving.
6.) Select the required display (e.g. d001) and press the FUNC button to confirm.

Changing parameter settings on the 2nd control level:

1.) Switch to the 1st control level using the FUNC button.
2.) Use the UP/DOWN buttons to select the required parameter group A, b, C, H or P.
3.) Press the FUNC button to enter the selected parameter group (2nd control level).
4.) Use the UP/DOWN buttons to select the required parameter.
5.) Press the FUNC button to switch to setting mode.
6.) Use the UP/DOWN buttons to enter the new setting.
7.) Press the STR button to confirm, save and return to 2nd control level. Press the FUNC botton to return to 2nd control level without saving.
8.) Press the FUNC button to return to the 1st control level.
9.) Select the required display (e.g. d001) and press the STR button to confirm.

Overview of parameters

The following overviwe shows all parameters arranged according to their functions.

	Display actual values Parameter name	Adjusting range	Factory default	See page
d001	Output frequency	read only	-	16
d002	Output current	read only	-	16
d003	Direction of rotation	read only	-	16
d004	PID controller feedback	read only	-	16
d005	Condition of digital inputs	read only	-	17
d006	Condition of digital outputs	read only	-	17
d007	Output frequency scaled	read only	-	17
d013	Output voltage	read only	-	17
d014	Output power	read only	-	17
d016	Operating hours motor	read only	-	17
d017	Operating hours inverter	read only	-	17

	Base settings Parameter name	Adjusting range	Factory default	See page
A003	Base frequency	30...400 Hz	50 Hz	18
A004	Maximum frequency	30...400 Hz	50 Hz	18
F002	1st Acceleration ramp	0,01...3600 s	30 s	18
F003	1st Deceleration ramp	0,01...3600 s	30 s	18
F001	Output frequency	0,00...400,0 Hz	-	18
A020	Internal pre-set speed if A001=02	0,00...400,0 Hz	0,00 Hz	18
A001	Method of speed command	00 to 05	01	19
A002	Method of run command	01 to 05	01	19

	Analog inputs Parameter name	Adjusting range	Factory default	See page
A011	External frequency start O (0...10V)	0,00...400,0 Hz	0,00 Hz	19
A101	External frequency start OI (4...20mA)	0,00...400,0 Hz	0,00 Hz	19
A111	External frequency start O2 (-10...+10V)	-400,0...+400,0 Hz	0,00 Hz	19
A012	External frequency end O (0...10V)	0,00...400,0 Hz	0,00 Hz	19
A102	External frequency end OI (4...20mA)	0,00...400,0 Hz	0,00 Hz	19
A112	External frequency end O2 (-10...+10V)	-400,0...400,0 Hz	0,00 Hz	19
A013	Analog signal ref. for Start O (0...10V)	0...100 %	0 %	19
A103	Analog signal ref. for Start OI (4...20mA)	0...100 %	0 %	19
A113	Analog signal ref. for Start O2 (-10...+10V)	-100...+100 %	-100 %	19
A014	Analog signal reference for end O (0...10V)	0...100 %	100 %	20
A104	Analog signal ref. for end OI (4...20mA)	0...100 %	100 %	20
A114	Analog signal ref. for end O2 (-10...+10V)	-100...+100 %	100 %	20
A015	External frequency start pattern O (0...10V)	00 or 01	01	20
A105	Ext. frequency start pattern OI (4...20mA)	00 or 01	01	20
A005	AT Terminal selection	00 or 01	01	21
A006	O2 Control selection	00 to 02	00	21
A016	Time constant for analog signals	1...30	30	21
C081	Adjustment 0...10 V input	0...9999	Default	22
C082	Adjustment 4...20 mA input	0...9999	Default	22
C083	Adjustment -10...+10 V input	0...9999	Default	22
C121	Offset-adjustment 0...10 V input	0...9999	Default	22
C122	Offset-adjustment 4...20 mA input	0...9999	Default	22
C123	Offset-adjustment -10...+10 V input	0...9999	Default	22

	Multispeeds Parameter name	Adjusting range	Factory default	See page
A019	Multi speed selection	00 or 01	00	22
A021	Multi speed 1	0,00...400,0 Hz	0,00 Hz	22
A022	Multi speed 2	0,00...400,0 Hz	0,00 Hz	22
A023	Multi speed 3	0,00...400,0 Hz	0,00 Hz	22
A024	Multi speed 4	0,00...400,0 Hz	0,00 Hz	22
A025	Multi speed 5	0,00...400,0 Hz	0,00 Hz	22
A026	Multi speed 6	0,00...400,0 Hz	0,00 Hz	22
A027	Multi speed 7	0,00...400,0 Hz	0,00 Hz	22
A028	Multi speed 8	0,00...400,0 Hz	0,00 Hz	22
A029	Multi speed 9	0,00...400,0 Hz	0,00 Hz	22
A030	Multi speed 10	0,00...400,0 Hz	0,00 Hz	22
A031	Multi speed 11	0,00...400,0 Hz	0,00 Hz	22
A032	Multi speed 12	0,00...400,0 Hz	0,00 Hz	22
A033	Multi speed 13	0,00...400,0 Hz	0,00 Hz	22
A034	Multi speed 14	0,00...400,0 Hz	0,00 Hz	22
A035	Multi speed 15	0,00...400,0 Hz	0,00 Hz	22
A038	Jogging frequency	0,00...9,99 Hz	1,00 Hz	23
A039	Stop mode of jog function	00 to 05	00	23

V/f	**V/f characteristic** Parameter name	Adjusting range	Factory default	See page
A041	Torque boost method selection	00 or 01	00	24
A042	Manual torque boost setting	0,0...20,0 %	1,0 %	24
A043	Manual torque boost frequency point	0,0...50,0 %	5,0 %	24
A044	V/f characteristic setting	00 to 02	00	24
A045	Voltage gain setting	20...100 %	100 %	25
b036	Start reduced voltage selection	00 to 06	00	25
b100	Free adjustable V/f: frequency 1	0...b102	0 Hz	25
b101	Free adjustable V/f: voltage 1	0,0...800,0 V	0,0 V	25
b102	Free adjustable V/f: frequency 2	0...b104	0 Hz	25
b103	Free adjustable V/f: voltage 2	0,0...800,0 V	0,0 V	25
b104	Free adjustable V/f: frequency 3	0...b106	0 Hz	25
b105	Free adjustable V/f: voltage 3	0,0...800,0 V	0,0 V	25
b106	Free adjustable V/f: frequency 4	0...b108	0 Hz	25
b107	Free adjustable V/f: voltage 4	0,0...800,0 V	0,0 V	25
b108	Free adjustable V/f: frequency 5	0...b110	0 Hz	25
b109	Free adjustable V/f: voltage 5	0,0...800,0 V	0,0 V	25
b110	Free adjustable V/f: frequency 6	0...b112	0 Hz	25
b111	Free adjustable V/f: voltage 6	0,0...800,0 V	0,0 V	25
b112	Free adjustable V/f: frequency 7	0...400 Hz	0 Hz	25
b113	Free adjustable V/f: voltage 7	0,0...800,0 V	0,0 V	25

(◯)	**DC brake** Parameter name	Adjusting range	Factory default	See page
A051	Selection of DC braking	00 or 01	00	26
A052	DC braking: frequency	0,00...60,00 Hz	0,50 Hz	26
A053	DC braking: waiting time	0,0...5,0 s	0,0 s	26
A054	DC braking: braking torque	0...70 %	0 %	26
A055	DC braking: braking time	0,0...60,0 s	0,0 s	26
A056	DC braking: edge/level selection	00 or 01	01	26
A057	DC braking: braking torque (start)	0...70,0 %	0 %	26
A058	DC braking: braking time (start)	0,0...60,0 s	0,0 s	26
A059	DC braking: carrier frequency	0,5...12,0 kHz	3,0 kHz	26
b090	Dynamic braking ratio	0,0...100,0 %	0,0 %	29
b095	Dynamic braking selection	00 to 02	00	29
b096	Dynamic braking ON-level	660...760 V	720 V	29

Hz	**Frequency limits** Parameter name	Adjusting range	Factory default	See page
A061	Frequency upper limit	0,00...400,0 Hz	0,00 Hz	29
A062	Frequency lower limit	0,00...400,0 Hz	0,00 Hz	29
A063	1st Jump frequency	0,00...400,0 Hz	0,00 Hz	30
A064	1st Jump frequency width	0,00...10,0 Hz	0,50 Hz	30
A065	2nd Jump frequency	0,00...400,0 Hz	0,00 Hz	30
A066	2nd Jump frequency width	0,00...10,0 Hz	0,50 Hz	30
A067	3rd Jump frequency	0,00...400,0 Hz	0,00 Hz	30
A068	3rd Jump frequency width	0,00...10,0 Hz	0,50 Hz	30

PID	**PID Configuration** Parameter name	Adjusting range	Factory default	See page
A071	Selection of PID function: ON/OFF	00 or 01	00	32
A072	PID controller: Proportional gain (kp)	0,2...5,0	1,0	32
A073	PID controller: Integral gain(Tn)	0,0...3600 s	1,0	32
A074	PID controller: Differential gain(Tv)	0,00...100,0 s	0,00	32
A075	PID controller: Scale conversion	0,01...99,99	1,00	33
A076	PID controller: Feedback destination	00 or 01	00	33
C044	PID controller: Level of deviation	0...100 %	3,0 %	33

V/f	**Automatic voltage regulation** Parameter name	Adjusting range	Factory default	See page
A081	Selection of AVR function	00 to 02	02	34
A082	Selection of voltage for AVR	380...480 V	400 V	34

2. Hz	**Ramp adjustment** Parameter name	Adjusting range	Factory default	See page
A092	2nd Acceleration ramp	0,01...3600 s	15,00 s	34
A093	2nd deceleration ramp	0,01...3600 s	15,00 s	34
A094	Select method of 2nd stage	00 or 01	00	34
A095	Switch-over 1./2. acceleration ramp	0,00...400,0 Hz	0,00 Hz	35
A096	Switch-over 1./2. deceleration ramp	0,00...400,0 Hz	0,00 Hz	35
A097	Pattern of acceleration ramp	00 to 03	00	35
A098	Pattern of deceleration ramp	00 to 03	00	35
A131	Acceleration curve constant	01 to 10	02	35
A132	Deceleration curve constant	01 to 10	02	35
b091	Stopping mode selection	00 or 01	00	35
A069	Acceleration stop frequency	0,00...400,0 Hz	0,00 Hz	35
A070	Acceleration stop time	0,0...60,0 s	0,0 s	35

	Thermal protection Parameter name	Adjusting range	Factory default	See page
b012	Electronic overload setting	0,2...1,2 x IFI	FI-INOM	36
b013	Electronic overload characteristic	00 to 02	01	36
b015	Free electronic thermal: frequency 1	0...400 Hz	0 Hz	36
b016	Free electronic thermal: current 1	0,0...1000 A	0,0 A	36
b017	Free electronic thermal: frequency 2	0...400 Hz	0 Hz	36
b018	Free electronic thermal: current 2	0,0...1000 A	0,0 A	36
b019	Free electronic thermal: frequency 3	0...400 Hz	0 Hz	36
b020	Free electronic thermal: current 3	0,0...1000 A	0,0 A	36

	Overload protection Parameter name	Adjusting range	Factory default	See page
b021	Selection of 1st overload restriction	00 to 02	01	37
b022	Level of 1st overload restriction	0,5...1,5 x IFI	1,20 x IN	37
b023	Rate of 1st decel. at overload restriction	0,10...30,00 s	1,00 s	37
b024	Selection of 2nd overload restriction	00 to 02	01	37
b025	Level of 2nd overload restriction	0,5...1,5 x IFI	1,20 x IN	37
b026	Rate of 2nd decel. at overload restriction	0,10...30,00 s	1,00 s	37

	Digital inputs Parameter name	Adjusting range	Factory default	See page
C001	Function of input 1	01 to 39, NO	18	38
C002	Function of input 2	01 to 39, NO	16	38
C003	Function of input 3	01 to 39, NO	03	38
C004	Function of input 4	01 to 39, NO	02	38
C005	Function of input 5	01 to 39, NO	01	38
C011	Condition of input C01	00 or 01	00	45
C012	Condition of input C02	00 or 01	00	45
C013	Condition of input C03	00 or 01	00	45
C014	Condition of input C04	00 or 01	00	45
C015	Condition of input C05	00 or 01	00	45
C019	Condition of input FW	00 or 01	00	45
b098	Thermistor type seleciton	00 to 02	00	45
b099	Thermistor error level	0...9999 Ω	3000 Ω	45
C085	Standardization of thermistor input	0...100	Default	45
C101	Reference up/down selecteion	00 or 01	00	45
C102	Reset function selection	00 to 02	00	45
C103	Neustart nach Reset	00 or 01	00	45

	Digital outputs Parameter name	Adjusting range	Factory default	See page
C021	Function of relay 11	00 to 13	01	46
C022	Function of relay 12	00 to 13	00	46
C026	Function of relay AL	00 to 13	05	46
C031	Relay output 11: Inversion	00 or 01	00	48
C032	Relay output 12: Inversion	00 or 01	00	48
C036	Relay output AL: Inversion	00 or 01	01	48

	Output functions Parameter name	Adjusting range	Factory default	See page
C040	Overload signal output mode	00 or 01	00	49
C041	Level of overload signal 1	0...2 x INOM	INOM	49
C042	Arrival signal for Acceleration 1	0,0...360,0 Hz	0,0 Hz	49
C043	Arrival signal for Deceleration 1	0,0...360,0 Hz	0,0 Hz	49
C061	Level of thermal motor protection	0...100 %	80 %	50
b034	Run/Power on time	0...9999	0	50

	Undervoltage / Autoreset Parameter name	Adjusting range	Factory default	See page
b001	Selection of restart mode	00 to 03	00	50
b002	Allowable undervoltage time	0,3...1,0 sec	1,0 sec	50
b003	Retry waiting time	0,3...100,0 sec	1,0 sec	50
b004	Undervoltage trip during stop	00 to 02	00	51
b005	Undervoltage Number of retry	00 or 01	00	51
b006	Input phase loss protection	00 or 01	00	51
b007	Matching frequency setting	0,00...400,0 Hz	0,00Hz	51

	General functions Parameter name	Adjusting range	Factory default	See page
F004	Running direction of RUN key	read only	00	51
b035	Direction restriciton (input)	00 to 02	00	52
b082	Start frequency adjustment	0,10...9,99 Hz	0,50 Hz	52
b083	Carrier frequency setting	0,5...12,0 kHz	3,0 kHz	52
b086	Frequency converted value setting	0,1...99,9	1,0	52
b087	Selection of STOP key	00 or 01	00	52
b088	After FRS cancelled	00 or 01	00	52
b092	Cooling fan control	00 or 01	00	53
b037	Display selection	00 to 02	00	53

	Motor data Parameter name	Adjusting range	Factory default	See page
H003	Motor kW rating	0,20...75,0 kW	Default	53
H004	Motor poles	2 / 4 / 6 / 8	4	53
H006	Motor stabilisation constant	0...255	100	53

	2nd Set Parameter name	Adjusting range	Factory default	See page
A203	2nd Base frequency	30...400 Hz	50 Hz	53
A204	2nd Maximum Frequency	30...400 Hz	50 Hz	53
F202	2nd Acceleration ramp	0,01...3600 s	30 s	53
F203	2nd Deceleration ramp	0,01...3600 s	30 s	54
A220	2nd Internal pre-set speed	0,00...400,0 Hz	0,00 Hz	54
A241	2nd Torque boost method selection	00 or 01	00	54
A242	2nd Manual torque boost setting	0,0...20,0 %	1,0 %	54
A243	2nd Manual torque boost frequency point	0,0...50,0 %	5,0 %	54
A244	2nd V/f characteristic setting	00 to 02	00	54
A261	2nd Frequency upper limit	0,00...400,0 Hz	0,00 Hz	54
A262	2nd Frequency lower limit	0,00...400,0 Hz	0,00 Hz	54
A292	2nd Second acceleration ramp	0,01...3600 s	15,00 s	55
A293	2nd Second deceleration ramp	0,01...3600 s	15,00 s	55
A294	2nd Method of second stage selection	00 or 01	00	55
A295	2nd Stage Acceleration change over point	0,00...400,0 Hz	0,00 Hz	55
A296	2nd Stage Deceleration change over point	0,00...400,0 Hz	0,00 Hz	55
b212	2nd Electronic overload setting	0,2...1,2 x IFIIN	FU-INOM	55
b213	2nd Selection of electronic overload charact.	00 to 02	01	55
H203	2nd Motor kW rate	0,20...75,0 kW	Default	55
H204	2nd Motor poles	2 / 4 / 6 / 8	4	55
H206	2nd Motor stabilisation constant	0...255	100	55

	Analog outputs Parameter name	Adjusting range	Factory default	See page
C027	Function of FM PWM output	00 to 07	00	56
C028	Function of AM analog output	00 to 07	00	56
C029	Function of AMI analog output	00 to 07	00	56
b080	AM analog adjustment	0...255	180	57
b081	FM PWM meter adjustment	0...255	60	57
C087	AMI analog adjustment	0...255	50	57
C086	AM analog offset	0,0...10,0 V	Default	57
C088	AMI analog offset	0,0...20,0 mA	Default	57

	Energy saving Parameter name	Adjusting range	Factory default	See page
A085	Operation mode selection	00 or 01	00	57
A086	Energy saving response	0,0...100,0	50,0	57

RS485	**Serial communication** Parameter name	Adjusting range	Factory default	See page
C070	Data command	02 to 05	02	58
C071	Transmission speed	02 to 06	04	58
C072	Identification code	1...32	1	58
C073	Data bits	7 or 8	7	58
C074	Parity	00 to 02	00	58
C075	Number of Stop bits	1 or 2	1	58
C078	Waiting time	0...1000 ms	0	58

1 2 PCB	**Option cards** Parameter name	Adjusting range	Factory default	See page
P001	Option 1 Selection on error	00 or 01	00	58
P002	Option 1 Selection on error	00 or 01	00	58

	Software lock, Factory default Parameter name	Adjusting range	Factory default	See page
b031	Software lock	00 to 10	01	59
b084	Factory default setting	00 to 02	00	59
b085	Kind of factory default	00 to 03	01	59

	Fault memory Parameter name	Adjusting range	Factory default	See page
d080	Number of trips	read only	-	61
d081 ... d086	Trip messages	read only	-	61
d090	Warning monitor	read only	-	65

Commissioning

Before working with the equipment check following points:

1.) Check that mains supply and motor cables are connected properly.
2.) Are the control lines properly connected to the right terminals ?
3.) s the frequency inverter properly grounded and assembled ?
4.) Remove installation residues, such as cable residues, in order to avoid short circuits.
5.) Are all screws and terminals tight ?
6.) Is the motor designed for the intended frequency range, in particular for the maximum frequency ?

Factory defalut (initialisation):

All *>pDRIVE< CX* frequency inverters are initialised on delivery, i.e. with the default settings (default) entered. The devices can be reset to these defaults settings at any time.

To reset the default settings, proceed as follows:

1.) Adjust parameter b084 to setting 01.
2.) Select the European configuration with parameter b085=01 (= default setting).
3.) Press the FUNC, UP and DOWN buttons at the same time.
4.) Hold these three buttons and press the STOP/Reset button to confirm.
5.) The inverter automatically starts initialisation. (The relevant country setting appears on the display). If "d001" appears on the diplay, the procedure has finished.

Note:
If the software lock is active, a reset to factory default is not possible.

Commissioning via the built-in keypad:

The built-in control panel allows to control the frequency inverter without additional wiring of the control terminals.

1.) Switch on the mains supply; the Power LED on the control panel lights up.
2.) Set parameter A002 to 02.
3.) The LED above the RUN button lights up.
4.) SSet parameter A001 to 00.
5.) The LED above the potentiometer lights up. Press the RUN button and turn the potentiometer. The motor starts turning and the RUN LED lights up.
6.) Press the STOP button to stop the motor.

Check the following points after commissioning:

1.) Did the motor turn in the right direction ?
2.) Was there an error message during acceleration or deceleration ?
If the error message Overcurrent or Overvoltage appeared, increase the acceleration or deceleration time.
3.) Were there any abnormal motor noises or vibrations ?

Description of parameters

The parameters of the >*pDRIVE*< *CX* are arranged and described according to their functions.

The following example explains the attributes of parameters:

A038	Jogging frequency	VIC	0,0...9,9 Hz	1,0 Hz

Name of parameter
Number of parameter
Group of parameter
Factory default
Adjusting range

Parameter description:

- adjustable only if software lock is open 1.)
- adjustable in pulse lock state 2.)
- parameter is adjustable

1.) see parameter b031

2.) If such parameters are adjusted, no start command is accepted during adjustment. Impulse contacts and retained commands will be ignored as long as the inverter is still in setting mode.

Display actual values

d001	Output frequency	-	read only	-

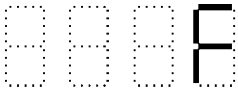
Displays the output frequency on the LED display.
If this display mode is selected, the Hz-LED right of the display lights up.

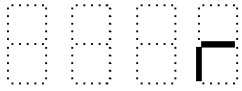
d002	Output current	-	read only	-

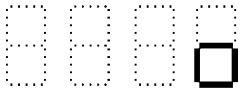
Displays the motor current on the LED display.
If this display mode is selected, the A-LED right of the display lights up.

d003	Direction of rotation	-	read only	-

Displays the direction of rotation on the display.


Rechtslauf/forward

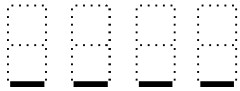

Linkslauf/reverse


Stop

d004	PID controller feedback	-	read only	-

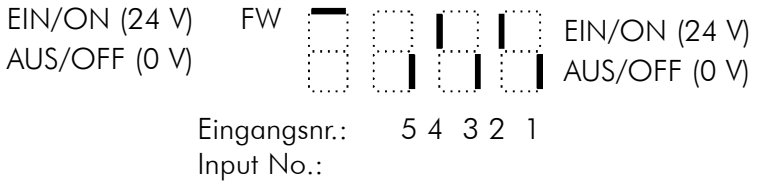
Displays the actual PID controller value scaled using parameter A075.
Display = Feedback PID controller x A075

If the PID controller is not active, the display shows:



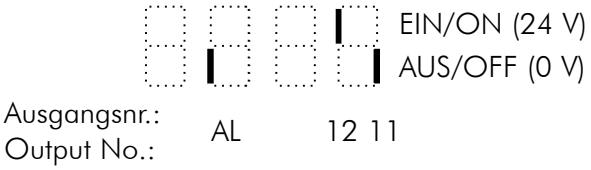
d005	Condition of digital inputs	-	read only	-

Status display (ON/OFF) of digital inputs on the LED display.



d006	Condition of digital outputs	-	read only	-

Status display (ON/OFF) of digital outputs on the LED display.



d007	Output frequency scaled	-	read only	-

Displays the scaled output frequency on the LED display. The scaling factor can be set using parameter b086.
Display = Output frequency * b086
This function is used e.g. for converting the frequency into speed.

d013	Output voltage	-	read only	-

Displays the output voltage on the LED display.
If this display mode is selected, the V-LED right of the display lights up.

d014	Output power	-	read only	-

Displays the output power on the LED display.
If this display mode is selected, the A-LED and V-LED right of the display light up.

d016	Operating hours motor	-	read only	-

Displays the operating hours of the motor with d016, that means the time how long the inverter is in operating (Run) state.

0. - 9999.	Operating hours x1
1000 - 9999	Operating hours x10

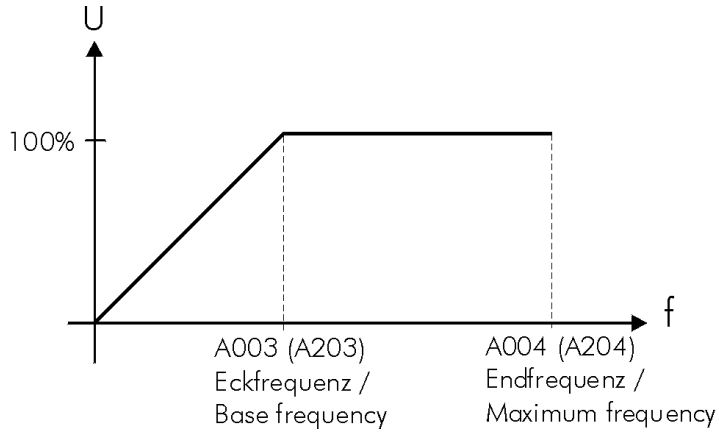
d017	Operating hours inverter	-	read only	-

Displays the operating hours of the inverter, that means the time how long the inverter is supplied with voltage.

0. - 9999.	Operating hours x1
1000 - 9999	Operating hours x10

A003	Base frequency	VIC	30...400 Hz	50 Hz

Adjustment of the base frequency. The base frequency is the frequency at which the output voltage reaches its maximum value. Normally, the base frequency is equal to the nominal motor frequency.



A004	Maximum frequency	VIC	30...400 Hz	50 Hz

Adjustment of maximum frequency. Between base frequency and maximum frequency the output voltage is constant (field suppression).

F002	1st Acceleration ramp	VC	0,01...3600 s	30 s

Setting of required acceleration time. The time is in reference with the range from 0 Hz to maximum frequency (parameter A004).

F003	1st Deceleration ramp	VC	0,01...3600 s	30 s

Setting of required deceleration time. The time is in reference with the range from 0 Hz to maximum frequency (parameter A004).

F001	Output frequency	VC	0,00...400,0 Hz	-

Setting the reference value in MANUAL operation via the buttons at the keypad instead of the potentiometer. Therefore, parameter A001 must be set to position 02.

A020	Internal pre-set speed if A001=02	VC	0,00...400,0 Hz	0,00 Hz

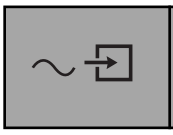
Entry of frequency reference value, if function A001 is set to position 02. Allows the entry of a minimum frequency to which the inverter runs up without selecting a digital input “CF1...CF4” as soon as a Start-command is issued.
If the PID controller is active, the adjusting range changes into 0 to 100 %.

A001	Method of speed command	VIC	00 to 05	01

Setting	Reference via
00	Potentiometer on the keypad
01	Control terminals (analog inputs or multi speeds)
02	Parameter F001, A020/A220 or motorpotentiometer
03	RS 485
04	Option 1
05	Option 2

A002	Method of run command	VIC	01 to 05	01

Setting	Control command via
01	Control terminals (FW, REV inputs)
02	RUN button at keypad
03	RS 485
04	Option 1
05	Option 2



Analog inputs

Analog Input

A011	External frequency start O (0...10V)	VIC	0,00...400,0 Hz	0,00 Hz
A101	External frequency start OI (4...20mA)	VIC	0,00...400,0 Hz	0,00 Hz
A111	External frequency start O2 (-10...+10V)	VIC	-400,0...+400,0 Hz	0,00 Hz

This parameters adjust the output frequency at minimum reference value at the analog input (e.g. 0 V, 4 mA or -10V). Therefore, parameter A015 or A105 must be set to position 00. If the PID controller is activated, the adjusting range changes into 0 to 800 or to the process sizes depending on parameter A075.

A012	External frequency end O (0...10V)	VIC	0,00...400,0 Hz	0,00 Hz
A102	External frequency end OI (4...20mA)	VIC	0,00...400,0 Hz	0,00 Hz
A112	External frequency end O2 (-10...+10V)	VIC	-400,0...400,0 Hz	0,00 Hz

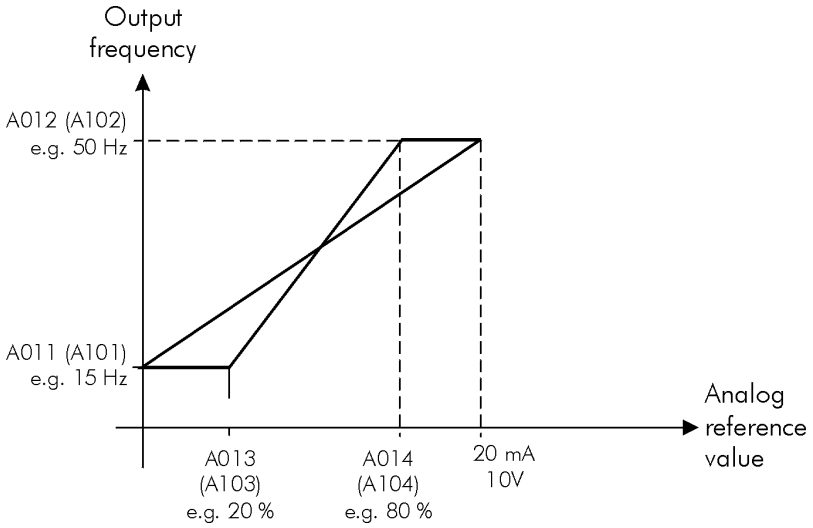
This parameters adjust the output frequency at maximum reference value at the analog input (e.g. 10 V, 20 mA or +10 V). If the PID controller is activated, the adjusting range changes into 0 to 800 or to the process sizes depending on parameter A075.

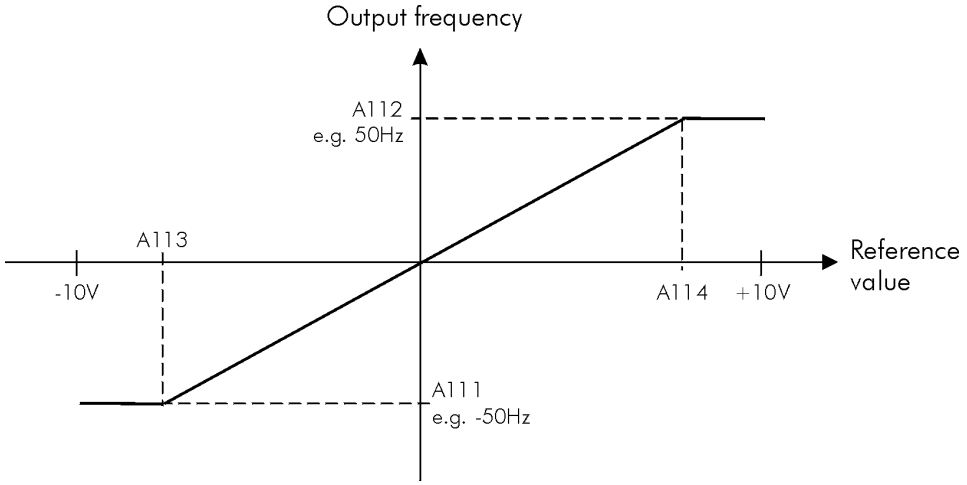
A013	Analog signal reference for Start O (0...10V)	VIC	0...100 %	0 %
A103	Analog signal ref. for Start OI (4...20mA)	VIC	0...100 %	20 %
A113	Analog signal ref. for Start O2 (-10...+10V)	VIC	-100...+100 %	-100 %

This parameters define the minimum reference value if it should be other than 0 V, 4 mA or -10 V. 100 % are equivalent to 10 V or 20 mA.

A014	Analog signal reference for end O (0...10V)	VIC	0...100 %	100 %
A104	Analog signal ref. for end OI (4...20mA)	VIC	0...100 %	100 %
A114	Analog signal ref. for end O2 (-10...+10V)	VIC	-100...+100 %	100 %

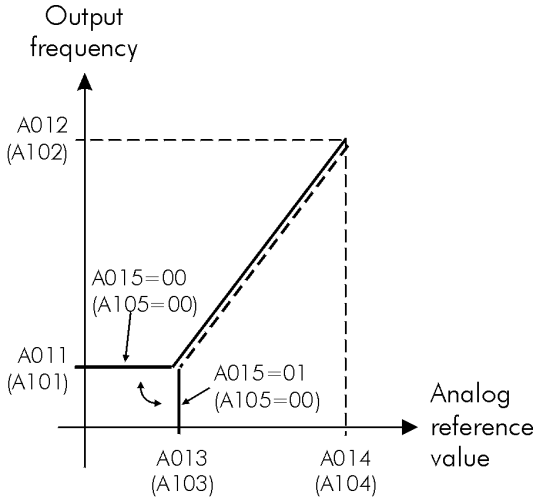
This parameters define the maximum reference value if it should be other than 10 V, 20 mA or +10 V. 100 % are equivalent to 10 V or 20 mA.





A015	External frequency start pattern O (0...10V)	VIC	00 or 01	01
A105	Ext. frequency start pattern OI (4...20mA)	VIC	00 or 01	01

Setting	Function
00	Motor starts-up with external frequency start setting
01	Motor does not start-up until a reference > A013



A005	AT Terminal selection	VIC	00 or 01	01

Setting	Function
00	Switching between 0...10V and 4...20mA (O / OI)
01	Switching between 0...10V and -10...+10V (O / O2)

A006	O2 Control selection	VIC	00 to 02	00

Setting	Function
00	Single reference value (without f-correction)
01	Addition of f-correction without changing direction
02	Addition of f-correction with change of direction

Parameter A006	Parameter A005	Terminal AT 1.)	Main reference value	f-correction	Change of direction 2.)
00	00	0	0...10V	–	no
00	00	1	4...20mA	–	no
00	01	0	0...10V	–	no
00	01	1	-10...+10V	–	yes
01	00	0	0...10V	-10...+10V	no
01	00	1	4...20mA	-10...+10V	no
01	01	0	0...10V	-10...+10V	no
01	01	1	-10...+10V	–	yes
02	00	0	0...10V	-10...+10V	yes
02	00	1	4...20mA	-10...+10V	yes
02	01	0	0...10V	-10...+10V	yes
02	01	1	-10...+10V	–	yes

1.) Set digital input to function "16 AT switch-over to automatic reference value" (0...open, 1...closed)

2.) Change of direction allowed (if sum of reference values < 0)

If no digital input is set to "16 AT Switch-over to automatic reference value", A006 has following function:

Setting	Function
00	Single reference value -10...+10V
01	Addition of 0...10V and 4...20mA without changing direction
02	Addition of 0...10V and 4...20mA with change of direction

A016	Time constant for analog signals	VIC	1...30	30

In order to realize shoerter reaction times to changes of the reference values, the set value for this function can be reduced. However, the smaller this value, the smaller the filter effect for interfering residual frequency on the reference signal is.

Setting	1 30
Filter effect for interfering frequency	low ..... high
Reaction time to changes in reference	fast ..... slow

C081	Adjustment 0...10 V input	VC	0...9999	Default
C082	Adjustment 4...20 mA input	VC	0...9999	Default
C083	Adjustment -10...+10 V input	VC	0...9999	Default
C121	Offset-adjustment 0...10 V input	VC	0...9999	Default
C122	Offset-adjustment 4...20 mA input	VC	0...9999	Default
C123	Offset-adjustment -10...+10 V input		VC	0...9999

This adjustments are done in factory and should not be changed!

Multispeeds

Multi Speeds

A019	Multi speed selection	VIC	00 or 01	00

Setting	Function
00	"binary" function (selection with CF1...CF4)
01	"bit" function (selection with SF1...SF7)

A021	Multi speed 1	VC	0,00...400,0 Hz	0,00 Hz
A022	Multi speed 2	VC	0,00...400,0 Hz	0,00 Hz
A023	Multi speed 3	VC	0,00...400,0 Hz	0,00 Hz
A024	Multi speed 4	VC	0,00...400,0 Hz	0,00 Hz
A025	Multi speed 5	VC	0,00...400,0 Hz	0,00 Hz
A026	Multi speed 6	VC	0,00...400,0 Hz	0,00 Hz
A027	Multi speed 7	VC	0,00...400,0 Hz	0,00 Hz
A028	Multi speed 8	VC	0,00...400,0 Hz	0,00 Hz
A029	Multi speed 9	VC	0,00...400,0 Hz	0,00 Hz
A030	Multi speed 10	VC	0,00...400,0 Hz	0,00 Hz
A031	Multi speed 11	VC	0,00...400,0 Hz	0,00 Hz
A032	Multi speed 12	VC	0,00...400,0 Hz	0,00 Hz
A033	Multi speed 13	VC	0,00...400,0 Hz	0,00 Hz
A034	Multi speed 14	VC	0,00...400,0 Hz	0,00 Hz
A035	Multi speed 15	VC	0,00...400,0 Hz	0,00 Hz

The multispeeds are selected using the digital commands CF1...CF4 or SF1...SF7, which must be programmed on the terminals first. See Digital inputs.

Multispeeds are pure reference values. The ON and OFF commands are not influenced by the selection of multispeeds, that means that an additional Start command is necessary for operation

Note:

Multispeeds always override the actual reference value, independent from the setting of parameter A001.

If no digital input is selected at parameter A001 = 01, the reference value is set using the analog inputs.

Multi speeds – "binary" function

CF1	CF2	CF3	CF4	Adjusted value	Parameter
0	0	0	0	Internal preset speed if A001=02	A020
1	0	0	0	Multispeed 1	A021
0	1	0	0	Multispeed 2	A022
1	1	0	0	Multispeed 3	A023
0	0	1	0	Multispeed 4	A024
1	0	1	0	Multispeed 5	A025
0	1	1	0	Multispeed 6	A026
1	1	1	0	Multispeed 7	A027
0	0	0	1	Multispeed 8	A028
1	0	0	1	Multispeed 9	A029
0	1	0	1	Multispeed 10	A030
1	1	0	1	Multispeed 11	A031
0	0	1	1	Multispeed 12	A032
1	0	1	1	Multispeed 13	A033
0	1	1	1	Multispeed 14	A034
1	1	1	1	Multispeed 15	A035

Multispeeds – "bit" function

SF1	SF2	SF3	SF4	SF5	SF6	SF7	Adjusted value	Parameter
0	0	0	0	0	0	0	Internal preset speed if A001=02	A020
1	x	x	x	x	x	x	Multispeed 1	A021
0	1	x	x	x	x	x	Multispeed 2	A022
0	0	1	x	x	x	x	Multispeed 3	A023
0	0	0	1	x	x	x	Multispeed 4	A024
0	0	0	0	1	x	x	Multispeed 5	A025
0	0	0	0	0	1	x	Multispeed 6	A026
0	0	0	0	0	0	1	Multispeed 7	A027

A038	Jogging frequency	VC	0,00...9,99 Hz	1,00 Hz

The jog function is used for checking, setting or adjusting the application. For this purpose, the digital command "Jog mode" (see Digital inputs) is available.

A039	Stop mode of jog function	VIC	00 to 05	00

Setting	Stop-function	
00	Idle stop after jog mode	Jog mode only
01	Normal deceleration after jog mode	possible during
02	DC braking after jog mode	Stop status
03	Idle run after jog mode	Jode mode also
04	Normal deceleration after jog mode	during operation
05	DC braking after jog mode	possible

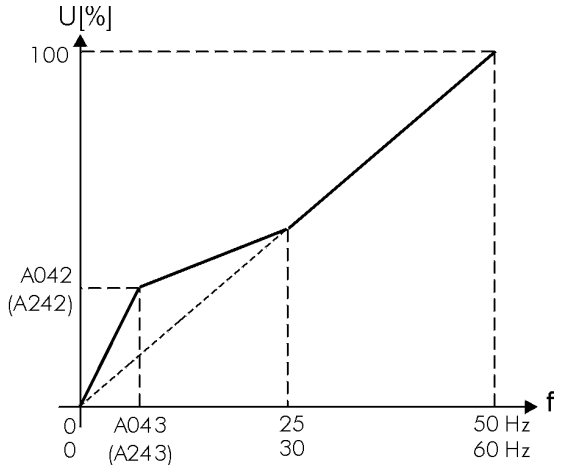
V/f	**V/f characteristic** **V/f**

A041	Torque boost method selection	VIC	00 or 01	00

Setting	Function
00	manual boost
01	automatic boost

A042	Manual torque boost setting	VC	0,0...20,0 %	1,0 %
A043	Manual torque boost frequency point	VC	0,0...50,0 %	5,0 %

For applications which require higher starting torque, the standard starting torque can be increased. Use parameter A041 to select between automatic and manual boost. Parameter A042 defines the value by which the torque has to be boosted. The range in which this boost takes effect is defined by parameter A043.



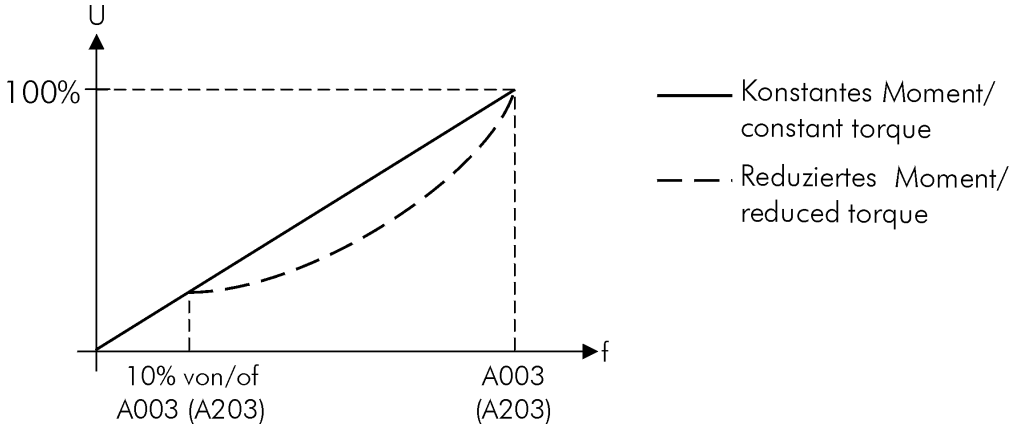
At manual boost, the torque is increased between 0 Hz and 50 % of the base frequency.
At automatic boost, this process depends on the load.

Note:
Beware of overloading the motor

A044	V/f characteristic setting	VIC	00 to 02	00

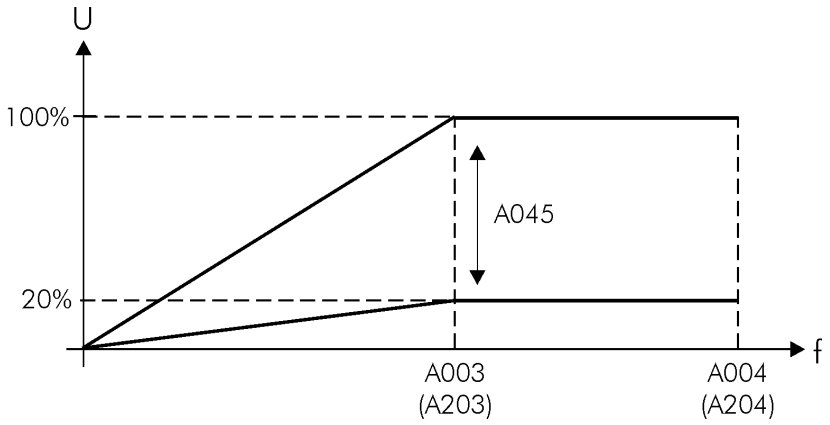
Parameter to set one of the possible V/f characteristics.

Setting	Function
00	constant torque
01	reduced torque (Economy mode)
02	free adjustable V/f characteristic (b100...b113)



A045	Voltage gain setting	VC	20...100 %	100 %

The output voltage can be set within the range of 20...100 % of the motor voltage set with parameter A082.



b036	Start reduced voltage selection	VIC	00 to 06	00

With this parameter the control time of the start voltage is set.

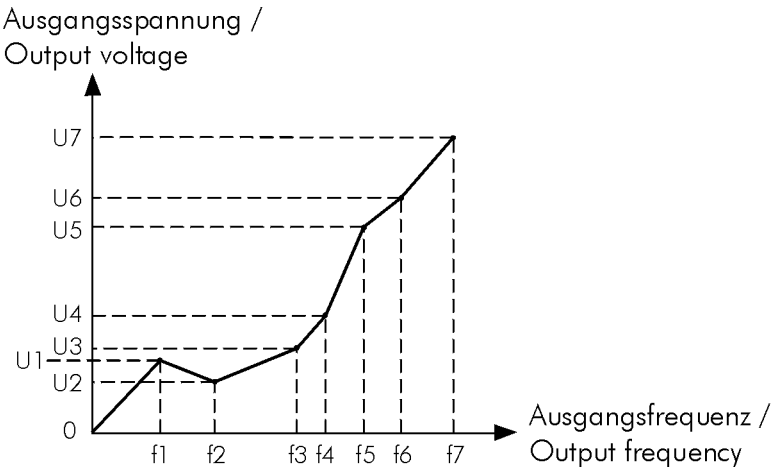
Setting	00 06
Control time	fast ..... slow

b100	Free adjustable V/f: frequency 1	VIC	0...b102	0 Hz
b101	Free adjustable V/f: voltage 1	VIC	0,0...800,0 V	0,0 V
b102	Free adjustable V/f: frequency 2	VIC	0...b104	0 Hz
b103	Free adjustable V/f: voltage 2	VIC	0,0...800,0 V	0,0 V
b104	Free adjustable V/f: frequency 3	VIC	0...b106	0 Hz
b105	Free adjustable V/f: voltage 3	VIC	0,0...800,0 V	0,0 V
b106	Free adjustable V/f: frequency 4	VIC	0...b108	0 Hz
b107	Free adjustable V/f: voltage 4	VIC	0,0...800,0 V	0,0 V
b108	Free adjustable V/f: frequency 5	VIC	0...b110	0 Hz
b109	Free adjustable V/f: voltage 5	VIC	0,0...800,0 V	0,0 V
b110	Free adjustable V/f: frequency 6	VIC	0...b112	0 Hz
b111	Free adjustable V/f: voltage 6	VIC	0,0...800,0 V	0,0 V
b112	Free adjustable V/f: frequency 7	VIC	0...400 Hz	0 Hz
b113	Free adjustable V/f: voltage 7	VIC	0,0...800,0 V	0,0 V

With parameters b100 to b113 a free adjustable V/f characteristic can be programmed.

The parameters for torque boost (A041 / A241) and for the base frequency (A003 / A203) are not active.

Free adjustable V/f characteristic:



DC brake
Braking

The frequency inverters >*pDRIVE*< *CX profi* have an adjustable DC brake. By locking a clocked DC rotor voltage onto the base of the motor, the rotor produces a braking torque that counteracts the rotation. With the help of the DC brake, braking a drive to minimum speed is possible, before the mechanical brake is activated.

A051	Selection of DC braking	VIC	00 or 01	00

Setting	Function
00	can be controlled with digital input DB
01	alwaysactive

A052	DC braking: frequency	VIC	0,00...60,00 Hz	0,50 Hz
A053	DC braking: waiting time	VIC	0,0...5,0 s	0,0 s
A054	DC braking: braking torque	VIC	0...70 %	0 %
A055	DC braking: braking time	VIC	0,0...60,0 s	0,0 s
A056	DC braking: edge/level selection	VIC	00 or 01	01
A057	DC braking: braking torque (start)	VIC	0...70,0 %	0 %
A058	DC braking: braking time (start)	VIC	0,0...60,0 s	0,0 s
A059	DC braking: carrier frequency	VIC	0,5...12,0 kHz	3,0 kHz

Parameter A051 defines whether the internal DC brake is active or not.

Parameter A052 defines the frequency at which the DC brake starts. The setting is possible in the range of 0,0 to 60,0 Hz.

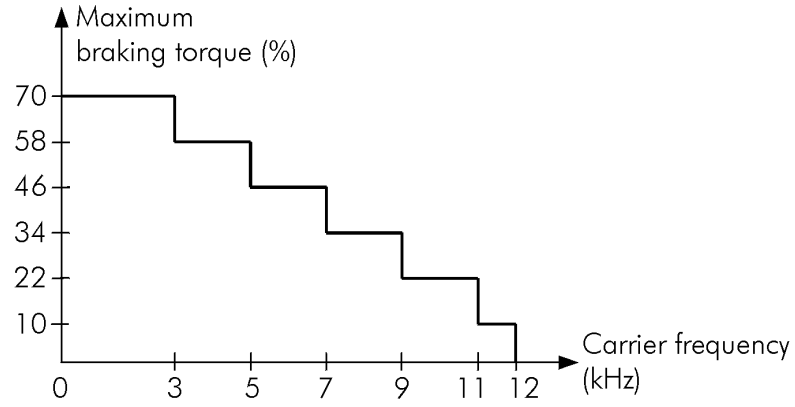
Parameter A053 defines when the DC injetion braking is activated after the frequency set at A052 is exceeded. During this time the motor is running idle.

Parameter A054 and A057 define the power value with which DC injection braking is carried out. 0% mean "very low" and 70% "very high".

Parameter A055 and A058 define the duration of DC injection braking. The value is set within the range from 0,1 to 60 seconds.

Parameter A056 defines wheter the DC brake is active depending on time or depending on a contact.

Parameter A059 defines the carrier frequency during DC braking. With high carrier frequency the maximum possible braking torque is reduced.

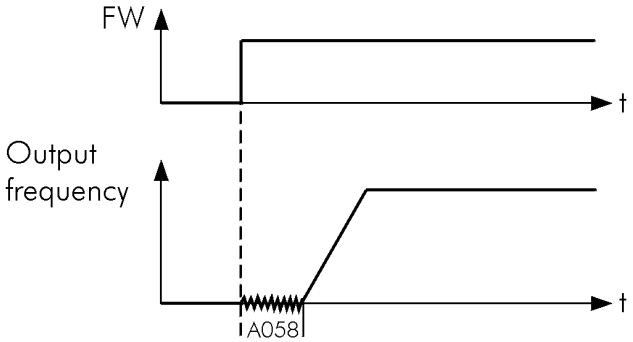


DC brake always active (A051=01):

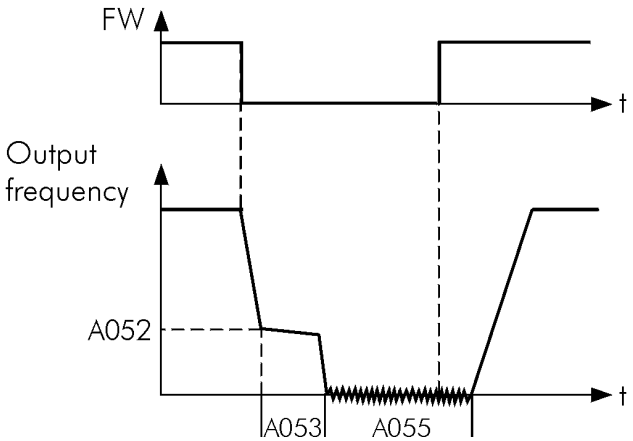
If the DC brake is active (A051 = 01) this function is active at each Start and/or Stop.
After the Start-command the DC brake is active during the time set with parameter A058.
After the Stop-command the inverter runs down along the set deceleration ramp and starts with DC braking at the frequency set with parameter A052.

DC brake depending on time (A056 = 00)

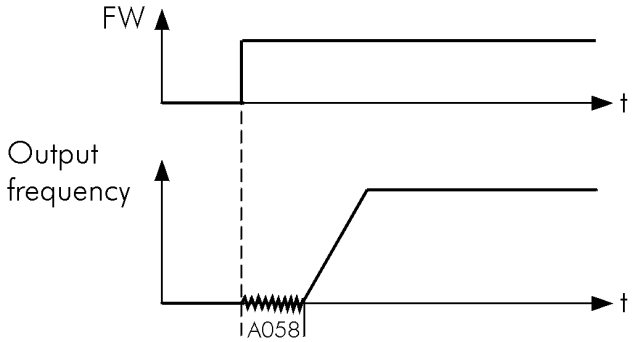
At starting:

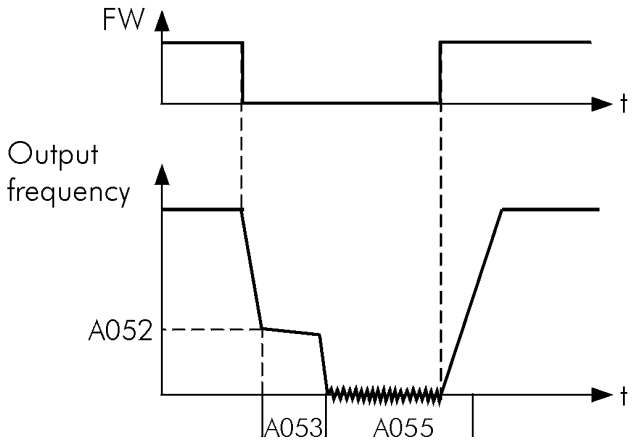


At stopping:



DC brake depending on contact (A056 = 01)



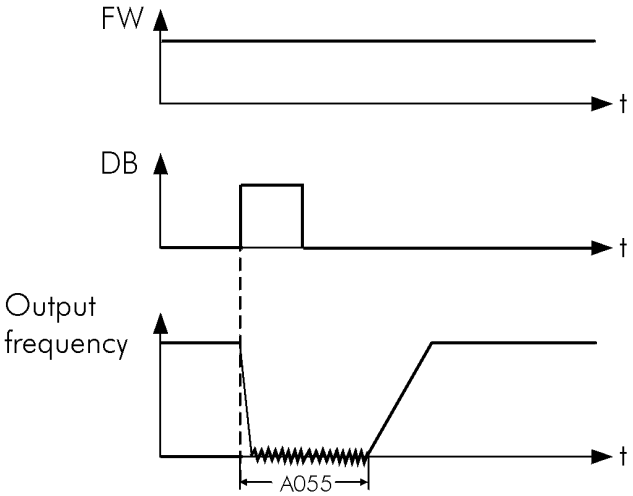


DC brake controlled via digital input (A051=00)

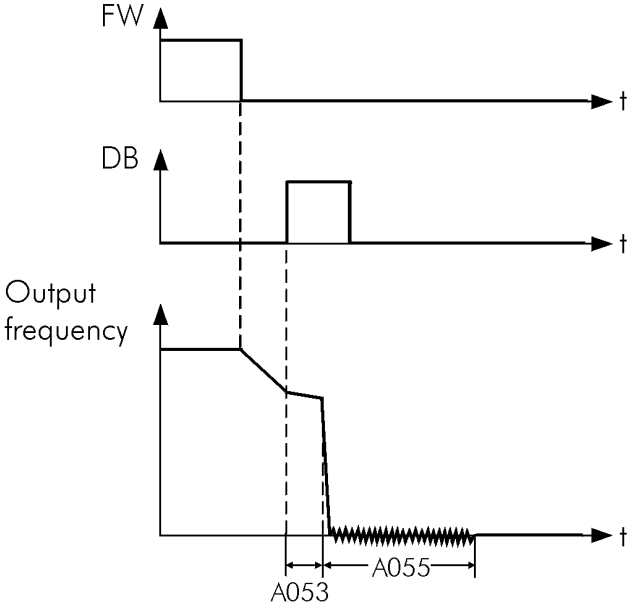
The DC brake is activated via a digital input (D8: C001...C005=7).

DC brake depending on time (A056 = 00)

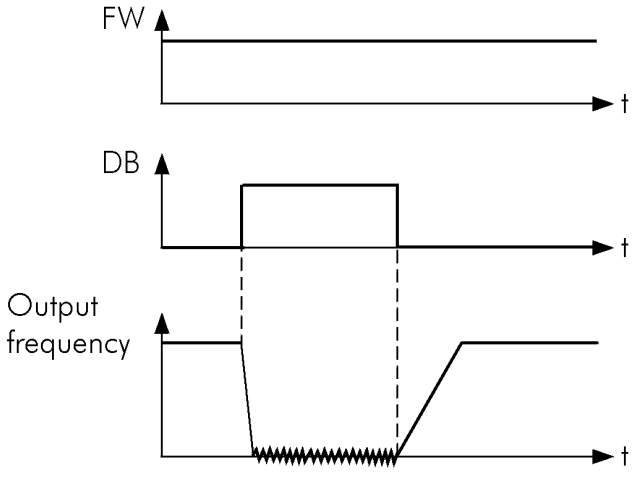
During operation:

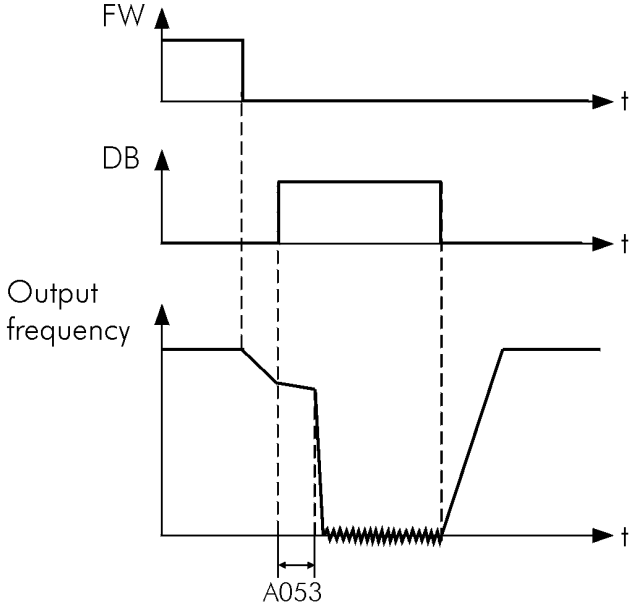


At stopping:



DC brake depending on contact (A056 = 01)

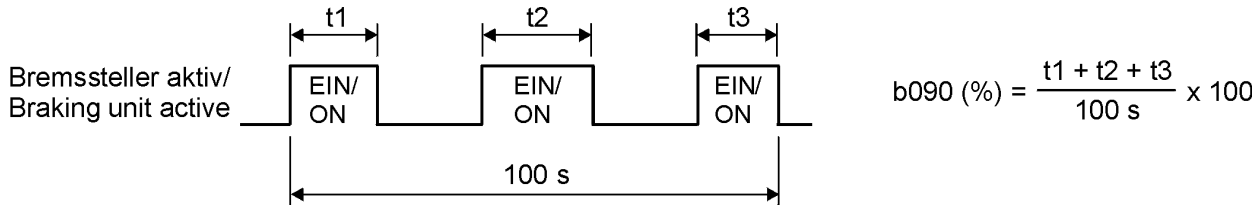




Note:
The DC brake causes a heating of the connected motor.
Be sure that the motor does not get to warm.

b090	Dynamic braking ratio	VIC	0,0...100,0 %	0,0 %

Adjusting the allowed duration time of the braking resistor (only at *CX profi 11* and *15*).
Setting 0,0 % means that the internal braking unit is not active.



b095	Dynamic braking selection	VIC	00 to 02	00

Setting	Function
00	not active
01	only active during operation
02	always active

b096	Dynamic braking ON-level	VIC	660...760 V	720 V

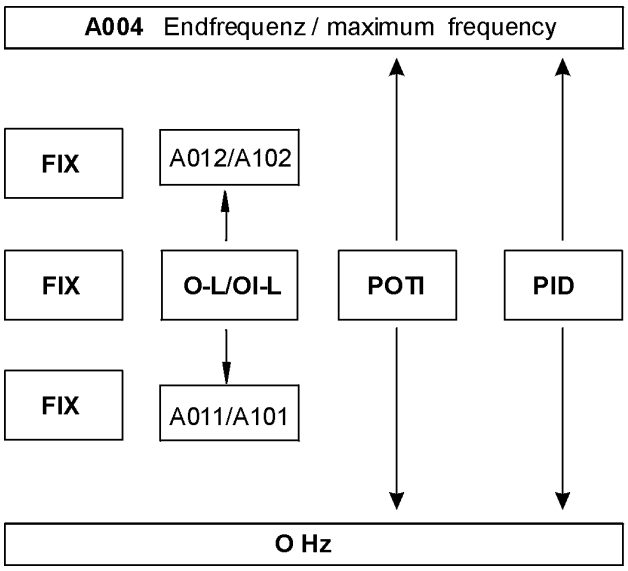
Defines the ON-level of the braking unit depending on the DC link voltage.

Frequency limits
Limits

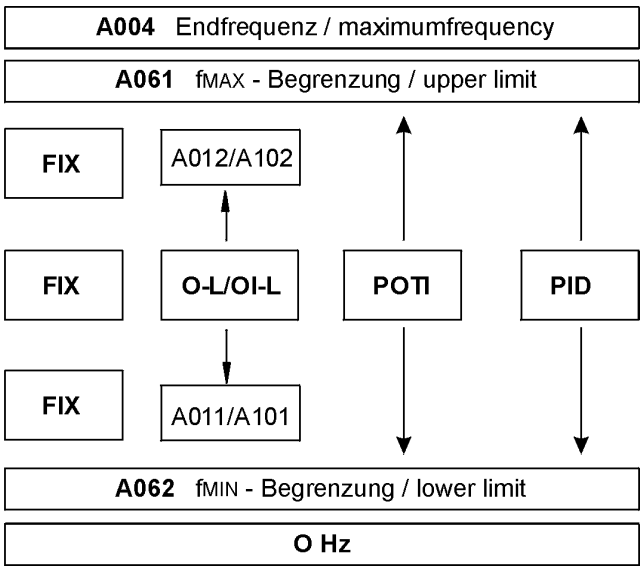
A061	Frequency upper limit	VIC	0,00...400,0 Hz	0,00 Hz
A062	Frequency lower limit	VIC	0,00...400,0 Hz	0,00 Hz

Defining the frequency range within a range from 0 to parameter A004 (max. 400 Hz). If the values are set to 0,00 Hz, their function is cancelled.

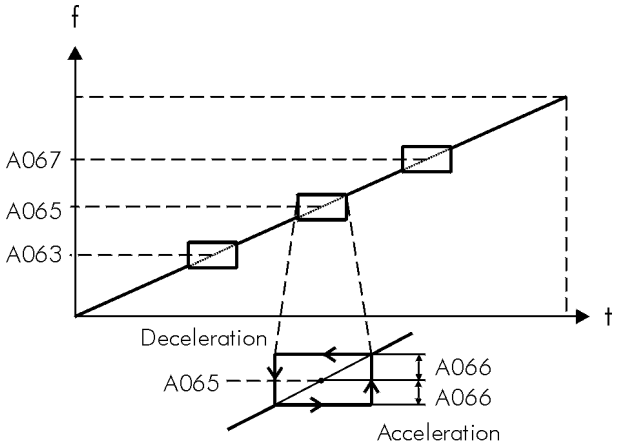
Without parameter A061 and A062



With parameter A061 and A062



A063	1st Jump frequency	VIC	0,00...400,0 Hz	0,00 Hz
A064	1st Jump frequency width	VIC	0,00...10,0 Hz	0,50 Hz
A065	2nd Jump frequency	VIC	0,00...400,0 Hz	0,00 Hz
A066	2nd Jump frequency width	VIC	0,00...10,0 Hz	0,50 Hz
A067	3rd Jump frequency	VIC	0,00...400,0 Hz	0,00 Hz
A068	3rd Jump frequency width	VIC	0,00...10,0 Hz	0,50 Hz



To avoid possible resonance in the drive system, it is possible to program three jump frequency ranges using functions A063...A068.

The jump frequency defines the frequency at which the drive should not be operated in steady-state. The adjustable jump frequency range determines the frequency range faded out and actions symmetrical to the jump frequency.

PID Configuration

PID

General

The PID controller is designed as a process controller with the variable "Frequency [Hz]", whereby P (kp), I (T_N) and D (Tv) can be adjusted individually. The reverence and actual value are standardised in % (range 0...100 %). For better presentation, they can be converted to the individual plant value using A075 (e.g. flow 0...30 l/h).

The PID controller output is limited with 0 Hz (or A062) at the bottom and with the maximum frequency A004 (or A061) at the top end. As a result, there is no reversal of the motor in the event of negative deviation.

In order to optimize the disturbance behaviour of the controller, it is advisable to set the acceleration and deceleration ramps as small as possible.

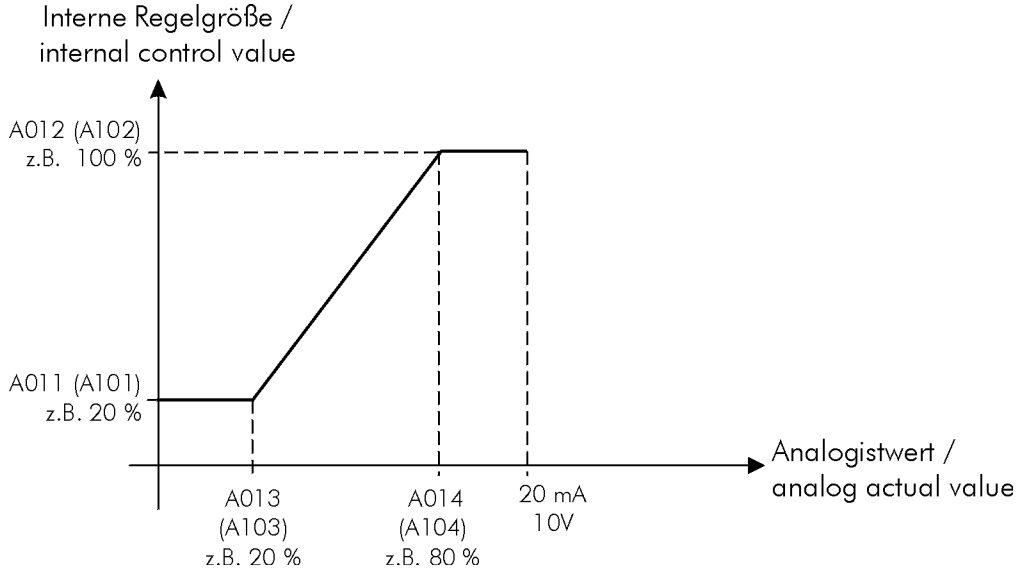
PID reference value

The reference value is selected using parameter A001. The following values can be used as reference source:

Reference value	Settings	Standardization
Potentiometer built-in	A001 = 00	0...100 %
Parameter value F001	A001 = 02	0...100 % x Parameter A075
Multispeeds A020...A035		0...100 % x Parameter A075
Analog input O (0...10 V)	A001 = 01	0...100 % (independent from A011...A014
Analog input OI (4...20 mA)		0...100 % or A101...A104)

Actual value

One of the two analog inputs (O or OI) can be used as actual value input (selectio with A076).
The actual value registration is adjusted using the analog input function.
See parameters A011...A014 or A101...A104.
The settings of parameters A011 and A012 are changed by activating the PID controller (A071) from Hz to % and by setting parameter A075 to process values.



Note:
By using the PID controller, the digital function "Automatic reference value (4..20 mA)" is not available!

Note:
Because of the influence of parameter A071 to the scaling of the reference and actual value, it is important to change this parameter before changing any other!

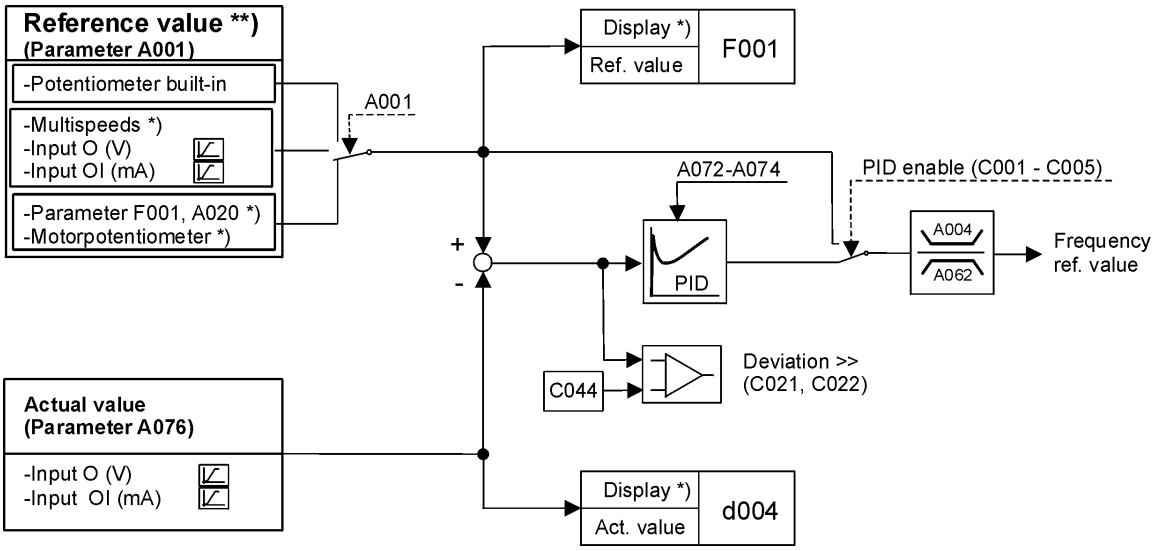
Displays

Parameter d004 allows the display of the actual value, parameter F001 displays the reference value on the LED. This values can be converted to process values using the display factor A075.
If parameter F001 is selected, the current PID reference value is displayed. It is not updated continuously.
The actual value display (parameter d004) is updated continuously.

A071	Selection of PID function: ON/OFF	VIC	00 or 01	00

The PID controller is activated and deactivated using parameter A071.

Setting	Function
00	PID controller not active
01	PID controller active; with digital input to setting 23 (PID enable) switch-over to manual control



*) After setting the scale conversion (parameter A075) this parameters are adjusted and displayed in process sizes.

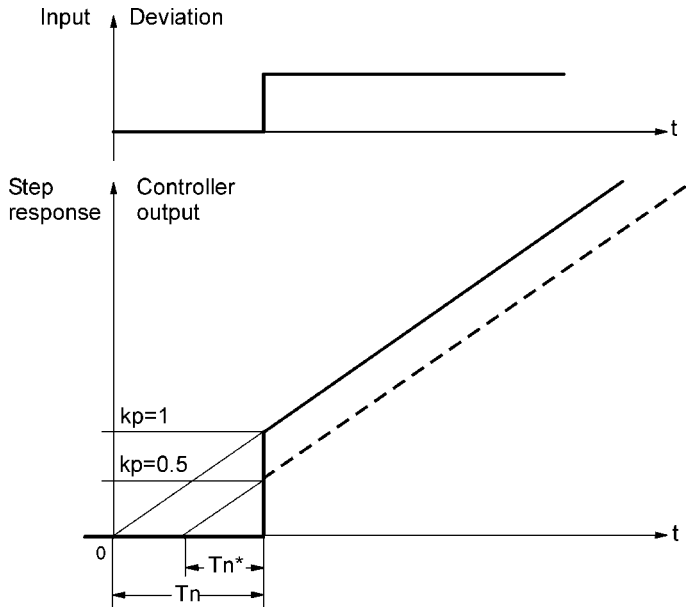
**) If the PID controller is active, the reference value is set and displayed in percent or in process size dependent on A075. By switch-over to manual controll (DIx ... 23 PID enable) the values are scaled and also displayed in Hz.

This values are scaled with parameters A011...A014 (terminal O [V]) and A101...A104 (terminal OI [mA]).

The display parameters F001 and d004 are updated continuously !

A072	PID controller: Proportional gain (kp)	VIC	0,2...5,0	1,0
A073	PID controller: Integral gain(Tn)	VIC	0,0...3600 s	1,0
A074	PID controller: Differential gain(Tv)	VIC	0,00...100,0 s	0,00

Parameters A072, A073 and A074 are used to set the PID controller factors.
Please not that the individual factors can be set separately, but that they have an influence on each other. If P (kp) is changed, T_N also changes..



Generally is:

T_N is right at kp = 1

$kp \neq 1 \Rightarrow T_N = T_N \times kp$

T_N = selected reset time (A073) at kp = 1

T_N* = effective reset time at kp = 0,5

T_N* = T_N x 0,5

A075	PID controller: Scale conversion	VIC	0,01...99,99	1,00

Parameter A075 allows the setting of a conversion factor for the proper process presentation of the PID reference and actual value on the LED display.
Parameters A011 (A101), A012 (A102), d004, F001 and A020...A035 are converted in accordance with the setting of A075.

A076	PID controller: Feedback destination	VIC	00 or 01	00

Parameter A076 defines the type of feedback signal.

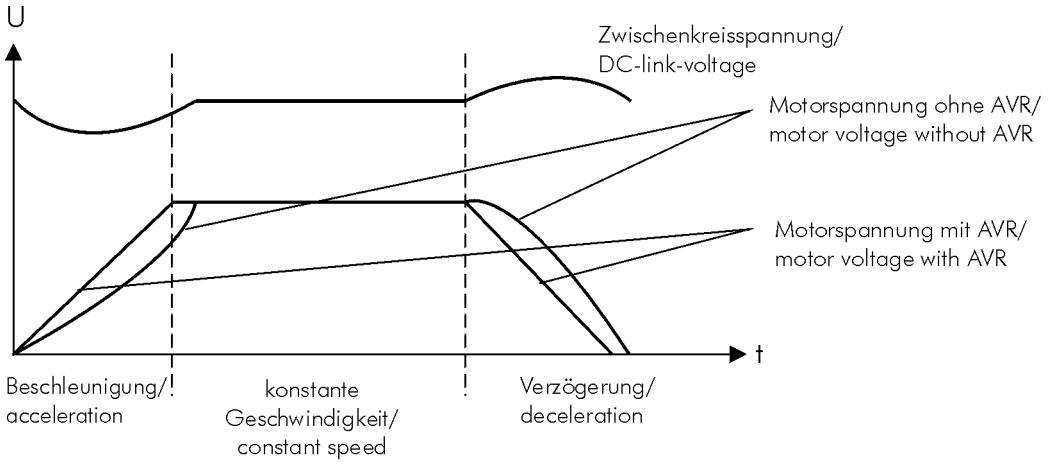
Setting	Function
00	Current signal at terminals OI - L
01	Voltage signal at terminals O - L

C044	PID controller: Level of deviation	VIC	0...100 %	3,0 %

Adjusting the difference between reference and actual value in percent, at which a signal is to be issued. The setting can be done in a range from 0,0 to 100,0 % with a resolution of 0,1 % (bipolar).

V/f	**Automatic voltage regulation** **AVR**

The AVR function (Automatic Voltage Regulation) stabilises the motor voltage in case of fluctuating intermediate circuit voltage (e.g. due to unstable mains supply or because of intermediate circuit voltage drops or surges due to short acceleration or deceleration times) in order to maintain such a high torque - especially during acceleration.



During the delay phase (generatoric operation) the DC link voltage increases (as shown above). This leads to an increase of the motor voltage. This higher motor voltage causes a higher braking torque. Therefore, the AVR function for deceleration can be deactivated with function A081.

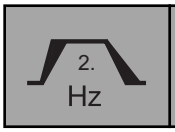
A081	Selection of AVR function	VIC	00 to 02	00

Parameter A081 switches the "Automatic Voltage Regulation" for the motor on and off.

Setting	Function
00	AVR function active
01	AVR function not active
02	AVR function not active during deceleration

A082	Selection of voltage for AVR	VIC	380...480 V	400 V

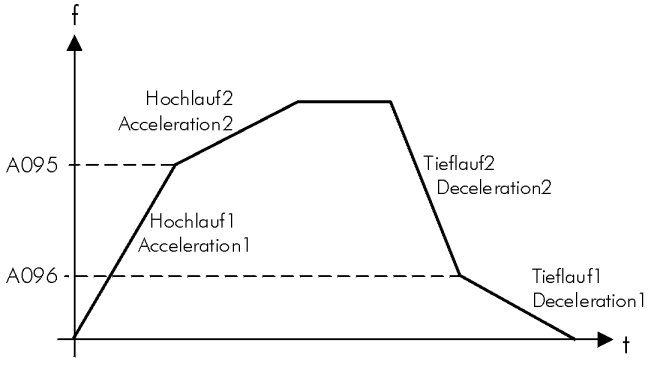
The nominal motor voltage (380 / 400 / 415 / 440 / 460 / 480 V) is set with parameter A082. (output voltages higher than the mains voltage are not possible)



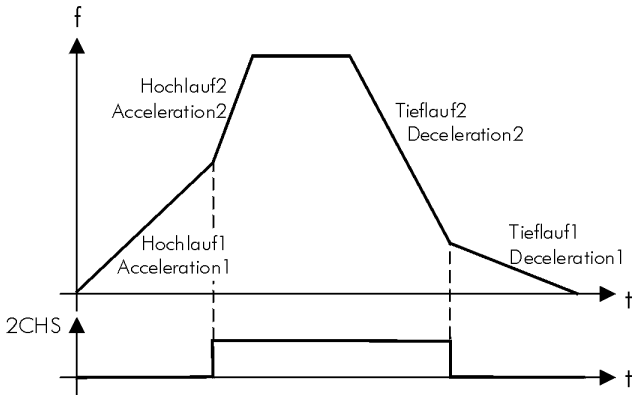
Ramp adjustment
Speed ramps

Allows to switch the time ramps adjusted with F002 and F003 to the ramps adjusted with A092 and A093 during operation. This can be done either at any time using an external signal or when exact, set frequencies are reached.

A094 = 01



A094 = 00



A092	2nd Acceleration ramp	VIC	0,01...3600 s	15,00 s
A093	2nd deceleration ramp	VIC	0,01...3600 s	15,00 s
A094	Select method of 2nd stage	VIC	00 or 01	00

Setting	Function
00	Switch-over via an external signal on a digital input (setting: 09)
01	Switch-over when the frequencies set at parameter A095 and A096 are reached

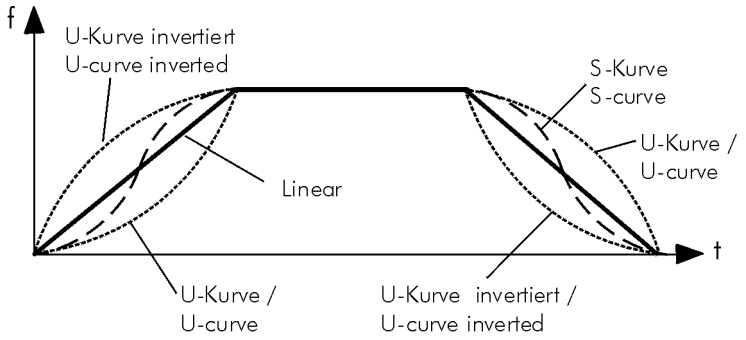
A095	Switch-over 1./2. acceleration ramp	VIC	0,00...400,0 Hz	0,00 Hz
A096	Switch-over 1./2. deceleration ramp	VIC	0,00...400,0 Hz	0,00 Hz

Particularly, this switch-over is used for EMERGENCY STOP functions and speed-related acceleration and deceleration times. The adjusted acceleration/deceleration time is related to the maximum frequency A004.

A097	Pattern of acceleration ramp	VIC	00 to 03	00
A098	Pattern of deceleration ramp	VIC	00 to 03	00

These two parameters determine whether the acceleration (A097) and/or deceleration (A098) are linear or follow an S ramp.

Setting	Function
00	linear
01	S ramp
02	U ramp
03	U ramp inverted



A131	Acceleration curve constant	VIC	01 to 10	02
A132	Deceleration curve constant	VIC	01 to 10	02

This two parameters determine how intensive the acceleration ramp (A131) and/or the deceleration ramp (A132) have an S-curve. Setting: 01...slight S-ramp; 10...strong S-ramp

b091	Stopping mode selection	VIC	00 or 01	00

This parameter defines the behaviour of the inverter after a Stop-command.

Setting	Function
00	Deceleration ramp
01	Idle-run

A069	Acceleration stop frequency	VIC	0,00...400,0 Hz	0,00 Hz
A070	Acceleration stop time	VIC	0,0...60,0 s	0,0 s

With this function the acceleration process can be stopped. Parameter A070 defines how long the acceleration process is stopped after reaching the frequency set with A069.

Thermal protection
Electronic Overload

b012	Electronic overload setting	VIC	0,2...1,2 x IFI	FI-INOM

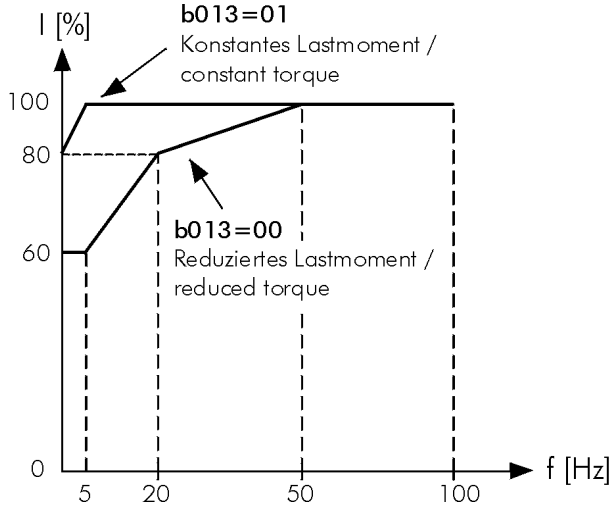
A thermal motor contactor ("maximum continuous current") can be set by entering the nominal motor current in A.

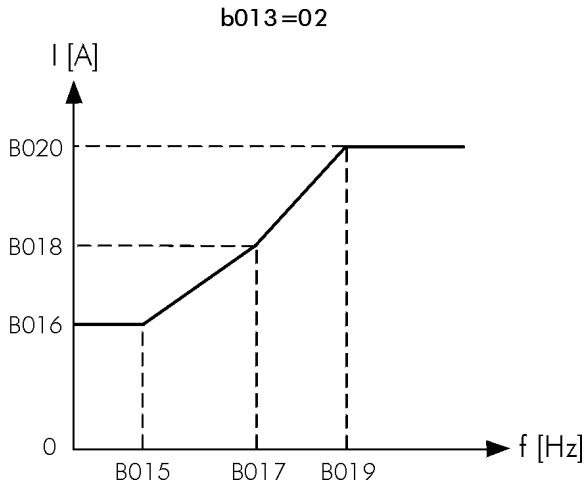
Note:
If the value is higher than the nominal motor current, the motor cannot be protected by an electronic motor contactor. In this case, thermistors or similar mechanism are required.
After a power cut, the thermal motor model always starts up again with a "cold" machine !!

b013	Electronic overload characteristic	VIC	00 to 02	01

Defines the characteristic curve of the thermal motor contactor.

Setting	Function
00	reduced load torque (self-ventilated)
01	constant load torque (force-ventilated)
02	free adjustable load torque





b015	Free electronic thermal: frequency 1	VIC	0...400 Hz	0 Hz
b016	Free electronic thermal: current 1	VIC	0,0...1000 A	0,0 A
b017	Free electronic thermal: frequency 2	VIC	0...400 Hz	0 Hz
b018	Free electronic thermal: current 2	VIC	0,0...1000 A	0,0 A
b019	Free electronic thermal: frequency 3	VIC	0...400 Hz	0 Hz
b020	Free electronic thermal: current 3	VIC	0,0...1000 A	0,0 A

With this parameters the free adjustable electronic overload characteristic is defined (see above).

+ A / 0	**Overload protection** **Overload restriction**

b021	Selection of 1st overload restriction	VIC	00 to 02	01

This parameter defines when the current limitation is active.

Setting	Function
00	not active
01	during acceleration and constant speed
02	only at constant speed

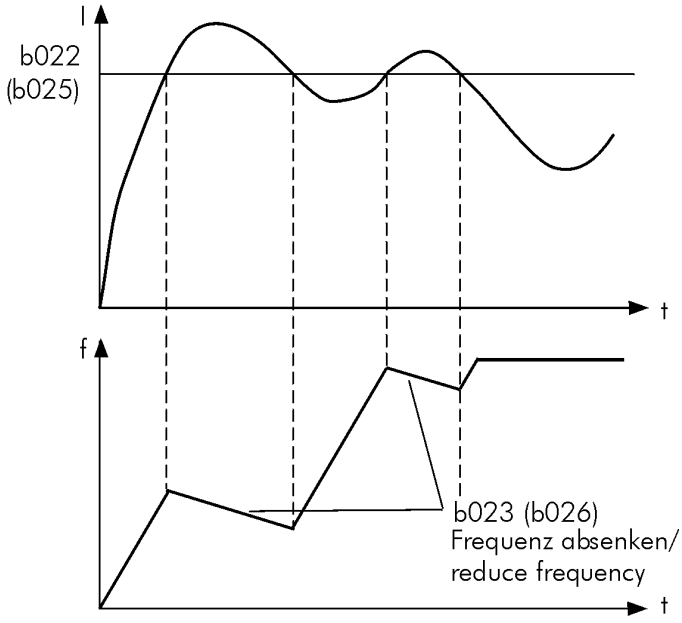
Note:
The overload restriction is not active during deceleration.

b022	Level of 1st overload restriction	VIC	0,5...1,5 x I_{FI}	1,20 x I_N

Defines the value in amperes at which the inverter tries to reduce the load by decreasing the output frequency.

b023	Rate of 1st decel. at overload restriction	VIC	0,10...30,00 s	1,00 s

When reaching the adjusted current limit, the frequency is reduced according to the set ramp.



b024	Selection of 2nd overload restriction	VIC	00 to 02	01
b025	Level of 2nd overload restriction	VIC	0,5...1,5 x I_{FI}	1,20 x I_N
b026	Rate of 2nd decel. at overload restriction	VIC	0,10...30,00 s	1,00 s

With the parameters B021...b023 and b024...b026 two different overload restrictions can be set. The switch-over is done via a digital input (OLR: C001...C005 = 39).

Digital inputs
Input terminals

C001	Function of input 1	VIC	01 to 39, NO	18
C002	Function of input 2	VIC	01 to 39, NO	16
C003	Function of input 3	VIC	01 to 39, NO	03
C004	Function of input 4	VIC	01 to 39, NO	02
C005	Function of input 5	VIC	01 to 39, NO	01

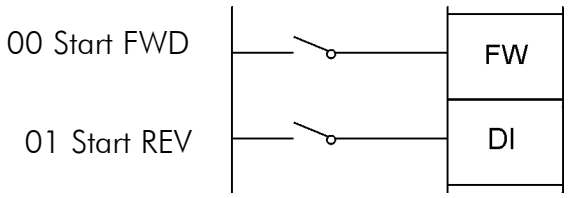
Parameter	Control terminal	Default	
C001	1	18	External reset
C002	2	16	Switch-over O/OI
C003	3	03	CF2
C004	4	02	CF1
C005	5	01	Start reverse

The programmable inputs (control terminals 1 to 5)can be allocated to the parameters in accordance with the following table:

Setting	Short-cut	Function
01	REV	Start reverse
02	CF1	Fix A
03	CF2	Fix B
04	CF3	Fix C
05	CF4	Fix D
06	JG	Jog mode
07	DB	DC braking
08	SET	2nd set
09	2CH	2nd accel./decel. ramp
11	FRS	Impulse lock-free run
12	EXT	External fault
13	USP	Restart lock at undervoltage (USP)
14	CS	Bypass signal
15	SFT	Software lock
16	AT	Switch-over to automatic ref. value 4...20 mA
18	RS	External reset
20	STA	Start impulse

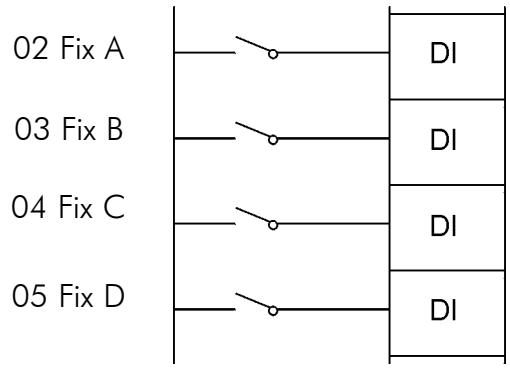
Setting	Short-cut	Function
21	STP	Stop impulse
22	F/R	Forward/reverse
23	PID	PID enable
24	PIDC	PID reset
27	UP	Motorpot increase
28	DOWN	Motorpot decrease
29	UDC	Motorpot reset
31	OPE	Local control
32	SF1	FIX 1
33	SF2	FIX 2
34	SF3	FIX 3
35	SF4	FIX 4
36	SF5	FIX 5
37	SF6	FIX 6
38	SF7	FIX 7
39	OLR	Switch-over of overload restriction
NO	NO	no function

Explanations of the functions for the digital inputs



Start/Stop via switch contacts:
When the contacts are closed, a Start command is issued in the right direction (acceleration on gradient), when open, a stop command is issued (deceleration on gradient). The simultaneous closing of Start forward and Start reverse also issues a Stop command to the inverter.

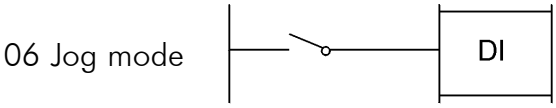
Multispeeds ("binary" function):
The multispeeds (maximum 15) are selected via the signals CF1...4 according to the table:



CF1	CF2	CF3	CF4	Reference value
0	0	0	0	analog value
1	0	0	0	1 (A021)
0	1	0	0	2 (A022)
1	1	0	0	3 (A023)
0	0	1	0	4 (A024)
1	0	1	0	5 (A025)
0	1	1	0	6 (A026)
1	1	1	0	7 (A027)
0	0	0	1	8 (A028)
1	0	0	1	9 (A029)
0	1	0	1	10 (A030)
1	1	0	1	11 (A031)
0	0	1	1	12 (A032)
1	0	1	1	13 (A033)
0	1	1	1	14 (A034)
1	1	1	1	15 (A035)

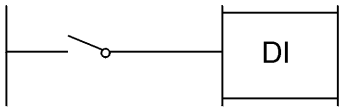
The number of digital inputs to be programmed depends on the number of multispeeds actually needed. The multispeeds are programmed in parameter group A. The multispeeds are pure reference values without any Start/Stop commands.
Therefore, Parameter A001 "Method of speed command" must be set to 01 "control terminals" !

Jog mode:



If the Jog command is activated, the inverter accelerates the motor with the fastest possible acceleration time to the set jog frequency A038.

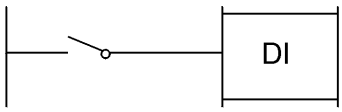
07 DC brake



DC brake:

If this command is activated, the DC brake is active.

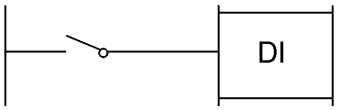
08 2nd Set



Switch-over of parameters:

If this command is activated, the inverter switches over to the 2nd set of parameters. Motor data, minimum and maximum limits and the acceleration and deceleration times are switched over.
The concerned parameters are named A2xx.

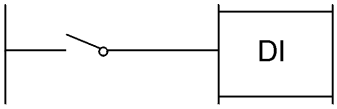
09 2nd ramp



Switch-over of ramps:

Two sets of acceleration and deceleration ramps are avaliable. The signal "2nd ramp" is used to switch between these two ramp sets. The values of acceleration and deceleration time must be set in parameter group A.
Contact closed: 2nd set of ramps active

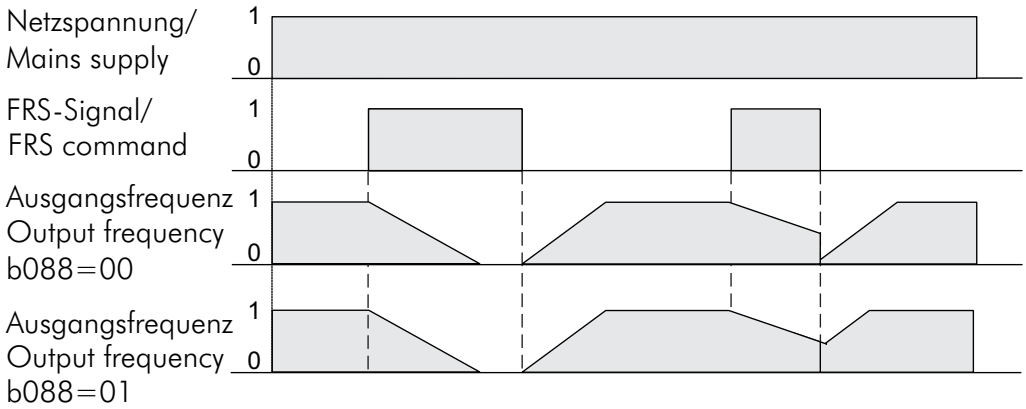
11 Impulse lock



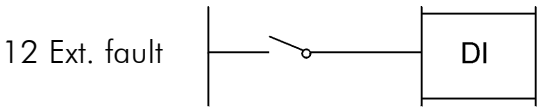
Impulse lock:

If this command is activated, the inverter is locked immediately, allowing the motor to come to standstill freely. The function can be inverted (parameters C011 to C015). By setting parameter b088 to position 00, the inverter starts from 0 Hz once the FRS signal is cancelled.
However, if parameter b88 is set to position 01, the inverter starts with the acutal frequency fo the motor ("interception of the motor").

In both cases, the inverter starts after the waiting time set with parameter b003. If the speed of the motor is declined during this time beneath the matching (restart) frequency set with parameter b007, a restart happens at 0 Hz.

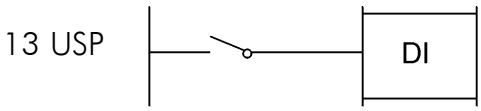


External fault:

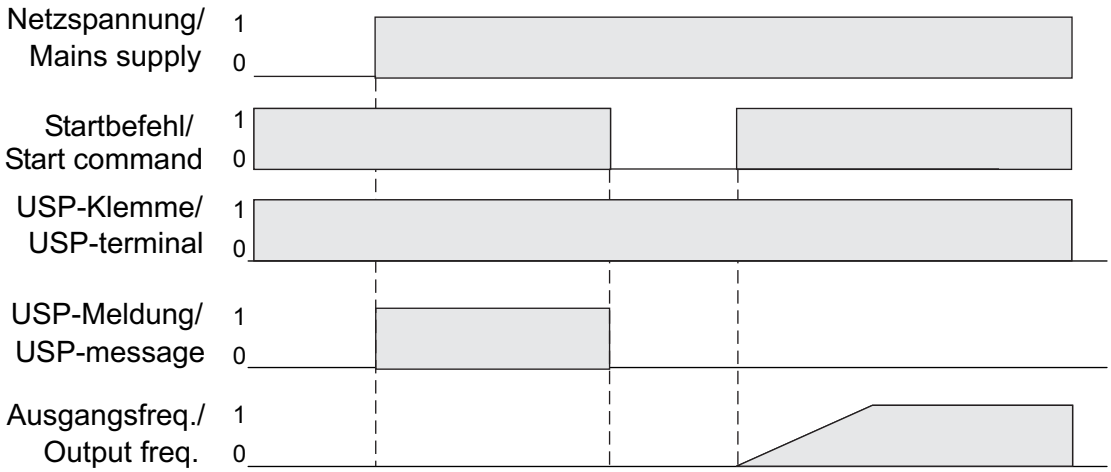


The activated command leads to immediate fault shut-down with the error message „E12 - Ext. fault". Using this input, plant errors can be integrated in the control of the frequency inverter. The error message cn be realised using the break or make contact (parameter C011 to C015).

Restart lock for undervoltage (USP)



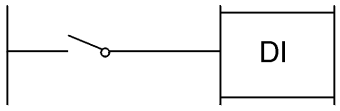
This function prevents an automatic motor start when the voltage returns after a power cut or undervoltage. A restart is only possible after resetting the error or by switching the Start command on/off.



Notes:

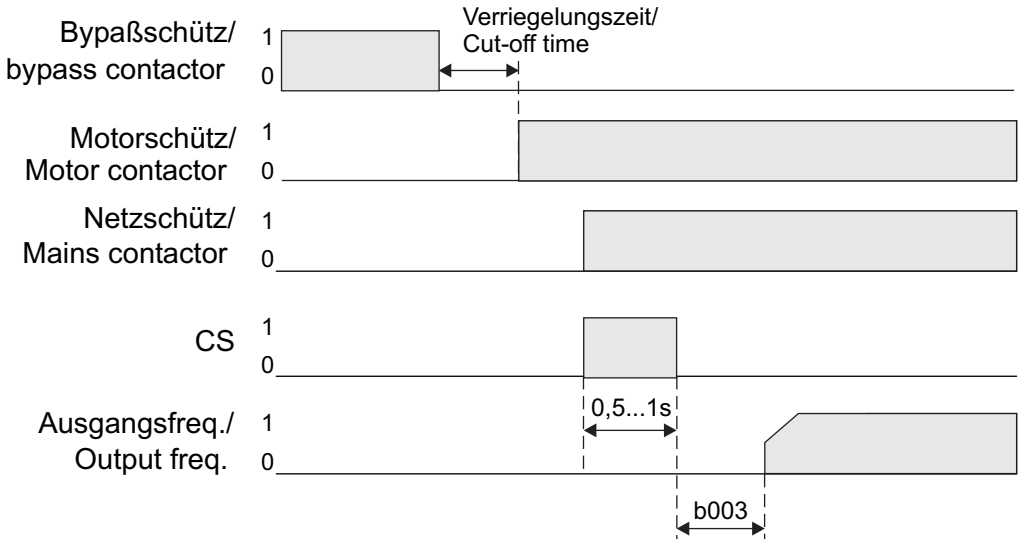
- If the USP function is activated and the power supply comes back or is switched-on during a Start-command, the inverter trips with E13.
- The USP function is also executed after an undervoltage trip E09.

14 Bypass signal



Bypass signal:

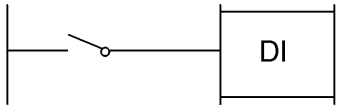
An activation of the command leads an holding of the running motor after mains operaiton.



After the switch-over from bypass to inverter operation, the inverter takes over the running motor after the waiting time set with parameter b003. If the speed of the motor has declined during this time the matching (restart) frequency set with parameter b007, a restart is done at 0 Hz.

Software lock:

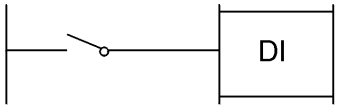
15 Software lock



This function allows an additional lock for parameter changes via the terminals. Thus, it is possible e.g. to lock the parameter editing function via an externa key switch.
Contact open: parametrization enabled,
Contact closed: parametrization locked.

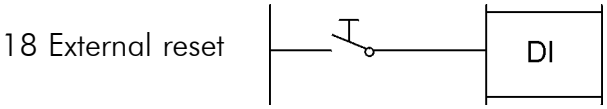
Switch-over to automatic reference value (4..20 mA)

16 Automatic ref. value (4 .. 20 mA)



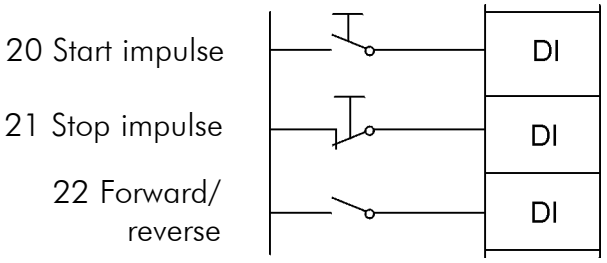
By closing the contact, it is possible to define the frequency ref. value usnig a current input signal (4...20mA). When the contact is open, the frequency is defined via a voltage input signal (0...10V). If the contact is closed, the frequency is defined via the 4...20 mA analog input (terminals OI - L). If the contact is open, the analog signal 0...10 V (terminals O - L) is conductive. If no digital input is parametrized for this function, the two reference values are added (f-correction).

External reset:



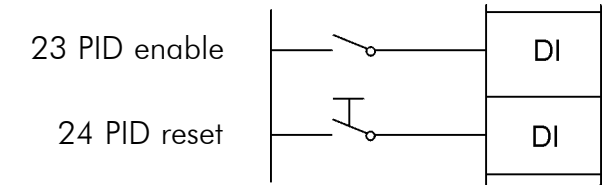
Allows you to confirm an error via the terminals. During operation, an external Reset-command stops the inverter!! The signal must not be inverted and must not be issued for more than 4 seconds. A permanent reset is not possible. If the inverter is running without problems, it runs to 0 Hz when an RS signal is issued! In plants, where a common reset signal is used for all devices, parameter C102 must be set to position 02 !

Start/Stop via impulses:



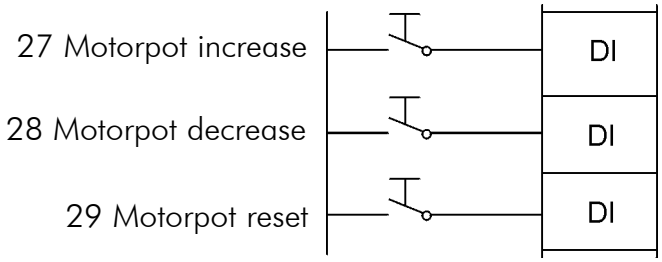
An impulse contact (N.O.) leads a Start-command. An impulse contact (N.C.) leads a Stop-command. Closing the contact leads to a change of direction. Contact open = Forward

PID controller:



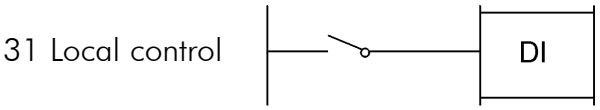
If the PID controller is activated (A071=1), the command "PID enable" disables the PID controller and the PID ref. value acts directly on the output frequency.

Motorpotentiometer:



Reference values via the motorpotentiometer are defined via the signals "Motorpot increase" and "Motorpot decrease".
Thereby, the reference value is increased and decreased with the adjusted acceleration/ deceleration time (F002/F003 and F202/F203) as long as the command is active.
The motorpotentiometer is activated via parameter A001 = 02.
The command "Motorpot reset" deletes the reference value, if he is stored with parameter C101 = 01.

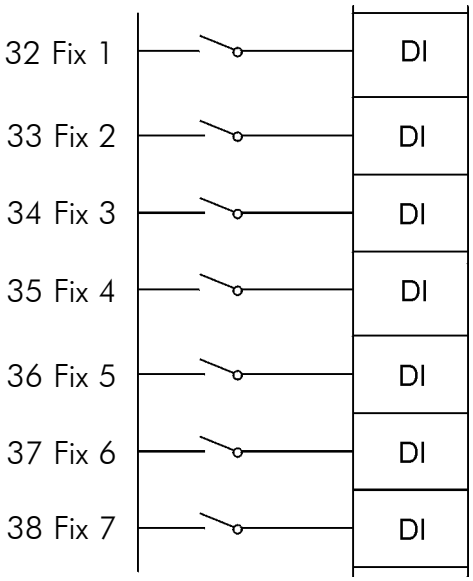
Local control:



By closing this contact, the control via the keypad is activated. After pressing the RUN key, the inverter accellerates up to the reference value set with F001 - independent from A002 "Method of run command".
If the contact is closed during operation, the drive stops first.

Multispeeds ("bit"-function):

The multispeeds (maximum 7) are selected using the signals SF1...SF7 according to the table:



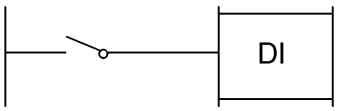
SF1	SF2	SF3	SF4	SF5	SF6	SF7	Ref. value
0	0	0	0	0	0	0	analog value
1	x	x	x	x	x	x	1 (A021)
0	1	x	x	x	x	x	2 (A022)
0	0	1	x	x	x	x	3 (A023)
0	0	0	1	x	x	x	4 (A024)
0	0	0	0	1	x	x	5 (A025)
0	0	0	0	0	1	x	6 (A026)
0	0	0	0	0	0	1	7 (A027)

If several multispeeds are selected at one time, the lower value has priority.
The number of multispeeds depends on the actual number of digital inputs. Maximum 5 free adjustable digital inputs are available at a standard control terminal.

The multispeeds are programmed in parameter group A. The multispeeds are pure reference values without any Start/Stop commands.

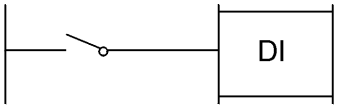
Switch-over of overload restriction:

39 Switch-over of overload restriction



With this command a switch-over between the two different overload restrictions (b021...b023 and b024...b026) is possible .

NO no function



This command has no effect !

Notes:

- You can not use the same value for parameters C001 to C005.
- If a parameter is to be shifted to another terminal, the "from" terminal must be set first, then the old value set for the "to" terminal.

C011	Condition of input C001	VIC	00 or 01	00
C012	Condition of input C002	VIC	00 or 01	00
C013	Condition of input C003	VIC	00 or 01	00
C014	Condition of input C004	VIC	00 or 01	00
C015	Condition of input C005	VIC	00 or 01	00
C019	Condition of input FW	VIC	00 or 01	00

This parameters define the status of the programmable digital inputs C001 to C005 and FW.

Setting	State
00	N.O.
01	N.C.

b098	Thermistor type seleciton	VIC	00 to 02	00

Setting	Function
00	Thermistor not active
01	Thermistor active (PTC-behaviour)
02	NTC active

b099	Thermistor error level	VIC	0...9999 Ω	3000 Ω

This parameter defines the trigger value of the thermistor monitoring.

C085	Standardization of thermistor input	VC	0...100	Default

This balance is set in factory and should not be changed.

C101	Reference up/down selecteion	VIC	00 or 01	00

Setting	Function
00	Does not store value of motorpotentiometer
01	Stores value of motorpotentiometer

C102	Reset function selection	VC	00 to 02	00

Setting	Function
00	Reset at positive ramp
01	Reset at negative ramp
02	Reset at positive ramp, no effect during operation

If position 00 or 01 is adjusted, a Reset-signal during operation locks the output.

C103	Reset restart function selection	VIC	00 or 01	00

Setting	Function
00	Restart with 0 Hz
01	Holds the motor during restart

Digital outputs

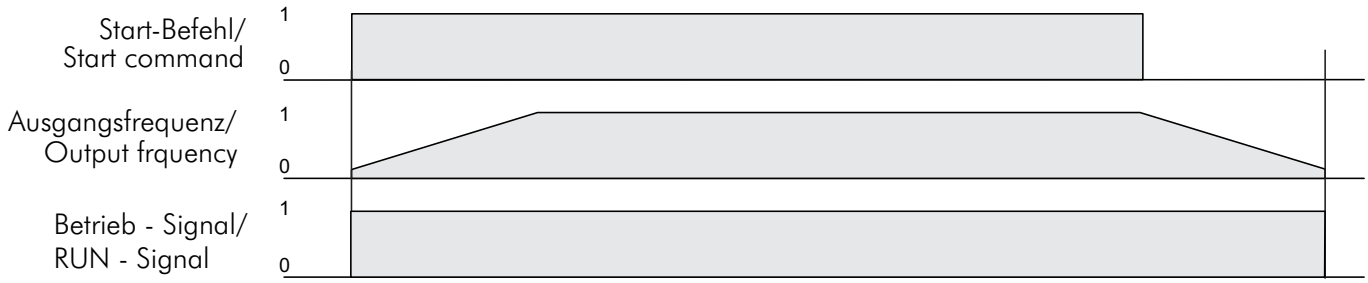
Output terminals

C021	Function of relay 11	VIC	00 to 13	01
C022	Function of relay 12	VIC	00 to 13	00
C026	Function of relay AL	VIC	00 to 13	05

The programmable relay outputs (terminals 11 and 12 and also AL) can be programmed using parameters C021, C022 and C026. The following functions can be programmed:

Setting	Short-cut	Function
00	RUN	Operation
01	FA1	„Reference value arrival" - signal
02	FA2	„Frequency exceeded" - signal (C042, C043)
03	OL	Overload message
04	OD	PID deviation too high
05	AL	Error message
06	FA3	„Frequency arrival" - signal (C042, C043)
08	IP	Mains failure
09	UV	Undervoltage
11	RNT	Operating hours motor exceeded (b034)
12	ONT	Operating hours inverter exceeded (b034)
13	THM	Temperature alarm (C061)

Function: RUN C021, C022 or C026 = 00 RUN "Operation"

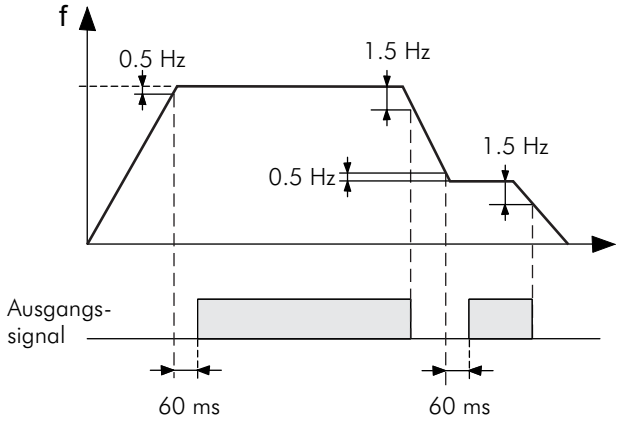


Note:
If the frequency value of the inverter is smaller than the start frequency (which is set with parameter b082), there is no "Operation"-signal (RUN).

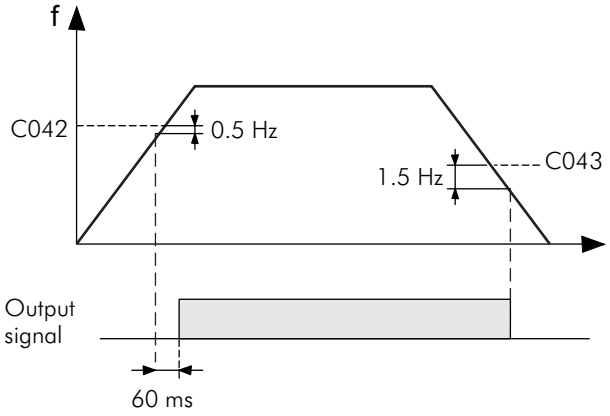
Function: FA1	C021, C022 or C026 = 01	FA1	"Ref. value arrival"
Function: FA2	C021, C022 or C026 = 02	FA2	"Frequency exceeded"
Function: FA3	C021, C022 or C026 = 06	FA3	"Frequency arrival"

The frequency at which the signal is to be issued during acceleration is set using parameter C042 (hysteresis -0,5 Hz bis +1,5 Hz).
The frequency at which th signal is to be issued during deceleration is set using parameter C043 (hysteresis +0,5 Hz bis -1,5 Hz).

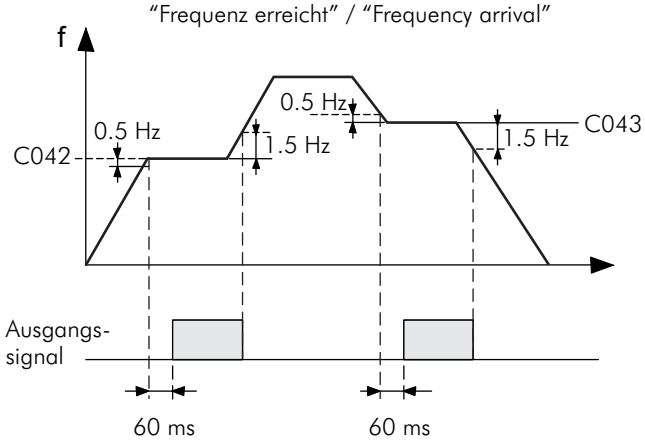
Funktion FA1: C021, C022 oder/or C026 = 1
"Sollwert erreicht" / "Reference value arrival"



Funktion FA2: C021, C022 oder/or C026 = 2
"Frequenz überschritten" / "Frequency exceeded"

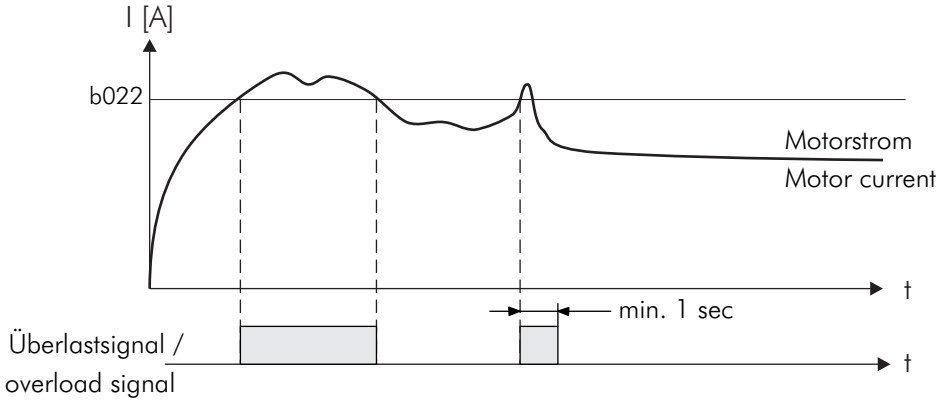


Funktion FA3: C021, C022 oder/or C026 = 6
"Frequenz erreicht" / "Frequency arrival"



Function: OL	C021, C022 or C026 = 03 OL "Overload message"

This message is issued as soon as the motor current exceeds the value set for parameter C041, both during motor and generator operation.



Function: OD	C021, C022 or C026 = 04 OD "PID deviation too high"

This message is issued as soon as the difference between reference value and actual value exceeds the value set for parameter C044 (bipolar).

Function: AL C021, C022 or C026 = 05 AL "Error message"

If one of the outputs C021 or C022 is set to position 05, an error signal is issued if an error occurs. During mains failure the error signal will continue only as long as there is still power in the inverter.

Function: IP C021, C022 or C026 = 08 IP "Mains failure"

This message occurs as soon as the Input phase loss protection (b006) triggers.

Function: UV C021, C022 or C026 = 09 UV "Undervoltage"

This message occurs as soon as the undervoltage monitoring of the DC link triggers.

Function: RNT C021, C022 or C026 = 11 RNT "Operating hours motor"

If the operating time of the motor (d016) exceeds the value set with b034, a message is indicated.

Function: ONT C021, C022 or C026 = 12 ONT "Operating hours inverter"

If the operating time of the inverter (d017) exceeds the value set with b034, a message is indicated.

Function: THM C021, C022 or C026 = 13 THM "Temperature alarm"

As soon as the thermal motor model exceeds the value set with C061, a message is displayed.

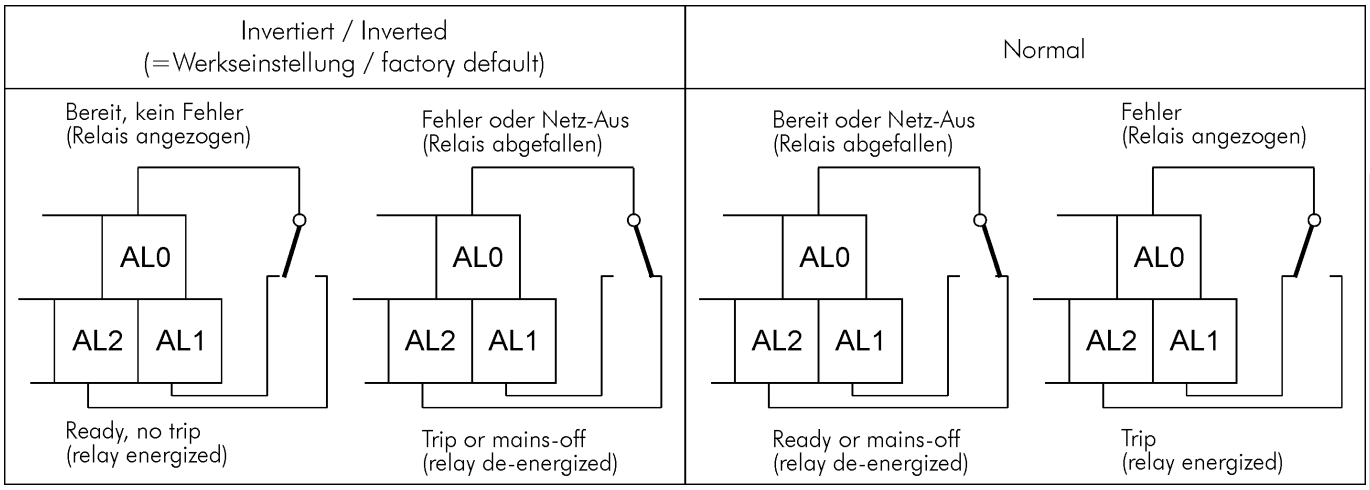
C031	Relay output 11: Inversion	VIC	00 or 01	00
C032	Relay output 12: Inversion	VIC	00 or 01	00
C036	Relay output AL: Inversion	VIC	00 or 01	01

These parameters change the status of the programmable outputs.

Setting	Function
00	normal (open)
01	inverted

Function	Mains	State	Relay	AL0-AL1	AL0-AL2
„inverted"	ON	Ready	energized	closed	open
(factory-	ON	Trip	de-energized	open	closed
default)	OFF	-----	de-energized	open	closed

Function	Mains	State	Relay	AL0-AL1	AL0-AL2
„normal"	ON	Ready	de-energized	open	closed
	ON	Trip	energized	closed	open
	OFF	-----	energized	open	closed



Output functions

`Output functions`

C040	Overload signal output mode	VIC	00 or 01	00

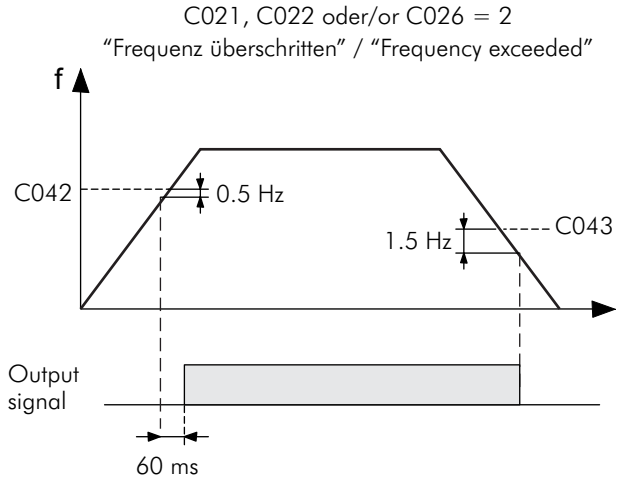
Setting	Function
00	Message during acceleration and constant frequency
01	Message only at constant frequency

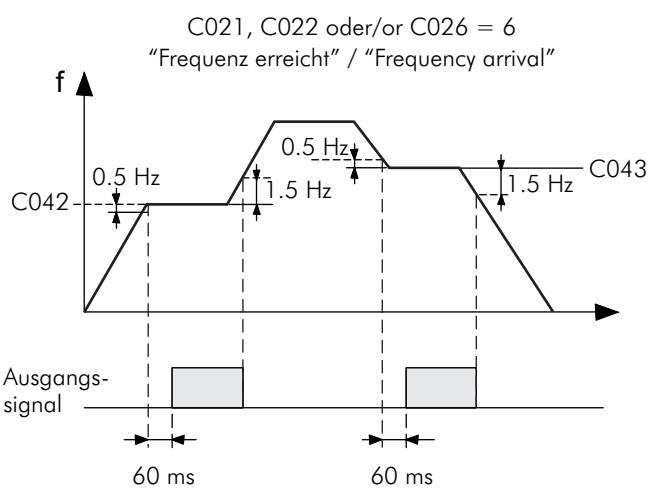
C041	Level of overload signal 1	VIC	0...2 x INOM	INOM

Setting the parameter within a range of 0 to 200 % with reference to the nominal current of the inverter.
If the motor current exceeds the value of parameter C041, an overload signal is issued.

C042	Arrival signal for Acceleration 1	VIC	0,0...360,0 Hz	0,0 Hz
C043	Arrival signal for Deceleration 1	VIC	0,0...360,0 Hz	0,0 Hz

With C042 and C043 the frequencies are set, at which the output switches over.





C061	Level of thermal motor protection	VIC	0...100 %	80 %

This parameter defines the level, at which the alarm message "Temperature alarm" occurs at the digital output. If this parameter is set to 0 %, the function is not active.

b034	Run/Power on time	VC	0...9999	0

This parameter acts as reference for d016 and d017.
If the operating hours counter exceeds this value, an alarm message may occur, which can be programmed to a digital output.

0. - 9999.	Operating hours x 1
100 - 9999	Operating hours x 10

Undervoltage / Autoreset

Re-Start method

b001	Selection of restart mode	VIC	00 to 03	00

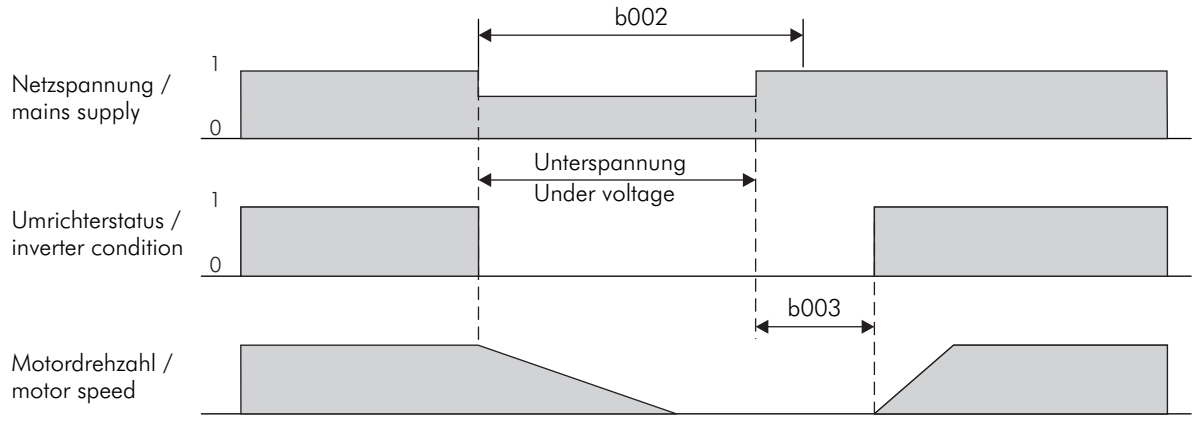
Influences the behaviour of the frequency inverter in the event of an error.

Setting	Function
00	Error message immediately
01	Autoreset with 0 Hz after the waiting time b003
02	Autoreset with "interception" of the motor after the waiting time b003
03	Autoreset with "interception" of the motor after the waiting time b003 with following deceleration to 0 Hz and output of an error message signal

The inverter tries to reset 3x on I>> and U>>. At U<< the inverter tries to reset 16 times (b005).

Note:
Attention! Synchronisation to the motor speed is only possible if the speed is less than 40% of the nominal speed and if the remanent motor voltage has not decreased too much (approx. 2...3 seconds).

b002	Allowable undervoltage time	VIC	0,3...1,0 sec	1,0 sec
b003	Retry waiting time	VIC	0,3...100,0 sec	1,0 sec



In the event of a low-voltage trip during operation, e.g. mains failure, the inverter switches to impulse lock. If the voltage returns within the time set with b002, the inverter can be started again. Otherwise, the unit shuts down with the message undervoltage.
If parameter b001 is set to 01, the time period b003 can be set after which the frequency inverter tries to start-up again (after return of power). Of course, this will only happen if the power returns within the set time.

b004	Undervoltage trip during stop	VIC	00 to 02	00

Setting	Function
00	Monitoring of undervoltage not active
01	Monitoring of undervoltage always active
02	Monitoring of undervoltage only during operation active

b005	Undervoltage Number of retry	VIC	00 or 01	00

Setting	Function
00	Tries to reset 16 times, then error message occurs
01	Tries to reset any times

b006	Input phase loss protection	VIC	00 or 01	00

Setting	Function
00	not active
01	active

b007	Matching frequency setting	VIC	0,00...400,0 Hz	0,00Hz

This parameter defines the motor speed dependent behaviour at reset.
If the speed of the motor is higher than the frequency set with b007, the inverter tries to catch on the fly and to accelerate to the set reference value.
If the speed of the motor is lower thant the frequency set with b007, a reset is done at 0,0 Hz.

f_x General functions
Miscellaneous

F004	Running direction of RUN key	-	00 or 01	00

Setting for direction of motor when controlling the motor via the RUN button on the control panel:

Setting	Function
00	Forward
01	Reverse

b035	Direction restriciton (input)	VIC	00 to 02	00

Setting	Function
00	Forward and reverse possible
01	Only forward possible
02	Only reverse possible

b082	Start frequency adjustment	VIC	0,10...9,99 Hz	0,50 Hz

The devices start with a minimum of 0,1 Hz.
The value can be increased to a maximum of 9,99 Hz in increments of 0,01 Hz.

Note:
The acceleration and deceleration time is shorter, if the start frequency is increased.
Too high start frequency may cause a sweep (breakover) of the motor. Therefore, the starting frequency should not be set higher than the slip frequency.

b083	Carrier frequency setting	VIC	0,5...12,0 kHz	3,0 kHz

Setting the switching frequency of the IPM module.

Note:
A lower switching frequency will reduce the disturbances and earth currents caused by the cables, but will increase the motor noise on the other hand.
If the carrier frequency is higher than 3 kHz, the nominal current of the inverter must be decreased.

b086	Frequency converted value setting	VC	0,1...99,9	1,0

Conversion factor for the frequency display (see parameter d007).
d007 = frequency * b086
This factor is also used to adjust the "digital actual frequency" signal, which can optionally be issued via the analog output FM up to a max. frequency of 3,6 Hz in proportion to the current frequency.

b087	Selection of STOP key	VIC	00 or 01	00

Defines the function of the STOP button on the control panel.

Setting	Function
00	STOP key always active
01	STOP key only in local operation active

b088	After FRS cancelled	VIC	00 or 01	00

Defines the behaviour of the inverter after reseting the idle command (FRS).

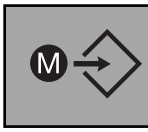
Setting	Function
00	Restart at 0 Hz
01	Restart at the acutal frequency ("interception")

b092	Cooling fan control	VIC	00 or 01	00

Setting	Function
00	Fan is alway running
01	Fan runs only during operation (after mains switch-on and after stop-command the fan still runs 5 minutes)

b037	Display selection	VIC	00 to 02	00

This parameter must be always set to 00.



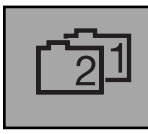
Motor data
Motor data

H003	Motor kW rating	VIC	0,20...75,0 kW	Default
H004	Motor poles	VIC	2 / 4 / 6 / 8	4

With this parameters the nominal motor data according to the type plate are adjusted.

H006	Motor stabilisation constant	VC	0...255	100

With the help of this parameter the drive can be stabilized. If the motor does not run roundly, the value must be increased. If the inverter operates a motor with higher power than the inverter, the value must be reduced.



2nd Set
2nd Set-up

A203	2nd Base frequency	VIC	30...400 Hz	50 Hz

Adjustment of the base frequency. The base frequency is the frequency at which the output voltage reaches its maximum value. Normally, the base frequency is equal to the nominal motor frequency (more information see parameter A003).

A204	2nd Maximum Frequency	VIC	30...400 Hz	50 Hz

Adjustment of maximum frequency. Between base frequency and maximum frequency the output voltage is constant (field suppression).

F202	2nd Acceleration ramp	VC	0,01...3600 s	30 s

Setting of required acceleration time. The time is in reference with the range from 0 Hz to maximum frequency (parameter A204).

F203	2nd Deceleration ramp	VC	0,01...3600 s	30 s

Setting of required deceleration time. The time is in reference with the range from 0 Hz to maximum frequency (parameter A204).

A220	2nd Internal pre-set speed	VC	0,00...400,0 Hz	0,00 Hz

Entry of frequency reference value, if function A001 is set to position 02. Allows the entry of a minimum frequency to which the inverter runs up without selecting a digital input "CF1...CF4" as soon as a Start-command is issued.
If the PID controller is active, the adjusting range changes into 0 to 100 %.

A241	2nd Torque boost method selection	VIC	00 or 01	00

Setting	Function
00	manual boost
01	automatic boost

A242	2nd Manual torque boost setting	VC	0,0...20,0 %	1,0 %
A243	2nd Manual torque boost frequency point	VC	0,0...50,0 %	5,0 %

For applications which require higher starting torque, the standard starting torque can be increased by up to 50 %. Use parameter A241 to select between automatic and manual boost. Parameter A242 defines the value by which the torque has to be boosted. The range in which this boost takes effect is defined by parameter A243.
(more information see parameters A042 and A043)

A244	2nd V/f characteristic setting	VIC	00 to 02	00

Parameter to set one of the possible V/f characteristics.

Setting	Function
00	constant torque
01	reduced torque (Economy mode)
02	free adjustable V/f characteristic (b100...b113)

A261	2nd Frequency upper limit	VIC	0,00...400,0 Hz	0,00 Hz
A262	2nd Frequency lower limit	VIC	0,00...400,0 Hz	0,00 Hz

Defining the frequency range within a range from 0 to parameter A204 (max. 400 Hz). If the values are set to 0,00 Hz, their function is cancelled (more details see parameters A061 and A062).

A292	2nd Second acceleration ramp	VIC	0,01...3600 s	15,00 s
A293	2nd Second deceleration ramp	VIC	0,01...3600 s	15,00 s
A294	2nd Method of second stage selection	VIC	00 or 01	00

Setting	Function
00	Switch-over via an external signal on a digital input (setting: 09)
01	Switch-over when the frequencies set at parameter A295 and A296 are reached

A295	2nd Stage Acceleration change over point	VIC	0,00...400,0 Hz	0,00 Hz
A296	2nd Stage Deceleration change over point	VIC	0,00...400,0 Hz	0,00 Hz

Particularly, this switch-over is used for EMERGENCY STOP functions and speed-related acceleration and deceleration times. The adjusted acceleration/deceleration time is related to the maximum frequency A004.

b212	2nd Electronic overload setting	VIC	0,2...1,2 x IFIIN	FU-INOM

A thermal motor contactor ("maximum continuous current") can be set by entering the nominal motor current in A (more information see parameter b012).

b213	2nd Selection of electronic overload charact.	VIC	00 to 02	01

Defines the characteristic curve of the thermal motor contactor (more information see b013).

Setting	Function
00	reduced load torque (self-ventilated)
01	constant load torque (force-ventilated)
02	free adjustable load torque

H203	2nd Motor kW rate	VIC	0,20...75,0 kW	Default
H204	2nd Motor poles	VIC	2 / 4 / 6 / 8	4

With this parameters the nominal motor data according to the type plate are adjusted.

H206	2nd Motor stabilisation constant	VC	0...255	100

With the help of this parameter the drive can be stabilized. If the motor does not run roundly, the value must be increased. If the inverter operates a motor with higher power than the inverter, the value must be reduced.

	Analog outputs **Analog output**

C027	Function of FM PWM output	VIC	00 to 07	00
C028	Function of AM analog output	VIC	00 to 07	00
C029	Function of AMI analog output	VIC	00 to 07	00

Programming the function of the analog/digital output FM and of the analog outputs AM and AMI.

Setting	Function
00	Analog display of the frequency
01	Analog display of the current
03	Digital display of the frequency (setting only possible at C027)
04	Analog display of the output voltage
05	Analog display of the power taken up
06	Analog display of the thermal utilization
07	Analog display of the LAD frequency

Function: Display output frequency C027, C028 or C029 = 00

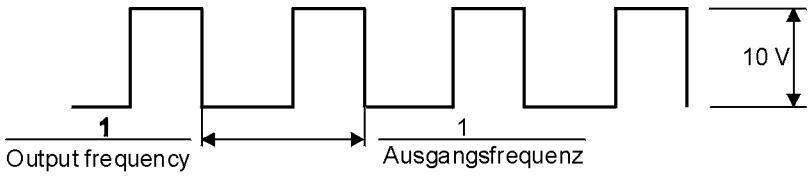
10V or 20mA correspond with the maximum frequency (parameter A004 or A204).

Function: Display of motor current C027, C028 or C029 = 01

10V or 20mA correspond with 200% of the nominal inverter current.

Function: Digital output frequency C027 = 03

There is a digital frequency signal corresponding to the output frequency at the output. The output delivers a 1:1 square signal with 10 V amplitude (a different multiplication factor, max. 3,6 kHz, can be set using parameter b086).
This function is only possible at analog/digital output FM (parameter C027).



Function: Analog display of motor voltage C027, C028 or C029 = 04

10V or 20mA correspond with the maximum motor voltage A082.

Function: Analog display of power consumption C027, C028 or C029 = 05

10V or 20mA correspond with 200% of the nominal inverter power.

Function: Analog display of thermal utilization C027, C028 or C029 = 06

10V or 20mA correspond with the maximum thermal utilization of the motor (in accordance with the thermal motor model: parameter b012 or b212 "Electronic overload setting").

Function: Analog display of LAD-frequency C027, C028 or C029 = 07

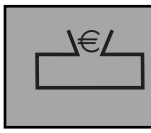
10V or 20mA correspond with the maximum frequency (parameter A004 or A204).

b080	AM analog adjustment	VC	0...255	180
b081	FM PWM meter adjustment	VC	0...255	60

With this parameter the analog output AM and the digital PWM-output FM can be adjusted. At the FM output the changed relation of pulse and pause can lead to full-scale deflection at maximum output value.

C086	AM analog offset	VC	0,0...10,0 V	Default
C087	AMI analog adjustment	VC	0...255	50
C088	AMI analog offset	VC	0,0...20,0 mA	Default

This adjustments are done in factory and should not be changed!



Energy saving

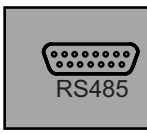
Energy Saving

A085	Operation mode selection	VIC	00 or 01	00

Setting	Function
00	Operation mode not active
01	Operation mode active

A086	Energy saving response	VC	0,0...100,0	50,0

Parameter A086 defines the voltage decrease at energy saving. If A086 = 0,0 the voltage is not reduced but at 100,0 the voltage is very much reduced.



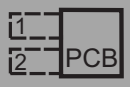
Serial communication

Communications

C070	Data command	VIC	02 to 05	02
C071	Transmission speed	VIC	02 to 06	04
C072	Identification code	VIC	1...32	1
C073	Data bits	VIC	7 or 8	7
C074	Parity	VIC	00 to 02	00
C075	Number of Stop bits	VIC	1 or 2	1
C078	Waiting time	VIC	0...1000 ms	0

Parameters C070...C078 allow the configuration of the serial interface RS485.

This function is not supplied at the moment !



Option cards

Option card

P001	Option 1 Selection on error	VIC	00 or 01	00
P002	Option 2 Selection on error	VIC	00 or 01	00

This parameter defines, if an error in the connection with the option cards leads a trip message or not.

Setting	Function
00	Error
01	No error

Software lock, Factory default

b031	Software lock	VIC	00 to 10	01

Locks or releases adjustment of parameters.

Setting	Function
00	All parameters locked (excepted parameter b031) as long as there is a lock signal at the control terminals (set one of the parameters C001...C005 to position 15)
01	All parameters locked (excepted parameter b031 and frequency reference value F001) as long as there is a lock signal at the control terminals (set one of the parameters C001...C005 to position 15)
02	All parameters locked (excepted parameter b031) as long as parameter b031 is set to position 02
03	All parameters locked (excepted parameter b031 and frequency reference value F001) as long as parameter b031 is set to position 03
10	All parameters locked (excepted parameter b031) and all parameters, which can be adjusted during operation, are active as long as parameter b031 is set to 10.

b084	Factory default setting	VIC	00 to 02	00

Setting	Function
00	Delete error message
01	Reset to factory default (see "Commissioning")
02	Deletes error message and resets to factory default

b085	Kind of factory default	VIC	00 to 03	01

Selection of factory defalt.

Setting	Function
00	-
01	Factory default of parameters for Europe
02	Factory default of parameters for USA
03	-

Notes

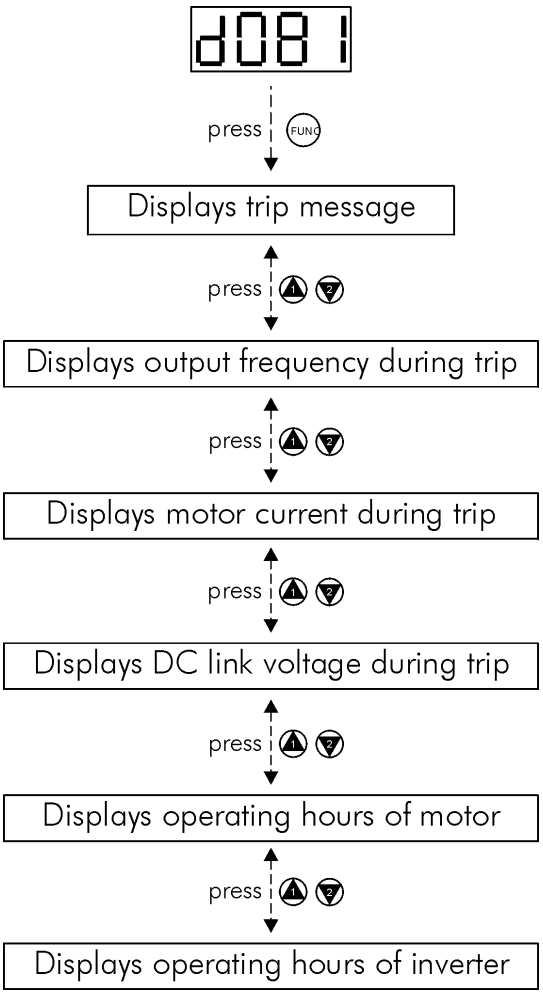
Fault memory

d080	Number of trips	-	read only	-

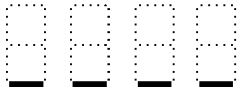
Display of the number of trip messages on the LED display.

d081...d086	Trip messages	-	read only	-

Parameters d081 to d086 display the last error messages. They show the output frequency, the motor current, operating hours of motor and inverter during fault at the display.
d081 shows the last error, d082 the error before ...



If no trip has occured, the display indicates:

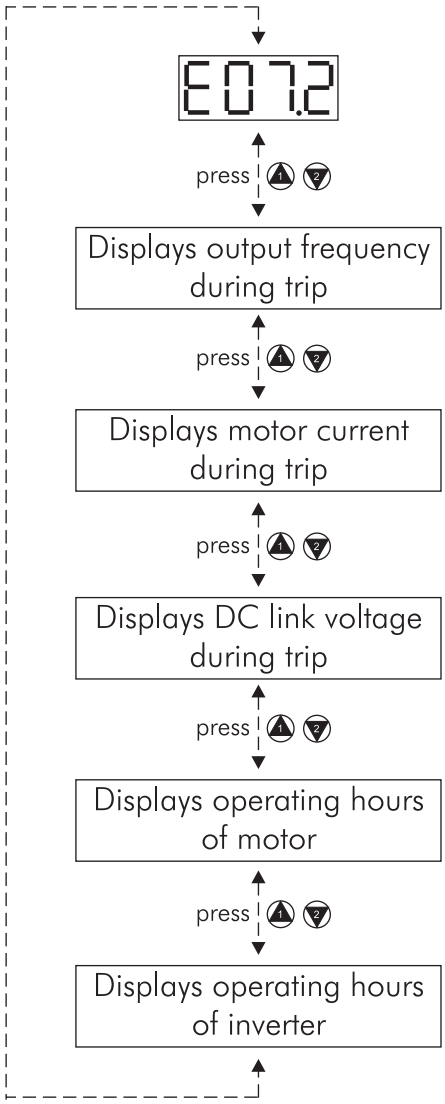


Error messages

The frequency inverters have protection functions against e.g. overcurrent, overvoltage, undervoltage,... In case of a trip, the output voltage is switched off, the motor stops idle and the inverter stays in trip state until the trip is resetted.

No.	Trip	Possible cause	Remedy actions
E01	Overcurrent or overvoltage of the IPMs in static operation	Sudden load spikes, stalling motor, short circuit on the motor terminals, earth fault, nominal motor current is higher than nominal current of inverter	Avoid sudden overloads, select inverter and motor with higher power capacity, check motor cable and motor for short circuit or earth fault, decrease parameter A045
E02	Overcurrent or overtemperature during deceleration	Set deceleration time is too short, short circuit at motor terminals, earth fault, nominal motor current is higher than nominal current of inverter	Increase deceleration time, check motor cable and motor for short circuit or earth fault, decrease parameter A045
E03	Overcurrent or overtemperature of the IPMs during acceleration	Set acceleration time too short, short circuit at motor terminals, earth fault, set voltage boost to high, stalling motor, nominal motor current is higher than nominal current of inverter	Increase acceleration time, check motor cable and motor for short circuit or earth fault, check the load and starting torque, decrease parameter A042 (A242)
E04	Overcurrent or overtemperature during stand-still	Too high ambient temperature	Check ambient temperature; decrease parameter A045
E05	Triggering of the int. motor protection	Motor overload	Select an inverter and motor with higher power capacity
E06	Overload of braking resistor	Duration time of internal braking unit is too high	Increase deceleration time, increase duration time of braking unit (b090)
E07	DC link overvoltage	Set deceleration time is to short, motor is in generator-mode	Increase deceleration time, use a braking resistor, do not activate AVR during deceleration, adjust higher motor voltage (A082)
E08	EEPROM error	Above-average high data storage, power supply failure during data storage, high electromagnetic fields, or too high ambient temperature	The life time of the EEPROM is about 10000 storages (related to 10 years with a few storages a day)
E09	Mains undervoltage	Wrong mains voltage, short mains losses	Check input voltage

No.	Trip	Possible cause	Remedy actions
E10	Trips at the current transformers	Current transformer is defect	Replace current transfomer
E11	Trip of calculator	Electromagnetic fields, frequency inverter defect	Check of possible external disturbances, contact the customer service
E12	External fault	An external fault is send via a digital input of the inverter	Check the reason of the trip and solve the problem
E13	Trip by restart lock	Switch-on of mains voltage at active lock or mains failure at active lock	The corresponding terminal must not be interconnected before switching on mains, check mains voltage supply
E14	Earth fault on the motor terminals	Earth fault	Remove earth fault and check the motor
E15	Mains overvoltage	Mains overvoltage is higher than the nominal voltage of the inverter	Check the mains voltage
E16	Short mains failures	Are there mains voltage dips in the range > 15ms ?	Check the input voltage
E21	Overtemperature in power part	Inverter overload, ambient temperature too high	Check the motor current, check ambient temperature, check fans
E23	Communication error	Trip between CPU and interface	Replace control printed circuit
E24	Phase failure	A phase of the mains voltage fails or the mains voltage is switched off during deceleration	Check mains voltage
E30	IGBT failure	Is the motor bigger than the frequency inverter ? Was there a sudden load increase or is the motor stalling ? Is there a short-circuit of the motor terminals U, V, W ?	Select a frequency inverter of higher performance. Avoid overloads. Use inverter and motor of higher performance. Check motor and motor cables for short-circuit.
E35	Motor thermistor activated	Motor overload, Is the self-ventilation of the motor - especially at low speed - to less, built-in distances to short	Check load of the motor, check built-in distances



Trip no.

State of the inverter during trip

Trip occurs during:

0	Reset
1	Stop
2	Deceleration
3	Constant speed
4	Acceleration
5	Run command without frequency ref. value.
6	Start
7	DC braking
8	Overload restriction

Error messages can be removed with Reset. There are several possibilities:

- Link the programmed input for short time with P24
- Press the STOP/RESET key on the keypad
- Switch-off the power supply

Note:

An inverter which operates without any failure, will decelerate to 0 Hz if an reset signal is released !! Set parameter C102 “Reset function selection” to position 02 !!
If the error message stays after reset was released, please call your customer service department or the supplier of the unit.

Alarm messages

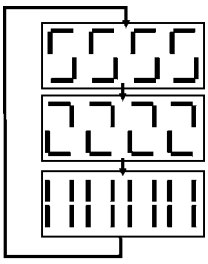
The frequency inverter displays alarm messages H (= H) if the parameter settings do not match.

Display	Meaning		
H001 / H201	A061 / A261	>	A004 / A204
H002 / H202	A062 / A262	>	A004 / A204
H004 / H204	A003 / A203	>	A004 / A204
H005 / H205	F001, A020 / A220	>	A004 / A204
H006 / H206	A021 - A035	>	A004 / A204
H012 / H212	A062 / A262	>	A061 / A261
H015 / H215	F001, A020 / A220	>	A061 / A261
H016 / H216	A021 - A035	>	A061 / A261
H021 / H221	A061 / A261	<	A062 / A262
H025 / H225	F001, A020 / A220	<	A062 / A262
H031 / H231	A061 / A261	<	b082
H032 / H232	A062 / A262	<	b082
H035 / H235	F001, A020 / A220	<	b082
H036	A021 - A035	<	b082
H037	A038	<	b082
H085 / H285	F001, A020 / A220	=	A063 - A068
H086	A021 - A035	=	A063 - A068
H091 / H291	A061 / A261	>	b112
H092 / H292	A062 / A262	>	b112
H095 / H295	F001, A020 / A220	>	b112
H096	A021 - A035	>	b112
H110	b100, b102, b104, b106, b108, b110	>	b112
	b100, b102, b104, b106, b108	>	b110
	b100, b102, b104, b106	>	b108
	b100, b102, b104	>	b106
	b100, b102	>	b104
	b100	>	b102
H120	b015, b017	>	b019
	b015	>	b017

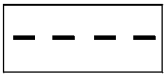
d090	Warning monitor	-	read only	-

Parameter d090 also displays the actual warnings.

Further displays

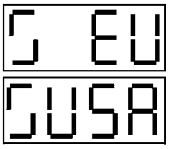


Is displayed during initialisation, when switching on and if a reset signal is issued.

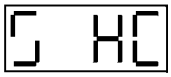


Is displayed in the event of low voltage or mains failure.

The waiting time for automatic restart expires.
(see parameter b001 to b003)



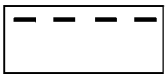
Is displayed during initialisation of parameters and indicates the initialisation version:
EU ... European version
USA ... American version



Is displayed during deleting the error list.

Is displayed during copying.

No data available (e.g. display under d081...d086 if the fault memory is empty or display under d004 if the PID controller is not active).



The keypad is not plugged-in correctly or there is no contact.

Special safety instructions

Short mains failure

During a mains failure, the *>pDRIVE< CX profi* frequency inverter continues operating until the intermediate circuit voltage drops below the minimum working level (approx. 20 % below the lowest supply voltage). The time depends on the mains voltage before switching off, and on the load.
If a Start command is issued, the motor runs up again as soon as the power supply returns. This can be blocked with the function "USP". If a digital input is parametrised for the function 13 USP "Restart lock" and this signal is also issued, an error message (E13) is issued whenever the mains supply is switched on, if a Start command has already been issued. (See description of parameters C001 to C005)

Automatic restart

- After low mains voltage:
  If a Start command is issued, there is an automatic restart every time the mains supply returns.
- After confirming an error
- After autoreset (parameter b001)

Frequencies > 60 Hz

When operating motors with frequencies over 60 Hz, the suitability of the corresponding components must be checked first. An inquiry with the motor or machine manufacturer is important. 4-8 pole motors are usually suitable for operation up to 100 Hz.

Insulation tests

All *>pDRIVE< CX* frequency inverters are tested for voltage stability and insulating resistance in accordance with EN 50178. Insulating resistance measurements, e.g. within the scope of an inspection, must be carried out between the short-circuited power terminals and earth only. For a correct, complete insulation test, the CE filters must be disconnected.
Do not carry out any insulation resistance tests with the control terminals !!

Installation rules for compliance with CE regulations

The *>pDRIVE< CX profi* frequency inverters together with the available filter options CE-DR comply with the EMV directive 89/336/EEC and the low-voltage directive 73/23/EEC, i.e. conformity with EN 61800-3 and EN 50178

- Use of the option "CE-DR Filter" or use of an equivalent filter solution
- Assembly on a properly grounded metal assembly plate with good HF connection between the motor cable screen and filter.
- Use and proper connection (bipolar !!) of screened motor cables
- Use of an AMF (Output Motor Filter) for greater motor cable lengths
- Use and proper connection of screened control cables
- Grounding the frequency inverter with at least 10 mm^2 personal safety
- Separate installation of motor cables and other cables, especially control wires

Technical Data

>*pDRIVE*< *CX profi*	*11*	*15*	*18*	*22*	*30*	*37*

Power data						
Motor rating (recomended)	11 kW	15 kW	18,5 kW	22 kW	30 kW	37 kW
Continuous output power	15,2 kVA	20,1 kVA	25,3 kVA	29,4 kVA	39,4 kVA	48,4 kVA
Continuous output current	22 A	29 A	37 A	43 A	57 A	70 A
Nom. input current						
without line choke	24 A	32 A	40 A	47 A	63 A	76 A
with line choke	21 A	28 A	36 A	42 A	56 A	68 A
Maximum current	120 % I_N (>60 s / 10 min); 150 % I_N for 0,5 s					
Starting torque	> 150% T_N					

General data						
Input voltage	3 AC 380...480 V ±10%; 50/60 Hz ±5%					
Output voltage	3 AC, 0...100 % of mains voltage					
Output frequency	0,1...400 Hz, adjustable					
Base frequency	30...400 Hz, adjustable					
Losses at 100% I_N	600 W	800 W	975 W	1150 W	1550 W	1900 W
at 70% I_N	435 W	575 W	700 W	820 W	1100 W	1350 W
Weight approx.	5 kg		12 kg			20 kg
Dimensions Height	260 mm		390 mm			540 mm
Width	210 mm		250 mm			310 mm
Depth	170 mm		190 mm			195 mm
Design / Protection degree	Built-in unit for vertical mounting / IP20					
Operating/Storage temp.	-10...+40°C / -20...+65°C					
Temperature increase	+50°C with max. 2 kHz carrier frequency					
Pollution degree	2 according to EN 50178					
Cooling	forced					
Humidity	20...90%, non-condensing					
Altitude	≤1000 m (above: power reduction of 1% per 100 m; max. 2000 m)					

Braking function				
Braking torque	80% with BR60R	60% with BR60R	10% without option	10% without option
Internal braking unit	built-in		–	–
External braking option	BS 400/27 with 2 x BR60R parallel		BS 400/27 with BR20R	BS 400/27 with BR20R
DC braking	f, t and I adjustable			

General technical data

Standards	CE-EMC directive in connection with optinal RFI filter and under consideration of the installation remarks CE low voltage directive, UL
Product standard	EN 61 800-3 "Power drive system"
NSR directive	73/23 EWG
Vibration/ Shock	5,9 m/s^2 (0,6 G) 10...55 Hz (*CX profi 37*: 2,94 m/s^2 (0,3 G))
Protection class	class 1 in accordance with EN 50178
Environmental class	3K3 in accordance with DIN IEC 721-3-3
Overvoltage class	III in accordance with EN 50178
Frequency resolution	digital: 0,1 Hz, analog: f_{MAX}/1000
Frequency stability	digital ±0,01 % of f_{MAX}; analog ±0, 2 % of f_{MAX}
Reference voltage	+10 V, max. 20mA
Auxiliary voltage	+24 V, max. 100 mA
Control method	V/f - characteristic, PWM sine modulated
V/f-characteristic	U/f-characteristics for constant and squared increasing torque; output voltage, base and maximum frequency base frequency adjustable
Carrier frequency	3 kHz, 0,5...12 kHz adjustable
Control	Keypad or terminals
Analog input O	0...+10 V, R_i = 10 kΩ
Analog input O2	-10...+10 V, R_i = 10 kΩ
Analog input OI	4...20 mA, R_i = 100 Ω
Digital input FW	+24 V, positive/negative logic
Digital input 1...5	+24 V, positive/negative logic
Thermistor input	R_i = 10 kΩ
PWM output FM	0...10 V; max. 1 mA
Analog output AM	0...10 V; max. 2 mA
Analog output AMI	4...20 mA
Relay output AL	max. 250 V AC
Relay output 11	max. 250 V AC
Relay output 12	max. 250 V AC
Protection functions	for overcurrent, over- and undervoltage, earth fault, trip of fan, overload, electronic motor protection
Options	RFI footprint filter with line choke, output motor filter AMF isolating amplifier TV5 / TV6
Busoption	GW-PBO2 Gateway for Profibus DP

Remarks on power supply

Mains impedance

Virtually all frequency inverters produce harmonic oscillation when connected to the mains, which can interfere with other devices due to the voltage distortions thus caused.
Please note that all converters with connected intermediate circuit voltage (diode rectifier at input) are a load on the mains supply in their total output. The use of a line choke (integrated in the CE-DR filter) is therefore highly recommended, even when using an industrial supply network.
It is absolutely necessary if:

- the mains symmetry can be >3%
- the output of the upstream transformer is ≥ 500 kVA
- there are strong mains voltage drops
- the inverter is operated on a generator
- the inverter is used in residential areas
- several inverters connected via a short bus bar are supplied by the mains network

Without a line choke, the above operating conditions can cause damage to the inverter!!

Safety remarks / FI safety switch

Frequency inverters, particularly those with CE filters (RFI filters) and screened motor cables, conduct an increased leakage current to earth. This depends on:

- the length of the motor cable
- the type of installation and whether the motor cable is screened or not
- the set clock frequency
- the use of a radio interference suppression filters (yes or no)
- the grounding of the motor on location (grounded or not)

Especially at the moment of switching on the filter's capacitors and during operation, the earth capacities can lead to an unwanted FI safety switch trip. On the other hand, it is possible to block this trip function through mains rectification at the input of the inverter with d.c. components.
Therefore, please note the following:

- Use only short-time delayed and clock-sensitive FI safety switches with considerably higher rated trip current.
- Protect other consumers with a separate FI safety switch.
- FI safety switches upstream from a inverter are not an absolute safeguard against direct contact!! Therefore, they should always be used in conjunction with other protective measures.
- The >*pDRIVE*< *CX* frequency inverters do not have a current-limiting effect (with fault currents), and thus do not violate the grounding conditions.

In plants with cables of medium length, the leakage current can easily be greater than 300 mA, depending on the conditions!!

Mains fuses and cable diameters

1.) 2.) 1.) 4.) 5.) 1.) 1.) 3.)

Mains supply				Frequency inverter			Motor-output
Pre-or conduit fuses	Cu cable	Mains fuse "inverter protection" "sf"	Lines in the cubicle (per phase)	>*pDRIVE*<	Max. contin. current	Connec-tion	Motor cable
40 A	3x6 mm^2	32 A	6 mm^2	*CX profi 11*	22 A	M6	3x6 mm^2
50 A	3x10 mm^2	40 A	10 mm^2	*CX profi 15*	29 A	M6	3x6 mm^2
63 A	3x16 mm^2	50 A	10 mm^2	*CX profi 18*	37 A	M6	3x10 mm^2
63 A	3x16 mm^2	50 A	10 mm^2	*CX profi 22*	43 A	M6	3x10 mm^2
80 A	3x25 mm^2	63 A	10 mm^2	*CX profi 30*	57 A	M6	3x10 mm^2
100 A	3x35 mm^2	80 A	16 mm^2	*CX profi 37*	70 A	M6	3x16 mm^2

Key to table:

1. The cable diameter indicated in the table are an index for laying the cable in air at max. 40°C, based on the ÖVN EN 1 and VDE 0100 regulations.

   For other ambient conditions and different regulations, the cable diameters must be adjusted accordingly.
2. Pre-fuses calculated for DOL starting with bypass circuit.
3. The motor cables are designed for the maximum continuous current at an ambient temperature of 40°C and laid in air. When a bypass circuit is used, the motor cable must be designed for the value of the pre- or condiut fuses!
   The use of NYCY or NYCWY cables for the motor cables (power cables with concentric protection core) is a low-price alternative to screended cables.
4. In case of a trip, sf fuses protect the inverter from secondary damage in the rectifier, the charging circuit etc.
   The mains fuses represent a secondary protection of the inverter in the case of failure of the electronic protection. However, if this fuses are blown, a primary defect has already occurred inside the unit. Therefore, changing the blown fuses and switching the inverter on again is not effective. Furthermore, it is not advantageous to use circuit breakers. This has the disadvantage of a slower switch-off.
5. If the inverter is used without line choke (CE-DR filter) the fuses must be selected one type higher to protect the inverter.

Remarks to the inverter output side

Motor cable lengths

The distances between inverter and motor indicated in the table in the chapter "CE-DR Options" must be complied with. Too long motor cables can damage the inverters!

Option: AMF (output motor filter)

To reduce the voltage rate of rise on the inverter output and the effects on parallel lines thus possible, it is of advantage to use the AMF.
With long motor cables, the AMF protects the inverter and motor, and is absolutely imperative. See table "Allocation Inverter Options Motor Cable Motor".
Especially with multimotor drives and the respective parallel motor cables, non-compliance with the cable lengths can lead to destruction of the inverter.

Compensation capacitors

Compensation capacitors, mains filters and overvoltage protection equipment must never be connected to the output of the inverters !!!

Switching at the inverter's output

Operational switching between the inverter and the motor is not permissible. This would cause stress load on the power semiconductor, and possible safety shut-down of the inverter !! This would shorten the inverter's life !!!

Exception: A revision switch that is only used in very rare cases. Here, too, the CX should be locked first, if possible (digital input programmed to 11 FRS "Impulse lock - idle").

Change of direction

Reversal protection switches for change in direction must not be used (see "Switching at the inverter's output"). In order to change the direction of rotation, a digital input on the control terminal strip or a parameter for direction selection (parameter F004) is provided.

Note:
Too long motor cables may damage the inverter.

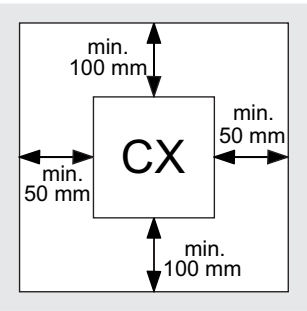
General Mounting Information

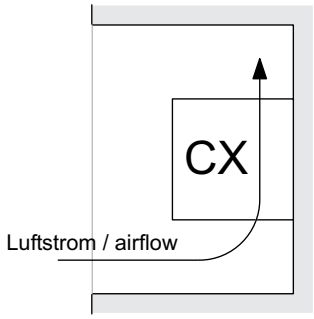
Make sure, that the input voltage is 3 AC 380...480 V ±10 %, 50/60 Hz ±5 %. Ambient factors such as high temperatures, high humidity, dust, dirt and aggressive gases must be avoided. The inverter should be installed in a well ventilated place that is protected against direct sunlight. Install the inverter on a fire-proof, vertical wall that does not transmit vibrations.

Warning! Do not apply mains power to the output terminals U, V, W.

Issue the operating signals START/STOP via the control terminals or the control panel, not by switching the mains or the motor contactor. Do not install capacitors or surge absorbers in the motor wires.

Distances from other devices or against the wall





Because of thermal convection, the frequency inverters >*pDRIVE*< *CX* are designed for vertical wall assembly. Especially when installing the inverter in a niche, you must comply with the specified minimum distance from side wall or other equipment. Objects that penetrate the interior of the inverter can cause damage.

The permissible temperature range (-10°C to +40°C, +50°C with 2 kHz clock frequency) must not be undercut or exceeded. The higher the ambient temperature, the shorter the lifetime of the inverter.

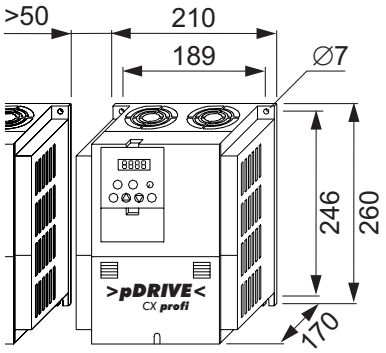
Do not install the inverter near heat-radiating equipment.

When installing the inverter in a cubicle, please note the size and heat elimination capacity of the cubicle. Provide ventilation, if necessary.

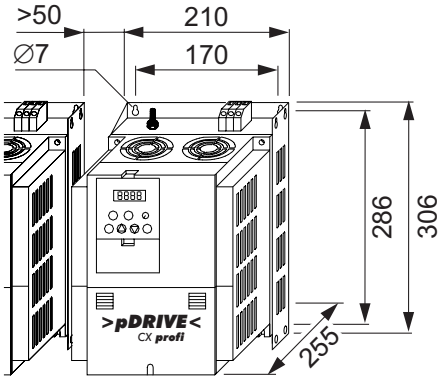
Dimensions

>*pDRIVE*< CX *profi 11* and *15*

without filter

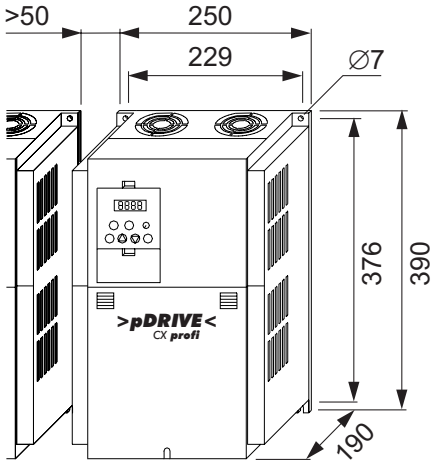


with option CE-DR 400/28
RFI-filter incl. line choke

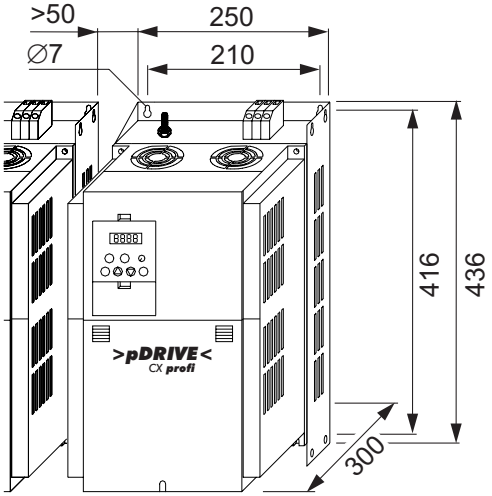


>*pDRIVE*< CX *profi 18* to *30*

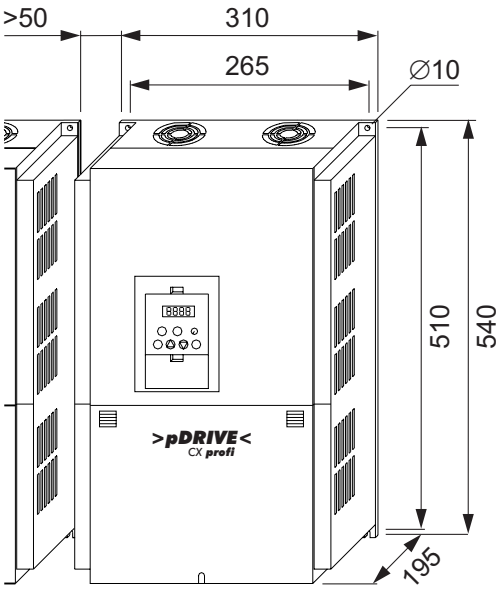
without filter



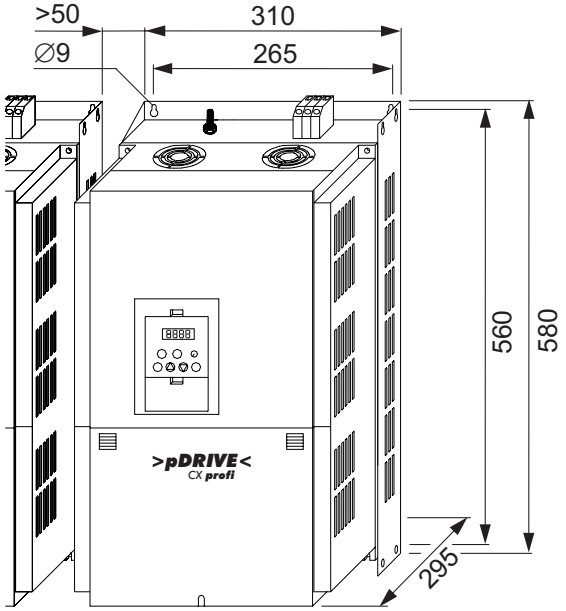
with option CE-DR 400/56
RFI-filter incl. line choke



without filter



with option CE-DR 400/68
RFI-filter incl. line choke



Notes

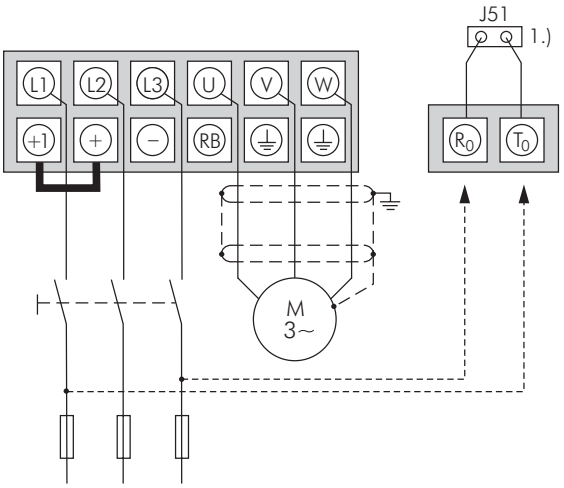
Power connections

For wiring the power and control terminals, the front cover must be removed. Do not apply mains power to the motor terminals U, V, W, since this can cause damage to the frequency inverter.

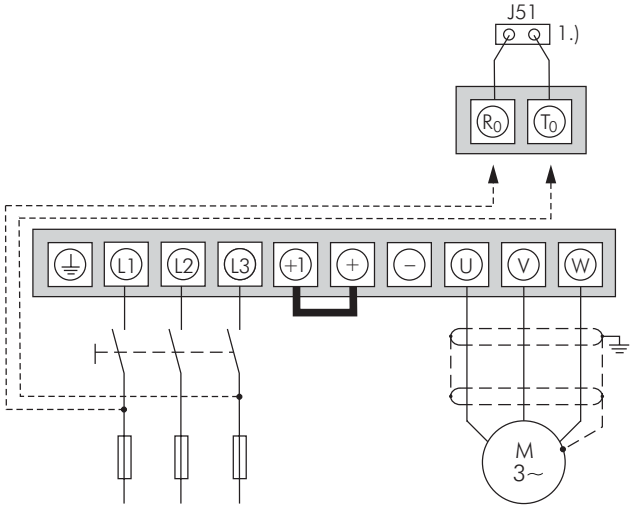
In multimotor operation, a motor protection relay must be provided for each motor.

Power connections

*>pDRIVE< CX **profi 11** and **15***



*>pDRIVE< CX **profi 18** to **37***

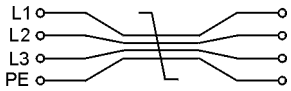


1.) If an external voltage supply is used to maintain the supply for the electronics, the internal connection between terminals R0, T0 and plug J51 must be removed

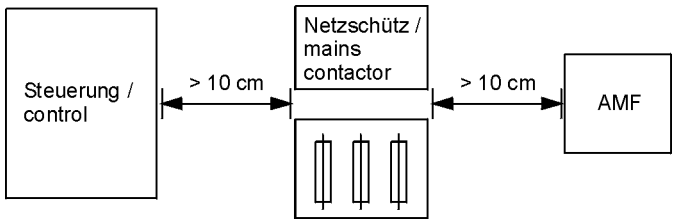
Terminal	Function	Description
L1, L2, L3	Mains connection	3 AC 380...480 V ±10%, 50/60Hz ±5 %
U, V, W	Motor connection	0...mains voltage (typ.: 3 AC 400 V)
+, –	Braking unit (Option)	Connection for the braking unit
+, RB	Braking resistor (Option)	Connection for the braking resistor at internal braking unit (only at *CX profi 11* and *15*)
+1, +	Connection for DC choke	Linked (factory default) !!
⏚	PE connection	Min. 10 mm^2 or 2 wires electronically parallel via two separated terminals.
R_0, T_0	Supply of mains part	Connection for the voltage supply of the mains part. Can be used to maintain the control voltage at switched-off power part (1 AC 400V).

General connecting information:

1.) Power wiring with individual wires should always be installed close to the corresponding PE conductor.

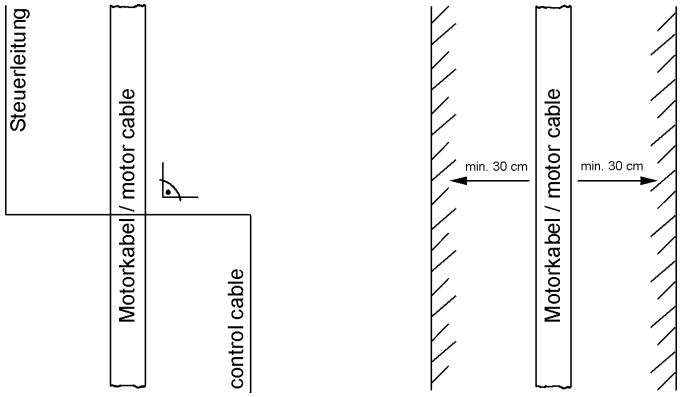


2.) Control, mains supply and motor discharge should be separated, if possible



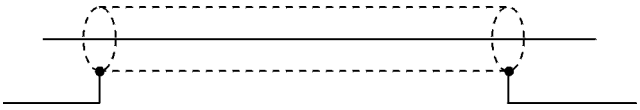
3.) Never install control lines, mains wires or motor cable in a common cable conduit!!

If control lines have to cross power cables, they should do so at right angles.

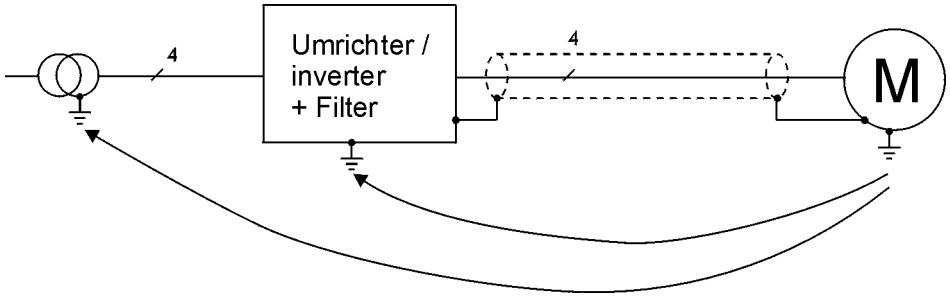


Control lines should be separated from motor cables by a distance of at least 30 cm.

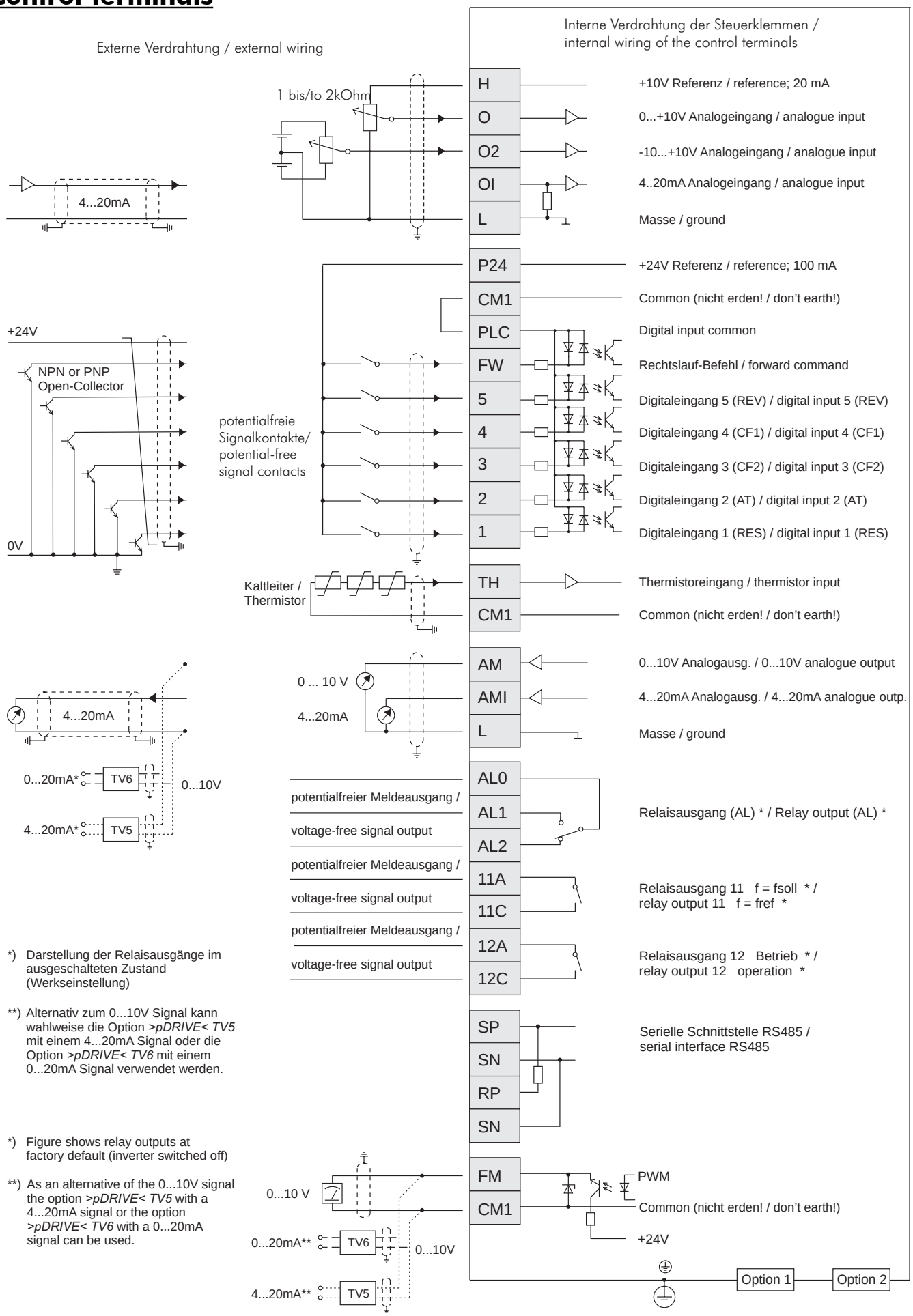
4.) Use only screened control lines (**exception**: relay contacts and digital inputs, if installed completely separate from the power cables). The screen must always be grounded bilaterally (**exception**: in case of earth circuit problems due to transient currents that heat the screen, only the signal input side is grounded or a parallel compensating wire is installed).



5.) The primary function of the motor cable screen is to improve the connection between motor and inverter, so that as little interfering current as possible flows past the filter to the mains earth. Therefore, a screened 4-pole motor cable must be used and the screen must be connected at both ends in accordance with the valid HF rules. The screening material (copper or steel) is less important than good at both ends connection.



Control terminals



*) Darstellung der Relaisausgänge im ausgeschalteten Zustand (Werkseinstellung)

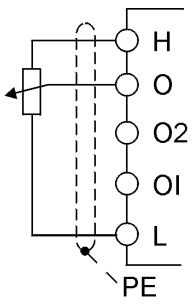
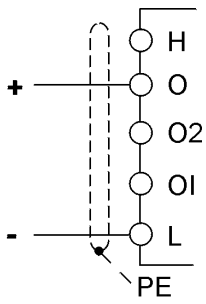
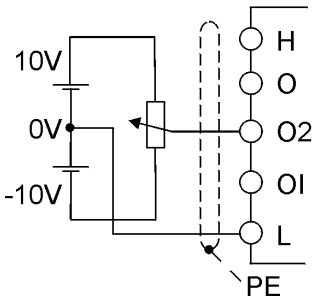
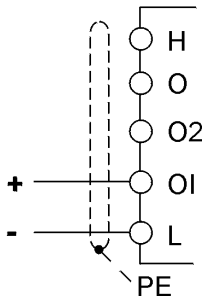
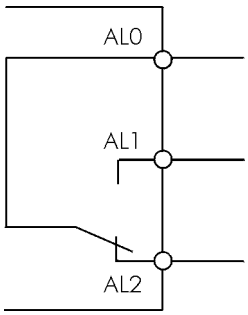
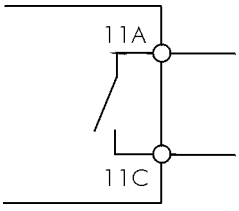
**) Alternativ zum 0...10V Signal kann wahlweise die Option >*pDRIVE*< *TV5* mit einem 4...20mA Signal oder die Option >*pDRIVE*< *TV6* mit einem 0...20mA Signal verwendet werden.

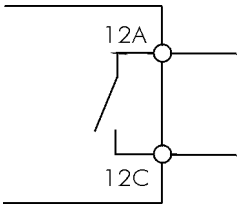
*) Figure shows relay outputs at factory default (inverter switched off)

**) As an alternative of the 0...10V signal the option >*pDRIVE*< *TV5* with a 4...20mA signal or the option >*pDRIVE*< *TV6* with a 0...20mA signal can be used.

Specification of control terminals

Terminal	Function		Description	
P24	24V		24V potential for digital inputs; max. load 100 mA	
CM1	0V		0V potential for digital inputs	
PLC	Common		Common connection for digital inputs	
FW	Start RL		Starts the inverter in forward direction	
1 2 3 4 5	Programmable digital inputs		approx. 5 mA per input The digital inputs 1...5 can be programmed with parameters C001 to C005 as follows (in addition, the inputs can be inverted with parameters C011 to C015):	
		01	REV	Starts the inverter with anti-clockwise field
		02..05	CF1...CF4	Definition of multi-speeds
		06	JG	Jog mode
		07	DB	DC brake
		08	SET	2. parameter set
		09	2CH	Activates the 2nd acceleration/decel. time
		11	FRS	Impulse lock - idle run
		12	EXT	Shut-down due to external fault
		13	USP	Prevents restart after undervoltage trip
		14	CS	Bypass signal
		15	SFT	Prevents the editing of parameters
		16	AT	Switch-over to automatic referene value 0...10 V / 4...20 mA
		18	RS	External reset
		20	STA	Start impulse
		21	STP	Stop impulse
		22	F/R	Forward/reverse
		23	PID	PID enable
		24	PIDC	PID reset
		27	UP	Motorpot increase
		28	DOWN	Motorpot decrease
		29	UDC	Motorpot reset
		31	OPE	Local control
		32...38	SF1...SF7	FIX 1...7
		39	OLR	Switch-over of current limitation
		NO	NO	no use

Terminal	Function	Description
H	10V reference voltage for definition of frequency reference value max. 20 mA	Potentiometer 1...2 kOhm  0...10 V Voltage signal 
O	Analog voltage input frequency ref. value 0...10V or PID controller ref. value/ act. value	
O2	Analog voltage input frequency ref. value -10...+10V	
OI	Analog current input frequency ref. value 4...20mA or PID controller ref. value / actual value	Potentiometer 1...2 kOhm  4...20 mA Current signal 
L	0V reference potential	
AL0 AL1 AL2	Relay output	 250V AC; 2,5A 30V DC; 3,0A Minimum: 100V AC; 10mA 5V DC; 100mA
11A 11C	Relay output	 Minimum: 1V DC, 1mA ohmic load: 250V AC; 5A 30V DC, 5A inductive load: 250V AC; 1A 30V DC; 1A

Terminal	Function	Description
12A 12C	Relay output	 Minimum: 1V DC, 1mA ohmic load: 250V AC; 5A 30V DC, 5A inductive load: 250V AC; 1A 30V DC; 1A
	00	RUN Operation
	01	FA1 "Frequency value arrival" - signal
	02	FA2 "Frequency exceeded" - signal (C042, C043)
	03	OL Overload message
	04	OD PID deviation too high
	05	AL Error message
	06	FA3 "Frequency arrival" - signal (C042, C043)
	08	IP Mains failure
	09	UV Undervoltage
	11	RNT Operating hours motor exceeded (b034)
	12	ONT Operating hours inverter exceeded (b034)
	13	THM Temperature alarm (C061)
AM	0...10V analog output	Analog output 0...10V; max. load 2mA
AMI	4...20mA analog output	Analog output 4...20mA; max. ohmic resistance250 Ω
	00	analog display of frequency 10V (20mA) = max. frequency A004, A204
	01	analog display of current 10V (20mA) = 200% of nominal inverter current
	03	digital display of frequency (only C027)
	04	analog display of output voltage 10V (20mA) = max. motor voltage A082
	05	analog display of power display 10V (20mA) = 200% of nominal inverter power
	06	analog display of thermal load 10V (20mA) = 100% consumption
	07	analog display of LAD frequency 10V (20mA) = max. frequency A004, A204
FM	PWM output	The actual frequency value is available optionally as an imulse signal. (In default setting, the actual frequency value is available as an analog signal.) Impulse signal: Frequency = output frequency x factor of multiplied frequency display (parameter b086, factory default = 1), max. frequency 3,6kHz.
TH	Thermistor input	Input for connection of a motor PTC resistor
CM1	Elektronic ground	0V potential for analog outputs and thermistor input

Wiring examples

Manual operation via the built-in keypad

Following parameters have to be changed:

A001 = 00	Reference value via potentiometer on the keypad
A002 = 02	Control commands via RUN/STOP buttons
F002 = 10 s	Adjust acceleration time
F003 = 10 s	Adjust deceleration time
A004 = 50 Hz	Increase max. frequency
A041 = 01	Automatic torque boost

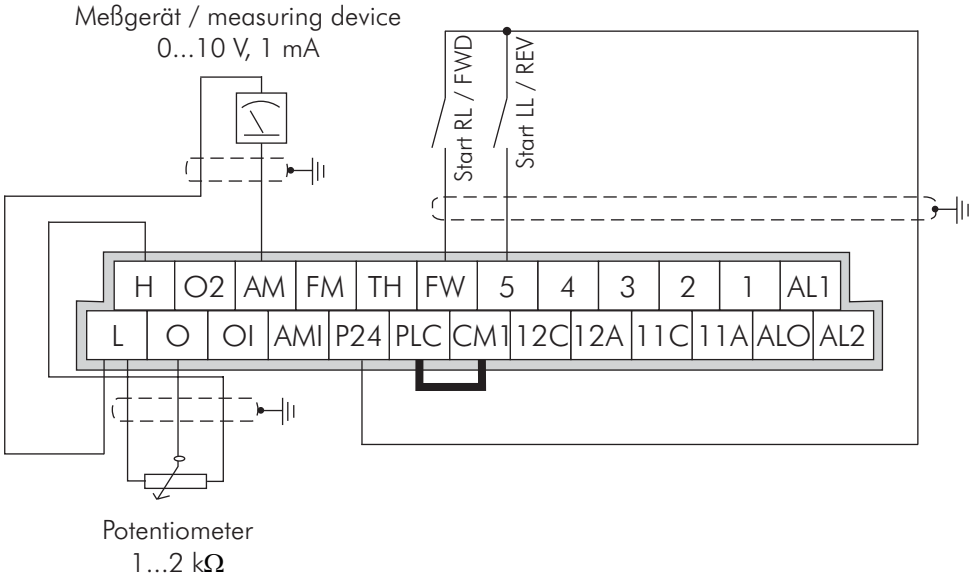
Wiring of the terminals is not necessary!!

After setting the parameters above, the frequency inverter can be started by pressing the RUN button, the green LED above is already on. Only the frequency ref. value can be defined using the potentiometer integrated in the control panel As soon as the RUN button is pressed, the green RUN LED to the left of the display lights up, that means that a start command is issued. The STOP button stops the motor or confirms an error. Alternatively, the speed definition with parameter F001 is possible using the UP and DOWN buttons (saved in case of mains-off). Thereby, A001 must be set to 02.

Operation via analogue reference value 0...10 V

Following parameters have to be changed:

A001 = 01 Reference value via terminal
A002 = 01 Control command via digital input
F002 = 10 s Adjust acceleration time
F003 = 10 s Adjust deceleration time
C005 = 01 REV Start reverse on digital input 5
b080 = 180 Adjustment of analog display

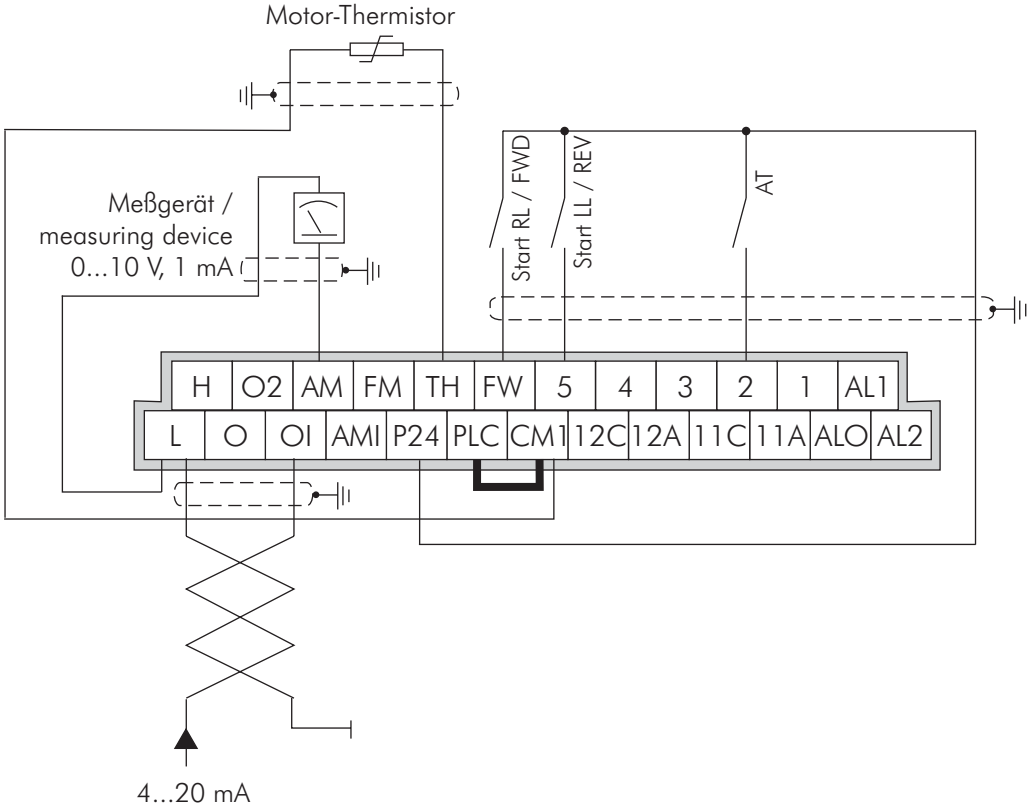


Start/Stop is realised via the digital inputs FW and 5. If both terminals are closed at the same time, a Stop command is issued to the frequency inverter.
The required frequency can be set by turning the external potentiometer.
In addition, a test device to display the actual frequency value was also built into this example on the analog output AM. If parameter C028 is set to 01, the motor current is displayed on the test device. The output signal can be adjusted using parameter b080.

Operation via analog reference value 4...20 mA

Following parameters have to be changed:

A001 = 01 Reference value via control terminals
A002 = 01 Control command via digital input
F002 = 10 s Adjust acceleration time
F003 = 10 s Adjust deceleration time
C002 = 16 AT Switch-over to 4 .. 20 mA reference value with digital input 2
C005 = 01 REV Start reverse on digital input 5
b098 = 01 PTC PTC resistor on thermistor input
b080 = 180 Adjustment of analog display



After setting the parameters, the inverter can be started with clockwise rotation field using terminal FW or with anti-clockwise rotation field using terminal 5. If both terminals are closed at the same time, a Stop command is issued to the frequency inverter.
The digital input terminals 2 (parameter setting 16 AT) switches from voltage ref. value to current ref. value.

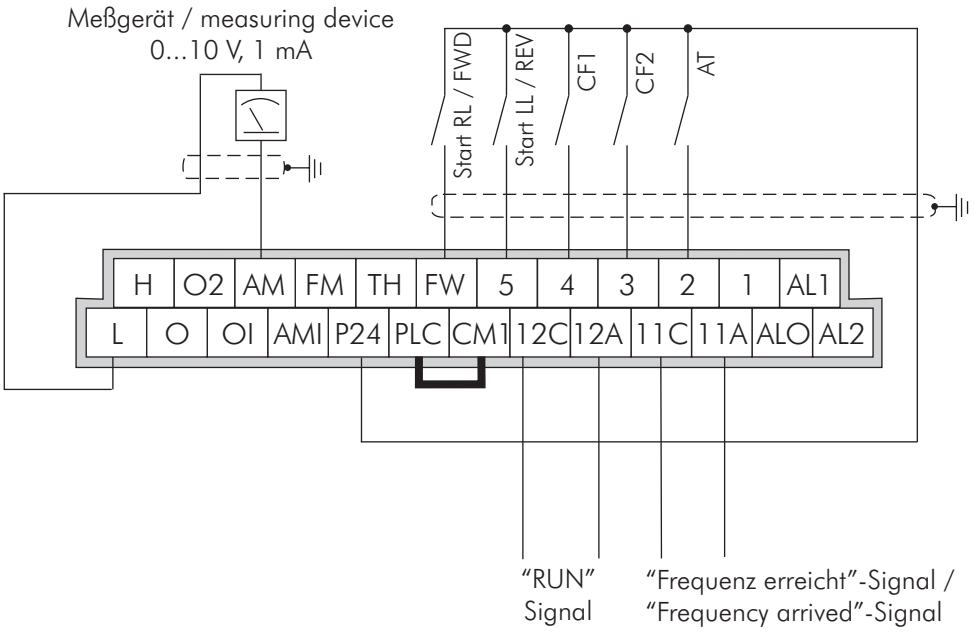
*) Instead of fixed or switched wiring to terminal 2, parameter C012 can be set to position 01 (input for break contact).

The wiring example also includes the integration of a motor PTC protection. Thereby, the use of a screened control line and separate installation of the motor cable is important!
(Earth the screen on the inverter side only!)

Operation via multispeeds

Following parameters have to be changed:

A001 = 01	Reference value via control terminals
A002 = 01	Control command via digital input
F002 = 10 s	Adjust acceleration time
F003 = 10 s	Adjust deceleration time
C002 = 16	AT Switch-over to 4 .. 20 mA ref. value with digital input 2
C005 = 01	REV Start reverse on digital input 5
C004 = 02	CF1 Multispeed A with digital input 4
C003 = 03	CF2 Multispeed B with digital input 3
A021 = Multispeed 1	if Fix A is 1 and Fix B is 0
A022 = Multispeed 2	if Fix A is 0 and Fix B is 1
A023 = Multispeed 3	if Fix A and Fix B are 1

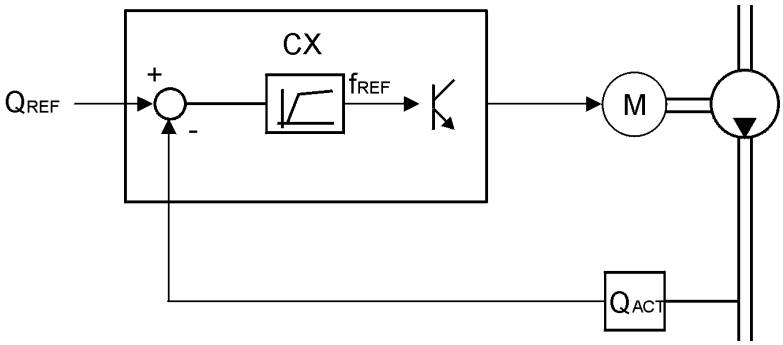


After setting the parameters, the inverter can be started with clockwise rotation field using terminal FW or with anti-clockwise rotation field using terminal 5. If both terminals are closed at the same time, a Stop command is issued to the frequency inverter.
If one of the multispeed inputs is activated, the actual ref. value is overruled and the frequency inverter is accelerated or the motor is slowed down to the new reference setting. If no digital input is selected, the speed can be defined using the analog inputs.
For the combination of the individual multispeeds, please see the description of parameters F001 and A020 to A035.
The wiring example also includes the parametrization of the relay outputs for terminal 11 and 12 for external messages.

Operation via integrated PID controller

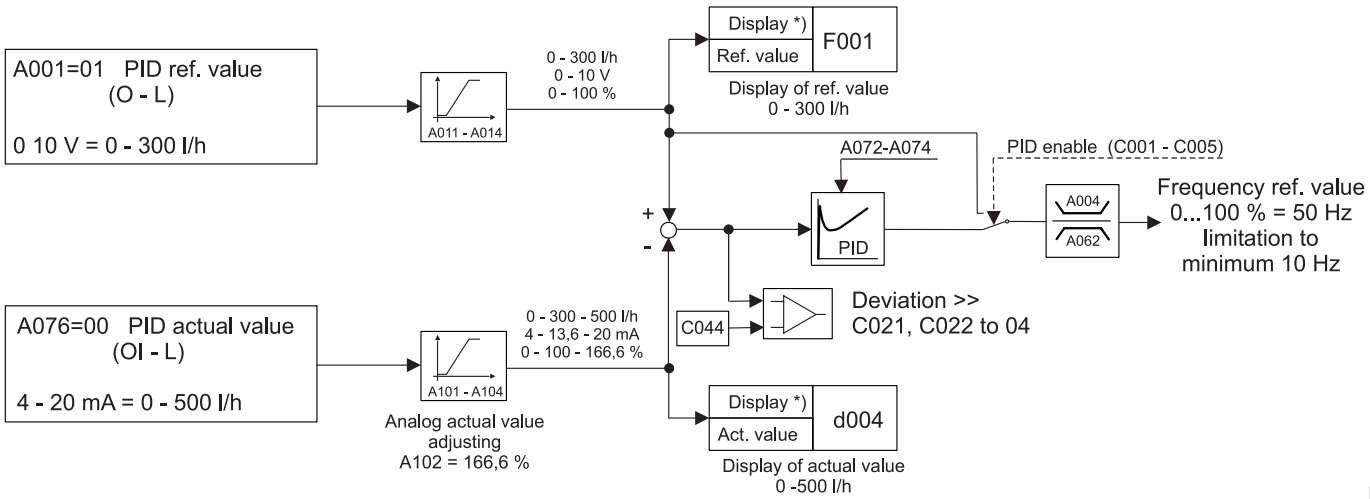
Setting example: flow control

A flow rate control should be set up with the internal PID controller of the >*pDRIVE*< *CX* .



The reference value can be set via voltage input: 0...10 V = 0...300 l/h
The actual value is recorded by a data recorder 0...500 l/h = 4...20 mA.
In the event of PID deviations greater than 20 %, a warning signal must be generated.
The minimum frequency of 10 Hz must not be undercut.
The reference and actual values for the controller must be displayed in process sizes:
300 l/h =100 % control size

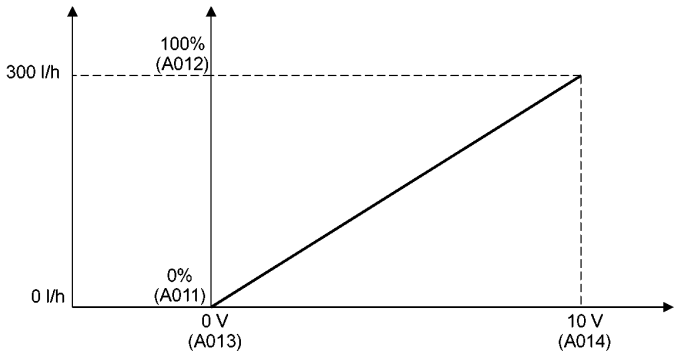
Control diagram



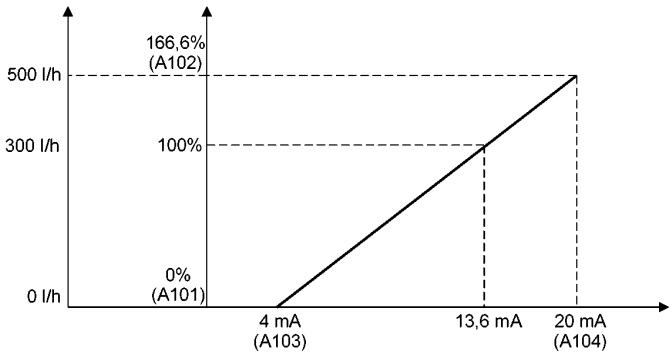
*) For the proper setting of the reference value, A075 = 3,00 is selected. Thus, 100 % PID ref. value is represented as 300 l/h flow rate.

Ref. value needed:	0...100 % correspond to 0...300 l/h
Data recorder:	4...20 mA correspond to 0...500 l/h
Setting A102:	4...13,6 mA = 0...300 l/h = 0...100% intern
	20 mA = 500 l/h = 166,6% intern → **A102 = 166,6 %**
Scale conversion A075:	**3,0** (100% x 3,0 = 300 l/h)

Reference value:



Actual value:



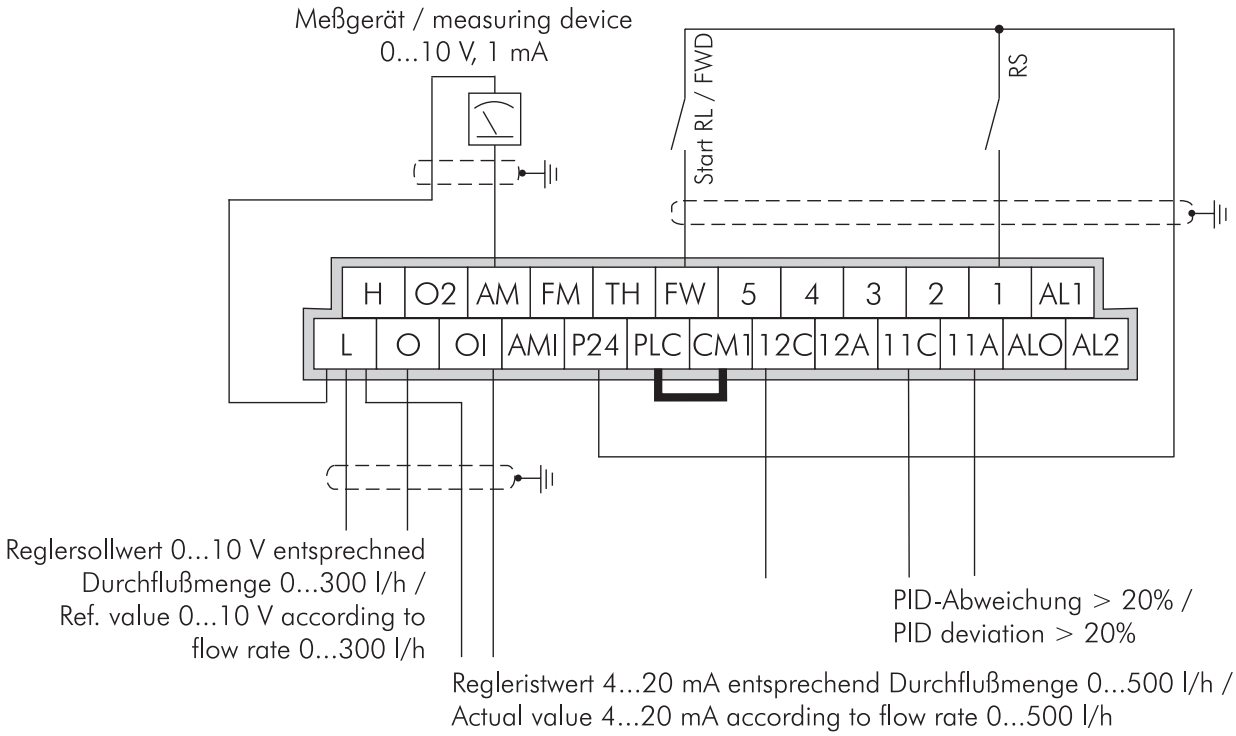
Remark:
In order to ensure a correct control process within the whole PID range, the feedback value must be able to exceed the reference value.
(A deviation is absolutely necessary in order to achieve a control action !)

To adjust the acutal value input (0...500 l/h) to the reference value input (0...300 l/h), it is necessary to synchronize the actual value at the current input with parameter A101...A104.
Therefore, parameter A102 must be set to 500 l/h (166,6 %), so that an actual value of 300 l/h corresponds with an reference value of 100 %.

Parameter adjustments:

A001 = 01	Reference value via control terminals
A002 = 01	Control command via digital input
A071 = 01	PID controller active
A075 = 3,0	Scale conversion
A072 = 1,0	P - gain
A073 = 1,0 s	I - gain
A074 = 0,0 s	D - gain
A011 = 0 l/h	Adaptation of the analog ref. value
A012 = 300 l/h	
A013 = 0 %	
A014 = 100 %	
A101 = 0 l/h	Adaptation of the analog actual value
A102 = 500 l/h	
A103 = 0 %	
A104 = 100 %	
F002 = appr. 3 s	Adjust acceleration time
F003 = appr. 5 s	Adjust deceleration time
C001 = 18	RS Reset on digital input 1
C021 = 04	PID deviation signal on terminal 11
C044 = 20 %	maximum controller deviation as warning signal 20 %
A062 = 10 Hz	Minimum frequency

After setting parameter A062 to 10 Hz, the frequency inverters displays the alarm message W025. The PRG-LED starts flashing until the inverter is started. The alarm means, that the ref. value is lower than the minimum frequency.



After setting the parameters, the inverter can be started with clockwise rotation field unsing terminal FW.

The example for defining the ref. value via the analog voltage input is only one configuration example. It is also possible to define the reference value using the built-in potentiometer, using parameter F001, with the UP and DOWN buttons or using the 2nd analog input.

RFI-filters CE-DR

All devices and equipment in electric power engineering can cause electromagnetic interference and be disturbed by electromagnetic interference. Therefore, they are subject to the provisions of the **EMV directive 89/336/EEC** since 1.1.1996.

However, frequency inverters cannot be regarded as machines with at least one mechanically moving component. Therefore, the **Machine Directive 89/392/EEC** does **not** apply.

The frequency inverters *>pDRIVE< CX* have a CE mark on the rating plate. However, in order to reach the relevant limits, it is necessary to comply with the installation instructions.

In conjunction with the available CE-DR filter options, the CX frequency inverters comply with the EMV Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC, i.e. conformity with: EN 61800-3 and EN 50178

Installation rules:

- Use of the option "CE-DR Filter" or use of an equivalent filter solution
- Assembly on a properly grounded metal assembly plate.
- Use and proper connection (at both ends !!) of screened motor cables
- Reduce clock frequency to ≤ 5 kHz
- Use and proper connection of screened control cables
- Grounding the frequency inverter with at least 10 mm^2 for personal safety
- Separate installation of motor cables and other cables, especially control wires

Important remarks:

Motor cable lengths

The specifications regarding the permissible distance between the inverter and the motor must be complied with. Too long motor cables can damage the inverter!

Protective measure FI safety switch

Radio interference suppression filters contain conduction capacitors to earth, i.e. the leakage current of the entire drive is increased and there is a short charging current when the inverter is switched on.

REMEDY: Use FI safety switches with short-time delay and higher trigger level.

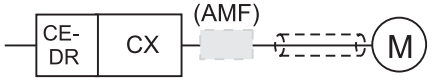
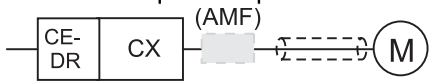
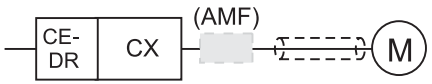
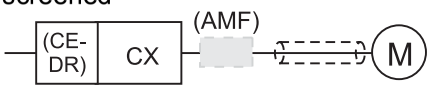
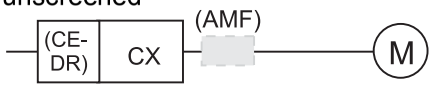
WARNING: FI safety switches do not provide absolute protection against direct contact!! Therefore, they should always be used in conjunction with other protective measures.

Line choke (built-in into the CE-DR RFI-filter)

The CE-DR filters contain a line choke. Therefore, an additional external choke is not required.
The line choke is used to reduce the harmonic oscillation caused by the intermediate circuit and the commutation drops caused by the rectifier.

Technical Data

Filtertype >*pDRIVE*<	CE-DR 400/28	CE-DR 400/56	CE-DR 400/68
for >*pDRIVE*< inverters	*CX* ***profi 11*** *and* ***15***	*CX* ***profi 18...30***	*CX* ***profi 37***
Mains connection			
Phases	3 AC 3 AC	3 AC	
Voltage	380...480 V ±10%	380...480 V ±10%	380...480 V ±10%
Nomina current	28 A	56 A	68 A
Overload	20 % for 60 s	20 % for 60 s	20 % for 60 s
Leakage current (maximum)	80 mA	80 mA	80 mA
Frequency	50...60 Hz ±5%	50...60 Hz ±5%	50...60 Hz ±5%
Ambient conditions			
Ambient temperature	0°C...+40°C		
Solling gradient	2 according to EN 50178		
Protection	IP20		
Altitude	max. 2000 m, above: reduction		
Humidity	20% to 90% related humidity, non-condensing		
Mounting	vertical on a mounting panel		
Connections			
Input terminals	16 mm^2	25 mm^2	50 mm^2
Connection to the inverter	6,0 mm^2	10 mm^2	16 mm^2
Mains fuses max.	50 A	80 A	100 A
Grounding diameter	10 mm^2	10 mm^2	10 mm^2
General			
Inductivity of choke	660 µH	330 µH	270 µH
Losses (ca.)	100 W	200 W	240 W
Weight of the filter	10 kg	16 kg	21 kg
Cooling	forced		
Material	galvanized sheet steel		

Maximum allowed distance (single motor cable length) Frequency inverter - Motor		*CX profi 11*	*CX profi 15*	*CX profi 18*	*CX profi 22*	*CX profi 30*	*CX profi 37*
Filter (incl. line choke)	CE-DR	400/28	400/28	400/56	400/56	400/56	400/68
AMF (Output-Motor-Filter)	AMF	450/48	450/48	450/48	450/48	450/90	450/90
typical motor cable	mm²	3x6²	3x6²	3x10²	3x10²	3x10²	3x16²
Maximum distance Inverter - Motor							
1st environment (domestic premises) unrestricted to every person	without AMF	20m	20m	20m	20m	20m	20m
	with AMF	35m	35m	35m	35m	35m	35m
1st environment (domestic premises) restricted to qualified persons	without AMF	50m	50m	50m	50m	50m	50m
	with AMF	80m	80m	80m	80m	80m	80m
2nd environment (industrial premises)	without AMF	60m	60m	60m	60m	60m	60m
	with AMF	120m	120m	120m	120m	120m	120m
Maximum distance Inverter - Motorwithout standards							
screened	without AMF	75m	75m	75m	75m	75m	75m
	with 1 AMF	150m	150m	150m	150m	150m	150m
	with AMF (one type bigger)	200m	200m	200m	200m	200m	200m
unscreened	without AMF	100m	100m	100m	100m	100m	100m
	with 1 AMF	200m	200m	200m	200m	200m	200m
	with AMF (one type bigger)	250m	250m	250m	250m	250m	250m

Multiplicationfactors:

8 kHz instead of 4(5) kHz switching frequency	all values x0,7	2 motors parallel with 2 long cables	all values x0,4
16 kHz instead of 4(5) kHz switching frequency	all values x0,5	3 motors parallel with 3 long cables	all values x0,25
		4 motors parallel with 4 long cables	all values x0,15
2 motors parallel with 1 long cable (distribution near the motor)	all values x0,8	5 motors parallel with 5 long cables	all values x0,10

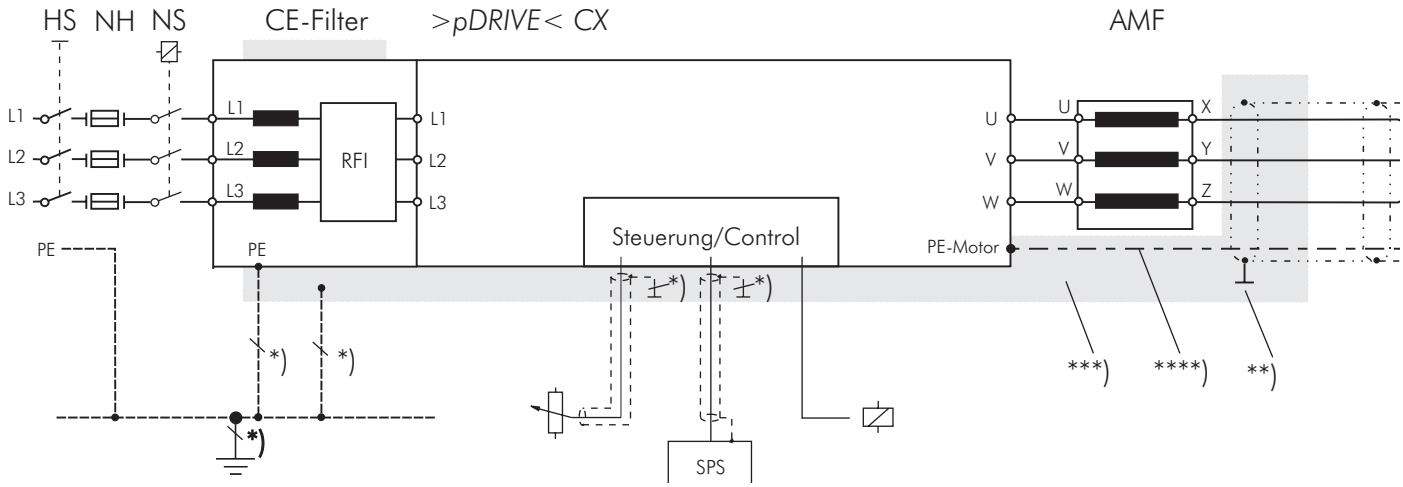
Regulations

To satisfy the EMC directive 89/336/EEC, the following points should be kept:

1.) Mains voltage
- Voltage fluctuation ≤ ±10 %
- Voltage unbalance ≤ ±3 %
- Frequency variations ≤ ±5 %
- Voltage distortion (THD) ≤ 10 %

2.) Wiring
- For complying with the EMC-directive screened motor cables are required.
- For getting higher lengths of motor cable, it is necessary to connect an output motor filter AMF to the output of the inverter, to reduce the stress of the inverter and the line filter caused by the higher earth leakage currents.
- Seperate main circuit wiring from control circuit wiring.

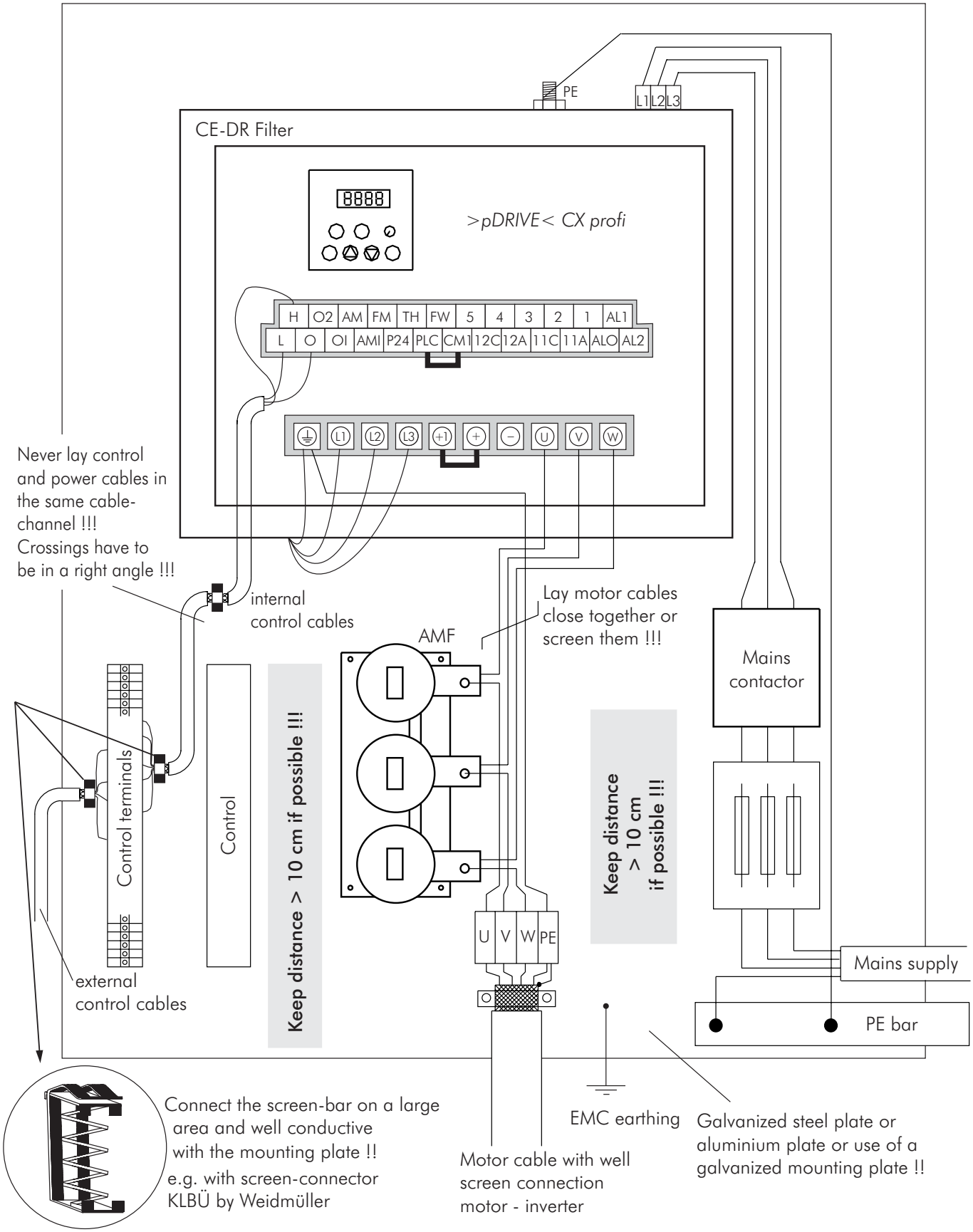
3.) Wiring diagram



HS ... Main switch
NH ... Mains fuses
NS ... Mains contactor
CE-Filter ... RFI-filter (with integraded line choke at CE-DR)
AMF ... Output-Motor-Filter
*) EMC earthing (earth connection on a large area to drain off the high-frequent disturbances; maybe in parallel to the yellow/green wire) !!
**) Connect the screen on a large area on the mounting panel or directly on the CE-DR!!
***) Important: Well conductive mounting plate (i.e. precious steel or galvanized)
****) The PE conductor should be wired to the inverter as directly as possible, so that there is good conduction of the interference signals to the filter, i.e. the PE terminal should be insulated in the case of intermediate terminals.

ATTENTION: Important for EMC corresponding installation of the drive is the good (HF) connection of the motor cable to the CE-filter.

Mounting and Connection



Once the filter has been assembled on an assembly plate, the frequency inverter is fixed using the 4 drill holes on the filter.

The electric connection between the filter and the frequency inverter is then made using the cable from the filter, whereby the phase-sequence is irrelevant.

The mains connection is provided at the top of the filter, on terminals L1, L2 and L3. To do this, the PE cable is connected to the provided bolts.

The filters for >*pDRIVE*< *CX* have leakage currents >3.5 mA. Therefore, they must be grounded with a protective conductor of at least 10 mm^2. (Personal safety!)

Output-Motor-Filter AMF

Modern frequency inverters are using IGBT power modules, by which it is possible to build compact and cheap units.

Because of the higher switching frequency it was possible to refine the principe of a pulse-wide modulated (triggered) output voltage.

Disadvantageous are the high-frequently earth leakage currents caused by the motor cable and it´s capacitance against earth.

Furthermore the high slew rate (du/dt) causes
couplings to parallel lines and voltage spikes on the motor terminals.

The real effects are depending on several influences:

- A low switching frequency reduces the leakage current and the losses in the choke.
- A screened motor cable reduces the couplings to parallel lines but increases the leakage current and the losses in the choke very high.
- A long motor cable increases the leakage current and the losses in the choke very high.
- The kind of laying the cable, e.g. under water, increases the leakage current and the losses in the choke like a screened cable.

By using an output motor filter AMF and paying attention to the cable lenghts in the table, it is possible to keep the following limits:

Slew rate (du/dt) ≤ 500 V/µs

Peak voltage (U_{Peak}) ≤ 1000 V

AMF specification

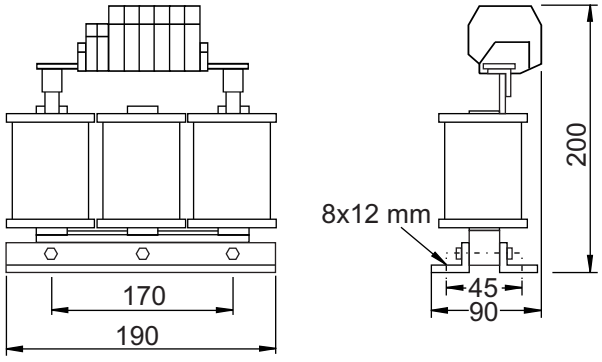
The output-motor-filter AMF can be mounted in any position.

Because of the losses caused by high switching frequencies or high cable lenghts it is recommended to place the filter above the inverter. In that case it will be forced cooled and the inverters cooling air will not be preheated.

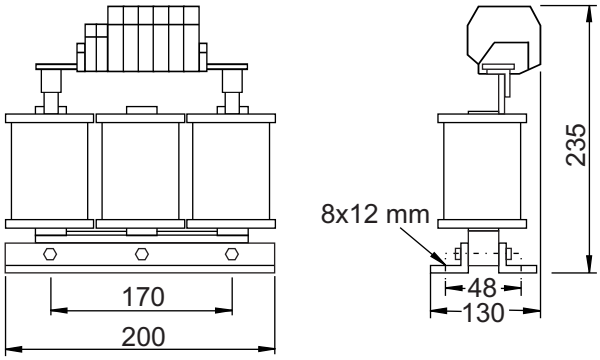
Due to the magnetic stray field of the AMF filter the recommended minimum distances above and on the sides must be observed, that means no mounting plates, steel bars, control lines, electronic

	AMF 450/12	AMF 450/48	AMF 450/90
Mains voltage	3 x 380...500 V	3 x 380...500 V	3 x 380...500 V
Nominal current	12 A	48 A	90 A
Overload capacity	20 % for 60 s	20 % for 60 s	20 % for 60 s
Losses	max. 150 W	max. 250 W	max. 350 W
Protection degree	IP00	IP00	IP00
Terminals	VBG4	VBG4	VBG4
Cable diameter	max. 10 mm^2	max. 16 mm^2	∅11 mm
Weight	approx. 5,5 kg	approx. 8,0 kg	approx. 10 kg
Protection	Thermoclixon 120°	Thermoclixon 120°	Thermoclixon 120°
Contact	N.C.	N.C.	N.C.

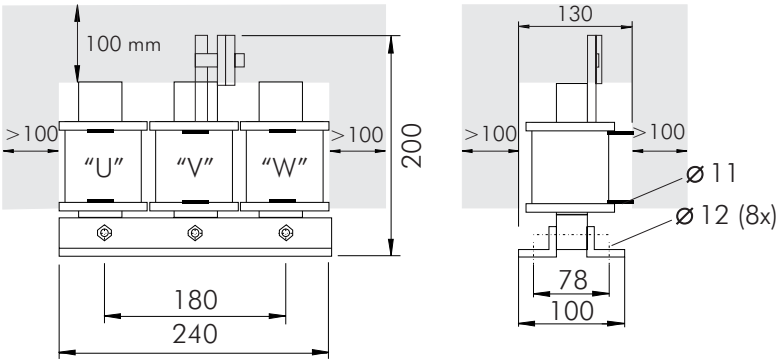
AMF 450/12:



AMF 450/48:

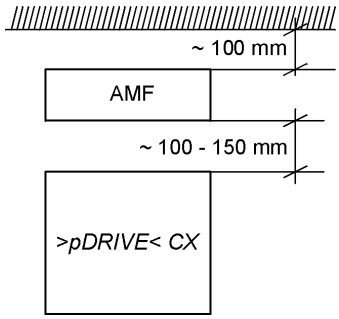


AMF 450/90:



The choke has to be connected directly to the output terminals (U,V, W) of the frequency inverter. In case of overtemperature of the choke caused by too high switching frequencies and/or too long cables, the inverter will trip with "external trip".

To prevent the cooling air of the frequency inverter against pre-heating and to cool the choke, it is recommended to place the choke appr. 100...150 mm above the frequency inverter.



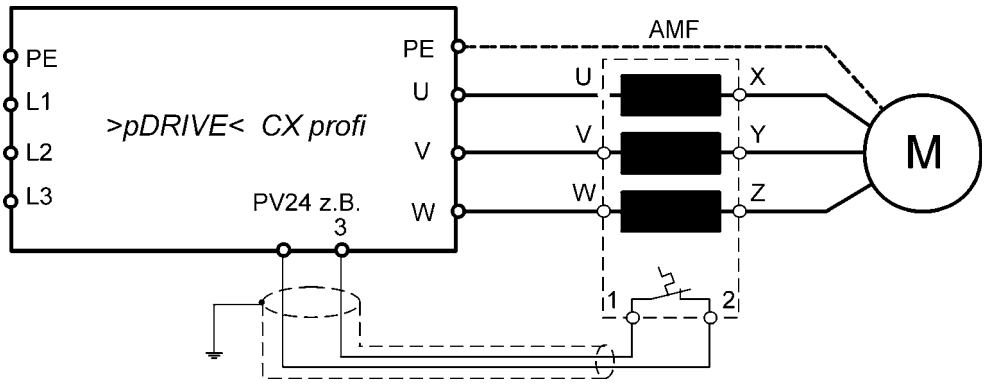
Remarks

- The switching frequencies of >*pDRIVE*< *CX* must be set to a value of 3 kHz or less in accordance to the table "allowed cable length"
- Because of the higher earth capacitances, parallel motor cables should only be used for short distances (see table "allowed cable length")
- The kind of laying the cable influences the losses of the choke. The table refers to laying the cable into a cable location line. Laying under ground or in water increases the leakage current. The switching frequency has to be reduced furthermore.
- It is not allowed to operate the frequency inverter without an effective connection to earth. The connection has to be in accordance to the local regulations for high leakage current (> 3,5 mA).
- It is not allowed to operate the frequency inverter with a standard earth-leakage breaker, if the local regulations don´t permit this because of a possible D.C. amount in the leakage current.

Overtemperature protection

1.) Set the switching frequency in accordance to the table.
Low switching frequencies mean less losses of the choke and reduce the leakage current.
Set parameter b083 to 3 kHz or less.

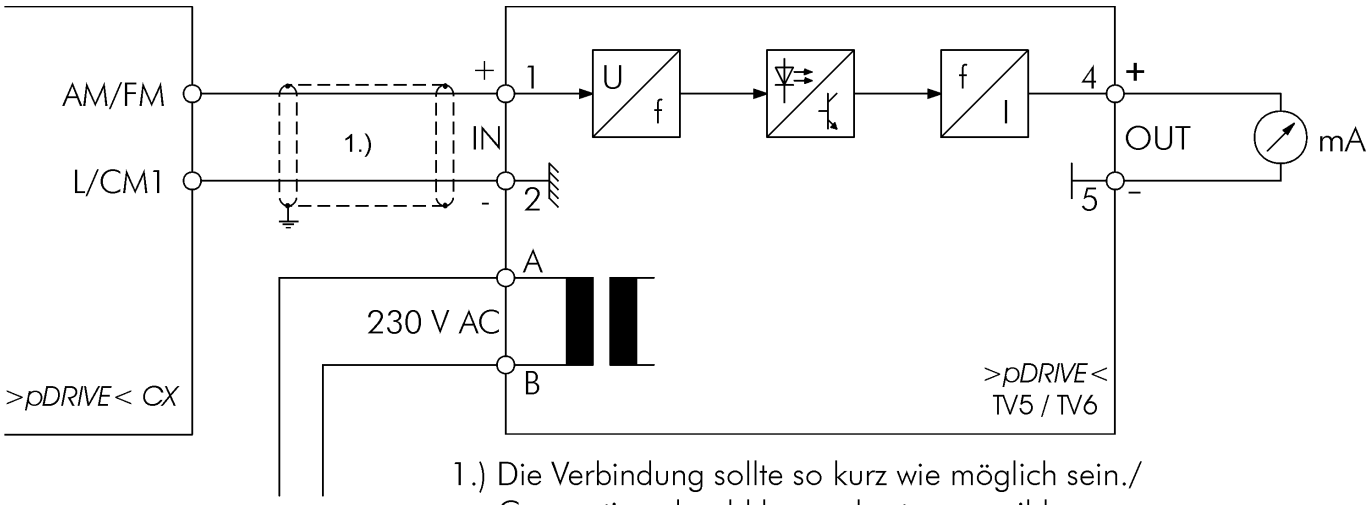
2.) Integrate the thermoclixon of the choke for switchoffs in case of overtemperature
e.g. use of terminal 3 as external trip
Parameter C013 = 01 (Inversion of Te. 3)
Parameter C003 = 12 (=EXT, "external trip")



Isolated amplifier TV5, TV6

The *>pDRIVE< TV5* is an active isolating amplifier which transforms the input signal (0-10 V) to an output signal (4...20 mA).
The *>pDRIVE< TV6* is an active isolating amplifier which transforms the input signal (0-10 V) to an output signal (0...20 mA).
It operates according to the principle of optoelectronic potential separation and has three-way separation between input, output and supply.
The unit requires an auxiliary voltage of 230 V AC and is mounted on a TS35 rail.

The unit works unipolar and should not be operated with open input.



1.) Die Verbindung sollte so kurz wie möglich sein./
Connection should be as short as possible

Technical Data

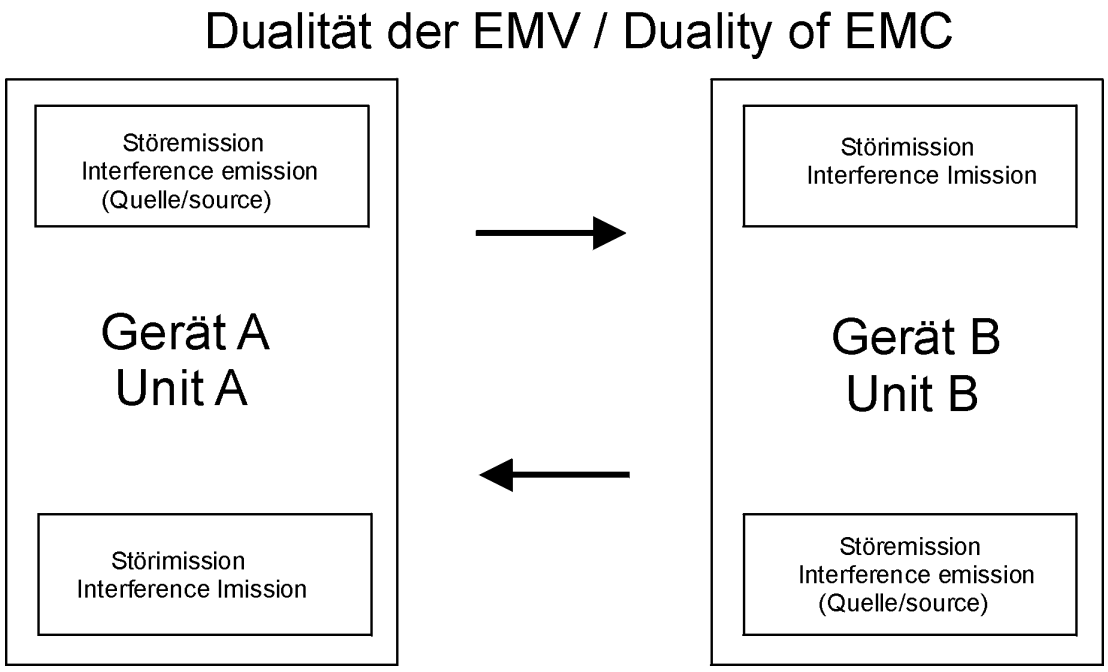
Auxiliary supply	230 V ±10 %, 50-60 Hz
Power consumption	3 VA
Voltage input	0 ... 10 V / R_{IN} = 100 kΩ
Overload	max. 50 V
Current output TV5	4 ... 20 mA
Current output TV6	0 ... 20 mA
Output burden	max. 500 Ω
Max. isolating voltage	750 V
Transmission frequency	25 Hz
Linear fault	0,15 %
Ambient temperature	0 ... 50°C
Weight	270 g
Dimensions (H x W x D)	117mm x 45mm x 80mm

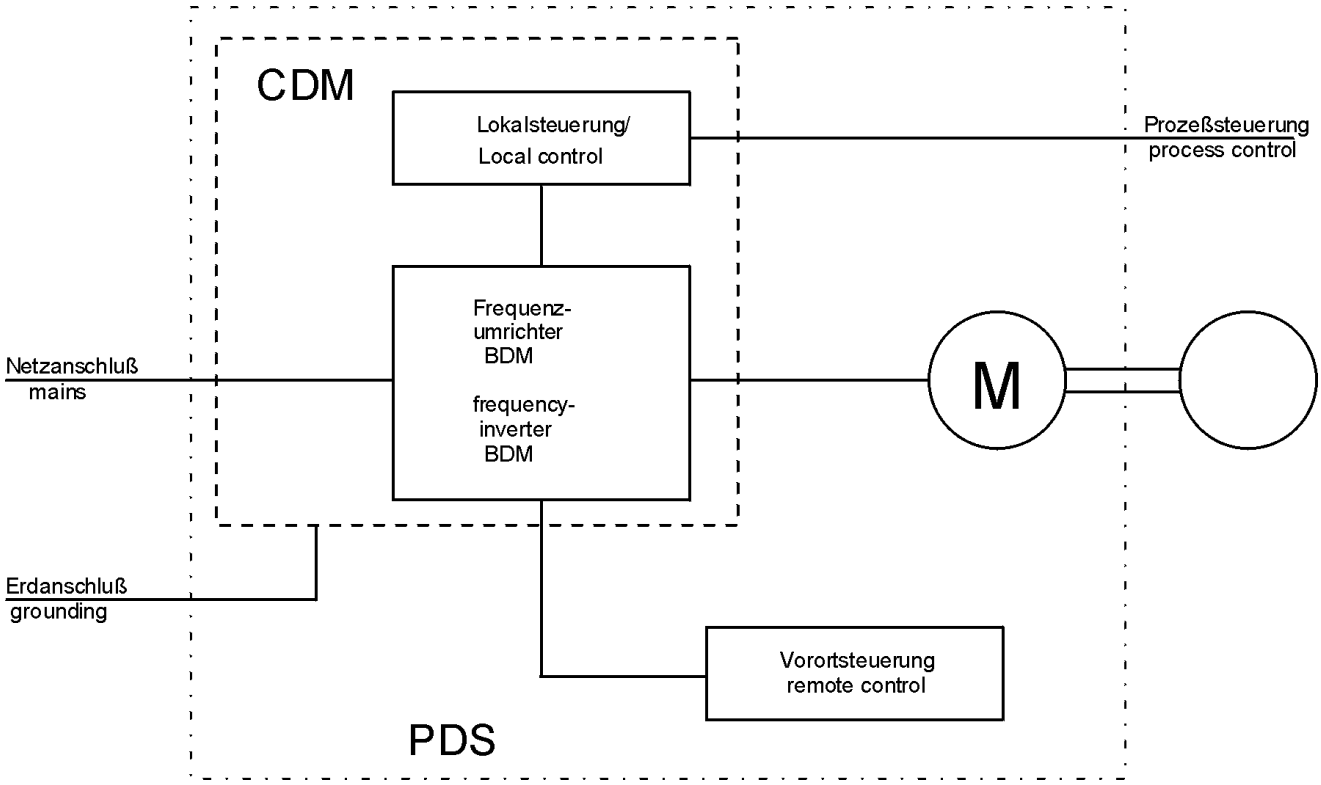
EMC product standard for PDS (Power-Drive-Systems) EN 61800-3

In June 1996 the product standard EN 61800-3 for frequency inverter based drives was released. It has priority over the existing general standards (generic standards). If a drive is build-in into another unit for which exists an own EMC-standard then this standard has to be considered.

Objective of the EMC-standard 89/336/EEC is the ability of electrical and electronical installations to be well functional in their electromagnetic enviroment, without any influence to itself or any other installation within it.

Due to this objective the PDS product standard consists of limitation values for allowed interferences as well as of requirements for the necessary supression measurements.
The Power-Drive-Standard EN 61800-3 covers the complete drive, from the mains supply to the motor shaft.





BDM: Base-Drive-Module
Basic drive unit consisting of the power part and the control electronic. i.e. frequency inverter - build-in unit

CDM: Complete-Drive-Module
Drive module consisting of: BDM (basic unit) and possible extensions i.e. cubicle including RFI-Filter, AMF, line contactor, ...)

PDS: Power-Drive-System
Drive system consisting of CDM (drive module), the motor, motor cable on site controlling, mains transformer, ... i.e. the complete electrical drive of a machine

The main differences for the use of frequency inverters result in difference regarding to the sales methode and the area of duty:

1.) Use in domestic premises where the sales is generally done (unrestricted to every person)
For drives < 25 A the allowed interference limits are likely the same as to the standard EN 55011 class B, that means: 66-56/56/60 dB(µV) quasi-peak and 30/37 dB(µV/m) at 10 m distance.
For drives ≥ 25 A the limits are related to the class A, that means: 79/73/73 dB(µV) quasi-peak and 30/37 dB(µV/m) at 30 m distance.

2.) Use in domestic premises where the sales is restricted to qualified and trained EMC resellers
All drives must keep the interference limit of the so far used class A,
that means: 79/73/73 dB(µV) quasi-peak and 30/37 dB(µV/m) at 30 m distance

3.) Use in industrial premises with quiet enough noise supression

Domestic premises:

The standard calls those establishments „first enviroment". Drives that are connected without an intermediate transformer to the public power network supplying residential areas. The valid interference limits are very low and can only be observed by keeping all installation requirements.

Industrial premises:

The standard refers to such environments as "second environment". These are areas that are separated from the public power network by separate transformer.

If the neighbouring network is a public network for residential areas, the stricter limits 66-56 / 56 / 60 dB(µV) quasi-peak must be complied with. In industrial networks, the higher limits 79 / 73 / 73 dB(µV) quasi-peak can be used.

Moreover, in the case of an influence on other devices, suppression of the interference is required. This suppression is the plant owner's responsibility.

The limits for immunity are much stricter, since a higher level of interference has the be assumed.

In non-grounded mains, compliance with the limits is usually not possible. Filter capacitors complicate the detection of insulation faults, and thus interfere with the concept of an earth-free energy supply. Filters

>*pDRIVE*< *CX profi* Frequency inverters

Start-up Log

Type:	❑ *CX profi 11*	❑ *CX profi 15*	❑ *CX profi 18*
	❑ *CX profi 22*	❑ *CX profi 30*	❑ *CX profi 37*
Serial number:		Code:	
Customer / Company:		Supplier / Company:	
Date of delivery:		Commissioning date:	

Parameter adjustments

F-Parameters

No.	Parameter name	Factory default	Setting	Page
F001	Output frequency	-		18
F002	1st Acceleration ramp	30 s		18
F202	2nd Acceleration ramp	30 s		53
F003	1st Deceleration ramp	30 s		18
F203	2nd Deceleration ramp	30 s		54
F004	Running direction of RUN key	00		51

A-Parameters

No.	Parameter name	Factory default	Setting	Page
A001	Method of speed command	01		19
A002	Method of run command	01		19
A003	Base frequency	50 Hz		18
A203	2nd Base frequency	50 Hz		53
A004	Maximum frequency	50 Hz		18
A204	2nd Maximum Frequency	50 Hz		53
A005	AT Terminal selection	01		21

No.	Parameter name	Factory default	Setting	Page
A006	O2 Control selection	00		21
A011	External frequency start O (0...10V)	0,00 Hz		19
A012	External frequency end O (0...10V)	0,00 Hz		19
A013	Analog signal ref. for Start O (0...10V)	0 %		19
A014	Analog signal reference for end O (0...10V)	100 %		20
A015	External frequency start pattern O (0...10V)	01		20
A016	Time constant for analog signals	30		21
A019	Multi speed selection	00		22
A020	Internal pre-set speed if A001=02	0,00 Hz		18
A220	2nd Internal pre-set speed	0,00 Hz		54
A021	Multi speed 1	0,00 Hz		22
A022	Multi speed 2	0,00 Hz		22
A023	Multi speed 3	0,00 Hz		22
A024	Multi speed 4	0,00 Hz		22
A025	Multi speed 5	0,00 Hz		22
A026	Multi speed 6	0,00 Hz		22
A027	Multi speed 7	0,00 Hz		22
A028	Multi speed 8	0,00 Hz		22
A029	Multi speed 9	0,00 Hz		22
A030	Multi speed 10	0,00 Hz		22
A031	Multi speed 11	0,00 Hz		22
A032	Multi speed 12	0,00 Hz		22
A033	Multi speed 13	0,00 Hz		22
A034	Multi speed 14	0,00 Hz		22
A035	Multi speed 15	0,00 Hz		22
A038	Jogging frequency	1,00 Hz		23
A039	Stop mode of jog function	00		23
A041	Torque boost method selection	00		24
A241	2nd Torque boost method selection	00		54
A042	Manual torque boost setting	1,0 %		24
A242	2nd Manual torque boost setting	1,0 %		54
A043	Manual torque boost frequency point	5,0 %		24
A243	2nd Manual torque boost frequency point	5,0 %		54
A044	V/f characteristic setting	00		24
A244	2nd V/f characteristic setting	00		54
A045	Voltage gain setting	100 %		25
A051	Selection of DC braking	00		26
A052	DC braking: frequency	0,50 Hz		26
A053	DC braking: waiting time	0,0 s		26

No.	Parameter name	Factory default	Setting	Page
A054	DC braking: braking torque	0 %		26
A055	DC braking: braking time	0,0 s		26
A056	DC braking: edge/level selection	01		26
A057	DC braking: braking torque (start)	0 %		26
A058	DC braking: braking time (start)	0,0 s		26
A059	DC braking: carrier frequency	3,0 kHz		26
A061	Frequency upper limit	0,00 Hz		29
A261	2nd Frequency upper limit	0,00 Hz		54
A062	Frequency lower limit	0,00 Hz		29
A262	2nd Frequency lower limit	0,00 Hz		54
A063	1st Jump frequency	0,00 Hz		30
A064	1st Jump frequency width	0,50 Hz		30
A065	2nd Jump frequency	0,00 Hz		30
A066	2nd Jump frequency width	0,50 Hz		30
A067	3rd Jump frequency	0,00 Hz		30
A068	3rd Jump frequency width	0,50 Hz		30
A069	Acceleration stop frequency	0,00 Hz		35
A070	Acceleration stop time	0,0 s		35
A071	Selection of PID function: ON/OFF	00		32
A072	PID controller: Proportional gain (kp)	1,0		32
A073	PID controller: Integral gain(Tn)	1,0		32
A074	PID controller: Differential gain(Tv)	0,00		32
A075	PID controller: Scale conversion	1,00		33
A076	PID controller: Feedback destination	00		33
A081	Selection of AVR function	02		34
A082	Selection of voltage for AVR	400 V		34
A085	Operation mode selection	00		57
A086	Energy saving response	50,0		57
A092	2nd Acceleration ramp	15,00 s		34
A292	2nd Second acceleration ramp	15,00 s		55
A093	2nd deceleration ramp	15,00 s		34
A293	2nd Second deceleration ramp	15,00 s		55
A094	Select method of 2nd stage	00		34
A294	2nd Method of second stage selection	00		55
A095	Switch-over 1./2. acceleration ramp	0,00 Hz		35
A295	2nd Stage Acceleration change over point	0,00 Hz		55
A096	Switch-over 1./2. deceleration ramp	0,00 Hz		35
A296	2nd Stage Deceleration change over point	0,00 Hz		55
A097	Pattern of acceleration ramp	00		35
A098	Pattern of deceleration ramp	00		35

No.	Parameter name	Factory default	Setting	Page
A101	External frequency start OI (4...20mA)	0,00 Hz		19
A102	External frequency end OI (4...20mA)	0,00 Hz		19
A103	Analog signal ref. for Start OI (4...20mA)	0 %		19
A104	Analog signal ref. for end OI (4...20mA)	100 %		20
A105	Ext. frequency start pattern OI (4...20mA)	01		20
A111	External frequency start O2 (-10...+10V)	0,00 Hz		19
A112	External frequency end O2 (-10...+10V)	0,00 Hz		19
A113	Analog signal ref. for Start O2 (-10...+10V)	-100 %		19
A114	Analog signal ref. for end O2 (-10...+10V)	100 %		20
A131	Acceleration curve constant	02		35
A132	Deceleration curve constant	02		35

b-Parameters

No.	Parameter name	Factory default	Setting	Page
b001	Selection of restart mode	00		50
b002	Allowable undervoltage time	1,0 sec		50
b003	Retry waiting time	1,0 sec		50
b004	Undervoltage trip during stop	00		51
b005	Undervoltage Number of retry	00		51
b006	Input phase loss protection	00		51
b007	Matching frequency setting	0,00 Hz		51
b012	Electronic overload setting	FI-INOM		36
b212	2nd Electronic overload setting	FU-INOM		55
b013	Electronic overload characteristic	01		36
b213	2nd Selection of electronic overload charact.	01		55
b015	Free electronic thermal: frequency 1	0 Hz		36
b016	Free electronic thermal: current 1	0,0 A		36
b017	Free electronic thermal: frequency 2	0 Hz		36
b018	Free electronic thermal: current 2	0,0 A		36
b019	Free electronic thermal: frequency 3	0 Hz		36
b020	Free electronic thermal: current 3	0,0 A		36
b021	Selection of 1st overload restriction	01		37
b022	Level of 1st overload restriction	1,20 x IN		37
b023	Rate of 1st decel. at overload restriction	1,00 s		37
b024	Selection of 2nd overload restriction	01		37
b025	Level of 2nd overload restriction	1,20 x IN		37
b026	Rate of 2nd decel. at overload restriction	1,00 s		37

No.	Parameter name	Factory default	Setting	Page
b031	Software lock	01		59
b034	Run/Power on time	0		50
b035	Direction restriciton (input)	00		52
b036	Start reduced voltage selection	00		25
b037	Display selection	00		53
b080	AM analog adjustment	180		57
b081	FM PWM meter adjustment	60		57
b082	Start frequency adjustment	0,50 Hz		52
b083	Carrier frequency setting	3,0 kHz		52
b084	Factory default setting	00		59
b085	Kind of factory default	01		59
b086	Frequency converted value setting	1,0		52
b087	Selection of STOP key	00		52
b088	After FRS cancelled	00		52
b090	Dynamic braking ratio	0,0 %		29
b091	Stopping mode selection	00		35
b092	Cooling fan control	00		53
b095	Dynamic braking selection	00		29
b096	Dynamic braking ON-level	720 V		29
b098	Thermistor type seleciton	00		45
b099	Thermistor error level	3000 Ω		45
b100	Free adjustable V/f: frequency 1	0 Hz		25
b101	Free adjustable V/f: voltage 1	0,0 V		25
b102	Free adjustable V/f: frequency 2	0 Hz		25
b103	Free adjustable V/f: voltage 2	0,0 V		25
b104	Free adjustable V/f: frequency 3	0 Hz		25
b105	Free adjustable V/f: voltage 3	0,0 V		25
b106	Free adjustable V/f: frequency 4	0 Hz		25
b107	Free adjustable V/f: voltage 4	0,0 V		25
b108	Free adjustable V/f: frequency 5	0 Hz		25
b109	Free adjustable V/f: voltage 5	0,0 V		25
b110	Free adjustable V/f: frequency 6	0 Hz		25
b111	Free adjustable V/f: voltage 6	0,0 V		25
b112	Free adjustable V/f: frequency 7	0 Hz		25
b113	Free adjustable V/f: voltage 7	0,0 V		25

C-Parameters

No.	Parameter name	Factory default	Setting	Page
C001	Function of input 1	18		38
C002	Function of input 2	16		38
C003	Function of input 3	03		38
C004	Function of input 4	02		38
C005	Function of input 5	01		38
C011	Condition of input C01	00		45
C012	Condition of input C02	00		45
C013	Condition of input C03	00		45
C014	Condition of input C04	00		45
C015	Condition of input C05	00		45
C019	Condition of input FW	00		45
C021	Function of relay 11	01		46
C022	Function of relay 12	00		46
C026	Function of relay AL	05		46
C027	Function of FM PWM output	00		56
C028	Function of AM analog output	00		56
C029	Function of AMI analog output	00		56
C031	Relay output 11: Inversion	00		48
C032	Relay output 12: Inversion	00		48
C036	Relay output AL: Inversion	01		48
C040	Overload signal output mode	00		49
C041	Level of overload signal 1	INOM		49
C042	Arrival signal for Acceleration 1	0,0 Hz		49
C043	Arrival signal for Deceleration 1	0,0 Hz		49
C044	PID controller: Level of deviation	3,0 %		33
C061	Level of thermal motor protection	80 %		50
C070	Data command	02		58
C071	Transmission speed	04		58
C072	Identification code	1		58
C073	Data bits	7		58
C074	Parity	00		58
C075	Number of Stop bits	1		58
C078	Waiting time	0		58
C081	Adjustment 0...10 V input	Default		22
C082	Adjustment 4...20 mA input	Default		22
C083	Adjustment -10...+10 V input	Default		22

No.	Parameter name	Factory default	Setting	Page
C085	Standardization of thermistor input	Default		45
C086	AM analog offset	Default		57
C087	AMI analog adjustment	50		57
C088	AMI analog offset	Default		57
C101	Reference up/down selecteion	00		45
C102	Reset function selection	00		45
C103	Reset restart function selection	00		45
C121	Offset-adjustment 0...10 V input	Default		22
C122	Offset-adjustment 4...20 mA input	Default		22
C123	Offset-adjustment -10...+10 V input	Default		22

H-Parameters

No.	Parameter name	Factory default	Setting	Page
H003	Motor kW rating	Default		53
H203	2nd Motor kW rate	Default		55
H004	Motor poles	4		53
H204	2nd Motor poles	4		55
H006	Motor stabilisation constant	100		53
H206	2nd Motor stabilisation constant	100		55

P-Parameters

No.	Parameter name	Factory default	Setting	Page
P001	Option 1 Selection on error	00		58
P002	Option 2 Selection on error	00		58

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