



USER'S MANUAL
NXL FREQUENCY CONVERTERS

ALFIFF28
NXL LIFT APPLICATION
APPLICATION MANUAL

NXL Lift Application (Software ALFIF28) Version 2.03 or higher

INDEX

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LIFT APPLICATION FOR NXL

1. INTRODUCTION

The NXL Lift Application can be used with modern Lift systems. There are functions included that are required to achieve a smooth ride in the lift car. The I/O interface table includes the most commonly needed signals in lift applications.

In the application, constant speeds are presented in [m/s], acceleration and deceleration are presented in [m/s^2] and jerks are presented in [s].

Mechanical brake control logic is designed to achieve smooth departures from and landings to floor level. The brake can be set in various ways to meet the different requirements of lift motors and lift control logic.

The used hardware can be any Vacon NXL frequency converter.

NXL supports only open loop operation.

Evacuation is not supported by NXL.

Choose NXS or NXP if evacuation is required.

All outputs are freely programmable. The inputs DIN3, DIN4 (AI1) and DIN5 (AI2) are also freely programmable.

Start forward and reverse signals are fixed to input DIN1 and DIN2 (see next page).

An Expander board, OPT-AA will be needed to get the external inputs signals DIE1-DIE3.

These are as default settings used as speed reference selection inputs when digital inputs are used as speed reference inputs. The relay output on this board (or the internal R01) can be used for mechanical brake control.

It is possible to run without OPT-AA if DIN3, DIN4 and DIN5 are programmed as speed references. But then there is no input signal available for other functions such as fault reset.

OPT-AI can be used in place of OPT-AA if thermistor input is needed.

OPT-AI is similar to OPT-AA board but the transistor output DO1 is not available on this board.

2. CONTROL I/O

NXL internal I/O board			
Terminal	Signal	Description	
1	+10V _{ref}	Reference output	Voltage for potentiometer, etc.
	AI1+ DIN4	Analogue input, voltage range 0–10V DC.	Voltage input Used as digital input DIN4
3	AI1-	I/O Ground	Ground for reference and controls
4	AI2+	Analogue input, voltage range 0–10V DC, or current range 0/4–20mA	Used as digital input DIN5
5	AI2- /GND		
6	+24V	Control voltage output	Voltage for switches, etc. max 0.1 A
7	GND	I/O ground	Ground for reference and controls
8	DIN1	Start forward (programmable)	Contact closed = start forward
9	DIN2	Start reverse (programmable)	Contact closed = start reverse
10	DIN3	Fault Reset (programmable)	Contact open = No Reset Contact closed = Reset
11	GND	I/O ground	Ground for reference and controls
18	A01+	Output frequency Analogue output	Programmable. Can be used as D02 Range 0–20 mA/R _L , max. 500Ω
19	A01-		
A	RS 485	Serial bus	Differential receiver/transmitter
B	RS 485	Serial bus	Differential receiver/transmitter
30	+24V	24V aux. input voltage	Control power supply backup
21	R01	Relay output 1 RUN	Programmable
22	R01		
23	R01		

Table 2-1. Lift application default I/O configuration.

I/O terminals on option board OPT-AA

Terminal	Signal in application	Description
X3		
1	+24V	Control voltage output Voltage for switches etc, max. 150 mA
2	GND	I/O ground Ground for reference and controls
3	DIN1	DIE1 Speed reference selection (programmable)
4	DIN2	DIE2 Speed reference selection (programmable)
5	DIN3	DIE3 Speed reference selection (programmable)
6	D01	Exp. D01, Ready Open collector output, 50mA/48V, programmable
X5		
24	R01	Exp R01, Mechanical brake Relay output 1 (NO), function programmable Switching capacity: 24VDC/8A 250VAC/8A 125VDC/0,4A
25	R01	
26	R01	


Table 2-2. I/O terminals of option board NXOPTAA

Note! The +24 V control voltage terminal can also be used to power the control module (but not the power module).

3. LIFT APPLICATION – PARAMETER LISTS

On the next pages you will find the lists of parameters within the respective parameter groups. The parameter descriptions are given on pages 13 to 40.

Column explanations:

Code	= Location indication on the keypad; Shows the operator the present param. Number
Parameter	= Name of parameter
Min	= Minimum value of parameter
Max	= Maximum value of parameter
Unit	= Unit of parameter value; Given if available
Default	= Value preset by factory
Cust	= Customer's own setting
ID	= ID number of the parameter (used with PC tools)
	= On the parameter code: parameter value can only be changed after the FC has been stopped.

3.1 Monitoring values (Control keypad: menu M1)

The monitoring values are the actual values of parameters and signals as well as statuses and measurements. Monitoring values cannot be edited.

See Vacon NXL User's Manual, Chapter 7.4.1 for more information.

Code	Parameter	Unit	ID	Description
V1.1	Output frequency	Hz	1	Output frequency to motor
V1.2	Frequency reference	Hz	25	Frequency reference to motor control
V1.3	Motor speed	rpm	2	Motor speed in rpm
V1.4	Motor current	A	3	Measured motor current
V1.5	Motor torque	%	4	In % of the nominal motor torque
V1.6	Motor power	%	5	Motor shaft power
V1.7	Motor voltage	V	6	Calculated motor voltage
V1.8	DC link voltage	V	7	Measured DC-link voltage
V1.9	Unit temperature	°C	8	Heatsink temperature
V1.10	Analogue input 1		13	AI1, used as digital input DIN4
V1.11	Analogue input 2		14	AI2, used as digital input DIN5
V1.12	Analogue I _{out}	mA	26	AO1
V1.13	DIN1, DIN2, DIN3		15	Digital input statuses
V1.14	DIE1, DIE2, DIE3		33	I/O Expander board: Digital input statuses
V1.15	RO1, ROE1, DOE1		1720	Relay and digital output statuses
V1.16	Lift Speed	m/s	1719	Lift speed in m/s

Table 3-1. Monitoring values

3.2 Motor Parameters (Control keypad: Menu P2 → P2.1)

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Note
P2.1.1	Nominal voltage of the motor	180	690	V	NXL2:230V NXL5:400V		110	
P2.1.2	Nominal frequency of the motor	0,00	320,00	Hz	50,00		111	Check the rating plate of the motor
P2.1.3	Nominal speed of the motor	0	20 000	Rpm	rpm		112	The default applies for a 4-pole motor and a nominal size frequency converter.
P2.1.4	Nominal current of the motor	$0,3 \times I_L$	$1,5 \times I_L$	A	I_L		113	Check the rating plate of the motor
P2.1.5	Motor cos ϕ	0,30	1,00		0,85		120	Check the rating plate of the motor
P2.1.6	Current limit	$0,1 \times I_L$	$1,5 \times I_L$	A	I_L		107	NOTE: Formulas apply approx. up to MF3. For greater sizes consult the factory.

Table 1-2. Motor parameters P2.1

3.3 Speed control (Control keypad: Menu P2 → P2.2)

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Note
P2.2.1	Nominal Linear Speed	0,20	5,00	m/s	1,00		1600	Nominal speed for lift
P2.2.2	Speed Reference Selection	0	4		0		1601	0=Activity Reference 1=Activity Reference with direction 2=Binary reference 3=Fieldbus 4=Keypad
P2.2.3.x	Speed Reference [m/s]							
P2.2.3.1	Levelling Speed	0,00	par2.2.1	m/s	0,10		1602	
P2.2.3.2	Nominal Speed	0,00	par2.2.1	m/s	1,00		1603	
P2.2.3.3	Limited Speed	0,00	par2.2.1	m/s	0,25		1604	
P2.2.3.4	Inspection Speed	0,00	$1,5 \times$ par2.2.1	m/s	0,50		1605	
P2.2.3.5	Speed Reference 4	0,00	par2.2.1	m/s	0,10		1606	
P2.2.3.6	Speed Reference 5	0,00	par2.2.1	m/s	1,00		1607	
P2.2.3.7	Speed Reference 6	0,00	par2.2.1	m/s	0,25		1608	
P2.2.3.8	Speed Reference 7	0,00	par2.2.1	m/s	0,50		1609	
P2.2.3.9	Override speed	0,00	$1,5 \times$ par2.2.1	m/s	0,10		1610	

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Note
P2.2.4.x	SPEED CURVE 1							
P2.2.4.1	Acceleration 1	0,20	2,00	m/s ²	0,70		103	
P2.2.4.2	Deceleration 1	0,20	2,00	m/s ²	0,70		104	
P2.2.4.3	Acceleration increase jerk 1	0,01	3,00	S	0,50		1611	
P2.2.4.4	Acceleration Decrease jerk 1	0,01	3,00	S	0,25		1612	
P2.2.4.5	Deceleration increase jerk 1	0,01	3,00	S	0,25		1613	
P2.2.4.6	Deceleration decrease jerk 1	0,01	3,00	S	0,50		1614	
P2.2.5.x	SPEED CURVE 2							
P2.2.5.1	Internal Ramp Switch	0	MaxFreq	Hz	0		1710	
P2.2.5.2	Acceleration 2	0,20	2,00	m/s ²	0,20		1711	
P2.2.5.3	Deceleration 2	0,20	2,00	m/s ²	0,20		1712	
P2.2.5.4	Acceleration increase jerk 2	0,01	3,00	S	0,50		1713	
P2.2.5.5	Acceleration decrease jerk 2	0,01	3,00	S	0,50		1714	
P2.2.5.6	Deceleration increase jerk2	0,01	3,00	S	0,50		1715	
P2.2.5.7	Deceleration decrease jerk 2	0,01	3,00	S	0,50		1716	

Table 3-3. Speed control parameters P2.2

3.4 Mechanical Brake control parameters (Control keypad: Menu M2 → P2.3)

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Note
G2.3.1.x	OPENING BRAKE							
P2.3.1.1	Current limit FWD	0	par2.1.4	A	0		1700	
P2.3.1.2	Current limit REV	0	par2.1.4	A	0		1701	
P2.3.1.3	Torque limit FWD	0	100,0	%	30		1702	
P2.3.1.4	Torque limit REV	0	100,0	%	30		1703	
P2.3.1.5	Frequency limit FWD	0	par2.1.2	Hz	1,00		1704	
P2.3.1.6	Frequency limit REV	0	par2.1.2	Hz	1,00		1705	
P2.3.1.7	Brake Open Delay	0	10,00	s	0,15		1706	
P2.3.1.8	MecBr React Time	0	10,0	s	0,05		1622	Mechanical brake physical reaction time
P2.3.1.9	MaxFreqBrClosed	0	MaxFreq	Hz	4,0		1621	Maximum allowed frequency reference when brake is closed
G2.3.2.x	CLOSING BRAKE							
P2.3.2.1	Freq. Limit close	0,01	par2.1.2	Hz	2,00		1707	Frequency limit for closing brake when stopping
P2.3.2.2	Brake close delay	0	10,0	s	0,0		1708	

Table 3-4. Mechanical brake control parameters G2.3.

G2.3.3.x	DC BRAKE							
P2.3.3.1	DC brake current	MinCurrent	1,5 x I _N	A	Varies		1740	
P2.3.3.2	Start DC-brake time	0	600,00	S	1,00		1750	0=DC brake is off at start
P2.3.3.3	Stop DC-brake time	0	600,00	S	1,00		1717	0=DC brake is off at stop
P2.3.3.4	Stop DC-brake frequency	0,10	10,00	Hz	3,00		515	

Table 3-5. DC brake control parameters G2.3.3

3.5 Drive Control (Control keypad: Menu M2 → P2.4)

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Note
P2.4.1	Brake chopper	0	3		1		504	0=Disabled 1=Used in Run state 2=Used in Run state 3=Ready
P2.4.2	Stop Function	0	2		2		506	0=Coasting 1=Ramping 2=Stop type by Freq. Limit
P2.4.3	Frequency limit	0	MaxFreq	Hz	5,00		1623	Used only if par 4.2=2

Table 3-6. Drive control parameters P2.4

3.6 Motor control parameters (Control keypad: Menu P2 → P2.5)

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Note
P2.5.1	Motor control mode	0	1		1		600	0=Frequency control 1=Speed control
P2.5.2	U/f Optimization	0	1		0		109	0=None 1=Automatic torque boost
P2.5.3	U/f ratio selection	0	3		0		108	0=Linear 1=Squared 2=Programmable 3=Linear with flux optim.
P2.5.4	Field weakening point	30,00	320,00	Hz	50,00		602	
P2.5.5	Voltage at field weakening point	10,00	200,00	%	100,00		603	$n\% \times U_{n\text{mot}}$
P2.5.6	U/f curve midpoint frequency	0,00	par. P2.5.4	Hz	50,00		604	
P2.5.7	U/f curve midpoint voltage	0,00	100,00	%	100,00		605	$n\% \times U_{n\text{mot}}$ Parameter max. value = par. 2.5.5
P2.5.8	Output voltage at zero frequency	0,00	40,00	%	0,00		606	$n\% \times U_{n\text{mot}}$
P2.5.9	Switching frequency	1,0	Max SwFreq.	KHz	6,0		601	Depends on kW
P2.5.10	Overvoltage controller	0	1		0		607	0=Not used 1=Used
P2.5.11	Undervoltage controller	0	1		0		608	0=Not used 1=Used
P2.5.12	Meas.RsVolt Drop	0	10000				1721	Measured Voltage drop at stator resistance

Table 3-7. Motor control parameters P2.5

3.7 Input Signals (Control keypad: Menu P2 → P2.6)

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Note		
P2.6.1	Start/stop Logic	0	2		0		300	DIN1		
								0	ForwP	RevP
								1	Start	Rev
								2	Forw	Rew
P2.6.2	DIN3 Function	0	12		4		301	0=Not used 1=Speed curve 2 2=Ext Fault close 3=Ext Fault open 4=Fault Reset 5=Run Enable 6=Emergency stop CC 7=Emergency stop OC 8=Override speed 9=Brake open Enable 10=Speed Reference 1 11=Speed Reference 2 12=Speed Reference 3		
P2.6.3	DIN4 (AI1)Function	0	12		2		499	As parameter 2.6.2		
P2.6.4	DIN5 (AI2)Function	0	12		0		1500	As parameter 2.6.2		
P2.6.5	DIE1 Function	0	12		10		368	As parameter 2.6.2		
P2.6.6	DIE2 Function	0	12		11		330	As parameter 2.6.2		
P2.6.7	DIE3 Function	0	12		12		369	As parameter 2.6.2		

Table 3-8. Input signals P2.6

3.8 Output signals (Control keypad: Menu P2 → P2.7)

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Note
P2.7.1	Relay output 1 function	0	16		2		313	0=Not used 1=Ready 2=Run 3=Fault 4=Fault inverted 5=FC overheat warning 6=Ext. fault or warning 7=Not Used 8=Warning 9=Reversed 10=Preset speed 11=At speed 12=Mot. regulator active 13=OP freq. limit superv.1 14=Control place: IO 15=Thermistor fault/ warn 16=Mechanical brake
P2.7.2	DO2 [A01] function	0	16		3		490	As parameter 2.7.1
P2.7.3	Expander board relay output 1 function	0	16		16		314	As parameter 2.7.1
P2.7.4	Expander board digital output 1 function	0	16		1		312	As parameter 2.7.1
P2.7.5	Analogue output function	0	9		1		307	0=Not used 1=Output freq. (0– f_{max}) 2=Freq. reference (0– f_{max}) 3=Motor speed (0–Motor nominal speed) 4=Output current (0– I_{nMotor}) 5=Motor torque (0– T_{nMotor}) 6=Motor power (0– P_{nMotor}) 7=Motor voltage (0– U_{nMotor}) 8=DC-link volt (0–1000V) 9=Digital output 2
P2.7.6	Analogue output filter time	0,00	10,00	S	1,00		308	0=No filtering
P2.7.7	Analogue output inversion	0	1		0		309	0=Not inverted 1=Inverted
P2.7.8	Analogue output minimum	0	1		0		310	0=0 mA 1=4 mA
P2.7.9	Analogue output scale	10	1000	%	100		311	
P2.7.10	Output frequency limit 1 supervision	0	2		0		315	0=No limit 1=Low limit supervision 2=High limit supervision
P2.7.11	Output frequency limit 1; Supervised value	0,00	Max Freq	Hz	0,00		316	

Table 3- 9. Output signals, P2.7

3.9 Protections (Control keypad: Menu P2 → P2.8)

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Note
P2.8.1	Response to external fault	0	3		0		701	0=No response 1=Warning 2=Fault,stop acc. to 2.4.2 3=Fault,stop by coasting
P2.8.2	Response to undervoltage fault	1	3		2		727	0=No response 1=Warning 2=Fault,stop acc. to 2.4.2 3=Fault,stop by coasting
P2.8.3	Output phase supervision	0	3		2		702	
P2.8.4	Earth fault protection	0	3		2		703	
P2.8.5	Thermal protection of the motor	0	3		2		704	
P2.8.6	Motor ambient temperature factor	-100,0	100,0	%	0,0		705	
P2.8.7	Motor cooling factor at zero speed	0,0	150,0	%	40,0		706	
P2.8.8	Motor thermal time constant	1	200	Min	45		707	
P2.8.9	Motor duty cycle	0	100	%	100		708	
P2.8.10	Stall protection	0	3		1		709	As par. 2.7.1
P2.8.11	Stall current limit	0	$2 \times I_{n\text{motor}}$	A	$I_{n\text{motor}} \times 1.3$		710	
P2.8.12	Stall time limit	1,00	120,00	S	15,00		711	
P2.8.13	Stall frequency limit	1,0	P 2.1.2	Hz	25,0		712	
P2.8.14	Response to thermistor fault	0	3		0		732	As par. 2.7.1
P2.8.15	Response to fieldbus fault	0	3		2		733	As par. 2.7.1
P2.8.16	Response to slot fault	0	3		2		734	As par. 2.7.1
P2.8.17	Min. Current Limit	0	P 2.1.4	A			1760	

Table 3-10. Protections, P2.8

3.10 Autorestart parameters (Control keypad: Menu P2 → P2.9)

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Note
P2.9.1	Enable/Disable	0	1		0		731	0=Disabled 1=Enabled
P2.9.2	Wait time	0,10	10,00	s	0,50		717	
P2.9.3	Trial time	0,00	60,00	s	30,00		718	

Table 3-11. Autorestart parameters, P2.9

3.11 Keypad control (Control keypad: Menu K3)

The parameters for the selection of control place and direction on the keypad are listed below. See the Keypad control menu in the Vacon NXL User's Manual.

Code	Parameter	Min	Max	Unit	Default	Cust	ID	Note
P3.1	Control place	1	3		1		125	1 = I/O terminal 2 = Keypad 3 = Fieldbus
R3.2	Freq reference	0	MaxFreq	Hz	0			
P3.3	Direction (on keypad)	0	1		0		123	0 = Forward 1 = Reverse
R3.4	Stop button	0	1		1		114	0=Limited function of Stop button 1=Stop button always enabled

Table 3 12. Keypad control parameters, K3

3.12 System menu (Control keypad: Menu S6)

For parameters and functions related to the general use of the frequency converter, such as customised parameter sets or information about the hardware and software, see Chapter 7.4.6 in the Vacon NXL User's Manual.

3.13 Expander boards (Control keypad: Menu E7)

The E7 menu shows the expander boards attached to the control board and board-related information. For more information, see Chapter 7.4.7 in the Vacon NXL User's Manual.

4. DESCRIPTION OF PARAMETERS

2.1 MOTOR PARAMETERS

2.1.1 *Nominal voltage of the motor*

Find this value U_n on the rating plate of the motor. This parameter sets the voltage at the field weakening point (parameter 2.5.5) to $100\% \times U_{n\text{motor}}$.

2.1.2 *Nominal frequency of the motor*

Find this value f_n on the rating plate of the motor. This parameter sets the field weakening point ([parameter 2.5.4](#)) to the same value.

2.1.3 *Nominal speed of the motor*

Find this value n_n on the rating plate of the motor.

2.1.4 *Nominal current of the motor*

Find this value I_n on the rating plate of the motor.

2.1.5 *Motor cos phi*

Find this value "cos phi" on the rating plate of the motor.

2.1.6 *Current limit*

This parameter determines the maximum motor current from the frequency converter. To avoid motor overload, set this parameter according to the rated current of the motor. The current limit is equal to the rated converter current (I_L) by default.

2.2 SPEED CONTROL

2.2.1 Nominal Linear Speed

Nominal linear speed corresponds to the lift speed at nominal frequency of the motor ([parameter 2.1.2](#))

Speed parameters in group 2.2.3 are entered in linear magnitudes.

2.2.2 Speed reference selection

Defines which frequency reference source is selected when controlled from the I/O control place. Default value is 0.

0 = Activity coding

1 = Activity coding with direction

2 = Binary coding

4 = Fieldbus

5 = Keypad

Speed reference can be determined in three different ways with the external digital inputs on option board.

The first column contains the state of the digital inputs (marked as DIE1, DIE2 and DIE3).

The second column contains the parameter and the next column the corresponding speed reference. The priority column defines which speed is activated if more than one digital input is activated. If Speed reference is different when running to different direction the direction is defined in direction column.

0 = Activity coding

Four different constant speeds can be selected.

DIE [1,2,3]	Parameters	SpeedRef	Priority	Direction
[0;0;0]	2.2.3.1	(levelling speed)	0 low	irrelevant
[1;0;0]	2.2.3.2	(nominal speed)	1 medium	irrelevant
[0;1;0]	2.2.3.3	(limited speed)	2 high	irrelevant
[0;0;1]	2.2.3.4	(inspection speed)	3 highest	irrelevant

Table 4-1. Activity reference.

1 = Activity coding with direction

The constant speeds are selected according to the state of digital inputs and motor direction. Four different speeds per direction are available.

DIE [1,2,3]	Parameters	SpeedRef	Priority	Direction
[0;0;0]	2.2.3.1	(levelling speed)	0 low	forward
[1;0;0]	2.2.3.2	(nominal speed)	1 medium	forward
[0;1;0]	2.2.3.3	(limited speed)	2 high	forward
[0;0;1]	2.2.3.4	(inspection speed)	3 highest	forward
[0;0;0]	2.2.3.5	(preset speed 4)	0 low	reverse
[1;0;0]	2.2.3.6	(preset speed 5)	1 medium	reverse
[0;1;0]	2.2.3.7	(preset speed 6)	2 high	reverse
[0;0;1]	2.2.3.8	(preset speed 7)	3 highest	reverse

Table 4--2. Activity reference with direction.

2 = Binary coding

Eight different constant speeds are selected according to binary word formed through digital inputs.

DIE [1,2,3]	Parameters	SpeedRef	Priority	Direction
[0;0;0]	2.2.3.1	(levelling speed)	-	irrelevant
[1;0;0]	2.2.3.2	(nominal speed)	-	irrelevant
[0;1;0]	2.2.3.3	(limited speed)	-	irrelevant
[1;1;0]	2.2.3.4	(inspection speed)	-	irrelevant
[0;0;1]	2.2.3.5	(preset speed 4)	-	irrelevant
[1;0;1]	2.2.3.6	(preset speed 5)	-	irrelevant
[0;1;1]	2.2.3.7	(preset speed 6)	-	irrelevant
[1;1;1]	2.2.3.8	(preset speed 7)	-	irrelevant

Table 4-3. Binary reference.

Speed reference [m/s] parameters (M2 -> G2.2.3)

Parameters in group 2.2.3 define the speed reference in linear magnitudes [m/s].

- 2.2.3.1 *Levelling Speed*
- 2.2.3.2 *Nominal Speed*
- 2.2.3.3 *Limited Speed*
- 2.2.3.4 *Inspection Speed*
- 2.2.3.5 *Speed reference 4*
- 2.2.3.6 *Speed reference 5*
- 2.2.3.7 *Speed reference 6*
- 2.2.3.8 *Speed reference 7*
- 2.2.3.9 *Override Speed*

Speed Curve 1 parameters (M2 -> G2.2.4)

Speed curve 1 is used as the default values for acceleration and deceleration and jerks.

2.2.4.1 Acceleration time 1

2.2.4.2 Deceleration time 1

Acceleration and deceleration of the lift car are presented in [m/s²]. Acceleration and deceleration curves are affected by the jerk time settings, too.

2.2.4.3 Acc inc jerk 1

Acceleration increase jerk1.
Jerk times are presented in [ms].

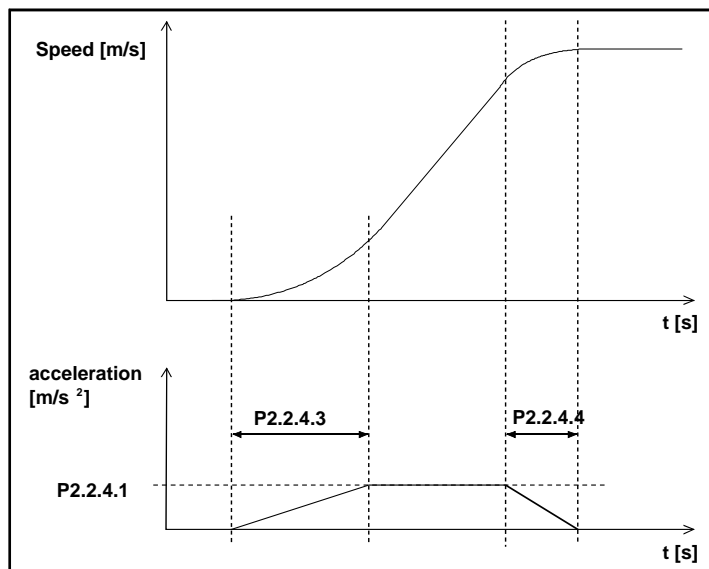


Figure 1. Jerks related to speed and acceleration

2.2.4.4 Acc dec jerk 1

Acceleration decrease jerk 1.

2.2.4.5 Dec inc jerk 1

Deceleration increase jerk 1.

2.2.4.6 Dec dec jerk 1

Deceleration decrease jerk 1.

Speed Curve 1 parameters (M2 -> G2.2.5)

Parameters in group Speed curve 2 are used when internal ramp switch function is activated (see parameter P2.2.5.1). Then the Speed curve 1 parameters will be replaced by Speed curve 2 parameters.

2.2.5.1 Internal Ramp switching frequency

0 = Not used

The ramp set 2 (Speed Curve2 parameters) can be activated internally. The update is done when the speed is decelerated below the internal ramp switch frequency and the reference frequency is reached.

Ramp set 1 (Speed Curve1 parameters) is changed back when the Run request of the frequency converter is inactivated.

2.2.5.2 Acceleration time 2

2.2.5.3 Deceleration time 2

Acceleration and deceleration of the lift car are presented in [m/s²]. Acceleration and deceleration curves are affected by the jerk time settings, too.

2.2.5.4 Acc inc jerk 2

Acceleration increase jerk 2. See Figure 1. Jerks related to speed and acceleration.

2.2.5.5 Acc dec jerk 2

Acceleration decrease jerk 2.

2.2.5.6 Dec inc jerk 2

Deceleration increase jerk 2.

2.2.5.7 Dec dec jerk 2

Deceleration decrease jerk 2.

2.3 MECHANICAL BRAKE CONTROL

The mechanical brake control parameters affect the mechanical brake control, the smooth start and stop function and the safety functions.

The mechanical brake can be set to release on current, on torque or on frequency. These parameters can be set individually for forward and reverse direction

DIN3 or DIN4 can be programmed for brake open Enable.

The closing is performed by frequency and by Run request signal. In case of fault the brake closes immediately without delay.

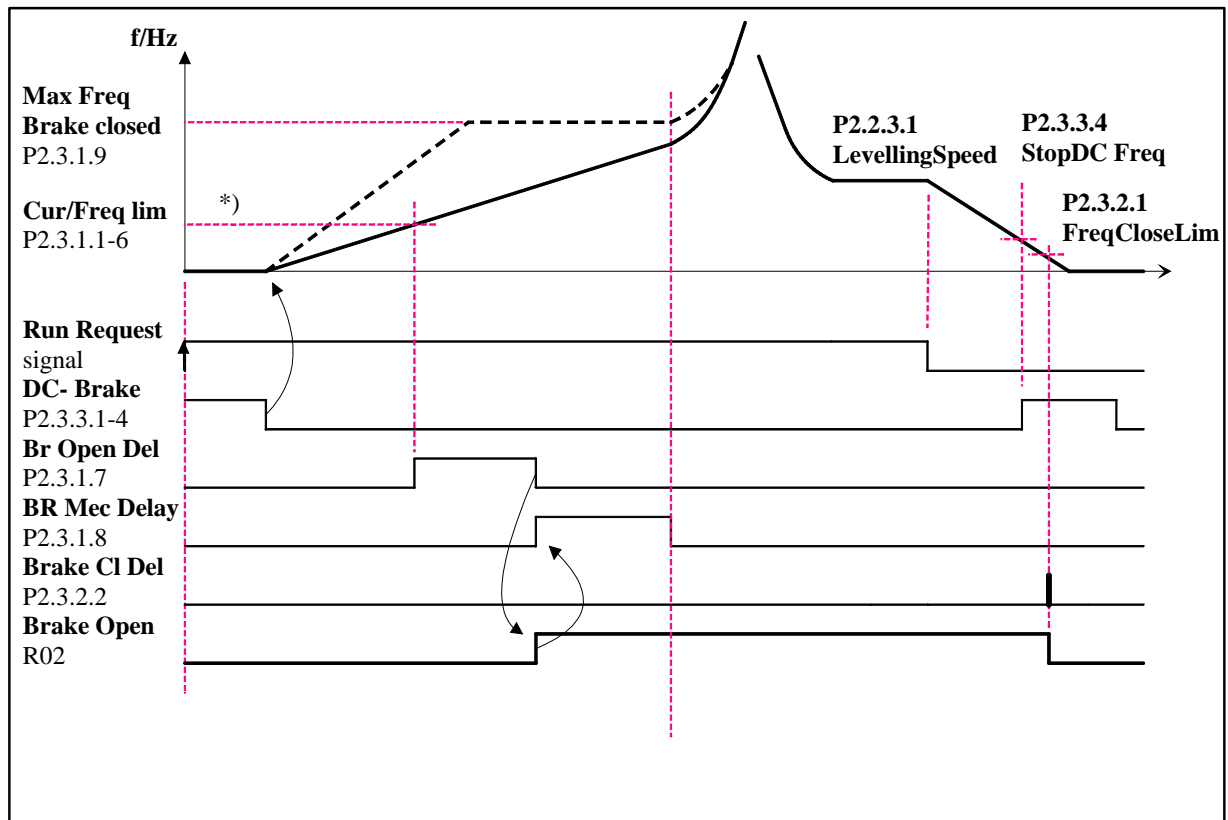


Figure 2. Mechanical brake control logic.

*) Start signal to Brake open delay when current, freq. and torque exceed limits defined by parameters.

Mechanical Brake Control Logic

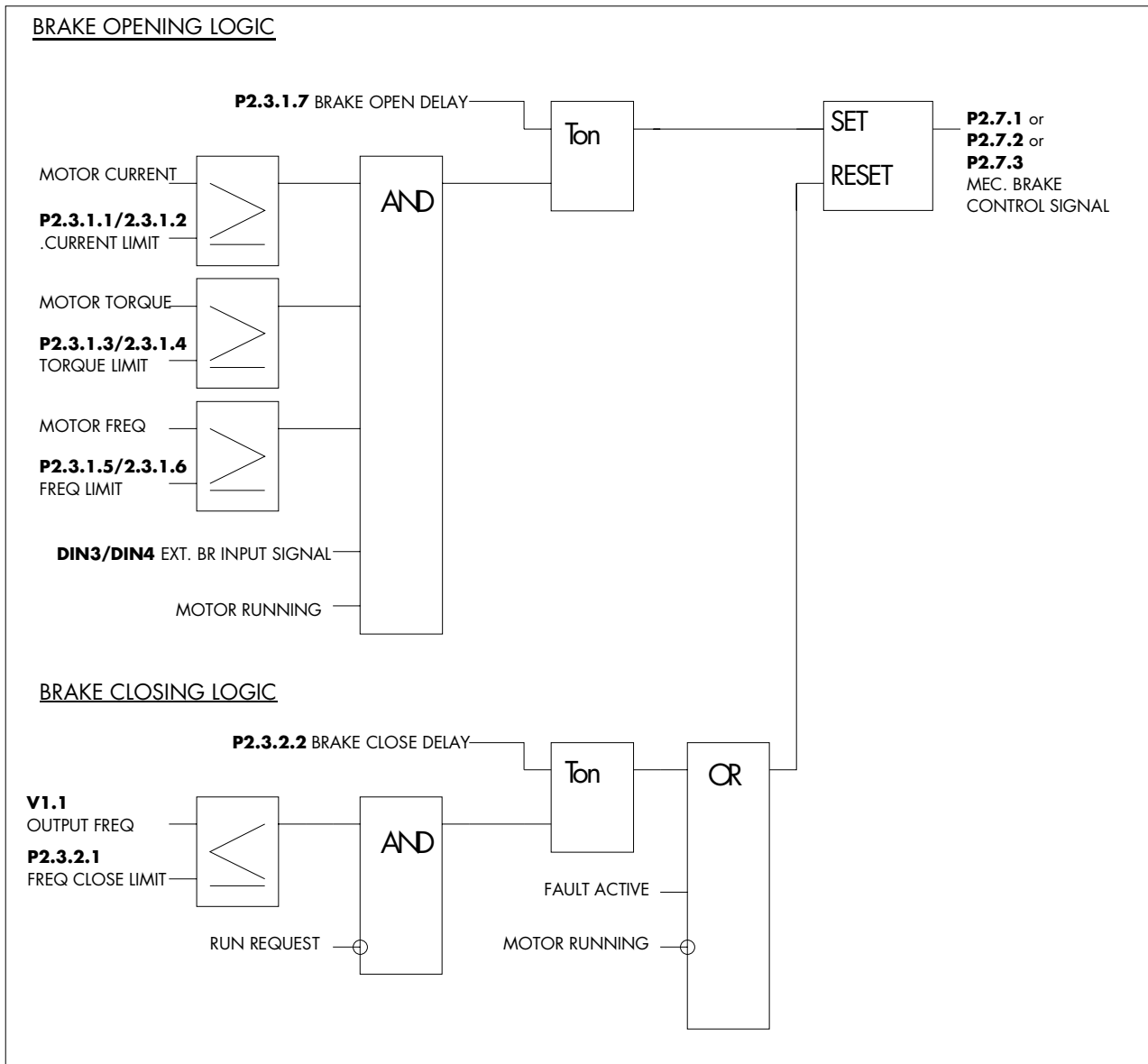


Figure 3. Mechanical brake control logic.

Mechanical brake control signal can be selected to any digital or relay output to control the external mechanical brake.

In the upper section of Figure 3 you can find the mechanical brake opening logic. Five signals and the delay are required for the mechanical brake to open. If current, torque or frequency signal is not needed for brake opening, then these parameters can be set to zero. The external brake input signal is programmable for digital input DIN3 or DIN4.

In the lower section of Figure 3 you can find the mechanical brake closing logic. The brake close circuit has higher priority than the open circuit. So if closing signal is active the mechanical brake will be closed.

The brake will be closed immediately in case of fault or when the motor is stopped.

In normal operation the brake will be closed when frequency falls below the Frequency close limit (P2.3.2.1) AND when the Run Request signal is switched OFF. If the Frequency close limit signal is not needed for the closing logic it can be set to zero. After the conditions are true there is a brake close delay (P2.3.2.2) after which the brake will be closed.

Opening Brake Parameters (M2 -> G2.3.1)

Please note that there are limitations parameters for both Forward (FWD) and Reverse (REV) direction.

Different values for FWD and REV can be set when application requires.

For example when counter weight is not used (e.g. Mechanical Brake Control application)

2.3.1.1 Current Limit FWD

Parameter defines the actual current limit that has to be exceeded for a brake release. If set to zero this condition is excluded. The value is updated always when the nominal current of the motor (parameter 2.1.4) is set (see Figure 3).

2.3.1.2 Current Limit REV

Parameter defines the actual current limit that has to be exceeded for a brake release. If set to zero this condition is excluded. The value is updated always when the nominal current of the motor (parameter 2.1.4) is set (see Figure 3).

2.3.1.3 Torque limit FWD

Parameter defines the actual torque limit that has to be exceeded for a brake release. If set to zero this condition is excluded.

100 % corresponds to the calculated nominal torque of the motor (see Figure 3).

2.3.1.4 Torque limit REV

Parameter defines the actual torque limit that has to be exceeded for a brake release. If set to zero this condition is excluded.

100 % corresponds to the calculated nominal torque of the motor (see Figure 3).

2.3.1.5 Frequency limit FWD

Parameter defines the actual frequency limit that has to be exceeded for brake release. If set to zero this condition is excluded (see Figure 3).

2.3.1.6 Frequency limit REV

Parameter defines the actual frequency limit that has to be exceeded for brake release. If set to zero this condition is excluded (see Figure 3).

2.3.1.7 Brake open delay

Delay which starts when the opening conditions (see parameters 2.3.1.1-2.3.1.6) are TRUE (see Figure 3).

2.3.1.8 *Mechanical brake reaction time*

Mechanical brake reaction time will hold the speed reference for the defined time by this parameter. This hold time should be set according to the mechanical brake reaction time (see [figure 2](#))

2.3.1.9 *Maximum frequency brake closed*

Output frequency does not exceed this value when mechanical brake is closed. When modifying this parameter make sure that the brake release by frequency (see parameter [2.3.1.5/2.3.1.6](#)) is possible with new value.

Closing Brake Parameters (M2 -> G2.3.2)

2.3.2.1 *Frequency limit closing*

The output frequency limit for the brake closing. The run request signal needs to be disabled to allow the signal to affect.

2.3.2.2 *Closing delay*

The brake closing is delayed with defined time. If set to zero there is no delay between the brake closing condition and the actual brake closing.

DC Brake Parameters (M2 -> G2.3.3)

2.3.3.1 DC-brake current

Defines the current injected into the motor during DC-braking.

2.3.3.2 DC-braking time at start

DC-brake is activated when the start command is given. This parameter defines the time before the brake is released.

2.3.3.3 DC-braking time at stop

Determines if braking is ON or OFF and the braking time of the DC-brake when the motor is stopping. The function of the DC-brake depends on the stop function, parameter 2.4.2.

- 0 DC-brake is not used
- >0 DC-brake is in use and its function depends on the Stop function, [par. 2.4.2]. The DC-braking time is determined with this parameter

Par. 2.4.2 = 0; Stop function = Coasting:

After the stop command, the motor coasts to a stop without control of the frequency converter.

With DC-injection, the motor can be electrically stopped in the shortest possible time, without using an optional external-braking resistor.

The braking time is scaled according to the frequency when the DC-braking starts. If the frequency is \geq the nominal frequency of the motor, the set value of [parameter 2.3.3.3](#) determines the braking time. When the frequency is $\leq 10\%$ of the nominal, the braking time is 10% of the set value of [parameter 2.3.3.3](#).

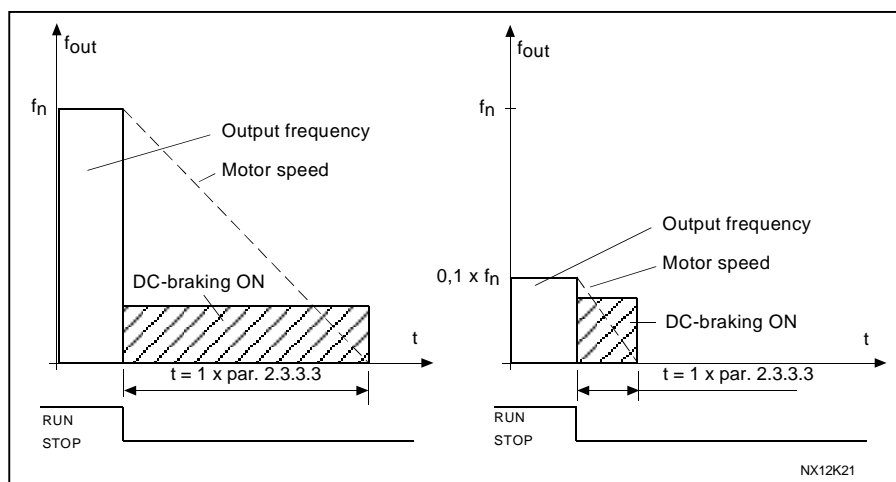


Figure 4. DC-braking time when Stop mode = Coasting.

Par. 2.4.2 = 1; Stop function = Ramp

After the Stop command, the speed of the motor is reduced according to the set deceleration parameters, as fast as possible, to the speed defined with [parameter 2.3.3.4](#), where the DC-braking starts.

The braking time is defined with [parameter 2.3.3.3](#). If high inertia exists, it is recommended to use an external braking resistor for faster deceleration. See Figure 5.

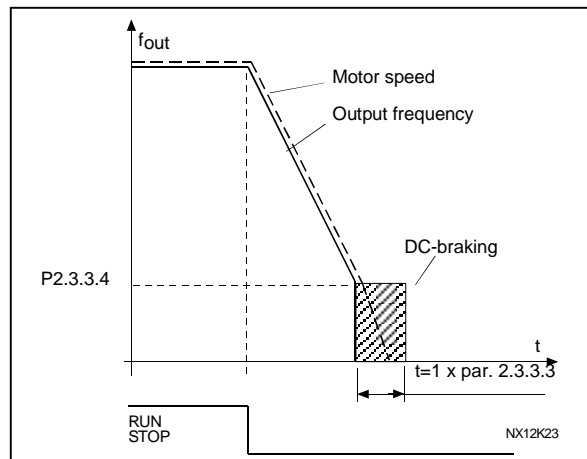


Figure 5. DC-braking time when Stop mode = Ramp

Par. 2.4.2 = 2; Stop function = Stop by frequency. limit

Stop mode depends on the actual frequency of the motor. If frequency is above the frequency limit ([par. 2.4.3](#)) then the stop mode is coasting (see Figure 4). If frequency is even or below the frequency limit then the stop mode is ramp (see Figure 5).

2.3.3.4 DC-braking frequency at stop

The output frequency which the DC-braking is applied. See Figure 5

2.4 DRIVE CONTROL

2.4.1 Brake chopper

- 0 = No brake chopper used
- 1 = Brake chopper in use when running
- 2 = Brake chopper in use when running
- 3 = Used drive is ready

When the frequency converter is decelerating the motor, the inertia of the motor and the load are fed into an external brake resistor. This enables the frequency converter to decelerate the load with a torque equal to that of acceleration (provided that the correct brake resistor has been selected). See separate Brake resistor installation manual.

2.4.2 Stop function

Coasting:

- 0 The motor coasts to a halt without any control from the frequency converter, after the Stop command.

Ramp:

- 1 After the Stop command, the speed of the motor is decelerated according to the set deceleration parameters.
If the regenerated energy is high it may be necessary to use an external braking resistor for faster deceleration.

Frequency limit

- 2 Coasting Stop if the motor frequency is above the frequency limit ([par. 2.4.3](#)) when stop request is given. Stop by ramp if the motor frequency is the same or below this parameter when stop request is given.

2.4.3 Frequency limit

Defines the frequency limit for the stop function if selected as the frequency limit (par. 2.4.2=2).

If the motor frequency is above the frequency limit the motor coasts to stop and if it is below or the same as the frequency limit the stop function is ramp.

2.5 MOTOR CONTROL

2.5.1 Motor control mode

- 0 Frequency control: The I/O terminal and keypad references are frequency references and the frequency converter controls the output frequency (output frequency resolution = 0.01 Hz)
- 1 Speed control: The I/O terminal and keypad references are speed references and the frequency converter controls the motor speed (accuracy $\pm 0,5\%$).

2.5.2 U/f optimisation

Automatic torque boost The voltage to the motor changes automatically which makes the motor produce sufficient torque to start and run at low frequencies. The voltage increase depends on the motor type and power. Automatic torque boost can be used in applications where starting torque due to starting friction is high, e.g. in conveyors.

NOTE! *In high torque - low speed applications - it is likely that the motor will overheat. If the motor has to run a prolonged time under these conditions, special attention must be paid to cooling the motor. Use external cooling for the motor if the temperature tends to rise too high.*

2.5.3 U/f ratio selection

Linear: The voltage of the motor changes linearly with the frequency in the constant flux area from 0 Hz to the field weakening point where the nominal voltage is supplied to the motor. Linear U/f ratio should be used in constant torque applications. **This default setting should be used if there is no special need for another setting.**

Squared: The voltage of the motor changes following a squared curve form with the frequency in the area from 0 Hz to the field weakening point where the nominal voltage is also supplied to the motor. The motor runs under magnetised below the field weakening point and produces less torque and electromechanical noise. Squared U/f ratio can be used in applications where torque demand of the load is proportional to the square of the speed, e.g in centrifugal fans and pumps.

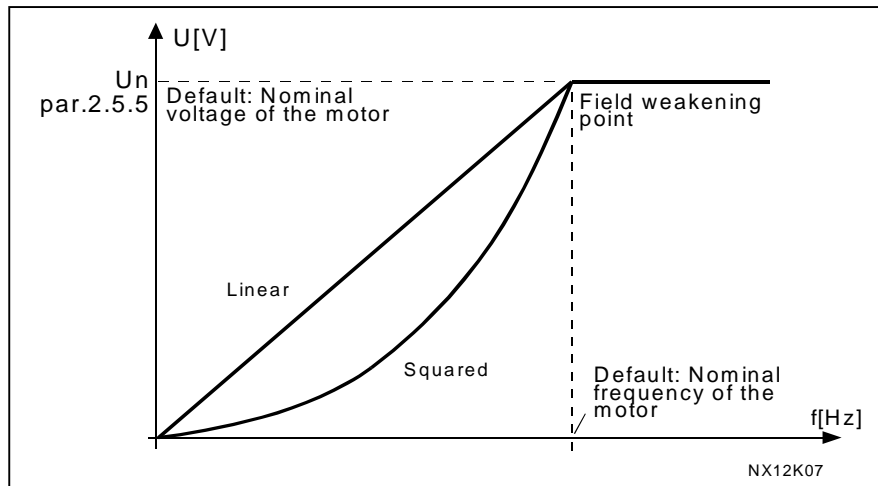


Figure 6. Linear and squared change of motor voltage

Programmable U/f curve:

- 2 The U/f curve can be programmed with three different points. Programmable U/f curve can be used if the other settings do not satisfy the needs of the application.

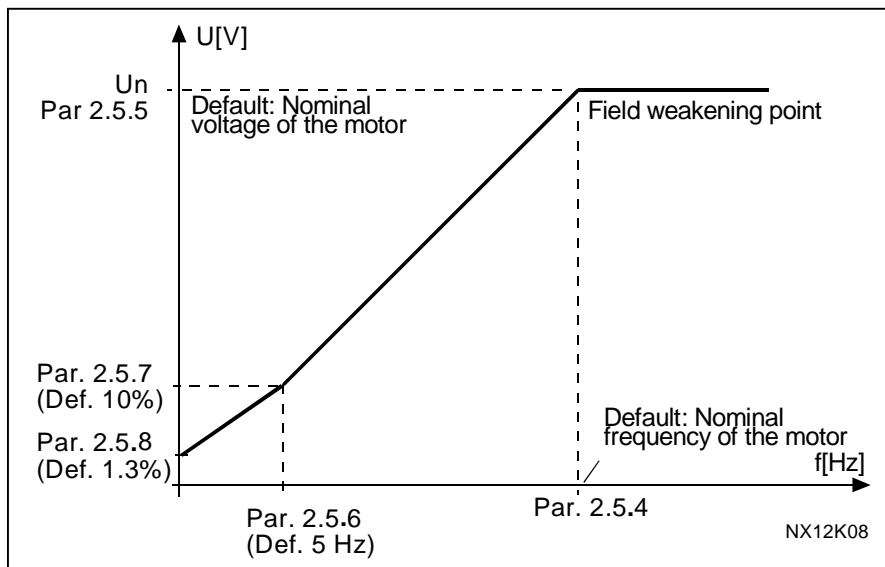


Figure 7. Programmable U/f curve.

Linear with flux optimisation:

- 3 The frequency converter starts to search for the minimum motor current in order to save energy, lower the disturbance level and the noise. This function can be used in applications with constant motor load, such as fans, pumps etc.

2.5.4 Field weakening point

The field weakening point is the output frequency at which the output voltage reaches the set (par. 2.5.5) maximum value.

2.5.5 *Voltage at field weakening point*

Above the frequency at the field weakening point, the output voltage remains at the set maximum value. Below the frequency at the field weakening point, the output voltage depends on the setting of the U/f curve parameters. See parameters 2.5.2, 2.5.3, 2.5.6 and 2.5.7.

When the parameters 2.1.1 and 2.1.2 (nominal voltage and nominal frequency of the motor) are set the parameters 2.5.4 and 2.5.5 are automatically given the corresponding values. If you need different values for the field weakening point and the maximum output voltage, change these parameters **after** setting the parameters 2.1.1 and 2.1.2.

2.5.6 *U/f curve, middle point frequency*

If the programmable U/f curve has been selected with the parameter 2.5.3 this parameter defines the middle point frequency of the curve. See Figure 7.

2.5.7 *U/f curve, middle point voltage*

If the programmable U/f curve has been selected with the parameter 2.5.3 this parameter defines the middle point voltage of the curve. See Figure 7.

2.5.8 *Output voltage at zero frequency*

If the programmable U/f curve has been selected with the parameter 2.5.3 this parameter defines the zero frequency voltage of the curve. See Figure 7.

2.5.9 *Switching frequency*

Motor noise can be minimised using a high switching frequency. Increasing the switching frequency reduces the capacity of the frequency converter unit. The range of this parameter depends on the size of the frequency converter:

2.5.10 *Overvoltage controller*

2.5.11 *Undervoltage controller*

These parameters allow the under-/overvoltage controllers to be switched out of operation. This may be useful, for example, if the mains supply voltage varies more than -15% to +10% and the application will not tolerate this over-/undervoltage. In this case, the regulator controls the output frequency taking the supply fluctuations into account.

Note: Over-/undervoltage trips may occur when controllers are switched out of operation.

- 0 Controller switched off
- 1 Controller switched on

2.5.12. *Measured RS voltage drop*

Measured Voltage drop at stator resistance between two phases of the motor with nominal current of motor.

2.6 INPUT SIGNALS

2.6.1 Start/Stop logic selection

- 0 DIN1: closed contact = start forward (rising edge pulse is required)
 DIN2: closed contact = start reverse (rising edge pulse is required)

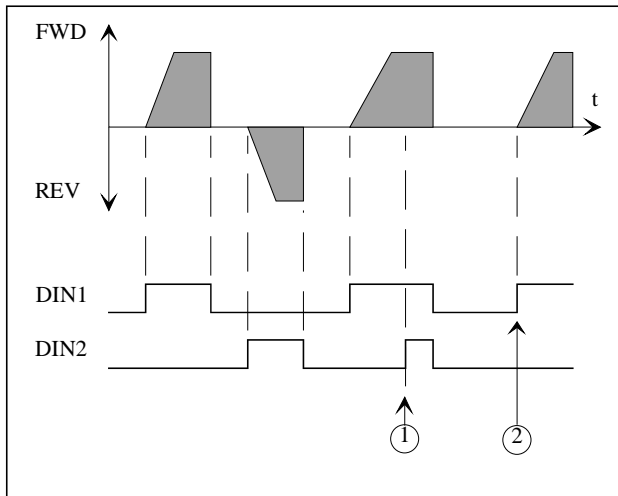


Figure 8. Start forward/Start reverse

- ① If both DIN switches are ON at the same time the second input is ignored.
 ② The drive can be re-started when both DIN switches are in OFF position.

- 1 DIN1: closed contact = start open contact = stop
 DIN2: closed contact = reverse open contact = forward

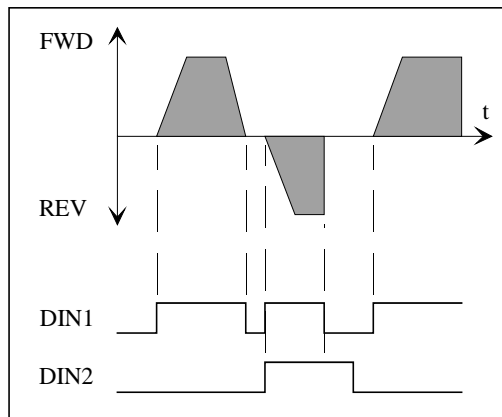


Figure 9. Start, Stop, Reverse

- 2 DIN1: closed contact = start forward
 DIN2: closed contact = start reverse

Same as selection 0 except rising edge pulse is not required.
 Fault is not activated if both DIN switches are on.

2.6.2 ***DIN3 function***

This parameter has 8 selections. If digital input DIN3 need not be used, set the parameter value to 0.

- 1 Speed curve2
- 2 Ext Fault close
- 3 Ext Fault open
- 4 Fault reset
- 5 Run enable
- 6 Emergency stop CC
- 7 Emergency stop OC
- 8 Override speed
- 9 Brake open enable

2.6.3 ***DIN4 (Analog input 1) function***

The analog input 1 is used as digital input DIN4.

Selections are the same as for Parameter 2.6.2

2.6.4 ***DIN5 (Analog input 2) function***

The analog input 2 is used as digital input DIN5.

Selections are the same as for Parameter 2.6.2

2.6.5 ***Expander board DIE1 function***

Function selection for Expander board digital input DIE1.

Selections are the same as for Parameter 2.6.2

2.6.6 ***Expander board DIE2 function***

Function selection for Expander board digital input DIE2.

Selections are the same as for Parameter 2.6.2

2.6.7 ***Expander board DIE3 function***

Function selection for Expander board digital input DIE3.

Selections are the same as for Parameter 2.6.2

2.7 OUTPUT SIGNALS

2.7.1 Relay output 1 function

2.7.2 Digital output 2 (Analogue output 1) function

2.7.3 Expander board relay output 1 function

2.7.4 Expander board digital output 1 function

Setting value	Signal content
0 = Not used	Out of operation
	<u>Relay output R01 and expander board programmable relays (R01, D01) are activated when:</u>
1 = Ready	The frequency converter is ready to operate
2 = Run	The frequency converter operates (motor is running)
3 = Fault	A fault trip has occurred
4 = Fault inverted	A fault trip <u>not</u> occurred
5 = Frequency converter overheat warning	The heat-sink temperature exceeds +70°C
6 = External fault or warning	Fault or warning depending on par. 2.8.1
7 = Not Used	Not Used
8 = Warning	Always if a warning exists
9 = Reversed	The reverse command has been selected
10 = Preset speed	A preset speed has been selected
11 = At speed	The output frequency has reached the set reference
12 = Motor regulator activated	Overvoltage or overcurrent regulator was activated
13 = Output frequency limit 1 supervision	Not used in this application
14 = Control from I/O terminals	Selected control place (Menu K3 ; par. 3.1) is "I/O terminal"
15 = Thermistor fault or warning	The thermistor input of option board indicates overtemperature. Fault or warning depending on parameter 2.8.14
16 = Mechanical brake	External brake ON/OFF control (see parameter Group G2.3)

Table 4-4. Output signals via R01, D02 and expander board R01, and D01.

2.7.5 Analogue output function

This parameter selects the desired function for the analogue output signal. See the table on page 10 for the parameter values. Maximum analogue output is activated when output selected by [P2.7.2](#) is true.

2.7.6 Analogue output filter time

Defines the filtering time of the analogue output signal.

If you set value **0** for this parameter, no filtering takes place.

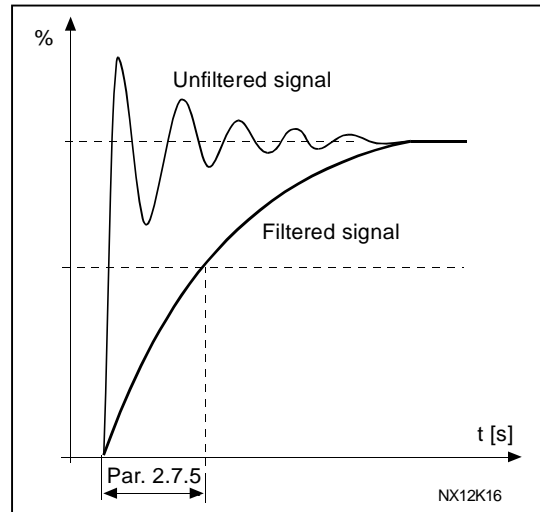


Figure 10. Analogue output filtering

2.7.7 Analogue output invert

Inverts the analogue output signal:

Maximum output signal = 0 %

Minimum output signal = Maximum set value (parameter 2.7.9)

0 Not inverted

1 Inverted

See [parameter 2.7.9](#).

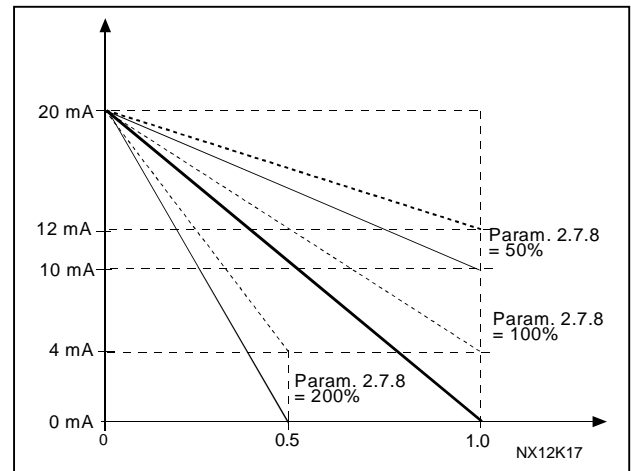


Figure 11. Analogue output invert

2.7.8 Analogue output minimum

Sets the signal minimum to either 0 mA or 4 mA (living zero). Note the difference in the analogue output scaling in [parameter 2.7.9](#).

2.7.9 Analogue output scale

Scaling factor for the analogue output.

Signal	Max. value of the signal
Output frequency	100% x f_{max}
Motor speed	100% x Motor nom. speed
Output current	100% x I_{nMotor}
Motor torque	100% x T_{nMotor}
Motor power	100% x P_{nMotor}
Motor voltage	100% x U_{nmotor}
DC-link voltage	1000 V

Table 1- 1. Analogue output scaling

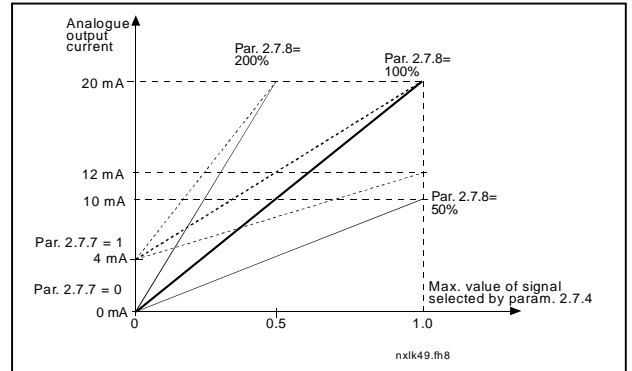


Figure 12. Analogue output scaling

2.7.10 Output frequency limit 1 supervision function

- 0 No supervision
- 1 Low limit supervision
- 2 High limit supervision

If the output frequency goes under/over the set limit (par. 2.7.10) this function generates a warning message via the relay outputs depending on the settings of [parameters 2.7.1 – 2.7.3](#)

2.7.11 Output frequency limit 1 supervised value

Selects the frequency value supervised by parameter 2.7.9

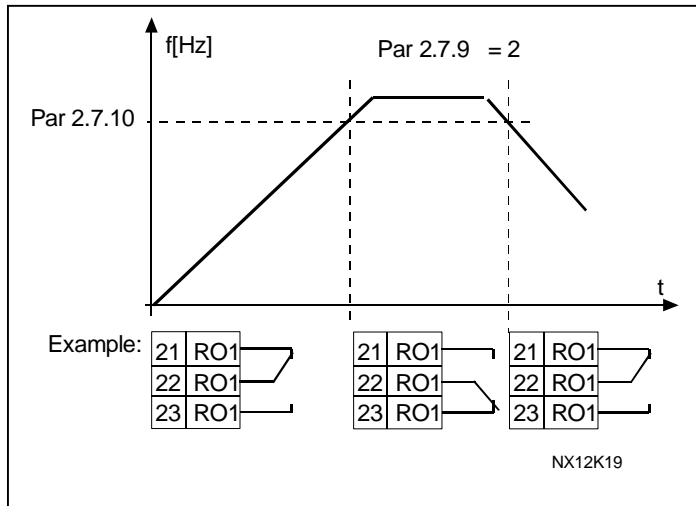


Figure 13. Output frequency supervision

2.8 PROTECTIONS

I/O Faults parameters (M2 -> G2.8.1)

2.8.1 *Response to external fault*

- 0 = No response
- 1 = Warning
- 2 = Fault, stop mode after fault according to [parameter 2.4.2](#).
- 3 = Fault, stop mode after fault always by coasting

A warning or a fault action and message is generated from the external fault signal in the programmable digital inputs. The information can also be programmed into relay outputs.

2.8.2 *Response to undervoltage fault*

- 1 = Warning
- 2 = Fault, stop mode after fault according to [parameter 2.4.2](#).
- 3 = Fault, stop mode after fault always by coasting

For the undervoltage limits see Vacon NXL User's Manual. Table 4-3.
Note: This protection can not be inactivated.

2.8.3 *Output phase supervision*

- 0 = No response
- 1 = Warning
- 2 = Fault, stop mode after fault according to [parameter 2.4.2](#).
- 3 = Fault, stop mode after fault always by coasting

Output phase supervision of the motor ensures that the motor phases have an approximately equal current.

2.8.4 *Earth fault protection*

- 0 = No response
- 1 = Warning
- 2 = Fault, stop mode after fault according to [parameter 2.4.2](#).
- 3 = Fault, stop mode after fault always by coasting

Earth fault protection ensures that the sum of the motor phase currents is zero. The overcurrent protection is always working and protects the frequency converter from earth faults with high currents.

Motor Faults parameters

Parameters 2.8.5—2.8.8, Motor thermal protection: General

The motor thermal protection is to protect the motor from overheating. The Vacon drive is capable of supplying higher than nominal current to the motor. If the load requires this high current there is a risk that the motor will be thermally overloaded. This is the case especially at low frequencies. At low frequencies the cooling effect of the motor is reduced as well as its capacity. If the motor is equipped with an external fan the load reduction at low speeds is small.

The motor thermal protection is based on a calculated model and it uses the output current of the drive to determine the load on the motor.

The motor thermal protection can be adjusted with parameters. The thermal current I_T specifies the load current above which the motor is overloaded. This current limit is a function of the output frequency.



CAUTION! *The calculated model does not protect the motor if the airflow to the motor is reduced by blocked air intake grill.*

2.8.5 *Motor thermal protection*

0 = No response

1 = Warning

2 = Fault, stop mode after fault according to [parameter 2.4.2](#).

3 = Fault, stop mode after fault always by coasting

If tripping is selected the drive will stop and activate the fault stage.

Deactivating the protection, i.e. setting parameter to 0, will reset the thermal stage of the motor to 0%.

2.8.6 *Motor thermal protection: Motor ambient temperature factor*

When the motor ambient temperature must be taken into consideration, it is recommended to set a value for this parameter. The value of the factor can be set between -100.0% and 100.0% where -100.0% corresponds to 0°C and 100.0% to the maximum running ambient temperature of the motor. Setting this parameter value to 0% assumes that the ambient temperature is the same as the temperature of the heatsink at power-on.

2.8.7 Motor thermal protection: Cooling factor at zero speed

The cooling power can be set between 0–150.0% x cooling power at nominal frequency. See Figure 14.

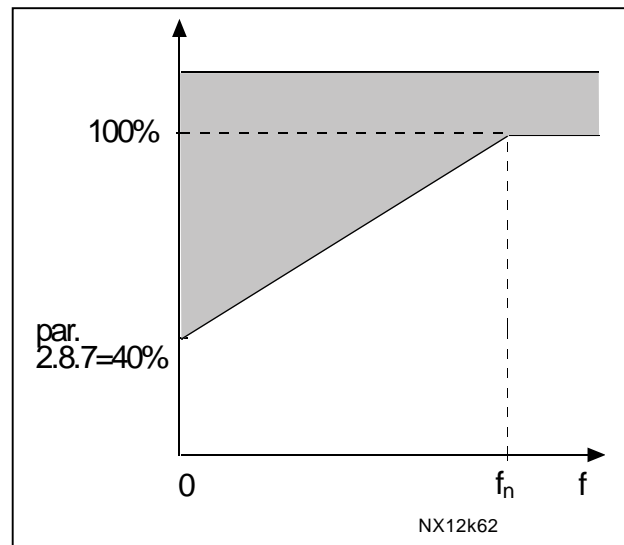


Figure 14. Motor cooling power

2.8.8 Motor thermal protection: Time constant

This time can be set between 1 and 200 minutes.

This is the thermal time constant of the motor. The bigger the motor, the bigger the time constant. The time constant is the time within which the calculated thermal model has reached 63% of its final value.

The motor thermal time is specific to the motor design and it varies between different motor manufacturers.

If the motor's t_6 -time (t_6 is the time in seconds the motor can safely operate at six times the rated current) is known (given by the motor manufacturer) the time constant parameter can be set basing on it. As a rule of thumb, the motor thermal time constant in minutes equals to $2 \times t_6$. If the drive is in stop state the time constant is internally increased to three times the set parameter value. The cooling in the stop state is based on convection and the time constant is increased. See also Figure 10.

Note: If the nominal speed (par. 2.1.3) or the nominal current (par. 2.1.4) of the motor are changed this parameter is automatically set to the default value (45).

2.8.9 Motor thermal protection: Motor duty cycle

Defines how much of the nominal motor load is applied. The value can be set to 0%...100%.

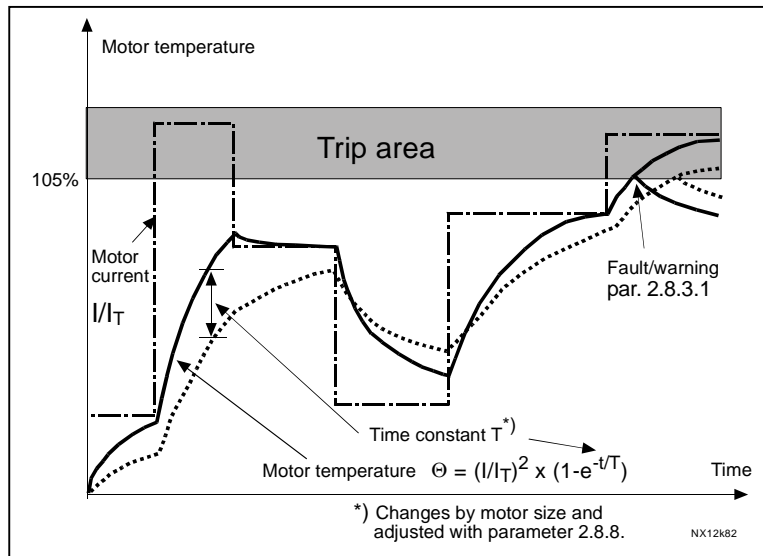


Figure 15. Motor temperature calculation

Parameters 2.8.10-2.8.13, Stall protection:

General

The motor stall protection protects the motor from short time overload situations such as one caused by a stalled shaft. The reaction time of the stall protection can be set shorter than that of motor thermal protection. The stall state is defined with two parameters, 2.8.11 (Stall current) and 2.8.13 (Stall frequency). If the current is higher than the set limit and output frequency is lower than the set limit, the stall state is true. There is actually no real indication of the shaft rotation. Stall protection is a type of overcurrent protection.

2.8.10 Stall protection

- 0 = No response
- 1 = Warning
- 2 = Fault, stop mode after fault according to [parameter 2.4.2](#)
- 3 = Fault, stop mode after fault always by coasting

Setting the parameter to 0 will deactivate the protection and reset the stall time counter.

2.8.11 Stall current limit

The current can be set to $0.0 \dots I_{nMotor} * 2$. For a stall stage to occur, the current must have exceeded this limit. See Figure 1- 20. The software does not allow entering a greater value than $I_{nMotor} * 2$. If the [parameter 2.1.4](#) Nominal current of motor is changed, this parameter is automatically restored to the default value ($I_{nMotor} * 1.3$).

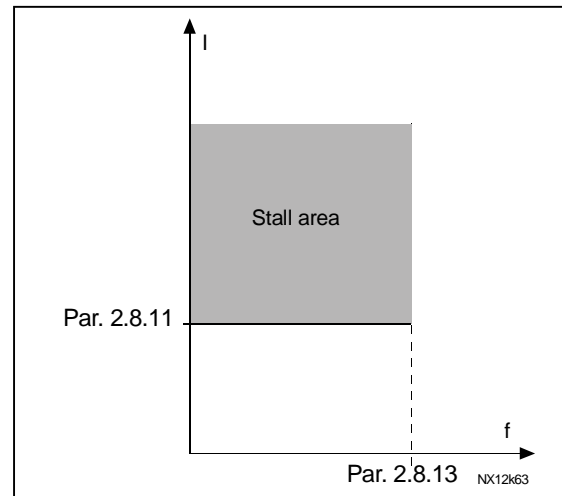


Figure 16. Stall characteristics settings

2.8.12 Stall time limit

This time can be set between 1.0 and 120.0s. This is the maximum time allowed for a stall stage. The stall time is counted by an internal up/down counter. If the stall time counter value goes above this limit the protection will cause a trip (see [parameter 2.8.10](#)).

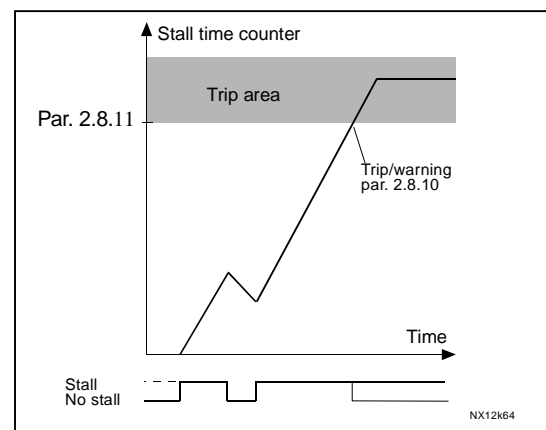


Figure 17. Stall time count

2.8.13 Maximum stall frequency

The frequency can be set between $1-f_{max}$ ([par. 2.1.2](#)). For a stall state to occur, the output frequency must have remained below this limit.

Parameters 2.8.14-2.8.17, other protections:

2.8.14 *Response to thermistor fault*

0 = No response

1 = Warning

2 = Fault, stop mode after fault according to [parameter 2.4.2](#).

3 = Fault, stop mode after fault always by coasting

2.8.15 *Response to fieldbus fault*

Set here the response mode for the fieldbus fault if a fieldbus board is used. For more information, see the respective Fieldbus Board Manual.

See [parameter 2.8.14](#).

2.8.16 *Response to slot fault*

Set here the response mode for a board slot fault due to missing or broken board.

See [parameter 2.8.14](#).

2.8.17 *Minimum current limit*

If actual current of the motor is below the minimum current limit fault is activated. The fault is activated only when the mechanical brake is open.

2.9 AUTO RESTART PARAMETERS

2.9.1 Automatic restart: Enable

Set this parameter to 1 to enable the automatic restart function.

Restart function works for following faults:

Undervoltage, Overvoltage, Overcurrent, IGBT overtemperature, Motor overtemperature and External fault.

2.9.2 Automatic restart: Wait time

Defines the time before the frequency converter tries to automatically restart the motor after the fault has disappeared.

2.9.3 Automatic restart: Trial time

The Automatic restart function restarts the frequency converter when the faults have disappeared and the waiting time has elapsed.

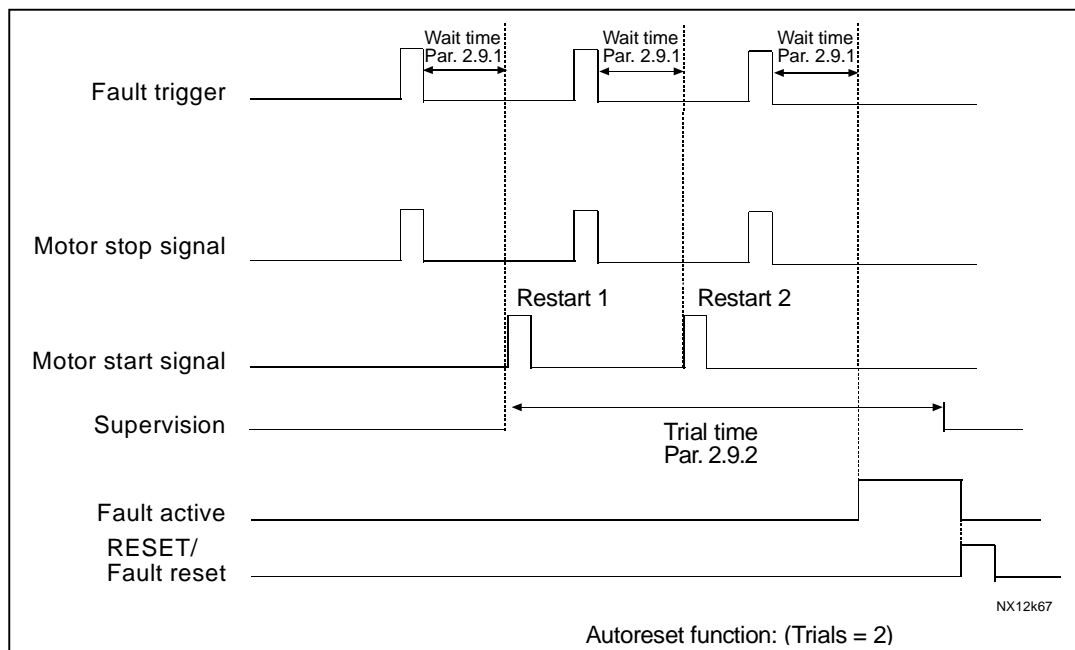


Figure 10. Example of Automatic restart with two restarts.

The time count starts from the first autorestart. If the number of faults occurring during the trial time exceeds three, the fault state becomes active. Otherwise the fault is cleared after the trial time has elapsed and the next fault starts the trial time count again.

If a single fault remains during the trial time, a fault state is true.

2.10 KEYPAD CONTROL PARAMETERS

3.1 *Control place*

The active control place can be changed with this parameter. For more information, see Vacon NXL User's Manual, Chapter 7.4.3.

3.2 *Keypad frequency reference*

The frequency reference can be adjusted from the keypad with this parameter. For more information, see Vacon NXL User's Manual, Chapter 7.4.3.2.

3.3 *Keypad direction*

- 0 Forward: The rotation of the motor is forward, when the keypad is the active control place.
- 1 Reverse: The rotation of the motor is reversed, when the keypad is the active control place.

For more information, see Vacon NXL User's Manual, Chapter 7.4.3.3.

3.4 *Stop button activated*

If you wish to make the Stop button a "hotspot" which always stops the drive regardless of the selected control place, give this parameter the value 1 (default). See Vacon NXL User's Manual, Chapter 7.4.3.

See also [parameter 3.1](#).

3. CONTROL SIGNALS IN LIFT APPLICATION

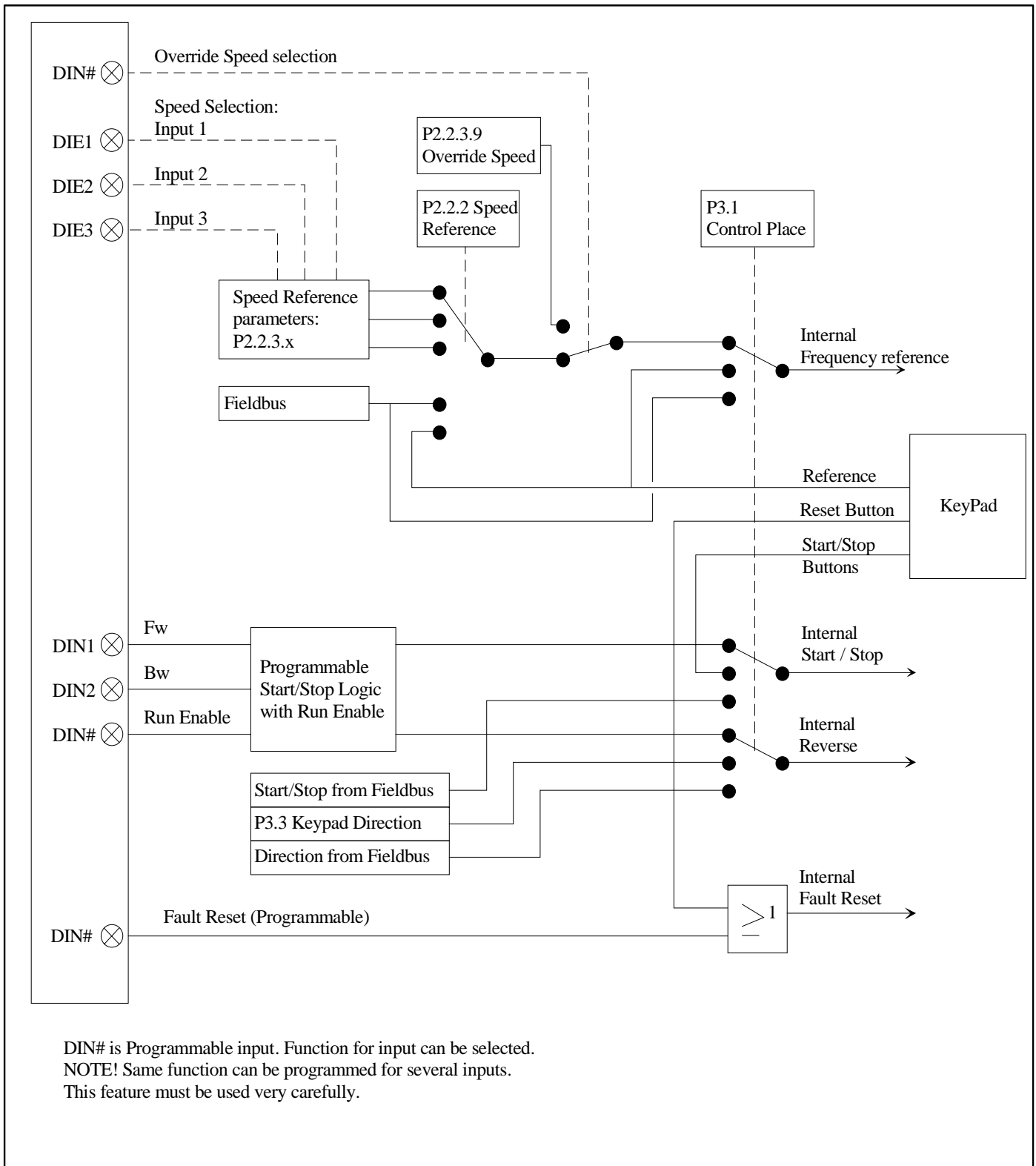


Figure 19. Control signal logic in the Lift Application

3.1 FAULT TRACING

When a fault is detected by the frequency converter control electronics, the drive is stopped and the symbol **F** together with the ordinal number of the fault and the fault code appear on the display. The fault can be reset with the *Reset button* on the control keypad or via the I/O terminal. The faults are stored in the Fault history menu (H5) which can be browsed. The different fault codes you will find in the table below.

The fault codes, their causes and correcting actions are presented in the table below. The shadowed faults are A faults only. The items written in white on black background present faults for which you can program different responses in the application. See parameter group Protections.

Fault code	Fault	Possible cause	Correcting measures
1	Overcurrent	Frequency converter has detected too high a current ($>4 \cdot I_n$) in the motor cable: <ul style="list-style-type: none"> – sudden heavy load increase – short circuit in motor cables – unsuitable motor 	Check loading. Check motor size. Check cables.
2	Overvoltage	The DC-link voltage has exceeded the limits defined in. <ul style="list-style-type: none"> – too short a deceleration time – high overvoltage spikes in utility 	Make the deceleration time longer.
3	Earth fault	Current measurement has detected that the sum of motor phase current is not zero. <ul style="list-style-type: none"> – insulation failure in cables or motor 	Check motor cables and motor.
5	Charging switch	The charging switch is open, when the START command has been given. <ul style="list-style-type: none"> – faulty operation – component failure 	Reset the fault and restart. Should the fault re-occur, contact the distributor near to you.
8	System fault	<ul style="list-style-type: none"> - component failure - faulty operation 	Reset the fault and restart. Should the fault re-occur, contact the distributor near to you.
9	Undervoltage	DC-link voltage is under the voltage limits defined in. <ul style="list-style-type: none"> – most probable cause: too low a supply voltage – frequency converter internal fault 	In case of temporary supply voltage break reset the fault and restart the frequency converter. Check the supply voltage. If it is adequate, an internal failure has occurred. Contact the distributor near to you.
11	Output phase supervision	Current measurement has detected that there is no current in one motor phase.	Check motor cable and motor.
13	Frequency converter under-temperature	Heatsink temperature is under -10°C	
14	Frequency converter overtemperature	Heatsink temperature is over 90°C . Overtemperature warning is issued when the heatsink temperature exceeds 85°C .	Check the correct amount and flow of cooling air. Check the heatsink for dust. Check the ambient temperature. Make sure that the switching frequency is not too high in relation to ambient temperature and motor load.

15	Motor stalled	Motor stall protection has tripped.	Check motor.
16	Motor overtemperature	Motor overheating has been detected by frequency converter motor temperature model. Motor is overloaded.	Decrease the motor load. If no motor overload exists, check the temperature model parameters.
17	Motor underload	Motor underload protection has tripped.	
22	EEPROM checksum fault	Parameter save fault – faulty operation – component failure	Contact the distributor near to you
24	Counter fault	Values displayed on counters are incorrect	
25	Microprocessor watchdog fault	– faulty operation – component failure	Reset the fault and restart. Should the fault re-occur, contact the distributor near to you.
29	Thermistor fault	The thermistor input of option board has detected increase of the motor temperature	Check motor cooling and loading Check thermistor connection (If thermistor input of the option board is not in use it has to be short circuited)
34	Internal bus communication	Ambient interference or defective hardware	Should the fault re-occur, contact the distributor near to you.
39	Device removed	Option board removed. Drive removed.	Reset
40	Device unknown	Unknown option board or drive.	Contact the distributor near to you.
41	IGBT temperature	IGBT Inverter Bridge overtemperature protection has detected too high a motor current.	Check loading. Check motor size.
44	Device change	Option board changed. Option board has default settings.	Reset
45	Device added	Option board added.	Reset
51	External fault	Digital input fault. Digital input has been programmed as external fault input and this input is active.	Check the programming and the device indicated by the external fault information. Check also the cabling of this device.
52	Keypad communication fault	The connection between the control keypad and the frequency converter is broken.	Check keypad connection and possible keypad cable.
53	Fieldbus fault	The data connection between the fieldbus Master and the fieldbus board is broken	Check installation. If installation is correct contact the nearest Vacon distributor.
54	Slot fault	Defective option board or slot	Check board and slot. Contact the nearest Vacon distributor.
58	Minimum Current	Motor Current is less than set limit of P2.8.17	Check motor cables

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