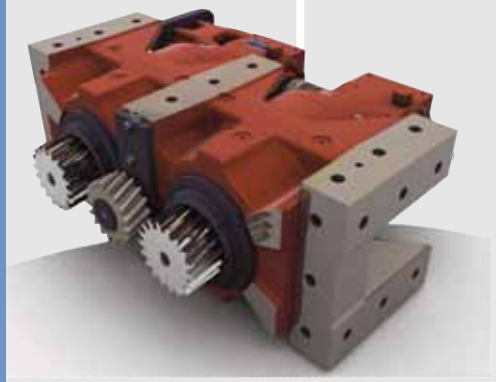
PRECISION ENGINEERING SOLUTIONS



Vacon AC Frequency Inverters type NXL

ANDANTEX

EASY TO PLUG, AND EASIEST TO PLAY

The Vacon NXL is a powerful and compact AC drive for industrial and residential purposes in the power range from 0.25 to 30 kW. The space-saving bookshelf design with high protection classes, versatile control and programming capabilities offer an optimal solution for all operating environments. Installation, connection and commissioning procedures are extremely quick and convenient with instructions attached to the unit.

Thanks to an extremely effective design, everything is included as standard. The units can be installed on the wall without additional cabinets because of high protection classes. The RFI filters and brake choppers are always integrated. The standard units fit almost everywhere in both industrial and residential areas. The integrated AC choke is the most effective way to protect the drive against the overvoltage spikes and to reduce the stress on supply transformers, cables and fuses.

Convenient installation and programming

The installation and programming is extremely quick and convenient with the help of the credit-card-size Quick Guide. The programming is often just a selection of load type and fine-tuning of the motor nominal current and speed.

Although the Vacon NXL is simple in construction compared to other Vacon NX ranges, it is the most flexible drive in its class. The flexibility means a wide range of control possibilities, programmable features, installation possibilities and modularity. The easy-to-use PC tools can be used e.g. for programming and parameter copying. Sometimes it is possible to remove the PLC from the system by adding logic to the drive with the NC1131-3 PC tool.

The double rating of the Vacon NXL and dynamic open loop vector control make the NXL a perfect choice for all kinds of loads, from simple pumps and fans to demanding material handling applications.

The motor noise level is extremely low because of a high switching frequency and a near-sinusoidal current waveform.

More features, more performance

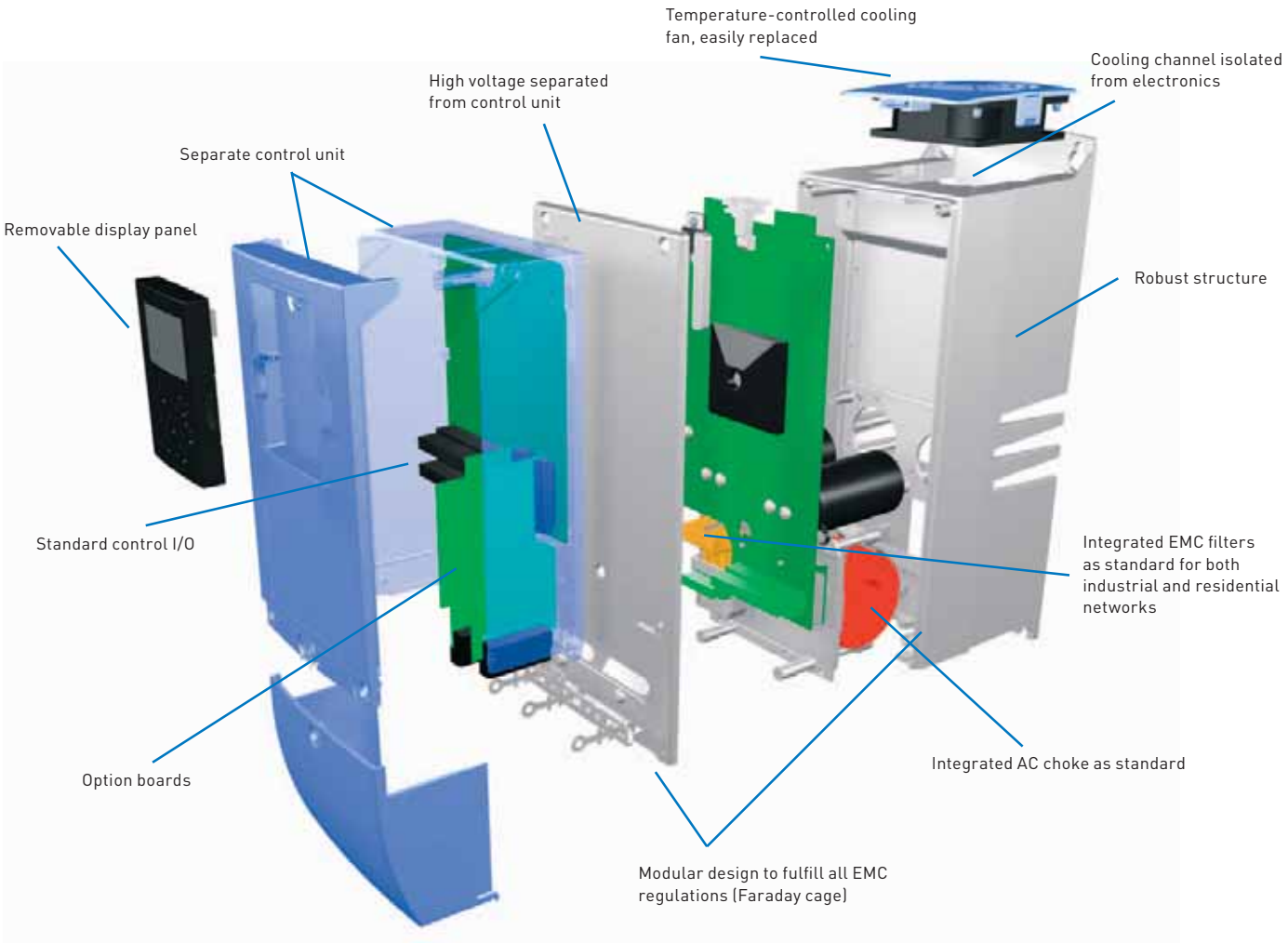
- No additional cabinets required
- Everything integrated as standard (dust/water protection, RFI filter, AC choke, brake chopper)
- Easy to install, easy to use
- Low noise (both drive and motor)
- Large amount of control possibilities (via I/Os, field buses or display panel)
- Large amount of features (e.g. fully programmable I/O, auto-identification, PID controller, flying start)
- High performance

VACON NXL MF4-MF6, IP21

VACON NXL MF4-MF6, IP54

The mechanical design is extremely compact. The IP54 units in particular are the smallest AC drives on the market. All units are suitable for both wall and enclosure mounting with all necessary components: integrated EMC filters, AC chokes, cable protection, dust and water protection. The effective super-cooling principle allows high ambient temperatures and high switching frequencies without derating.

Motor nominal values			Vacon NXL features							
Voltage U (V)	Power High overload P_H (kW)	Power Low overload P_L (kW)	Supply voltage U (V)	EMC	Enclosure	Dimensions W x H x D (mm)	Weight (kg)	Integrated brake chopper	Integrated AC choke	Mechanical frame size
400	0.75...4	1.1...5.5	380...500	H/T, C	IP21/IP54	128 x 292 x 190	5	standard	standard	**MF4**
500	1.1...5.5	1.5...7.5	380...500	H/T, C	IP21/IP54	128 x 292 x 190	5	standard	standard	**MF4**
400	5.5...11	7.5...15	380...500	H/T, C	IP21/IP54	144 x 391 x 214	8.1	standard	standard	**MF5**
500	7.5...15	11...18.5	380...500	H/T, C	IP21/IP54	144 x 391 x 214	8.1	standard	standard	**MF5**
400	15...22	18.5...30	380...500	H/T, C	IP21/IP54	195 x 519 x 237	18.5	standard	standard	**MF6**
500	18.5...30	22...37	380...500	H/T, C	IP21/IP54	195 x 519 x 237	18.5	standard	standard	**MF6**



MF4-MF6 PRODUCT RANGE

Mains voltage 380—500 V, 50/60 Hz, 3~, enclosure class IP21/IP54, EMC level H

AC drive type *	Loadability					Motor shaft power		Frame size
	Low		High		Maximum current I_S	400 V supply		
	Rated continuous current I_L (A)	10% overload current (A)	Rated continuous current I_H (A)	50% overload current (A)		10% overload 40°C P (kW)	50% overload 50°C P (kW)	
NXL 0003 5 C 2 H 1	3.3	3.6	2.2	3.3	4.4	1.1	0.75	**MF4**
NXL 0004 5 C 2 H 1	4.3	4.7	3.3	5.0	6.2	1.5	1.1	**MF4**
NXL 0005 5 C 2 H 1	5.6	6.2	4.3	6.5	8.6	2.2	1.5	**MF4**
NXL 0007 5 C 2 H 1	7.6	8.4	5.6	8.4	10.8	3	2.2	**MF4**
NXL 0009 5 C 2 H 1	9	9.9	7.6	11.4	14	4	3	**MF4**
NXL 0012 5 C 2 H 1	12	13.2	9	13.5	18	5.5	4	**MF4**
NXL 0016 5 C 2 H 1	16	17.6	12	18.0	24	7.5	5,5	**MF5**
NXL 0023 5 C 2 H 1	23	25.3	16	24.0	32	11	7,5	**MF5**
NXL 0031 5 C 2 H 1	31	34	23	35	46	15	11	**MF5**
NXL 0038 5 C 2 H 1	38	42	31	47	62	18.5	15	**MF6**
NXL 0046 5 C 2 H 1	46	51	38	57	76	22	18.5	**MF6**
NXL 0061 5 C 2 H 1	61	67	46	69	92	30	22	**MF6**

* Type code of the IP21 unit. The type code of the IP54 unit: replace '2' with '5'; for example, NXL 0003 5C5H1

For all Vacon NXL drives, overloadability is defined as follows:
High: 1.5 x I_H (1 min/10 min) at 50°C; Low: 1.1 x I_L (1 min/10 min) at 40°C; I_S for 2 seconds every 20 seconds.

VACON NXL MF4—MF6 TYPE DESIGNATION CODE

NXL 0007 5 C 2 H 1 SSS 00 AI

Factory installed I/O expander boards and fieldbus boards (slot E)
- 00 = no board
- AI = I/O extension board (3xDI, 1xRO, 1xTherm)
- AA = I/O extension board (3xDI, 1xRO, 1xDO)
- C3 = Profibus DP
- - More boards, see page 6

Factory installed fieldbus boards (slot D)
- 00 = no board
- C3 = Profibus DP
- - More boards, see page 6

Hardware modifications (power unit, special modifications, board varnishing)
- SSS = standard
- SSV = varnished boards
- STS = flange mounting

Brake chopper option
- 1 = internal brake chopper (standard)

Emission level
- H = fulfills the standard EN 61800-3 (2004), category C2
- C = fulfills the standard EN 61800-3 (2004), category C1
- T = Low earth-current solution for IT networks (can be modified from H level units)

Enclosure classification
- 2 = IP21
- 5 = IP54

Control keypad
- C = 7-segment LCD keypad
- B = no keypad

Nominal mains voltage
- 5 = 380...500 V AC (3-phase)

Nominal current (Low overload)
- e.g. 0007 = 7 Amps

Product range
- Vacon NXL

The Vacon NXL range also offers compact, cabinet-mounted units for lower motor powers. Frames MF2 and MF3 are suitable for both 208–230 V and 380–500 V supply voltages for powers up to 2.2 kW. The compact size and flexible installation options make the Vacon NXL suitable for installations where space is at a premium. The standard control I/O can be extended with one I/O expander board or one fieldbus board.

Features

- Small size
- Flexible installation (back or side, screw or DIN rail)
- Easy to install and use
- Low noise
- Large amount of control possibilities (via I/Os, fieldbuses or display panel)
- Large amount of features (e.g. fully programmable I/O, auto-identification, PID controller, flying start)
- High performance
- RFI filters and AC chokes available as options

Mains voltage 380—500 V, 50/60 Hz, 3~, enclosure class IP20, EMC level N

AC drive type	Loadability					Motor shaft power		Frame size and dimensions (W x H x D)
	Low		High		Maximum current I_S	400 V supply		
	Rated continuous current I_L (A)	10% overload current (A)	Rated continuous current I_H (A)	50% overload current (A)		10% overload 40°C P (kW)	50% overload 50°C P (kW)	
NXL 0001 5 C 1 N 0	1.9	2.1	1.3	2.0	2.6	0.55	0.37	**MF2 / 60 x 130 x 150**
NXL 0002 5 C 1 N 0	2.4	2.6	1.9	2.9	3.8	0.75	0.55	**MF2 / 60 x 130 x 150**
NXL 0003 5 C 1 N 1	3.3	3.6	2.4	3.6	4.8	1.1	0.75	**MF3 / 84 x 184 x 172**
NXL 0004 5 C 1 N 1	4.3	4.7	3.3	5.0	6.6	1.5	1.1	**MF3 / 84 x 184 x 172**
NXL 0005 5 C 1 N 1	5.4	5.9	4.3	6.5	8.6	2.2	1.5	**MF3 / 84 x 220 x 172**

Mains voltage 208—240 V, 50/60 Hz, 1/3~ (3~ motor), enclosure class IP20, EMC level N

AC drive type	Loadability					Motor shaft power		Frame size and dimensions (W x H x D)
	Low		High		Maximum current I_S	230 V supply		
	Rated continuous current I_L (A)	10% overload current (A)	Rated continuous current I_H (A)	50% overload current (A)		10% overload 40°C P (kW)	50% overload 50°C P (kW)	
NXL 0002 2 C 1 N 0*	2.4	2.6	1.7	2.6	3.4	0.37	0.25	**MF2 / 60 x 130 x 150**
NXL 0003 2 C 1 N 1	3.7	4.1	2.8	4.2	5.6	0.75	0.55	**MF3 / 84 x 184 x 172**
NXL 0004 2 C 1 N 1	4.8	5.3	3.7	5.6	7.4	1.1	0.75	**MF3 / 84 x 184 x 172**
NXL 0006 2 C 1 N 1	6.6	7.2	4.8	7.2	9.6	1.5	1.1	**MF3 / 84 x 220 x 172**

* suitable only for single-phase supply voltage (the rest suitable for both single-phase and three-phase supply voltages)

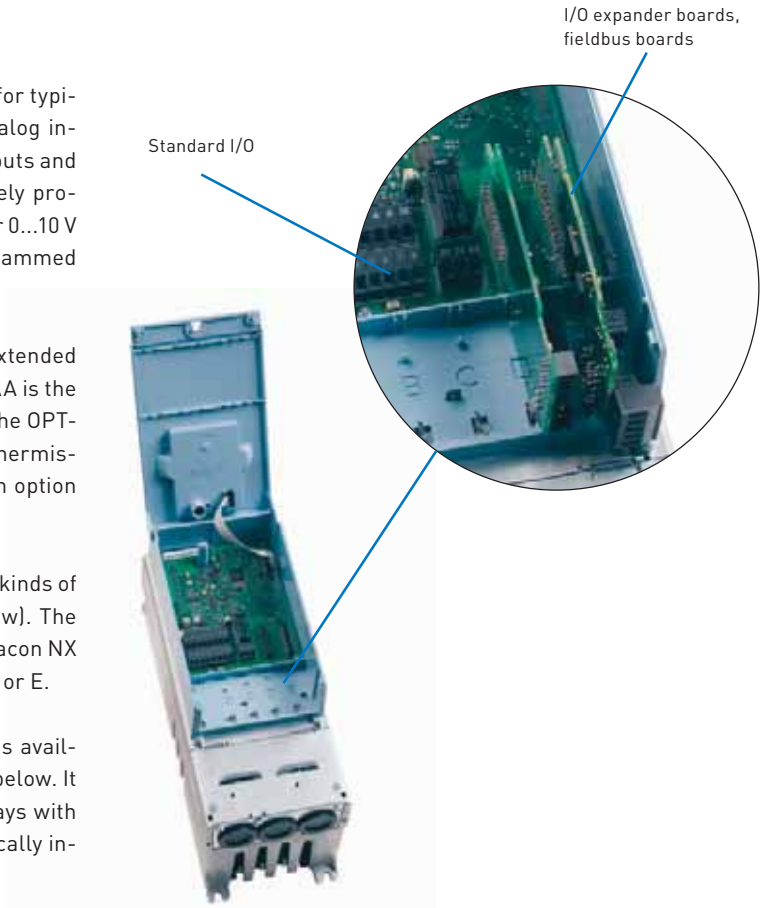
VACON NXL CONTROL UNIT

The standard I/O of the Vacon NXL has been optimized for typical control requirements. In addition to digital and analog inputs and outputs, RS485 is included as standard. All inputs and outputs of the standard I/O and option boards are freely programmable. Both Analog Inputs can be programmed for 0...10 V or 0(4)...20 mA signals. Analog Input can also be programmed as Digital Input.

The standard I/O can easily and cost-effectively be extended with OPT-AA or OPT-AI boards, if necessary. The OPT-AA is the most effective way to add one more Relay Output, and the OPT-AI is normally used when galvanically isolated motor thermistor connection is needed. These boards are installed in option board slot E.

It is also possible to control the Vacon NXL with various kinds of fieldbuses with OPT-C-type boards (see the table below). The I/O extension and fieldbus boards are the same for all Vacon NX products. The fieldbus boards can be installed in slot D or E.

There are a large number of OPT-B-type option boards available. The most typical boards are included in the table below. It is possible, for instance, to add three more output relays with OPT-B5, if necessary. The OPT-B-type boards are typically installed in slot E.



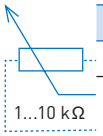
VACON NXL OPTION BOARDS

Card typecode	Slot		I/O signal								
	D	E	DI	DO	AI mA isol.	AO mA isol.	RO NO NC	RO NO	Therm	+24 EXT +24V	NOTE
Basic I/O cards (OPT-A)											
OPT-AA			3	1			1				
OPT-AI			3					1	1		
I/O expander cards (OPT-B), typical											
OPT-B2							1	1	1		
OPT-B4					1	2				1	analog signals galvanically isolated separately
OPT-B5								3			
Fieldbus cards (OPT-C)											
OPT-C2			RS-485 (Multiprotocol)								N2 (Modbus as standard)
OPT-C3			Profibus DP								
OPT-C4			LonWorks								
OPT-C5			Profibus DP (D9 type connector)								
OPT-C6			CANopen (slave)								
OPT-C7			DeviceNet								
OPT-C8			RS-485 (Multiprotocol, D9 type connector)								N2 (Modbus as standard)
OPT-CI			Modbus/TCP (Ethernet)								
OPT-CJ			BACnet								

NOTES: Allowed slots for the board are marked in blue. Allowed option board combinations are as follows:
no boards, 1xOPT-Ax, 1xOPT-Bx, 1xOPT-Cx, or 1xOPT-Ax and 1xOPT-Cx.

VACON NXL CONTROL I/O

Standard I/O



Terminal		Signal, default settings
1	+10V	Reference voltage
2	AI1+	Analog input, 0–10 V (0/4–20 mA)
3	AI1-	AI common
4	AI2+	Analog input, 0/4–20 mA (0–10 V)
5	AI2-	AI common
6	+24V	24V auxiliary voltage
7	GND	I/O ground
8	DIN1	Start forward
9	DIN2	Start reverse
10	DIN3	Preset speed 1
11	GND	I/O ground
18	AO1+	Analog output, output frequency
19	AO1-	AO common
A	RS485	Serial bus (Modbus RTU)
B	RS485	Serial bus
30	+24V	External control voltage supply
21	RO1	Relay output 1, FAULT
22	RO1	
23	RO1	

All inputs and outputs of the standard I/O and option boards are freely programmable.

OPT-AA (typical option)

Terminal		Signal, default settings
1	+24V	24 V auxiliary voltage
2	GND	I/O ground
3	DIN1	Preset speed 2
4	DIN2	Fault reset
5	DIN3	Disable PID
6	DO1	Digital output, Ready
24	RO1	Relay output 1, RUN
25	RO1	
26	RO1	

OPT-AI (typical option)

Terminal		Signal, default settings
12	+24V	24 V auxiliary voltage
13	GND	I/O ground
14	DIN1	Preset speed 2
15	DIN2	Fault reset
16	DIN3	Disable PID
25	RO1	Relay output 1, RUN
26	RO1	
28	TI1+	Thermistor input
29	TI1-	(galvanically isolated)

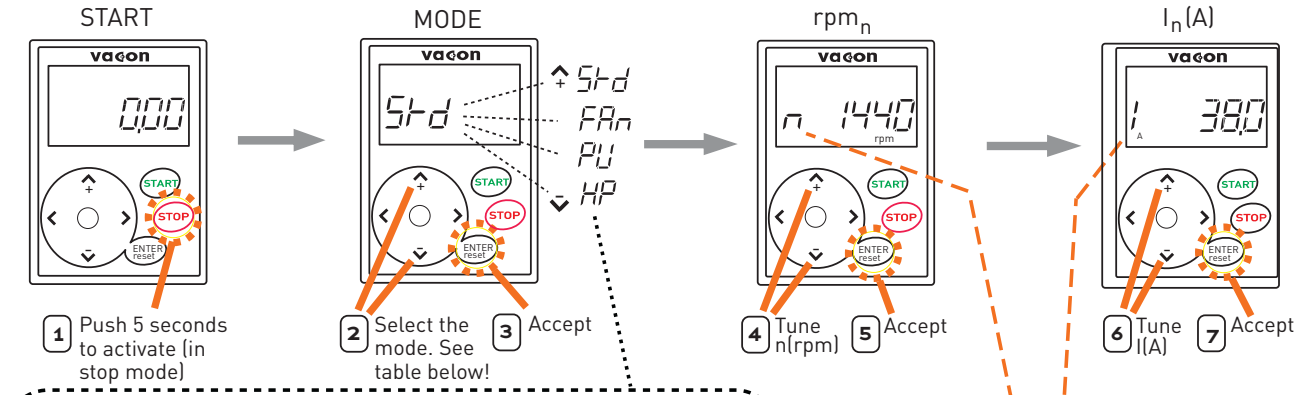
OTHER TYPICAL OPTIONS

OPTION	ORDER TYPECODE	SUITABILITY	NOTE
IP54 enclosure	Factory option	MF4-MF6	Replace '2' by '5' in the type code, e.g. NXL00315C**5**H1 (SSS...)
	IP5-FR_	MF4-MF6	IP54 kit, e.g. IP5-FR4
Through-hole mounting	Factory option	MF4-MF6	E.g. NXL00315C**T**H1S**T**S..., IP54 back, IP21 front, kits available
External brake resistors	BRR-0022-LD-5	00035-00225	LD = Light Duty: 5 sec nominal torque braking from nominal speed decreasing linearily to zero, once per 120 sec. HD = Heavy Duty: 3 sec nominal torque braking at nominal speed + 7 sec nominal torque braking from nominal speed decreasing linearily to zero, once per 120 sec. Replace LD by HD in the type code, e.g. BRR-0031-**HD**-5 The brake resistor manual is available for more precise selection
	BRR-0031-LD-5	00315	
	BRR-0045-LD-5	00385-00465	
	BRR-0061-LD-5	00615	
Panel door installation sets	DRA-02L DRA-04L	All	Door installation set with a 2-m RS232C cable Door installation set with a 4-m RS232C cable
PC adapter	PAN-RS	All	Adapter PAN-RS and a RS232C cable are required for PC connection
RS232C cables	RS232C-2M RS232C-4M	All	2-meter-long RS232C cable for PC connection 4-meter-long RS232C cable for PC connection
Varnished circuit boards	Factory option	MF4-MF6	Replace the 'S' by 'V', e.g. NXL00315C5H1SS**V**...
C-level RFI filters	Factory option	MF4-MF6	Replace 'H' by 'C' in the typecode, e.g. NXL00315C2**C**1 (SSS...)
OPTIONS FOR COMPACT UNITS (MF2-MF3)			
RFI filters	RFI-0012-2-1	00022-00062	RFI filter for 208-230 V units, H level, 1~ supply
	RFI-0013-2-1	00022-00062	RFI filter for 208-230 V units, H level, 1~ supply, footprint installation
	RFI-0008-5-1	00015-00055	RFI filter for 380-500 V units, H level, footprint installation
DIN rail installation	Factory option	MF2-MF3	Replace 'S' by 'D' in the typecode, e.g. NXL 00025C1HO S**D**S

FIRST-CLASS USABILITY

The basic settings can be programmed by simply launching the Vacon NXL start-up wizard. Only four steps are required, and the drive is ready to run.

START-UP WIZARD =Push the button



	P2.1.1 Min. Freq (Hz)	P2.1.2 Max.Freq (Hz)	P2.1.3 Acc time (s)	P2.1.4 Dec time (s)	P2.1.5 Current limit(A)	P2.1.6 Motor Un (V)	P2.1.7 Motor fn(Hz)	P2.1.11 Start funct.	P2.1.12 Stop funct.	P2.1.13 U/f optimization	P2.1.14 I/O ref	P2.1.21 Auto restart	P3.1 Control place
Std Standard	0 Hz	50 Hz	3 s	3 s	I_H*1,5	400 V	50 Hz	0= Ramp	0= Coasting	0= Not used	0= Ai1 0-10V	0= Not used	I/O
FAn Fan	20 Hz	50 Hz	20 s	20 s	I_L*1,1	400 V	50 Hz	0= Ramp	0= Coasting	0= Not used	0= Ai1 0-10V	0= Not used	I/O
PU Pump	20 Hz	50 Hz	5 s	5 s	I_L*1,1	400 V	50 Hz	0= Ramp	1= Ramp	0= Not used	0= Ai1 0-10V	0= Not used	I/O
HP High performance	0 Hz	50 Hz	1 s	1 s	I_H*1,8	400 V	50 Hz	0= Ramp	0= Coasting	1= automatic torque boost	0= Ai1 0-10V	0= Not used	I/O

For example: These settings are made automatically if the fan mode is selected.

The instructions to install, connect and program the Vacon NXL are included in the credit-card size Quick Guide attached to each unit.

MULTI-CONTROL APPLICATION

The standard Multi-Control Application software of the Vacon NXL is extremely flexible and easy to use. All inputs and outputs are programmable, and there is a full set of features and possibilities for system or process control and protections.

The default settings are very close to optimum, and the drive operates accurately enough without any programming. It still is recommended to check and fine-tune the motor nominal values to optimize the performance and motor protection. Programming can be made simply by using the start-up wizard feature of the display panel, programming parameter by parameter with display panel, or programming by the NCDrive tool. The instructions, if required, can be found in the credit-card-size Quick Guide.

There are many parameters and features which can be utilized, if necessary. For example:

- PID controller
- Pump and fan control for a maximum of 4 parallel motors
- Flying start
- Auto-tuning
- Programming of all control inputs and outputs
- Output relay delays

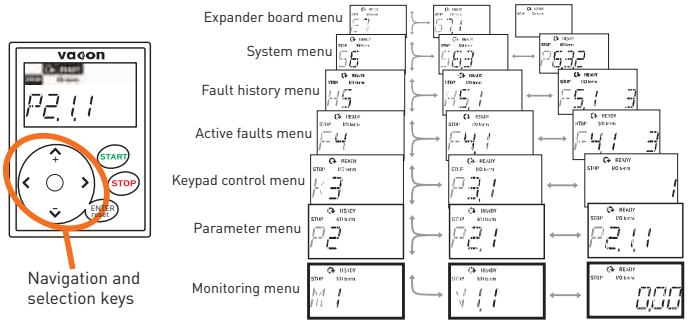
In addition to the standard MultiControl Application software, some special application software is also available. It is even possible to make totally customer-specific software with the NC1131-3 Engineering tool, and remove the PLC by integrating the logic to the NXL software.

The Vacon PC tools are available for downloading from the Vacon website at http://www.vacon.com. These include:

- Vacon NCDrive for parameter setting, copying, storing, printing, monitoring and controlling
- Vacon NCLoad for software updating and uploading special software to the drive
- Vacon NC1131-3 Engineering is available for making tailor-made software. (A license key and training required)

The following software applications are available for special requirements:

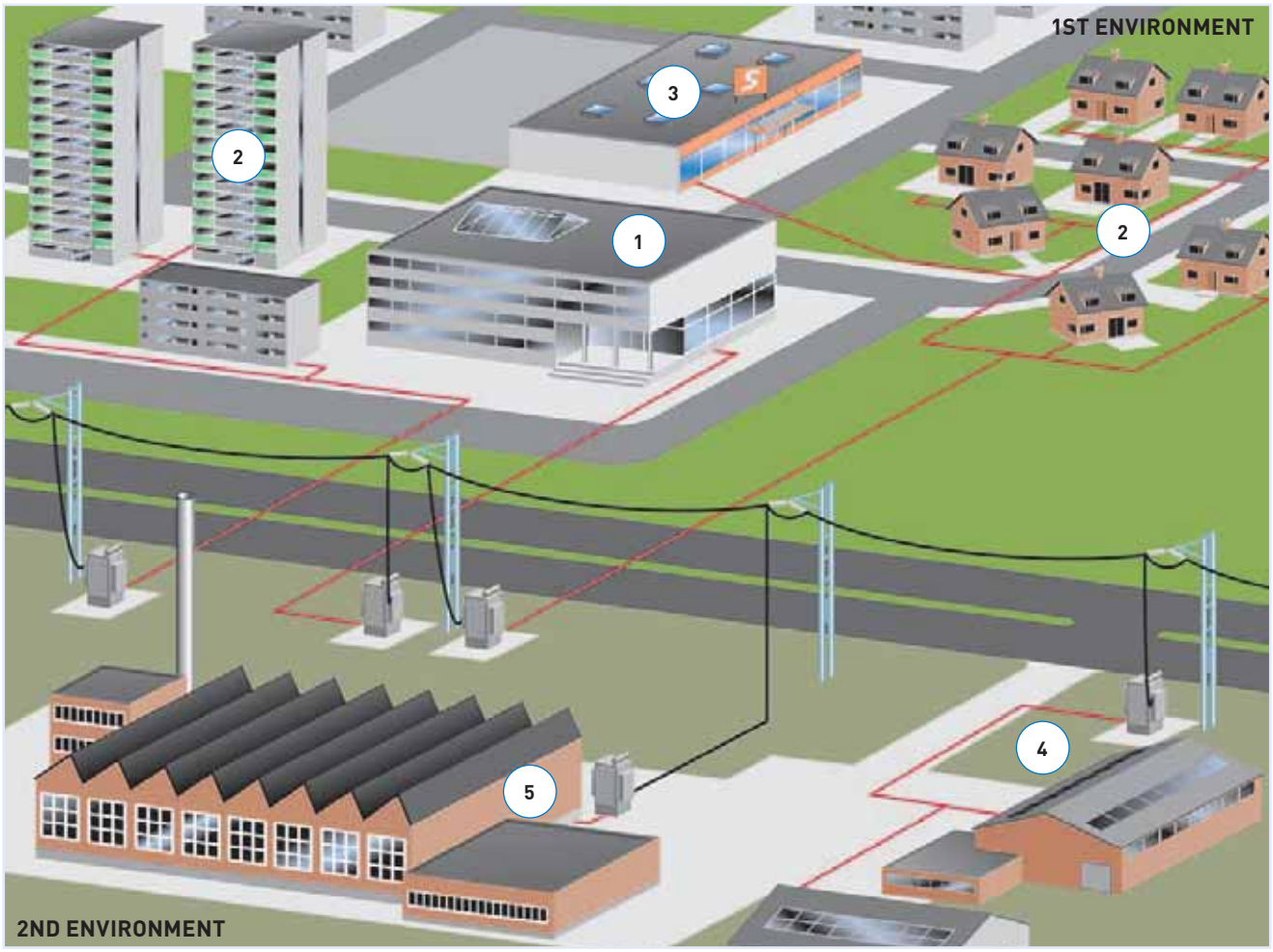
- Brake control
- Lift
- Multi-motor
- Sliding door
- Local/remote
- Fire mode
- Multi-purpose



Navigating the menu structure (e.g. special parameters, monitoring signals)

Activating the start-up wizard

EMC AND INSTALLATION ENVIRONMENT



The product family standard EN61800-3 sets limits for both emissions and immunity of radio frequency disturbances. The environment has been divided into the 1st and 2nd environments, which, in practice, means public and industrial networks.

Radio Frequency Interference (RFI) filters are typically required to meet the EN61800-3 standard. These filters are integrated in the Vacon NXL MF4-MF6 as standard.

The Vacon NXL fulfills all the requirements of the 1st and 2nd environments (H level: EN61800-3 (2004), category C2). No additional RFI filters or cabinets are required for frames MF4-MF6.

The Vacon NXL MF4-MF6 units are also available with extremely low-emission integrated EMC filters (C level: EN61800-3 (2004), category C1; EN55011, class B). These filters are sometimes required in very sensitive locations such as hospitals.

EMC Selection Table, restricted distribution

	1	2	3	4	5	
Vacon NXL EMC	**Hospital**	**Residential Area**	**Commercial**	**Light Industry Area**	**Heavy Industry**	**Marine**
C	O					
H	R	R	R	O	O	
L				R	R	
T					R (IT Network)	R (IT Network)

R = Required ; O = Optional

Mains connection	Input voltage U_{in}	380...500 V, –10%...+10%, 208...240 V, -10%...+10%
	Input frequency	45...66 Hz
	Connection to mains	Once per minute or less (normal case)
Motor connection	Output voltage	0...U_{in}
	Continuous output current	High overloadability: I_H, ambient temperature max. +50°C Low overloadability: I_L, ambient temperature max. +40°C
	Overloadability	High: 1.5 x I_H (1 min/10 min), Low: 1.1 x I_L (1 min/10 min)
	Max. starting current	I_s for 2 s every 20 s
	Output frequency	0...320 Hz
	Frequency resolution	0.01 Hz
Control characteristics	Control method	Frequency control U/f; Open Loop Vector Control (speed, torque)
	Switching frequency	1...16 kHz; Factory default 6 kHz
	Field weakening point	8...320 Hz
	Acceleration time	0...3000 s
	Deceleration time	0...3000 s
	Braking	DC brake: 30% * T_N (without brake resistor), flux braking
Ambient conditions	Ambient operating temperature	–10°C (no frost)...+50°C: I_H –10°C (no frost)...+40°C: I_L
	Storage temperature	–40°C...+70°C
	Relative humidity	0 to 95% RH, non-condensing, non-corrosive, no dripping water
	Air quality: - chemical vapours - mechanical particles	 IEC 721-3-3, unit in operation, class 3C2 IEC 721-3-3, unit in operation, class 3S2
	Altitude	100% load capacity (no derating) up to 1000 m 1% derating for each 100 m above 1000 m; max. 3000 m
	Vibration EN50178/EN60068-2-6	5...150 Hz Displacement amplitude 1 mm (peak) at 3...15.8 Hz Max acceleration amplitude 1 G at 15.8...150 Hz
	Shock EN50178, EN60068-2-27	UPS Drop Test (for applicable UPS weights) Storage and shipping: max 15 G, 11 ms (in package)
	Enclosure class	MF4-MF6: IP21 and IP54; MF2-MF3: IP20
EMC	Immunity	Fulfills all EMC immunity requirements
	Emissions	**MF4-MF6:** **EMC level H**: EN61800-3 (2004), category C2; EN61000-6-4, EN50081-2; EN55011 class A **EMC level C**: EN61800-3 (2004), category C1; EN61000-6-3, EN50081-1,-2; EN55011 class B **EMC level T**: Low earth-current solution suitable for IT networks (can be modified from H-level units) **MF2-MF3:** **EMC level N**: EN61800-3 (2004), category C4 **EMC level H w/ RFI filter**: EN61800-3 (2004), category C2; EN61000-6-4, EN50081-2; EN55011 class A.
Safety		EN 50178 (1997), EN 60204-1 (1996), EN 60950 (2000, 3rd edition) (as relevant), IEC 61800-5, CE, UL, CUL, FI, GOST R; (see unit nameplate for more detailed approvals)
Control connections (values in brackets valid for OPT-AA or OPT-AI)	Analogue input voltage	0...+10 V, R_i = 200 kΩ, resolution 0.1%, accuracy ±1%
	Analogue input current	0(4)...20 mA, R_i = 250 Ω differential, resolution 0.1%, accuracy ±1%
	Digital inputs	3 (6), 18...30 VDC
	Auxiliary voltage	+24 V, ±15 %, max. 100 mA
	Output reference voltage	+10 V, +3%, max. load 10 mA
	Analogue output	0(4)...20 mA; R_L max. 500 Ω, resolution 10 bit, accuracy ±2%
	Relay outputs	1 (2) programmable relay output(s) Switching capacity: 24 VDC/8 A, 250 VAC/8 A, 125 VDC/0.4 A. Min. switching load: 5 V/10 mA
	RS-485	Serial bus (Modbus RTU)
	Thermistor input	Galvanically isolated, R_{trip} = 4.7 kΩ (OPT-AI)
Protections		Overvoltage, undervoltage, earth fault, motor phase supervision, overcurrent, unit overtemperature, motor overload, motor stall, motor underload, short-circuit of +24 V and +10 V reference voltages

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