VACON®

DRIVEN BY DRIVES

VACON® AC DRIVES
PRODUCT CATALOGUE 2014

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VACON IN BRIEF

Vacon is driven by a passion to develop, manufacture and sell the best AC drives and inverters in the world — and to provide efficient life-cycle services for its customers. Our AC drives offer optimum process control and energy efficiency for electric motors. VACON® inverters are a key component in producing energy from renewable sources. We have R&D and production units in Finland, the USA, China, Italy, India, and sales & service offices in 29 countries.

PASSIONATE ATTITUDE TOWARDS PRODUCT LEADERSHIP

Exclusively focused on variable speed AC drives, Vacon offers a unique blend of a dynamic and passionate attitude towards product leadership and customer services. Vacon is constantly working with a wide customer base where AC drives play an integral part of the business.

Vacon concentrates only on the essential: improving the customer's own product or process in order to bring the best possible value for the customer. With many years of experience in the field, we understand the customer's needs and can offer the most cost-effective solution to meet them in terms of process efficiency, energy savings, eco-friendliness, and the total cost of ownership.

UNIQUE CRAFTSMANSHIP AND R&D

More than 1,600 Vacon professionals worldwide concentrate on one thing only: providing state-of-the-art AC drives as close to the customer as possible. The secret behind Vacon's success lies in unique engineering craftsmanship and innovations. Vacon's R&D is constantly investigating the best practices in the field that are most appropriate for customers.

Today, as much as 7% of the revenues are invested into R&D, and our R&D units are located in Finland, China, USA and Italy. Therefore, we dare to say that VACON® AC drives make a difference in the market: whatever the need is – from the simplest to the most demanding – we are always open to take the challenge!

CLEANTECH WHICH BRINGS SUBSTANTIAL SAVINGS

VACON® AC drives are 100% cleantech. Cleantech refers to all products, services, processes and systems that are less harmful to the environment than their alternatives. Vacon AC drives represent technology that not only helps you save in energy costs but also significantly improves the process control in your business.

If all AC motors in the world were equipped with VACON AC drives, it could give savings of about 30% in the energy consumption of AC motors. This saving is about 10% of the world's total consumption of electrical energy.

ATTRACTIVE PARTNER

Vacon has a unique position in the market. It is an independent company that can focus entirely on developing AC drives. A global network combined with local production in different parts of the world makes Vacon an attractive business partner on all continents.

Vacon offers OEM partners, system integrators, brand label customers, distributors and industrial end-users and added value resellers a broad product portfolio and a high level of product and application expertise.

GLOBAL PRODUCTION & MULTICHANNEL PRODUCT AND SERVICE NETWORK

Vacon currently manufactures AC drives in Finland, China, Italy, India and the United States. Adapting products as close as possible to the customer gives flexible production and short delivery times.

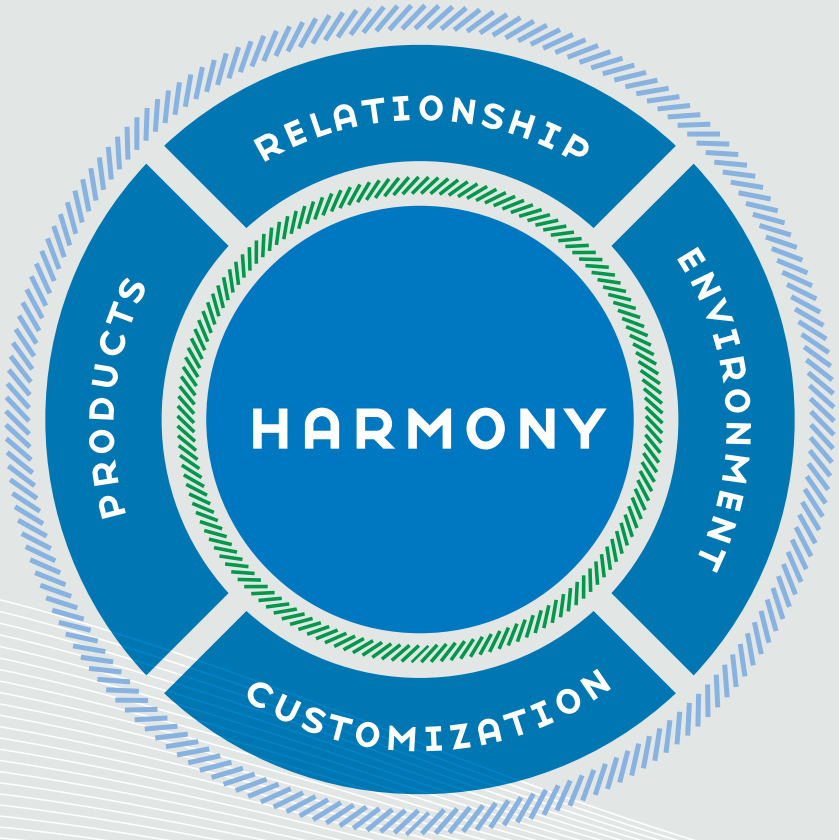
VACON® AC drives are sold in more than 100 countries. We have subsidiaries, business partners and service centers around the world. We increase our local presence systematically, ensuring good availability of products and service wherever you are.

VACON GROWS AT A FAST PACE

For many years, Vacon has been growing two times faster than the global AC drive market. Today, Vacon is one of the biggest AC drives manufacturers in the world. Vacon's main competitors are global conglomerates, for which AC drives are just one product among many.

The growth in the AC drive market is based on rising energy prices, increasing automation, falling electronics prices, and investments in renewable energy generation. There is room for growth in the market, for at the moment only about 10% of the electric motors in the world are controlled by AC drives.

VACON® COMPACT AC DRIVES
CREATING PERFECT HARMONY



CREATING PERFECT HARMONY

Drives help improve the control of machines and increase energy efficiency. Selecting the right AC drive is, however, more than just selecting the right product – it is just as much about selecting a supplier with the right attitude towards partnership. Aiming for perfect harmony means selecting the right product, the optimum solution and the best co-operation... And doing it all in harmony with nature.

IT ALL STARTS WITH THE ATTITUDE

We very much understand, and we have seen it so many times, that our success is always a result of our customer's success. When our customer is the winner in his market, we as a partner are also a winner. Realizing this simple fact, we have built our company culture and ways of working around this attitude. Working with Vacon you can be sure that all the efforts are made to reach the best end result – be it product related, solutions related, logistics and support related. This is what makes Vacon your best choice for partnership.

HARMONY IN RELATIONSHIPS

Vacon is a young drives supplier that in a short period of time has grown to be one of the main drives suppliers globally. The Vacon team of drives professionals is here to provide their expertise and skills in order to serve our customers in the best possible way. Our target is a long-term relationship built on confidence and trust – to us that is perfect harmony.

WHAT IS HARMONY?

We see harmony as a state of balance. The feeling that the solution created is the best possible for your specific needs. That the supplier selected is the right one. That there is good communication and an understanding of your needs. That environmental issues are handled in the best possible way.

A DEDICATED OEM SUPPLIER

HARMONY IN PRODUCTS

To meet the various needs of our customers we have created a wide range of compact AC products. All the products: VACON® 10, VACON® 20 and VACON® 20 Cold Plate have one major thing in common. They are designed to be efficient and easy to use. Applying the product should be easy, it should fit into the space available for it and we want the installation and configuration time to be as short as possible.

HARMONY IN CUSTOMIZATION

Machinery and products produced in large quantities should be well optimized and efficient. A standard drive solution is not always the optimum solution. We at Vacon have, from the start, developed our working processes in a way that allows us to customize the products to meet customer needs. So if you are a high volume user of drives, contact your local Vacon partner to find out how we can create a world-class drives solution together.

IN HARMONY WITH THE ENVIRONMENT

The use of AC drives is one of the key contributors to energy saving and thus to reduced emissions and pollution. Vacon aims to be an all around environmentally friendly company – our products are a good example of that. You can also see it in our ways of working. We have developed our manufacturing process in order to minimize the impact on the environment. All excess materials in the production and service processes are carefully sorted and recycled.

VACON® 10 – AS EASY AS POSSIBLE

VACON 10 is an AC drive designed for applications where simplicity and efficiency are the key requirements. When you need a compact AC drive that does its job without extra hassle, the VACON 10 is the product you should be taking a closer look at.

The leading design feature of the VACON 10 is simplicity, which means short handling time. It has all the functionality built into one simple unit. Our VACON 10 customers appreciate a quick setup and compact size.

FAST INSTALLATION

Choose VACON 10, and benefit from the quick installation process. If the drive is mounted on a DIN rail no screws are required for the fixing. No external components, such as RFI filters etc., are needed as they can all be integrated into the drive.

FAST SETUP

In order to save our customers time, we have created tools to program VACON 10 as efficiently as possible. A start-up wizard in the drive allows for programming with as few as three parameters. With the MCA Unit, our customers can clone their drive in seconds - all without connecting main power to the drive.

COMPACT SIZE

The space available for the drive is often limited. It is also a cost factor as providing more space leads to increased cost for the enclosure. The secret behind the compact size of VACON 10 is the unique cooling concept of the drive. It is made just like most PC computers – a high efficiency forced cooled heat sink mounted directly onto the power semiconductors.

KEY BENEFITS:

- Short installation time
- Space saving design
- Parameter copying without main power

RATINGS AND DIMENSIONS

Supply voltage	AC drive type	Power		Motor current		Frame size	Dimensions W x H x D		Weight	
		kW	HP	I_N (A)	1.5 x I_N (A)		mm	inches	kg	lb
110-120 VAC, 1-phase (North America only)	VACON0010-1L-0001-1	0.25	0.33	1.7	2.6	MI2	90 x 195 x 102	3.54 x 7.68 x 4.02	0.7	1.54
	VACON0010-1L-0002-1	0.37	0.5	2.4	3.6					
	VACON0010-1L-0003-1	0.55	0.75	2.8	4.2					
	VACON0010-1L-0004-1	0.75	1	3.7	5.6					
	VACON0010-1L-0005-1	1.1	1.5	4.8	7.2	MI3	100 x 255 x 109	3.94 x 10.04 x 4.29	0.99	2.18
208-240 VAC, 1-phase	VACON0010-1L-0001-2	0.25	0.33	1.7	2.6	MI1	66 x 160 x 99	2.60 x 6.30 x 3.90	0.55	1.21
	VACON0010-1L-0002-2	0.37	0.5	2.4	3.6					
	VACON0010-1L-0003-2	0.55	0.75	2.8	4.2					
	VACON0010-1L-0004-2	0.75	1	3.7	5.6	MI2	90 x 195 x 102	3.54 x 7.68 x 4.02	0.7	1.54
	VACON0010-1L-0005-2	1.1	1.5	4.8	7.2					
	VACON0010-1L-0007-2	1.5	2	7	10.5					
	VACON0010-1L-0009-2	2.2	3	9.6	14.4	MI3	100 x 255 x 109	3.94 x 10.04 x 4.29	0.99	2.18
208-240 VAC, 3-phase	VACON0010-3L-0001-2	0.25	0.33	1.7	2.6	MI1	66 x 160 x 99	2.60 x 6.30 x 3.90	0.55	1.21
	VACON0010-3L-0002-2	0.37	0.5	2.4	3.6					
	VACON0010-3L-0003-2	0.55	0.75	2.8	4.2					
	VACON0010-3L-0004-2	0.75	1	3.7	5.6	MI2	90 x 195 x 102	3.54 x 7.68 x 4.02	0.7	1.54
	VACON0010-3L-0005-2	1.1	1.5	4.8	7.2					
	VACON0010-3L-0007-2	1.5	2	7	10.5					
	VACON0010-3L-0011-2	2.2	3	11	16.5	MI3	100 x 255 x 109	3.94 x 10.04 x 4.29	0.99	2.18
380-480 VAC, 3-phase	VACON0010-3L-0001-4	0.37	0.5	1.3	2.0	MI1	66 x 160 x 99	2.60 x 6.30 x 3.90	0.55	1.21
	VACON0010-3L-0002-4	0.55	0.75	1.9	2.9					
	VACON0010-3L-0003-4	0.75	1	2.4	3.6					
	VACON0010-3L-0004-4	1.1	1.5	3.3	5.0	MI2	90 x 195 x 102	3.54 x 7.68 x 4.02	0.7	1.54
	VACON0010-3L-0005-4	1.5	2	4.3	6.5					
	VACON0010-3L-0006-4	2.2	3	5.6	8.4					
	VACON0010-3L-0008-4	3	5	7.6	11.4	MI3	100 x 255 x 109	3.94 x 10.04 x 4.29	0.99	2.18
	VACON0010-3L-0009-4	4	6	9	13.5					
	VACON0010-3L-0012-4	5.5	7.5	12	18.0					
575 VAC, 3-phase (North America only)	VACON0010-3L-0002-7	0.75	1	1.7	2.6	MI3	100 x 255 x 109	3.94 x 10.04 x 4.29	0.99	2.18
	VACON0010-3L-0003-7	1.5	2	2.7	4.1					
	VACON0010-3L-0004-7	2.2	3	3.9	5.9					
	VACON0010-3L-0006-7	4	5	6.1	9.2					
	VACON0010-3L-0009-7	5.5	7.5	9	13.5					

TYPICAL APPLICATIONS:

- Pumps
- Fans
- Conveyors

TECHNICAL HIGHLIGHTS

- Easy to use push button interface
- Wide standard I/O
- Temperature controlled cooling fan
- Side by side mounting
- EMC filter built-in
- PI controller built-in

VACON® 20 – POSSIBILITIES AND PERFORMANCE

VACON 20 AC drive comes packed with functionality and possibilities to bring any machine control to a completely new level. The compact size in combination with a wide power range is the base, but VACON 20's possibilities do not end there. A built-in PLC functionality, which is one of the most flexible on the market, makes this product adapt to every task and bring cost savings to the user.

In order for machine builders to be able to compete in an increasingly competitive market, it is important to continuously seek solutions to further improve performance and cost efficiency – VACON 20 offers new possibilities here.

WIDE POWER RANGE

VACON 20 is available in all common voltages in the range of 110-575V. Combined with a wide power range up to 18.5kW /25 HP. VACON 20 has something for customers all over the globe. Customers can reduce costs by implementing our harmonized product range and increase efficiency in their manufacturing processes. In currents above 16A the drive is available with a built-in harmonic filtering choke for public networks according to IEC61000-3-12.

CUTTING-EDGE PERFORMANCE

Machinery performance is very much dependent on the performance of the AC drive. In VACON 20 we have done our best to cut cycle times and maximize the control performance of the drive. The built-in RS-485 interface offers a cost effective and simple serial control interface for the drive. With optional modules, VACON 20 can be connected to almost any fieldbus system including CANOpen, DeviceNet and Profibus DP.

FAST INSTALLATION AND SET-UP

VACON 20 is designed for efficient volume manufacturing where every second in installation and configuration time counts. Easy access terminals, built-in DIN rail mounting and the MCA parameter copying tool which can clone settings without main power in the drive are all examples of features that help reduce start-up time.

BUILT-IN PLC FUNCTIONALITY BASED ON IEC61131-3

The built-in PLC functionality presents an opportunity to increase machine performance and save costs. The customer can build his own control logic in the drive and utilize unused I/O of the drive for performing other machine related tasks. Another unique feature of VACON 20 is that the parameter list can be freely modified and application specific parameter sets and default settings can be created. By utilizing the opportunities of optimizing the drive control VACON 20 can help make better and more cost efficient machine designs.

KEY BENEFITS:

- Fieldbus connectivity
- Parameter copying without main power
- Custom-made software possible

RATINGS AND DIMENSIONS

Supply voltage	AC drive type	Power		Motor current		Frame size	Dimensions W x H x D		Weight	
		kW	HP	I_N (A)	1.5 x I_N (A)		mm	inches	kg	lb
110-120 VAC, 1-phase (North America only)	VACON0020-1L-0001-1	0.25	0.33	1.7	2.6	MI2	90 x 195 x 102	3.54 x 7.68 x 4.02	0.7	1.54
	VACON0020-1L-0002-1	0.37	0.5	2.4	3.6					
	VACON0020-1L-0003-1	0.55	0.75	2.8	4.2					
	VACON0020-1L-0004-1	0.75	1	3.7	5.6					
	VACON0020-1L-0005-1	1.1	1.5	4.8	7.2	MI3	100 x 255 x 109	3.94 x 10.04 x 4.29	0.99	2.18
208-240 VAC, 1-phase	VACON0020-1L-0001-2	0.25	0.33	1.7	2.6	MI1	66 x 160 x 99	2.60 x 6.30 x 3.90	0.55	1.21
	VACON0020-1L-0002-2	0.37	0.5	2.4	3.6					
	VACON0020-1L-0003-2	0.55	0.75	2.8	4.2					
	VACON0020-1L-0004-2	0.75	1	3.7	5.6	MI2	90 x 195 x 102	3.54 x 7.68 x 4.02	0.7	1.54
	VACON0020-1L-0005-2	1.1	1.5	4.8	7.2					
	VACON0020-1L-0007-2	1.5	2	7	10.5					
	VACON0020-1L-0009-2	2.2	3	9.6	14.4	MI3	100 x 255 x 109	3.94 x 10.04 x 4.29	0.99	2.18
208-240 VAC, 3-phase	VACON0020-3L-0001-2	0.25	0.33	1.7	2.6	MI1	66 x 160 x 99	2.60 x 6.30 x 3.90	0.55	1.21
	VACON0020-3L-0002-2	0.37	0.5	2.4	3.6					
	VACON0020-3L-0003-2	0.55	0.75	2.8	4.2					
	VACON0020-3L-0004-2	0.75	1	3.7	5.6	MI2	90 x 195 x 102	3.54 x 7.68 x 4.02	0.7	1.54
	VACON0020-3L-0005-2	1.1	1.5	4.8	7.2					
	VACON0020-3L-0007-2	1.5	2	7	10.5					
	VACON0020-3L-0011-2	2.2	3	11	16.5	MI3	100 x 255 x 109	3.94 x 10.04 x 4.29	0.99	2.18
	VACON0020-3L-0012-2	3	4	12.5	18.8	MI4	165 x 370 x 165	6.5 x 14.6 x 6.5	8	18
	VACON0020-3L-0017-2	4	5	17.5	26.3					
	VACON0020-3L-0025-2	5.5	7.5	25	37.5					
	VACON0020-3L-0031-2	7.5	10	31	46.5	MI5	165 x 414 x 202	6.5 x 16.3 x 8	10	22
	VACON0020-3L-0038-2	11	15	38	57					
380-480 VAC, 3-phase	VACON0020-3L-0001-4	0.37	0.5	1.3	2.0	MI1	66 x 160 x 99	2.60 x 6.30 x 3.90	0.55	1.21
	VACON0020-3L-0002-4	0.55	0.75	1.9	2.9					
	VACON0020-3L-0003-4	0.75	1	2.4	3.6					
	VACON0020-3L-0004-4	1.1	1.5	3.3	5.0	MI2	90 x 195 x 102	3.54 x 7.68 x 4.02	0.7	1.54
	VACON0020-3L-0005-4	1.5	2	4.3	6.5					
	VACON0020-3L-0006-4	2.2	3	5.6	8.4					
	VACON0020-3L-0008-4	3	5	7.6	11.4	MI3	100 x 255 x 109	3.94 x 10.04 x 4.29	0.99	2.18
	VACON0020-3L-0009-4	4	6	9	13.5					
	VACON0020-3L-0012-4	5.5	7.5	12	18.0					
	VACON0020-3L-0016-4	7.5	10	16	24	MI4	165 x 370 x 165	6.5 x 14.6 x 6.5	8	18
	VACON0020-3L-0023-4	11	15	23	34.5					
	VACON0020-3L-0031-4	15	20	31	46.5	MI5	165 x 414 x 202	6.5 x 16.3 x 8	10	22
	VACON0020-3L-0038-4	18.5	25	38	57					
575 VAC, 3-phase (North America only)	VACON0020-3L-0002-7	0.75	1	1.7	2.6	MI3	100 x 255 x 109	3.94 x 10.04 x 4.29	0.99	2.18
	VACON0020-3L-0003-7	1.5	2	2.7	4.1					
	VACON0020-3L-0004-7	2.2	3	3.9	5.9					
	VACON0020-3L-0006-7	4	5	6.1	9.2					
	VACON0020-3L-0009-7	5.5	7.5	9	13.5					

TYPICAL APPLICATIONS:

- Pumps & Fans
- Conveyors
- Packaging, processing and washing machines

TECHNICAL HIGHLIGHTS:

- Wide power range up to 18.5kW
- High performance and functionality
- Full I/O + option board support
- Fast installation and setup
- Built-in choke as option in ≥16A types

VACON® 20 COLD PLATE – FLEXIBILITY IN COOLING

When the environment is more demanding or there is a cooling media such as liquid already available, the AC drive cooling can also be optimized further. VACON 20 Cold Plate shares the control and power topology with the standard VACON 20 drive, but offers completely new possibilities for creating unique and efficient cooling solutions.

AC drives are extremely energy efficient products; they do however, still generate some heat. The heat loss can sometimes limit the density of the machine design, especially if mounted in a sealed enclosure simply because there is no air circulation. VACON 20 Cold Plate design is based around a flat surface of the drive onto which the majority of the heat losses are concentrated. By attaching this surface to a cooling element, i.e. to the "cold plate", the cooling of the drive can work even under the most demanding circumstances.

USE ANY COOLING MEDIA

As the cooling is done through a clear cooling interface, it is possible to use different cooling media depending on the situation. By attaching the drive to a heat sink with large cooling ribs, a fully passively cooled drive is created. As an alternative, the drive can be mounted on a plate, which is cooled by liquid in order to create a liquid cooled drive solution. Other possible cooling media include different types of refrigerants or metal constructions with a high heat energy conducting mass.

COMPACT SEALED ENCLOSURES

If the heat transport from the drive is not handled through air circulation, but through the heat being conducted out of the enclosure through a flat metal surface, the sealing of the enclosure is no longer a factor that significantly affects the cooling performance. It is thus possible to create and install the drive enclosure in environments with high amounts of dust and moisture. VACON 20 has a unique form that is designed to allow slim and flat enclosure solutions that can be highly integrated in the machine construction to be created.

BUILT-IN PLC FUNCTIONALITY ACCORDING TO IEC61131-3

VACON 20 Cold Plate utilizes the advanced control concept of VACON® 20 product family, offering full control performance and functionality. It also supports the built-in PLC functionality that allows the creation of application-specific software and solutions.

KEY BENEFITS:

- Highest cooling flexibility
- Fast plugging of I/O wiring
- Custom-made software possible

RATINGS AND DIMENSIONS

Supply voltage	AC drive type	Power		Motor Current		Frame size	Dimensions W x H x D		Weight	
		kW	HP	I_N (A	1.5 x I_N (A)		mm	inches	kg	lb
208-240 VAC, 3-phase	VACON0020-3L-0004-2-CP	0.75	1	3.7	5.6	MS2	133 x 159 x 80	5.24 x 6.26 x 3.15	2	4.4
	VACON0020-3L-0005-2-CP	1.1	1.5	4.8	7.2					
	VACON0020-3L-0007-2-CP	1.5	2	7.0	10.5					
	VACON0020-3L-0011-2-CP	2.2	3	11.0	16.5	MS3	161 x 240 x 83	6.34 x 9.45 x 3.27	3	6.6
	VACON0020-3L-0012-2-CP	3.0	4	12.5	18.8					
	VACON0020-3L-0017-2-CP	4.0	5	17.5	26.3					
380-480 VAC, 3-phase	VACON0020-3L-0003-4-CP	0.75	1	2.4	3.6	MS2	133 x 159 x 80	5.24 x 6.26 x 3.15	2	4.4
	VACON0020-3L-0004-4-CP	1.1	1.5	3.3	5.0					
	VACON0020-3L-0005-4-CP	1.5	2	4.3	6.5					
	VACON0020-3L-0006-4-CP	2.2	3	5.6	8.4					
	VACON0020-3L-0008-4-CP	3.0	5	7.6	11.4					
	VACON0020-3L-0009-4-CP	4.0	6	9.0	13.5	MS3	161 x 240 x 83	6.34 x 9.45 x 3.27	3	6.6
	VACON0020-3L-0012-4-CP	5.5	7.5	12.0	18.0					
	VACON0020-3L-0016-4-CP	7.5	10	16.0	24.0					

TYPICAL APPLICATIONS:

- Textile machinery
- Hoists and cranes
- Conveyors in demanding environment
- Compressors and heat pumps

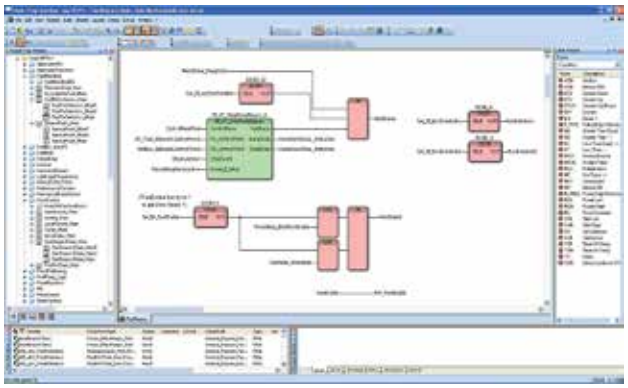
TECHNICAL HIGHLIGHTS:

- Cold plate cooling
- Unique low depth design
- STO - Safe Torque Off approved for SIL2 application
- High performance and functionality
- High ambient temperature rating up to 70°C
- Induction and PM motor support
- Integrated brake resistor
- Status LED's on drive
- Expansion slot for I/O or fieldbus
- Handheld text keypad with copy function
- Single plug I/O connector for OEMs

TAILORING THE SOFTWARE

VACON® PROGRAMMING

VACON® 20 product's built-in PLC functionality and programming is in accordance with IEC611131-3. The optional tool enables the user to modify the drive software by editing the existing application logic or by creating completely new software. The parameter list and default settings are edited with a separate tool.



PC INTERFACE AND PARAMETER COPYING

The MCA (Micro Communications Adapter) is a snap-on and intelligent copying unit for VACON® 10 and VACON® 20 products.

- Parameter copying without main power in the drive
- Download settings directly to the MCA from PC without a drive
- HW interface for PC connection to the drive

VACON® 20 Cold Plate drive parameter copying is done with the handheld keypad.

I/O CONFIGURATION

Terminal		Description	VACON 10	VACON 20	VACON 20 CP
1	+10 V_{ref}	Maximum load 10 mA	●	●	●
2	AI1	0-10V	●	●	0-10V / 0(4)-20mA*
3	GND		●	●	●
4	AI2	0-10V / 0(4)-20mA*	0(4)-20mA	●	●
5	GND		●	●	●
6	24 V_{out}	Max. 50 mA / CP 100 mA	●	●	●
7	GND/DIC*		GND	●	●
8	DI1	0-+30 V R_i = 12 kΩ Cold Plate R_i = 4 kΩ	●	●	●
9	DI2		●	●	●
10	DI3		●	●	●
13	DOC	Digital output common	GND	●	●
14	DI4	0-+30 V R_i = 12 kΩ Cold Plate R_i = 4 kΩ	●	●	●
15	DI5		●	●	●
16	DI6		●	●	●
18	AO	Analogue output	0(4)-20mA	0-10V / 0(4)-20mA*	0-10V
20	DO	Open collector, max. load 48 V/50 mA	●	●	●
22	RO13-CM	Relay output 1	●	●	●
23	RO14-NO		●	●	●
24	RO22-NC	Relay output 2	●	●	●
25	RO21-CM		●	●	●
26	RO24-NO		●	●	●
A	A - RS485	Modbus RTU	●	●	●
B	B - RS485	Modbus RTU	●	●	●
	STO	Inputs S1, G1, S2, G2 Feedback F+/F-			●

* Selectable

MCA ADAPTER

OPTION BOARD MOUNTING KIT

KEYPAD DOOR MOUNTING KIT

IP21/NEMA1 KIT

TECHNICAL DATA

Mains connection	Input voltage U_{in}	110...120 V, -15 %...+10 % 1~ 208...240 V, -15 %...+10 % 1~ 208...240 V, -15 %...+10 % 3~ 380...480 V, -15 %...+10 % 3~ 575 V, -15 %...+10 % 3~
	Input frequency	45...66 Hz
	Connection to mains	Once per minute or less (normal case)
Motor connection	Output voltage	0...U_{in} (2 x U_{in} with 115 V drives)
	Output current	Continuous rated current I_N at rated ambient temperature overload 1.5 x I_N max. 1 min/10 min
	Starting current / Torque	Current 2 x I_N for 2 secs in every 20 sec period Torque depends on motor
	Output frequency	0...320 Hz
	Frequency resolution	0.01 Hz
Control characteristics	Control method	Frequency Control U/f. Open loop sensorless vector control
	Switching frequency	1.5...16 kHz; Factory default 4 kHz, (575 V model de- fault 2 kHz) Cold Plate models 6 kHz
	Braking torque	100 % x T_N with brake chopper in 3-phase version sizes MS2-3, MI2-5 30 % x T_N with DC-braking. Dynamic flux braking available in all types
Ambient conditions	Ambient operating temperature	–10°C (no frost)...+50°C: rated loadability I_N (1L-0009-2, 3L-0007-2, 3L-0011-2 and with options ENC-IP21-MIx and ENC-IN01-MIx ambient max +40°C) Cold Plate models -10°C...+70°C
	Storage temperature	–40°C...+70°C
	Altitude	100 % load capacity (no derating) up to 1000 m 1 % derating for each 100 m above 1000 m; max. 2000 m Cold Plate max 3000 m
	Enclosure class	MI1-3:IP20, MI4-5:IP21, Cold Plate:IP00
EMC	Immunity	Complies with EN61800-3 (2004)
	Emissions	208-240 V: EMC level C2: with an internal +EMC2 option 380-480 V: EMC level C2: with an internal +EMC2 option
Approvals	EN61800, C-Tick, Gost R, CB, CE, UL, cUL, IEC (not all versions, see unit nameplate for more detailed approvals)	

Factory installed options code	Description	Suitability		
		VACON 10	VACON 20	VACON 20 CP
+EMC2	C2-Level EMC filter (includes +QPES)	●	●	●
+QPES	Cable shield grounding kit	●	●	
+QFLG	Flange mounting kit for MI4 and MI5		●	
+DBIR	Integrated cold plate brake resistor			●

OPTIONS BOARDS

VACON® 20 and VACON® 20 CP products support a wide range of option boards including Profibus DP, DeviceNet, CANOpen, as well as a wide range of I/O extension boards. Contact your Vacon partner for more information.

Separately delivered options code	Description	Suitability		
		VACON 10	VACON 20	VACON 20 CP
ENC-SLOT-MC03-13	Option board mounting kit VACON 20 MI1-MI3			
ENC-SLOT-MC03-45	Option board mounting kit VACON 20 MI4-MI5			
ENC-IP21-MIx	IP21 cover MI1-MI3. x=1,2,3			
ENC-IN01-MIx	Nema 1 Kit MI1-MI5. x=1,2,3,4,5			
VACON-ADP-MCAA	MCA RS-422 adapter w/ parameter copy			
VACON-ADP-MCAA-KIT	Complete MCA + USB cable kit			
CAB-USB/RS-485	USB cable only			
VACON-ADP-PASSIVE	Passive RS-422 adapter			
VACON-PAN-HMDR-MC03	Complete keypad door mounting kit (3.0 m cable)			
VACON-PAN-HMTX-MC06	Magnetic/Handheld keypad (1.0m cable)			

*Requires VACON-ADP-PASSIVE

TYPE CODE KEY

VACON 0020 - 3L - 0009 - 4 - CP + OPTION CODES

Product	Input phase	Curent rating	Voltage rating	Version	+ Options

VACON® 100 HVAC
FOR INDOOR CLIMATE CONTROL

IT'S EFFICIENCY THAT COUNTS

VACON® 100 HVAC is designed to meet and exceed even the stringent requirements of the building automation industry. Easy installation, efficient and trouble-free operation, and fast return on investment are guaranteed.

No HVAC task is too complex for VACON 100 HVAC. Installing and commissioning the VACON 100 HVAC can be done by just about anyone. VACON 100 HVAC is available in the power range of 0.55 to 160 kW (0.75 to 200 HP), and supply voltages of 230 to 480 V.

EFFICIENT INVESTMENT

With VACON® 100 HVAC, a short payback time is guaranteed as continuous energy savings are achieved throughout the product's lifetime. Further, a standard delivery of VACON 100 HVAC includes all the necessary hardware, I/O and communication features, usually with no need to buy any additional options. VACON 100 HVAC complies with all the relevant approvals and standards, including those for EMC and safety.

EASY INSTALLATION

VACON 100 HVAC , with its smallest IP54/UL Type 12 footprint and built-in accessories, makes installation extremely easy and fast. The high-resolution graphical keypad with intuitive wizards and online help add to the user-friendliness during installation and operation. Installation is space saving and easy as VACON 100 HVAC IP54/UL Type 12 units can be mounted side by side.

SMOOTH OPERATION

Interference-free operation is ensured with built-in RFI filters and harmonics filters. VACON 100 HVAC operates silently in a building area with the use of high switching frequency and the optimum use of a cooling fan. With the help of a real-time clock and calendar-based functions, the HVAC process can be optimized to achieve considerable energy savings.

LONG LIFETIME

All the components of VACON 100 HVAC have a typical lifetime of 10 years or more, and they are environmentally friendly for easy recycling. There is no need to change any parts during periodic maintenance. Should you require help with your drive, Vacon guarantees that support and service are always available, both locally and globally.

FEATURES AND BENEFITS

BUILT IN

VACON® 100 HVAC is ready to communicate with an external controller via Ethernet and RS 485 protocols used in HVAC. BACnet IP and Modbus TCP via Ethernet and Modbus RTU, Metasys N2 and BACnet MSTP via RS485 are available as standard. **Saves on investment costs. Simple to order.**

VACON 100 HVAC has integrated harmonics filters in the DC link. Complies with the harmonics standard IEC 61000-3-12. **Saves on costs. No need for additional harmonics filter.**

All circuit boards are varnished. **High immunity against demanding environments.**

The IP21/UL Type 1 and IP54/UL Type 12 units have the same footprint, and the IP54/UL Type12 units can be mounted side by side. **Easy integration of IP21/UL Type 1 units to enclosures, smallest IP54/UL Type 12 saves space and investment costs.**

Thanks to the flange mounting option, VACON 100 HVAC can be mounted in the plenum, which allows easy integration with other HVAC equipment. **Saves on investment costs. Easy integration.**

INTEGRATED DRIVE SUPPLY SWITCH

Using the integrated drive supply switch option, the drive's main supply can be disconnected and locked during maintenance work. This option is UL , CE and CUL certified. **Saves on investment costs and space. Provides safety during maintenance.**

DEDICATED TO HVAC

2 x PID controller for accurate HVAC process control **Reduces the need for an external controller. Improves the performance of the HVAC system. Reduces investment costs as one PID controller is available for external use.**

Fire mode is enabled in case of a fire hazard in a building. VACON 100 HVAC overrides faults and continues to operate in spite of harsh conditions. **Safety in case of fire hazard, smooth evacuation in case of fire.**

The motor switch ride-through feature ensures tripless operation when the motor is disconnected and reconnected to the drive while running. **Fast and tripless maintenance of the motor or HVAC equipment.**

Using the multipump feature, a single VACON 100 HVAC drive can control the HVAC process with 4 pumps. **Reduces investment costs. Increases the lifetime of pumps.**

EASY TO USE KEYPAD

9 values can be monitored at the same time on a single page with the graphical keypad. **Monitors process and drive at the same time. Easy to use.**

Help in plain text is provided for parameters, faults and alarms. **Saves time during installation and maintenance. Often no need for manuals.**

Start-up wizard and mini-wizard guide the user with simple question and answer sessions through the installation of the drive and commissioning of advanced features such as PID and multipump. **Saves time, no need for special skills. Easy to use.**

SAVE ENERGY

All VACON® 100 HVAC drives have an efficiency level of more than 97,5%. **Energy saving.**

The use of a cooling fan in the VACON 100 HVAC is optimized and controlled according to the need. The cooling fan is also easy to replace. **Energy saving, longer lifetime and silent operation.**

When the sleep mode is used, the drive automatically stops when there is no demand from the process. It also wakes up on demand. **Energy saving**.

A real-time clock allows the HVAC process to run with 5 calendar-based schedules and 3 timer inputs. **Energy saving.**

SUPPORT FROM SOFTWARE TOOLS

The VACON® Live software tool communicates directly via Ethernet, and helps in installation, commissioning and maintenance. A USB-to-RS422 interface is also available. This software is free of charge. **Saves on operating and maintenance costs. Easy to configure and use.**

The drive as well as process-related values can be graphically monitored on a real-time axis. Parameters can be edited, saved for backup, and compared with defaults or a back-up file. **Easy commissioning and maintenance.**

A service info file can be sent quickly to maintenance staff or a service provider. It contains back-up of all parameters, faults and alarms, including a history buffer, as well as drive hardware and software details. **Reduces downtime. Saves on operating and maintenance costs.**

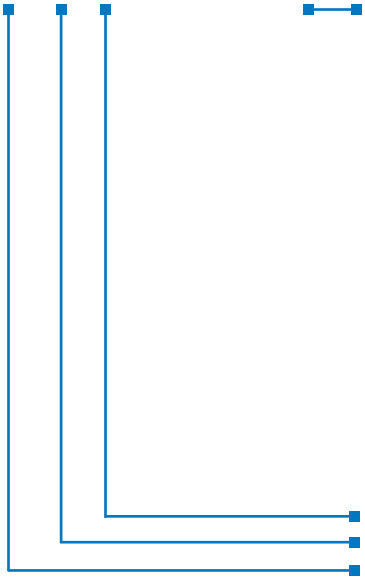
RATINGS AND DIMENSIONS

AC drive type	Loadability		Max Current I_s (2 sec)	Motor shaft power		Frame size	Dimensions WxHxD (mm) WxHxD (inch)	Weight (kg) (lbs)
	Cont. current I_L (A)	10% overload current [A]		10% overload 40°C [kW]	10% overload 104°F [HP]			
Mains voltage 208—240 v, 50/60 hz, 3~								
VACON 0100-3L-0003-2-HVAC	3.7	4.1	5.2	0.55	0.75	MR4	128x328x190 5x12.9x7.5	6.0 13.0
VACON 0100-3L-0004-2-HVAC	4.8	5.3	7.4	0.75	1.0			
VACON 0100-3L-0007-2-HVAC	6.6	7.3	9.6	1.1	1.5			
VACON 0100-3L-0008-2-HVAC	8.0	8.8	13.2	1.5	2.0			
VACON 0100-3L-0011-2-HVAC	11.0	12.1	16.0	2.2	3.0			
VACON 0100-3L-0012-2-HVAC	12.5	13.8	19.2	3.0	4.0			
VACON 0100-3L-0018-2-HVAC	18.0	19.8	25.0	4.0	5.0	MR5	144x419x214 5.7x16.5x8.4	10.0 22.0
VACON 0100-3L-0024-2-HVAC	24.0	26.4	36.0	5.5	7.5			
VACON 0100-3L-0031-2-HVAC	31.0	34.1	46.0	7.5	10.0			
VACON 0100-3L-0048-2-HVAC	48.0	52.8	62.0	11.0	15.0	MR6	195x557x229 7.7x21.9x9	20.0 44.0
VACON 0100-3L-0062-2-HVAC	62.0	68.2	96.0	15.0	20.0			
VACON 0100-3L-0075-2-HVAC	75.0	82.5	124.0	18.5	25.0	MR7	237x660x259 9.3x26x10.2	37.5 83.0
VACON 0100-3L-0088-2-HVAC	88.0	96.8	150.0	22.0	30.0			
VACON 0100-3L-0105-2-HVAC	105.0	115.5	176.0	30.0	40.0			
VACON 0100-3L-0140-2-HVAC	140.0	154.0	210.0	37.0	50.0	MR8	290x966x343 11.4x38x13.5	66.0 145.5
VACON 0100-3L-0170-2-HVAC	170.0	187.0	280.0	45.0	60.0			
VACON 0100-3L-0205-2-HVAC	205.0	225.5	340.0	55.0	75.0			
VACON 0100-3L-0261-2-HVAC	261.0	287.1	410.0	75.0	100.0	MR9	480x1150x365 18.9x45.3x14.4	108.0 238.0
VACON 0100-3L-0310-2-HVAC	310.0	341.0	502.0	90.0	125.0			
VACON 0100-3L-0140-2-HVAC +IP00	140.0	154.0	210.0	37.0	50.0	MR8*	290x794x343 11.4x31.3x13.5	62.0 136.7
VACON 0100-3L-0170-2-HVAC +IP00	170.0	187.0	280.0	45.0	60.0			
VACON 0100-3L-0205-2-HVAC +IP00	205.0	225.5	340.0	55.0	75.0			
VACON 0100-3L-0261-2-HVAC +IP00	261.0	287.1	410.0	75.0	100.0	MR9*	480x970x365 18.9x38.2x14.4	97.0 213.8
VACON 0100-3L-0310-2-HVAC +IP00	310.0	341.0	502.0	90.0	125.0			
Mains voltage 380—480V, 50/60 hz, 3~								
VACON 0100-3L-0003-4-HVAC	3.4	3.7	5.2	1.1	1.5	MR4	128x328x190 5x12.9x7.5	6.0 13.0
VACON 0100-3L-0004-4-HVAC	4.8	5.3	6.8	1.5	2.0			
VACON 0100-3L-0005-4-HVAC	5.6	6.2	8.6	2.2	3.0			
VACON 0100-3L-0008-4-HVAC	8.0	8.8	11.2	3.0	4.0			
VACON 0100-3L-0009-4-HVAC	9.6	10.6	16.0	4.0	5.0			
VACON 0100-3L-0012-4-HVAC	12.0	13.2	19.2	5.5	7.5			
VACON 0100-3L-0016-4-HVAC	16.0	17.6	24.0	7.5	10.0	MR5	144x419x214 5.7x16.5x8.4	10.0 22.0
VACON 0100-3L-0023-4-HVAC	23.0	25.3	32.0	11.0	15.0			
VACON 0100-3L-0031-4-HVAC	31.0	34.1	46.0	15.0	20.0			
VACON 0100-3L-0038-4-HVAC	38.0	41.8	62.0	18.5	25.0	MR6	195x557x229 7.7x21.9x9	20.0 44.0
VACON 0100-3L-0046-4-HVAC	46.0	50.6	76.0	22.0	30.0			
VACON 0100-3L-0061-4-HVAC	61.0	67.1	92.0	30.0	40.0			
VACON 0100-3L-0072-4-HVAC	72.0	79.2	122.0	37.0	50.0	MR7	237x660x259 9.3x26x10.2	37.5 83.0
VACON 0100-3L-0087-4-HVAC	87.0	95.7	144.0	45.0	60.0			
VACON 0100-3L-0105-4-HVAC	105.0	115.5	174.0	55.0	75.0			
VACON 0100-3L-0140-4-HVAC	140.0	154.0	210.0	75.0	100.0	MR8	290x966x343 11.4x38x13.5	66.0 145.5
VACON 0100-3L-0170-4-HVAC	170.0	187.0	280.0	90.0	125.0			
VACON 0100-3L-0205-4-HVAC	205.0	225.5	340.0	110.0	150.0			
VACON 0100-3L-0261-4-HVAC	261.0	287.1	410.0	132.0	200.0	MR9	480x1150x365 18.9x45.3x14.4	108.0 238.0
VACON 0100-3L-0310-4-HVAC	310.0	341.0	502.0	160.0	250.0			
VACON 0100-3L-0140-4-HVAC +IP00	140.0	154.0	210.0	75.0	100.0	MR8*	290x794x343 11.4x31.3x13.5	62.0 136.7
VACON 0100-3L-0170-4-HVAC +IP00	170.0	187.0	280.0	90.0	125.0			
VACON 0100-3L-0205-4-HVAC +IP00	205.0	225.5	340.0	110.0	150.0			
VACON 0100-3L-0261-4-HVAC +IP00	261.0	287.1	410.0	132.0	200.0	MR9*	480x970x365 18.9x38.2x14.4	97.0 213.8
VACON 0100-3L-0310-4-HVAC +IP00	310.0	341.0	502.0	160.0	250.0			

*** Frame sizes MR8 and MR9 are available as IP00/UL Open Type for enclosure installation**

TYPE CODE KEY

VACON0100-3L-0061-4-HVAC +OPTION CODES



+SBF2 = 2 x RO + Thermistor (Replaces 3 relay standard board)
+IP54 = IP54/Type 12
+IP00 = IP00 (MR8 & MR9)
+SRBT = Real-time clock battery
+S_B1 = 6 x DI/DO, (slot D or E)
+S_B2 = 2 x RO + Thermistor, (slot D or E)
+S_B4 = 1 x AI, 2 x AO, (slot D or E)
+S_B5 = 3 x RO, (slot D or E)
+S_B9 = 1 x RO, 5 x DI (42-240 VAC), (slot D or E)
+S_BF = 1 x AO, 1 x DO, 1 x RO, (slot D or E)
+S_BH = 3 x Temperature measurement input
(PT100, PT1000, NI1000, KTY84-130, KTY84-150, KTY84-131)
+S_C4 = LonWorks, (slot D or E)
+QFLG = Flange mounting (MR4-MR7)
+QGLC = Conduit plate with inch holes
+QDSS = Integrated Drive Supply Switch
+EMC4 = Change to EMC-level C4 for IT networks
Language packages:
+FL01 = English, German, Italian, French, Finnish, Swedish
+FL02 = English, German, Finnish, Danish, Swedish, Norwegian
+FL03 = English, Spanish, French, Italian, Dutch, Portuguese
+FL04 = English, German, Czech, Polish, Russian, Slovakian
+FL05 = English, German, Romanian, Turkish
+FL06 = English, Chinese, Russian
Supply voltage: 2 = 208-240 V, 4 = 380-480 V
Drive rating in Ampere: e.g. 0061 = 61 A
Input/Function: 3L = Three-phase input

Standard delivery includes IP21/ Type 1, EMC level C2, graphical display keypad, relay board 1 +SBF1 (3 x RO) and +FL01.

Mains connection	Input voltage Uin	208...240 V; 380...480 V; -10%...+10%
	Input frequency	50...60 Hz, -5%...+10%
	Connection to mains	Once per minute or less
	Starting delay	4 s (MR4 to MR6); 6 s (MR7 to MR9)
Motor connection	Output voltage	0-Uin
	Continuous output current	IL: Ambient temperature up to 40°C (104°F) overload 1.1 x IL (1 min./10 min.)
	Output frequency	0...320 Hz (standard)
	Frequency resolution	0.01 Hz
Control characteristics	Switching frequency	1.5...10 kHz; Automatic switching frequency derating in case of overheating
	Frequency reference Analog input	Resolution 0.01 Hz Resolution 0.1% (10-bit)
	Field weakening point	8...320 Hz
	Acceleration time	0.1...3000 sec
	Deceleration time	0.1...3000 sec
Ambient conditions	Ambient operating temperature	IL : -10°C (-14°F) (no frost)... +50°C (122°F) Above +40°C (104°F) derating 1,5% per degree/°C
	Storage temperature	-40°C (-40°F)...+70°C (158°F)
	Relative humidity	0 to 95% RH, non-condensing, non-corrosive
	Air quality: IEC 60068-2-60 • chemical vapors • mechanical particles	 EN/IEC 60721-3-3, unit in operation, class 3C3 (IP21/UL Type 1 Models 3C2) IEC 60721-3-3, unit in operation, class 3S2
	Altitude	100% load capacity (no derating) up to 1.000 m (3280 ft) 1% derating for each 100 m (328 ft) above 1.000 m (3280 ft) Max. altitudes: 4000 m (13123 ft) (TN and IT systems) 240V relay voltage up to 3000m (9842 ft) from 3000 m ...4000m (9842 ft ... 13123 ft) 120V relay voltage can be used.
	Vibration	IEC 61800-5-1 IEC 60068-2-6
	Shock	IEC 61800-5-1 IEC 60068-2-27
	Enclosure class	IP21/Type 1 standard in entire range IP54/Type 12 option
EMC (at default settings)	Immunity	Fulfils IEC 61800-3, first and second environment
	Emissions	EN/IEC 61800-3, Category C2 VACON 100 HVAC will be delivered with class C2 EMC filtering, if not otherwise specified. VACON 100 HVAC can be modified for IT networks
Emissions	Average sound pressure level in dB(A) (1 m from the drive)	MR4: 45...56, MR5: 57...65, MR6: 63...72, MR7: 43...73, MR8: 58...73, MR9: 54...75 Sound pressure depends on the cooling fans speed which is controlled in accordance with the drive temperature.
Safety and Approvals		EN 61800-5-1, EN 61800-3, EN 61000-3-12, UL 508 C, CE, UL, cUL, GOST-R; (see unit nameplate for more detailed approvals)

Basic I/O board

Terminal		Signal
1	+10 V_{ref}	Reference output
2	AI1+	Analog input, voltage or current
3	AI1-	Analog input common (current)
4	AI2+	Analog input, voltage or current
5	AI2-	Analog input common (current)
6	24 V_{out}	24 V aux. voltage
7	GND	I/O ground
8	DI1	Digital input 1
9	DI2	Digital input 2
10	DI3	Digital input 3
11	CM	Common A for DI1-DI6
12	24 V_{out}	24 V aux. voltage
13	GND	I/O ground
14	DI4	Digital input 4
15	DI5	Digital input 5
16	DI6	Digital input 6
17	CM	Common A for DI1-DI6
18	AO1+	Analog signal (+output)
19	AO-/GND	Analog output common
30	+24 V_{in}	24 V auxiliary input voltage
A	RS485	Differential receiver/transmitter
B	RS485	Differential receiver/transmitter

Standard relay board

Terminal		
21	RO1/1 NC	Relay output 1
22	RO1/2 CM	
23	RO1/3 NO	
24	RO2/1 NC	Relay output 2
25	RO2/2 CM	
26	RO2/3 NO	
32	RO3/1 CM	Relay output 3
33	RO3/2 NO	

Optional relay board (+SBF2)

Terminal		
21	RO1/1 NC	Relay output 1
22	RO1/2 CM	
23	RO1/3 NO	
24	RO2/1 NC	Relay output 2
25	RO2/2 CM	
26	RO2/3 NO	
28	TI1+	Thermistor input
29	TI1-	

Option boards (all boards are varnished)

OPT-F1-V	3 x Relay output
OPT-F2-V	2 x Relay output + Thermistor
OPT-B1-V	6 x DI/DO, each I/O can be individually programmable as input or output
OPT-B2-V	2 x Relay output + Thermistor
OPT-B4-V	1 x AI, 2 x AO (isolated)
OPT-B5-V	3 x Relay output
OPT-B9-V	1 x RO, 5 x DI (42-240 VAC)
OPT-BH	3 x Temperature (PT100, PT1000, NI1000, KTY84)
OPT-C4-V	LonWorks
OPT-BF-V	1 x AO, 1 x DO, 1 x RO

Standard relay board (3 x RO) can be replaced by SBF2 (2 x RO + Thermistor).

VACON® 100 FLOW
INTELLIGENT PROCESS CONTROL

TAKING CARE OF THE ESSENTIALS

The Water & Wastewater and Building Automation industries are two key ingredients in our everyday lives and yet so often go unnoticed. In fact, the only time most people become aware of them is when a problem arises somewhere along the line. VACON® 100 FLOW is designed to ensure pump and fan solutions control air- and waterflow quietly, efficiently and without interruptions.

EXPERTISE IN THE FIELD

VACON 100 FLOW builds on a long and illustrious track record in the industry. Vacon has produced a number of significant innovations ever since the company's founding in 1993. In 1995 we introduced a Multipump application. VACON 100 FLOW further develops Multimaster technology, first introduced in 2002, to provide functionalities that significantly extend flow systems' lifecycle and reduce operational costs. Compared to conventional control schemes, VACON® AC Drives are typically able to reduce energy costs by as much as 30% in pump and fan applications, usually offering a return on investment of less than a year.

GOING WITH THE FLOW

Pumps and fans control the flow of water and air through the pipes, vents and waterways that are often out of sight, and yet remain central to our lives. Like in so many industrial processes, AC drives optimize these systems and make sure that processes use as little energy as possible. Pumping process water, cooling water and other fluids usually requires that pressure remains constant despite varying demand. VACON 100 FLOW comes equipped with a number of innovative functions that ensure you achieve this.

24/7 SERVICE AND SUPPORT

When it comes to flow control processes, it's critical for systems to run smoothly at all times. Since Vacon is the world's leading company that's whole focus is on AC drive solutions, it's only right that our aftermarket product care is second to none. We offer services that ensure products remain effective for as long as possible, so that repairs and downtime are kept to the bare minimum.

INTELLIGENT PUMP & FAN CONTROL

VACON® 100 FLOW is an AC drive dedicated to improving flow control in Water & Wastewater and Building Automation applications. It combines the core functionality of VACON® 100 with dedicated functions that are specifically designed with flow control application processes in mind. VACON 100 FLOW is available in a number of frame sizes with either IP21/UL Type 1 or IP54/UL Type 12 approved enclosures. It has a power range of 0.55 kW/0.75 HP to 160 kW/250 HP and a voltage range of 230 V to 500 V.

DEDICATED FUNCTIONALITY

VACON 100 FLOW places an emphasis on user-friendliness and functionalities created for use in pump & fan applications. We have used our extensive experience in the field to handpick all the features that are best suited to application requirements and putting them in one dedicated product. For instance, standard PID control eliminates the need for an external controller by using a sensor to control pump speed. This is useful when reacting to fluctuations in demand.

APPLICATION MENUS FOR WATER AND HVAC

StartUp Wizard and the Quick Setup menu make it easy for users to select the relevant parameters and monitoring values. Unique application menus guide the user through a quick and easy installation and commissioning, with all the relevant parameters presented to them without the need to navigate a long list. StartUp Wizard and the Quick Setup menu can be activated either through the detachable keypad or by using VACON® Live, Vacon's online PC programming tool for AC drives.

CONNECT TO YOUR CONTROL SYSTEM

All VACON 100 series AC drives are equipped with built-in Ethernet. This feature means that no additional options or gateways are needed to communicate with process automation. It also provides access for commissioning and maintenance through VACON Live and makes local or remote monitoring possible.

BUILT TO LAST WITHOUT INTERRUPTION

Unplanned downtime is a problem for all applications, not least pump and fan systems, which is why it is important that components have as long a lifecycle as possible. VACON 100 FLOW uses electrolytic-free DC link technology which guarantees users the longest possible lifecycle and availability. By avoiding the need to replace electrolytic capacitors — that often wear out over time — interruptions and costs are kept to a minimum.

EASY TO OPERATE

USER-FRIENDLY KEYPAD

Vacon has ensured that the user interface is simple and intuitive to use. You will enjoy the keypad's well-structured menu system which enables fast commissioning and trouble-free operation.

- Graphical and text keypad with multiple language support
- 9 signals can be monitored at the same time on a single multimonitor page is configurable to either 4, 6 or 9 signals
- 3 color LED status indicator on the control unit:
  = ready; = run;
  = alarm; = fault
- Trend display for two signals at the same time

QUICK SET UP

Easy commissioning tools ensure a hassle-free set up whatever the application. Easy diagnostic with help in plain text is provided for each parameter, signal and fault.

StartUp Wizard — for fast setup of the drive
Fire Mode Wizard — for easy commissioning of Fire Mode function
Application selections — for easy commissioning of HVAC, PID, Multipump single drive and Multipump Multidrive applications

VACON 100® FLOW also features a real-time clock that supports calendar-based functions.

EASY INSTALLATION

- Both IP21/UL Type 1 and IP54/UL Type 12 units have the same footprint. Compact IP54/UL Type 12 units can be installed side-by-side to save a space.
- Frame sizes MR8 and MR9 are also available as IP00/UL Open Type for enclosure installation
- Flange mounting option for throughhole mounting, reducing heat loss and enclosure size
- Integrated lead-in grommets and 360 degree grounding ensure IP54/UL Type 12 and EMC compliance and lead to further cost savings.

DRIVE CUSTOMIZER

- Built-in functionality enables the drive to adapt to functions requiring I/O and control logic
- Wide array of logical and numerical functions which ensure specific user requirements are met
- No need for special tools or training
- Fully graphically configurable using VACON® Live

EASY TO INTEGRATE

FIELDBUS OPTIONS

- Easy integration with plant automation system using built-in Modbus RTU (RS485) or Modbus TCP (Ethernet)
- Integration over Profinet IO or Ethernet IP systems through software options
- Click-in fieldbus options facilitate integration to traditional systems using Profibus DP, DeviceNet, CANopen & LonWorks
  - Ensures increased control and monitoring with reduced cabling

Modbus TCP, Ethernet IP, Profinet IO, Modbus RTU, Profibus DP, DeviceNet, LonWorks, CANOpen, BACnet MSTP, BACnet IP, Metasys N2 available.

BUILT-IN ETHERNET

- No additional options or gateways needed
- Access provided for commissioning and maintenance through VACON® Live
- Local or remote monitoring possible

SAFE TORQUE OFF, ATEX THERMISTOR INPUT

- STO prevents drive from generating torque on the motor shaft or unintentionally starting
- Eliminates separate components and the need to wire and service them
- Certified and compliant with European ATEX directive, 94/9/EC for temperature supervision of motors that are placed in potentially hazardous areas
- Available with option board

VACON® SAVE

VACON Save is a savings calculator for pump, fan and compressor applications which can be used to estimate cost and energy savings. It's a great tool for customers who are looking to work out the best and most economical pump and fan solution. Downloadable from www.vacon.com

MULTIPUMP CONTROL SOLUTIONS

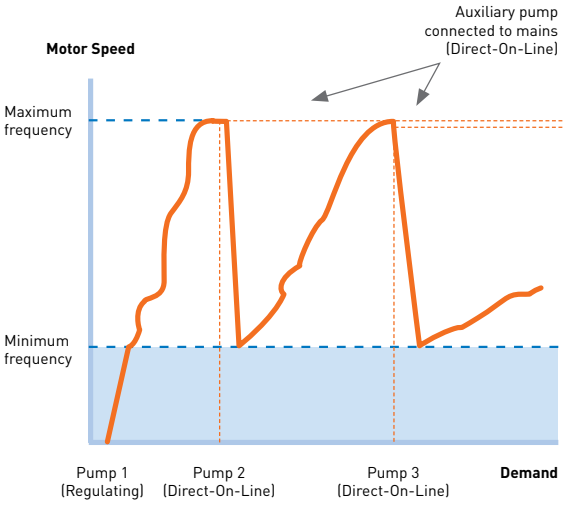
Vacon has long provided pump and fan solutions which ensure that users get the best functionality and cost-efficiency out of their process. We are able to offer three Multipump control solutions, each of which offers unsurpassed control of flow and pressure.

Demand for water or ventilation fluctuates throughout the course of a day. For instance, demand for running water in a major city usually peaks in the morning, as a great number of inhabitants are in the shower preparing for the working day. Conversely, in the middle of the night next to no water is being used.

By using several pumps as opposed to a single one, higher redundancy and efficiency is achieved since the load is lightened by being spread across several pumps. It also makes for greater redundancy – if one pump fails, the others can take on its load.

SINGLE DRIVE SYSTEM

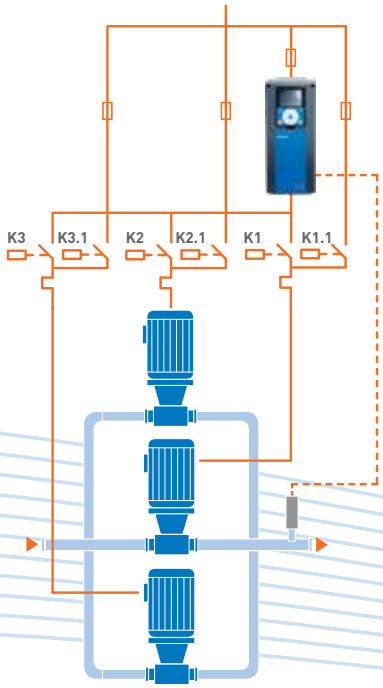
Multipump control is a single-drive solution in which one AC drive controls the leading pump. If the demand exceeds the capabilities of the pump, additional fixed-speed pumps can be connected online directly or with a soft starter. You can choose between fixed setups and solutions in which the leading and auxiliary pumps alternate in roles to equalize wear and tear.



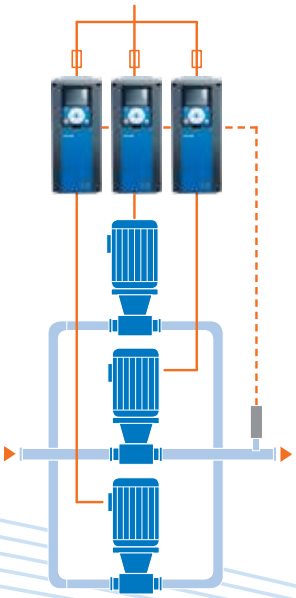
Single drive Multipump

SINGLE DRIVE SYSTEM IN BRIEF

- Maximum 8 pumps
- No need for an external controller
- Alternation of all pumps or only auxiliary pumps



Single drive system

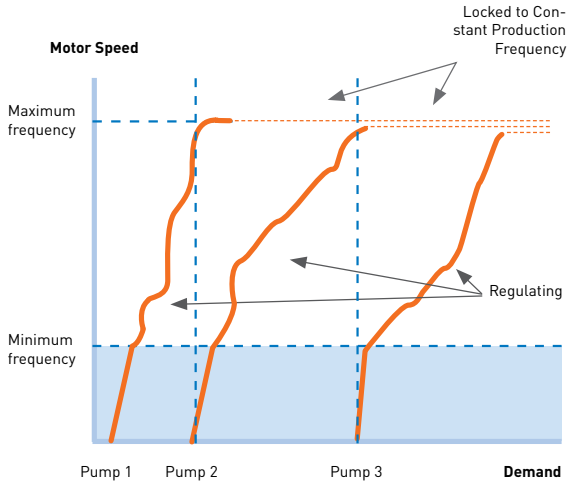


Multi drive system

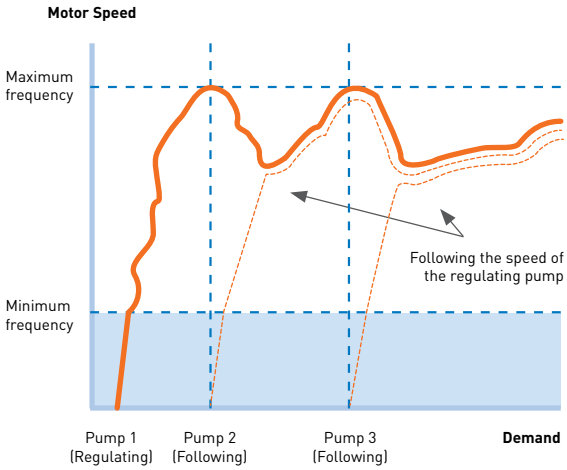
MULTIDRIVE SYSTEMS

In **Multimaster** technology, each pump is controlled by its own AC drive. The integrated RS-485 interface allows the drives to communicate without the need for any external controller. As demand increases, the leading drive increases its speed until the capacity is exceeded, at which point the excess load is transferred to the next drive in the series. This method ensures pumps start and stop smoothly, and reduces the need for additional control wiring, motor protection relay and contactors.

Multifollower mode follows the same principle as Multimaster in that each pump is controlled by its own AC drive. Where this system differs is that, as demand increases and the lead drive's capacity is exceeded, additional drives running in parallel are brought into operation. This ensures that all pumps run at the same operating speed, reducing noise and general stress, thus improving reliability.



Multimaster



Multifollower

MULTIDRIVE SYSTEMS IN BRIEF

- Maximum 8 pumps
- No need for an external controller
- Communication between drives using integrated RS-485

WHAT'S IN IT FOR YOU

MULTIPUMP FEATURES

FUNCTION	DESCRIPTION	BENEFITS
Multipump single drive	Multipump solution with one drive and auxiliary pumps running at fixed speeds	Simplest multipump solution
Multipump Multifollower	Intelligent multipump solution using parallel pumps with comprehensive speed control	Efficient pumping and minimal noise for systems with large flow variations.
Multipump Multimaster	Intelligent speed control of parallel pumps with speed control of all pumps	Efficient pumping in systems with large flow variations
Multipump interlocking of pumps	Able to disconnect pumps from multipump system using a digital signal	Avoid unnecessary downtime during pump system maintenance
Multipump diagnostics	Monitor usage period and number of starts for each pump	Enables preventive maintenance based on pump usage
Anti-blocking system	Ensures inactive pumps are run at regular intervals to avoid deterioration.	High level of redundancy ensures pumps remain in good condition
Multipump overpressure protection	Fast disconnect of pumps during periods of high line pressure	Reduces the risk of overpressure in case of sudden flow reduction
Pump alternation within multipump systems	Alternates multipump control sequence	Usage spread equally across all pumps
Real-time clock based multipump alternation	Alternates pumps at designated times	Spreads load across pumps to reduce wear and tear

PUMPING FEATURES

FUNCTION	DESCRIPTION	BENEFITS
PID controller	Built-in controller that controls drive speed to maintain constant pressure	No need for external controllers
Second PID controller	Built-in controller that can be used to control external equipment	Saves the need of using external controllers
2-Zone PID control	Control of two parallel process values	Better process control when two values are needed simultaneously
Frost protection for pump	Temperature-sensitive sleep mode for pump	Reduces risk of frost-induced damages to pump
Pressure loss compensation	Compensates pressure loss in piping when pressure sensor is close to pump	Stabilizes pressure in systems with long pipes
Start boost	Increased starting torque	Ensures that pump starts reliably
Sleep boosting	Increases system pressure before entering sleep mode	Maximizes pressure buffering time before wakeup e.g. in hydrofor applications
No demand detection	Ensures pump pressure is speed-responsive	Ensures that the pump does not run at unnecessarily high speeds, reducing energy consumption
Soft filling of pipe	Runs the pump at low speed until a pressure increase indicates the pipe is full	Reduces the risk of water hammers in the piping system
Dry pump supervision	Stops pump when there is not enough torque on the motor shaft	Protects the pump from damage from long dry runs
Priming pump	Control of additional priming pump with relay output	Main pump and piping automatically filled with water during startup
Jockey pump	Control of small jockey pump during low flow hours to maintain pressure	Main pump can be disconnected during periods of low demand
Auto-cleaning / anti-ragging	Detects when pump torque is increasing due to blocked pump and runs a user-defined cleaning sequence	Reduces risk of unplanned downtime in wastewater applications

AC drive type	Loadability		Max Current I_s	Motor shaft power		Frame size	Dimensions WxHxD (mm) WxHxD (inch)	Weight (kg) (lbs)
	Cont. current I_L (A)	10% overload current [A]		10% overload 40°C [kW]	10% overload 104°F [HP]			
VACON 0100-3L-0003-2-FLOW VACON 0100-3L-0004-2-FLOW VACON 0100-3L-0007-2-FLOW VACON 0100-3L-0008-2-FLOW VACON 0100-3L-0011-2-FLOW VACON 0100-3L-0012-2-FLOW	3.7 4.8 6.6 8.0 11.0 12.5	4.1 5.3 7.3 8.8 12.1 13.8	5.2 7.4 9.6 13.2 16.0 19.2	0.55 0.75 1.1 1.5 2.2 3.0	0.75 1.0 1.5 2.0 3.0 4.0	MR4	128x328x190 5x12.9x7.5	6.0 13.0
VACON 0100-3L-0018-2-FLOW VACON 0100-3L-0024-2-FLOW VACON 0100-3L-0031-2-FLOW	18.0 24.0 31.0	19.8 26.4 34.1	25.0 36.0 46.0	4.0 5.5 7.5	5.0 7.5 10.0	MR5	144x419x214 5.7x16.5x8.4	10.0 22.0
VACON 0100-3L-0048-2-FLOW VACON 0100-3L-0062-2-FLOW	48.0 62.0	52.8 68.2	62.0 96.0	11.0 15.0	15.0 20.0	MR6	195x557x229 7.7x21.9x9	20.0 44.0
VACON 0100-3L-0075-2-FLOW VACON 0100-3L-0088-2-FLOW VACON 0100-3L-0105-2-FLOW	75.0 88.0 105.0	82.5 96.8 115.5	124.0 150.0 176.0	18.5 22.0 30.0	25.0 30.0 40.0	MR7	237x660x259 9.3x26x10.2	37.5 83.0
VACON 0100-3L-0140-2-FLOW VACON 0100-3L-0170-2-FLOW VACON 0100-3L-0205-2-FLOW	140.0 170.0 205.0	154.0 187.0 225.5	210.0 280.0 340.0	37.0 45.0 55.0	50.0 60.0 75.0	MR8	290x966x343 11.4x38x13.5	66.0 145.5
VACON 0100-3L-0261-2-FLOW VACON 0100-3L-0310-2-FLOW	261.0 310.0	287.1 341.0	410.0 502.0	75.0 90.0	100.0 125.0	MR9	480x1150x365 18.9x45.3x14.4	108.0 238.0
VACON 0100-3L-0140-2-FLOW +IP00 VACON 0100-3L-0170-2-FLOW +IP00 VACON 0100-3L-0205-2-FLOW +IP00	140.0 170.0 205.0	154.0 187.0 225.5	210.0 280.0 340.0	37.0 45.0 55.0	50.0 60.0 75.0	MR8*	290x794x343 11.4x31.3x13.5	62.0 136.7
VACON 0100-3L-0261-2-FLOW +IP00 VACON 0100-3L-0310-2-FLOW +IP00	261.0 310.0	287.1 341.0	410.0 502.0	75.0 90.0	100.0 125.0	MR9*	480x970x365 18.9x38.2x14.4	97.0 213.8

*** Frame sizes MR8 and MR9 are available as IP00/UL Open Type for enclosure installation**

MAINS VOLTAGE 380—500 V. 50/60 HZ. 3~

AC drive type	Loadability		Max Current I_s	Motor shaft power		Frame size	Dimensions WxHxD (mm) WxHxD (inch)	Weight (kg) (lbs)
	Cont. current I_L (A)	10% overload current [A]		10% overload 40°C [kW]	10% over-load 104°F [HP]			
VACON 0100-3L-0003-5-FLOW VACON 0100-3L-0004-5-FLOW VACON 0100-3L-0005-5-FLOW VACON 0100-3L-0008-5-FLOW VACON 0100-3L-0009-5-FLOW VACON 0100-3L-0012-5-FLOW	3.4 4.8 5.6 8.0 9.6 12.0	3.7 5.3 6.2 8.8 10.6 13.2	5.2 6.8 8.6 11.2 16.0 19.2	1.1 1.5 2.2 3.0 4.0 5.5	1.5 2.0 3.0 4.0 5.0 7.5	MR4	128x328x190 5x12.9x7.5	6.0 13.0
VACON 0100-3L-0016-5-FLOW VACON 0100-3L-0023-5-FLOW VACON 0100-3L-0031-5-FLOW	16.0 23.0 31.0	17.6 25.3 34.1	24.0 32.0 46.0	7.5 11.0 15.0	10.0 15.0 20.0	MR5	144x419x214 5.7x16.5x8.4	10.0 22.0
VACON 0100-3L-0038-5-FLOW VACON 0100-3L-0046-5-FLOW VACON 0100-3L-0061-5-FLOW	38.0 46.0 61.0	41.8 50.6 67.1	62.0 76.0 92.0	18.5 22.0 30.0	25.0 30.0 40.0	MR6	195x557x229 7.7x21.9x9	20.0 44.0
VACON 0100-3L-0072-5-FLOW VACON 0100-3L-0087-5-FLOW VACON 0100-3L-0105-5-FLOW	72.0 87.0 105.0	79.2 95.7 115.5	122.0 144.0 174.0	37.0 45.0 55.0	50.0 60.0 75.0	MR7	237x660x259 9.3x26x10.2	37.5 83.0
VACON 0100-3L-0140-5-FLOW VACON 0100-3L-0170-5-FLOW VACON 0100-3L-0205-5-FLOW	140.0 170.0 205.0	154.0 187.0 225.5	210.0 280.0 340.0	75.0 90.0 110.0	100.0 125.0 150.0	MR8	290x966x343 11.4x38x13.5	66.0 145.5
VACON 0100-3L-0261-5-FLOW VACON 0100-3L-0310-5-FLOW	261.0 310.0	287.1 341.0	410.0 502.0	132.0 160.0	200.0 250.0	MR9	480x1150x365 18.9x45.3x14.4	108.0 238.0
VACON 0100-3L-0140-5-FLOW +IP00 VACON 0100-3L-0170-5-FLOW +IP00 VACON 0100-3L-0205-5-FLOW +IP00	140.0 170.0 205.0	154.0 187.0 225.5	210.0 280.0 340.0	75.0 90.0 110.0	100.0 125.0 150.0	MR8*	290x794x343 11.4x31.3x13.5	62.0 136.7
VACON 0100-3L-0261-5-FLOW +IP00 VACON 0100-3L-0310-5-FLOW +IP00	261.0 310.0	287.1 341.0	410.0 502.0	132.0 160.0	200.0 250.0	MR9*	480x970x365 18.9x38.2x14.4	97.0 213.8

*** Frame sizes MR8 and MR9 are available as IP00/UL Open Type for enclosure installation**

TECHNICAL DATA

Mains connection	Input voltage Uin	208...240 V; 380...500 V; -10%...+10%
	Input frequency	47 - 65Hz
	Connection to mains	Once per minute or less
	Starting delay	4 s (MR4 to MR6); 6 s (MR7 to MR9)
Motor connection	Output voltage	0-Uin
	Continuous output current	Il: Ambient temperature up to 40°C (104°F) overload 1.1 x Il (1 min./10 min).
	Output frequency	0...320 Hz (standard)
	Frequency resolution	0.01 Hz
Control characteristics	Switching frequency	1.5...10 kHz; Automatic switching frequency reduction in case of overheating
	Frequency reference	Resolution 0.01 Hz
	Analog input	Resolution 0.1% (10-bit)
	Field weakening point	8...320 Hz
	Acceleration time	0.1...3000 sec
	Deceleration time	0.1...3000 sec
Ambient conditions	Ambient operating temperature	IL : -10°C (-14°F) (no frost)... +50°C (122°F) Above +40°C (104°F) derating 1,5% per degree/°C
	Storage temperature	-40°C (-40°F)...+70°C (158°F)
	Relative humidity	0 to 95% RH, non-condensing, non-corrosive
	Air quality: • Chemical vapors • Mechanical particles	 EN/IEC 60721-3-3, unit in operation, class 3C3 (IP21/UL Type 1 Models 3C2) EN/IEC 60721-3-3, unit in operation, class 3S2
	Altitude	100% load capacity (no derating) up to 1.000 m (3280 ft) 1% derating for each 100 m (328 ft) above 1.000 m (3280 ft) Max. altitudes: 4000 m (13123 ft) (TN and IT systems) 240V relay voltage up to 3000m (9842 ft) from 3000 m ...4000m (9842 ft ... 13123 ft) 120V relay voltage can be used.
	Vibration	EN/IEC 61800-5-1 EN/IEC 60068-2-6
	Shock	EN/IEC 61800-5-1 EN/IEC 60068-2-27
	Enclosure class	IP21/UL Type 1 standard in entire range IP54/UL Type 12 option IP00/UL Open Type option for frames MR8, MR9
EMC (at default settings)	Immunity	Fulfils EN/IEC 61800-3, first and second environment
	Emissions	EN/IEC 61800-3, Category C2 Vacon 100 will be delivered with class C2 EMC filtering, if not otherwise specified. Vacon 100 can be modified for IT networks
Emissions	Average sound pressure level in dB(A) (1 m from the drive)	MR4: 45...56 MR5: 57...65 MR6: 63...72 MR7: 43...73 MR8: 58...73 MR9: 54...75 Sound pressure depends on the cooling fans speed which is controlled in accordance with the drive temperature.
Safety and Approvals		EN/IEC 61800-5-1, EN/IEC 61800-3, EN/IEC 61000-3-12, UL 508 C, CE, UL, cUL, GOST-R, C-Tick; (see unit nameplate for more detailed approvals)
Functional safety *	STO ATEX Thermistor input	EN/IEC 61800-5-2 Safe Torque Off (STO) SIL3, EN ISO 13849-1 PL"e" Category 3, EN 62061: SILCL3, IEC 61508: SIL3. 94/9/EC, CE 0537 Ex 11 (2) GD

*** Optional**

TYPE CODE KEY

VACON 0100 - 3L - 0009 - 5 - FLOW + OPTION CODES

Product	Input phase	Current rating	Voltage rating	+ Options

Basic I/O board					
Terminal		**Signal**	**Terminal**		**Signal**
1	+10 V_{ref}	Reference output	**12**	24 V_{out}	24 V aux. voltage
2	AI1+	Analog input, voltage or current	**13**	GND	I/O ground
3	AI1-	Analog input common (current)	**14**	DI4	Digital input 4
4	AI2+	Analog input, voltage or current	**15**	DI5	Digital input 5
5	AI2-	Analog input common (current)	**16**	DI6	Digital input 6
6	24 V_{out}	24 V aux. voltage	**17**	CM	Common A for DI1-DI6
7	GND	I/O ground	**18**	AO1+	Analog signal (+output)
8	DI1	Digital input 1	**19**	AO-/GND	Analog output common
9	DI2	Digital input 2	**30**	+24 V_{in}	24 V auxiliary input voltage
10	DI3	Digital input 3	**A**	RS485	Differential receiver/transmitter
11	CM	Common A for DI1-DI6	**B**	RS485	Differential receiver/transmitter

Standard relay board			Optional relay board *		
Terminal		**+SBF3**	**Terminal**		**+SBF4**
21	RO1/1 NC	Relay output 1	**21**	RO1/1 NC	Relay output 1
22	RO1/2 CM		**22**	RO1/2 CM	
23	RO1/3 NO		**23**	RO1/3 NO	
24	RO2/1 NC	Relay output 2	**24**	RO2/1 NC	Relay output 2
25	RO2/2 CM		**25**	RO2/2 CM	
26	RO2/3 NO		**26**	RO2/3 NO	
32	RO3/1 CM	Relay output 3	**28**	TI1+	Thermistor input
33	RO3/2 NO		**29**	TI1-	

*** Standard relay board SBF3 (3XRO) can be replaced by SBF4 (2 x RO + Thermistor)**

Ethernet Terminal	
Terminal	**Signal**
RJ45	Ethernet 10/100 Mbit/s

Factory options	Description
+SBF4	2 x Ro + Thermistor (Replaces 3 relay standard board)
+IP54	IP54 / UL Type 12
+IP00	IP00 / UL Upen Type (for MR8 and MR9)
+SRBT	Real-time clock battery
ENC-QFLG-MR	Flange mounting kit for MR4-7
+HMTX	Text keypad
+HMPA	Panel adapter
+S_B1	6 x DI/DO option board
+S_B2	2 x RO + Thermistor option board
+S_B4	1 x AI, 2 x AO option board
+S_B5	3 x RO option board
+S_B9	1 x RO, 5 x DI (42-240 VAC) option board
+S_BF	1 x AO, 1 x DO, 1 x RO option board
+S_BH	Temperature measurement option board (PT100, PT1000, NI1000, KTY84-130, KTY84-150, KTY84-131)
+S_E3	Profibus DPV1 option board
+S_E5	Profibus DPV1 (D9) option board
+S_E6	CANopen option board
+S_E7	DeviceNET option board
+S_BJ	Safe Torque Off/ATEX option board
+FBIE	Ethernet IP and Profinet IO (software option onboard)
+QFLG	Flange mounting (MR4-MR7, for MR8 and MR9 with IP00)
+QGLC	Conduit plate with inch holes
+EMC4	Change to EMC-level c4 for IT networks
Language packages	
+FL01	English, German, Italian, French, Finnish, Swedish
+FL02	English, German, Finnish, Danish, Swedish, Norwegian
+FL03	English, Spanish, French, Italian, Dutch, Portuguese
+FL04	English, German, Czech, Polish, Russian, Slovakian
+FL05	English, German, Estonian, Hungarian, Romanian, Turkish

VACON® 100
SIMPLY SUPERIOR

IT'S REALLY THAT EASY

Imagine the energy savings if all motors were controlled by AC drives. Industry automation continues to increase and so much energy is lost through traditional constant speed and mechanical control mechanisms at present. This is why energy saving programs and policy interventions are a global priority. Our new VACON® 100 AC drives make these savings easy. They are simple to use and optimize across multiple applications and are wise investment.

ONE DRIVE, EXTENSIVE APPLICATIONS

With VACON 100, we have raised the bar on the design and functionality of standard drives. VACON 100 AC drives can be easily optimized to suit various process control applications across a wide spectrum of industries. Just choose your application, and quantify the potential savings. We've made sure that you can optimize your drive your way with a wide range of fieldbus options and features for motor and process control.

SAVE AND SAVE SOME MORE

Adding AC drives to your power installation makes good business sense. Companies and utilities are faced with a growing list of concerns including customer demands for improved efficiency, escalating energy prices, environmental care, increased competition and quality standards. In order to meet these demands, and still cut production costs, major users in industry increasingly see energy reduction as a key to improving profitability and competitiveness.

In addition to providing direct energy savings, AC drives can also be used to upgrade existing production machinery and increase both capacity and quality by ensuring better control of the entire installation. In other words, it doesn't take long for your investment in variable speed drives to pay for itself.

KEY APPROVALS

- CE,UL, cUL, C-Tick
- RoHS & WEEE
- Gost-R
- EMC & Harmonics

100 REASONS TO CHOOSE VACON® 100

VACON 100 AC drives provide the lowest overall cost of ownership across the widest range of applications.

DRIVING YOUR BUSINESS

PARTNERSHIP MATTERS

Selecting the right AC drive is also about choosing a supplier with the right attitude towards partnership. When you succeed, we succeed. Partnering with Vacon, you can be sure that all efforts aim to the best end result – be it product related, solutions related, or logistics and service-related. You'll notice that we are driven by our passion to develop, manufacture and sell simply the best AC drives on the planet.

VACON AT YOUR SERVICE

Vacon drives are sold in over 100 countries, with production and R&D in 3 continents, sales offices in 27 countries and service centers in nearly 90 locations worldwide.

We provide services to help you meet your business targets. Our global service solutions are available 24/7 throughout the product lifecycle with the intent to minimize the total cost of ownership and environmental load.

IN HARMONY WITH THE ENVIRONMENT

While saving energy with VACON 100, you naturally contribute to reduced emissions and pollution. Our new VACON 100 portfolio fulfills key international standards and global requirements, including RoHS (lead free), EMC & Harmonics approvals.

We have also carried out a lifecycle analysis of our Vacon 100 to determine its carbon footprint. During the production of one 18.5 kW VACON 100 drive, 255 kg of CO2e (carbon dioxide equivalent) emissions occur. However, when that drive is put to work in a typical fan application (compared to a two speed electric motor), it actually saves 24 500 kg in CO2e emissions over a 10 year period.

EXCEEDING EXPECTATIONS

It may look like a traditional AC drive - but it's not. VACON® 100 is bursting with smart new features. Benefit from functional safety with Safe Torque Off to prevent the motor from generating torque on the motor shaft, Safe Stop 1, and ATEX certified motor over-temperature protection. VACON 100 also has a unique feature with built-in Ethernet to make integration to plant automation easy and efficient via integrated ModBus TCP, Ethernet I/P or Profinet IO.

VACON 100 is ideal for a wide range of constant power/torque applications including pumps, fans, compressors and conveyors. These are applications where energy efficiency and productivity improvements often result in a rapid return on project investments.

In addition to several standard features such as built-in I/Os with 3 option slots, integrated RS485 and Ethernet based fieldbus support, varnished boards and robust motor control features for reliability, the VACON 100 also has dedicated features for each of these key applications. VACON 100 is available in the power range of 0.55 to 90 kW (0.75 - 125 HP) 230 V and 1.1-160 kW (1.5 - 200 HP) 500 V. The wall-mountable drive modules are easy to install and operate, with IP21/UL Type1 provided as standard. Options include IP54/UL Type12 and flange (through hole) mounting. Frame sizes MR8 and MR9 are also available as compact IP00 for easy installation to enclosures.

VACON 100 allows you to do much more than you would expect from a standard drive. At Vacon, we aim to exceed your expectations.

TYPICAL APPLICATIONS

Process industry
- Conveyors
- Pumps & fans
- Chippers, debarking drums, sawmills

Marine
- Cargo pumps, compressors
- Steering gear

Industrial HVAC/ Semiconductor industry
- Compressors
- Pumps & fans

Water
- Distribution
- Desalination
- Treatment
- Pumps, compressors, conveyors

Chemical, Oil & Gas
- Pumps & fans
- Compressors

Mining & Minerals
- Conveyors
- Pumps & fans

Cement auxiliary drives
- Conveyors
- Pumps & fans

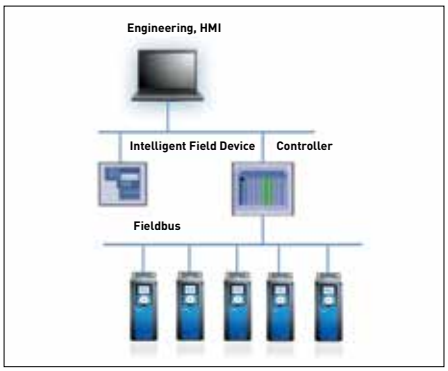
100 REASONS TO CHOOSE VACON® 100

This one-drive-for-all-applications makes VACON 100 your easy, economical solution to improved process control and energy savings.

WHAT'S IN IT FOR YOU

VACON 100	Common features	Benefits
	Compliance with global standards	Global compatibility.
	Built-in Modbus TCP and Modbus RTU Profinet IO or Ethernet/IP as software option	Most of what is needed is in-built. Easy integration with plant automation.
	Safe torque off, Safe Stop and ATEX	Improved safety at work.
	EMC compliance with integrated RFI filter. Integrated DC chokes	No additional accessories required
	Conformal coating Compact IP54/ UL Type 12 with same footprint as IP21/UL Type 1 Flange mounting Side by side mounting for IP54/ UL Type 12	High reliability in difficult environments, easy and cost effective installation.
	Standard I/0 + 3 free slots Fieldbus options, Built in PLC capability	Reduces need for an external controller.
	High efficiency >97% + energy optimisation Energy counter Real time clock with calender based functions Optimized control of cooling fan	Fast investment payback, increase profits. Easy monitoring of energy savings. Reduce noise levels.
	Dedicated features	**Added benefits**
• **Pumps**	2 PID controllers with Sleep Mode Soft Fill , Jockey Pump, Pump Autoclean PM and induction motor support	Demand based optimization of the process for accurate process control and energy saving. Easy selection for any motor. PM motor allows higher power density, less mechanics.
• **Fans**	Flying start, Motor Switch 3 Prohibit Frequency Ranges PM and induction motor support	Save time during process operation and maintenance. Fan lifetime increased due to reduced mechanical stress. Easy selection for any motor. PM motor allows higher power density= energy savings
• **Compressors**	IP21/UL Type 1 and IP54/ UL Type 12 Flange (through hole) mounting IP00 for MR8 and MR9	Suitable for wide installation needs. Easy to integrate into the machine, saving space and cost of integration and cooling.
• **Conveyors**	Load drooping, Identification run without disconnecting the motor from the load, mechanical brake, torque boost	Avoid stress on mechanics. Easy commissioning.

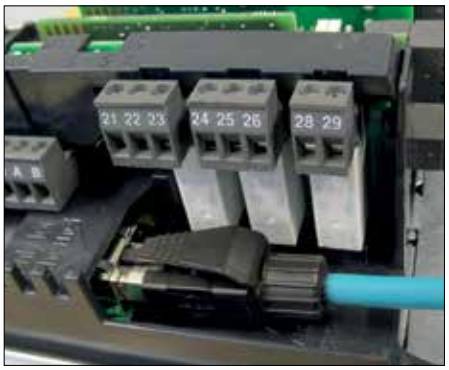
SMART INTEGRATION TO YOUR PLANT AUTOMATION



FIELDBUS OPTIONS

VACON® 100 is easily integrated with your plant's automation system using built-in Modbus RTU (RS485) or Modbus TCP (Ethernet). Integration over Profinet IO or Ethernet IP systems is made possible through software options. Click-in fieldbus options facilitate integration to traditional systems using Profibus DP, DeviceNet, CANOpen & LONWorks. Fieldbus technology ensures increased control and monitoring of the process equipment with reduced cabling.

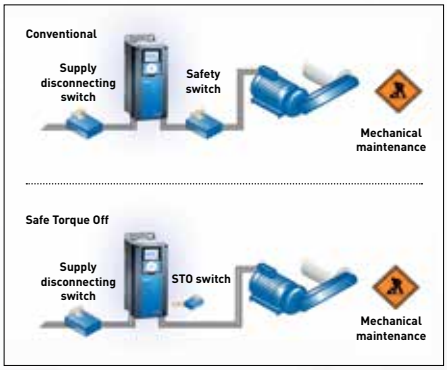
MODBUS TCP, Ethernet IP, Profinet IO
Modbus RTU, Profibus DP, DeviceNet, LONWorks, CANOpen



BUILT-IN ETHERNET

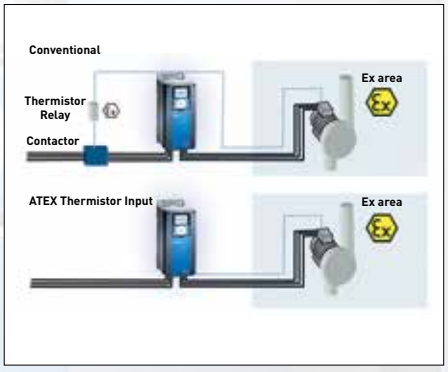
Ethernet based communication is common in all process industries today and VACON 100 is an obvious economical choice. No additional options or gateways are needed for the communication with process automation due to its unique built-in Ethernet. It not only provides access for commissioning and maintenance through VACON® Live but also makes local or remote wireless monitoring possible.

FUNCTIONAL SAFETY



SAFE TORQUE OFF, SAFE STOP 1

Safe Torque Off (STO) prevents the drive from generating torque on the motor shaft and prevents unintentional start-ups. The function also corresponds to an uncontrolled stop in accordance with stop category 0, EN60204-1. Safe Stop 1 (SS1) initiates motor deceleration and initiates the STO function after an application specific time delay. The function also corresponds to a controlled stop in accordance with stop category 1, EN 60204-1.
The advantage of the integrated STO and SS1 safety options compared to standard safety technology using electromechanical switchgear is the elimination of separate components and the effort required to wire and service them, while still maintaining the required level of safety at work.



ATEX CERTIFIED THERMISTOR INPUT

Vacon has developed an ATEX approved thermistor input, as an integrated option. Certified and compliant with the European ATEX directive, 94/9/EC, the integrated thermistor input is specially designed for the temperature supervision of motors that are placed in areas in which potentially explosive gas, vapor, mist or air mixtures are present and areas with combustible dust. Typical industries requiring such supervision include chemical, petrochemical, marine, metal, mechanical, mining, and oil drilling. If over-heating is detected, the drive immediately stops feeding energy to the motor. As no external components are needed, the cabling is kept to a minimum, improving reliability and saving on both space and costs.

USER FRIENDLY KEYPAD

Vacon has ensured that the user interface is simple and intuitive to use. You will enjoy the keypad's well-structured menu system that allows for fast commissioning and trouble-free operation.

- Graphical and text keypad with multiple language support
- 9 signals can be monitored at the same time on a single multimonitor page and is configurable to either 9,6 or 4 signals
- 3 color LED status indication on the control unit: **blinking green** = ready; **green** = run; **red** = fault
- Trend display for two signals at the same time

QUICK SET UP

Easy commissioning tools ensure a hassle-free set up whatever the application. Easy diagnostic with help in plain text is provided for each parameter, signal and fault.

Startup Wizard — for fast setup of basic pump or fan applications
PID Mini-Wizard — for easy commissioning of internal PID Controller
Multi-Pump Wizard — for easy commissioning of Multi-Pump system
Fire Mode Wizard — for easy commissioning of Fire Mode function

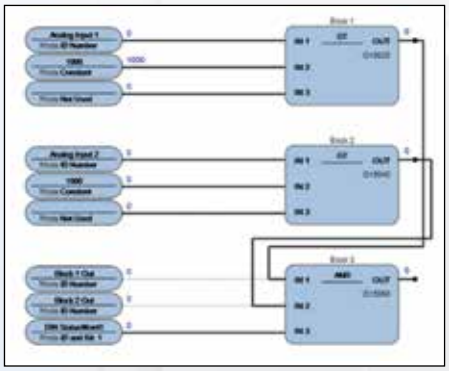
VACON® 100 also features a real time clock with calendar based functions.

EASY INSTALLATION

Both IP21/UL Type 1 and IP54/UL Type 12 units have the same footprint making either an easy choice. Compact IP54/UL Type12 units can be installed side by side and require no additional space between them. Frame size MR8 and MR9 are available as IP00 for enclosure installation. Our flange mounting option makes through-hole mounting in the enclosure possible, with the heat sink remaining outside the enclosure. This significantly reduces heat losses in the enclosure and thus the enclosure size. Likewise, integrated lead-in grommets and 360 degree grounding improve both the IP54/UL Type 12 and EMC respectively, and lead to further cost savings.

DRIVE CUSTOMIZER

VACON 100 comes equipped with a built-in functionality that enables the drive to adapt to almost any function requiring I/O and control logic. The drive customizer function features a wide array of logical and numerical function blocks that can combine and extend standard drive functionalities, ensuring specific user requirements are met. The drive customizer does not require any special tools or training, while a fully graphical configuration can be performed using our own configuration tool, VACON® Live. Configurations can be copied using VACON Live as part of the normal parameter list.



OPTIMIZE YOUR DRIVE YOUR WAY WITH VACON SOFTWARE TOOLS

VACON® PROGRAMMING

Machine builders or OEMs can achieve a high level of machine performance by optimizing the application with our new VACON Programming software tools. These licensed tools feature a built-in PLC functionality based on IEC61131-3. You can simply program and secure your own control logic into the drive and use its intelligence and IO resources for performing other machine related tasks.

COMMISSIONING MADE EASY WITH VACON® LIVE

VACON Live is a PC tool which communicates directly with the VACON 100 drive via Ethernet or through a USB-to-RS485 interface. This makes for particularly easy installation, commissioning and maintenance.

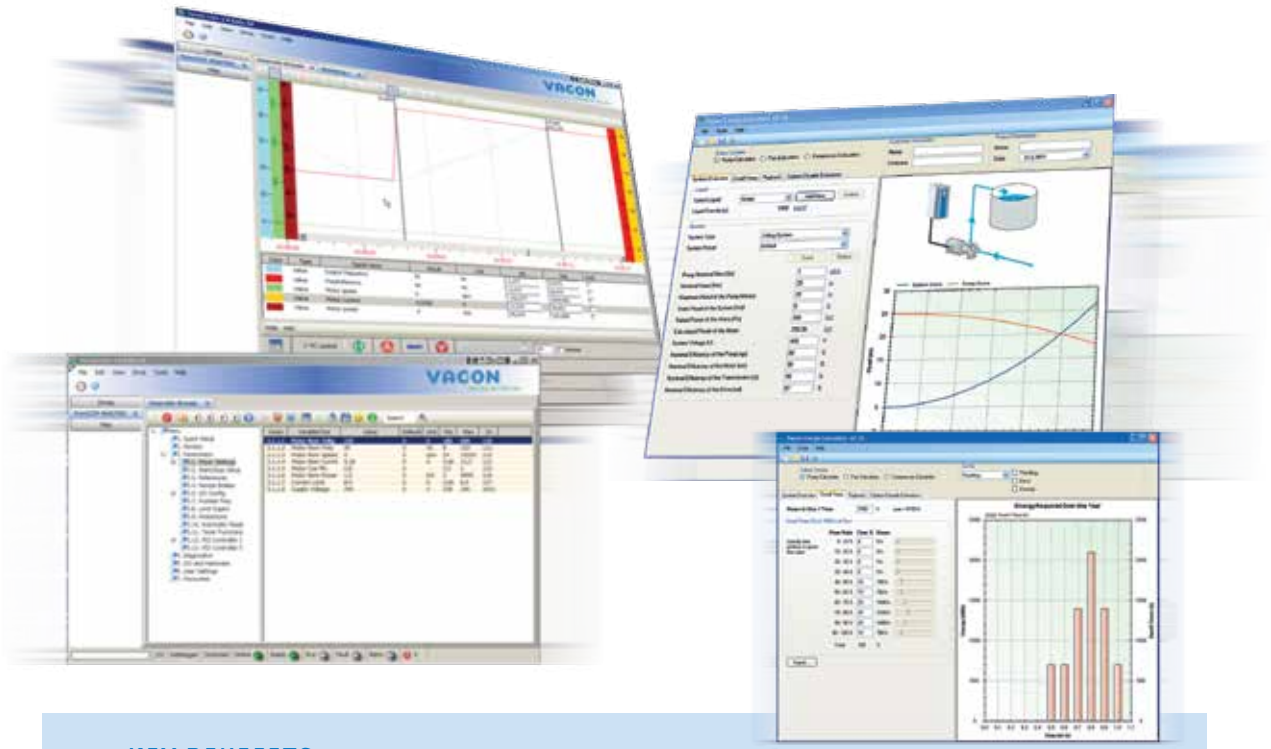
The drive, as well as process-related values can be graphically monitored in real time. Parameters can be edited, saved for back-up and compared with defaults or a back-up file. You only need to send one service info file to your service provider for quick support. A service info file contains parameters and other data such as history of faults and alarms, as well as drive hardware and software details. Drive software and language support files can be loaded to the drive using VACON Loader software, which is included in the VACON Live tool.

VACON® SAVE

Energy costs account for the majority of your installation's lifetime costs. With VACON Save you can calculate your energy savings in kWh when you use VACON 100 to the pumps and fans in your processes. While displaying savings in your own currency, it will also estimate the short payback time of your VACON 100 purchases as well as the reductions in carbon dioxide emissions in your country.

VACON® HARMONICS

VACON 100 has built-in harmonics filtering. You can estimate the harmonics and power quality of your operations quickly using our VACON Harmonics tool. It illustrates the total harmonic effect of your existing or intended drives in your supply networks, so that you can plan for the effective solution in compliance with local harmonic standards.



KEY BENEFITS

Economical
- Save on operating & maintenance costs
- Reduce downtime
- Optimize energy savings
- Minimize costs due to harmonic disruptions

Easy
- Simple to configure and use
- Customize on field with Block Programming
- Easy commissioning & maintenance
- Meet harmonic standards the easy way

Mains voltage 208—240 V, 50/60 Hz, 3~

AC drive type	Loadability				Max current I_S	Motor shaft power				Frame size	Dimensions WxHxD (mm) WxHxD (inch)	Weight (kg) Weight (lbs)
	Low*		High*			230V supply		230V supply				
	Continuous current I_L [A]	10% overload current [A]	Continuous current I_H [A]	50% overload current [A]		10% overload 40°C [kW]	50% overload 50°C [kW]	10% overload 104°F [hp]	50% overload 122°F [hp]			
VACON 0100-3L-0003-2	3.7	4.1	2.6	3.9	5.2	0.55	0.37	0.75	0.5	MR4	128x328x190	6.0
VACON 0100-3L-0004-2	4.8	5.3	3.7	5.6	7.4	0.75	0.55	1.0	0.75		5x12.9x7.5	13.0
VACON 0100-3L-0007-2	6.6	7.3	4.8	7.2	9.6	1.1	0.75	1.5	1.0			
VACON 0100-3L-0008-2	8.0	8.8	6.6	9.9	13.2	1.5	1.1	2.0	1.5			
VACON 0100-3L-0011-2	11.0	12.1	8.0	12.0	16.0	2.2	1.5	3.0	2.0			
VACON 0100-3L-0012-2	12.5	13.8	9.6	14.4	19.2	3.0	2.2	4.0	3.0			
VACON 0100-3L-0018-2	18.0	19.8	12.5	18.8	25.0	4.0	3.0	5.0	4.0	MR5	144x419x214	10.0
VACON 0100-3L-0024-2	24.0	26.4	18.0	27.0	36.0	5.5	4.0	7.5	5.0		5.7x16.5x8.4	22.0
VACON 0100-3L-0031-2	31.0	34.1	25.0	37.5	46.0	7.5	5.5	10.0	7.5			
VACON 0100-3L-0048-2	48.0	52.8	31.0	46.5	62.0	11.0	7.5	15.0	10.0	MR6	195x557x229	20.0
VACON 0100-3L-0062-2	62.0	68.2	48.0	72.0	96.0	15.0	11.0	20.0	15.0		7.7x21.9x9	44.0
VACON 0100-3L-0075-2	75.0	82.5	62.0	93.0	124.0	18.5	15.0	25.0	20.0	MR7	237x660x259	37.5
VACON 0100-3L-0088-2	88.0	96.8	75.0	112.5	150.0	22.0	18.5	30.0	25.0		9.3x26x10.2	83.0
VACON 0100-3L-0105-2	105.0	115.5	88.0	132.0	176.0	30.0	22.0	40.0	30.0			
VACON 0100-3L-0140-2	140.0	154.0	114.0	171.0	210.0	37.0	30.0	50.0	40.0	MR8	290x966x343	66.0
VACON 0100-3L-0170-2	170.0	187.0	140.0	210.0	280.0	45.0	37.0	60.0	50.0		11.4x38x13.5	145.5
VACON0100-3L-0205-2	205.0	225.5	170.0	255.0	340.0	55.0	45.0	75.0	60.0			
VACON 0100-3L-0261-2	261.0	287.1	211.0	316.5	410.0	75.0	55.0	100.0	75.0	MR9	480x1150x365	108.0
VACON 0100-3L-0310-2	310.0	341.0	251.0	376.5	502.0	90.0	75.0	125.0	100.0		18.9x45.3x14.4	238.0
VACON 0100-3L-0140-2	140.0	154.0	114.0	171.0	210.0	37.0	30.0	50.0	40.0	MR8 IP00	290x794x343	62.0
VACON 0100-3L-0170-2	170.0	187.0	140.0	210.0	280.0	45.0	37.0	60.0	50.0		11.4x31.3x13.5	136.7
VACON0100-3L-0205-2	205.0	225.5	170.0	255.0	340.0	55.0	45.0	75.0	60.0			
VACON 0100-3L-0261-2	261.0	287.1	211.0	316.5	410.0	75.0	55.0	100.0	75.0	MR9 IP00	480x970x365	97.0
VACON 0100-3L-0310-2	310.0	341.0	251.0	376.5	502.0	90.0	75.0	125.0	100.0		18.9x38.2x14.4	213.8

*** For all VACON 100 drives, overloadability is defined as follows: High: 1.5 x IH (1 min/10 min) @ 50°C; Low: 1.1 x IL (1 min/10 min) @ 40°C; IS for 2 sec.**

Mains voltage 380—500 V, 50/60 Hz, 3~

AC drive type	Loadability				Max current I_S	Motor shaft power				Frame size	Dimensions WxHxD (mm) WxHxD (inch)	Weight (kg) Weight (lbs)
	Low*		High*			400V supply		480V supply				
	Continuous current I_L [A]	10% overload current [A]	Continuous current I_H [A]	50% overload current [A]		10% overload 40°C [kW]	50% overload 50°C [kW]	10% overload 104°F [hp]	50% overload 122°F [hp]			
VACON 0100-3L-0003-5	3.4	3.7	2.6	3.9	5.2	1.1	0.75	1.5	1.0	MR4	128x328x190	6.0
VACON 0100-3L-0004-5	4.8	5.3	3.4	5.1	6.8	1.5	1.1	2.0	1.5		5x12.9x7.5	13.0
VACON 0100-3L-0005-5	5.6	6.2	4.3	6.5	8.6	2.2	1.5	3.0	2.0			
VACON 0100-3L-0008-5	8.0	8.8	5.6	8.4	11.2	3.0	2.2	4.0	3.0			
VACON 0100-3L-0009-5	9.6	10.6	8.0	12.0	16.0	4.0	3.0	5.0	4.0			
VACON 0100-3L-0012-5	12.0	13.2	9.6	14.4	19.2	5.5	4.0	7.5	5.0			
VACON 0100-3L-0016-5	16.0	17.6	12.0	18.0	24.0	7.5	5.5	10.0	7.5	MR5	144x419x214	10.0
VACON 0100-3L-0023-5	23.0	25.3	16.0	24.0	32.0	11.0	7.5	15.0	10.0		5.7x16.5x8.4	22.0
VACON 0100-3L-0031-5	31.0	34.1	23.0	34.5	46.0	15.0	11.0	20.0	15.0			
VACON 0100-3L-0038-5	38.0	41.8	31.0	46.5	62.0	18.5	15.0	25.0	20.0	MR6	195x557x229	20.0
VACON 0100-3L-0046-5	46.0	50.6	38.0	57.0	76.0	22.0	18.5	30.0	25.0		7.7x21.9x9	44.0
VACON 0100-3L-0061-5	61.0	67.1	46.0	69.0	92.0	30.0	22.0	40.0	30.0			
VACON 0100-3L-0072-5	72.0	79.2	61.0	91.5	122.0	37.0	30.0	50.0	40.0	MR7	237x660x259	37.5
VACON 0100-3L-0087-5	87.0	95.7	72.0	108.0	144.0	45.0	37.0	60.0	50.0		9.3x26x10.2	83.0
VACON 0100-3L-0105-5	105.0	115.5	87.0	130.5	174.0	55.0	45.0	75.0	60.0			
VACON 0100-3L-0140-5	140.0	154.0	105.0	157.5	210.0	75.0	55.0	100.0	75.0	MR8	290x966x343	66.0
VACON 0100-3L-0170-5	170.0	187.0	140.0	210.0	280.0	90.0	75.0	125.0	100.0		11.4x38x13.5	145.5
VACON 0100-3L-0205-5	205.0	225.5	170.0	255.0	340.0	110.0	90.0	150.0	125.0			
VACON 0100-3L-0261-5	261.0	287.1	205.0	307.5	410.0	132.0	110.0	200.0	150.0	MR9	480x1150x365	108.0
VACON 0100-3L-0310-5	310.0	341.0	251.0	376.5	502.0	160.0	132.0	250.0	200.0		18.9x45.3x14.4	238.0
VACON 0100-3L-0140-5	140.0	154.0	105.0	157.5	210.0	75.0	55.0	100.0	75.0	MR8 IP00	290x794x343	62.0
VACON 0100-3L-0170-5	170.0	187.0	140.0	210.0	280.0	90.0	75.0	125.0	100.0		11.4x31.3x13.5	136.7
VACON 0100-3L-0205-5	205.0	225.5	170.0	255.0	340.0	110.0	90.0	150.0	125.0			
VACON 0100-3L-0261-5	261.0	287.1	205.0	307.5	410.0	132.0	110.0	200.0	150.0	MR9 IP00	480x970x365	97.0
VACON 0100-3L-0310-5	310.0	341.0	251.0	376.5	502.0	160.0	132.0	250.0	200.0		18.9x38.2x14.4	213.8

*** For all VACON 100 drives, overloadability is defined as follows: High: 1.5 x IH (1 min/10 min) @ 50°C; Low: 1.1 x IL (1 min/10 min) @ 40°C; IS for 2 sec.**

TECHNICAL DATA

Mains connection	Input voltage Uin	208...240 V; 380...500 V; -10%...+10%
	Input frequency	47 - 65Hz
	Connection to mains	Once per minute or less
	Starting delay	4 s (MR4 to MR6); 6 s (MR7 to MR9)
Motor connection	Output voltage	0-Uin
	Continuous output current	IL: Ambient temperature up to 40°C (104°F) overload 1.1 x IL (1 min./10 min). IH: Ambient temperature up to 50°C (122°F) overload 1.5 x IH (1 min./10 min).
	Output frequency	0...320 Hz (standard)
	Frequency resolution	0.01 Hz
Control characteristics	Switching frequency	1.5...10 kHz; Automatic switching frequency reduction in case of overheating
	Frequency reference	Resolution 0.01 Hz
	Analog input	Resolution 0.1% (10-bit)
	Field weakening point	8...320 Hz
	Acceleration time	0.1...3000 sec
	Deceleration time	0.1...3000 sec
Ambient conditions	Ambient operating temperature	IL : -10°C (-14°F) (no frost)... +40°C (104°F) IH: -10C (-14°F)(no frost)... +50°C (122°F)
	Storage temperature	-40°C (-40°F)...+70°C (158°F)
	Relative humidity	0 to 95% RH, non-condensing, non-corrosive
	Air quality: EN/IEC 60068-2-60 • chemical vapors • mechanical particles	 EN/IEC 60721-3-3, unit in operation, class 3C2 EN/IEC 60721-3-3, unit in operation, class 3S2
	Altitude	100% load capacity (no derating) up to 1.000 m (3280 ft) 1% derating for each 100 m (328 ft) above 1.000 m (3280 ft) Max. altitudes: 4000 m (13123 ft) (TN and IT systems) 240V relay voltage up to 3000m (9842 ft) from 3000 m ...4000m (9842 ft ... 13123 ft) 120V relay voltage can be used.
	Vibration	EN/IEC 61800-5-1 EN/IEC 60068-2-6
	Shock	EN/IEC 61800-5-1 EN/IEC 60068-2-27
	Enclosure class	IP21/UL Type 1 standard in entire range IP54/UL Type 12 option IP00 for frames MR8, MR9
EMC (at default settings)	Immunity	Fulfils EN/IEC 61800-3, first and second environment
	Emissions	61800-3, Category C2 Vacon 100 will be delivered with class C2 EMC filtering, if not otherwise specified. Vacon 100 can be modified for IT networks
Emissions	Average sound pressure level in dB(A) (1 m from the drive)	MR4: 45...56 MR5: 57...65 MR6: 63...72 MR7: 43...73 MR8: 58...73 MR9: 54...75 Sound pressure depends on the cooling fans speed which is controlled in accordance with the drive temperature.
Safety and Approvals		EN/IEC 61800-5-1, EN/IEC 61800-3, EN/IEC 61000-3-12, UL 508 C, CE, UL, cUL, GOST-R, C-Tick; (see unit nameplate for more detailed approvals)
Functional safety *	STO SS1 ATEX Thermistor input	EN/IEC 61800-5-2 Safe Torque Off (STO) SIL3, EN ISO 13849-1 PL"e" Category 3, EN 62061: SILCL3, IEC 61508: SIL3. EN /IEC 61800-5-2 Safe Stop 1 (SS1) SIL2, EN ISO 13849-1 PL"d" Category 3, EN /IEC62061: SILCL2, IEC 61508: SIL2. 94/9/EC, CE 0537 Ex 11 (2) GD

*** Optional**

TYPE CODE KEY

VACON 0100 - 3L - 0009 - 5 + OPTION CODES

Product	Input phase	Current rating	Voltage rating	+ Options

Basic I/O board		
Terminal		**Signal**
1	+10 V_{ref}	Reference output
2	AI1+	Analog input, voltage or current
3	AI1-	Analog input common (current)
4	AI2+	Analog input, voltage or current
5	AI2-	Analog input common (current)
6	24 V_{out}	24 V aux. voltage
7	GND	I/O ground
8	DI1	Digital input 1
9	DI2	Digital input 2
10	DI3	Digital input 3
11	CM	Common A for DI1-DI6
12	24 V_{out}	24 V aux. voltage
13	GND	I/O ground
14	DI4	Digital input 4
15	DI5	Digital input 5
16	DI6	Digital input 6
17	CM	Common A for DI1-DI6
18	AO1+	Analog signal (+output)
19	AO-/GND	Analog output common
30	+24 V_{in}	24 V auxiliary input voltage
A	RS485	Differential receiver/transmitter
B	RS485	Differential receiver/transmitter

Standard relay board			Optional relay board *		
Terminal		**+SBF3**	**Terminal**		**+SBF4**
21	RO1/1 NC	Relay output 1	**21**	RO1/1 NC	Relay output 1
22	RO1/2 CM		**22**	RO1/2 CM	
23	RO1/3 NO		**23**	RO1/3 NO	
24	RO2/1 NC	Relay output 2	**24**	RO2/1 NC	Relay output 2
25	RO2/2 CM		**25**	RO2/2 CM	
26	RO2/3 NO		**26**	RO2/3 NO	
32	RO3/1 CM	Relay output 3	**28**	TI1+	Thermistor input
33	RO3/2 NO		**29**	TI1-	

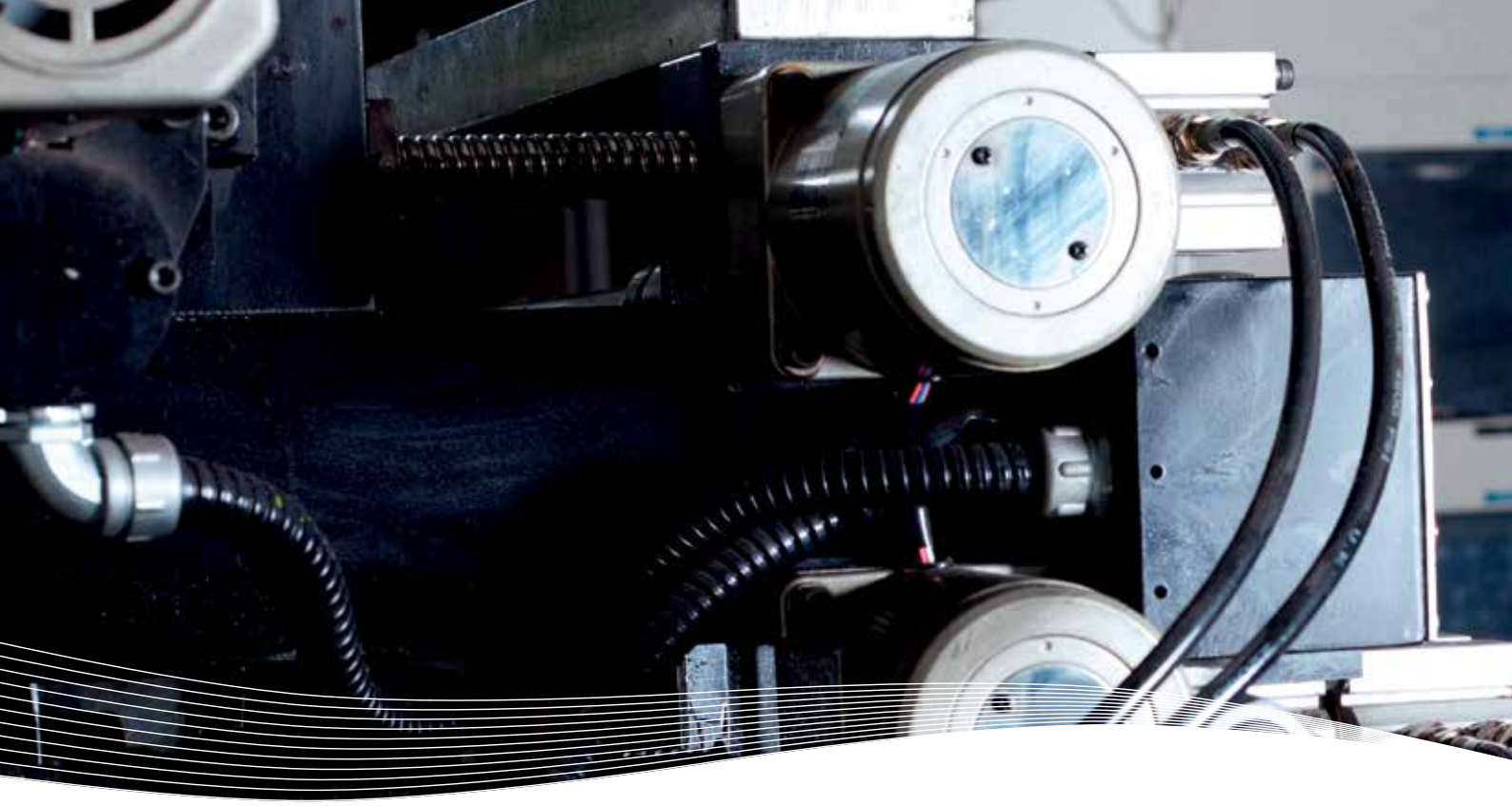
*** Standard relay board SBF3 (3XRO) can be replaced by SBF4 (2 x RO + Thermistor)**

Option boards (all boards are varnished)		Option slot		
		C	D	E
OPT-F3-V	3 x Relay output	-	-	-
OPT-F4-V	2 x Relay output + Thermistor	-	-	-
OPT-B1-V	6 x DI/DO, each I/O can be individually programmable as input or output	●	●	●
OPT-B2-V	2 x Relay output + Thermistor	●	●	●
OPT-B4-V	1 x AI, 2 x AO (isolated)	●	●	●
OPT-B5-V	3 x Relay output	●	●	●
OPT-B9-V	1 x RO, 5 x DI (42-240 VAC)	●	●	●
OPT-BF-V	1 x AO, 1 x DO, 1 x RO	●	●	●
OPT-BH-V	3 x Temperature measurement (support for PT100, PT1000, NI1000, KTY84-130, KTY84-150, KTY84-131 sensors)	●	●	●
OPT-BJ-V	Safe torque-off, ATEX thermistor input, Safe Stop 1	-	-	●
OPT-E3-V	Profibus DPV1 (Screw connector)	-	●	●
OPT-E5-V	Profibus DPV1 (D9 connector)	-	●	●
OPT-E6-V	CANopen	-	●	●
OPT-E7-V	DeviceNet	-	●	●

Factory options	Description
+SBF4	2 x Ro + Thermistor (Replaces 3 relay standard board)
+IP54	IP54 / UL Type 12
+IP00	IP00 (for MR8 and MR9)
+SRBT	Real-time clock battery
ENC-QFLG-MR	Flange mounting kit for MR4-7
+HMTX	Text keypad
+HMPA	Panel adapter
+S_B1	6 x DI/DO
+S_B2	2 x RO + Thermistor
+S_B4	1 x AI, 2 x AO
+S_B5	3 x RO
+S_B9	1 x RO, 5 x DI (42-240 VAC)
+S_BF	1 x AO, 1 x DO, 1 x RO
+S_BH	Temperature measurement
+S_E3	Profibus DPV1
+S_E5	Profibus DPV1 (D9)
+S_E6	CANopen
+S_E7	DeviceNET
+S_BJ	Safe Torque Off/ATEX
+FBPN	Profinet IO (software option onboard)
+FBEI	Ethernet IP (software option onboard)
+QFLG	Flange mounting (MR4-MR7, for MR8 and MR9 with IP00)
+QGLC	Conduit plate with inch holes
+EMC4	Change to EMC-level c4 for IT networks
+DBIN	Dynamic braking (for MR7-MR9)
Language packages	
+FL01	English, German, Italian, French, Finnish, Swedish
+FL02	English, German, Finnish, Danish, Swedish, Norwegian
+FL03	English, Spanish, French, Italian, Dutch, Portuguese
+FL04	English, German, Czech, Polish, Russian, Slovakian
+FL05	English, German, Estonian, Hungarian, Romanian, Turkish

VACON® 100 X & VACON® 20 X

DECENTRALIZED AC DRIVES



MAXIMUM PROTECTION WHEREVER YOU WANT

Decentralized drive solutions enable engineers and machine designers to save on costs and space. VACON® 100 X and VACON® 20 X manage to combine IP66/Type 4X Outdoor enclosure protection with a compact design, which means they can be mounted directly onto the motor, machine or wherever the most efficient location for the drive is.

DECENTRALIZED SOLUTIONS

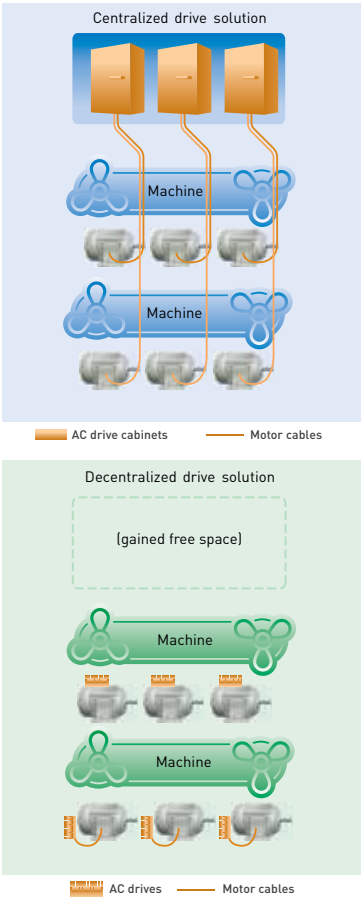
In a decentralized drive solution, the drives are located as close as possible to the motor. Significant savings can be achieved in cabling costs, space and energy when the installation does not require the drives to be mounted in a separate electrical room or enclosure.

MOTOR MOUNTABLE OEM SOLUTIONS

The motor mounted approach has been used in mechanical transmission applications for many years. VACON 100 X now brings this trend to a wider range of applications, such as high pumps, fans, compressors and many more. In many cases, the best location for the drive can be directly on the working machine, as close to the motor as possible.

AN INDEPENDENT DRIVES SUPPLIER

Vacon's motor mountable drives are not tied to any specific motor supplier, which gives the customer the go-ahead to choose the best available solution. Many competitors only offer decentralized drives that work with a specific motor — by selecting Vacon the customer will receive all the advantages and freedom necessary to ensure processes run at an optimal level.



THE DECENTRALIZED DRIVES APPROACH IN A NUTSHELL

- Locating the drive as close to the motor as possible
- Minimizing the use of electrical rooms
- Integrating the drive as part of the machine
- No enclosures used for the drives
- Significantly shorter length of shield cables needed, reducing costs

SAVINGS BUILT-IN

SAVE ON ENCLOSURE COSTS

These are examples of how VACON® 100 X and VACON® 20 X can help save on enclosure costs:

- No enclosure needed for the drive
- Heat loss from the drives does not have to be ventilated out of the enclosure
- Weight and size of the enclosure is significantly reduced
- Installation time for the drive is shorter if mounted without an enclosure

SAVE MORE IN HIGH POWERS

With drives available in powers all the way up to 37 kW the decentralized drive technology can be utilized in new applications that have previously been limited to traditional enclosure solutions. Examples of how VACON® Decentralized AC drives save more energy when operating with high power include:

- Lower enclosure ventilation costs, if enclosure still needed, as drive heat loss is external
- Savings in cable costs increase with the size of the motor cable
- Less cooling costs for electrical rooms

SAVE ON CABLING COSTS

Compared to a traditional solution, with the AC drives located in an electrical room, a decentralized solution offers significant savings potential in cabling costs. By locating the drive at the machine the length of the motor cable will be minimized. Examples of how VACON 100 X and VACON 20 X can help save on cabling costs:

- Minimized length of more costly shielded motor cable
- Reduced cable laying costs

SINGLE PACKAGE FROM THE MACHINE BUILDER

A decentralized solution provides a more flexible solution as an OEM manufacturer can deliver its machine in one piece and there is no need to install the drives separately.

- A complete package delivered in one piece
- Possibility to offer the customer a better optimized solution
- Minimized installation costs for the end-customer

Activity	Cost centralised	Cost decentralised	
Enclosure + accessories + Drive mounting	760 €	0 €	 **Savings 1016 €**
Additional cost for shielded motor cable	50m x 6 €	1m x 6 €	
Additional cost for fieldbus cable	1m x 2 €	50m x 2 €	
Enclosure/Drive installation on site	3h x 30 €	1h x 30 €	
Total cost	**1152 €**	**136 €**	

Example cost for the installation of a 30 kW drive in a centralized enclosure vs. a decentralized drive solution. AC drive costs not included in calculation.

VACON® 20 X — PERFORMANCE UNDER PRESSURE

VACON 20 X sees Vacon building on its experience of producing high class enclosures drives to offer a decentralized drive solution with countless possibilities. An IP66/Type 4X Outdoor enclosure enclosure offers the best possible protection from any factors that may be encountered in harsh environments, while other great features such as large cooling ribs and an integrated mains switch make VACON 20 X the right choice when your drive needs to be integrated directly into the application.

WHEN YOU NEED A DECENTRALIZED SOLUTION

The main purpose of VACON 20 X is to offer an AC drive that can act in all kinds of decentralized applications and is still flexible and easy to use. With this in mind, it has features such as a wide array of fieldbus connections, and Safe Torque Off mode, proving that robustness doesn't have to compromise simplicity.

IP66/TYPE 4X OUTDOOR ENCLOSURE CERTIFIED PROTECTION

VACON 20 X comes with an enclosure that is compliant with IP66/Type 4X Outdoor enclosure requirements, offering the best possible protection against external issues. This protection is essential in moist or dusty conditions, where dust could otherwise build up through airflow and cause internal components to fail. The enclosure is certified 3M6, IEC 60068-2 resistant to 2g vibrations and the rubber sealing comes equipped with a protective Snap-in Vent. This ensures the pressure inside the drive is equalized with the surrounding environment, which in turn prevents the sealing from being worn down. In addition, the drive's design is such that it is operable in temperatures of up to 40°C.

EVERYTHING IN ONE PLACE

Despite its highly developed enclosure, the drive remains a masterpiece in easy installation and commissioning. If you're looking for a decentralized solution, chances are that space is at a premium. VACON 20 X has all the standard features you would expect along with a wide range of options, all in one place. The option of having a built-in main switch is a great saver when it comes to installation costs – the drive provides the housing for the switch and makes the drive work in the field to full effect. No need for engine rooms or cabling systems – with VACON 20 X, all the standard functionality and a whole range of options come in a single box.

TYPICAL APPLICATIONS

- Machinery
- Pumps
- Conveyors
- Fans
- Washdown duty installations
- General purpose installations

RATINGS & DIMENSIONS

Supply voltage	AC drive type	Power		Motor Current		Frame size	Dimensions W x H x D		Weight	
		kW	HP	I_N [A]	1.5 x I_N [A]		mm	inches	kg	lb
208-240 VAC, 3-phase	VACON0020-3L-0004-2-X	0.75	1.0	3.7	5.6	MU2	169 x 295 x 154	6.65 x 11.61 x 6.06	3.4	7.50
	VACON0020-3L-0005-2-X	1.1	1.5	4.8	7.2					
	VACON0020-3L-0007-2-X	1.5	2.0	7.0	10.5					
	VACON0020-3L-0011-2-X	2.2	3.0	11.0	16.5	MU3	205 x 375 x 180	8.07 x 14.76 x 7.09	6	13.23
	VACON0020-3L-0012-2-X	3.0	4.0	12.5	18.8					
	VACON0020-3L-0017-2-X	4.0	5.0	17.5	26.3					
380-480 VAC, 3-phase	VACON0020-3L-0003-4-X	0.75	1.0	2.4	3.6	MU2	169 x 295 x 154	6.65 x 11.61 x 6.06	3.4	7.50
	VACON0020-3L-0004-4-X	1.1	1.5	3.3	5.0					
	VACON0020-3L-0005-4-X	1.5	2.0	4.3	6.5					
	VACON0020-3L-0006-4-X	2.2	3.0	5.6	8.4					
	VACON0020-3L-0008-4-X	3.0	5.0	7.6	11.4					
	VACON0020-3L-0009-4-X	4.0	6.0	9.0	13.5	MU3	205 x 375 x 180	8.07 x 14.76 x 7.09	6	13.23
	VACON0020-3L-0012-4-X	5.5	7.5	12.0	18.0					
	VACON0020-3L-0016-4-X	7.5	10.0	16.0	24.0					

TECHNICAL HIGHLIGHTS

- 2g resistance to vibrations (according to 3M6/IEC 60068-2)
- IP66/Type 4X Outdoor enclosure
- Large cooling ribs
- Option of integrated mains switch
- Safe Torque Off (STO) mode according to SIL3
- Runs induction and permanent magnet motors
- Integrated PID controller
- Wide amount of fieldbus connections
- Built-in EMC filter for category level C2.
- Brake chopper integrated

BENEFITS

- Cost savings from decentralized concept
- Can be used in almost any environment
- Can be cleaned with pressurized water
- Custom-made software solutions with built-in PLC functionality for OEMs
- Mountable in any position; fits into any available space

WHAT'S INSIDE VACON® 20 X

REMOVABLE KEYPAD AS OPTION

Vacon's removable text keypad has non-volatile memory (for copy/paste parameter settings). Mounted with a magnetic fixing, it can be removed and mounted next to the drive or used remotely during commissioning.

IP66/TYPE 4X OUTDOOR ENCLOSURE CERTIFIED PROTECTION

VACON 20 X has an enclosure that is IP66/Type 4X Outdoor enclosure approved, meaning that the drive is resistant to potential hazards such as moisture, dust, detergents and fluctuations in temperature.

MAINS SWITCH INTEGRATED AS OPTION

Using the integrated drive supply switch option, the drive's main supply can be disconnected and locked for safety during maintenance work. This also saves on investment costs and space.

PRESSURE EQUALIZER VENT

The pressure equalizer vent allows the enclosure to breathe, no matter how harsh the external conditions, acting as a barrier against condensation, dust and dirt. It equalizes the pressure inside the drive with the surrounding environment, which is vital in preventing the sealing from getting worn down.

EXPANSION SLOT FOR ADDITIONAL OPTION BOARDS

An expansion slot opens up the possibility of connecting to other fieldbuses and I/O boards.

PROGRAMMING DESIGNED FOR OEMS

Built-in PLC functionality, using IEC61131-1 programming methods, allows software logic and parameter list definitions to be modified with the optional VACON® Programming Tool.

GENERAL

Communication	RS485	Standard: Modbus RTU
	HMI	RS422 based for PC tools or Keypad interface
Software features	Control characteristics	Induction and PMSM motor control Switching frequency up to 16 kHz (factory default 6 kHz) Frequency control U/f and Open loop sensorless vector control Motor tuning identification and flying start mode
Motor connection	Output voltage	0...Uin
	Output current	Continuous rated current In at rated ambient temperature Overload 1.5 x In max 1 min / 10 min
	Starting current / torque	Current 2 x In for 2 secs every 20 sec period
	Output frequency	0...320 Hz - resolution 0.01 Hz
Ambient conditions	Ambient operating temperature Vibration Altitude Enclosure class	-10 °C...+40 °C without derating (max. temperature 50°C with derating) 2g resistance to vibrations (according to 3M6/IEC 60068-2) 100% load capacity (no derating) up to 1000 m; 1% derating every 100 m up to 3000 m IP66 / Type 4X Outdoor enclosure
EMC	Immunity Emissions	Complies with EN 61800-3, level C2
Functional safety	Safe Torque Off (STO)	SIL 3 according to IEC61800-5-2 PL e / Cat 4 according to ISO13849-1

I/O CONNECTIONS

Standard I/O		
Terminal		**Signal**
A	RS485	Differential receiver/transmitter
B	RS485	Differential receiver/transmitter
1	+10V$_{ref}$	Reference output
2	AI1+	Analog input 1, voltage or current
3	AI1- /GND	Analog input 1 common
4	AI2+	Analog input 2, voltage or current
5	AI2- / GND	Analog input 2 common
6	24V$_{out}$	24 V aux. voltage
7	GND / DIC	I/O ground
8	DI1	Digital input 1
9	DI2	Digital input 2
10	DI3	Digital input 3
13	GND	I/O ground
14	DI4	Digital input 4
15	DI5	Digital input 5
16	DI6	Digital input 6
18	AO1+	Analog output signal (+output), voltage
20	DO1	Digital output (open collector)

Relays			**STO connections**	
Terminal			**Terminal**	
22	RO1/2 CM	Relay output 1	**S1**	Isolated digital output 1
23	RO1/3 NO		**G1**	
24	RO2/1 NC	Relay output 2	**S2**	Isolated digital output 2
25	RO2/2 CM		**G2**	
26	RO2/3 NO		**F+**	STO feedback
			F-	

OPTIONS

Keypad	
VACON-PAN-HMTX-MC06X	Magnetic Handheld keypad

OPTION BOARDS

Option boards	
OPT-B1-V	6 x DI/DO, each digital input can be individually programmed to also act as digital output
OPT-B2-V	2 x Relay output + Thermistor
OPT-B4-V	1 x AI, 2 x AO (isolated)
OPT-B5-V	3 x Relay output
OPT-B9-V	1 x RO, 5 x DI (42-240 VAC)
OPT-BF-V	1 x AO, 1 x DO, 1 x RO
OPT-E3-V	Profibus DPV1, (screw connector)
OPT-E5-V	Profibus DPV1, (D9 connector)
OPT-E6-V	CANopen
OPT-E7-V	DeviceNet

TYPE CODE KEY

VACON0020 - 3L - 0006 - 4 - X + OPTION CODES

0020 — **Product range**
VACON 20

3L — **Input/Function**
3L = Three-phase input

0006 — **Drive rating in Ampere**
eg. 0006 =6 A

4 — **Supply voltage**
2 = 208-240 V
4 = 380-480 V

X — **IP66/Type 4X Outdoor enclosure drive**

+
EMC level C2
STO integrated
Brake chopper integrated

OPTION CODES
+HMTX = Text keypad
+ QDSS = Mains switch

VACON® 100 X — A DECENTRALIZED DRIVE LIKE NO OTHER

The VACON 100 X sets a new benchmark for decentralized drive solutions. It has a power range up to 37 kW (unmatched by competitors), comes with IP66/Type 4X Outdoor enclosure protection and has highly advanced control capability which guarantees processes run exactly how you want them to. On top of all this, it has built-in harmonic filtering chokes, making it suitable for public networks.

TOP CLASS PROTECTION

IP66/Type 4X Outdoor enclosure approval means that VACON 100 X comes with all the armour it needs in order to stand up to the challenges that demanding applications can throw at it. The robust, die-cast metal frame is strong enough to withstand 3g vibrations, and its cooling capabilities are second to none. The enclosure is powder coated for protection against corrosion and is designed to be fully operational in outdoor environments. A Snap-in Vent (Membrane IP69K) is designed to prevent external factors such as dust or moisture reaching inside the drive, while offering "in/out" pressure equalization, preventing the sealing from being worn down. In short, there really is no other option with such capabilities for high performance in challenging environments.

INTO THE HEAT OF THE ACTION

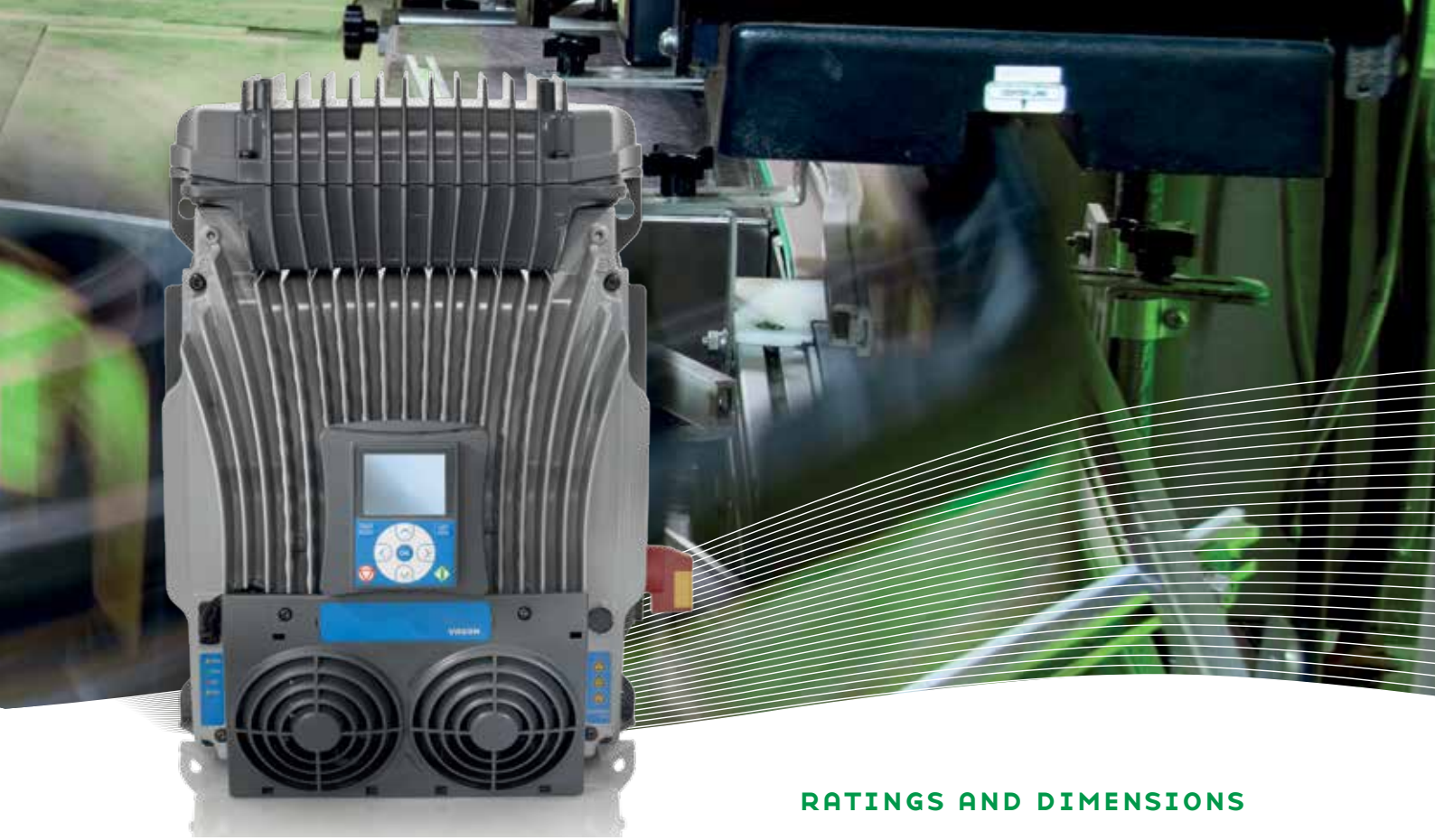
The enclosure's heatsink is easy to clean and the large, open cooling ribs allow the drive to perform in temperatures up to 60°C (with derating). The cooling system is such that it is not dependent on motor airflow like most motor mounted drives, and the fan is speed-controlled and pluggable, and therefore easy to replace.

PROGRAMMING DESIGNED FOR OEMS

Built-in PLC functionality, using IEC61131-1 programming methods, allows software logic and parameter list definitions to be modified with VACON® Programming Tool. This means that users can customize the drive around their requirements, making it an attractive option for OEM customers.

TYPICAL APPLICATIONS

- Machinery
- Conveyors
- Pumps
- Fans
- Decentralized solutions in a high variety of applications
- Outdoor applications
- Applications exposed to vibrations



RATINGS AND DIMENSIONS

Supply voltage	AC drive type	Power		Motor Current		Frame size	Dimensions W x H x D		Weight	
		kW	HP	I_N [A]	1.5 x I_N [A]		mm	inches	kg	lb
208-240 VAC, 3-phase	VACON0100-3L-0006-2-X	1.1	1.5	6.6	9.9	MM4	191 x 314 x 187	7.52 x 12.36 x 7.36	8.8	19.4
	VACON0100-3L-0008-2-X	1.5	2.0	8.0	12.0					
	VACON0100-3L-0011-2-X	2.2	3.0	11.0	16.5					
	VACON0100-3L-0012-2-X	3.0	4.0	12.5	18.8					
	VACON0100-3L-0018-2-X	4.0	5.0	18.0	27.0	MM5	233 x 366 x 205	9.17 x 14.41 x 8.07	14.9	32.9
	VACON0100-3L-0024-2-X	5.5	7.5	24.2	36.3					
	VACON0100-3L-0031-2-X	7.5	10.0	31.0	46.5					
	VACON0100-3L-0048-2-X	11.0	15.0	48.0	72.0	MM6	350 x 500 x 235	13.78 x 19.69 x 9.25	31.5	69.5
	VACON0100-3L-0062-2-X	15.0	20.0	62.0	93.0					
380-480 VAC, 3-phase	VACON0100-3L-0003-4-X	1.1	1.5	3.4	5.1	MM4	191 x 314 x 187	7.52 x 12.36 x 7.36	8.8	19.4
	VACON0100-3L-0004-4-X	1.5	2.0	4.8	7.2					
	VACON0100-3L-0005-4-X	2.2	3.0	5.6	8.4					
	VACON0100-3L-0008-4-X	3.0	5.0	8.0	12.0					
	VACON0100-3L-0009-4-X	4.0	5.0	9.6	14.4					
	VACON0100-3L-0012-4-X	5.5	7.5	12.0	18.0					
	VACON0100-3L-0016-4-X	7.5	10.0	16.0	24.0	MM5	233 x 366 x 205	9.17 x 14.41 x 8.07	14.9	32.9
	VACON0100-3L-0023-4-X	11.0	15.0	23.0	34.5					
	VACON0100-3L-0031-4-X	15.0	20.0	31.0	46.5					
	VACON0100-3L-0038-4-X	18.5	25.0	38.0	57.0	MM6	350 x 500 x 235	13.78 x 19.69 x 9.25	31.5	69.5
	VACON0100-3L-0046-4-X	22.0	30.0	46.0	69.0					
	VACON0100-3L-0061-4-X	30.0	40.0	61.0	91.5					
	VACON0100-3L-0072-4-X	37.0*	50.0*	72.0*	80.0*					

* Low Overload (110%)

TECHNICAL HIGHLIGHTS

- IP66/Type 4X Outdoor enclosure enclosure
- 3g resistance to vibrations (according to 3M7/IEC 60068-2)
- Supports both induction and permanent magnet motors
- Option of ability to operate in temperatures ranging from -40°C to 60°C
- Integrated with RS485 Modbus and Ethernet communication
- Safe Torque Off (STO) mode according to SIL3
- Built-in EMC filter for EN61800-3 category C2 (C1 as option)
- DC choke and film capacitor meets EN61000-3-12 requirements
- Integrated brake chopper
- PTC input as standard

BENEFITS

- Able to withstand rough conditions such as heat, dirt and vibrations
- Easy to keep clean
- Approval for public networks makes it flexible for installation
- Vacon Programming enables top class integration for countless OEM applications
- High efficiency and simulated air flow ensure long lifetime
- Mountable in any position; fits into any available space

WHAT'S INSIDE VACON® 100 X

PRESSURE EQUALIZER VENT

Just like VACON 20® X, VACON 100 X comes with a Pressure equalizer vent which allows the enclosure to breathe, however harsh the external conditions, and prevents it from getting worn down. This acts as a barrier against condensation, dust and dirt and ensures pressure inside the drive is equalized with the surrounding environment.

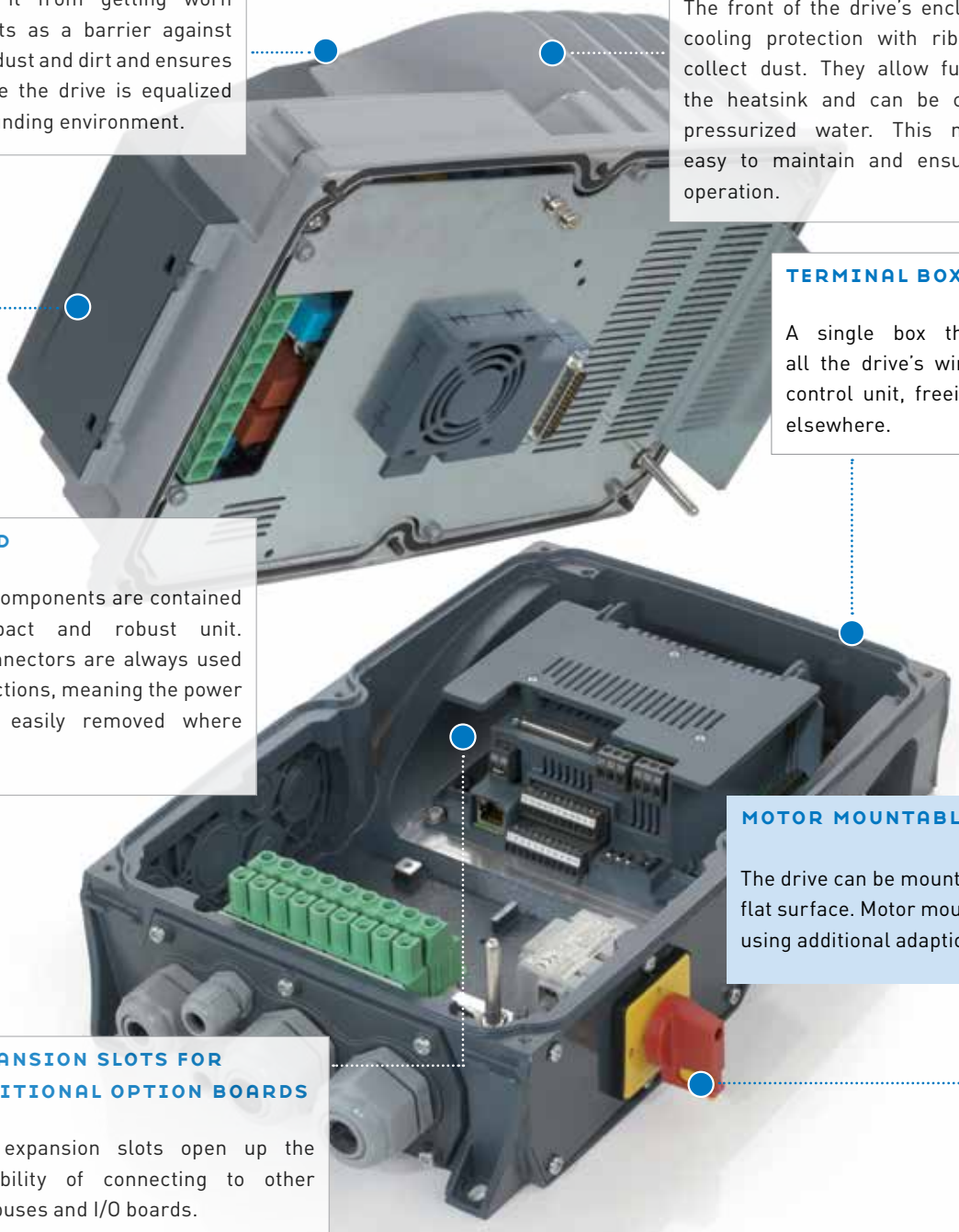
TÜV/SÜD CERTIFIED SOLUTION

LARGE COOLING RIBS

The front of the drive's enclosure offers cooling protection with ribs that don't collect dust. They allow full access to the heatsink and can be cleaned with pressurized water. This makes them easy to maintain and ensures reliable operation.

TERMINAL BOX

A single box that contains all the drive's wiring and the control unit, freeing up space elsewhere.



POWER HEAD

All the power components are contained in one compact and robust unit. Removable connectors are always used to make connections, meaning the power head can be easily removed where needed.

MOTOR MOUNTABLE

The drive can be mounted onto any flat surface. Motor mounting is done using additional adaption parts.

EXPANSION SLOTS FOR ADDITIONAL OPTION BOARDS

Two expansion slots open up the possibility of connecting to other fieldbuses and I/O boards.

MOUNTABLE IN FOUR ORIENTATIONS

Both the drive and the keypad can be mountable in four positions. This means that however you set up the VACON 100 X, the keypad will remain easily operable. Since there are no electrical cable connections to worry about, it can even be rotated in the field.

MAINS SWITCH INTEGRATED AS OPTION

Using the integrated drive supply switch option, the drive's main supply can be disconnected and locked during maintenance work. This helps save on investment costs and space and provides safety during the job.

GENERAL

Communication	RS485	Standard: Modbus RTU, BACnet, N2
	Ethernet	Standard: Modbus TCP
	HMI	RS422 based for PC tools or Keypad interface
Software features	Control characteristics	Induction and PMSM motor control Switching frequency up to 16 kHz (factory default 6 kHz) Frequency control U/f and Open loop sensorless vector control Motor tuning identification and flying start mode
Motor connection	Output voltage	0...Uin
	Output current	Continuous rated current In at rated ambient temperature
		Overload 1.5 x In max 1 min / 10 min
	Starting current / torque	Current 2 x In for 2 secs every 20 sec period
	Output frequency	0...320 Hz - resolution 0.01 Hz
Ambient conditions	Ambient operating temperature Vibration Altitude Enclosure class	-10 °C...+40 °C without derating (max. temperature 60°C with derating); Arctic mode as option with temperature down to -40°C 3g resistance to vibrations (according to 3M7/IEC 60068-2) 100% load capacity (no derating) up to 1000 m; 1% derating every 100 m up to 3000 m IP66 / Type 4X Outdoor enclosure
EMC	Immunity Emissions	Complies with EN 61800-3, level C2 (C1 as option)
Functional safety	Safe Torque Off (STO)	SIL 3 according to IEC61800-5-2 PL e / Cat 4 according to ISO13849-1

I/O CONNECTIONS

Standard I/O		
Terminal		**Signal**
A	RS485	Differential receiver / transmitter
B	RS485	Differential receiver / transmitter
1	$+10V_{ref}$	Reference output
2	AI1+	Analog input 1, voltage or current
3	AI1- / GND	Analog input 1 common
4	AI2+	Analog input 2, voltage or current
5	AI2- / GND	Analog input 2 common
6	$24V_{out}$	24 V aux. voltage
7	GND	I/O ground
8	DI1	Digital input 1
9	DI2	Digital input 2
10	DI3	Digital input 3
11	DICOM A	Common for DI1 - DI3
12	$24V_{out}$	24 V aux. voltage
13	GND	I/O ground
14	DI4	Digital input 4
15	DI5	Digital input 5
16	DI6	Digital input 6
17	DICOM B	Common for DI4 - DI6
18	AO1+	Analog output (+output), voltage current
19	AO1- / GND	Analog output signal common (-output)
30	24 V	24 V aux. input voltage

Relays			**STO connections**	
Terminal			**Terminal**	
21	RO1/1 NC	Relay output 1	**S1**	Isolated digital output 1
22	RO1/2 CM			
23	RO1/3 NO		**G1**	
24	RO2/1 NC	Relay output 2	**S2**	Isolated digital output 2
25	RO2/2 CM		**G2**	
26	RO2/3 NO		**F+**	STO feedback
			F-	
28	Thermistor input			
29				

OPTION BOARDS

Option boards	
OPT-B1-V	6 x DI/DO, each digital input can be individually programmed to also act as digital output
OPT-B2-V	2 x Relay output + Thermistor
OPT-B4-V	1 x AI, 2 x AO (isolated)
OPT-B5-V	3 x Relay output
OPT-B9-V	1 x RO, 5 x DI (42-240 VAC)
OPT-BF-V	1 x AO, 1 x DO, 1 x RO
OPT-E3-V	Profibus DPV1, (screw connector)
OPT-E5-V	Profibus DPV1, (D9 connector)
OPT-E6-V	CANopen
OPT-E7-V	DeviceNet

OPTIONS

VACON-PAN-HMGR-MC05	Magnetic Handheld keypad
POW-QDSS-MM4	Integrated Mains switch MM4
POW-QDSS-MM5	Integrated Mains switch MM5
POW-QDSS-MM6	Integrated Mains switch MM6
ENC-QAFH-MM04	Artic mode heater
ENC-QAFH-MM05	Artic mode heater
ENC-QAFH-MM06	Artic mode heater
QFLG-ALL-MM4	Motor mounting flange adapter
QFLG-ALL-MM5	Motor mounting flange adapter
QFLG-ALL-MM6	Motor mounting flange adapter

TYPE CODE KEY

VACON0100 - 3L - 0006 - 4 - X + OPTION CODES

0100 — **Product range**
VACON 100

3L — **Input/Function**
3L = Three-phase input

0006 — **Drive rating in Ampere**
eg. 0006 =6 A

4 — **Supply voltage**
2 = 208-240 V
4 = 380-480 V

X — **IP66/Type 4X Outdoor enclosure**
EMC level C2
STO integrated
Brake chopper integrated

+

OPTION CODES — +HMGR = Graphical keypad

VACON® NXS

FLEXIBLE DRIVES FOR ANY APPLICATION

THE RELIABLE CHOICE

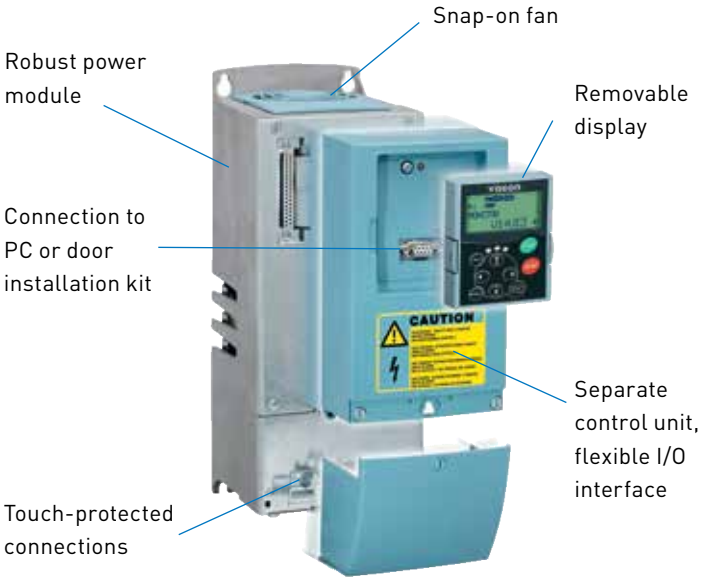
The VACON® NXS is a compact AC drive in the power range of 0.50—250 HP (0.55—190kW) and supply voltages of 208—690 V for heavy use in machines, buildings and all branches of industry.

The VACON® NXS is the drive that does it all and then some. No job is too simple or too complex for the seven built-in application packages to solve. The Vacon NX also has several free task specific applications available to make even the most demanding jobs that much quicker to start up.

The VACON® NXS features a modular design that offers several advantages for any installation. The robust power module is designed for efficient cooling and features a snap-on fan unit that is simple to remove and replace. The control box, found on every VACON® NXS drive, is designed to safely separate the control terminals from the power terminals. This modular design also allows the VACON® NXS to be field upgraded to a UL TYPE 12/IP55 enclosure without the need to increase the footprint of the drive.

FEATURES

- Easy to use display panel
- Interactive programming with Start-Up Wizard
- Versatile All-in-One Package
- PID controller and PFC for 1-5 pumps
- Special applications available (water application package, high speed, etc.)
- Five slots for control boards (2 basic boards and 3 option boards)
- High switching frequency, low noise
- Steady state speed error < 1%
- Low torque ripple
- Starting torque > 200%, depending on AC drive sizing
- Suitable for multi-motor applications



INTUITIVE INTERFACE

- Plain Text Display
- Common human interface across all frame sizes
- Multiple language packs for many countries
- Seven built in application packages for easy comissioning

BENEFITS

- Simple programming
- Languages for many countries
- Reduces start up time

ULTIMATE FLEXIBILITY

- UL Type 1/IP21 and UL Type 12/ IP54 in the same footprint
- Many free specialty application programs
- Built-in AC Line Reactors standard for every frame size
- Five option card slots for communications and additional I/O
- Flange mounting and remote keypad mounting kits available

BENEFITS

- Reduces investment costs
- One drive for many applications
- Protection against incoming power spikes
- Mount on a wall or in a enclosure

VACON® NX CONTROL UNIT

The VACON® NX Family offers a high-performance control platform for all demanding drive applications. There are five slots (A, B, C, D and E) for I/O boards, and a suitable board can be selected for each slot (see table below).

The VACON NX Family drives are delivered with OPT-A1 and OPT-A2 boards if the I/O is not specified. In many countries, boards OPT-A1 and OPT-A3 are used as standard I/O as the galvanically isolated thermistor input is often required.

Removable terminals, snap-in card installation, automatic card identification and instructions on the drive help making quick connections. If necessary, the inputs, outputs and fieldbus boards can be added in the field. The VACON NX Family is simply the most flexible frequency converter series on the market.

An external +24 V supply option enables communication with the control unit even if the mains supply is switched off (e.g. fieldbus communication and parameter settings).

OPTION BOARDS

Type	Card slot					Suitability		I / O signal																				
	A	B	C	D	E	NXS	NXP	DI	DO	DI DO	AI (mA/ V/±V)	AI (mA) isolated	AO (mA/V)	AO (mA) isolated	RO (NO/ NC)	RO (NO)	+10V$_{ref}$	Therm	+24V/ EXT +24V	pt100	42-240 VAC input	DI/DO (10...24V)	DI/DO (RS422)	DI ~ 1Vp-p	Resolver	Out +5V/ +15V/ +24V	Out +15V/ +24V	Out +5V/ +12V/ +15V	Note
Basic I/O cards (OPT-A)																													
OPT-A1								6	1		2		1				1		2										
OPT-A2															2														
OPT-A3															1	1		1											
OPT-A4								2															3/0			1			
OPT-A5								2														3/0					1		
OPT-A8								6	1		2		1				1		2										1)
OPT-A9								6	1		2		1				1		2										2.5 mm^2 terminals
OPT-AE									2													3/0					1		DO = Divider+Direction
I/O expander cards (OPT-B)																													
OPT-B1										6									1										Selectable DI/DO
OPT-B2															1	1		1											
OPT-B4												1		2					1										2)
OPT-B5																3													
OPT-B8																			1	3									
OPT-B9								2								1					5								
OPT-BB								2															0/2	2				1	Sin/Cos + EnDat
OPT-BC																						3/3			1				Encoder out = Resolver simulation
OPT-BE																													EnDat/SSI
Fieldbus cards (OPT-C)																													
OPT-C2								RS-485 (Multiprotocol)																				Modbus, N2
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)																				Modbus, N2	
OPT-CG								SELMA 2 protocol																					
OPT-CI								Modbus/TCP (Ethernet)																					
OPT-CJ								BACNet, RS-485																					
OPT-CP								ProfiNet I/O (Ethernet)																					
OPT-CQ								Ethernet/IP (Ethernet)																					

NOTES: Allowed slots for the board are marked in blue. 1) analogue signals galvanically isolated as a group 2) analogue signals galvanically isolated separately

The mechanical design is extremely compact. The UL Type 12 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.

PRODUCT RANGE

VACON NXS 208-240V, 50/60HZ, 3~

Product Code For UL Type 12, replace '2' with '5', e.g. NXS00042A**5**H1....	**Motor Shaft Power and Current**						**Frame Size**	**Dimensions** W x H x D (mm) **W x H x D (in)**	Weight (kg) **Weight (lbs)**
	High Overload (150%)			Low Overload (110%)					
	Power (HP)	Power (kW)	I_H (A)	Power (HP)	Power (kW)	I_L (A)			
NXS00042A2H1SSSA1A2	0.75	0.55	3.7	1	0.75	4.8	FR4	128.01 x 292.1 x 189.99 **5.04 x 11.50 x 7.48**	4.989 **11**
NXS00072A2H1SSSA1A2	1	0.75	4.8	1.5	1.1	6.6			
NXS00082A2H1SSSA1A2	1.5	1.1	6.6	2	1,5	7.8			
NXS00112A2H1SSSA1A2	2	1.5	7.8	3	2.2	11			
NXS00122A2H1SSSA1A2	3	2.2	11	4	3	12.5			
NXS00172A2H1SSSA1A2	4	3	12.5	5	4	17.5	FR5	144.01 x 390.9 x 214.12 **5.67 x 15.39 x 8.43**	8.164 **18**
NXS00252A2H1SSSA1A2	5	4	17.5	7.5	5.5	25			
NXS00312A2H1SSSA1A2	7.5	5.5	25	10	7.5	31			
NXS00482A2H1SSSA1A2	10	7.5	31	15	11	48	FR6	195.07 x 518.92 x 236.98 **7.68 x 20.43 x 9.33**	18.597 **41**
NXS00612A2H1SSSA1A2	15	11	48	20	15	61			
NXS00752A2H0SSSA1A2	20	15	61	25	18.5	75	FR7	236.98 x 591.05 x 257.04 **9.33 x 23.27 x 10.12**	34.926 **77**
NXS00882A2H0SSSA1A2	25	18.5	75	30	22	88			
NXS01142A2H0SSSA1A2	30	22	88	40	30	114			
NXS01402A2H0SSSA1A2	40	30	105	50	37	140	FR8	291.08 x 757.93 x 343.91 **11.46 x 29.84 x 13.54**	58.059 **128**
NXS01702A2H0SSSA1A2	50	37	140	60	45	170			
NXS02052A2H0SSSA1A2	60	45	170	75	55	205			
NXS02612A2H0SSFA1A2	75	55	205	100	75	261	FR9	480.06 x 1,150.11 x 361.95 **18.90x45.28x14.25**	146.056 **322**
NXS03002A2H0SSFA1A2	100	75	245	125	90	300			

VACON NXS 380-500V, 50/60HZ, 3~

Product Code For UL Type 12, replace '2' by '5', e.g. NXS00035A**5**H1....	**Motor Shaft Power and Current**						**Frame Size**	**Dimensions** W x H x D (mm) **W x H x D (in)**	Weight (kg) **Weight (lbs)**
	High Overload (150%)			Low Overload (110%)					
	Power (HP)	Power (kW)	I_H (A)	Power (HP)	Power (kW)	I_L (A)			
NXS00035A2H1SSSA1A2	1	0.75	2.2	1.5	1.1	3.3	FR4	128.01 x 292.1 x 189.99 **5.04 x 11.50 x 7.48**	4.989 **11**
NXS00045A2H1SSSA1A2	1.5	1.1	3.3	2	1.5	4.3			
NXS00055A2H1SSSA1A2	2	1.5	4.3	3	2.2	5.6			
NXS00075A2H1SSSA1A2	3	2.2	5.6	5	3	7.6			
NXS00095A2H1SSSA1A2	5	3	7.6	5	4	9			
NXS00125A2H1SSSA1A2	5	4	9	7.5	5.5	12			
NXS00165A2H1SSSA1A2	7.5	5.5	12	10	7.5	16	FR5	144.01 x 390.9 x 214.12 **5.67 x 15.39 x 8.43**	8.164 **18**
NXS00225A2H1SSSA1A2	10	7.5	16	15	11	23			
NXS00315A2H1SSSA1A2	15	11	23	20	15	31			
NXS00385A2H1SSSA1A2	20	15	31	25	18.5	38	FR6	195.07 x 518.92 x 236.98 **7.68 x 20.43 x 9.33**	18.597 **41**
NXS00455A2H1SSSA1A2	25	18.5	38	30	22	46			
NXS00615A2H1SSSA1A2	30	22	46	40	30	61			
NXS00725A2H0SSSA1A2	40	30	61	50	37	72	FR7	236.98 x 591.05 x 257.04 **9.33 x 23.27 x 10.12**	34.926 **77**
NXS00875A2H0SSSA1A2	50	37	72	60	45	87			
NXS01055A2H0SSSA1A2	60	45	87	75	55	105			
NXS01405A2H0SSSA1A2	75	55	105	100	75	140	FR8	291.08 x 757.93 x 343.91 **11.46 x 29.84 x 13.54**	58.059 **128**
NXS01685A2H0SSSA1A2	100	75	140	125	90	170			
NXS02055A2H0SSSA1A2	125	90	170	150	110	205			
NXS02615A2H0SSFA1A2	150	110	205	200	132	261	FR9	480.06 x 1,150.11 x 361.95 **18.90 x 45.28 x 14.25**	146.056 **322**
NXS03005A2H0SSFA1A2	200	132	245	200	160	300			

PRODUCT RANGE

VACON NXS 500-690V, 50/60HZ, 3~

Product Code For UL Type 12, replace '2' by '5', e.g. NXS00035A**5**H1....	Motor Shaft Power and Current						Frame Size	Dimensions W x H x D (mm) **W x H x D (in)**	Weight (kg) **Weight (lbs)**
	High Overload (150%)			Low Overload (110%)					
	Power (HP)	Power (kW)*	I_H (A)	Power (HP)	Power (kW)*	I_L (A)			
NXS00046A2L0SSSA1A2	2	1.5	3.2	3	2.2	4.5	FR6	195.07 x 518.92 x 236.98 **7.68 x 20.43 x 9.33**	18.597 **41**
NXS00056A2L0SSSA1A2	3	2.2	4.5	-	3	5.5			
NXS00076A2L0SSSA1A2	-	3	5.5	5	4	7.5			
NXS00106A2L0SSSA1A2	5	4	7.5	7.5	5.5	10			
NXS00136A2L0SSSA1A2	7.5	5.5	10	10	7.5	13.5			
NXS00186A2L0SSSA1A2	10	7.5	13.5	15	11	18			
NXS00226A2L0SSSA1A2	15	11	18	20	15	22			
NXS00276A2L0SSSA1A2	20	15	22	25	18.5	27			
NXS00346A2L0SSSA1A2	25	18.5	27	30	22	34			
NXS00416A2L0SSSA1A2	30	22	34	40	30	41	FR7	236.98 x 591.05 x 257.04 **9.33 x 23.27 x 10.12**	34.926 **77**
NXS00526A2L0SSSA1A2	40	30	41	50	37	52			
NXS00626A2L0SSSA1A2	50	37	52	60	45	62	FR8	291.08 x 757.93 x 343.91 **11.46 x 29.84 x 13.54**	58.059 **128**
NXS00806A2L0SSSA1A2	60	45	62	75	55	80			
NXS01006A2L0SSSA1A2	75	55	80	100	75	100			
NXS01256A2L0SSFA1A2	100	75	100	125	90	125	FR9	480.06 x 1,150.11 x 361.95 **18.90 x 45.28 x 14.25**	146.056 **322**
NXS01446A2L0SSFA1A2	125	90	125	150	110	144			
NXS01706A2L0SSFA1A2	150	110	144	-	132	170			
NXS02086A2L0SSFA1A2	-	132	170	200	160	208			

* Power ratings in kW are at 575V. Contact your local Vacon Sales Representative for 690V ratings.

NXS KEYPAD

The text display with functions such as multi-monitoring, parameter copy, parameter backup and start-up wizard makes commissioning easy.

High-power VACON® NXS drives are also available in a compact standalone IP21 or IP54 enclosure. These units are designed for use in applications where the drive has to be compact and easy to install.

The VACON® NXS standalone drives are fully enclosed at the factory and are ready for immediate installation. The drive has integrated fuses as standard and no extra protections are required by the drive. It is also possible to equip the drive with an optional integrated load switch, which further simplifies handling in the field.

VACON NXS 380-500V, 50/60HZ, 3~

Product Code For UL Type 12, replace '2' by '5', e.g. NXS00035A**5**H1....	**Motor Shaft Power and Current**						**Frame Size**	**Dimensions** W x H x D (mm) **W x H x D (in)**	Weight (kg) **Weight (lbs)**
	High Overload (150%)			Low Overload (110%)					
	Power (HP)	Power (kW)	I_H (A)	Power (HP)	Power (kW)	I_L (A)			
NXS03855A2L0SSAA1A2	200	160	300	300	200	385	FR10	595 x 2018 x 602 **23.425 x 79.448 x 23.700**	340 **749.57**
NXS04605A2L0SSAA1A2	300	200	385	350	250	460			
NXS05205A2L0SSAA1A2	350	250	460	450	250	520			
NXS05905A2L0SSAA1A2	450	250	520	500	315	590	FR11	794 x 2018 x 602 **31.259 x 79.448 x 23.700**	470 **1,036.17**
NXS06505A2L0SSAA1A2	500	315	590	550	355	650			
NXS07305A2L0SSAA1A2	550	355	650	600	400	730			

VACON NXS 500-690V, 50/60HZ, 3~

Product Code For UL Type 12, replace '2' by '5', e.g. NXS00035A**5**H1....	**Motor Shaft Power and Current**						**Frame Size**	**Dimensions** W x H x D (mm) **W x H x D (in)**	Weight (kg) **Weight (lbs)**
	High Overload (150%)			Low Overload (110%)					
	Power (HP)	Power (kW)	I_H (A)	Power (HP)	Power (kW)	I_L (A)			
NXS02616A2L0SSAA1A2	200	200	208	250	250	261	FR10	595 x 2018 x 602 **23.425 x 79.448 x 23.700**	340 **749.57**
NXS03256A2L0SSAA1A2	250	250	261	300	315	325			
NXS03856A2L0SSAA1A2	300	315	325	400	355	385			
NXS04166A2L0SSAA1A2	400	355	385	450	400	416			
NXS04606A2L0SSAA1A2	450	400	416	*	450	460	FR11	794 x 2018 x 602 **31.259 x 79.448 x 23.700**	470 **1,036.17**
NXS05026A2L0SSAA1A2	*	450	460	500	500	502			
NXS05906A2L0SSAA1A2	500	500	502	550	560	590			

HARDWARE CONFIGURATIONS, STANDALONE UNITS

FUNCTION	AVAILABILITY
IP21 / UL Type 1	Standard
IP54 (FR10 only) / UL Type 12	Optional (H: +20mm)
Integrated fuses	Standard
Integrated load switch	Optional
EMC filtering L	Standard
EMC filtering T	Optional
Integrated brake chopper (cabling top entry)	Optional (H: +122 mm)

FR10

FR11

TECHNICAL DATA

Mains connection	Input voltage U_{in}	208...240 V; 380...500 V; 500...690 V; (–10%...+10%)
	Input frequency	50...60 Hz (± 10%)
	Connection to mains	Once per minute or less (normal case)
Motor connection	Output voltage	0—V_{in}
	Continuous output current	High overloadability Amps
		Low overloadability Amps
	Overload Capacity	High: 150% Nominal Amps; 1 min, Low: 110% Nominal Amps; 1 min
	Output frequency	0...320 Hz
	Frequency resolution	0.01 Hz
Control characteristics	Control method	Frequency control V/f; Open Loop Vector Control (speed, torque) Closed Loop Control, Permanent Magnet Synchronous Motor Control (NXP Only)
	Switching frequency	208..240V/380..500V: FR4-6: 1...16 kHz; Factory default: 10 kHz FR7-9: 1...10 kHz; Factory default: 3.6 kHz FR10-11: 1...6 kHz; Factory default: 3.6 kHz 500..690V: FR4-11: 1...6 kHz, Factory default: 1.5 kHz
	Field weakening point	8...320 Hz
	Acceleration time	0...3000 sec
	Deceleration time	0...3000 sec
	Braking	DC brake: 30% * T_N (without brake resistor), flux braking
Ambient conditions	Ambient operating temperature	14 F (no frost)...122 F: High OL (FR10-FR11: max 104 F) 14 F (no frost)...104 F: Low OL (NXS 0416 6 and NXS 0590 6: max 95 F)
	Storage temperature	-40F...158 F
	Relative humidity	0 to 95% RH, non-condensing, non-corrosive, no dripping water
	Air quality: - chemical vapours - mechanical particles	 IEC 60721-3-3, unit in operation, class 3C2 IEC 60721-3-3, unit in operation, class 3S2
	Altitude	100% load capacity (no derating) up to 3280 feet 1-% derating for each 328 feet above 3280 feet; max. 9840 feet
	Vibration EN50178/EN60068-2-6	5...150 Hz: Displacement amplitude 1 mm (peak) at 5...15.8 Hz (FR10-FR11: 0,25 mm (peak) at 5...31 Hz) Max acceleration amplitude 1 G at 15.8...150 Hz (FR10 and up: 1 G at 31...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	UL Type 1/IP21 and UL Type 12/IP54

EMC	Immunity	Fulfil all EMC immunity requirements
	Emissions	**EMC level C1**: IEC/EN61800-3 (2004), category C1 **EMC level C2**: IEC/EN61800-3 (2004), category C2 **EMC level C3**: IEC/EN61800-3 (2004), category C3 **EMC level C4**: Low earth-current solution suitable for IT networks, IEC/EN61800-3 (2004), category C4
Safety		EN 50178 (1997), EN 60204-1 (2006), IEC 61800-5, CE, UL, CUL; (see unit nameplate for more detailed approvals)
Control connections (OPT-A1, -A2 or OPT-A1, -A3)	Analogue input voltage	0...+10 V (–10 V...+10 V joystick control), 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	6, positive or negative logic; 18...30 VDC
	Auxiliary voltage	+24 V, ±15%, max. 250 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%
	Digital output	Open collector output, 50 mA/48 V
	Relay outputs	2 programmable change-over (NO/NC) relay outputs (OPT-A3: NO/NC+NO) Switching capacity: 24 VDC/8 A, 250 VAC/8 A, 125 VDC/0.4 A. Min. switching load: 5 V/10 mA
	Thermistor input (OPT-A3)	Galvanically isolated, R_{trip} = 4.7 kΩ
Protections		Overvoltage, undervoltage, earth fault, mains supervision, motor phase supervision, overcurrent, unit overtemperature, motor overload, motor stall, motor underload, short-circuit of +24 V and +10 V reference voltages

VACON NXS

VACON - NXS - 0003 - 5 - A - 2 - H - 1 - S - S - S - A1 A2 00 00 00

NXS — **Product Range**
VACON NXS

0003 — **Current Rating (Low Overload)**
Ex: 0003 = 3A

5 — **Supply Voltage**
2 = 208-240V Three Phase
5 = 380-500V Three Phase
6 = 525-690V Three Phase

A — **Keypad Option**
A = Standard Alpha-Numeric Display
B = No Keypad
F = Dummy Keypad (No interface)
G = Graphical Display (Cyrillic Languages)

2 — **Enclosure Class**
2 = IP21/UL Type 1
5 = IP54/UL Type 12
T = Flange Mounting Factory Installed

H — **EMC Emission Levels**
H, T or C = See Page 150 for more detail

1 — **Brake Chopper**
0 = No Brake Chopper
1 = Integrated Brake Chopper
2 = Integrated Brake Chopper + Brake Resistor

S — **Electrical Modifications**
S = Standard 6-Pulse w/ Integrated Choke
B = DC Bus Connection

S — **Mechanical Modifications**
S = Standard Air Cooled Drive
G = Standard Air Cooled Drive, No Conduit Box*

S — **Card Modifications**
S = Standard Connection / Not Varnished
V = Standard Connection / Varnished Boards

A1
A2
00
00
00 — **Option Boards (Installed)**
Each Two-digit code represents a card slot in order from left to right, Slot A, Slot B, Slot C, Slot D, Slot E
A = Basic I/O Cards
B = I/O Expansion Cards
C = Communications Cards
D = Special Option Cards

VACON® NXP & VACON® NXC AC DRIVES

DELIVERING PURE POWER

CONTINUOUS CONTROL. PURE POWER.

VACON NXP is a premium air-cooled AC drive for use in all applications where reliability, robust performance, precision and power are required. These drives are available in the power range from 0.55 kW to 2,000 kW.

IDEAL FOR DEMANDING APPLICATIONS

As a dedicated AC drives company, Vacon continues to pioneer trends in product design and provide innovative solutions for demanding applications and high power ranges. Our NXP range offers the ultimate in motor control, for both induction and permanent magnet (PM) motors, gearless drive applications and paralleling solutions for high power motors.

VACON NXP is the smart drive of choice. With fast fieldbus options and exceptional programming flexibility, your NXP is easily integrated into any plant's automation system. Satisfied customers also rely on our enclosed enclosure drive solution, VACON NXC, to perform in the most challenging industrial environments such as oil & gas, extrusion, mining, pulp & paper and water & wastewater applications.

With improved safety functions, extensive approvals in place and comprehensive maintenance tools, you can be sure that your VACON AC drives will give you the best possible control and ensure high operational quality and availability over the entire lifetime of your system.

Our VACON NXP portfolio fulfills key international standards and global requirements, including safety and EMC & Harmonics approvals.

IN HARMONY WITH THE ENVIRONMENT

Vacon is also committed to being an environmentally responsible company and our energy saving products and solutions are a good example of that. We have developed our manufacturing process in order to minimize the impact on the environment. All excess materials in the production and service processes are carefully sorted and recycled. Likewise, we continue to develop innovative solutions utilizing ie. regenerative energy and smart grid technology to help customers effectively monitor and control energy use and costs.

VACON AT YOUR SERVICE

Vacon drives are sold in over 100 countries, with production and R&D on 3 continents, sales offices in 27 countries and service centers in over 50 locations worldwide.

Whether you are an original equipment manufacturer (OEM), system integrator, brand label customer, distributor or end user, Vacon provides services to help you meet your business targets. Our global service solutions are available 24/7 throughout the product lifecycle with the intent to minimize the total cost of ownership and environmental load.

COUNT ON A SMOOTH RIDE

Vacon has partnered with global elevator manufacturers to provide drives solutions for both IM and PM motors used in high, mid and low rise buildings. Vacon drives are appreciated for their exceptionally smooth performance and approval ratings on harmonics, safety, and technology.

NXP WALL-MOUNTED RANGE

NXP DRIVE MODULES

NXC DRIVE ENCLOSURES

WHAT'S IN IT FOR YOU

VACON NXP/NXC

Typical segments	Key features	Benefits
• Mining & minerals • Compressors • Marine & offshore • Cranes & hoists • Metals • Chemical & refining • Water & wastewater • Oil & gas • Pulp & paper • Cement & glass • General process industry	Full power and voltage range from 0.55 kW to 2.0 MW for both induction and permanent magnet motors.	Same software tools, same control and option boards allowing the maximum utilisation of NXP features over a wide power range.
	Extensive range of ready-to-use applications for basic to demanding needs.	No additional software engineering required, saving time and money.
	Create your own applications with VACON NC61131-3 Engineering tool.	Customized applications provide added flexibility to meet process requirements.
	Five built-in expansion slots for additional I/O, fieldbus and functional safety boards.	No additional external modules required. Options boards are compact and easy to install at any time.

MULTIPLE OPTIONS

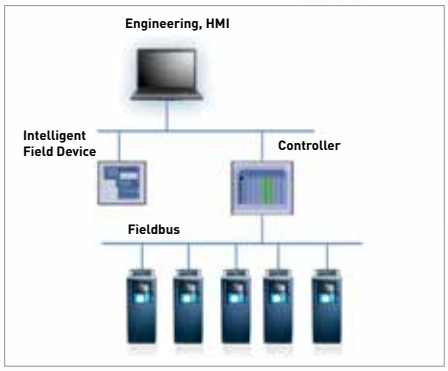
VACON NXP CONTROL

VACON NXP offers a high-performance control platform for all demanding drive applications. The micro controller provides both exceptional processing and calculation power. The VACON NXP supports both induction and permanent magnet motors in open and closed loop control modes. The VACON NXP features built-in PLC functionality without the need for any additional hardware. VACON NC61131-3 Engineering can be used to improve performance and create cost savings by integrating customer-specific functionality into the drive. The same control board is used in all NXP drives, allowing the maximum utilization of NXP control features over a wide power and voltage range.

OPTION BOARDS

Our NXP Control provides exceptional modularity by offering five (A, B, C, D and E) plug-in extension slots. Fieldbus boards, encoder boards as well as wide range of IO boards can simply be plugged-in at any time without the need to remove any other components.

A listing of all options boards is provided on pg. 21



FIELDBUS OPTIONS

Your VACON NXP is easily integrated within a plant's automation system by using plug-in fieldbus option boards including Profibus DP, Modbus RTU, DeviceNet and CANopen. Fieldbus technology ensures increased control and monitoring of the process equipment with reduced cabling - ideal for industries where the need to ensure that products are produced under the right conditions is of paramount importance. An external +24 V supply option enables communication with the control unit even if the main supply is switched off. Fast drive-to-drive communication is possible using Vacon's fast SystemBus fiber optic communication.

Profibus DP • DeviceNet • Modbus RTU • CANopen

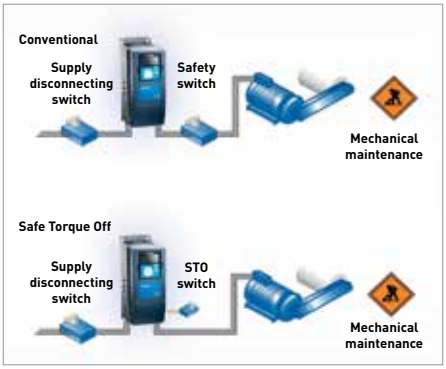
ETHERNET CONNECTIVITY

VACON NXP is the smart drive of choice, as there is no need to purchase additional communication tools. Ethernet connectivity allows remote drive access for monitoring, configuring and troubleshooting. Vacon's Ethernet protocols such as Profinet IO, Ethernet IP and Modbus/TCP are available for all NXP drives.

Modbus/TCP • Profinet IO • Ethernet I/P

SAFE TORQUE OFF, SAFE STOP 1

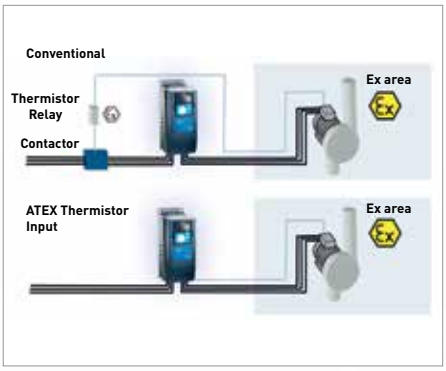
Safe Torque Off (STO) is available for all NXP drives. It prevents the drive from generating torque on the motor shaft and prevents unintentional start-ups. The function also corresponds to an uncontrolled stop in accordance with stop category 0, EN60204-1.
Safe Stop 1 (SS1) initiates the motor deceleration and initiates the STO function after an application specific time delay. The function also corresponds to a controlled stop in accordance with stop category 1, EN 60204-1.
The advantage of the integrated STO and SS1 safety options compared to standard safety technology using electromechanical switchgear is the elimination of separate components and the effort required to wire and service them, while still maintaining the required level of safety at work.



ATEX CERTIFIED THERMISTOR INPUT

Vacon has developed an ATEX approved thermistor input, as an integrated option. Certified and compliant with the European ATEX directive 94/9/EC, the integrated thermistor input is specially designed for the temperature supervision of motors that are placed in areas in which potentially explosive gas, vapor, mist or air mixtures are present and areas with combustible dust. Typical industries requiring such supervision include chemical, petrochemical, marine, metal, mechanical, mining, and oil drilling.

If over-heating is detected, the drive immediately stops feeding energy to the motor. As no external components are needed, the cabling is minimized, improving reliability and saving on both space and costs.



DC COOLING FANS

VACON NXP high-performance air-cooled products are equipped with DC fans. This significantly increases the reliability and lifetime of the fan also fulfilling the ERP2015 directive on decreasing fan losses. Likewise, the DC-DC supply board component ratings fulfill industrial requirement levels.

CONFORMAL COATING

To increase performance and durability, conformally coated circuit boards (also known as varnished boards) are provided as standard for power modules (FR7 - FR14).

The upgraded boards offer reliable protection against dust and moisture and extend the lifetime of the drive and critical components.

COMMISSIONING MADE EASY

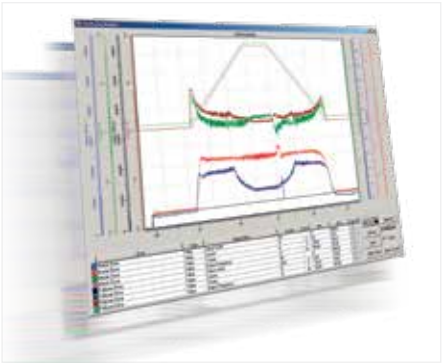
USER-FRIENDLY KEYPAD

Vacon has ensured that the user interface is intuitive to use. You will enjoy the keypad's well-structured menu system that allows for fast commissioning and trouble-free operation.

- Removable panel with plug-in connection
- Graphical and text keypad with multiple language support
- Text display multi-monitoring function
- Parameter backup and copy function with the panel's internal memory
- Vacon's Startup Wizard ensures a hassle-free set up. Choose the language, application type and main parameters during the first power-up.

DOCUMENTATION WIZARD

Make use of our Vacon Documentation Wizard and achieve dramatic savings in engineering time. The Documentation Wizard is a technical documentation tool, which creates a complete set of drawings for each NXC configuration. Just enter the product information, i.e. a type code, required variations and extra equipment (plus codes) into the user interface field, and the tool will automatically generate the documentation in any of the following formats: DWG (AutoCAD) drawings, DXF (AutoCAD) drawings, PDF (Adobe reader), and E-plan project (prj).

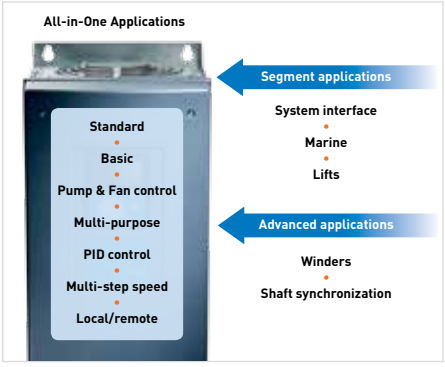


VACON NCDRIVE

VACON NCDrive is used for setting, copying, storing, printing, monitoring and controlling parameters. The VACON NCDrive communicates with the drive via the following interfaces: RS-232, Ethernet TCP/IP, CAN (fast multiple drive monitoring), CAN@Net (remote monitoring).

VACON NCDrive also includes a handy Datalogger function, which offers you the possibilty to track failure modes and perform root cause analysis.

VACON PC-tools can be downloaded from www.vacon.com



ALL-IN-ONE APPLICATION PACKAGE

Vacon's handy All-in-One application package has seven built-in software applications, which can be selected with one parameter.

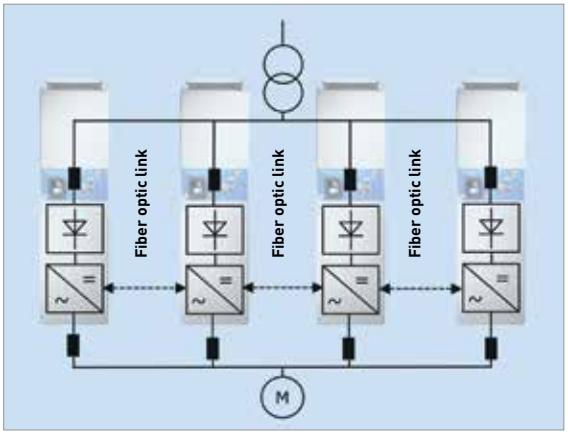
In addition to the All-in-One package, Vacon offers several segment specific and advanced applications such as System Interface, Marine, Lift and Shaft Synchronisation for more demanding uses.

VACON NXP applications can be downloaded from www.vacon.com

VACON DriveSynch is an innovative control concept for running standard drives in parallel to control high-power AC motors or increase the redundancy of a system. This concept suits high power single or multiple winding motors typically above 1 MW.

High power AC drives up to 5 MW can be built using standard drive components and have the following benefits:

- The system is modular and easy to expand
- High total power can be obtained by combining smaller drives
- System redundancy is higher than in a conventional drive because each unit can run independently
- Individual drive is easy to maintain and service
- Identical units reduce the required amount of spare parts thus reducing overall costs
- No special skills are required for the engineering, installation, commissioning and maintenance of high-power drives as they are comprised of standard modules
- It is possible to run multiple winding motors with a phase shift between the windings



Example of the DriveSynch configuration.

TYPICAL VACON DRIVESYNCH EXAMPLES USING NXP/NXC DRIVES

Mains voltage	AC drive type	Loadability					Motor shaft power		Frame size	Dimensions and weight W x H x D (mm)/ kg
		Low (+40°C)		High (+40°C)			400 V supply			
		Rated continuous current I_L (A)	10% overload current (A)	Rated continuous current I_H (A)	50% overload current (A)	Maximum current I_S (A)	10% overload P (kW)	50% overload P (kW)		
380-500 V 50/60 Hz	2 x NXC 1150 5 A 2 L 0 SSF	2150	2365	1940	2910	3492	1200	1100	2 x FR13	1606 x 2275 x 605/1350
	2 x NXC 1300 5 A 2 L 0 SSF	2470	2717	2185	3278	3933	1350	1100		
	2 x NXC 1450 5 A 2 L 0 SSF	2755	3031	2470	3705	4446	1500	1350		
	3 x NXC 1150 5 A 2 L 0 SSF	3278	3605	2936	4403	5284	1800	1500	3 x FR13	1606 x 2275 x 605/1350
	3 x NXC 1300 5 A 2 L 0 SSF	3705	4076	3278	4916	5900	2000	1800		
	3 x NXC 1450 5 A 2 L 0 SSF	4133	4546	3705	5558	6669	2250	2000		

values are given at switching frequency 2.0 kHz.

Mains voltage	AC drive type	Loadability					Motor shaft power		Frame size	Dimensions and weight W x H x D (mm)/ kg
		Low (+40°C)		High (+40°C)			690 V supply			
		Rated continuous current I_L (A)	10% overload current (A)	Rated continuous current I_H (A)	50% overload current (A)	Maximum current I_S (A)	10% overload P (kW)	50% overload P (kW)		
525-690 V 50/60 Hz	2 x NXC 0920 6 A 2 L 0 SSF	1748	1920	1500	2337	2679	1710	1520	2 x FR13	1406 x 2275 x 605/1250
	2 x NXC 1030 6 A 2 L 0 SSF	1810	2000	1500	2337	2679	1710	1520		
	2 x NXC 1180 6 A 2 L 0 SSF*	1950	2140	1630	2500	3335	1900	1610		
	3 x NXC 0920 6 A 2 L 0 SSF	2622	2884	2337	3490	4019	2500	2200	3 x FR13	1406 x 2275 x 605/1250
	3 x NXC 1030 6 A 2 L 0 SSF	2706	3000	2337	3490	4019	2500	2200		
	3 x NXC 1180 6 A 2 L 0 SSF*	2910	3210	2500	3735	5002	2800	2410		

* max. ambient temperature of +35°C.
values are given at switching frequency 2.0 kHz.

VACON® NXP WALL-MOUNTED

The VACON NXP Wall-Mounted is one of the most compact and comprehensive drive packages on the market, with all the necessary components integrated in a single frame. For the lower power range, VACON NXP drives are available in a compact IP21 or IP54 frame.

FULLY EQUIPPED

VACON NXP wall-mounted units are equipped with internal EMC filtering, and the power electronics are integrated into an all-metal frame. The smaller frame sizes (FR4-FR6) have an integrated brake chopper as standard, and the 380-500 V units can be equipped with an integrated brake resistor. The larger frames (FR7-FR12) can be equipped with an integrated brake chopper as an option.

FEATURES

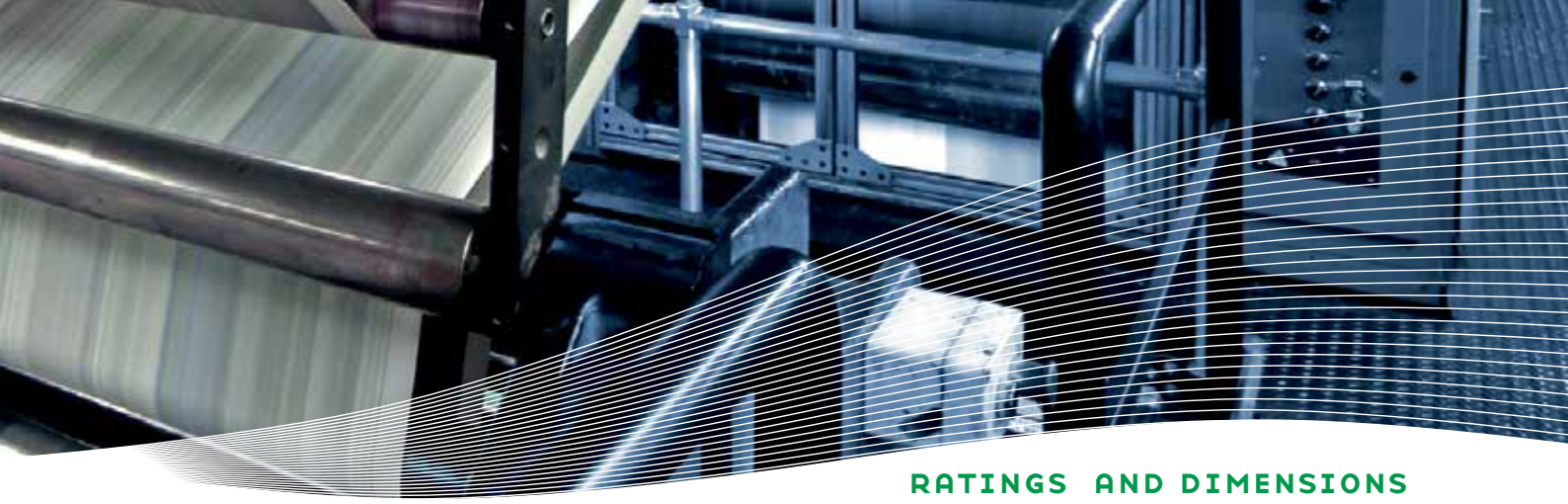
- Complete voltage range 230...690 VAC
- Removable panel with parameter back-up function
- Common control board
- Built-in I/O expandability, 5 slots available and option boards in all frame sizes
- Marine type approvals and functional safety features
- Integrated brake chopper as standard in FR4-6, 380-500 V units.

BENEFITS

- One type of drive for wide power and voltage range reduces the complexity and the need for additional training
- Easier commissioning – saves time
- Same software tools and applications for the entire range
- Compact and and easy to install – saves time and money
- System complexity can be reduced saving engineering time and costs

VACON NXP (FR8)

VACON NXP (FR7)



RATINGS AND DIMENSIONS

Mains voltage	AC drive type	Loadability					Motor shaft power		Frame size	Dimensions and weight W x H x D (mm)/ kg
		Low (+40°C)		High (+50°C)		Maximum current I_S	230 V / 400 V / 690 V			
		Rated continuous current I_L (A)	10% overload current (A)	Rated continuous current I_H (A)	50% overload current (A)		10% overload P (kW)	50% overload P (kW)		
208-240 V 50/60 Hz 3~	NXP 0003 2 A 2 H 1 S S S	3.7	4.1	2.4	3.6	4.8	0.55	0.37	FR4	128 x 292 x 190/ 5
	NXP 0004 2 A 2 H 1 S S S	4.8	5.3	3.7	5.6	7.4	0.75	0.55		
	NXP 0007 2 A 2 H 1 S S S	6.6	7.3	4.8	7.2	9.6	1.1	0.75		
	NXP 0008 2 A 2 H 1 S S S	7.8	8.6	6.6	9.9	13.2	1.5	1.1		
	NXP 0011 2 A 2 H 1 S S S	11	12.1	7.8	11.7	15.6	2.2	1.5		
	NXP 0012 2 A 2 H 1 S S S	12.5	13.8	11	16.5	22	3	2.2		
	NXP 0017 2 A 2 H 1 S S S	17.5	19.3	12.5	18.8	25	4	3	FR5	144 x 391 x 214/ 8.1
	NXP 0025 2 A 2 H 1 S S S	25	27.5	17.5	26.3	35	5.5	4		
	NXP 0031 2 A 2 H 1 S S S	31	34.1	25	37.5	50	7.5	5.5		
	NXP 0048 2 A 2 H 1 S S S	48	52.8	31	46.5	62	11	7.5	FR6	195 x 519 x 237/ 18.5
	NXP 0061 2 A 2 H 1 S S S	61	67.1	48	72	96	15	11		
	NXP 0075 2 A 2 H 0 S S S	75	83	61	92	122	22	15	FR7	237 x 591 x 257/ 35
	NXP 0088 2 A 2 H 0 S S S	88	97	75	113	150	22	22		
	NXP 0114 2 A 2 H 0 S S S	114	125	88	132	176	30	22		
	NXP 0140 2 A 2 H 0 S S S	140	154	105	158	210	37	30	FR8	291 x 758 x 344 / 58
	NXP 0170 2 A 2 H 0 S S S	170	187	140	210	280	45	37		
	NXP 0205 2 A 2 H 0 S S S	205	226	170	255	336	55	45		
	NXP 0261 2 A 2 H 0 S S F	261	287	205	308	349	75	55	FR9	480 x 1150 x 362/ 146
	NXP 0300 2 A 2 H 0 S S F	300	330	245	368	444	90	75		
380-500 V 50/60 Hz 3~	NXP 0003 5 A 2 H 1 S S S	3.3	3.6	2.2	3.3	4.4	1.1	0.75	FR4	128 x 292 x 190/ 5
	NXP 0004 5 A 2 H 1 S S S	4.3	4.7	3.3	5	6.2	1.5	1.1		
	NXP 0005 5 A 2 H 1 S S S	5.6	6.2	4.3	6.5	8.6	2.2	1.5		
	NXP 0007 5 A 2 H 1 S S S	7.6	8.4	5.6	8.4	10.8	3	2.2		
	NXP 0009 5 A 2 H 1 S S S	9	9.9	7.6	11.4	14	4	3		
	NXP 0012 5 A 2 H 1 S S S	12	13.2	9	13.5	18	5.5	4		
	NXP 0016 5 A 2 H 1 S S S	16	17.6	12	18	24	7.5	5.5	FR5	144 x 391 x 214/8.1
	NXP 0022 5 A 2 H 1 S S S	23	25.3	16	24	32	11	7.5		
	NXP 0031 5 A 2 H 1 S S S	31	34	23	35	46	15	11		
	NXP 0038 5 A 2 H 1 S S S	38	42	31	47	62	18.5	15	FR6	195 x 519 x 237/18.5
	NXP 0045 5 A 2 H 1 S S S	46	51	38	57	76	22	18.5		
	NXP 0061 5 A 2 H 1 S S S	61	67	46	69	92	30	22		
	NXP 0072 5 A 2 H 0 S S S	72	79	61	92	122	37	30	FR7	237 x 591 x 257/35
	NXP 0087 5 A 2 H 0 S S S	87	96	72	108	144	45	37		
	NXP 0105 5 A 2 H 0 S S S	105	116	87	131	174	55	45		
	NXP 0140 5 A 2 H 0 S S S	140	154	105	158	210	75	55	FR8	291 x 758 x 344/58
	NXP 0168 5 A 2 H 0 S S S	170	187	140	210	280	90	75		
	NXP 0205 5 A 2 H 0 S S S	205	226	170	255	336	110	90		
	NXP 0261 5 A 2 H 0 S S F	261	287	205	308	349	132	110	FR9	480 x 1150 x 362/146
	NXP 0300 5 A 2 H 0 S S F	300	330	245	368	444	160	132		
525-690 V 50/60 Hz 3~	NXP 0004 6 A 2 L 0 S S S	4.5	5	3.2	4.8	6.4	3	2.2	FR6	195 x 519 x 237/18.5
	NXP 0005 6 A 2 L 0 S S S	5.5	6.1	4.5	6.8	9.0	4	3		
	NXP 0007 6 A 2 L 0 S S S	7.5	8.3	5.5	8.3	11	5.5	4		
	NXP 0010 6 A 2 L 0 S S S	10	11	7.5	11.3	15	7.5	5.5		
	NXP 0013 6 A 2 L 0 S S S	13.5	14.9	10	15	20	11	7.5		
	NXP 0018 6 A 2 L 0 S S S	18	19.8	13.5	20.3	27	15	11		
	NXP 0022 6 A 2 L 0 S S S	22	24.2	18	27	36	18.5	15		
	NXP 0027 6 A 2 L 0 S S S	27	29.7	22	33	44	22	18.5		
	NXP 0034 6 A 2 L 0 S S S	34	37	27	41	54	30	22		
	NXP 0041 6 A 2 L 0 S S S	41	45	34	51	68	37.5	30	FR7	237 x 591 x 257/35
	NXP 0052 6 A 2 L 0 S S S	52	57	41	62	82	45	37.5		
	NXP 0062 6 A 2 L 0 S S S	62	68	52	78	104	55	45	FR8	291 x 758 x 344/58
	NXP 0080 6 A 2 L 0 S S S	80	88	62	93	124	75	55		
	NXP 0100 6 A 2 L 0 S S S	100	110	80	120	160	90	75		
	NXP 0125 6 A 2 L 0 S S F	125	138	100	150	200	110	90	FR9	480 x 1150 x 362/146
	NXP 0144 6 A 2 L 0 S S F	144	158	125	188	213	132	110		
	NXP 0170 6 A 2 L 0 S S F	170	187	144	216	245	160	132		
	NXP 0208 6 A 2 L 0 S S F	208	229	170	255	289	200	160		

TYPICAL APPLICATIONS

- Elevators & escalators
- Cranes & hoists
- Winches & cargo pumps
- Pumps & fans
- Conveyors
- Machine tools
- Yaw & pitch control
- Oil pumps
- Winders & unwinders
- Pulp dryers
- Tissue machinery
- Extruders

VACON® NXP DRIVE MODULE

VACON NXP high-power IP00 drive modules are intended for installation into a enclosure, switchgear or any separate enclosure. Module installation in standard enclosures is easy given the compact design.

DESIGNED TO FIT

VACON NXP drive modules of frame size FR10 - FR12 embody one (FR10 and FR11) or two (FR12) power modules. NXP frame sizes FR13 - FR14 comprise two to four non-regenerative front-end (NFE) units and one (FR13) or two (FR14) inverter units. External AC-chokes are also included in the delivery. The NXP modules are available as both 6-pulse and 12-pulse supply versions.

FEATURES

- Easy enclosure integration with additional assembly kits
- One of the smallest on the market
- Extensive marine type approvals
- DriveSynch features for high power or/and redundancy

BENEFITS

- With optimized module design, less engineering is needed saving time and money
- Compact module size require less enclosure space, while reducing the overall costs
- Improved redundancy and higher powers up to 5.0 MW

VACON NXP DRIVE MODULE (FR10)

HARDWARE CONFIGURATIONS

Function	Availability
Integrated control	Standard
External control	Optional
Integrated brake chopper	Optional (FR 10-12)
6-Pulse Supply	Standard
12-Pulse Supply	Optional
EMC filtering N	Standard
EMC filtering T (for IT -networks)	Optional
AC choke	Standard
Output filters Du/dt, Sine and common mode	Optional

RATINGS AND DIMENSIONS

Mains voltage	AC drive type	Loadability					Motor shaft power		Frame size	Module W x H x D (mm)/ kg	Chokes W x H x D (mm)/ kg
		Low (+40°C)		High (+40°C)		Maximum current I_S	400 V / 690 V				
		Rated continuous current I_L (A)	10% overload current (A)	Rated continuous current I_H (A)	50% overload current (A)		10% overload P (kW)	50% overload P (kW)			
380-500 V 50/60 Hz 3~	NXP 0385 5 A 0 N 0 SSA	385	424	300	450	540	200	160	FR10	500 x 1165 x 506/120	350 x 383 x 262/84 [1]
	NXP 0460 5 A 0 N 0 SSA	460	506	385	578	693	250	200			497 x 399 x 244/115 [1]
	NXP 0520 5 A 0 N 0 SSA	520	572	460	690	828	250	250			497 x 399 x 244/115 [1]
	NXP 0590 5 A 0 N 0 SSA	590	649	520	780	936	315	250	FR11	709 x 1206 x 506/210	2x (350 x 383 x 262/ 84)
	NXP 0650 5 A 0 N 0 SSA	650	715	590	885	1062	355	315			
	NXP 0730 5 A 0 N 0 SSA	730	803	650	975	1170	400	355			
	NXP 0820 5 A 0 N 0 SSA	820	902	730	1095	1314	450	400	FR12	2x (500 x 1165 x 506/120)	2x (497 x 399 x 244/115)
	NXP 0920 5 A 0 N 0 SSA	920	1012	820	1230	1476	500	450			
	NXP 1030 5 A 0 N 0 SSA	1030	1133	920	1380	1656	560	500			
	NXP 1150 5 A 0 N 0 SSF	1150	1265	1030	1545	1854	630	560	FR13	2x (239 x 1030 x 372/67)+ 1x (708 x 1030 x 553/302)	2x (497 x 449 x 249/130)
	NXP 1300 5 A 0 N 0 SSF	1300	1430	1150	1725	2070	710	630		3x (239 x 1030 x 372/67)+ 1x (708 x 1030 x 553/302) [2]	3x(497 x 449 x 249/130) [2]
	NXP 1450 5 A 0 N 0 SSF	1450	1595	1300	1950	2340	800	710		3x (239 x 1030 x 372/67) + 1x (708 x 1030 x 553/302) [2]	3x(497 x 449 x 249/130) [2]
	NXP 1770 5 A 0 N 0 SSF	1770	1947	1600	2400	2880	1000	900	FR14	4x (239 x 1030 x 372/67) + 2x (708 x 1032 x 553/302)	4x (497 x 449 x 249/130)
	NXP 2150 5 A 0 N 0 SSF	2150	2365	1940	2910	3492	1200	1100		4x (239 x 1030 x 372/67) + 2x (708 x 1032 x 553/302)	4x (497 x 449 x 249/130)
525-690 V 50/60 Hz 3~	NXP 0261 6 A 0 N 0 SSA	261	287	208	312	375	250	200	FR10	500 x 1165 x 506/120	354 x 319 x 230/53 [3]
	NXP 0325 6 A 0 N 0 SSA	325	358	261	392	470	315	250		500 x 1165 x 506/120	350 x 383 x 262/84 [3]
	NXP 0385 6 A 0 N 0 SSA	385	424	325	488	585	355	315		500 x 1165 x 506/120	350 x 383 x 262/84 [3]
	NXP 0416 6 A 0 N 0 SSA*	416	458	325	488	585	400	315		500 x 1165 x 506/120	350 x 383 x 262/84 [3]
	NXP 0460 6 A 0 N 0 SSA	460	506	385	578	693	450	355	FR11	709 x 1206 x 506/210	497 x 399 x 244/115 [4]
	NXP 0502 6 A 0 N 0 SSA	502	552	460	690	828	500	450		709 x 1206 x 506/210	497 x 399 x 244/115 [4]
	NXP 0590 6 A 0 N 0 SSA*	590	649	502	753	904	560	500		709 x 1206 x 506/210	2 x (350 x 383 x 262/84)
	NXP 0650 6 A 0 N 0 SSA	650	715	590	885	1062	630	560	FR12	2x(500 x 1165 x 506/120)	2x (350 x 383 x 262/84)
	NXP 0750 6 A 0 N 0 SSA	750	825	650	975	1170	710	630		2x (500 x 1165 x 506/120)	2x (350 x 383 x 262/84)
	NXP 0820 6 A 0 N 0 SSA*	820	902	650	975	1170	800	630		2x (500 x 1165 x 506/120)	2x (350 x 383 x 262/84)
	NXP 0920 6 A 0 N 0 SSF	920	820	820	1230	1410	900	800	FR13	2x (239 x 1030 x 372/67) + 1x (708 x 1030 x 553/302)	2x (497 x 449 x 249/130)
	NXP 1030 6 A 0 N 0 SSF	1030	920	920	1380	1755	1000	900		2x (239 x 1030 x 372/67)+ 1x (708 x 1030 x 553/302)	2x (497 x 449 x 249/130)
	NXP 1180 6 A 0 N 0 SSF*	1180	1030	1030	1463	1755	1150	1000		2x (239 x 1030 x 372/67)+ 1x (708 x 1030 x 553/302)	2x (497 x 449 x 249/130)
	NXP 1500 6 A 0 N 0 SSF	1500	1300	1300	1950	2340	1500	1300	FR14	3x (239 x 1030 x 372/67)+ 2x (708 x 103 x 553/302) [3]	3x (497 x 449 x 249/130) [5]
	NXP 1900 6 A 0 N 0 SSF	1900	1500	1500	2250	2700	1800	1500		4x (239 x 1030 x 372/67)+ 2x (708 x 1030 x 553/302)	4x (497 x 449 x 249/130)
	NXP 2250 6 A 0 N 0 SSF*	2250	1900	1900	2782	3335	2000	1800		4x (239 x 1030 x 372/67)+ 2x (708 x 1030 x 553/302)	4x (497 x 449 x 249/130)

***** max. ambient temperature of +35°C **1)** 12-pulse units, 2x(354*319*230/ 53 kg) **2)** 12-pulse units, 4x (497 x 449 x 249/130) **3)** 12-pulse units, 2x (354 x 319 x 230/53 kg)
4) 12-pulse units, 4x(239 x 1030 x 372/67) +2x (708 x 1030 x 372/302) **5)** 12-pulse units, 4x (497 x 449 x 249/130)

TYPICAL APPLICATIONS

- Conveyors
- Cranes & lifts
- High-speed compressors
- Ski lifts
- Main propulsion & bow thrusters
- Extruders
- Winches & cargo pumps
- Oil pumps
- Test benches
- Static power supply
- Grinders & mixers
- Winders & unwinders
- Chippers
- Tunneling Machines

VACON® NXP STANDALONE

Premium VACON NXP drives are also available in standalone IP21 or IP54 enclosures. These units are delivered in a compact enclosure, making them perfect for areas with limited space, while still providing full NXP control flexibility.

ROBUST AND RELIABLE

VACON NXP standalone drives are fully enclosed at the factory and ready for immediate installation. The drive is ideal for pumps, fans and other single drive applications. The drive has integrated fuses as standard and no extra protection components are required. It is also possible to equip the drive with an optional integrated load switch, which further simplifies handling in the field.

FEATURES

- Extremely compact enclosure enclosure
- Delivered with ultra rapid AC-fuses
- Optional built-in brake chopper and DC-link connectors

BENEFITS

- Maximize the utilization of available space while reducing the overall costs
- No need to consider any additional protection components

VACON NXP STANDALONE (FR11)

HARDWARE CONFIGURATIONS

Function	Availability
IP21	Standard
IP54 (FR10 only)	Optional (H: +20mm)
Integrated ultra rapid fuses	Standard
Load switch (IEC or UL version)	Optional
EMC filtering L (EN 61800-3, category C3)	Standard
EMC filtering T (for IT -networks)	Optional
Brake chopper (cabling top entry)	Optional (H: +122 mm)

RATINGS AND DIMENSIONS

Mains voltage	AC drive type	Loadability					Motor shaft power		Frame size	Dimensions & weight W x H x D (mm)/ kg
		Low (+40°C)		High (+40°C)		Maximum current I S	400 V / 690 V			
		Rated continuous current I L (A)	10% overload current (A)	Rated continuous current I H (A)	50% overload current (A)		10% overload P (kW)	50% overload P (kW)		
380-500 V 50/60 Hz 3~	NXP 0385 5 A 2 L 0 SSA	385	424	300	450	540	200	160	FR10	595 x 2020 x 602/340
	NXP 0460 5 A 2 L 0 SSA	460	506	385	578	693	250	200		
	NXP 0520 5 A 2 L 0 SSA	520	572	460	690	828	250	250		
	NXP 0590 5 A 2 L 0 SSA	590	649	520	780	936	315	250	FR11	794 x 2020 x 602/470
	NXP 0650 5 A 2 L 0 SSA	650	715	590	885	1062	355	315		
	NXP 0730 5 A 2 L 0 SSA	730	803	650	975	1170	400	355		
525-690 V 50/60 Hz 3~	NXP 0261 6 A 2 L 0 SSA	261	287	208	312	375	250	200	FR10	595 x 2020 x 602/340
	NXP 0325 6 A 2 L 0 SSA	325	358	261	392	470	315	250		
	NXP 0385 6 A 2 L 0 SSA	385	424	325	488	585	355	315		
	NXP 0416 6 A 2 L 0 SSA*	416	458	325	488	585	400	315		
	NXP 0460 6 A 2 L 0 SSA	460	506	385	578	693	450	355	FR11	794 x 2020 x 602/400
	NXP 0502 6 A 2 L 0 SSA	502	552	460	690	828	500	450		794 x 2020 x 602/400
	NXP 0590 6 A 2 L 0 SSA*	590	649	502	753	904	560	500		794 x 2020 x 602/470

* max. ambient temperature of +35°C

TYPICAL APPLICATIONS

- Auxiliary equipment
- Pump & fans
- Main propulsion & bow thrusters
- Compressors
- Cranes & lifts

VACON® NXC

Our VACON NXC is designed to meet the most demanding requirements for flexibility, robustness, compactness and service-friendliness. It is a safe choice for any application and available in the 160 to 2000 kW power range and 380-500 V, 500-690 V voltage range.

EXCEPTIONAL PERFORMANCE

Our enclosed VACON NXC variable speed AC drives are compact and well tested to meet harsh operating conditions. They are typically put to work in segments, such as mining, oil & gas, water & wastewater. The reliable thermal handling of the enclosure guarantees extended lifetime of the frequency converter and trouble-free operation in tough environments. Approved EMC solutions ensure reliable operation of the converter without disturbing other electrical equipment.

USER-FRIENDLY

VACON NXC features an easily accessible control compartment for relays, auxiliary terminals and other equipment and ample space around the power terminals allows for easy installation and connection of power cables. Our trademark handy keypad is located on the door with additional door options including indicators, meters and switches. Bottom plates and earthing claps for 360 degree earthing of motor cables are provided as standard.

SERVICE-FRIENDLY

VACON NXC enclosures are easy to install with lifting lugs for easy handling and can be wall-mounted or free-standing. VACON NXP power units are rail-mounted for easy pull-out, and the optional pull-out jig enables hassle-free servicing of the power unit. No additional cooling fans are required in the enclosure IP21/IP54 and the fans can be easily replaced without having to remove the power unit.

VACON NXC (FR10)

FEATURES

- Robust and tested design
- Wide range of standard options
- One of the most compact on the market
- Welded Rittal TS8 frame
- EMC approved (EN61800-3, 2nd env.)
- Service concept with pullout jig
- No additional fans in IP54 enclosure

BENEFITS

- Trouble free installation and operation
- Adapts to your needs w/o engineering
- Easy to fit into small spaces
- Global enclosure availability, easy to extend
- Fast service, easy maintenance

RATINGS AND DIMENSIONS

VACON NXC, 6-PULSE SUPPLY

Mains Voltage	AC drive type	Loadability					Motor shaft power		Frame size	Dimensions & weight W x H x D (mm)/ kg
		Low (+40°C)		High (+40°C)		Maximum current I_S	400 V / 690 V			
		Rated continuous current I_L (A)	10% overload current (A)	Rated continuous current I_H (A)	50% overload current (A)		10% overload P (kW)	50% overload P (kW)		
380-500 V 50/60 Hz 3~	NXC 0261 5 A 2 H 0 SSF	261	287	205	308	349	132	110	FR9	606 x 2275 x 605/371
	NXC 0300 5 A 2 H 0 SSF	300	330	245	368	444	160	132		
	NXC 0385 5 A 2 L 0 SSF	385	424	300	450	540	200	160	FR10	606 x 2275 x 605/403
	NXC 0460 5 A 2 L 0 SSF	460	506	385	578	693	250	200		
	NXC 0520 5 A 2 L 0 SSF	520	572	460	690	828	250	250		
	NXC 0590 5 A 2 L 0 SSF	590	649	520	780	936	315	250	FR11	806 x 2275 x 605/577
	NXC 0650 5 A 2 L 0 SSF	650	715	590	885	1062	355	315		
	NXC 0730 5 A 2 L 0 SSF	730	803	650	975	1170	400	355		
	NXC 0820 5 A 2 L 0 SSF	820	902	730	1095	1314	450	400	FR12	1206 x 2275 x 605/810
	NXC 0920 5 A 2 L 0 SSF	920	1012	820	1230	1476	500	450		
	NXC 1030 5 A 2 L 0 SSF	1030	1133	920	1380	1656	560	500		
	NXC 1150 5 A 2 L 0 SSF	1150	1265	1030	1545	1854	630	560	FR13	1406 x 2275 x 605/1000
	NXC 1300 5 A 2 L 0 SSF	1300	1430	1150	1725	2070	710	630		1606 x 2275 x 605/1150
	NXC 1450 5 A 2 L 0 SSF	1450	1595	1300	1950	2340	800	710		1606 x 2275 x 605/1150
	NXC 1770 5 A 2 L 0 SSF	1770	1947	1600	2400	2880	1000	900	FR14	2806 x 2275 x 605/2440
	NXC 2150 5 A 2 L 0 SSF	2150	2365	1940	2910	3492	1200	1100		
525-690 V 50/60 Hz 3~	NXC 0125 6 A 2 L 0 SSF	125	138	100	150	200	110	90	FR9	606 x 2275 x 605/371
	NXC 0144 6 A 2 L 0 SSF	144	158	125	188	213	132	110		
	NXC 0170 6 A 2 L 0 SSF	170	187	144	216	245	160	132		
	NXC 0208 6 A 2 L 0 SSF	208	229	170	255	289	200	160		
	NXC 0261 6 A 2 L 0 SSF	261	287	208	312	375	250	200	FR10	606 x 2275 x 605/371
	NXC 0325 6 A 2 L 0 SSF	325	358	261	392	470	315	250		
	NXC 0385 6 A 2 L 0 SSF	385	424	325	488	585	355	315		
	NXC 0416 6 A 2 L 0 SSF*	416	458	325	488	585	400	315		
	NXC 0460 6 A 2 L 0 SSF	460	506	385	578	693	450	355	FR11	806 x 2275 x 605/524
	NXC 0502 6 A 2 L 0 SSF	502	552	460	690	828	500	450		806 x 2275 x 605/577
	NXC 0590 6 A 2 L 0 SSF*	590	649	502	753	904	560	500		
	NXC 0650 6 A 2 L 0 SSF	650	715	590	885	1062	630	560	FR12	1206 x 2275 x 605/745
	NXC 0750 6 A 2 L 0 SSF	750	825	650	975	1170	710	630		
	NXC 0820 6 A 2 L 0 SSF*	820	902	650	975	1170	800	630		
	NXC 0920 6 A 2 L 0 SSF	920	1012	820	1230	1410	900	800	FR13	1406 x 2275 x 605/1000
	NXC 1030 6 A 2 L 0 SSF	1030	1133	920	1380	1755	1000	900		
	NXC 1180 6 A 2 L 0 SSF*	1180	1298	1030	1463	1755	1150	1000		
	NXC 1500 6 A 2 L 0 SSF	1500	1650	1300	1950	2340	1500	1300	FR14	2406 x 2275 x 605/2350
	NXC 1900 6 A 2 L 0 SSF	1900	2090	1500	2250	2700	1800	1500		2806 x 2275 x 605/2440
	NXC 2250 6 A 2 L 0 SSF*	2250	2475	1900	2782	3335	2000	1800		2806 x 2275 x 605/2500

* max. ambient temperature of +35°C

TYPICAL APPLICATIONS

- Pumps & fans
- Extruders
- Main propulsion & bow thrusters
- Wood handling machines
- Conveyors & crushers
- Feeders & mixers
- Test benches
- Water treatment
- Winches
- Compressors
- Static power supply
- Industrial elevators

RATINGS AND DIMENSIONS

VACON NXC, 12-PULSE SUPPLY

Mains Voltage	AC drive type	Loadability					Motor shaft power		Frame size	Dimensions and weight W x H x D (mm)/ kg
		Low (+40°C)		High (+40°C)			400 V / 690 V			
		Rated continuous current I_L (A)	10% overload current (A)	Rated continuous current I_H (A)	50% overload current (A)	Maximum current I_S	10% overload P (kW)	50% overload P (kW)		
380-500 V 50/60 Hz 3~	NXC 0385 5 A 2 L 0 TSF	385	424	300	450	540	200	160	FR10	606 x 2275 x 605/371
	NXC 0460 5 A 2 L 0 TSF	460	506	385	578	693	250	200		606 x 2275 x 605/403
	NXC 0520 5 A 2 L 0 TSF	520	572	460	690	828	250	250		606 x 2275 x 605/403
	NXC 0590 5 A 2 L 0 TSF	590	649	520	780	936	315	250	FR11	806 x 2275 x 605/ 577
	NXC 0650 5 A 2 L 0 TSF	650	715	590	885	1062	355	315		806 x 2275 x 605/577
	NXC 0730 5 A 2 L 0 TSF	730	803	650	975	1170	400	355		806 x 2275 x 605/577
	NXC 0820 5 A 2 L 0 TSF	820	902	730	1095	1314	450	400	FR12	1206 x 2275 x 605/810
	NXC 0920 5 A 2 L 0 TSF	920	1012	820	1230	1476	500	450		1206 x 2275 x 605/810
	NXC 1030 5 A 2 L 0 TSF	1030	1133	920	1380	1656	560	500		1206 x 2275 x 605/810
	NXC 1150 5 A 2 L 0 TSF	1150	1265	1030	1545	1854	630	560	FR13	1406 x 2275 x 605/1000
	NXC 1300 5 A 2 L 0 TSF	1300	1430	1150	1725	2070	710	630		2006 x 2275 x 605/1150
	NXC 1450 5 A 2 L 0 TSF	1450	1595	1300	1950	2340	800	710		2006 x 2275 x 605/1150
	NXC 1770 5 A 2 L 0 TSF	1770	1947	1600	2400	2880	1000	900	FR14	2806 x 2275 x 605/2440
	NXC 2150 5 A 2 L 0 TSF	2150	2365	1940	2910	3492	1200	1100		2806 x 2275 x 605/2500
525-690 V 50/60 Hz 3~	NXC 0261 6 A 2 L 0 TSF	261	287	208	312	375	250	200	FR10	606 x 2275 x 605/341
	NXC 0325 6 A 2 L 0 TSF	325	358	261	392	470	315	250		606 x 2275 x 605/371
	NXC 0385 6 A 2 L 0 TSF	385	424	325	488	585	355	315		606 x 2275 x 605/371
	NXC 0416 6 A 2 L 0 TSF*	416	458	325	488	585	400	315		606 x 2275 x 605/403
	NXC 0460 6 A 2 L 0 TSF	460	506	385	578	693	450	355	FR11	806 x 2275 x 605/524
	NXC 0502 6 A 2 L 0 TSF	502	552	460	690	828	500	450		806 x 2275 x 605/524
	NXC 0590 6 A 2 L 0 TSF*	590	649	502	753	904	560	500		806 x 2275 x 605/577
	NXC 0650 6 A 2 L 0 TSF	650	715	590	885	1062	630	560	FR12	1206 x 2275 x 605/745
	NXC 0750 6 A 2 L 0 TSF	750	825	650	975	1170	710	630		1206 x 2275 x 605/745
	NXC 0820 6 A 2 L 0 TSF*	820	902	650	975	1170	800	630		1206 x 2275 x 605/745
	NXC 0920 6 A 2 L 0 TSF	920	1012	820	1230	1410	900	800	FR13	1406 x 2275 x 605/1000
	NXC 1030 6 A 2 L 0 TSF	1030	1133	920	1380	1755	1000	900		1406 x 2275 x 605/1000
	NXC 1180 6 A 2 L 0 TSF*	1180	1298	1030	1463	1755	1150	1000		1406 x 2275 x 605/1000
	NXC 1500 6 A 2 L 0 TSF	1500	1650	1300	1950	2340	1500	1300	FR14	2806 x 2275 x 605/2440
	NXC 1900 6 A 2 L 0 TSF	1900	2090	1500	2250	2700	1800	1500		2806 x 2275 x 605/2440
	NXC 2250 6 A 2 L 0 TSF*	2250	2475	1900	2782	3335	2000	1800		2806 x 2275 x 605/2500

* max. ambient temperature of +35°C

HARDWARE CONFIGURATIONS, 6-PULSE SUPPLY

6-pulse	Enclosure		EMC			Brake chopper	Cabling		Input device					Output filters		
380-500 V	IP21	IP54	L	T	H		Bottom	Top +CIT/+COT	+IFU	+ILS	+IFD	+ICO	+ICB	+OCM/ +OCH	+ODU	+OSI
FR9	S	O (H: +130)	S	O	-	O	S	O (W: +400)	O	O	O	O	O	O	O	O(W: +600)
FR10	S	O (H: +130)	S	O	-	O	S	O (W: +400)	O	O	O	O	O	O	O (W: +400)	O(W: +600)
FR11	S	O (H: +130)*	S	O	-	O	S	O (W: +400)	O	O	O	O	O	O	O (W: +400)	O(W: +600-800)
FR12	S	O (H: +130)	S	O	-	O	S	O (W: +400)	O	O	O	O	O	O	O (W: +400)	O(W: +1200)
FR13	S	O (H: +170)	S	O	-	[1]	S	O (W: +400)	-	-	S	-	O	O	O	O(W: +800)
FR14	S	O (H: +170)	S	O	-	[1]	S	O (W: +600)	-	-	-	-	S	O	S	O(W: +1600)
500-690 V																
FR9	S	O (H: +130)	S	O	-	O	S	O (W: +400)	O	O	O	O	O	O	O	O(W: +600)
FR10	S	O (H: +130)	S	O	-	O	S	O (W: +400)	O	O	O	O	O	O	O (W: +400)	O(W: +600)
FR11	S	O (H: +130)*	S	O	-	O	S	O (W: +400)	O	O	O	O	O	O	O (W: +400)	O(W: +600-800)
FR12	S	O (H: +130)	S	O	-	O	S	O (W: +400)	O	O	O	O	O	O	O (W: +400)	O(W: +1200)
FR13	S	O (H: +170)	S	O	-	[1]	S	O (W: +400)	-	-	S	-	O	O	O	O(W: +800)
FR14	S	O (H: +170)	S	O	-	[1]	S	O (W: +600)	-	-	-	-	S	O	S	O(W: +1600)

S = Standard **O =** Optional [1] **(W: +400) =** Contact factory ***** NXC07305 and NXC05906, H: +170 mm

HARDWARE CONFIGURATIONS, 12-PULSE SUPPLY

12-pulse	Enclosure		EMC			Brake chopper	Cabling		Input device					Output filters		
380-500 V	IP21	IP54	L	T	H		Bottom	Top +CIT/+COT	+IFU	+ILS	+IFD	+ICO	+ICB	+OCM/ +OCH	+ODU	+OSI
FR10	S	O (H: +130)	S	O	-	-	S	O (W: +400)	O	-	-	-	O	O	O (W: +400)	O(W: +600)
FR11	S	O (H: +130)*	S	O	-	O	S	O (W: +400)	O	O	O	O	O	O	O (W: +400)	O(W: +600)
FR12	S	O (H: +130)	S	O	-	O	S	O (W: +400)	O	O	O	O	O	O	O (W: +400)	O(W: +1200)
FR13	S	O (H: +170)	S	O	-	[1]	S	O (W: +400)	-	-	-	-	S	O	O	O(W: +800)
FR14	S	O (H: +170)	S	O	-	[1]	S	O (W: +800)	-	-	-	-	S	O	S	O(W: +1600)
500-690 V																
FR10	S	O (H: +130)	S	O	-	-	S	O (W: +400)	O	-	-	-	O	O	O (W: +400)	O(W: +600)
FR11	S	O (H: +130)*	S	O	-	O	S	O (W: +400)	O	O	O	O	O	O	O (W: +400)	O(W: +600-800)
FR12	S	O (H: +130)	S	O	-	O	S	O (W: +400)	O	O	O	O	O	O	O (W: +400)	O(W: +1200)
FR13	S	O (H: +170)	S	O	-	[1]	S	O (W: +400)	-	-	-	-	S	O	O	O(W: +800)
FR14	S	O (H: +170)	S	O	-	[1]	S	O (W: +800)	-	-	-	-	S	O	S	O(W: +1600)

S = Standard **O =** Optional [1] **(W: +400) =** Contact factory ***** NXC07305 and NXC05906, H: +170 mm

PURE PERFORMANCE

Rising energy prices, environmental legislation and process improvement are key issues when designing water handling systems. Use of Vacon AC drives for flow and pressure control instead of dampers or valves gives substantial energy savings resulting in short payback time of the initial investment.

VACON® NXC LOW-HARMONIC

The VACON NXC low-harmonic drive is the perfect choice for applications where low-harmonics are required. This drive not only meets the most demanding requirements for clean power but also provides other important benefits such as regenerative braking and voltage boost for maximum output power.

CLEAN POWER SAVES MONEY

The low-harmonic enclosure drive offers an excellent total solution to meet even the most demanding power quality requirements. The drive also complies with the IEEE-519, G5/4 harmonic standards.

The low THDi reduces supply currents and allows supply transformers, protection devices and power cables to be dimensioned according to the actual active power. It creates savings for both new and retrofit projects as there's no need to invest in expensive 12- or 18-pulse transformers.

FEATURES

- Clean power with total current harmonics THDi < 5 %
- Over-dimensioning of power transformer or input cables is not required
- Regenerative function available
- Reducing system complexity
- No need for special 12-pulse transformers
- Well-suited for retrofit projects
- Increased flexibility with a wide range of standard options

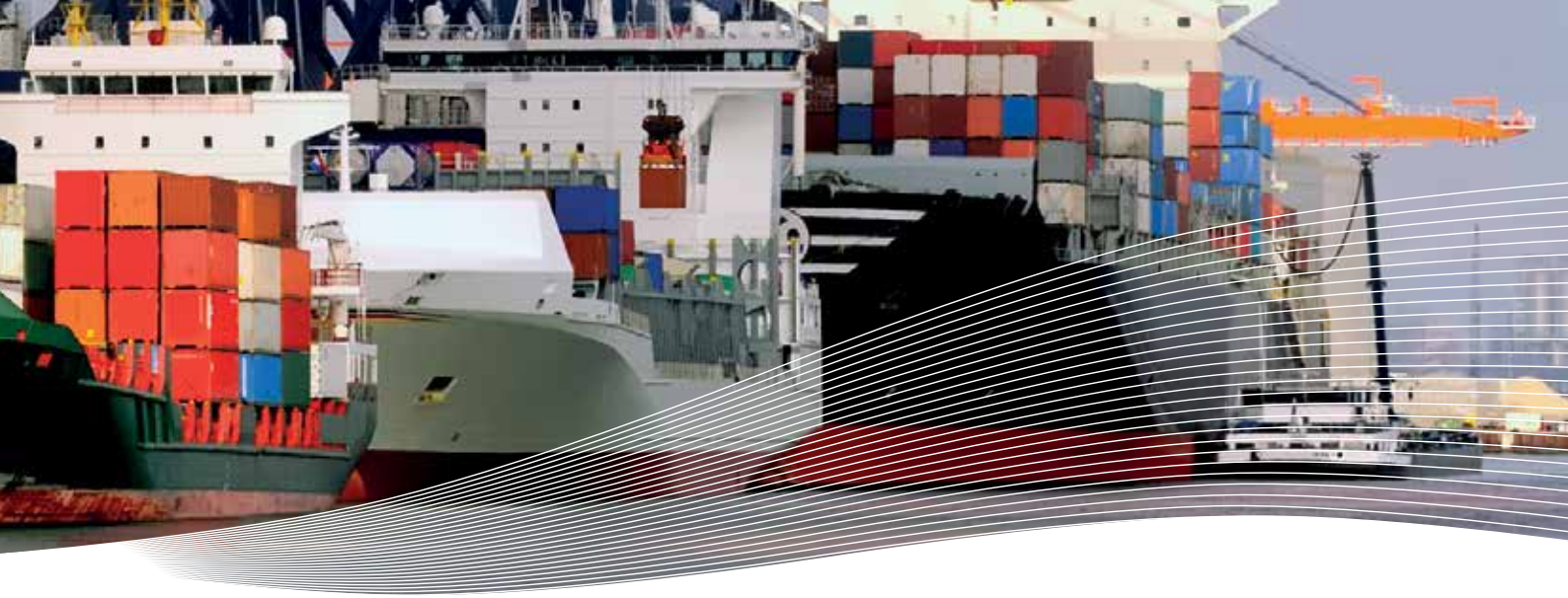
VACON NXC LOW-HARMONIC (AF10)

BENEFITS

- Over-dimensioning of input components is not needed, reducing the total costs
- Voltage boost function for maximum output power
- Braking energy can be fed back to network reducing energy costs
- Reduces overall investment costs and optimizes the use of available space

TYPICAL APPLICATIONS

- Pumps & fans
- Water treatment
- Thrusters & main propulsion
- Crushers & conveyors & mills
- Industrial elevators
- Test benches
- Sugar refineries



RATINGS AND DIMENSIONS

Mains voltage	Low-harmonic drive type	Loadability					Motor shaft power		Frame size	Dimensions & weight W x H x D (mm)/ kg
		Low (+40°C)		High (+40°C)			400 V / 690 V			
		Rated continuous current I_L (A)	10% overload current (A)	Rated continuous current I_H (A)	50% overload current (A)	Maximum current I_S (A)	10% overload P (kW)	50% overload P (kW)		
380-500 V 50/60 Hz	NXC 0261 5 A 2 L 0 RSF	261	287	205	308	349	132	110	AF9	1006 x 2275 x 605/680
	NXC 0300 5 A 2 L 0 RSF	300	330	245	368	444	160	132		
	NXC 0385 5 A 2 L 0 RSF	385	424	300	450	540	200	160	AF10	1006 x 2275 x 605/700
	NXC 0460 5 A 2 L 0 RSF	460	506	385	578	693	250	200		
	NXC 0520 5 A 2 L 0 RSF	520	572	460	690	828	250	250		
	NXC 0650 5 A 2 L 0 RSF	650	715	590	885	1062	355	315	AF12	2006 x 2275 x 605/1400
	NXC 0730 5 A 2 L 0 RSF	730	803	650	975	1170	400	355		
	NXC 0820 5 A 2 L 0 RSF	820	902	730	1095	1314	450	400		
	NXC 0920 5 A 2 L 0 RSF	920	1012	820	1230	1476	500	450		
	NXC 1030 5 A 2 L 0 RSF	1030	1133	920	1380	1656	560	500		
	NXC 1150 5 A 2 L 0 RSF	1150	1265	1030	1545	1854	630	560	AF13	2206 x 2275 x 605/1950
	NXC 1300 5 A 2 L 0 RSF	1300	1430	1150	1725	2070	710	630		
	NXC 1450 5 A 2 L 0 RSF	1450	1595	1300	1950	2340	800	710		
	NXC 1770 5 A 2 L 0 RSF	1770	1947	1600	2400	2880	1000	900	AF14	4406 x 2275 x 605/3900
	NXC 2150 5 A 2 L 0 RSF	2150	2365	1940	2910	3492	1200	1100		
	NXC 2700 5 A 2 L 0 RSF	2700	2970	2300	3278	3933	1500	1200		
525-690 V 50/60 Hz	NXC 0125 6 A 2 L 0 RSF	125	138	100	150	200	110	90	AF9	1006 x 2275 x 605/680
	NXC 0144 6 A 2 L 0 RSF	144	158	125	188	213	132	110		
	NXC 0170 6 A 2 L 0 RSF	170	187	144	216	245	160	132		
	NXC 0208 6 A 2 L 0 RSF*	208	229	170	255	289	200	160		
	NXC 0261 6 A 2 L 0 RSF	261	287	208	312	375	250	200	AF10	1006 x 2275 x 605/700
	NXC 0325 6 A 2 L 0 RSF	325	358	261	392	470	315	250		
	NXC 0385 6 A 2 L 0 RSF	385	424	325	488	585	355	315		
	NXC 0416 6 A 2 L 0 RSF*	416	416	325	488	585	400	315		
	NXC 0460 6 A 2 L 0 RSF	460	506	385	578	693	450	355	AF12	2006 x 2275 x 605/1400
	NXC 0502 6 A 2 L 0 RSF	502	552	460	690	828	500	450		
	NXC 0590 6 A 2 L 0 RSF	590	649	502	753	904	560	500		
	NXC 0650 6 A 2 L 0 RSF	650	715	590	885	1062	630	560		
	NXC 0750 6 A 2 L 0 RSF	750	825	650	975	1170	710	630		
	NXC 0820 6 A 2 L 0 RSF*	820	902	650	975	1170	750	650		
	NXC 0920 6 A 2 L 0 RSF	920	1012	820	1230	1476	900	800	AF13	2206 x 2275 x 605/1950
	NXC 1030 6 A 2 L 0 RSF	1030	1133	920	1380	1656	1000	900		
	NXC 1180 6 A 2 L 0 RSF*	1180	1298	1030	1463	1755	1150	1000		
	NXC 1500 6 A 2 L 0 RSF	1500	1650	1300	1950	2340	1500	1300	AF14	4406 x 2275 x 605/3900
	NXC 1900 6 A 2 L 0 RSF	1900	2090	1500	2250	2700	1800	1500		
	NXC 2250 6 A 2 L 0 RSF*	2250	2475	1900	2782	3335	2000	1800		

***** max. ambient temperature of +35˚C

HARDWARE CONFIGURATIONS

Active front-end	Enclosure		EMC		Brake chopper	Cabling		Input device		Output filters	
380-500 V	IP21	IP54	L	T		Bottom	Top +CIT/+COT	+ILS & +ICB	+OCM/ +OCH	+ODU	+OSI
AF9	S	O (H: +130)	S	O	* (W: +400)	S	O (W: +400)	S	O	O (W:+400)	O (W: +600)
AF10	S	O (H: +130)	S	O	* (W: +400)	S	O (W: +400)	S	O	O (W:+400)	O (W: +600)
AF12	S	O (H: +130)	S	O	* (W: +400)	S	O (W: +400)	S	O	O (W:+400)	O (W: +1200)
AF13	S	O (H: +170)	S	O	* (W: +400)	S	O (W: +400)	S	O	O	O (W: +800)
AF14	S	O (H: +170)	S	O	* (W: +400)	S	O (W: +600)	S	O	S	O (W: +1600)
525-690 V											
AF9	S	O (H: +130)	S	O	* (W: +400)	S	O (W: +400)	S	O	O (W:+400)	O (W: +600)
AF10	S	O (H: +130)	S	O	* (W: +400)	S	O (W: +400)	S	O	O (W:+400)	O (W: +600)
AF12	S	O (H: +130)	S	O	* (W: +400)	S	O (W: +400)	S	O	O (W:+400)	O (W: +1200)
AF13	S	O (H: +170)	S	O	* z(W: +400)	S	O (W: +400)	S	O	O	O (W: +800)
AF14	S	O (H: +170)	S	O	* (W: +400)	S	O (W: +600)	S	O	S	O (W: +1600)

***** Contact factory **S =** Standard **O =** Optional

TECHNICAL DATA

Mains connection	Input voltage U_{in}	208...240 V; 380...500 V; 525...690 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 (≥FR10 + 40°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
Control characteristics	Control performance	Open loop vector control (5-150% of base speed): speed control 0.5%, dynamic 0.3%sec, torque lin. <2%, torque rise time ~5 ms Closed loop vector control (entire speed range): speed control 0.01%, dynamic 0.2% sec, torque lin. <2%, torque rise time ~2 ms
	Switching frequency	NX_2/ NX_5: Up to and including NX_0061: 1...16 kHz; Factory default 10 kHz From NX_0072: 1...6 kHz; Factory default 3.6 kHz NX_6: 1...6 kHz; Factory default 1.5 kHz
	Field weakening point	8...320 Hz
	Acceleration time	0...3000 sec
	Deceleration time	0...3000 sec
	Braking	DC brake: 30% of T_N (without brake resistor), flux braking
Ambient conditions	Ambient operating temperature	–10°C (no frost)...+50°C: I_H (≥FR10 + 40°C) –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 60721-3-3, unit in operation, class 3C3 (tested in accordance with IEC60068-2-60, Method I C CH_2 and SO_2) IEC 60721-3-3, 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. 4866 m (690 V max. 2000 m)
	Vibration EN 50178/EN 60068-2-6	5...150 Hz: Displacement amplitude 1 mm (peak) at 5...15.8 Hz (≥FR10: 0.25 mm (peak) at 5...31 Hz) Max acceleration amplitude 1 G at 15.8...150 Hz (≥FR10: 1 G at 31...150 Hz)
	Shock EN 50178, EN 60068-2-27	UPS Drop Test (for applicable UPS weights) Storage and shipping: max 15 G, 11 ms (in package)
EMC	Immunity	Fulfils all EMC immunity requirements
	Emissions	EMC level C: EN 61800-3, category C1 EMC level H: EN 61800-3, category C2 EMC level L: EN 61800-3, category C3 EMC level T: Low earth-current solution is suitable for IT networks, (can be modified from L/H-level units)
Safety		EN 50178, EN/IEC 60204-1, IEC 61800-5-1, CE, UL, CUL; (see unit nameplate for more details)
Functional safety *	STO SS1 ATEX Thermistor input	EN/IEC 61800-5-2 Safe Torque Off (STO) SIL2, EN ISO 13849-1 PL"d" Category 3, EN 62061: SILCL2, IEC 61508: SIL2. EN /IEC 61800-5-2 Safe Stop 1 (SS1) SIL2, EN ISO 13849-1 PL"d" Category 3, EN /IEC62061: SILCL2, IEC 61508: SIL2. 94/9/EC, CE 0537 Ex 11 (2) GD
Control connections (OPT-A1, -A2 or OPT-A1, -A3)	Analogue input voltage	0...+10 V (–10 V...+10 V joystick control), 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	6, positive or negative logic; 18...30 VDC
	Auxiliary voltage	+24 V, ±15%, max. 250 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%
	Digital output	Open collector output, 50 mA/48 V
	Relay outputs	2 programmable change-over (NO/NC) relay outputs (OPT-A3: NO/NC+NO) Switching capacity: 24 VDC/8 A, 250 VAC/8 A, 125 VDC/0.4 A. Min. switching load: 5 V/10 mA
	Thermistor input (OPT-A3)	Galvanically isolated, R_{trip} = 4.7 kΩ
Protections		Overvoltage, undervoltage, earth fault, mains supervision, motor phase supervision, overcurrent, unit overtemperature, motor overload, motor stall, motor underload, short-circuit of +24 V and +10 V reference voltages

* with OPT-AF board

Type	Card slot					I / O signal																				
	A	B	C	D	E	DI	DO	DI DO	AI (mA/ V/±V)	AI (mA) iso-lated	AO (mA/V)	AO (mA) iso-lated	RO (NO/ NC)	RO (NO)	+10V$_{ref}$	Therm	+24V/ EXT +24V	pt100	KTY84	42-240 VAC input	DI/DO (10...24V)	DI/DO (RS422)	DI – 1Vp-p	Re-solver	Out +5V/ +15V/ +24V	Out +15V/ +24V	Out +5V/ +12V/ +15V	Note
Basic I/O cards (OPT-A)																											
OPT-A1						6	1		2		1				1		2										
OPT-A2													2														
OPT-A3													1	1		1											
OPT-A4						2																3/0			1		
OPT-A5						2															3/0					1	
OPT-A7																					6/2					1	2 enc. input + 1 enc. output
OPT-A8						6	1		2		1				1		2										1]
OPT-A9						6	1		2		1				1		2										2.5 mm^2 terminals
OPT-AE							2														3/0					1	DO = Divider+Direction
OPT-AF						2							1	1		1											
OPT-AK																							3			1	Sin/Cos/ Marker
OPT-AN						6			2		2																
I/O expander cards (OPT-B)																											
OPT-B1								6									1										Selectable DI/DO
OPT-B2													1	1		1											
OPT-B4										1		2					1										2]
OPT-B5														3													
OPT-B8																	1	3									
OPT-B9						2								1						5							
OPT-BH																		3	3								3 x pt1000; 3 x Ni1000
OPT-BB						2																0/2	2				Sin/Cos + EnDat
OPT-BC																					3/3			1			Encoder out = Resolver simulation
OPT-BE																											EnDat/SSI
Fieldbus cards (OPT-C)																											
OPT-C2						RS-485 (Multiprotocol)																					Modbus, N2
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)																					Modbus, N2
OPT-CG						SELMA 2 protocol																					
OPT-CI						Modbus/TCP (Ethernet)																					
OPT-CJ						BACNet, RS485																					
OPT-CP						ProfiNet I/O (Ethernet)																					
OPT-CQ						Ethernet/IP (Ethernet)																					
Communication cards (OPT-D)																											
OPT-D1						System Bus adapter (2 x fiber optic pairs)																					
OPT-D2						System Bus adapter (1 x fiber optic pair) & CAN-bus adapter (galvanically decoupled)																					
OPT-D3						RS232 adapter card (galvanically decoupled), used mainly for application engineering to connect another keypad																					
OPT-D6						CAN-bus adapter (galvanically decoupled)																					
OPT-D7																											

VACON® NXC OPTIONS

Control terminal options (T group)	
+TIO*	Basic I/O wired to external single-tier terminals
+TID*	Basic I/O wired to external two-tier terminals + additional terminals
+TUP*	Terminals for 230 VAC control voltage
Input device options (I group)	
+ILS*	Load switch
+IFD	Switch fuse and fuses
+ICB*	Circuit breaker
+ICO	Input contactor
+IFU	Input fuses
Main circuit options (M group)	
+MDC	Terminals in enclosure for DC / brake chopper
Output filter options (O group)	
+OCM	Common mode filters
+OCH	Common mode filters with output terminals
+ODU	du/dt filter
+OSI	Sine wave filter
Protection devices (P group)	
+PTR	External thermistor relay
+PES	Emergency stop (cat 0)
+PED	Emergency stop (cat 1)
+PAP	Arc protection
+PIF	Insulation fault sensor
General options	
+G40	400 mm empty enclosure
+G60	600 mm empty enclosure
+G80	800 mm empty enclosure
+GPL	100 mm base
+GPH	200 mm base
+FAT	Factory acceptance tests
+MAR	Marine construction
+SWP	Seaworthy packing

***** Included as standard in low-harmonic drives

Cabling options (C group)	
+CIT	Input (mains) cabling from top
+COT	Output (motor) cabling from top
Auxiliary equipment (A group)	
+AMF	Motor fan control
+AMH	Motor heater feeder
+AMB	Mechanical brake control
+AMO*	Motor operator for +ICB
+ACH	Enclosure heater
+ACL	Enclosure light
+ACR	Control relay
+AAI	Analogue signal isolator
+AAA	Auxiliary contact (control voltage devices)
+AAC	Auxiliary contact (input device)
+AT1	Auxiliary voltage transformer 200 VA
+AT2*	Auxiliary voltage transformer 750 VA
+AT3	Auxiliary voltage transformer 2500 VA
+AT4	Auxiliary voltage transformer 4000 VA
+ADC*	Power supply 24 VDC 2.5 A
+ACS	230 VAC customer socket
Door-mounted options (D group)	
+DLV	Pilot light (Control voltage on)
+DLD	Pilot light (DO1)
+DLF	Pilot light (FLT)
+DLR	Pilot light (RUN)
+DCO*	Main contactor operation switch
+DRO*	Local / Remote operation switch
+DEP	Emergency stop push-button
+DRP	Reset push-button
+DAM	Analogue meter (AO1)
+DAR	Potentiometer for reference
+DCM	Analogue meter & current transformer
+DVM	Analogue voltage meter with selection switch

NXC	0520	5	A	2	L	0	S	S	F	A1 A2 00 00 00	+	IFD

NXC

Product Range
NXP = wall-mounted / standalone / module
NXC = enclosure

0520

Nominal current voltage
0520 = 520 A

5

Nominal mains voltage
2 = 208-240 V **5** = 380-500 V **6** = 525-690 V

A

Control keypad
A = standard alphanumeric **B** = no local keypad
F = dummy keypad **G** = graphic display

2

Enclosure class
5 = IP 54, FR4-10; NXC FR9-FR14; AF9-14
2 = IP 21, FR4-11; NXC FR9-FR14; AF9-14
0 = IP 00, NXP FR10-14

L

EMC emission levels
C = category C1, EN 61800-3 **H** = category C2, EN 61800-3
L = category C3, EN 61800-3 **T** = for IT networks
N = enclosure required (FR10-FR14)

0

Brake chopper
0 = no brake chopper
1 = integrated brake chopper

S

Supply
S = 6-pulse
T = 12-pulse
0 = 6-pulse + load switch (standalone)
R = Low-harmonic

S

Cooling
S = standard air-cooled
T = through-hole mounting FR4-FR9

F

Control
S = standard FR4-FR8 **F =** standard FR9 and NXC
A = standard NXP FR10-FR12 **N =** standard IP00 ≥ FR10 & NXC with IP54 control unit enclosure
V = as S, but varnished **G =** as F, but varnished boards
0 = as N, but varnished boards **B =** as A, but varnished boards

A1
A2
00
00
00

Option boards; each slot is represented by two characters:
Ax = basic I/O boards, **Bx** = expander I/O boards
Cx = fieldbus boards, **Dx** = special boards

+

IFD

NXC options, see tables p. 22

VACON® LOW HARMONIC PRODUCTS

CLEAN POWER SOLUTIONS

WHAT BUSINESSES DREAM OF

Businesses are always looking for ways in which production processes can be streamlined, energy usage reduced and costs minimized. Their goal is to achieve optimal efficiency levels by ensuring that all aspects of their production flow smoothly and without disturbance.

One potential source of unwanted problems is distortion in the energy supply, which is caused by the presence of harmonic currents and voltages. These distortions can cause disturbances for equipment connected to the same energy supply and create additional losses. Vacon offers solutions with active front-end (AFE) drives and active dynamic filters (ADF) which are designed to eliminate the disruption harmonics can cause to production processes. Studies have indicated that clean power, using low harmonic technology, will continue to grow in the near future, with more and more AC drives featuring it as businesses become aware of its benefits.

CLEAN ENERGY TO THE CORE

Vacon is a Cleantech company which means we're dedicated to including green values in everything we do. This includes constantly striving to improve our customers' processes so that they have as little impact on the surrounding environment as possible. Our range of low harmonic products offer some of the most effective ways in which we can achieve these goals: Low harmonic solutions eliminate the source of harmonics while active filters can clean previously dirty supply systems.

MAKING WAVES IN APPLICATION PROCESSES

AC drives have been instrumental in cutting costs and improving efficiency in numerous applications in all industries, but one issue that is sometimes present is the negative impact the harmonic currents they produce have on the power supply quality. All power supply systems are designed to handle sinusoidal currents but the diode rectifiers in power drive systems create non-sinusoidal currents containing harmonics. These currents have the potential to cause overheating in

cables and transformers, voltage distortion, even breakdowns and malfunctions in other equipment connected to the same supply.

An active front end (AFE) system eliminates the source of harmonic currents by replacing the diode rectifier with a controlled rectifier bridge, which creates a sinusoidal current with very low harmonic content. The load power factor can also be controlled. AFE reduces the THDi to less than 5% and, depending on process requirements, allows for energy to flow to and from the supply. This Vacon Low Harmonic solution can be used in applications where the load needs to be braked – such as elevators and cranes – allowing the brake energy to be fed into the mains for use elsewhere.

An active dynamic filter (ADF) eliminates the effect of harmonics by constantly monitoring the network and, at its point of connection, injecting currents into the supply to dynamically eliminate the harmonic currents created by other loads. This process often takes place at a central location, usually the transformer terminals. The filters also help in adjusting the system power factor and eliminating power system resonances. Active filters are particularly useful for larger installations and systems in helping compensate the harmonics created by large loads.

REACTIVE TO NETWORK REQUIREMENTS

Low-harmonic (AFE) technology reduces the supply current's total harmonic distortion (THDi) to less than 5%, which is low enough to avoid any problems. This decreases the RMS value of the current and minimizes losses in cables and transformers. This approach is already used in the water & waste water sector and heavy process industries such as oil & gas, mining, marine and power generation. The same basic technology is also used to produce clean energy from solar cells, fuel cells and the wind

VACON AT YOUR SERVICE

Vacon drives are sold in over 100 countries, with production and R&D on 3 continents, sales offices in 27 countries and service centers in nearly 90 locations worldwide. Whether you are an original equipment manufacturer (OEM), system integrator, brand label customer, distributor or end user, Vacon provides services to help you meet your business targets. Our global service solutions are available 24/7 throughout the product lifecycle with the intention of minimizing the total cost of ownership and environmental load. Vacon has been a pioneer in the AC drives market ever since it was founded in Vaasa, Finland in 1993.

VACON® LOW HARMONIC SOLUTION

VACON® NXC low harmonic drive is the perfect choice for applications where low harmonics solutions are required. Not only does it meet the most demanding requirements for clean power but also provides other important benefits, such as regenerative braking and voltage boosting for maximum output power.

CLEAN POWER SAVES MONEY

The low harmonic enclosed drive offers an excellent comprehensive solution for the most demanding power quality requirements. The drive complies with the IEEE-519/1993, G5/4 and the relevant IEC harmonic standards.

The low THDi reduces supply currents and allows supply transformers, protection devices and power cables to be sized according to the actual active power. It creates savings for both new and retrofit projects as there is no need to invest in expensive 12- or 18-pulse transformers, two classical solutions for low harmonic needs.

FEATURES

- Clean power with total current harmonics THDi < 5 %
- Over-dimensioning of power transformer or input cables is not required
- Regenerative function available
- Reduces system complexity
- Total power factor correction
- No need for special 12-pulse transformers
- Well-suited for retrofit projects
- Increased flexibility with a wide range of standard options
- Can be tailored to fit specific problems e.g. compensating different harmonics, many options in the application

BENEFITS

- 4-quadrant design allows braking energy to be fed to network
- Over-dimensioning of input components is not needed, reducing the total costs
- Voltage boost function for maximum output power
- Full motor voltage available (lower motor current, smaller sizing motor unit IGBTs, lower motor losses)
- Power factor can be controlled
- Can strengthen weak networks
- Constant DC voltage extends life time of components
- Smaller, more compact for normal power size 250-1500 kW.

TYPICAL APPLICATIONS

- Pumps & fans
- Extruders
- Main propulsion & bow thrusters
- Wood handling machines
- Conveyors & crushers
- Feeders & mixers
- Test benches
- Water treatment
- Winches
- Compressors
- Static power supply
- Industrial elevators

LOW HARMONIC SOLUTION IN ACTION

▲ VACON® NXC LOW HARMONIC

RWE GASSPEICHER GMBH, GRONAU-EPE, GERMANY

In 2011, a VACON Low harmonic solution helped RWE Gasspeicher GmbH to replace a conventional current source inverter (CSI) with voltage source inverters (VSI) using VACON® NXP Low harmonic AC drives using VACON DriveSynch technology.

Due to the age of many of the CSI drives, the project had to be a retrofit. RWE's specifications required a 12-pulse current source inverter for the large motor in the underground reservoir in Epe, along with an active voltage conditioner (AVC) to reduce harmonic distortion in the medium voltage grid.

Since the motor would then be considerably older and less advanced than the electrics, the chances of system failure rose exponentially. Due to successful projects in the past, RWE Power requested a quote from Vacon, but the results were not what they had expected. "We achieved the objective using a configuration that was completely different from what was requested in the quotation", explains Friedhelm Harf of Vacon GmbH. Four VACON NXP Low harmonic AC drives were connected in parallel to control the motor and ensure reliability and system availability. The active front-end drives meant RWE did not have to invest in the AVC filters they had expected to require, saving the company around EUR 450,000 while still reducing current harmonic distortion (THDi) to below 5%.

VACON® ACTIVE FILTER SOLUTION

Vacon has partnered with a third party to provide an industrial modular active filter with a twist. It's the first time Vacon has offered a solution which features cutting-edge Active Dynamic Filter technology to create a low harmonic solution. ADF filters are able to react to almost any problem or change in load by removing unnecessary losses and restoring a smooth sine wave without disturbances.

PRECISELY THE POWER REQUIRED

These unique low harmonic solutions are fully customizable, and multiple ADFs can be combined to accommodate higher power as required. They automatically track the changes in load and only supply the necessary amount of compensation. Not only are problems reduced but costs and energy consumption are kept to a bare minimum without any compromise in productivity. These ADF filters are modular constructions that can be paralleled for future expansion if necessary and are particularly suitable for use in heavy process industry and marine applications, often in conjunction with larger drive systems. By measuring voltage and current at the point of common coupling, the filter ensures optimum efficiency and eliminates the chances of issues with harmonics, flicker or voltage variations.

FEATURES

- Clean power with total current harmonics THDi < 5 % at the point of common coupling
- Compensates the harmonics as required
- Total power factor correction
- Rated voltage up to 480V or 690V
- Eliminates resonances in the supply
- Dynamic VAR compensation up to several MVA
- Air-cooled
- Several units can be paralleled for greater power needs

BENEFITS

- ADF eliminates extra losses in cables and transformers
- Able to handle changes in network conditions
- High performance and reliability
- Modular construction makes expansion possible

TYPICAL APPLICATIONS

- Fans and pumps
- Industrial and commercial elevators
- Marine applications
- Common DC bus system compensation

ACTIVE FILTER SOLUTION IN ACTION

VACON® ADF

PETROVIETNAM, SOUTH CHINA SEA

A LeTourneau 160E jack-up drilling platform in the South China Sea, not far from the Vietnamese coast, serves as the perfect example of how active filter technology can be the perfect solution for keeping processes running smoothly in potentially disruptive conditions. The rig was commissioned by PetroVietnam, Vietnam's national oil and gas group.

Offshore drilling rigs have large non-linear loads compared to the installed generator capacity. This has the potential to affect other equipment onboard. Norwegian system integrator TTS Sense installed 10 VACON® NXP liquid cooled (CH74) AC drives. This system has the potential to use 8 MW of power. Such a large amount of power being used in the system means there are a large amount of harmonics present, which in turn raises the potential for complications. With this in mind, a set of 4 VACON ADF active filters were installed in order to reduce the effect of harmonics, with resounding success – they helped reduce the THD(i) from a potentially hazardous 22% to just 5%.

TECHNICAL DATA

VACON® NXC LOW HARMONIC

Mains voltage	Low-harmonic drive type	Loadability					Motor shaft power		Frame size	Dimensions & weight W x H x D (mm)/ kg
		Low (+40°C)		High (+40°C)			400 V / 690 V			
		Rated continuous current I_L (A)	10% overload current (A)	Rated continuous current I_H (A)	50% overload current (A)	Maximum current I_S (A)	10% overload P (kW)	50% overload P (kW)		
380-500 V 50/60 Hz	NXC 0261 5 A 2 L 0 RSF	261	287	205	308	349	132	110	AF9	1006 x 2275 x 605/680
	NXC 0300 5 A 2 L 0 RSF	300	330	245	368	444	160	132		
	NXC 0385 5 A 2 L 0 RSF	385	424	300	450	540	200	160	AF10	1006 x 2275 x 605/700
	NXC 0460 5 A 2 L 0 RSF	460	506	385	578	693	250	200		
	NXC 0520 5 A 2 L 0 RSF	520	572	460	690	828	250	250		
	NXC 0650 5 A 2 L 0 RSF	650	715	590	885	1062	355	315	AF12	2006 x 2275 x 605/1400
	NXC 0730 5 A 2 L 0 RSF	730	803	650	975	1170	400	355		
	NXC 0820 5 A 2 L 0 RSF	820	902	730	1095	1314	450	400		
	NXC 0920 5 A 2 L 0 RSF	920	1012	820	1230	1476	500	450		
	NXC 1030 5 A 2 L 0 RSF	1030	1133	920	1380	1656	560	500		
	NXC 1150 5 A 2 L 0 RSF	1150	1265	1030	1545	1854	630	560	AF13	2206 x 2275 x 605/1950
	NXC 1300 5 A 2 L 0 RSF	1300	1430	1150	1725	2070	710	630		
	NXC 1450 5 A 2 L 0 RSF	1450	1595	1300	1950	2340	800	710		
	NXC 1770 5 A 2 L 0 RSF	1770	1947	1600	2400	2880	1000	900	AF14	4406 x 2275 x 605/3900
	NXC 2150 5 A 2 L 0 RSF	2150	2365	1940	2910	3492	1200	1100		
	NXC 2700 5 A 2 L 0 RSF	2700	2970	2300	3278	3933	1500	1200		
525-690 V 50/60 Hz	NXC 0125 6 A 2 L 0 RSF	125	138	100	150	200	110	90	AF9	1006 x 2275 x 605/680
	NXC 0144 6 A 2 L 0 RSF	144	158	125	188	213	132	110		
	NXC 0170 6 A 2 L 0 RSF	170	187	144	216	245	160	132		
	NXC 0208 6 A 2 L 0 RSF*	208	229	170	255	289	200	160		
	NXC 0261 6 A 2 L 0 RSF	261	287	208	312	375	250	200	AF10	1006 x 2275 x 605/700
	NXC 0325 6 A 2 L 0 RSF	325	358	261	392	470	315	250		
	NXC 0385 6 A 2 L 0 RSF	385	424	325	488	585	355	315		
	NXC 0416 6 A 2 L 0 RSF*	416	416	325	488	585	400	315		
	NXC 0460 6 A 2 L 0 RSF	460	506	385	578	693	450	355	AF12	2006 x 2275 x 605/1400
	NXC 0502 6 A 2 L 0 RSF	502	552	460	690	828	500	450		
	NXC 0590 6 A 2 L 0 RSF	590	649	502	753	904	560	500		
	NXC 0650 6 A 2 L 0 RSF	650	715	590	885	1062	630	560		
	NXC 0750 6 A 2 L 0 RSF	750	825	650	975	1170	710	630		
	NXC 0820 6 A 2 L 0 RSF*	820	902	650	975	1170	750	650		
	NXC 0920 6 A 2 L 0 RSF	920	1012	820	1230	1476	900	800	AF13	2206 x 2275 x 605/1950
	NXC 1030 6 A 2 L 0 RSF	1030	1133	920	1380	1656	1000	900		
	NXC 1180 6 A 2 L 0 RSF*	1180	1298	1030	1463	1755	1150	1000		
	NXC 1500 6 A 2 L 0 RSF	1500	1650	1300	1950	2340	1500	1300	AF14	4406 x 2275 x 605/3900
	NXC 1900 6 A 2 L 0 RSF	1900	2090	1500	2250	2700	1800	1500		
	NXC 2250 6 A 2 L 0 RSF*	2250	2475	1900	2782	3335	2000	1800		

***** max. ambient temperature of +35°C

HARDWARE CONFIGURATIONS

Active front-end	Enclosure		EMC		Brake chopper	Cabling		Input device	Output filters		
380-500 V	IP21	IP54	L	T		Bottom	Top +CIT/+COT	+ILS & +ICB	+OCM/ +OCH	+ODU	+OSI
AF9	S	O (H: +130)	S	O	* (W: +400)	S	O (W: +400)	S	O	O (W:+400)	O (W: +600)
AF10	S	O (H: +130)	S	O	* (W: +400)	S	O (W: +400)	S	O	O (W:+400)	O (W: +600)
AF12	S	O (H: +130)	S	O	* (W: +400)	S	O (W: +400)	S	O	O (W:+400)	O (W: +1200)
AF13	S	O (H: +170)	S	O	* (W: +400)	S	O (W: +400)	S	O	O	O (W: +800)
AF14	S	O (H: +170)	S	O	* (W: +400)	S	O (W: +600)	S	O	S	O (W: +1600)
525-690 V											
AF9	S	O (H: +130)	S	O	* (W: +400)	S	O (W: +400)	S	O	O (W:+400)	O (W: +600)
AF10	S	O (H: +130)	S	O	* (W: +400)	S	O (W: +400)	S	O	O (W:+400)	O (W: +600)
AF12	S	O (H: +130)	S	O	* (W: +400)	S	O (W: +400)	S	O	O (W:+400)	O (W: +1200)
AF13	S	O (H: +170)	S	O	* z(W: +400)	S	O (W: +400)	S	O	O	O (W: +800)
AF14	S	O (H: +170)	S	O	* (W: +400)	S	O (W: +600)	S	O	S	O (W: +1600)

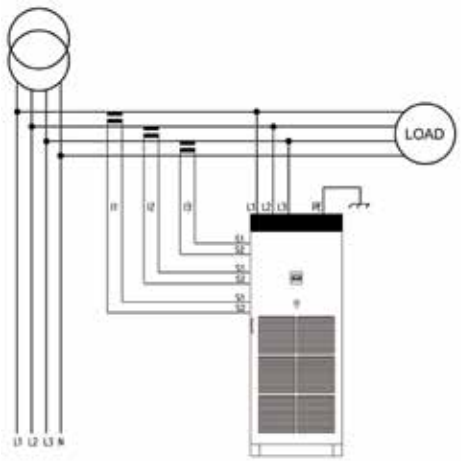
***** Contact factory **S =** Standard **O =** Optional

VACON® ADF

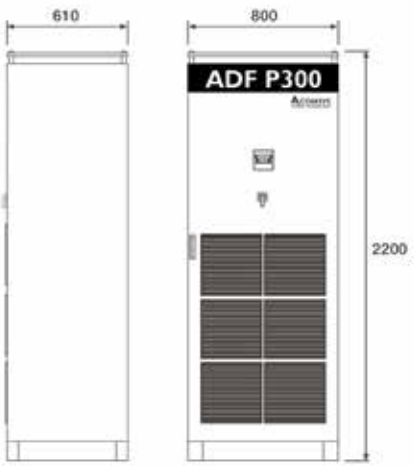
Model	ADF P300-100	ADF P300-200	ADF P300-300
Rated power *	70 kVA	140 kVA	210 kVA
Compensation current capacity	100 Arms	200 Arms	300 Arms
System voltage **		480 V (208 - 480 V), 690 V (480-690 V)	
Nominal frequency **		50/60 Hz ± 2%	
Number of phases		3 wire type	
Connection type		3 phase without neutral (TN, TT, IT)	
Harmonic current compensated		global compensation up to 50 th order	
Rate of harmonic reduction		better than 98%	
Current compensation of cos φ		up to 1.0	
Expandability		up to 8 ADF units in parallel	
Response time		<1 ms	
Power dissipation	< 1900 W	< 3800 W	< 5700 W
Maximum air flow requirement	600 m3/h	1200 m3/h	1800 m3/h
Noise level		< 60 dB	
Environment		0 to 95% RH non-condensing, max altitude 1000 m	
Operating temperature		0 to 40 °C continous, <25 °C recommended	
Dimensions		800 x 2200 x 610 mm (W x H x D)	
Weight	319 kg	445 kg	571 kg
Enclosure color		enclosure RAL 7035 (gray), base RAL 7022 (dark gray)	
Protection class		IP 20 according to IEC 529	
Environmental conditions		chemical 3C3, mechanical 3S3	
Electromagnetic compability		EN 61000-6-2, EN 61000-6-4	
Certificates		CE	

*** Compensation power at 400V nominal voltage**
**** Please state your system voltage and line frequency when ordering**

CONNECTION DIAGRAM



DIMENSIONS



TYPE CODE KEY

VACON® NXC LOW HARMONIC

NXC	0520	5	A	2	L	0	S	S	F	A1 A2 00 00 00	+	IFD

NXC — **Product Range**
NXC = enclosure

0520 — **Nominal current voltage**
0520 = 520 A

5 — **Nominal mains voltage**
5 = 380-500 V **6** = 525-690 V

A — **Control keypad**
A = standard alphanumeric **B** = no local keypad
F = dummy keypad **G** = graphic display

2 — **Enclosure class**
5 = IP 54, FR4-10; NXC FR9-FR14; AF9-14
2 = IP 21, FR4-11; NXC FR9-FR14; AF9-14

L — **EMC emission levels**
L = category C3, EN 61800-3 **T** = for IT networks

0 — = no brake chopper
= integrated brake chopper

S — **Supply**
R = Low-harmonic

S — **Cooling**
S = standard air-cooled

F — **Control**
F = standard FR9 and NXC
N = standard IP00 ≥ FR10 & NXC with IP54 control unit enclosure
G = as F, but varnished boards
O = as N, but varnished boards

A1 A2 00 00 00 — **Option boards; each slot is represented by two characters:**
Ax = basic I/O boards, **Bx** = expander I/O boards
Cx = fieldbus boards, **Dx** = special boards

+

IFD — **NXC options, see tables p. 22**

VACON® ADF

VACON ADF | P300 | 100 | 480

VACON ADF	VACON Active Dynamic Filter
P300	Product series number for air-cooled products
100	Current [A]
480	Supply Voltage

VACON ADF | P300 | 200 | 480

VACON ADF	VACON Active Dynamic Filter
P300	Product series number for air-cooled products
200	Current [A]
480	Supply Voltage

VACON ADF | P300 | 300 | 480

VACON ADF	VACON Active Dynamic Filter
P300	Product series number for air-cooled products
300	Current [A]
480	Supply Voltage

VACON ADF | P300 | 100 | 690

VACON ADF	VACON Active Dynamic Filter
P300	Product series number for air-cooled products
100	Current [A]
690	Supply Voltage

VACON ADF | P300 | 200 | 690

VACON ADF	VACON Active Dynamic Filter
P300	Product series number for air-cooled products
200	Current [A]
690	Supply Voltage

VACON ADF | P300 | 300 | 690

VACON ADF	VACON Active Dynamic Filter
P300	Product series number for air-cooled products
300	Current [A]
690	Supply Voltage

VACON® NXP COMMON DC BUS PRODUCTS

PROVIDING ULTIMATE FLEXIBILITY

MODULAR DRIVE SOLUTIONS

Vacon offers a comprehensive range of Common DC bus drive products comprising front-end units, inverter units and brake chopper units in the entire power range and voltages from 380 V to 690 V . The drive components are built on proven VACON® NX technology and provide the ideal energy sharing solution for a multitude of power systems.

RELIABLE. ROBUST. PROVEN.

When your goal is to ensure that all AC drives share energy within your industrial system, and that all energy is effectively utilized and redistributed, then VACON Common DC bus drive solutions are the right choice. Our Common DC bus components are used in a multitude of combinations across a wide spectrum of high-power process industries from the pulp & paper, steel, metal & mining and marine cranes to smaller machines and production lines, which also demand cost-effective solutions.

DC bus systems comprise two main categories: regenerative and non-regenerative. In a regenerative DC bus system the front-end unit is capable of generating power back to the mains network. This kind of system is suitable for processes where braking is needed often and the braking power is relatively high. In a non-regenerative system the braking power is redistributed to the other drives in the system via the common DC bus, and possible excess power can be dissipated as heat using an optional brake chopper unit and brake resistors. In small production lines or small paper machines where braking is needed less often, a non-regenerative common DC bus system is a cost-efficient solution. In high power applications, it is possible to parallel multiple front-end units.

In addition to the welcome cost savings, you'll also benefit from reduced power cabling and installation time and reduced overall footprint of your drive system. Your drive line-up tolerance to voltage dips/sags will be improved and the harmonic distortions your drive system will be minimized.

IN HARMONY WITH THE ENVIRONMENT

Vacon is committed to being an environmentally responsible company and our energy saving products and solutions are a good example of that. Our Common DC bus portfolio fulfills key international standards and global requirements, including safety and EMC & Harmonics approvals. Likewise, we continue to develop innovative solutions utilizing ie. regenerative energy and smart grid technology to help customers effectively monitor and control energy use and costs.

VACON AT YOUR SERVICE

Vacon AC drives are sold in over 100 countries, with production and R&D on 3 continents, sales offices in 27 countries and approximately 90 service centers in over 50 locations worldwide.

Whether you are an original equipment manufacturer (OEM), system integrator, brand label customer, distributor or end user, Vacon provides services to help you meet your business targets. Our global service solutions are available 24/7 throughout the product lifecycle with the intent to minimize the total cost of ownership and environmental load.

PURE PERFORMANCE

Speed and torque control must be just right when manufacturing top-class stainless steel products. Vacon AC drives have been succesfully implemented in various applications in the demanding metal processing industry.

AIR COOLED DRIVE MODULES WITHIN THE VACON NXP COMMON DC BUS PRODUCT RANGE

WHAT'S IN IT FOR YOU

VACON® NXP COMMON DC BUS

Typical segments	Key features	Benefits
• Metal • Pulp & paper • Crane systems • Mining & minerals • Marine	Full power(0.55 to 2.2 MW) and voltage (380 to 690V) range for both induction and permanent magnet motors.	Same software tool, same control option boards allowing the maximum utilization of NXP features over a wide power range.
	Five built-in expansion slots for additional I/O, fieldbus and functional safety boards.	No additional modules required. Option boards are compact and easy to install at any time.
	Low harmonic regenerative front end. Cost effective non-regenerative front end.	Optimized drive system configurations enabling minimized overall investment cost. Excessive braking energy can be fed back to network reducing energy costs.
	Compact drive modules and easy integration to enclosures.	Optimized module design reduces need for additional engineering and saves in enclosure space reducing overall costs.

TYPICAL APPLICATIONS

- Continuous web systems
- Metal lines eg. roller table systems
- Winders & unwinders
- Crane systems eg. main hoists, gantry & trolley drives
- Centrifuges
- Winches
- Conveyors
- Excavators

THE COMPLETE RANGE

Vacon's common DC bus product portfolio meets all the requirements with a flexible architecture, comprising a selection of active front-ends, non-regenerative front ends, inverters and brake choppers in the entire power range and voltages from 380 V to 690 V.

FLEXIBLE CONFIGURATION, CUSTOMIZED SOLUTIONS

Common DC bus components can be used in a multitude of combinations. In a typical DC bus configuration, the drives that are generating can transfer the energy directly to the drives in motoring mode. Common DC bus drive systems have different kinds of front-end units to meet the requirements of the electricity network and the process where the drives are used. With the right configuration, the drive system can achieve optimal performance and significant energy savings can be made when braking energy is utilized to its full potential.

FRONT-END UNITS

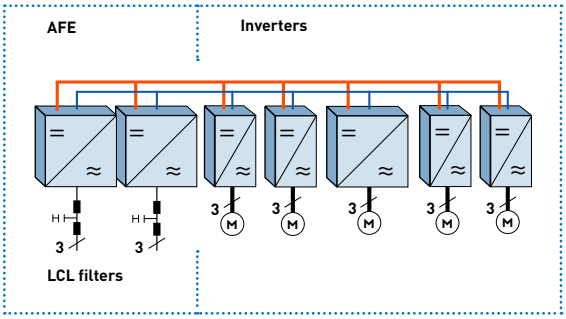
The front-end units convert a mains AC voltage and current into a DC voltage and current. The power is transferred from the mains to a common DC bus and, in certain cases, vice versa.

ACTIVE FRONT-END (AFE)

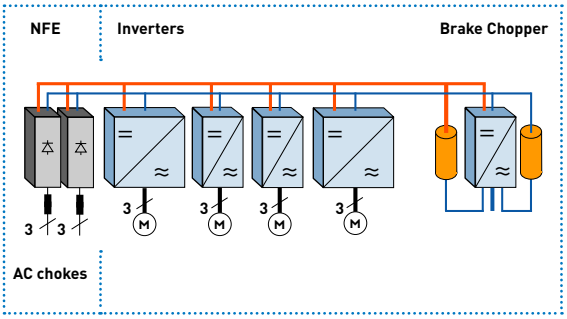
The AFE unit is a bidirectional (regenerative) power converter for the front-end of a common DC bus drive line-up. An external LCL filter is used at the input. This unit is suitable in applications where low mains harmonics are required. AFE is able to boost DC link voltage (default +10%) higher than nominal DC link voltage (1,35x UN). AFE needs an external pre-charging circuit. However, AFE does not need any external grid side measurements to operate. AFE units can operate in parallel to provide increased power and/or redundancy without any drive to drive communication between the units. AFE units can also be connected to the same fieldbus with inverters, and controlled and monitored via fieldbus.

A common DC bus system consists of one or more front-end modules and inverter modules connected together by a DC bus.

A regenerative common DC bus system



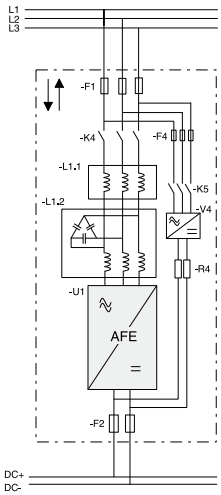
A non-regenerative common DC bus system



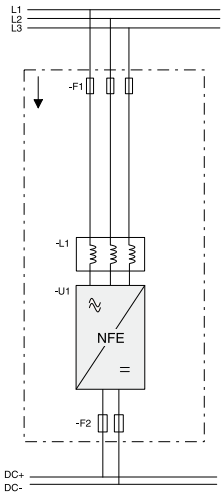
CONSISTENTLY RELIABLE

Vacon's proven performance, reliability and drive system modularity meet the needs of pulp & paper drive systems around the world.

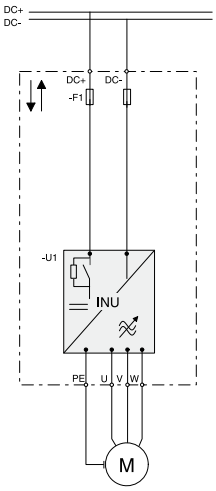
TYPICAL DEVICE CONFIGURATIONS



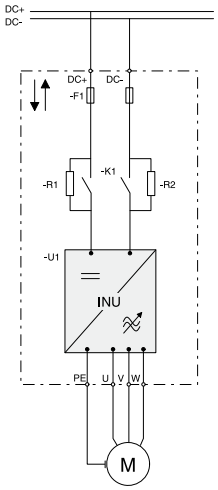
Active front-end



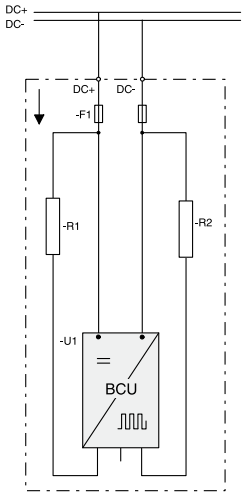
Non-regenerative front-end



Inverter Unit (FR4-FR8)



Inverter Unit (FI9-FI14)



Brake chopper unit

NON-REGENERATIVE FRONT-END (NFE)

The NFE unit is an unidirectional (motoring) power converter for the front-end of a common DC bus drive line-up. The NFE is a device that operates as a diode bridge using diode/thyristor components. A dedicated external choke is used at the input. The NFE unit has the capacity to charge a common DC bus, thus no external pre-charging is needed. This unit is suitable as a rectifying device when a normal level of harmonics is accepted and no regeneration to the mains is required. NFE units can be paralleled to increase power without any drive to drive communincation between the units.

INVERTER UNIT

The INU (Inverter unit) is a bidirectional DC-fed power inverter for the supply and control of AC motors. The INU is supplied from a common DC bus drive line-up. A charging circuit is needed in case the connection possibility to a live DC bus is required. The DC side charging circuit is integrated for powers up to 75 kW (FR4-FR8) and externally located for higher power ratings (FI9-FI14).

BRAKE CHOPPER UNIT

The BCU (Brake chopper unit) is a unidirectional power converter for the supply of excessive energy from a common DC bus drive line-up to resistors where the energy is dissipated as heat. External resistors are needed. By using two brake resistors, the braking power of the brake chopper is doubled.

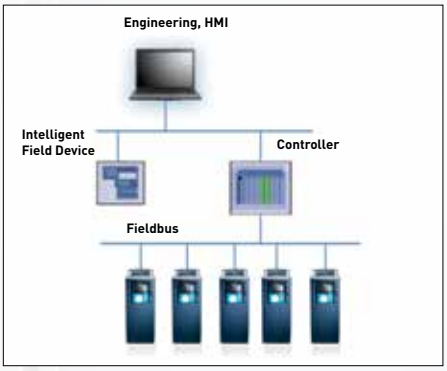
MULTIPLE OPTIONS

VACON NXP CONTROL

VACON NXP offers a high-performance control platform for all demanding drive applications. The micro controller provides both exceptional processing and calculation power. The VACON NXP supports both induction and permanent magnet motors in open and closed loop control modes. The VACON NXP features built-in PLC functionality without the need for any additional hardware. VACON NC61131-3 Engineering can be used to improve performance and create cost savings by integrating customer-specific functionality into the drive. The same control board is used in all NXP drives, allowing the maximum utilization of NXP control features over a wide power and voltage range.

OPTION BOARDS

Our NXP Control provides exceptional modularity by offering five (A, B, C, D and E) plug-in extension slots. Fieldbus boards, encoder boards as well as wide range of IO boards can simply be plugged-in at any time without the need to remove any other components.



FIELDBUS OPTIONS

Your VACON NXP is easily integrated into a plant's automation system by using plug-in fieldbus option boards including Profibus DP, Modbus RTU, DeviceNet and CANopen. Fieldbus technology ensures increased control and monitoring of the process equipment with reduced cabling - ideal for industries where the need to ensure that products are produced under the right conditions is of paramount importance. An external +24 V supply option enables communication with the control unit even if the main supply is switched off. Fast drive-to-drive communication is possible using Vacon's fast SystemBus fiber optic communication.

Profibus DP • DeviceNet • Modbus RTU • CANopen

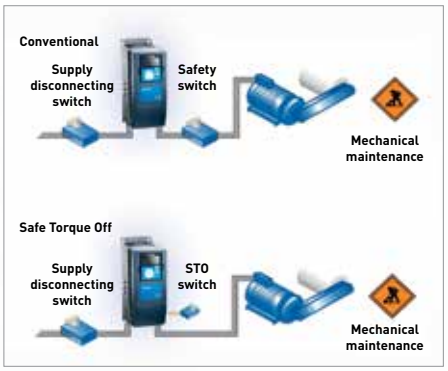
ETHERNET CONNECTIVITY

VACON NXP is the smart drive of choice, as there is no need to purchase additional communication tools. Ethernet connectivity allows remote drive access for monitoring, configuring and troubleshooting. Vacon's Ethernet protocols such as Profinet IO, Ethernet IP and Modbus/TCP are available for all NXP drives. New Ethernet protocols are being continuously developed.

Modbus/TCP • Profinet IO • Ethernet I/P

SAFE TORQUE OFF, SAFE STOP 1

Safe Torque Off (STO) is available for all NXP drives. It prevents the drive from generating torque on the motor shaft and prevents unintentional start-ups. The function also corresponds to an uncontrolled stop in accordance with stop category 0, EN60204-1.
Safe Stop 1 (SS1) initiates the motor deceleration and initiates the STO function after an application specific time delay. The function also corresponds to a controlled stop in accordance with stop category 1, EN 60204-1.
The advantage of the integrated STO and SS1 safety options compared to standard safety technology using electromechanical switchgear is the elimination of separate components and the effort required to wire and service them, while still maintaining the required level of safety at work.



ATEX CERTIFIED THERMISTOR INPUT

Vacon has developed an ATEX approved thermistor input, as an integrated option. Certified and compliant with the European ATEX directive 94/9/EC, the integrated thermistor input is specially designed for the temperature supervision of motors that are placed in areas in which potentially explosive gas, vapor, mist or air mixtures are present and areas with combustible dust. Typical industries requiring such supervision include chemical, petrochemical, marine, metal, mechanical, mining, and oil drilling.

If over-heating is detected, the drive immediately stops feeding energy to the motor. As no external components are needed, the cabling is minimized, improving reliability and saving on both space and costs.

DC COOLING FANS

VACON NXP high-performance air-cooled products are equipped with DC fans. This significantly increases the reliability and lifetime of the fan also fulfilling the ERP2015 directive on decreasing fan losses. Likewise, the DC-DC supply board component ratings fulfill industrial requirement levels.

CONFORMAL COATING

To increase performance and durability, conformally coated printed circuit boards (PCB's, also known as varnished boards) are provided as standard for power modules (FR7 - FI14).

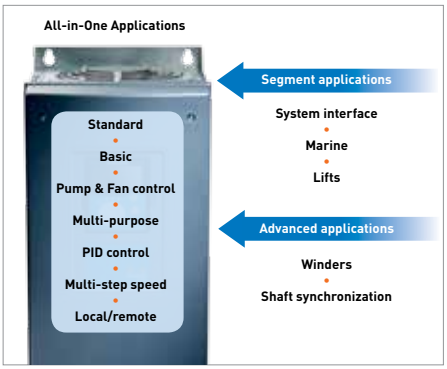
The upgraded PCB's offer reliable protection against dust and moisture and extend the lifetime of the drive and critical components.

COMMISSIONING MADE EASY

USER-FRIENDLY KEYPAD

Vacon has ensured that the user interface is intuitive to use. You will enjoy the keypad's well-structured menu system that allows for fast commissioning and trouble-free operation.

- Removable panel with plug-in connection
- Graphical and text keypad with multiple language support
- Text display multi-monitoring function
- Parameter backup and copy function with the panel's internal memory
- Vacon's Startup Wizard ensures a hassle-free set up. Choose the language, application type and main parameters during the first power-up.

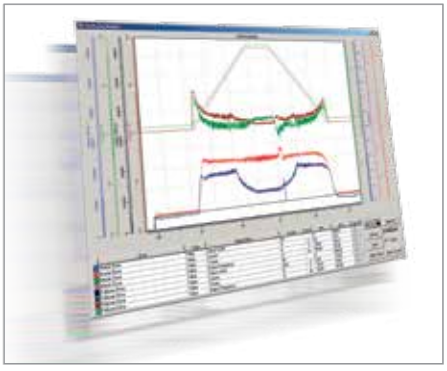


SOFTWARE MODULARITY

Vacon's handy All-in-One application package has seven built-in software applications, which can be selected with one parameter.

In addition to the All-in-One package, Vacon offers several segment specific and advanced applications such as System Interface, Marine, Lift and Shaft Synchronisation for more demanding uses.

VACON NXP applications can be downloaded from www.vacon.com



VACON NCDRIVE

VACON NCDrive is used for setting, copying, storing, printing, monitoring and controlling parameters. The VACON NCDrive communicates with the drive via the following interfaces: RS-232, Ethernet TCP/IP, CAN (fast multiple drive monitoring), CAN@Net (remote monitoring).

VACON NCDrive also includes a handy Datalogger function, which offers you the possibilty to track failure modes and perform root cause analysis.

Vacon PC-tools can be downloaded from www.vacon.com

INDEPENDENT PARALLELING

Benefit from Vacon's patented independent paralleling configuration of (AFE) front-end units.

- High redundancy
- No drive-to-drive communication needed
- Automatic load sharing
- NFE units can also be independently paralleled

380-500 VAC INVERTER MODULES

Type	Unit		Low overload (AC current)		High overload (AC current)		I_{max}
	Code	Frame	$I_{L\text{-}cont}$ [A]	I_{1min} [A]	$I_{H\text{-}cont}$ [A]	I_{1min} [A]	I_{2s} [A]
INU	NXI_0004 5 A2T0CSS	FR4	4.3	4.7	3.3	5.0	6.2
	NXI_0009 5 A2T0CSS	FR4	9	9.9	7.6	11.4	14
	NXI_0012 5 A2T0CSS	FR4	12	13.2	9	13.5	18
	NXI_0016 5 A2T0CSS	FR6	16	17.6	12	18	24
	NXI_0022 5 A2T0CSS	FR6	23	25.3	16	24	32
	NXI_0031 5 A2T0CSS	FR6	31	34	23	35	46
	NXI_0038 5 A2T0CSS	FR6	38	42	31	47	62
	NXI_0045 5 A2T0CSS	FR6	46	51	38	57	76
	NXI_0072 5 A2T0CSS	FR7	72	79	61	92	122
	NXI_0087 5 A2T0CSS	FR7	87	96	72	108	144
	NXI_0105 5 A2T0CSS	FR7	105	116	87	131	174
	NXI_0140 5 A0T0CSS	FR8	140	154	105	158	210
	NXI_0168 5 A0T0ISF	FI9	170	187	140	210	280
	NXI_0205 5 A0T0ISF	FI9	205	226	170	255	336
	NXI_0261 5 A0T0ISF	FI9	261	287	205	308	349
	NXI_0300 5 A0T0ISF	FI9	300	330	245	368	444
	NXI_0385 5 A0T0ISF	FI10	385	424	300	450	540
	NXI_0460 5 A0T0ISF	FI10	460	506	385	578	693
	NXI_0520 5 A0T0ISF	FI10	520	572	460	690	828
	NXI_0590 5 A0T0ISF	FI12	590	649	520	780	936
	NXI_0650 5 A0T0ISF	FI12	650	715	590	885	1062
	NXI_0730 5 A0T0ISF	FI12	730	803	650	975	1170
	NXI_0820 5 A0T0ISF	FI12	820	902	730	1095	1314
	NXI_0920 5 A0T0ISF	FI12	920	1012	820	1230	1476
	NXI_1030 5 A0T0ISF	FI12	1030	1133	920	1380	1656
	NXI_1150 5 A0T0ISF	FI13	1150	1265	1030	1545	1854
	NXI_1300 5 A0T0ISF	FI13	1300	1430	1150	1725	2070
	NXI_1450 5 A0T0ISF	FI13	1450	1595	1300	1950	2340
	NXI_1770 5 A0T0ISF	FI14	1770	1947	1600	2400	2880
	NXI_2150 5 A0T0ISF	FI14	2150	2365	1940	2910	3492
	NXI_2700 5 A0T0ISF	FI14	2700	2970	2300	3278	3933

525-690 VAC INVERTER MODULES

Type	Unit		Low overload (AC current)		High overload (AC current)		I_{max}
	Code	Frame	$I_{L\text{-}cont}$ [A]	I_{1min} [A]	$I_{H\text{-}cont}$ [A]	I_{1min} [A]	I_{2s} [A]
INU	NXI_0004 6 A2T0CSS	FR6	4.5	5	3.2	5	6.4
	NXI_0005 6 A2T0CSS	FR6	5.5	6	4.5	7	9
	NXI_0007 6 A2T0CSS	FR6	7.5	8	5.5	8	11
	NXI_0010 6 A2T0CSS	FR6	10	11	7.5	11	15
	NXI_0013 6 A2T0CSS	FR6	13.5	15	10	15	20
	NXI_0018 6 A2T0CSS	FR6	18	20	13.5	20	27
	NXI_0022 6 A2T0CSS	FR6	22	24	18	27	36
	NXI_0027 6 A2T0CSS	FR6	27	30	22	33	44
	NXI_0034 6 A2T0CSS	FR6	34	37	27	41	54
	NXI_0041 6 A2T0CSS	FR7	41	45	34	51	68
	NXI_0052 6 A2T0CSS	FR7	52	57	41	62	82
	NXI_0062 6 A0T0CSS	FR8	62	68	52	78	104
	NXI_0080 6 A0T0CSS	FR8	80	88	62	93	124
	NXI_0100 6 A0T0CSS	FR8	100	110	80	120	160
	NXI_0125 6 A0T0ISF	FI9	125	138	100	150	200
	NXI_0144 6 A0T0ISF	FI9	144	158	125	188	213
	NXI_0170 6 A0T0ISF	FI9	170	187	144	216	245
	NXI_0208 6 A0T0ISF	FI9	208	229	170	255	289
	NXI_0261 6 A0T0ISF	FI10	261	287	208	312	375
	NXI_0325 6 A0T0ISF	FI10	325	358	261	392	470
	NXI_0385 6 A0T0ISF	FI10	385	424	325	488	585
	NXI_0416 6 A0T0ISF	FI10	416	458	325	488	585
	NXI_0460 6 A0T0ISF	FI12	460	506	385	578	693
	NXI_0502 6 A0T0ISF	FI12	502	552	460	690	828
	NXI_0590 6 A0T0ISF	FI12	590	649	502	753	904
	NXI_0650 6 A0T0ISF	FI12	650	715	590	885	1062
	NXI_0750 6 A0T0ISF	FI12	750	825	650	975	1170
	NXI_0820 6 A0T0ISF	FI12	820	902	650	975	1170
	NXI_0920 6 A0T0ISF	FI13	920	1012	820	1230	1476
	NXI_1030 6 A0T0ISF	FI13	1030	1133	920	1380	1656
	NXI_1180 6 A0T0ISF	FI13	1180	1298	1030	1464	1755
	NXI_1500 6 A0T0ISF	FI14	1500	1650	1300	1950	2340
	NXI_1900 6 A0T0ISF	FI14	1900	2090	1500	2250	2700
	NXI_2250 6 A0T0ISF	FI14	2250	2475	1900	2782	3335

ELECTRICAL RATINGS

380-500 VAC FRONT-END MODULES

Type	Unit		Low overload (AC current)		High overload (AC current)		DC Power *	
	Code	Frame	$I_{L\text{-}cont}$ [A]	I_{1min} [A]	$I_{H\text{-}cont}$ [A]	I_{1min} [A]	400 V mains $P_{L\text{-}cont}$ (kW)	500 V mains $P_{L\text{-}cont}$ (kW)
AFE	1 x NXA_0261 5 A0T02SF	1 x FI9	261	287	205	308	176	220
	1 x NXA_0460 5 A0T02SF	1 x FI10	460	506	385	578	310	388
	2 x NXA_0460 5 A0T02SF	2 x FI10	875	962	732	1100	587	735
	1 x NXA_1300 5 A0T02SF	1 x FI13	1300	1430	1150	1725	876	1092
	2 x NXA_1300 5 A0T02SF	2 x FI13	2470	2717	2185	3278	1660	2075
	3 x NXA_1300 5 A0T02SF	3 x FI13	3705	4076	3278	4916	2490	3115
	4 x NXA_1300 5 A0T02SF	4 x FI13	4940	5434	4370	6550	3320	4140
NFE	1 x NXN_0650 6 X0T0SSV	1 x FI9	650	715	507	793	410	513
	2 x NXN_0650 6 X0T0SSV	2 x FI9	1235	1359	963	1507	780	975
	3 x NXN_0650 6 X0T0SSV	3 x FI9	1853	2038	1445	2260	1170	1462
	4 x NXN_0650 6 X0T0SSV	4 x FI9	2470	2717	1927	3013	1560	1950
	5 x NXN_0650 6 X0T0SSV	5 x FI9	3088	3396	2408	3767	1950	2437
	6 x NXN_0650 6 X0T0SSV	6 x FI9	3705	4076	2890	4520	2340	2924

*** In case you need to recalculate the power, please use the following formulas:**

$$P_{H\text{-}cont} = P_{L\text{-}cont} \times \frac{I_{H\text{-}cont}}{I_{L\text{-}cont}}$$

$P_{1min} = P_{L\text{-}cont}$ x 1.1 (Low overload)

$P_{1min} = P_{H\text{-}cont}$ x 1.5 (High overload)

$$P_{L\text{-}cont} \times \frac{U_x}{400\ V}$$

525 - 690 VAC FRONT-END MODULES

Type	Unit		Low overload (AC current)		High overload (AC current)		DC Power *
	Code	Frame	$I_{L\text{-}cont}$ [A]	I_{1min} [A]	$I_{H\text{-}cont}$ [A]	I_{1min} [A]	690 V mains $P_{L\text{-}cont}$ (kW)
AFE	1 x NXA_0170 6 A0T02SF	1 x FI9	170	187	144	216	198
	1 x NXA_0325 6 A0T02SF	1 x FI10	325	358	261	392	378
	2 x NXA_0325 6 A0T02SF	2 x FI10	634	698	509	764	716
	1 x NXA_1030 6 A0T02SF	1 x FI13	1030	1133	920	1380	1195
	2 x NXA_1030 6 A0T02SF	2 x FI13	2008	2209	1794	2691	2270
	3 x NXA_1030 6 A0T02SF	3 x FI13	2987	3286	2668	4002	3405
	4 x NXA_1030 6 A0T02SF	4 x FI13	3965	4362	3542	5313	4538
NFE	1 x NXN_0650 6X0T0SSV	1 x FI9	650	715	507	793	708
	2 x NXN_0650 6X0T0SSV	2 x FI9	1235	1359	963	1507	1345
	3 x NXN_0650 6X0T0SSV	3 x FI9	1853	2038	1445	2260	2018
	4 x NXN_0650 6X0T0SSV	4 x FI9	2470	2717	1927	3013	2690
	5 x NXN_0650 6X0T0SSV	5 x FI9	3088	3396	2408	3767	3363
	6 x NXN_0650 6X0T0SSV	6 x FI9	3705	4076	2890	4520	4036

*** In case you need to recalculate the power, please use the following formulas:**

$$P_{H\text{-}cont} = P_{L\text{-}cont} \times \frac{I_{H\text{-}cont}}{I_{L\text{-}cont}}$$

$P_{1min} = P_{L\text{-}cont}$ x 1.1 (Low overload)

$P_{1min} = P_{H\text{-}cont}$ x 1.5 (High overload)

$$P_{L\text{-}cont} \times \frac{U_x}{690\ V}$$

DIMENSIONS & WEIGHTS

Type	Frame	H (mm)	W (mm)	D (mm)	Weight (kg)
Power Module	FR4	292	128	190	5
	FR6	519	195	237	16
	FR7	591	237	257	29
	FR8	758	289	344	48
	FI9	1030	239	372	67
	FI10	1032	239	552	100
	FI12	1032	478	552	204
	FI13	1032	708	553	306
	FI14*	1032	2*708	553	612

*** only as inverter unit**

Type	Suitability	H (mm)	W (mm)	D (mm)	Weight (kg) 500 / 690 V
LCL-filter	AFE FI9	1775	291	515	241 / 245 *
	AFE FI10	1775	291	515	263 / 304 *
	AFE FI13	1442	494	525	477 / 473 *
AC-Choke	NFE	449	497	249	130

*** weight is different for 500 / 690 V versions, other dimensions are identical for both voltage classes**

380-500 VAC BRAKE-CHOPPER MODULES

Type	Unit		Braking current	Min. Braking resistor (Per resistor)		Continuous braking power	
	Code	Frame	$I_{L\text{-}cont}$* [A]	540 VDC [Ω]	675 VDC [Ω]	540 VDC [kW]	675 VDC P [kW]
BCU	NXB_0004 5 A2T08SS	FR4	8	159.30	199.13	5	6
	NXB_0009 5 A2T08SS	FR4	18	70.80	88.50	11	14
	NXB_0012 5 A2T08SS	FR4	24	53.10	66.38	15	19
	NXB_0016 5 A2T08SS	FR6	32	39.83	49.78	20	25
	NXB_0022 5 A2T08SS	FR6	44	28.96	36.20	28	35
	NXB_0031 5 A2T08SS	FR6	62	20.55	25.69	40	49
	NXB_0038 5 A2T08SS	FR6	76	16.77	20.96	48	61
	NXB_0045 5 A2T08SS	FR6	90	14.16	17.70	57	72
	NXB_0061 5 A2T08SS	FR7	122	10.45	13.06	78	97
	NXB_0072 5 A2T08SS	FR7	148	8.61	10.76	94	118
	NXB_0087 5 A2T08SS	FR7	174	7.32	9.16	111	139
	NXB_0105 5 A2T08SS	FR7	210	6.07	7.59	134	167
	NXB_0140 5 A0T08SS	FR8	280	4.55	5.69	178	223
	NXB_0168 5 A0T08SF	FI9	336	3.79	4.74	214	268
	NXB_0205 5 A0T08SF	FI9	410	3.11	3.89	261	327
	NXB_0261 5 A0T08SF	FI9	522	2.44	3.05	333	416
	NXB_0300 5 A0T08SF	FI9	600	2.12	2.66	382	478
	NXB_0385 5 A0T08SF	FI10	770	1.66	2.07	491	613
	NXB_0460 5 A0T08SF	FI10	920	1.39	1.73	586	733
	NXB_0520 5 A0T08SF	FI10	1040	1.23	1.53	663	828
	NXB_1150 5 A0T08SF	FI13	2300	0.55	0.69	1466	1832
	NXB_1300 5 A0T08SF	FI13	2600	0.49	0.61	1657	2071
	NXB_1450 5 A0T08SF	FI13	2900	0.44	0.55	1848	2310

525 - 690 VAC BRAKE CHOPPER MODULES

	NXB_0004 6 A2T08SS	FR6	8	238.36	274.65	6.7	9
	NXB_0005 6 A2T08SS	FR6	10	190.69	219.72	8	11
	NXB_0007 6 A2T08SS	FR6	14	136.21	156.94	12	15
	NXB_0010 6 A2T08SS	FR6	20	95.34	109.86	17	22
	NXB_0013 6 A2T08SS	FR6	26	73.34	84.51	22	29
	NXB_0018 6 A2T08SS	FR6	36	52.97	61.03	30	40
	NXB_0022 6 A2T08SS	FR6	44	43.34	49.94	37	48
	NXB_0027 6 A2T08SS	FR6	54	35.31	40.69	45	59
	NXB_0034 6 A2T08SS	FR6	68	28.04	32.31	57	75
	NXB_0041 6 A2T08SS	FR7	82	23.25	26.79	69	90
	NXB_0052 6 A2T08SS	FR7	104	18.34	21.13	87	114
	NXB_0062 6 A0T08SS	FR8	124	15.38	17.72	104	136
	NXB_0080 6 A0T08SS	FR8	160	11.92	13.73	134	176
	NXB_0100 6 A0T08SS	FR8	200	9.53	10.99	167	220
	NXB_0125 6 A0T08SF	FI9	250	7.63	8.79	209	275
	NXB_0144 6 A0T08SF	FI9	288	6.62	7.63	241	316
	NXB_0170 6 A0T08SF	FI9	340	5.61	6.46	284	374
	NXB_0208 6 A0T08SF	FI9	416	4.58	5.28	348	457
	NXB_0261 6 A0T08SF	FI10	522	3.65	4.21	436	573
	NXB_0325 6 A0T08SF	FI10	650	2.93	3.38	543	714
	NXB_0385 6 A0T08SF	FI10	770	2.48	2.85	643	846
	NXB_0416 6 A0T08SF	FI10	832	2.29	2.64	695	914
	NXB_0920 6 A0T08SF	FI13	1840	1.04	1.19	1537	2021
	NXB_1030 6 A0T08SF	FI13	2060	0.93	1.07	1721	2263
	NXB_1180 6 A0T08SF	FI13	2360	0.81	0.93	1972	2593

*** total braking current**

TECHNICAL DATA

Supply connection	Input voltage U_{in} (AC) Front-end modules	380-500 VAC / 525-690 VAC -10%...+10% (according to EN60204-1)
	Input voltage U_{in} (DC) Inverter and brake chopper modules	465...800 VDC / 640...1100 VDC. The voltage ripple of the inverter supply voltage, formed in rectification of the electric network's alternating voltage in basic frequency, must be less than 50 V peak-to-peak
	Output voltage U_{out} (AC) Inverter	3~ 0...U_{in} / 1.4
	Output voltage U_{out} (DC) Active front-end module	1.10 x 1.35 x U_{in} (Factory default)
	Output voltage U_{out} (DC) non-regenerative front-end module	1.35 x U_{in}
Control characteristics	Control performance	Open loop vector control (5-150% of base speed): speed control 0.5%, dynamic 0.3%sec, torque lin. <2%, torque rise time ~5 ms Closed loop vector control (entire speed range): speed control 0.01%, dynamic 0.2% sec, torque lin. <2%, torque rise time ~2 ms
	Switching frequency	NX_5: 1...16 kHz; Factory default 10 kHz From NX_0072: 1...6 kHz; Factory default 3.6 kHz NX_6: 1...6 kHz; Factory default 1.5 kHz
	Field weakening point	8...320 Hz
	Acceleration time	0...3000 sec
	Deceleration time	0...3000 sec
	Braking	DC brake: 30% of T_N (without brake resistor), flux braking
Ambient conditions	Ambient operating temperature	–10°C (no frost)...+40°C: I_H –10°C (no frost)...+40°C: I_L 1.5% derating for each 1°C above 40°C Max. ambient temperature +50°C
	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 1.5% derating for each 100 m above 1000 m Max. altitudes: NX_5: 3000 m; NX_6: 2000 m
	Vibration EN50178/EN60068-2-6	FR4 - FR8: Displacement amplitude 1 mm (peak) at 5...15.8 Hz Max acceleration 1 G at 15.8...150 Hz
		FI9 - FI13: Displacement amplitude 0.25 mm (peak) at 5...31 Hz Max acceleration 1 G at 31...150 Hz
	Shock EN50178, EN60068-2-27	UPS Drop Test (for applicable UPS weights) Storage and shipping: max 15 G, 11 ms (in package)
	Cooling capacity required	approximately 2%
	Cooling air required	FR4 70 m^3/h, FR6 425 m^3/h, FR7 425 m^3/h, FR8 650 m^3/h FI9 1150 m^3/h, FI10 1400 m^3/h, FI12 2800 m^3/h, FI13 4200 m^3/h
	Unit enclosure class	FR8, FI9 - 14 (IP00); FR4 - 7 (IP21)
EMC (at default settings)	Immunity	Fulfils all EMC immunity requirements, level T
Safety		CE, UL, CUL, EN 61800-5-1 (2003), see unit nameplate for more detailed approvals
Functional safety *	STO	EN/IEC 61800-5-2 Safe Torque Off (STO) SIL2, EN ISO 13849-1 PL"d" Category 3, EN 62061: SILCL2, IEC 61508: SIL2.
	SS1	EN /IEC 61800-5-2 Safe Stop 1 (SS1) SIL2, EN ISO 13849-1 PL"d" Category 3, EN /IEC62061: SILCL2, IEC 61508: SIL2.
	ATEX Thermistor input	94/9/EC, CE 0537 Ex 11 (2) GD
Control connections	Analogue input voltage	0...+10 V, R_i = 200 kΩ, (–10 V...+10 V joystick control) Resolution 0.1%, accuracy ±1%
	Analogue input current	0(4)...20 mA, R_i = 250 Ω differential
	Digital inputs	6, positive or negative logic; 18...30 VDC
	Auxiliary voltage	+24 V, ±15%, max. 250 mA
	Output reference voltage	+10 V, +3%, max. load 10 mA
	Analogue output	0(4)...20 mA; R_L max. 500 Ω; resolution 10 bits Accuracy ±2%
	Digital outputs	Open collector output, 50 mA / 48 V
	Relay outputs	2 programmable change-over relay outputs Switching capacity: 24 VDC / 8 A, 250 VAC / 8 A, 125 VDC / 0.4 A Min. switching load: 5 V / 10 mA
Protections	Overvoltage protection	NX_5: 911 VDC; NX_6: 1200 VDC
	Undervoltage protection	NX_5: 333 VDC; NX_6: 460 VDC
	Earth fault protection	Yes
	Motor phase supervision	Trips if any of the output phases is missing
	Overcurrent protection	Yes
	Unit overtemperature protection	Yes
	Motor overload protection	Yes
	Motor stall protection	Yes
	Motor underload protection	Yes
	Short-circuit protection of +24 V and +10 V reference voltages	Yes

*** with OPT-AF board**

Standard features						INU			AFE	NFE	BCU		
						NXI AAAA V			NXA AAAA V	NXN AAAA V	NXB AAAA V		
						FR4, 6, 7	FR8	FI9 - FI14	FI9 - FI13	FI9	FR4, 6, 7	FR8	FI9 - FI13
IP00							●	●	●	●		●	●
IP21						●					●		
IP54						o					o		
Air cooling						●	●	●	●	●	●	●	●
Standard board						●	●	●	●		●	●	●
Varnished board										●			
Alphanumeric keypad						●	●	●	●		●	●	●
EMC class T (EN 61800-3 for IT networks)						●	●	●	●	●	●	●	●
Safety CE / UL						●	●	●	●	●	●	●	●
Line reactor, external (required)										o			
LCL filter, external (required)									o				
No integrated charging								●	●				●
Integrated charging (DC side)						●	●			●	●	●	
Diode/thyristor rectifier										●			
IGBT						●	●	●	●		●	●	●
Standard I/O	Card slot												
	A	B	C	D	E	Number of I/O channels							
OPT-A1 Binary input (24 VDC)						6	6	6	6	n/a	6	6	6
OPT-A1 Binary output (24 VDC)						1	1	1	1	n/a	1	1	1
OPT-A1 Analog input						2	2	2	2	n/a	2	2	2
OPT-A1 Analog output						1	1	1	1	n/a	1	1	1
OPT-D7 Voltage measurement						-	-	-	z	n/a	-	-	-
OPT-A2 Relay output (NO/NC)						2	2	2	2	2 (NO)	2	2	2
Options													
Optional I/O cards													
OPT-A3 Relay output + Thermistor input						o	o	o	o	n/a	o	o	o
OPT-A4 Encoder TTL type						o	o	o	-	n/a	-	-	-
OPT-A5 Encoder HTL type						o	o	o	-	n/a	-	-	-
OPT-A7 Double encoder HTL type						o	o	o	-	n/a	-	-	-
OPT-A8 I/O as OPT-A1 (galvanic isolation)						o	o	o	o	n/a	o	o	o
OPT-A9 I/O as OPT-A1 (2.5 mm^2 terminals)						o	o	o	o	n/a	o	o	o
OPT-AE Encoder HTL type (Divider + direction)						o	o	o	-	n/a	-	-	-
OPT-AF						o	o	o	-	n/a	-	-	-
I/O expander cards (OPT-B)													
OPT-B1 Selectable I/O						o	o	o	o	n/a	o	o	o
OPT-B2 Relay output						o	o	o	o	n/a	o	o	o
OPT-B4 Analog input/output						o	o	o	o	n/a	o	o	o
OPT-B5 Relay output						o	o	o	o	n/a	o	o	o
OPT-B8 PT100						o	o	o	o	n/a	o	o	o
OPT-B9 Binary input + RO						o	o	o	o	n/a	o	o	o
OPT-BB + EnDat + Sin/Cos 1 Vp-p						o	o	o	-	n/a	-	-	-
OPT-BC Encoder out = Resolver simulation						o	o	o	-	n/a	-	-	-
Fieldbus cards (OPT-C)													
OPT-C2 RS-485 (Multiprotocol)						o	o	o	o	n/a	o	o	o
OPT-C3 Profibus DP						o	o	o	o	n/a	o	o	o
OPT-C4 LonWorks						o	o	o	o	n/a	o	o	o
OPT-C5 Profibus DP (D9-type connector)						o	o	o	o	n/a	o	o	o
OPT-C6 CANopen (slave)						o	o	o	o	n/a	o	o	o
OPT-C7 DeviceNet						o	o	o	o	n/a	o	o	o
OPT-C8 RS-485 (Multiprotocol, D9-type connector)						o	o	o	o	n/a	o	o	o
OPT-CG SELMA 2 protocol (SAMI)						o	o	o	o	n/a	o	o	o
OPT-CI Modbus / TCP (Ethernet)						o	o	o	o	n/a	o	o	o
OPT-CP Profinet I/O (Ethernet)						o	o	o	o	n/a	o	o	o
OPT-CQ Ethernet I/P (Ethernet)						o	o	o	o	n/a	o	o	o
Communication cards (OPT-D)													
OPT-D1 System Bus adapter (2 x fiber optic pairs)						o	o	o	o	n/a	o	o	o
OPT-D2 System Bus adapter (1 x fiber optic pair) & CAN-bus adapter (galvanically decoupled)						o	o	o	o	n/a	o	o	o
OPT-D3 RS232 adapter card (galvanically decoupled), used mainly for application engineering to connect another keypad						o	o	o	o	n/a	o	o	o
OPT-D6 CAN-bus adapter (galvanically decoupled)						o	o	o	o	n/a	o	o	o
OPT-D7 Voltage measurement card						o	o	o	o	n/a	-	-	-

● = included o = optional

VACON® NXP LIQUID COOLED AC DRIVES

POWERFUL PERFORMANCE IN EXTREME CONDITIONS

QUIET. COMPACT. COOL.

VACON® NXP liquid cooled drives are the ultimate in space-saving, high power density AC drives, well suited for locations where air-cooling is difficult, expensive or impractical or where installation space is at a premium. Their robust, modular design makes the VACON NXP a suitable platform for all drive needs in demanding applications and are available in the power range from 7.5 to 5300 kW at 380-690 VAC supply voltages.

POWER PACKED

As no air ducts are required, liquid cooled drives are extremely compact and suitable for a wide variety of heavy industries with harsh operating conditions such as marine & offshore, pulp & paper, renewable energy and mining & metal. The VACON NXP liquid cooled drive is an advanced AC drive for induction and permanent magnet motors.

As a high degree of protection (IP54 or higher) can easily be achieved with these drives, they can be installed almost anywhere in the plant/vessel. This significantly reduces the load on the air-conditioning system in the electrical rooms – an important cost and space consideration in many retrofit applications. And since liquid cooled drives do not require large cooling fans, they are also among the most silent AC drive on the market.

We are committed to providing you with the ultimate in high power density. VACON NXP liquid cooled products have one of the best power/size ratios on the market. For example, our compact 12 pulse, 1.5MW drive includes a built-in rectifier, inverter and optional brake all in same package and can be mounted in an 800mm wide enclosure. Once you've tried liquid cooled, you'll never look back.

IN HARMONY WITH THE ENVIRONMENT

Vacon is also committed to being an environmentally responsible company and our energy saving products and solutions are a good example of that. Our VACON NXP Liquid Cooled portfolio fulfills all relevant international standards and global requirements, including marine, safety and EMC & Harmonics approvals. Likewise, we continue to develop innovative solutions utilizing ie. regenerative energy and smart grid technology to help customers effectively monitor and control energy use and costs.

VACON AT YOUR SERVICE

Vacon drives are sold in over 100 countries, with production and R&D on 3 continents, sales offices in 27 countries and close to 90 service centers in over 50 locations worldwide.

Whether you are an original equipment manufacturer (OEM), system integrator, brand label customer, distributor or end user, Vacon provides services to help you meet your business targets. Our global service solutions are available 24/7 throughout the product lifecycle with the intent to minimize the total cost of ownership and environmental load.

SAVING FUEL AT SEA

In the highly competitive marine sector, increased demand for efficiency is the main reason for using AC drives in fan, winch, propeller, and various special applications across all vessel types, from large luxury liners and cargo ships to tugboats.

WHAT'S IN IT FOR YOU

VACON NXP LIQUID COOLED PRODUCT RANGE

Typical segments	Key features	Benefits
• Marine & offshore • Metal • Renewable energy • Mining & minerals • Water & wastewater • Power stations • Pulp & paper • Oil & gas • Machine building	Full power range from 7.5 kW to 5.3 MW for both induction motors and permanent magnet motors.	Same software tool, same control option boards allowing for maximum utilization of NXP features over a wide power range.
	Five built-in expansion slots for additional I/O, fieldbus and functional safety boards	No additional modules required. Option boards are compact and easy to install at any time
	Extensive range of ready-to-use applications for basic to demanding needs.	No additional software engineering required, saving time and money.
	High-tech liquid cooled AC drive design, heat loss can be transferred to most convenient place with no need for vast amount of filtered air.	Minimizes investment and operation costs as there is no need for large air conditioning systems. Liquid cooled AC drives installed in high IP class enclosures can be used in demanding environments.
	Compact size and high power density	Possibility to engineer compact solutions that save on floor space and infrastructure needs.

TYPICAL APPLICATIONS

- Propulsion and thrusters systems
- Wind turbines
- Pumps & fans
- Cranes and winch systems
- Compressors
- Extruders
- Test bench systems
- Power conversion systems
- Production lines
- Oil rigs
- Crushers
- Conveyors

THE LIQUID WAY TO STAY COOL

When comparing cooling technology solutions, it is important to understand the effects on the infrastructure of the electrical room, and the room's requirements. Additional comparison parameters are the geographical location, relevant industry/segment and process.

CLIMATE CONSIDERATIONS

In warm climates it is extremely important to observe the amount of heat load transferred to the electrical room because it is in direct relationship to the electrical energy consumption.

The type-tested switchgear standard EN 60439-1 specifies that the electrical room's 24-hour average temperature should be below +35°C and the maximum temporary temperature cannot exceed +40°C. As a result, the cooling system in electrical rooms is typically comprised of air conditioning chillers, which are dimensioned according to the maximum heat load, the temperature inside the electrical room and the maximum temperature outdoors. The typical electrical energy consumption of air conditioning is approx. 25 - 33% of the cooling power.

The initial investment in liquid cooled AC drives technology is slightly higher than in air cooled AC drives technology given the unique cooling pipe arrangements and heat exchanger systems. It is also important to consider that a heat exchanger should be compared with ventilation and air conditioning systems comprising of ventilation ducts, ventilation machines and ventilation automation systems.

THE HIGHER THE POWER, THE GREATER THE SAVINGS

Since there is no requirement to provide additional air conditioning capacity or extra ventilation for the areas in which the drives are used, liquid cooled drives may therefore be the most cost-effective option. Likewise, the related savings enable shorter payback times and the higher the power, the greater the savings potential.

The electrical energy cost trend certainly supports a wider use of liquid cooled drives technology, and the number of on-shore installations is growing rapidly.

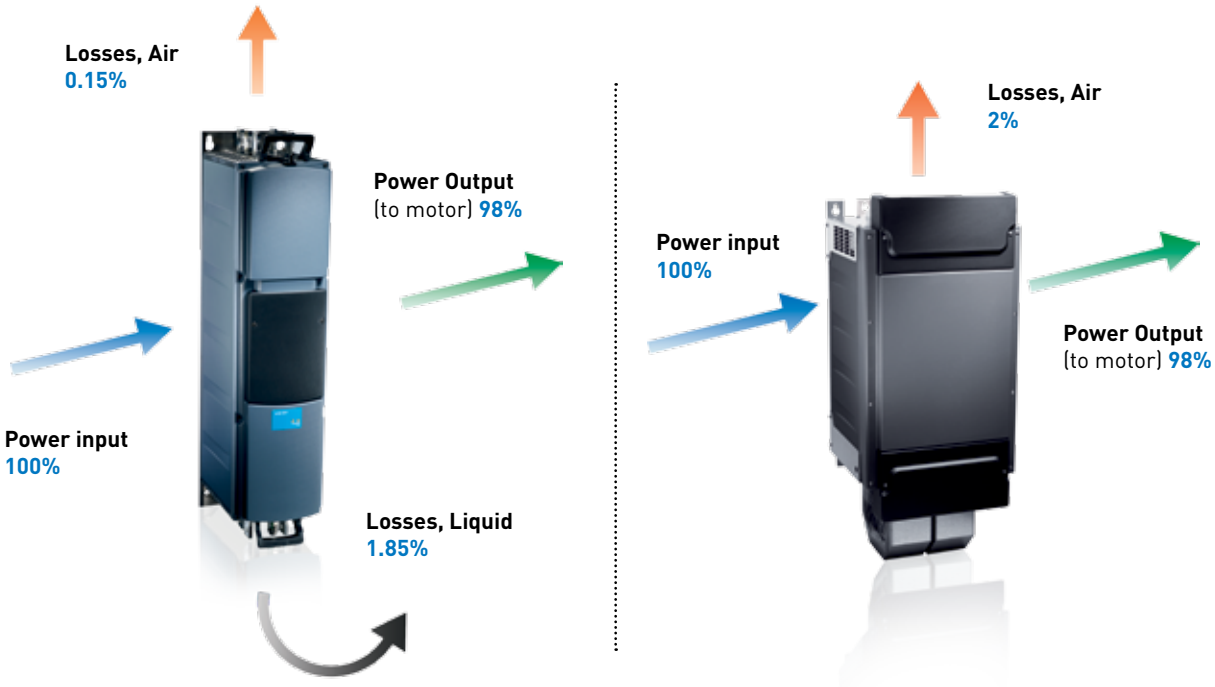
EXCLUSIVELY DESIGNED FOR LIQUID COOLING

The VACON NXP liquid cooled dissipates less than 5% of its total heat losses to air, only 0.1...0.15% of the drive rated load. A high-tech cooling heatsink enables better cooling efficiency and makes the cooling utilization ratio of the components higher than ever. Many other liquid cooled drives on the market are based on modifications of an air cooled drive, rather than exclusively designed for the purpose.

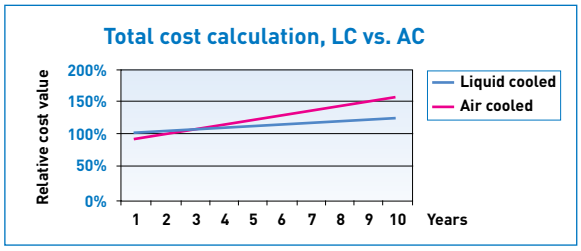
A DRIVING FORCE IN WIND ENERGY

Vacon products, including liquid cooled drives are essential components in windmill installations that convert kinetic energy produced by the rotating blades into AC power for the local electricity grid.

COOLING TECHNOLOGY ADVANTAGES



LIQUID COOLED VS AIR COOLED



A 400 kW, 690 VAC liquid cooled drive is:

- 32 % of the volume of the air cooled drive
- 50 % of the width of the air cooled drive
- 75 % of the weight of the air cooled drive
- 20 dBA more silent than the air cooled drive

EXTENSIVE PRODUCT PORTFOLIO

Liquid cooled AC drives can be used in a multitude of combinations - from a single dedicated frequency converter to large-scale Common DC bus systems. With the right configuration, optimal performance and significant energy savings can be achieved.

DEDICATED FREQUENCY CONVERTER

The VACON NXP Liquid Cooled single drives are available as 6- or 12-pulse frequency converters. Our largest unit, the CH74, can also be used as an 18-pulse converter. A frequency converter consists of a IP00 power unit, control unit and possibly one or more input chokes.

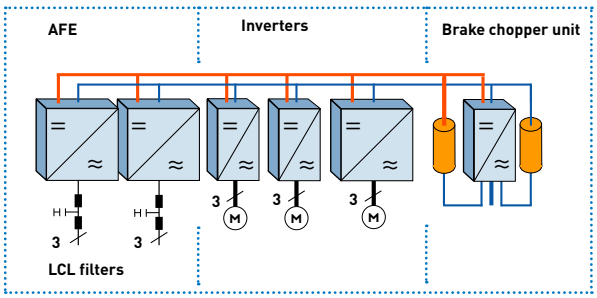
An internal brake chopper is available as standard for our smallest unit CH3. For CH72 (only 6-pulse) and CH74, it is available as internal option while in all other sizes the brake chopper is available as option and installed externally.

ACTIVE FRONT-END (AFE)

The AFE unit is a bi-directional (regenerative) power converter (supply unit) for the front-end of a common liquid cooled DC bus drive line-up. An external LCL filter is used at the input. This unit is suitable in applications where a low level of mains harmonics and high power factor are required. AFE units can operate in parallel to provide increased power and/or redundancy without any drive to drive communication between the units. AFE units can also be connected to the same fieldbus with inverters, and controlled and monitored via fieldbus. Fuses, LCL filters, pre-charging rectifiers and resistors must be ordered and specified separately.

The LCL filter guarantees that harmonics are not an issue in any network. With a power factor > 0.99 and low harmonics, the supply chain transformers, generators, etc. can be sized very accurately without reserving margins for the reactive power. This can mean a saving of 10 % in supply chain investments. Likewise the payback time is faster as regenerative energy is fed back to the grid.

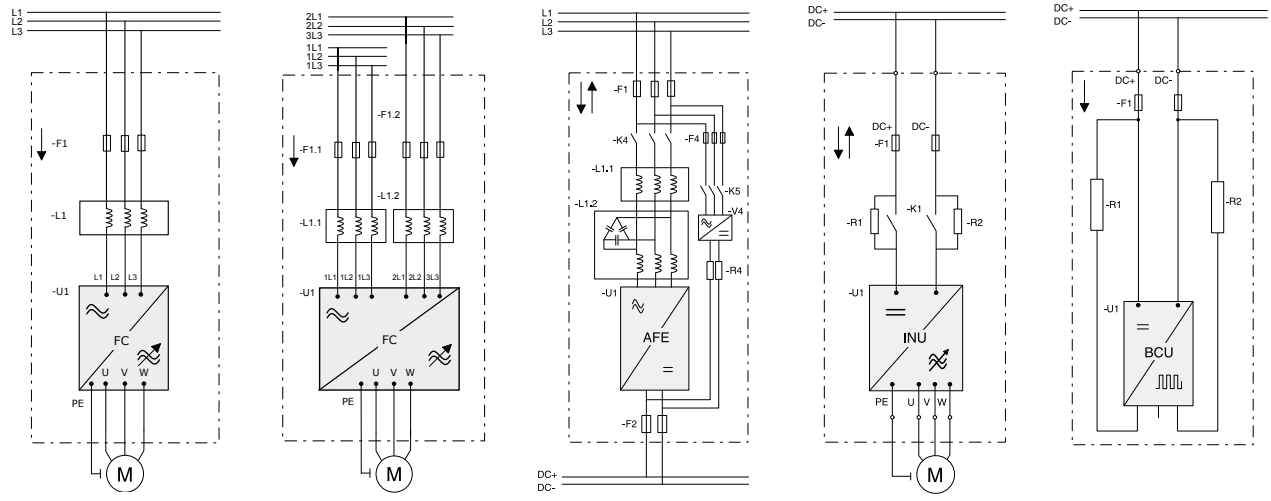
A regenerative common DC bus system



PURE PERFORMANCE

Speed and torque control must be accurate in order for many demanding production lines to reach optimum process control. Vacon AC drives have successfully been used in various applications across a wide spectrum of industries.

TYPICAL DEVICE CONFIGURATIONS



6-pulse frequency converter unit | **12-pulse frequency converter unit** | **Active front-end** | **Inverter Unit** | **Brake chopper unit**

INVERTER UNIT (INU)

The INU is a bidirectional DC-fed power inverter for the supply and control of AC motors. The INU is supplied from a common DC bus drive line-up. A charging circuit is needed in case a connection to a live DC bus is required. The DC-side charging circuit is external for inverter types.

Pre-charging resistors and switches or fuses are not included in an INU delivery and must be specified and ordered separately.

BRAKE CHOPPER UNIT (BCU)

The BCU is unidirectional power converter for the supply of excessive energy from a common DC bus drive line-up or big single drive to resistors where the energy is dissipated as heat. External resistors are required. However, resistors or fuses are not included in a BCU delivery and must be specified and ordered separately.

BCU's improve drive dynamic performance in a load regenerative operating point and protect common DC bus voltage level from overvoltage. In some cases they also reduce the need for AFE investments.

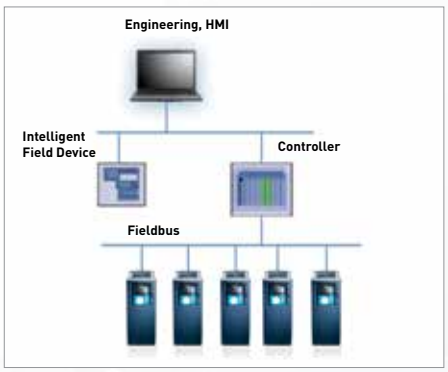
MULTIPLE OPTIONS

VACON NXP CONTROL

VACON NXP offers a high-performance control platform for all demanding drive applications. The micro controller provides both exceptional prosessing and calculation power. The VACON NXP supports both induction and permanent magnet motors in open and closed loop control modes. The VACON NXP features built-in PLC functionality without the need for any additional hardware. VACON NC61131-3 Engineering can be used to improve performance and create cost savings by integrating customer-specific functionality into the drive. The same control board is used in all NXP liquid cooled drives, allowing the maximum utilization of NXP control features over a wide power and voltage range.

OPTION BOARDS

Our NXP Control provides exceptional modularity by offering five (A, B, C, D and E) plug-in extension slots. Fieldbus boards, encoder boards as well as wide range of IO boards can simply be plugged-in at any time without the need to remove any other components.



FIELDBUS OPTIONS

Your VACON NXP is easily integrated within a plant's automation system by using plug-in fieldbus option boards including Profibus DP, Modbus RTU, DeviceNet and CANopen. Fieldbus technology ensures increased control and monitoring of the process equipment with reduced cabling - ideal for industries where the need to ensure that products are produced under the right conditions is of paramount importance. An external +24 V supply option enables communication with the control unit even if the main supply is switched off. Fast drive-to-drive communication is possible using Vacon's fast SystemBus fiber optic communication.

Profibus DP • DeviceNet • Modbus RTU • CANopen

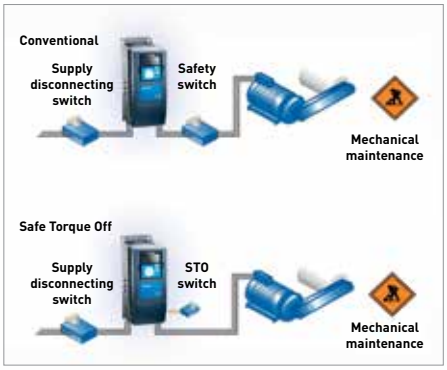
ETHERNET CONNECTIVITY

VACON NXP is the smart drive of choice, as there is no need to purchase additional communication tools. Ethernet connectivity allows remote drive access for monitoring, configuring and troubleshooting. Vacon's Ethernet protocols such as Profinet IO, Ethernet IP and Modbus/TCP are available for all NXP drives. New Ethernet protocols are being continuously developed.

Modbus/TCP • Profinet IO • Ethernet I/P

SAFE TORQUE OFF, SAFE STOP 1

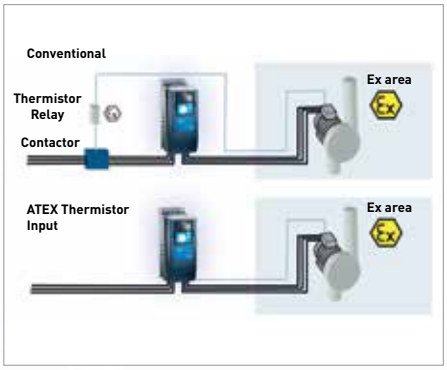
Safe Torque Off (STO) is available for all NXP drives. It prevents the drive from generating torque on the motor shaft and prevents unintentional start-ups. The function also corresponds to an uncontrolled stop in accordance with stop category 0, EN60204-1.
Safe Stop 1 (SS1) initiates the motor deceleration and initiates the STO function after an application specific time delay. The function also corresponds to a controlled stop in accordance with stop category 1, EN 60204-1.
The advantage of the integrated STO and SS1 safety options compared to standard safety technology using electromechanical switchgear is the elimination of separate components and the effort required to wire and service them, while still maintaining the required level of safety at work.



ATEX CERTIFIED THERMISTOR INPUT

Vacon has developed an ATEX approved thermistor input, as an integrated option. Certified and compliant with the European ATEX directive 94/9/EC, the integrated thermistor input is specially designed for the temperature supervision of motors that are placed in areas in which potentially explosive gas, vapor, mist or air mixtures are present and areas with combustible dust. Typical industries requiring such supervision include chemical, petrochemical, marine, metal, mechanical, mining, and oil drilling.

If over-heating is detected, the drive immediately stops feeding energy to the motor. As no external components are needed, the cabling is minimized, improving reliability and saving on both space and costs.



MARINE APPROVALS

With over 15 years of experience across a wide range of Marine & Offshore AC drives applications, VACON NXP Liquid Cooled AC drives fulfill type approvals of major classification societies:

- Type approval: DNV, BV, Lloyd's Register
- Delivery based approval: ABS, GL, Class NK, CCS, KR, RINA

We have delivered AC drives for over 700 propulsion drives systems and 1000 thrusters. Vacon has represented world-first and leading-pioneer AC drive technologies in several Marine & Offshore applications, e.g. diesel-electric propulsion systems with AFE drives, redundant electrical cargo pump systems, hybrid tugboats and shaft generator systems.

CONFORMAL COATING

To increase performance and durability, conformally coated circuit boards (also known as varnished boards) are provided as standard for power modules.

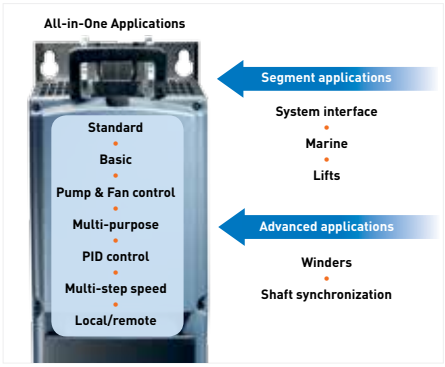
The upgraded boards offer reliable protection against dust and moisture and extend the lifetime of the drive and critical components.

COMMISSIONING MADE EASY

USER-FRIENDLY KEYPAD

Vacon has ensured that the user interface is intuitive to use. You will enjoy the keypad's well-structured menu system that allows for fast commissioning and trouble-free operation.

- Removable panel with plug-in connection
- Graphical and text keypad with multiple language support
- Text display multi-monitoring function
- Parameter backup and copy function with the panel's internal memory
- Vacon's Startup Wizard ensures a hassle-free set up. Choose the language, application type and main parameters during the first power-up.

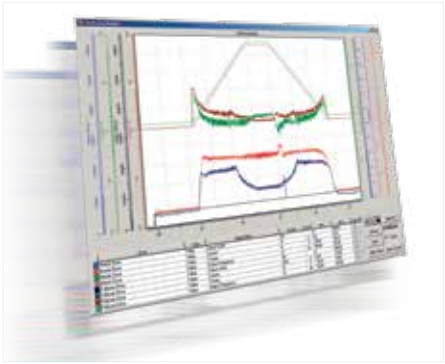


SOFTWARE MODULARITY

Vacon's handy All-in-One application package has seven built-in software applications, which can be selected with one parameter.

In addition to the All-in-One package, Vacon offers several segment specific and advanced applications such as System Interface, Marine, Lift (see page 11) and Shaft Synchronisation for more demanding uses.

VACON NXP applications can be downloa



VACON NCDRIVE

VACON NCDrive is used for setting, monitoring and controlling parameter communicates with the drive via the foll Ethernet TCP/IP, CAN (fast multiple dr (remote monitoring).

VACON NCDrive also includes a handy l offers you the possibilty to track failure cause analysis.

VACON PC-tools can be downloaded from www.vacon.com

INDEPENDENT PARALLELING

Benefit from Vacon's patented independent paralleling configuration of front-end (AFE) units.

- High redundancy
- No drive-to-drive communication needed
- Automatic load sharing

DEDICATED MARINE APPLICATION

Our **Vacon Marine Application** provides flexibility and performance across all Marine segment applications. We have pioneered several technologies and applications in the field of Marine & Offshore such as redundant electrical cargo pump systems, liquid cooled AFE propulsion systems, pipe-laying tensioners and winches as well as oil exploration fibre cable winches.

VACON NXP Liquid Cooled drives fulfill all major approvals and bring many benefits to this segment in particular such as: energy efficiency, improved process availability due to high redundancy, better process quality and control, as well as silent operation and substantially reduced emissions.

Added benefits:

- Power extension with Drive Synch
- Interface for power handling for power management system
- Black Out prevention logics
- Freely configurable PI control logic

INTELLIGENT SYSTEM INTERFACE

Our **Vacon System Interface Application (SIA)** provides flexible and extensive interface for use in coordinated drives, which have an overriding control system. The recommended interface to control the system is fieldbus communication through hardwired analogue and digital signals or via keypad and PC control.

Vacon SIA utilizes the most advanced functions of our NXP motor control software and is suitable for demanding drive systems such as those in the pulp & paper and metal industries, processing lines as well as many other standard applications.

Added benefits:

- Power extension with Drive Synch
- Master Follower functions for torque sharing
- Freely configurable PI control logic

ENGINEERED DRIVES PACKAGES

Vacon also offers high power liquid cooled engineered drive packages. For example, a single NXP CH64 enclosure solution can be used with AC motors in power sizes up to 1550kW. The power range can also be extended up to 5MW by using the innovative DriveSynch control concept.

Some of the advantages of this enclosure solution include:

- Bi-directional (regenerative) power converter, optimal performance and significant energy savings can be made when braking energy is utilized to its full potential.
- Current distortion below 5%
- Totally enclosed IP54 enclosure solutions that can be used in demanding environments and no need for large air conditioning systems
- Liquid cooled input and output filters
- Designed for easy installation and maintenance

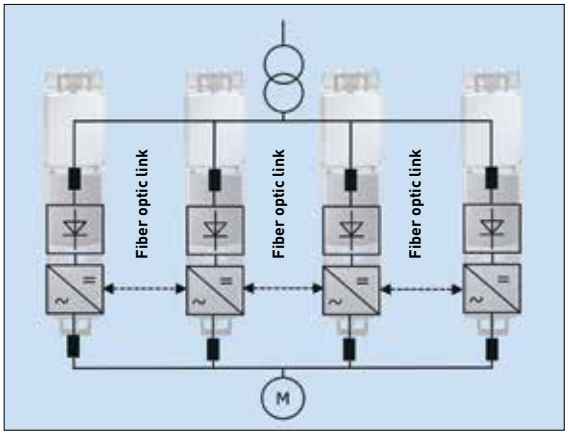
The VACON NXP is a state-of-the-art AC drive for use in all applications where robustness, dynamic performance, precision and power are required. VACON NXP supports both induction motors and permanent magnet motors in open and closed loop control modes as well as high speed motors.

HIGH POWER AND IMPROVED REDUNDANCY

VACON DriveSynch is an innovative control concept for running standard drives in parallel to control high-power AC motors or increase the redundancy of a system. This concept suits high power single or multiple winding motors typically above 1 MW.

High power AC drives up to 5 MW can be built using standard drive components and have the following benefits:

- The system is modular and easy to extend
- High total power can be obtained by combining smaller drives
- System redundancy is higher than in a conventional drive because each unit can run independently
- Individual drive is easy to maintain and service
- Identical units reduce the required amount of spare parts thus reducing overall costs
- No special skills are required for the engineering, installation, commissioning and maintenance of high-power drives as they are comprised of standard modules
- It is possible to run multiple winding motors with a phase shift between the windings



Example of the DriveSynch configuration.

In cooperation with HVAC professionals, Vacon has designed a range of cooling units based on liquid-to-liquid heat exchangers (HX), which improve the availability and usability of AC drive systems. The cooling units belong to the liquid cooled VACON NXP range and offer reliable and cost-effective cooling without ventilation concerns.

PROVEN RELIABILITY

Vacon's standardized heat exchanger makes the use of liquid cooled drives easier, because a well-planned and -sized unit is easier to apply than a project solution. In addition, a standard heat exchanger solution offers proven reliability.

To minimize the risk of possible leaks, splitting the cooling circuit into segments is worthwhile, because even in a large group of AC drives the volume of the liquid stays under 100 litres. An additional advantage of separated cooling segments is the opportunity to use inhibitors and glycol against corrosion, freezing and micro-organisms.

The Vacon heat exchanger has versatile protection and control functions. The whole system is supervised by the integrated drive's application software, which meets the standards of our most demanding customers. The operation of the unit can be monitored by an upper level automation system. The system controls the cooling conditions of the drives and supervises the flow, while detecting any possible leaks in the cooling system.

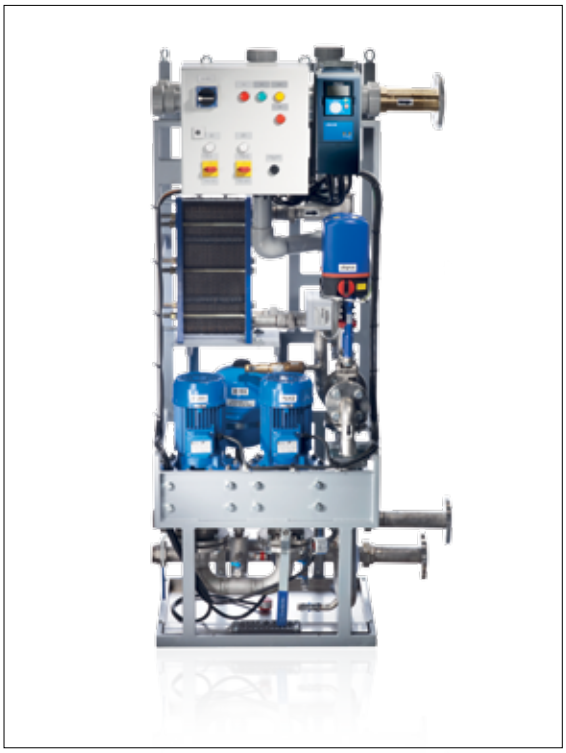
The Vacon heat exchanger can be used in different types of electrical networks where frequencies and voltages may vary, as the cooling pump is controlled by an AC drive. Such networks are typically used in the marine industry and other electrical island networks using diesel generators. This solution offers the added advantage of being able to adjust the flow capacity to meet the demand. Higher than expected pressure losses within the cooling circuit may be easily compensated for by changing the speed of the pump, thus raising the pressure and flow.

A standard cooling unit delivery consists of:

- Self-supporting module rack construction, which can be integrated into generic switchgear and enclosure solutions
- Cooling circuit equipped with threaded joints or flanges
- Heavy industry PVC-C pipework, which is excellent as it is lightweight and resists corrosion
- Industrial water heat exchanger, three-way-valve, pump, AC drive

Available cooling unit options:

- Stainless steel AISI piping
- Two-way-valve capable of optimizing the quantity of the cooling water, when the temperature of the process liquid is low
- Heat exchanger can be delivered installed inside a Rittal TS8 or VSG VEDA 5000 enclosure
- Double pumps can be selected for marine class requirements, types 120 kW and 300 kW
- Titanium heat exchanger is used in seawater circuits. The structure and performance differs from the fresh water models.



	HXL-M/V/R-040-N-P	HXL/M-M/V/R-120-N-P	HXS/T-M/V/R-070-N-P	HXL/M-M/R-300-N-P
Cooling power	0...40 kW	0...120 kW	0...69 kW	0...300 kW
Mains supply	380...420 VAC	380...420 VAC	380...420 VAC	380...500 VAC
Flow	40...120 l/min	120...360 l/min	120...200 l/min	360...900 l/min
Distribution pressure	0.3 bar / l=10 m, DN32*	HXL: 1 bar / l = 40 m, DN50 HXM: 0.7 bar / l = 30 m, DN50	HXS: 1 bar / l = 40 m, DN50 HXT: 0.7 bar / l = 25 m, DN50	HXL: 1 bar / l = 40 m, DN80 HXM: 0.7 bar / l = 25 m, DN80
Double pump		HXM	HXT	HXM
Enclosures	VEDA, Rittal	VEDA, Rittal	VEDA, Rittal	Rittal

* l = maximum distribution distance with specific DN diameter

RATINGS AND DIMENSIONS

VACON NXP LIQUID COOLED FREQUENCY CONVERTERS, 6-PULSE & 12-PULSE, MAINS VOLTAGE 400-500 VAC

AC drive type 6-pulse	AC drive type 12-pulse	Drive output current			Motor shaft power		Power loss c/a/T*) [kW]	Chassis	Choke type 6-pulse	Choke type 12-pulse
		Thermal I_{th} [A]	Rated cont. I_L [A]	Rated cont. I_H [A]	Optimum motor at I_{th} (400V) [kW]	Optimum motor at I_{th} (500V) [kW]				
NXP00165A0N1SWS		16	15	11	7.5	11	0.4/0.2/0.6	CH3	CHK0023N6A0	
NXP00225A0N1SWS		22	20	15	11	15	0.5/0.2/0.7	CH3	CHK0023N6A0	
NXP00315A0N1SWS		31	28	21	15	18.5	0.7/0.2/0.9	CH3	CHK0038N6A0	
NXP00385A0N1SWS		38	35	25	18.5	22	0.8/0.2/1.0	CH3	CHK0038N6A0	
NXP00455A0N1SWS		45	41	30	22	30	1.0/0.3/1.3	CH3	CHK0062N6A0	
NXP00615A0N1SWS		61	55	41	30	37	1.3/0.3/1.5	CH3	CHK0062N6A0	
NXP00725A0N0SWS		72	65	48	37	45	1.2/0.3/1.5	CH4	CHK0087N6A0	
NXP00875A0N0SWS		87	79	58	45	55	1.5/0.3/1.8	CH4	CHK0087N6A0	
NXP01055A0N0SWS		105	95	70	55	75	1.8/0.3/2.1	CH4	CHK0145N6A0	
NXP01405A0N0SWS		140	127	93	75	90	2.3/0.3/2.6	CH4	CHK0145N6A0	
NXP01685A0N0SWS		168	153	112	90	110	4.0/0.4/4.4	CH5	CHK0261N6A0	
NXP02055A0N0SWS		205	186	137	110	132	5.0/0.5/5.5	CH5	CHK0261N6A0	
NXP02615A0N0SWS		261	237	174	132	160	6.0/0.5/6.5	CH5	CHK0261N6A0	
NXP03005A0N0SWF		300	273	200	160	200	4.5/0.5/5.0	CH61	CHK0400N6A0	
NXP03855A0N0SWF		385	350	257	200	250	6.0/0.5/6.5	CH61	CHK0400N6A0	
NXP04605A0N0SWF	NXP04605A0N0TWF	460	418	307	250	315	6.5/0.5/7.0	CH72	CHK0520N6A0	2 x CHK0261N6A0
NXP05205A0N0SWF	NXP05205A0N0TWF	520	473	347	250	355	7.5/0.6/8.1	CH72	CHK0520N6A0	2 x CHK0261N6A0
NXP05905A0N0SWF	NXP05905A0N0TWF	590	536	393	315	400	9.0/0.7/9.7	CH72	CHK0650N6A0	2 x CHK0400N6A0
NXP06505A0N0SWF	NXP06505A0N0TWF	650	591	433	355	450	10.0/0.7/10.7	CH72	CHK0650N6A0	2 x CHK0400N6A0
NXP07305A0N0SWF	NXP07305A0N0TWF	730	664	487	400	500	12.0/0.8/12.8	CH72	CHK0750N6A0	2 x CHK0400N6A0
NXP08205A0N0SWF		820	745	547	450	560	12.5/0.8/13.3	CH63	CHK0820N6A0	
NXP09205A0N0SWF		920	836	613	500	600	14.4/0.9/15.3	CH63	CHK1030N6A0	
NXP10305A0N0SWF		1030	936	687	560	700	16.5/1.0/17.5	CH63	CHK1030N6A0	
NXP11505A0N0SWF		1150	1045	766	600	750	18.5/1.2/19.7	CH63	CHK1150N6A0	
NXP13705A0N0SWF	NXP13705A0N0TWF	1370	1245	913	700	900	19.0/1.2/20.2	CH74	3 x CHK0520N6A0	2 x CHK0750N6A0
NXP16405A0N0SWF	NXP16405A0N0TWF	1640	1491	1093	900	1100	24.0/1.4/25.4	CH74	3 x CHK0650N6A0	2 x CHK0820N6A0
NXP20605A0N0SWF	NXP20605A0N0TWF	2060	1873	1373	1100	1400	32.5/1.8/34.3	CH74	3 x CHK0750N6A0	2 x CHK1030N6A0
NXP23005A0N0SWF		2300	2091	1533	1250	1500	36.3/2.0/38.3	CH74	3 x CHK0820N6A0	
NXP24705A0N0SWF	NXP24705A0N0TWF	2470	2245	1647	1300	1600	38.8/2.2/41.0	2 x CH74	6 x CHK0520N6A0	4 x CHK0650N6A0
NXP29505A0N0SWF	NXP29505A0N0TWF	2950	2681	1967	1550	1950	46.3/2.6/48.9	2 x CH74	6 x CHK0520N6A0	4 x CHK0750N6A0
NXP37105A0N0SWF	NXP37105A0N0TWF	3710	3372	2473	1950	2450	58.2/3.0/61.2	2 x CH74	6 x CHK0650N6A0	4 x CHK1030N6A0
NXP41405A0N0SWF	NXP41405A0N0TWF	4140	3763	2760	2150	2700	65.0/3.6/68.6	2 x CH74	6 x CHK0750N6A0	4 x CHK1150N6A0
2 x NXP24705A0N0SWF	2 x NXP24705A0N0TWF	4700	4300	3100	2450	3050	73.7/4.2/77.9	4 x CH74	12 x CHK0520N6A0	8 x CHK0650N6A0
2 x NXP29505A0N0SWF	2 x NXP29505A0N0TWF	5600	5100	3700	2900	3600	88/5/93	4 x CH74	12 x CHK0520N6A0	8 x CHK0750N6A0
2 x NXP37105A0N0SWF	2 x NXP37105A0N0TWF	7000	6400	4700	3600	4500	110.6/5.7/116.3	4 x CH74	12 x CHK0650N6A0	8 x CHK1030N6A0
2 x NXP41405A0N0SWF	2 x NXP41405A0N0TWF	7900	7200	5300	4100	5150	123.5/6.9/130.4	4 x CH74	12 x CHK0750N6A0	8 x CHK1150N6A0

I_{th} = Thermal maximum continuous RMS current. Dimensioning can be done according to this current if the process does not require any overloadability or the process does not include any load variation or margin for overloadability.

I_L = Low overloadability current. Allows +10% load variation. 10% exceeding can be continuous.

I_H = High overloadability current. Allows +50% load variation. 50% exceeding can be continuous.

All values with cosφ = 0,83 and efficiency = 97%

***) c =** power loss into coolant; **a** = power loss into air; **T** = total power loss; power losses of input chokes not included. All power losses obtained using max. supply voltage, Ith and switching frequency of 3.6 kHz and ClosedLoop control mode. All power losses are worst case losses.

If some other mains voltage is used, apply the formula **P = √3 x Un x In x cosφ x eff%** to calculate the NX Liquid-Cooled drive output power.

The enclosure class for all NX Liquid-Cooled frequency converters is IP00.

If the motor is continuously run at frequencies below 5 Hz (besides start and stop ramps), please pay attention to the drive dimensioning for low frequencies, i.e. maximum I = 0.66*Ith or choose drive according to I_H. It is recommended to check the rating with your distributor or Vacon.

Drive overrating may also be necessary if the process requires high starting torque.

VACON NXP LIQUID COOLED FREQUENCY CONVERTERS, 6-PULSE & 12-PULSE, MAINS VOLTAGE 525-690 VAC

AC drive type 6-pulse	AC drive type 12-pulse	Drive output current			Motor shaft power		Power loss c/a/T*) [kW]	Chassis	Choke type 6-pulse	Choke type 12-pulse
		Thermal I_{th} [A]	Rated cont. I_L [A]	Rated cont. I_H [A]	Optimum motor at I_{th} (525V) [kW]	Optimum motor at I_{th} (690V) [kW]				
NXP01706A0T0SWF		170	155	113	110	160	4.0/0.2/4.2	CH61	CHK0261N6A0	
NXP02086A0T0SWF		208	189	139	132	200	4.8/0.3/5.1	CH61	CHK0261N6A0	
NXP02616A0T0SWF		261	237	174	160	250	6.3/0.3/6.6	CH61	CHK0261N6A0	
NXP03256A0T0SWF	NXP03256A0T0TWF	325	295	217	200	300	7.2/0.4/7.6	CH72	CHK0400N6A0	2 x CHK0261N6A0
NXP03856A0T0SWF	NXP03856A0T0TWF	385	350	257	250	355	8.5/0.5/9.0	CH72	CHK0400N6A0	2 x CHK0261N6A0
NXP04166A0T0SWF	NXP04166A0T0TWF	416	378	277	250	355	9.1/0.5/9.6	CH72	CHK0520N6A0	2 x CHK0261N6A0
NXP04606A0T0SWF	NXP04606A0T0TWF	460	418	307	300	400	10.0/0.5/10.5	CH72	CHK0520N6A0	2 x CHK0261N6A0
NXP05026A0T0SWF	NXP05026A0T0TWF	502	456	335	355	450	11.2/0.6/11.8	CH72	CHK0520N6A0	2 x CHK0261N6A0
NXP05906A0T0SWF		590	536	393	400	560	12.4/0.7/13.1	CH63	CHK0650N6A0	
NXP06506A0T0SWF		650	591	433	450	600	14.2/0.8/15.0	CH63	CHK0650N6A0	
NXP07506A0T0SWF		750	682	500	500	700	16.4/0.9/17.3	CH63	CHK0750N6A0	
NXP08206A0T0SWF	NXP08206A0T0TWF	820	745	547	560	800	17.3/1.0/18.3	CH74	3 x CHK0400N6A0	2 x CHK0520N6A0
NXP09206A0T0SWF	NXP09206A0T0TWF	920	836	613	650	850	19.4/1.1/20.5	CH74	3 x CHK0400N6A0	2 x CHK0520N6A0
NXP10306A0T0SWF	NXP10306A0T0TWF	1030	936	687	700	1000	21.6/1.2/22.8	CH74	3 x CHK0400N6A0	2 x CHK0520N6A0
NXP11806A0T0SWF	NXP11806A0T0TWF	1180	1073	787	800	1100	25.0/1.3/26.3	CH74	3 x CHK0400N6A0	2 x CHK0650N6A0
NXP13006A0T0SWF	NXP13006A0T0TWF	1300	1182	867	900	1200	27.3/1.5/28.8	CH74	3 x CHK0520N6A0	2 x CHK0650N6A0
NXP15006A0T0SWF	NXP15006A0T0TWF	1500	1364	1000	1050	1400	32.1/1.7/33.8	CH74	3 x CHK0520N6A0	2 x CHK0820N6A0
NXP17006A0T0SWF	NXP17006A0T0TWF	1700	1545	1133	1150	1550	36.5/1.9/38.4	CH74	3 x CHK0650N6A0	2 x CHK1030N6A0
NXP18506A0T0SWF	NXP18506A0T0TWF	1850	1682	1233	1250	1650	39.0/2.0/41.0	2 x CH74	6 x CHK0400N6A0	4 x CHK0520N6A0
NXP21206A0T0SWF	NXP21206A0T0TWF	2120	1927	1413	1450	1900	44.9/2.4/47.3	2 x CH74	6 x CHK0400N6A0	4 x CHK0650N6A0
NXP23406A0T0SWF	NXP23406A0T0TWF	2340	2127	1560	1600	2100	49.2/2.6/51.8	2 x CH74	6 x CHK0400N6A0	4 x CHK0650N6A0
NXP27006A0T0SWF	NXP27006A0T0TWF	2700	2455	1800	1850	2450	57.7/3.1/60.8	2 x CH74	6 x CHK0520N6A0	4 x CHK0750N6A0
NXP31006A0T0SWF	NXP31006A0T0TWF	3100	2818	2066	2150	2800	65.7/3.4/69.1	2 x CH74	6 x CHK0520N6A0	4 x CHK0820N6A0
2 x NXP18506A0T0SWF	2 x NXP18506A0T0TWF	3500	3200	2300	2400	3150	74,2/3,8/77,9	4 x CH74	12 x CHK0400N6A0	8 x CHK0520N6A0
2 x NXP21206A0T0SWF	2 x NXP21206A0T0TWF	4000	3600	2700	2750	3600	85,4/4,5/89,9	4 x CH74	12 x CHK0400N6A0	8 x CHK0650N6A0
2 x NXP23406A0T0SWF	2 x NXP23406A0T0TWF	4400	4000	2900	3050	3950	93,4/5,0/98,4	4 x CH74	12 x CHK0400N6A0	8 x CHK0650N6A0
2 x NXP27006A0T0SWF	2 x NXP27006A0T0TWF	5100	4600	3400	3500	4600	109,7/5,8/115,5	4 x CH74	12 x CHK0520N6A0	8 x CHK0750N6A0
2 x NXP31006A0T0SWF	2 x NXP31006A0T0TWF	5900	5400	3900	4050	5300	124,8/6,5/131,3	4 x CH74	12 x CHK0520N6A0	8 x CHK0820N6A0

STANDARD AIR COOLED CHOKES FOR VACON NX LIQUID COOLED PRODUCT RANGE

Choke type	Losses to air [kW]	Dimensions WxHxD [mm]	Weight [kg]
CHK0023N6A0	145	230 x 179 x 121	10
CHK0038N6A0	170	270 x 209 x 145	15
CHK0062N6A0	210	300 x 214 x 160	20
CHK0087N6A0	250	300 x 233 x 170	26
CHK0145N6A0	380	200 x 292 x 185	37
CHK0261N6A0	460	354 x 357 x 230	53
CHK0400N6A0	610	350 x 421 x 262	84
CHK0520N6A0	810	497 x 446 x 244	115
CHK0650N6A0	890	497 x 496 x 244	130
CHK0750N6A0	970	497 x 527 x 273	170
CHK0820N6A0	1020	497 x 529 x 275	170
CHK1030N6A0	1170	497 x 677 x 307	213
CHK1150N6A0	1420	497 x 677 x 307	213

RATINGS AND DIMENSIONS

VACON NXP LIQUID COOLED INVERTER UNITS, DC BUS VOLTAGE 465-800 VDC

AC drive type	Drive output current			Motor shaft power		Power loss c/a/T*) [kW]	Chassis
	Thermal I_{th} [A]	Rated cont. I_L [A]	Rated cont. I_H [A]	Optimum motor at I_{th} (540 VDC) [kW]	Optimum motor at I_{th} (675 VDC) [kW]		
NXP00165A0T1IWS	16	15	11	7.5	11	0.4/0.2/0.6	CH3
NXP00225A0T1IWS	22	20	15	11	15	0.5/0.2/0.7	CH3
NXP00315A0T1IWS	31	28	21	15	18.5	0.7/0.2/0.9	CH3
NXP00385A0T1IWS	38	35	25	18.5	22	0.8/0.2/1.0	CH3
NXP00455A0T1IWS	45	41	30	22	30	1.0/0.3/1.3	CH3
NXP00615A0T1IWS	61	55	41	30	37	1.3/0.3/1.5	CH3
NXP00725A0T0IWS	72	65	48	37	45	1.2/0.3/1.5	CH4
NXP00875A0T0IWS	87	79	58	45	55	1.5/0.3/1.8	CH4
NXP01055A0T0IWS	105	95	70	55	75	1.8/0.3/2.1	CH4
NXP01405A0T0IWS	140	127	93	75	90	2.3/0.3/2.6	CH4
NXP01685A0T0IWS	168	153	112	90	110	2.5/0.3/2.8	CH5
NXP02055A0T0IWS	205	186	137	110	132	3.0/0.4/3.4	CH5
NXP02615A0T0IWS	261	237	174	132	160	4.0/0.4/4.4	CH5
NXP03005A0T0IWF	300	273	200	160	200	4.5/0.4/4.9	CH61
NXP03855A0T0IWF	385	350	257	200	250	5.5/0.5/6.0	CH61
NXP04605A0T0IWF	460	418	307	250	315	5.5/0.5/6.0	CH62
NXP05205A0T0IWF	520	473	347	250	355	6.5/0.5/7.0	CH62
NXP05905A0T0IWF	590	536	393	315	400	7.5/0.6/8.1	CH62
NXP06505A0T0IWF	650	591	433	355	450	8.5/0.6/9.1	CH62
NXP07305A0T0IWF	730	664	487	400	500	10.0/0.7/10.7	CH62
NXP08205A0T0IWF	820	745	547	450	560	12.5/0.8/13.3	CH63
NXP09205A0T0IWF	920	836	613	500	600	14.4/0.9/15.3	CH63
NXP10305A0T0IWF	1030	936	687	560	700	16.5/1.0/17.5	CH63
NXP11505A0T0IWF	1150	1045	766	600	750	18.4/1.1/19.5	CH63
NXP13705A0T0IWF	1370	1245	913	700	900	15.5/1.0/16.5	CH64
NXP16405A0T0IWF	1640	1491	1093	900	1100	19.5/1.2/20.7	CH64
NXP20605A0T0IWF	2060	1873	1373	1100	1400	26.5/1.5/28.0	CH64
NXP23005A0T0IWF	2300	2091	1533	1250	1500	29.6/1.7/31.3	CH64
NXP24705A0T0IWF	2470	2245	1647	1300	1600	36.0/2.0/38.0	2 x CH64
NXP29505A0T0IWF	2950	2681	1967	1550	1950	39.0/2.4/41.4	2 x CH64
NXP37105A0T0IWF	3710	3372	2473	1950	2450	48.0/2.7/50.7	2 x CH64
NXP41405A0T0IWF	4140	3763	2760	2150	2700	53.0/3.0/56.0	2 x CH64
2 x NXP24705A0T0IWF	4700	4300	3100	2450	3050	69.1/3.9/73	4 x CH64
2 x NXP29505A0T0IWF	5600	5100	3700	2900	3600	74.4/4.6/79	4 x CH64
2 x NXP37105A0T0IWF	7000	6400	4700	3600	4500	90.8/5.2/96	4 x CH64
2 x NXP41405A0T0IWF	7900	7200	5300	4100	5150	101.2/5.8/107	4 x CH64

The voltage classes for the inverter units used in the tables above have been defined as follows:

Input 540 VDC = Rectified 400 VAC supply
Input 675 VDC = Rectified 500 VAC supply

VACON NXP LIQUID COOLED INVERTER UNITS, DC BUS VOLTAGE 640-1100 VDC

AC drive type	Drive output current			Motor shaft power		Power loss c/a/T*) [kW]	Chassis
	Thermal I_{th} [A]	Rated cont. I_L [A]	Rated cont. I_H [A]	Optimum motor at I_{th} (710 VDC) [kW]	Optimum motor at I_{th} (930 VDC) [kW]		
NXP01706A0T0IWF	170	155	113	110	160	3.6/0.2/3.8	CH61
NXP02086A0T0IWF	208	189	139	132	200	4.3/0.3/4.6	CH61
NXP02616A0T0IWF	261	237	174	160	250	5.4/0.3/5.7	CH61
NXP03256A0T0IWF	325	295	217	200	300	6.5/0.3/6.8	CH62
NXP03856A0T0IWF	385	350	257	250	355	7.5/0.4/7.9	CH62
NXP04166A0T0IWF	416	378	277	250	355	8.0/0.4/8.4	CH62
NXP04606A0T0IWF	460	418	307	300	400	8.7/0.4/9.1	CH62
NXP05026A0T0IWF	502	456	335	355	450	9.8/0.5/10.3	CH62
NXP05906A0T0IWF	590	536	393	400	560	10.9/0.6/11.5	CH63
NXP06506A0T0IWF	650	591	433	450	600	12.4/0.7/13.1	CH63
NXP07506A0T0IWF	750	682	500	500	700	14.4/0.8/15.2	CH63
NXP08206A0T0IWF	820	745	547	560	800	15.4/0.8/16.2	CH64
NXP09206A0T0IWF	920	836	613	650	850	17.2/0.9/18.1	CH64
NXP10306A0T0IWF	1030	936	687	700	1000	19.0/1.0/20.0	CH64
NXP11806A0T0IWF	1180	1073	787	800	1100	21.0/1.1/22.1	CH64
NXP13006A0T0IWF	1300	1182	867	900	1200	24.0/1.3/25.3	CH64
NXP15006A0T0IWF	1500	1364	1000	1050	1400	28.0/1.5/29.5	CH64
NXP17006A0T0IWF	1700	1545	1133	1150	1550	32.1/1.7/33.8	CH64
NXP18506A0T0IWF	1850	1682	1233	1250	1650	34.2/1.8/36.0	2 x CH64
NXP21206A0T0IWF	2120	1927	1413	1450	1900	37.8/2.0/39.8	2 x CH64
NXP23406A0T0IWF	2340	2127	1560	1600	2100	43.2/2.3/45.5	2 x CH64
NXP27006A0T0IWF	2700	2455	1800	1850	2450	50.4/2.7/53.1	2 x CH64
NXP31006A0T0IWF	3100	2818	2066	2150	2800	57.7/3.1/60.8	2 x CH64
2 x NXP18506A0T0IWF	3500	3200	2300	2400	3150	64,9/3,5/68,4	4 x CH64
2 x NXP21206A0T0IWF	4000	3600	2700	2750	3600	71,8/3,8/75,6	4 x CH64
2 x NXP23406A0T0IWF	4400	4000	2900	3050	3950	82,1/4,4/86,5	4 x CH64
2 x NXP27006A0T0IWF	5100	4600	3400	3500	4600	95,8/5,1/100,9	4 x CH64
2 x NXP31006A0T0IWF	5900	5400	3900	4050	5300	109,7/5,8/115,5	4 x CH64

The voltage classes for the inverter units used in the tables above have been defined as follows:

Input 710 VDC = Rectified 525 VAC supply
Input 930 VDC = Rectified 690 VAC supply

VACON NXP LIQUID COOLED DIMENSIONS: DRIVES CONSISTING OF ONE MODULE

Chassis	Width [mm]	Height [mm]	Depth [mm]	Weight [kg]
CH3	160	431	246	15
CH4	193	493	257	22
CH5	246	553	264	40
CH61/62	246	658	372	55
CH63	505	923	375	120
Ch64	746	923	375	180
CH72	246	1076	372	90
Ch74	746	1175	385	280

One-module drive dimensions (mounting base included)
Please note that AC chokes are not included

RATINGS AND DIMENSIONS

VACON NXA LIQUID COOLED ACTIVE FRONT-END, DC BUS VOLTAGE 465-800 VDC

AC drive type	AC Current			DC power					
	Thermal I_{th} [A]	Rated I_L [A]	Rated I_H [A]	400 VAC mains I_{th} (kW)	500 VAC mains I_{th} (kW)	400 VAC mains I_L (kW)	500 VAC mains I_L (kW)		
NXA01685A0T02WS	168	153	112	113	142	103	129	2.5/0.3/2.8	CH5
NXA02055A0T02WS	205	186	137	138	173	125	157	3.0/0.4/3.4	CH5
NXA02615A0T02WS	261	237	174	176	220	160	200	4.0/0.4/4.4	CH5
NXA03005A0T02WF	300	273	200	202	253	184	230	4.5/0.4/4.9	CH61
NXA03855A0T02WF	385	350	257	259	324	236	295	5.5/0.5/6.0	CH61
NXA04605A0T02WF	460	418	307	310	388	282	352	5.5/0.5/6.0	CH62
NXA05205A0T02WF	520	473	347	350	438	319	398	6.5/0.5/7.0	CH62
NXA05905A0T02WF	590	536	393	398	497	361	452	7.5/0.6/8.1	CH62
NXA06505A0T02WF	650	591	433	438	548	398	498	8.5/0.6/9.1	CH62
NXA07305A0T02WF	730	664	487	492	615	448	559	10.0/0.7/10.7	CH62
NXA08205A0T02WF	820	745	547	553	691	502	628	10.0/0.7/10.7	CH63
NXA09205A0T02WF	920	836	613	620	775	563	704	12.4/0.8/12.4	CH63
NXA10305A0T02WF	1030	936	687	694	868	631	789	13.5/0.9/14.4	CH63
NXA11505A0T02WF	1150	1045	767	775	969	704	880	16.0/1.0/17.0	CH63
NXA13705A0T02WF	1370	1245	913	923	1154	839	1049	15.5/1.0/16.5	CH64
NXA16405A0T02WF	1640	1491	1093	1105	1382	1005	1256	19.5/1.2/20.7	CH64
NXA20605A0T02WF	2060	1873	1373	1388	1736	1262	1578	26.5/1.5/28.0	CH64
NXA23005A0T02WF	2300	2091	1533	1550	1938	1409	1762	29.6/1.7/31.3	CH64

VACON NXA LIQUID COOLED ACTIVE FRONT-END, DC BUS VOLTAGE 640-1100 VDC

AC drive type	AC Current			DC power				Power loss c/a/T*) (kW)	Chassis
	Thermal I_{th} [A]	Rated I_L [A]	Rated I_H [A]	525 VAC mains I_{th} (kW)	690 VAC mains I_{th} (kW)	525 VAC mains I_L (kW)	690 VAC mains I_L (kW)		
NXA01706A0T02WF	170	155	113	150	198	137	180	3.6/0.2/3.8	CH61
NXA02086A0T02WF	208	189	139	184	242	167	220	4.3/0.3/4.6	CH61
NXA02616A0T02WF	261	237	174	231	303	210	276	5.4/0.3/5.7	CH61
NXA03256A0T02WF	325	295	217	287	378	261	343	6.5/0.3/6.8	CH62
NXA03856A0T02WF	385	350	257	341	448	310	407	7.5/0.4/7.9	CH62
NXA04166A0T02WF	416	378	277	368	484	334	439	8.0/0.4/8.4	CH62
NXA04606A0T02WF	460	418	307	407	535	370	486	8.7/0.4/9.1	CH62
NXA05026A0T02WF	502	456	335	444	584	403	530	9.8/0.5/10.3	CH62
NXA05906A0T02WF	590	536	393	522	686	474	623	10.9/0.6/11.5	CH63
NXA06506A0T02WF	650	591	433	575	756	523	687	12.4/0.7/13.1	CH63
NXA07506A0T02WF	750	682	500	663	872	603	793	14.4/0.8/15.2	CH63
NXA08206A0T02WF	820	745	547	725	953	659	866	15.4/0.8/16.2	CH64
NXA09206A0T02WF	920	836	613	814	1070	740	972	17.2/0.9/18.1	CH64
NXA10306A0T02WF	1030	936	687	911	1197	828	1088	19.0/1.0/20.0	CH64
NXA11806A0T02WF	1180	1073	787	1044	1372	949	1247	21.0/1.1/22.1	CH64
NXA13006A0T02WF	1300	1182	867	1150	1511	1046	1374	24.0/1.3/25.3	CH64
NXA15006A0T02WF	1500	1364	1000	1327	1744	1207	1586	28.0/1.5/29.5	CH64
NXA17006A0T02WF	1700	1545	1133	1504	1976	1367	1796	32.1/1.7/33.8	CH64

*** C** = power loss into coolant, **A** = power loss into air, **T** = total power loss

VACON NXP LIQUID COOLED REGENERATIVE LINE FILTERS

LCL Filter Type	Suitability	Power loss c/a/T*) [kW]	Dimensions L_{net} 1pcs, WxHxD [mm]	Dimensions L_{drive} 1pcs, (total 3pcs)WxHxD [mm]	Dimensions C_{bank} 1pcs, WxHxD [mm]	Total weight [kg]
RLC-0385-6-0	CH62/690VAC: 325A & 385A	2,6/0,8/3,4	580 x 450 x 385	410 x 415 x 385	360 x 265 x 150	458
RLC-0520-6-0	CH62/500-690VAC	2,65/0,65/3,3	580 x 450 x 385	410 x 415 x 385	360 x 265 x 150	481
RLC-0750-6-0	CH62/500VAC, CH63/690VAC	3,7/1/4,7	580 x 450 x 385	410 x 450 x 385	360 x 275 x 335	508
RLC-0920-6-0	CH63/500VAC, CH64/690VAC	4,5/1,4/5,9	580 x 500 x 390	410 x 500 x 400	360 x 275 x 335	577
RLC-1180-6-0	CH63/500VAC, CH64/690VAC	6,35/1,95/8,3	585 x 545 x 385	410 x 545 x 385	350 x 290 x 460	625
RLC-1640-6-0	CH64/500-690VAC	8,2/2,8/11	585 x 645 x 385	420 x 645 x 385	350 x 290 x 460	736
RLC-2300-5-0	CH64/500VAC: 2060A & 2300A	9,5/2,9/12,4	585 x 820 x 370	410 x 820 x 380	580 x 290 x 405	896

The RLC filter contains a 3-phase choke on the mains side, capacitors and 3pcs 1-phase chokes on the AFE side.

VACON NXB LIQUID COOLED EXTERNAL BRAKE CHOPPER, DC BUS VOLTAGE 460-800 VDC

AC drive type	Current				Braking power		Power loss c/a/T*) [kW]	Chassis
	BCU rated cont. braking current I_{br} [A]	Rated min resistance @800VDC (Ω)	Rated min resistance @600VDC (Ω)	Rated max input current (Adc)	Rated cont. braking power 2*R@ 800VDC [kW]	Rated cont. braking power 2*R@ 600VDC [kW]		
NXB00315A0T08WS	2*31	25.7	19.5	62	49	37	0.7/0.2/0.9	CH3
NXB00615A0T08WS	2*61	13.1	9.9	122	97	73	1.3/0.3/1.5	CH3
NXB00875A0T08WS	2*87	9.2	7.0	174	138	105	1.5/0.3/1.8	CH4
NXB01055A0T08WS	2*105	7.6	5.8	210	167	127	1.8/0.3/2.1	CH4
NXB01405A0T08WS	2*140	5.7	4.3	280	223	169	2.3/0.3/2.6	CH4
NXB01685A0T08WS	2*168	4.7	3.6	336	267	203	2.5/0.3/2.8	CH5
NXB02055A0T08WS	2*205	3.9	3.0	410	326	248	3.0/0.4/3.4	CH5
NXB02615A0T08WS	2*261	3.1	2.3	522	415	316	4.0/0.4/4.4	CH5
NXB03005A0T08WF	2*300	2.7	2.0	600	477	363	4.5/0.4/4.9	CH61
NXB03855A0T08WF	2*385	2.1	1.6	770	613	466	5.5/0.5/6.0	CH61
NXB04605A0T08WF	2*460	1.7	1.3	920	732	556	5.5/0.5/6.0	CH62
NXB05205A0T08WF	2*520	1.5	1.2	1040	828	629	6.5/0.5/7.0	CH62
NXB05905A0T08WF	2*590	1.4	1.1	1180	939	714	7.5/0.6/8.1	CH62
NXB06505A0T08WF	2*650	1.2	1.0	1300	1035	786	8.5/0.6/9.1	CH62
NXB07305A0T08WF	2*730	1.1	0.9	1460	1162	833	10.0/0.7/10.7	CH62

VACON NXB LIQUID COOLED EXTERNAL BRAKE CHOPPER, DC BUS VOLTAGE 640-1100 VDC

AC drive type	Current				Braking power		Power loss c/a/T*) [kW]	Chassis
	BCU rated cont. braking current I_{br} [A]	Rated min resistance @1100 VDC (Ω)	Rated min resistance @840 VDC (Ω)	Rated max input current (Adc)	Rated cont. braking power 2*R@1100 VDC [kW]	Rated cont. braking power 2*R@840 VDC [kW]		
NXB01706A0T08WF	2*170	6.5	4.9	340	372	282	4.5/0.2/4.7	CH61
NXB02086A0T08WF	2*208	5.3	4	416	456	346	5.5/0.3/5.8	CH61
NXB02616A0T08WF	2*261	4.2	3.2	522	572	435	5.5/0.3/5.8	CH61
NXB03256A0T08WF	2*325	3.4	2.6	650	713	542	6.5/0.3/6.8	CH62
NXB03856A0T08WF	2*385	2.9	2.2	770	845	643	7.5/0.4/7.9	CH62
NXB04166A0T08WF	2*416	2.6	2	832	913	693	8.1/0.4/8.4	CH62
NXB04606A0T08WF	2*460	2.4	1.8	920	1010	767	8.5/0.4/8.9	CH62
NXB05026A0T08WF	2*502	2.2	1.7	1004	1100	838	10.0/0.5/10.5	CH62

NOTE: The rated currents in given ambient (+50°C) and coolant (+30°) temperatures are achieved only when the switching frequency is equal to or less than the factory default.

NOTE: Braking power: $P_{brake} = 2*U_{brake}^2 / R_{resistor}$ when 2 resistors are used

NOTE: Max input DC current: $I_{in\_max} = P_{brake\_max} / U_{brake}$

VACON NXP LIQUID COOLED FREQUENCY CONVERTER, INTERNAL BRAKE CHOPPER UNIT, BRAKING VOLTAGE 460-800 VDC

Converter Type	Loadability	Braking capacity @ 600 VDC		Braking capacity @ 800 VDC		Chassis
	Rated min resistance [Ω]	Rated cont. braking power [kW]	BCU rated cont. braking current, I_{br} [A]	Rated cont. braking power [kW]	BCU rated cont. braking current, I_{br} [A]	
NX_460-730 5 1)	1.3	276	461	492	615	CH72
NX_1370-2300 5	1.3	276	461	492	615	CH74

VACON NXP LIQUID COOLED FREQUENCY CONVERTER, INTERNAL BRAKE CHOPPER UNIT, BRAKING VOLTAGE 840-1100 VDC

Converter Type	Loadability	Braking capacity @ 840 VDC		Braking capacity @ 1100 VDC		Chassis
	Rated min resistance [Ω]	Rated cont. braking power [kW]	BCU rated cont. braking current, I_{br} [A]	Rated cont. braking power [kW]	BCU rated cont. braking current, I_{br} [A]	
NX_325-502 6 1)	2.8	252	300	432	392	CH72
NX_820-1700 6	2.8	252	300	432	392	CH74

1) Only 6 pulse drives

The internal brake chopper can also be used in motor application where 2...4 x Ch7x drives are used for a single motor, but in this case the DC connections of the power modules must be connected together.

RATINGS AND DIMENSIONS

VACON EXTERNAL BRAKE RESISTORS FOR LIQUID COOLED CH72 (CH74) DRIVES - IP20

Product code	Voltage range [VDC]	Maximum brake power [kw]	Maximum average power [kW] (1 pulse/2min)	Resistance [Ω]	Maximum energy [kJ] (predefined power pulse)	Dimensions W x H x D [mm]	Weight [kg]
BRW-0730-LD-5 [1]	465...800VDC	637 [3]	13.3	1.3	1594	480 x 600 x 740	55
BRW-0730-HD-5 [2]	465...800VDC	637 [3]	34.5	1.3	4145	480 x 1020 x 740	95
BRW-0502-LD-6 [1]	640...1100VDC	516 [4]	10.8	2.8	1290	480 x 760 x 530	40
BRW-0502-HD-6 [2]	640...1100VDC	516 [4]	28	2.8	3354	480 x 1020 x 740	85

NOTE: Thermal protection switch included

[1] LD = Light Duty: 5s nominal torque braking from nominal speed reduced linearly to zero once per 120s
[2] HD = Heavy duty: 3s nominal torque braking at nominal speed + 7s nominal torque braking from nominal speed reduced linearly to zero once per 120s.
[3] at 911 VDC
[4] at 1200 VDC

OPTION BOARDS

Type	Card slot					I / O signal																			
	A	B	C	D	E	DI	DO	DI DO	AI (mA/ V/±V)	AI (mA) iso-lated	AO (mA/V)	AO (mA) iso-lated	RO (NO/ NC)	RO (NO)	+10V$_{ref}$	Therm	+24V/ EXT +24V	pt100	KTY84	42-240 VAC input	DI/DO (10...24V)	DI/DO (RS422)	DI ~ 1Vp-p	Re-solver	Out +5V/ +15V/ +24V	Out +15V/ +24V	Out +5V/ +12V/ +15V	Note
Basic I/O cards (OPT-A)																											
OPT-A1						6	1		2		1				1		2										
OPT-A2													2														
OPT-A3													1	1		1											
OPT-A4						2																3/0			1		
OPT-A5						2															3/0					1	
OPT-A7																					6/2					1	2 enc. input + 1 enc. output
OPT-A8						6	1		2		1				1		2										1)
OPT-A9						6	1		2		1				1		2										2.5 mm^2 terminals
OPT-AE							2														3/0					1	DO = Divider+Direction
OPT-AF						2							1	1		1											
OPT-AK																							3			1	Sin/Cos/ Marker
OPT-AN						6			2		2																Limited support
I/O expander cards (OPT-B)																											
OPT-B1								6									1										Selectable DI/DO
OPT-B2													1	1		1											
OPT-B4										1		2					1										2)
OPT-B5														3													
OPT-B8																	1	3									
OPT-B9						2								1						5							
OPT-BH																		3	3								3 x pt1000; 3 x Ni1000
OPT-BB						2																0/2	2				Sin/Cos + EnDat
OPT-BC																					3/3			1			Encoder out = Resolver simulation
OPT-BE																											EnDat/SSI
Fieldbus cards (OPT-C)																											
OPT-C2						RS-485 (Multiprotocol)																					Modbus, N2
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)																					Modbus, N2
OPT-CG						SELMA 2 protocol																					
OPT-CI						Modbus/TCP (Ethernet)																					
OPT-CJ						BACNet, RS485																					
OPT-CP						ProfiNet I/O (Ethernet)																					
OPT-CQ						Ethernet/IP (Ethernet)																					
Communication cards (OPT-D)																											
OPT-D1						System Bus adapter (2 x fiber optic pairs)																					
OPT-D2						System Bus adapter (1 x fiber optic pair) & CAN-bus adapter (galvanically decoupled)																					
OPT-D3						RS232 adapter card (galvanically decoupled), used mainly for application engineering to connect another keypad																					
OPT-D6						CAN-bus adapter (galvanically decoupled)																					
OPT-D7						Line voltage measurement																					

1) Analogue signals galvanically isolated as a group

2) Analogue signals galvanically isolated separately

Mains connection	Input voltage Uin	400...500 VAC; 525...690 VAC; (–10%...+10%) 465...800 VDC: 640...1100 VDC (–0%...+0%)
	Input frequency	45...66 Hz
Motor connection	Output voltage	0—U_{in}
	Output frequency	0...320 Hz
Control characteristics	Control method	Frequency control U/f Open loop vector control (5-150% of base speed): speed control 0.5%, dynamic 0.3%sec, torque lin. <2%, torque rise time ~5 ms Closed loop vector control (entire speed range): speed control 0.01%, dynamic 0.2% sec, torque lin. <2%, torque rise time ~2 ms
	Switching frequency	NX_5: Up to and including NX_0061: 1...16 kHz; Factory default 10 kHz From NX_0072: 1...12 kHz; Factory default 3.6 kHz NX_6: 1...6 kHz; Factory default 1.5 kHz"
	Field weakening point	8...320 Hz
	Acceleration time	0...3000 sec
	Deceleration time	0...3000 sec
	Braking	DC brake: 30% of TN (without brake resistor), flux braking
Ambient conditions	Ambient operating temperature	–10°C (no frost)...+50°C (at I_{th}); The NX liquid cooled drives must be used in an heated indoor controlled environment.
	Installation temperature	0...+70°C
	Storage temperature	–40°C...+70°C; no liquid in heatsink under 0°C
	Relative humidity	5 to 96% RH, non-condensing, no dripping water
	Air quality - chemical vapours - mechanical particles"	No corrosive gases IEC 60721-3-3, unit in operation, class 3C2 IEC 60721-3-3, unit in operation, class 3S2 (no conductive dust allowed)
	Altitude	NX_5: (380...500 V): 3000 m ASL; in case network is not corner grounded NX_6: (525...690 V) max. 2000 m ASL. For further requirements, contact factory 100-% load capacity (no derating) up to 1,000 m; above 1,000 m derating of maximum ambient operating temperature by 0,5°C per each 100 m is required.
	Vibration	5...150 Hz
	EN50178/EN60068-2-6	Displacement amplitude 0.25 mm (peak) at 3...31 Hz Max acceleration amplitude 1 G at 31...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	IP00 / standard in entire kW/HP range
EMC	Immunity	Fulfils all EMC immunity requirements
	Emissions	EMC level N, T (IT networks)
Safety		EN 50178, EN 60204-1, IEC 61800-5-1, CE, UL, CUL; (see unit nameplate for more details)
Functional safety *)	STO	EN/IEC 61800-5-2 Safe Torque Off (STO) SIL2, EN ISO 13849-1 PL"d" Category 3, EN 62061: SILCL2, IEC 61508: SIL2.
	SS1	EN /IEC 61800-5-2 Safe Stop 1 (SS1) SIL2, EN ISO 13849-1 PL"d" Category 3, EN /IEC62061: SILCL2, IEC 61508: SIL2.
	ATEX Thermistor input	94/9/EC, CE 0537 Ex 11 (2) GD
Approvals	Type tested	SGS Fimko CE, UL
	Type approval	DNV, BV, Lloyd's Register (other marine societies delivery based approvals)
	Approvals our partners have	Ex, SIRA
Liquid cooling	Allowed cooling agents	Drinking water Water-glycol mixture
	Temperature of cooling agent	0...35°C (I_{th})(input); 35...55°C, please see manual for further details Temperature rise during circulation max. 5°C No condensation allowed
	System max. working pressure	6 bar/ 30 bar peak
	Pressure loss (at nominal flow)	Varies according to size, please see manual for further details
Protections		Overvoltage, undervoltage, earth fault, mains supervision, motor phase supervision, overcurrent, unit overtemperature, motor overload, motor stall, motor underload, short-circuit of +24 V and +10 V reference voltages.

*** with OPT-AF board**

VACON®

DRIVEN BY DRIVES

VACON® NXP GRID CONVERTER

CLEANER POWER FOR PORTS AND SHIPS

HOW GOVERNMENTS ARE FOCUSING ON CUTTING EMISSIONS

The International Maritime Organization (IMO) has made the Energy Efficiency Design Index (EEDI), which sets out to ensure new ships improve carbon efficiency by 20% in 2020 and 30% in 2030.

The IMO has also created the Ship Energy Efficiency Management Plan (SEEMP), which means all ships must seek to establish a means of improving energy efficiency.

REDUCE EMISSIONS AND IMPROVE EFFICIENCY

The limits of the worlds natural resources dominate our times, and the marine industry is taking on the same challenges as everybody else regarding energy usage. VACON® NXP Grid Converter technology helps ship owners and port authorities reduce fuel intake and improve efficiency. This will please investors and environmental legislators alike – after all, lower energy consumption equals lower costs.

Ships require power when at sea and when docked in the harbour. Power is not only required to propel ships around the world, it also provides electricity to operate equipment on board at all times.

Take a cruise ship for example. Passengers pay a great deal of money and expect to be treated accordingly. Karaoke, champagne bars and swimming pools all need a lot of electricity to power them, as do more fundamental components, such as propulsion machinery and winches. This also applies when a ship's docked in a city harbour, as on-board facilities still need to operate. Port authorities and local residents appreciate the use of grid converters, since they can practically eradicate CO_2 and NO_x emissions while the vessel is docked.

ECO-FRIENDLY SEA TRAVEL

Providing clean energy and saving money for our customers is what drives Vacon, and we have developed environmentally and economically sound solutions for the past two decades. VACON NXP Grid Converter technology represents the next step, ensuring that ship and port owners can meet new stipulations while productivity increases and business prospers.

Using VACON® NXP Grid Converter in a shore supply solution enables ships to source energy from local grids on the shore, meaning that main ship generators can be switched off completely. Applying VACON® NXP Grid Converter to a shaft generator solution allows for optimum control of propulsion machinery at various speeds, thus saving plenty of energy. You can also rest assured that your products will be fully optimised for your particular solution with the help of VACON® Service.

SHORE SUPPLY SOLUTION WITH VACON® NXP GRID CONVERTER

Ships travel from port to port, sometimes stopping in a new country each day. Ports don't all use the same electrical frequencies, and ships have historically used a fuel-driven onboard generator to provide electrical power while docked. This is costly though, and city councils and local residents are reluctant to tolerate the noise and poor air quality that is often associated with a busy city harbour.

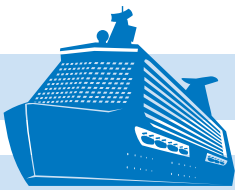
Many port authorities now prohibit, or at least strictly limit, the use of diesel generators while ships are docked. VACON® NXP Grid Converter technology ensures that the ship's frequency matches that of the local grid. This allows the ship's entire electrical network to be powered via a set of cables linking the vessel to the shore.

The main engine can be shut down, which prevents unnecessary carbon emissions and noise pollution, and allows maintenance work to take place when necessary. All in all, it's a far cleaner, more economical solution than before and is set to become a standard requirement in the future.

HOW IT WORKS

The shore side equipment typically includes an isolation transformer and either a 6/12 pulse or low harmonic Active Front End filter. The ship requires a VACON NXP Grid Converter, a filter and a connection interface. Shore side equipment is selected depending on the limit to total harmonic distortion (THDi) levels, which can be as low as <5% when an active front-end unit is installed.

KEY BENEFITS



Environmentally friendly
- Reduced CO_2 and NO_x emissions
- Reduced noise and vibration levels

High performance
- Improved efficiency
- Option of planned engine maintenance when docked

Cost savings
- Less running hours for main engine extends lifespan
- Significantly less fuel used

CLEAN POWER FOR THE LARGEST PORT IN THE WORLD

The port of Shanghai
Location: Shanghai, China

The Port of Shanghai is the busiest in the world in terms of cargo throughput, with nearly 170 large ships docking each day. Annual trade accounts for around ¼ of China's total foreign trade. This activity inevitably puts a strain on the local environment, which is why the port uses a movable 2000 kVA shore supply system to supply electricity from the national grid to ships that are docked.

VACON® NXP Grid Converter technology plays a key role in this design, ensuring 10 kV of shore power can be converted into 440 V/60 Hz or 380 V/50 Hz of high-quality clean power. The shore supply system has shown unprecedented technical benefits – if, and when, all large ships in the Port of Shanghai implement it, it will save 33,800 tons of harmful substances a year. Furthermore, a staggering 113,150 tons of CO2 is saved, as is 366,000 tons of standard coal.

TESTIMONIAL

"The delivery took place during the economic boom and we had a very tight deadline, but the system was up and running on schedule. The land-based power supply system has met expectations. There have been some small problems in synchronizing the national grid network and the on-board network, but the team came up with a solution for this as well."

Timo Lahdenranta,
Electrical Site Foreman at STX Europe Turku

LAND-BASED POWER SUPPLY FOR SHIPS IS ON THE INCREASE

STX Europe
Location: Turku, Finland

STX Europe is a world leader in shipbuilding, with 14,000 employees and 6 shipyards in Finland, France and Norway. In 2010, a EU directive was passed making it compulsory to use extremely low sulphur fuel in port areas. It became apparent that electricity should be sourced from local grids in order to save costs, emissions and noise.

STX's Turku shipyard builds large cruise liners, historically supplying them with electricity via its own 1.5MW diesel aggregate. When this power proved insufficient, the shipyard looked to source electricity from the national grid.

The grid converter solution Vacon produced was developed with VEO and featured two 4000+ VACON® NXP Liquid Cooled drives controlled by Vacon's DriveSynch technology. The shore supply system came into operation in late 2008, and has resulted in major reductions in emissions and noise.

SHAFT GENERATOR SOLUTION WITH VACON® NXP GRID CONVERTER

The cruise liners and cargo ships of today tend to resemble mobile cities with vast infrastructures. They require a huge amount of electricity to maintain both their internal setup and the mechanical power that's needed to travel around the world.

Due to constant voltage and frequency requirements of the ship's electrical network, the main engine operates at a fixed speed. For a number of years now, shaft generators have been used to supplement this with variable amounts of electrical power. With VACON® NXP Grid Converter technology, the engine speed can be optmised while keeping 100% pitch for the propeller. This increases efficiency and, by delivering constant voltage & frequency, allows the electrical network to help the auxiliary engines.

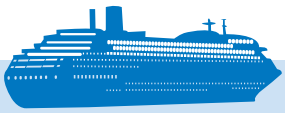
It also makes it far easier to control the speed of the ship. This is especially useful for ships that require regular changes in speed mid-voyage due to dynamic traffic conditions. If the main engine encounters problems at sea, an alternative source of power means that ships can still make it to safety.

HOW IT WORKS

Since the frequency produced by the alternator is proportional to the speed of the engine, the engine must operate at a constant speed. The application consists of equipment on both the generator side and the ship grid side. The machine – which can be induction, permanent magnet (PM) or synchronous – is controlled either by a low-voltage inverter or Active Front End.

The shaft generator is coupled to the main engine and power is taken out to the ship's electrical network to support the auxilliary generators (Power Take off /PTO). It's also possible to boost propulsion by transferring power to the shaft generator (Power Take In /PTI).

KEY BENEFITS



Environmentally friendly	• Reduced fuel consumption • Reduced CO_2 and NO_x emissions
Increased performance and efficiency	• Power Take Off (PTO) generates power to ship's electrical network • Power Take In (PTI) boosts ship's speed • Ship can be taken safely to harbour in case of main engine failure
Flexible solution	• Compatible with permanent magnet, induction or synchronous machines • Available for both new-build and retrofit installations

RoFlex® VESSEL WITH ENERGY EFFICIENT SHAFT GENERATOR CONFIGURATION

WE Tech / M/V Bore Sea
Location: Helsinki, Finland

M/V Bore Sea was one of two RoFlex vessels ordered by Rorel Ltd to transport Airbus components. After the enforcement of the SEEMP in January 2013, WE Tech Solutions Oy developed a solution which optimised main propulsion machinery and improved energy efficiency.

They chose a solution based on VACON® NXP Grid Converter technology. This is a system combining the shaft generator and the ship's electrical network which allows for large variation to the main engine's speed. This solution still delivers power with constant voltage and frequency, making it possible to optimize main engine efficiency and saving fuel.

TESTIMONIAL

"We're very pleased with the improved energy efficiency achieved through various technical solutions used on M/V Bore Sea. Data analyses verify the WE Tech Solutions' shaft generator with VACON® AC drives brings savings of approximately 10% in fuel costs. Given that fuel costs are about €500 per tonne, the annual cost savings are significant, and on top of that CO2 emissions are also cut by approximately 2000 tonnes."

Jörgen Mansnerus,
VP Marine Management, Bore Ltd.

TESTIMONIAL

"At any given moment the ship's energy needs are automatically calculated and the engines produce and supply only as much energy as needed. This allows the ship to use 20 % less energy than a comparable ship."

Thomas Bogler,
Viking River Cruises
Vice President of Nautical Operations

REDUCING CARBON FOOTPRINT ON RIVER CRUISES

Viking River
Location: Germany

River cruising is the hip younger brother of ocean cruises and has undergone something of a boom in the past decade. One challenge facing manufacturers is the limit on space for river-faring vessels, particularly when it comes to fitting diesel-electric propulsion equipment. Fortunately, VACON® NXP Grid Converter technology helps provide a solution via inverter-driven asynchronous generators.

Viking River Crusies are the world's largest river cruise company. Their boat MV Viking Legend made its maiden voyage in 2009, and was the world's first river cruise vessel to use a shaft generator network between main propulsion and the network.

The system connected VACON NXP Grid Converter technology with 3 diesel generators, and was able to use a far smaller diesel engine than usual. This significantly reduced fuel consumption and emissions, noise and vibrations. It also meant the vessel was much easier to manoeuvre, allowing passengers to get up close to the historic cities and villages that border the Rhine & the Danube.

RATINGS AND DIMENSIONS

VACON® NXP Grid Converter 465-800 VDC, Type Open, liquid-cooled, EMC Class T

PRODUCT CODE	AC CURRENT			DC POWER				POWER LOSS	SIZE/PROT.	DIMENSIONS	WEIGHT
	Thermal I_{TH} [A]	Rated I_L [A]	Rated I_H [A]	400VAC mains	500VAC mains	400VAC mains	500VAC mains	c/a/T*) [kW]	CH/Type/IP	W x H x D [mm]	[kg]
				I_{TH} [kW]	I_{TH} [kW]	I_L [kW]	I_L [kW]				
NXA02615A0T02WVA1A2000000+MASG	261	237	174.0	176	220	160	200	4,0/0,4/4,4	CH5/IP00	246x553x264	40
NXA03855A0T02WGA1A2000000+MASG	385	350	256.7	259	324	236	295	5,5/0,5/6,0	CH61/IP00	246x658x374	55
NXA05205A0T02WGA1A2000000+MASG	520	473	346.7	350	438	319	398	6,5/0,5/7,0	CH62/IP00	246x658x374	55
NXA07305A0T02WGA1A2000000+MASG	730	664	486.7	492	615	448	559	10,0/0,7/10,7	CH62/IP00	246x658x374	55
NXA09205A0T02WGA1A2000000+MASG	920	836	613.3	620	775	563	704	14,4/0,9/15,3	CH63/IP00	505x923x375	120
NXA11505A0T02WGA1A2000000+MASG	1150	1045	766.7	775	969	704	880	18,4/1,1/19,5	CH63/IP00	505x923x375	120
NXA16405A0T02WGA1A2000000+MASG	1640	1491	1093.3	1105	1382	1005	1256	19,5/1,2/20,7	CH64/IP00	746x923x375	180
NXA23005A0T02WGA1A2000000+MASG	2300	2091	1533.3	1550	1938	1409	1762	29,6/1,7/31,3	CH64/IP00	746x923x375	180

VACON® NXP Grid Converter 640-1100 VDC, Type Open, liquid-cooled, EMC Class T

PRODUCT CODE	AC CURRENT			DC POWER				POWER LOSS	SIZE/PROT.	DIMENSIONS	WEIGHT
	Thermal I_{TH} [A]	Rated I_L [A]	Rated I_H [A]	525VAC mains	690VAC mains	525VAC mains	690VAC mains	c/a/T*) [kW]	CH/Type/IP	W x H x D [mm]	[kg]
				I_{TH} [kW]	I_{TH} [kW]	I_L [kW]	I_L [kW]				
NXA02616A0T02WGA1A2000000+MASG	261	237	174.0	231	303	210	276	5.4/0.3/5.7	CH61/IP00	246X658X374	55
NXA03856A0T02WGA1A2000000+MASG	385	350	257.0	341	448	310	407	7.5/0.4/7.9	CH62/IP00	246X658X374	55
NXA05026A0T02WGA1A2000000+MASG	502	456	335.0	444	584	403	530	9.8/0.5/10.3	CH62/IP00	246X658X374	55
NXA07506A0T02WGA1A2000000+MASG	750	682	500.0	663	872	603	793	14.4/0.8/15.2	CH63/IP00	505x923x375	120
NXA11806A0T02WGA1A2000000+MASG	1180	1073	787.0	1044	1372	949	1247	21.0/1.1/22.1	CH64/IP00	746x923x375	180
NXA15006A0T02WGA1A2000000+MASG	1500	1364	1000.0	1327	1744	1207	1586	28.0/1.5/29.5	CH64/IP00	746x923x375	180
NXA17006A0T02WGA1A2000000+MASG	1700	1545	1133.0	1504	1976	1367	1796	32.1/1.7/33.8	CH64/IP00	746x923x375	180

VACON® NXP Grid Converter 640-1200 VDC, IP00, liquid-cooled, EMC level T

PRODUCT CODE	AC CURRENT			DC POWER				POWER LOSS	SIZE/PROT.	DIMENSIONS	WEIGHT
	Thermal I_{TH} [A]	Rated I_L [A]	Rated I_H [A]	525VAC mains	690VAC mains	525VAC mains	690VAC mains	c/a/T*) [kW]	CH/Type/IP	W x H x D [mm]	[kg]z
				I_{TH} [kW]	I_{TH} [kW]	I_L [kW]	I_L [kW]				
NXA02618A0T02WGA1A2000000+MASG	261	237	174.0	231	303	210	276	5.4/0.3/5.7	CH61/IP00	246X658X374	55
NXA03858A0T02WGA1A2000000+MASG	385	350	257.0	341	448	310	407	7.5/0.4/7.9	CH62/IP00	246X658X374	55
NXA05028A0T02WGA1A2000000+MASG	502	456	335.0	444	584	403	530	9.8/0.5/10.3	CH62/IP00	246X658X374	55
NXA07508A0T02WGA1A2000000+MASG	750	682	500.0	663	872	603	793	14.4/0.8/15.2	CH63/IP00	505x923x375	120
NXA11808A0T02WGA1A2000000+MASG	1180	1073	787.0	1044	1372	949	1247	21.0/1.1/22.1	CH64/IP00	746x923x375	180
NXA15008A0T02WGA1A2000000+MASG	1500	1364	1000.0	1327	1744	1207	1586	28.0/1.5/29.5	CH64/IP00	746x923x375	180
NXA17008A0T02WGA1A2000000+MASG	1700	1545	1133.0	1504	1976	1367	1796	32.1/1.7/33.8	CH64/IP00	746x923x375	180

I_{th} = Thermal maximum continuous RMS current. Dimensioning can be done according to this current if the process does not require any overloadability or the process does not include any load variation or margin for overloadability.

I_L = Low overloadability current. Allows +10% load variation. 10% exceeding can be continuous.

I_H = High overloadability current. Allows +50% load variation. 50% exceeding can be continuous.

All values with cosφ = 0,83 and efficiency = 97%

*) c = power loss into coolant; a = power loss into air; T = total power loss; power losses of input chokes not included. All power losses obtained using max. supply voltage, Ith and switching frequency of 3.6 kHz and ClosedLoop control mode. All power losses are worst case losses.

If some other mains voltage is used, apply the formula P = √3 x Un x In x cosφ x eff% to calculate the NX Liquid-Cooled drive output power.

The enclosure class for all NX Liquid-Cooled frequency converters is IP00.

If the motor is continuously run at frequencies below 5 Hz (besides start and stop ramps), please pay attention to the drive dimensioning for low frequencies, i.e. maximum I = 0.66*Ith or choose drive according to I_H. It is recommended to check the rating with your distributor or Vacon.

Drive overrating may also be necessary if the process requires high starting torque.

VACON® NXP Grid Converter 380-500 V, Type Open/IP00 air-cooled, EMC Class T

PRODUCT CODE	LOW OVERLOAD 110% / 40°C		HIGH OVERLOAD 150% / 40°C		DC POWER		SIZE/PROT.	DIMENSIONS	WEIGHT
	$I_{L\text{-}cont}$ [A]	I_{1min} [A]	$I_{H\text{-}cont}$ [A]	I_{1min} [A]	400VAC mains $P_{L\text{-}cont}$ [kW]	500VAC mains $P_{L\text{-}cont}$ [kW]	FR/Type/IP	W x H x D [mm]	[kg]
NXA02615A0T02SGA1A2000000+MASG	261	287	205	308	176	220	FI9/TypeOpen/IP00	239x1030x372	67
NXA04605A0T02SGA1A2000000+MASG	460	506	385	578	310	388	FI10/TypeOpen/IP00	239x1032x552	100
NXA13005A0T02SGA1A2000000+MASG	1300	1430	1150	1725	876	1092	FI13/TypeOpen/IP00	708x1032x553	306

VACON® NXP Grid Converter 525-690 V, Type Open /IP00, air-cooled, EMC Class T

PRODUCT CODE	LOW OVERLOAD 110% / 40°C		HIGH OVERLOAD 150% / 40°C		DC POWER	SIZE/PROT.	DIMENSIONS	WEIGHT
	$I_{L\text{-}cont}$ [A]	I_{1min} [A]	$I_{H\text{-}cont}$ [A]	I_{1min} [A]	600VAC mains $P_{L\text{-}cont}$ [kW]	FR/Type/IP	W x H x D [mm]	[kg]
NXA01706A0T02SGA1A2000000+MASG	170	187	144	216	198	FI9/TypeOpen/IP00	239x1030x372	67
NXA03256A0T02SGA1A2000000+MASG	325	358	261	392	378	FI10/TypeOpen/IP00	239x1032x552	100
NXA10306A0T02SGA1A2000000+MASG	1030	1133	920	1380	1195	FI13/TypeOpen/IP00	708x1032x553	306

NX A AAAA V A 2 T 0 C S S A1 A2 00 00 00 +PPPP

GTCTA	**Grid Converter**
NX	**Product generation**
A	**Module type A** = Based on Active Front End
AAAA	**Nominal current** (low overload) 0004 =4 A, 0520 = 520A, etc.
V	**Nominal supply voltage** **5** = 380...500 VAC / 465-800 VDC **6** = 525...690 VAC / 640-1100 VDC **8** = 525...690VAC / 640...1200VDC (Only Ch6x)
A	**Control keypad** **A** = standard (alpha numeric) **B** = no local control keypad **F** = dummy keypad **G** = graphic display
2	**Enclosure Class 0** = IP00
T	**EMC emission level; T** = IT networks (EN61800-3)
0	**Brake chopper 0** = N/A (no brake chopper)
C	**2 = AFE module**
S	**S** = Standard air cooled drive **W** = Liquid cooled drive
S	**Hardware modifications; module type - S - Boards** **V** = Direct connection, varnished boards, Ch5 **G** = Fiber connection, varnished boards **O** = IP54 control box
A1 A2 00 00 00	**Option boards; each slot is represented by two characters where:** **A** = basic I/O board **B** = expander I/O board **C** = fieldbus board **D** = special board
+PPPP	**+MASG** = Grid Converter Application

SHAFT GENERATOR QUICK GUIDE

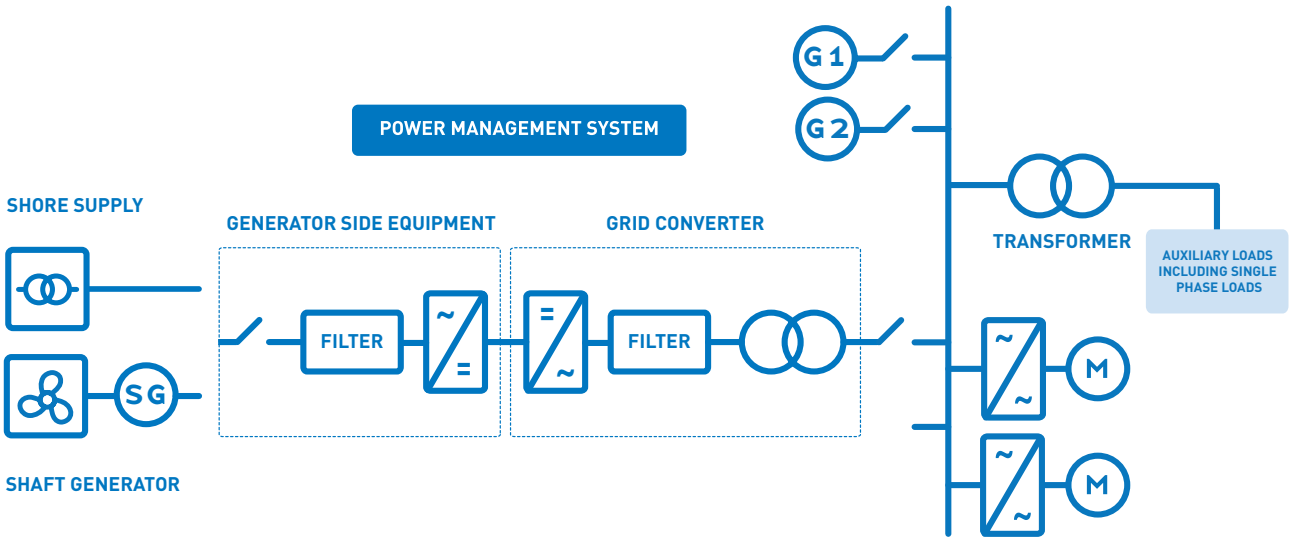
GENERATOR TYPE	MACHINE	ASYNCHRONOUS	PERMANENT MAGNET		SYNCHRONOUS	
Generator side equipment	Power unit	INU	INU	AFE	INU	AFE
	Filter	dU/dt or none	dU/dt or none	SINE or LCL	dU/dt or none	SINE or LCL
	Encoder	yes	yes	no	yes	no
	Software	Generator application ARFIFF03				
Ship grid equipment	Software	Grid converter application ARFIFF03				
	Power unit	Grid converter				
	Filter	SINE (LCL in case of paralleling)				
	Isolation	Transformer				

SHORE SUPPLY QUICK GUIDE

SHORE GRID HARMONICS REQUIREMENT	TOTAL CURRENT HARMONICS (THDi)	<5%	<15%	<30%
Shore grid equipment	Power unit	AFE	12-pulse NFE	6-pulse NFE
	Filter	LCL	Chokes	Choke
Ship grid equipment	Software	Grid converter application ARFIFF03		
	Power unit	Grid converter		
	Filter	SINE		
	Isolation	Transformer		

GRID CONVERTER CONFIGURATIONS

This illustration shows the typical configurations for both shore supply and shaft generator applications.



VACON®

DRIVEN BY DRIVES

VACON® NXP SYSTEM DRIVE

COMPLEX SOLUTIONS MADE SIMPLE

VACON – THE BEST PARTNER FOR RELIABILITY AND PERFORMANCE

Customers in heavy industries, such as Marine, Metals and Pulp & Paper, need drive systems that excel in terms of reliable performance. If you can rely on your system, it leaves you with more time and money to spend on optimizing the rest of the application. Vacon recognizes this, which is why we've been at the forefront of the drive systems business for the past twenty years.

You can now be sure to receive a drive system that is unmatched in terms of quality and ready in a shorter space of time than ever before. That's because we have changed our production approach to bring it into line with what customers are after. VACON® NXP System Drive ensures that you receive an excellent level of quality and service, each and every time.

People – partners and employees alike – are what make Vacon. Nowhere is this truer than in the system drives business. These kinds of large-scale projects often feature many different components which are reliant upon communication on both sides to avoid technical problems anywhere down the line.

DRIVEN BY DRIVES

Our ability to work around the challenges our customers face everyday, regarding efficiency and cost savings, is the reason why we have reached where we are so quickly. As a company that's focused 100% on AC drives, we live by their performance. By choosing Vacon, you can be sure to receive a top-class drive system – nothing else will do. We also won't compete with system integrators for projects, unlike many other drive suppliers. This enables an atmosphere of mutual trust with our network of system integrators and end-users.

COMPLEX SOLUTIONS MADE SIMPLE

It's essential that you receive a solution with a level of quality that's as consistent as it is excellent. VACON® NXP System Drive provides complex solutions which are simplified through standardization, resulting in a product that will easily integrate into the process. This doesn't prevent you from getting the exact solution you need – we can tailor some elements of the system in order to meet your requirements.

COST SAVINGS

- Traditionally, the design of a project-based enclosure accounts for up to 35% of the total cost.
- With VACON® NXP System Drive, this is reduced to around 5%.

100% FOCUS ON DRIVES

- We concentrate on drives so you can concentrate on the rest of the application.
- Vacon is always a non-competing partner for system integrators on projects.

QUALITY AS STANDARD

- Standardized and pre-tested solutions.
- We support our customers by supplying them with complete drive systems.

PROVEN TRACK RECORD

- We have been producing industry-leading AC drives since 1993.
- VACON® NXP Common DC Bus technology has been the ideal choice for drive systems for a number of years.

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VACON® NXP SYSTEM DRIVE – QUALITY AS STANDARD

RELIABILITY IS KEY

VACON® NXP System Drive brings what customers need above all else – consistent and reliable quality guaranteed. We excel in delivering verified and tested solutions that combine VACON AC Drives, DC bus components and options. No need to worry about waiting for technical data, documentation or piloting – we've done all that before it reaches your premises.

QUICK INSTALLATION

Aside from the quality delivered, VACON® NXP System drive is also easy to adapt. Engineered sections slot in alongside each other, allowing you to arrange integrated transport splits to save space. Alternatively, you can add extra transport sections to speed up installation. All larger modules have slide-out mechanics that facilitate setup and maintenance. This also enables late module delivery, which can be helpful if the system is to be installed in a harsh environment. All sections are grouped depending on their functionality, making it possible to plan each installation phase exactly how you wish.

COST EFFICIENCY

Besides the peace of mind that comes with stress-free installation and setup, you'll also save a lot of time and money. This is because the setup is essentially formulated when you order it, meaning system integrators can get on with designing the rest of the application. The fact that the drive system's setup is uniform also means that it's far easier to provide spare parts.

SAFETY AND SERVICE MEANS A LONGER LIFECYCLE

A complex and wide-ranging solution is not one you want to have to replace, which is why VACON® NXP System Drive is built to last. One of the cornerstones of Vacon's relationship with our partners is a commitment to drives performance that goes far beyond the point of purchase. Items such as busbar systems and high/low power devices are separated into individual compartments, away from each other. This means that, if things go wrong, the problem is compartmentalized and doesn't cause widespread failure. The fact that VACON NXP System Drive is easy to maintain also makes it safer. Service engineers are immediately familiar with the way the system is set up, meaning they can get straight to the focal point.

PROVEN AC DRIVE TECHNOLOGY FOR HEAVY INDUSTRY

Still need a reason to choose Vacon? How about the fact that VACON® NXP drives have been leading the way in the industry for the past decade. Aside from frequency converter units, Vacon can also deliver software and common DC bus components, which combine to make your personal solution. VACON® NXP Common DC bus technology has been the choice for our drive system customers for many years already – VACON NXP® System Drive simply ensures an optimal version of this solution, consistently and quickly.

TYPICAL APPLICATIONS

Marine & Offshore

- Cranes & Hoists
- Thrusters
- Deck machinery

Metals

- Metal plane lines
- Melting and casting
- Rolling mill applications

Pulp & paper

- Conveyors
- Sectional drives
- Debarking drums

KEY BENEFITS

Complete drive solutions

- Standardized products which fit all your application needs
- Modules can be delivered closer to start of the operation
- Minimized lifetime cost

Premium quality

- Industry-leading VACON® NXP & VACON® Common DC bus solutions
- Safe, tested and verified design
- Comprehensive documentation available with each delivery

Save on time and cost

- Modular design equipped with pull out feature for quick setup & maintenance
- Short setup time
- Easy to train onsite engineers

VACON® NXP SYSTEM DRIVE CONFIGURATOR

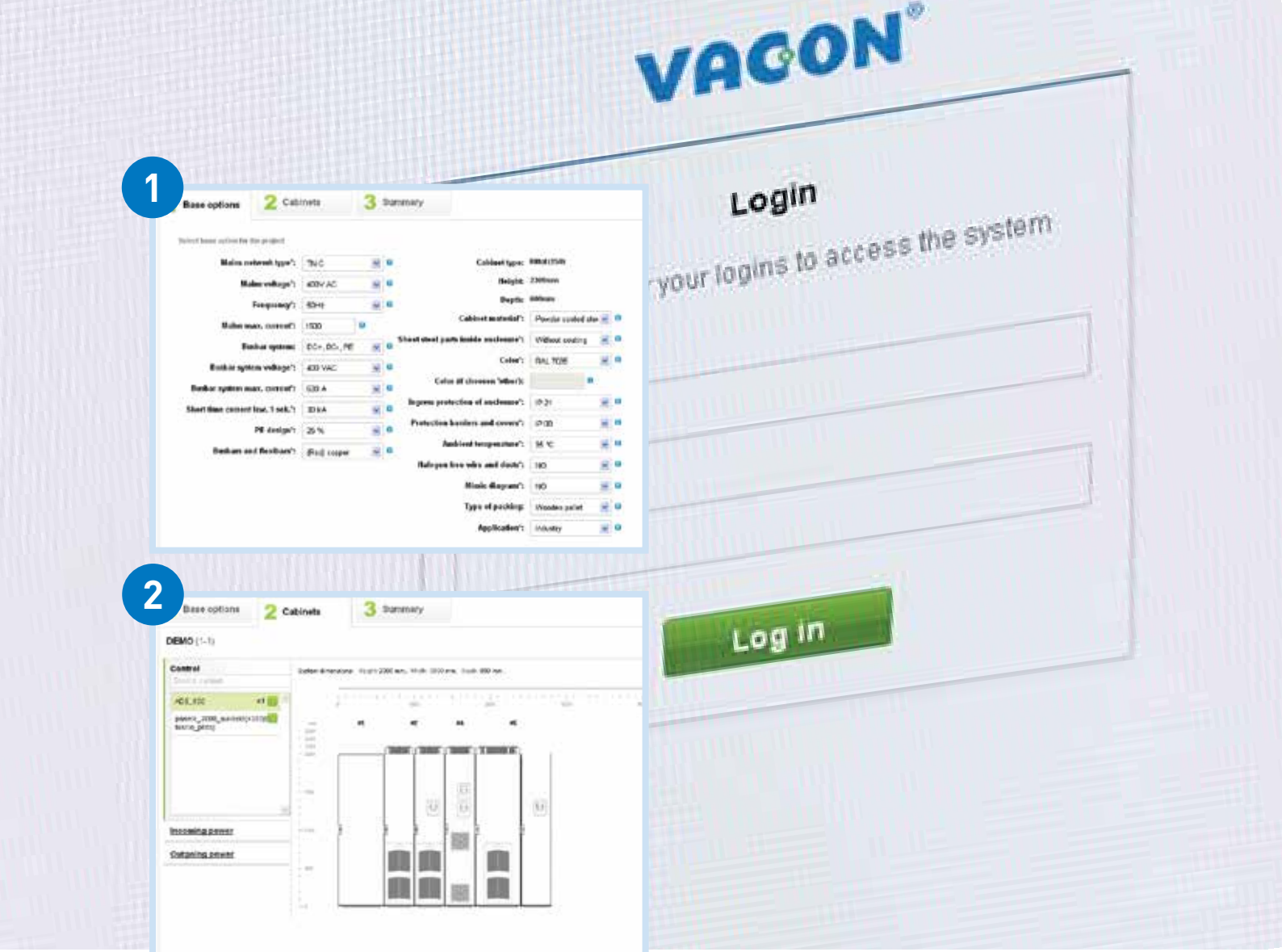
Setting up VACON® NXP System Drive couldn't be easier — our online configuration tool guides you through the whole design process while providing you with the necessary documentation.

THIS IS ALL ACHIEVED IN A NUMBER OF SIMPLE STEPS:

1. You enter all the standard process data you will need for the drive system to work as you want it to e.g. main network type, frequency, voltage, ambient temperature etc. Once you have selected all these, configuration will start automatically.

2. Now you can play around with the parts to ensure that they meet your needs. The dimensions (height x length x depth) are all listed so that you can ensure the setup fits into the space you have set aside for the system.

3. When everything is setup and is ready to go, VACON® Configurator will automatically provide you with the documentation you need for the initial system setup, including a technical description listing all the specifications.



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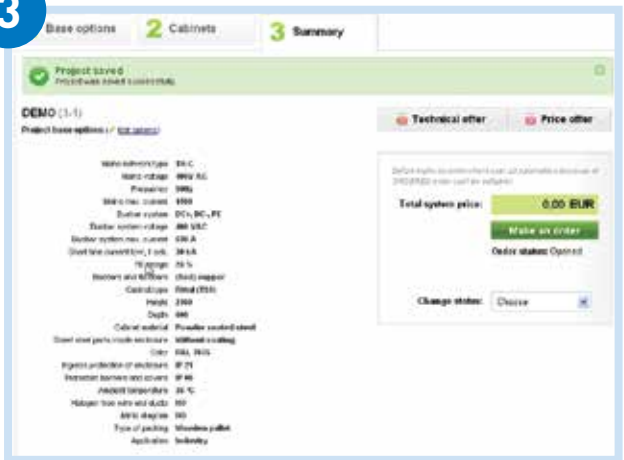


As a user of VACON® NXP System Drive Configuration Tool, you will have your own profile page which lists all your configurations, drafts and technical history. This allows you to easily keep track of your settings so that you don't have to spend time looking around for mislaid papers.

KEY BENEFITS

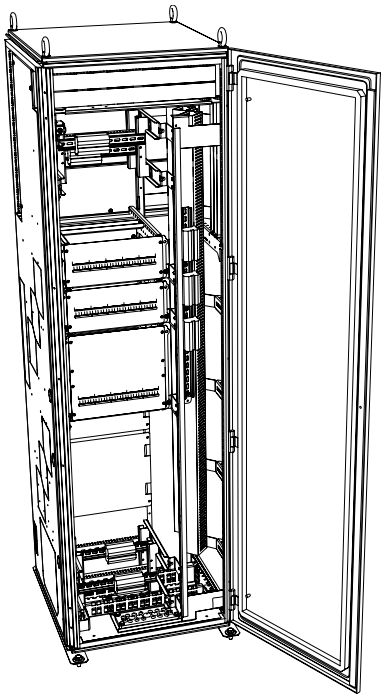
- Engineering process is cut to a minimum
- Prevents human mistakes from occurring during configuration
- Preferred configurations can be saved in customer profiles
- Easy and efficient way to try out implementation options

AVAILABLE SECTIONS

AUXILIARY DEVICE SECTION (ADS)

The auxiliary device section includes the common line-up controls. This section can be customized for all application and segment needs. There is one ADS size available.

ADS type	Dimensions, W x H x D (mm)
ADS_600	600 x 2000 x 605



As standard the ADS section has the following equipment:

- Control for the circuit breaker with +ICB selected
- Indication of the mains status (fault, pre-charging and ON)
- Auxiliary power supply 24 V, 5 A
- Auxiliary Transformer, 2500 VA 1-phase supply (in bottom of enclosure)
- Terminals for control and monitoring

As pre-engineered standard options, we can provide the following:

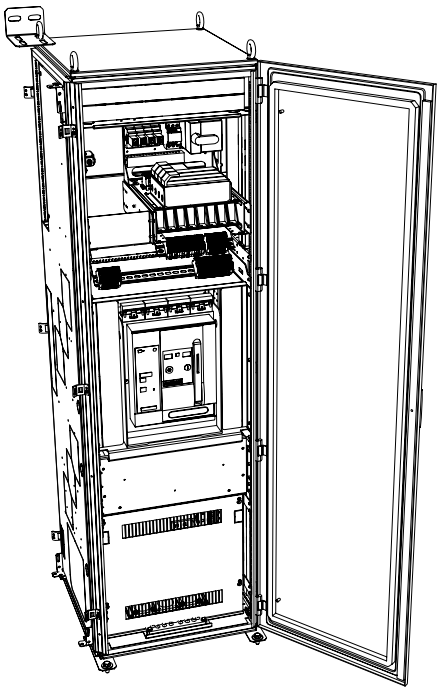
- Emergency stop CAT0 (+PES)
- Emergency stop CAT1 (+PED)
- Insulation fault sensor (+PIF)
- Arc protection (+PAP)*
- Enclosure heater (+ACH)
- Enclosure light (+ACL)
- Auxiliary voltage transformer 4000 VA (+AT4)
- Auxiliary voltage 110 VAC (+AT1)
- Auxiliary power supply 24 V, 10 A (+ADC)
- Cabling from the top (+CIT)
- Empty auxiliary 600 mm enclosure with door (+G60)
- UL approved design and components (+NAR)
- Customer specific option (+CSO)

* +PAP will have sub units in selected sections if needed, please refer to the circuit diagrams.

MAIN INCOMING SECTION (MIS)

The main incoming section includes the main incoming device. The main incoming device and size is dependent on the required current of the complete line-up.

MIS type	Input current	Dimensions, W x H x D (mm)
MIS_630	630 A	400 x 2000 x 605
MIS_1000	1000 A	600 x 2000 x 605
MIS_1250	1250 A	600 x 2000 x 605
MIS_1600	1600 A	600 x 2000 x 605
MIS_2500	2500 A	600 x 2000 x 605
MIS_3200	3200 A	800 x 2000 x 605
MIS_4000	4000 A	800 x 2000 x 605



As standard the MIS section has the following equipment:

- Main incoming device, Load Switch
- Mains connections
- Emergency disconnect push button
- Digital multi instrument with field bus connection

As pre-engineered standard options we can provide the following:

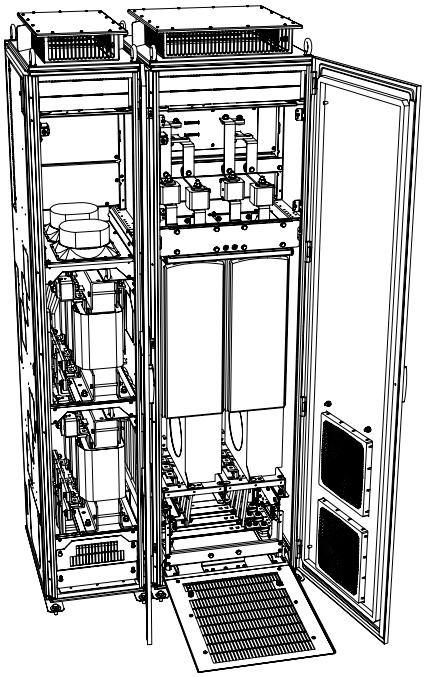
- Air Circuit breaker (+ICB)
- Cabling from the top (+CIT)
- Earth Switch (+ILE)*
- Current transducers (+ITR)
- UL approved design and components (+NAR)
- Arc protection (+PAP)
- Enclosure heater (+ACH)
- Enclosure light (+ACL)

* +ILE requires an additional section.

NON-REGENERATIVE FRONT-END SECTION (NFS)

The non-regenerative front-end section (NFS) includes one or multiple NXN units from the VACON® product family. The NXN is a non-regenerative supply unit that can be utilized in 6-pulse, 12-pulse,18-pulse and 24-pulse systems.

NFS type	Number of NXN units	Dimensions, W x H x D (mm)
NFS_1x	1	400 x 2000 x 605
NFS_2x	2	600 x 2000 x 605
NFS_3x	3	800 x 2000 x 605



As standard the NFS section includes the following:

- The NXN unit(s)
- Chokes
- Terminals for control and indication signals
- DC fuses for the Supply Unit
- AC fuses for the filter

As pre-engineered standard options, we can provide the following:

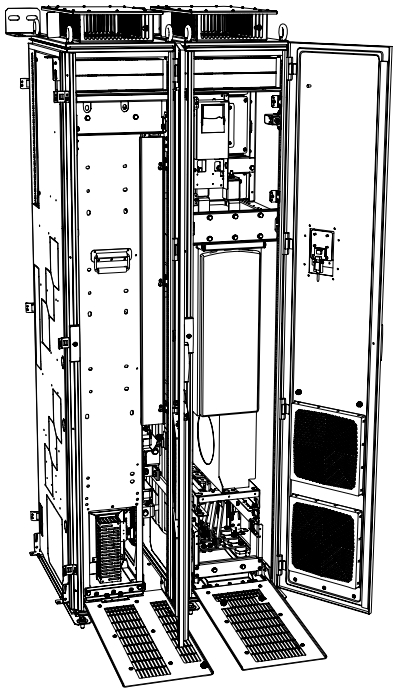
- UL approved design and components (+NAR)
- Arc protection (+PAP)
- Enclosure heater (+ACH)
- Enclosure light (+ACL)

ACTIVE FRONT-END SECTION (AFS)

The active front-end section includes an LCL-filter and an NXA unit from the VACON® product family. The active front-end provides low THD(I) and several units can be connected in parallel providing full or reduced redundancy.

AFS type	Drive size	Dimensions, W x H x D (mm)
AFS_9	FI9	800 x 2000 x 605*
AFS_10	FI10	800 x 2000 x 605*
AFS_13	FI13	1400 x 2000 x 605*

* Dimensions including LCL



As standard the AFS sections include the following:

- LCL Filter
- The NXA unit
- Control unit
- Pre-charging components
- Terminals for control and indication signals
- DC fuses for the Supply Unit
- AC fuses for the filter

As pre-engineered standard options we can provide the following:

- UL approved design and components (+NAR)
- Arc protection (+PAP)
- Enclosure heater (+ACH)
- Enclosure light (+ACL)

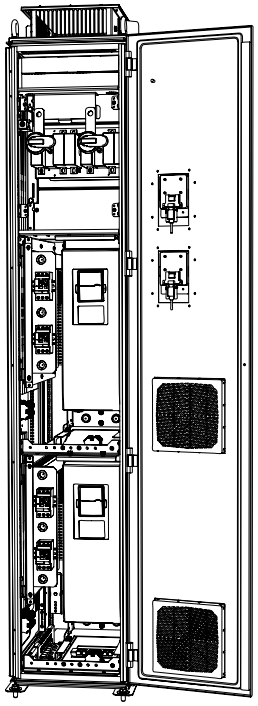
AVAILABLE SECTIONS

INVERTER UNIT SECTION (IUS) DRIVE SIZES FR4-FR8

The inverter unit section (IUS) includes one or several smaller NXI drives from the VACON® product family. The inverter units are all VACON® NXP drives.

IUS type	Drive size	Maximum amount of units per section	Dimensions, W x H x D (mm)
IUS_4	FR4	3*	400 x 2000 x 605**
IUS_4/6	FR4/FR6	2	400 x 2000 x 605**
IUS_7	FR7	1	400 x 2000 x 605**
IUS_8	FR8	1	400 x 2000 x 605**

* Only option board and fieldbus options
** Top exit +400mm can be shared between two sections



As standard the IUS section includes the following:

- Input fuses (DC fuses)
- The NXI drive(s)
- Control box (integrated into the module)
- Terminals for control and indication signals

As pre-engineered standard options we can provide the following:

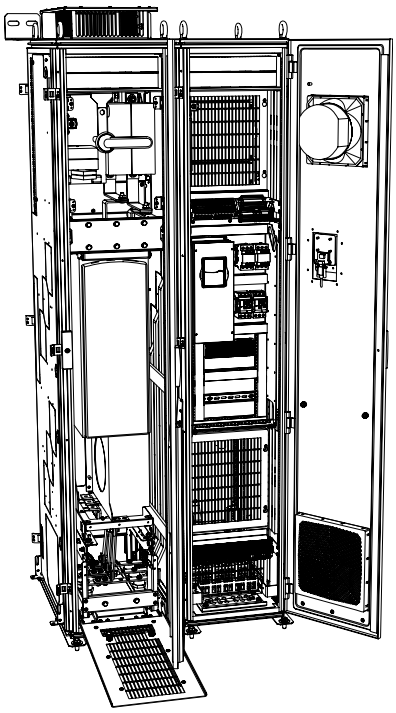
- dU/dt (+ODU)
- Common mode filter (+OCM)
- SINE filter (+OSI)
- Input Switch with charging (+ISC)
- Input Switch, DC-disconnect (+ISD)
- Arc detection (+ADU)
- Motor fan control (+AMF)
- Motor heater feeder (+AMH)
- Mechanical break control (+AMB)
- Section light (+SLT)
- Top cabling (+COT)
- UL approved design and components (+NAR)
- Arc protection (+PAP)
- Enclosure heater (+ACH)
- Enclosure light (+ACL)

AVAILABLE SECTIONS

INVERTER UNIT SECTION (IUS) DRIVE SIZES FI9-FI14

The inverter unit section (IUS) includes the largest NXI drives from the VACON® product family. The inverter units are all VACON® NXP drives.

MIS type	Drive size	Dimensions, W x H x D (mm)	Dimensions, W x H x D (mm) with space optimization
IUS_9	FI9	800 x 2000 x 605	600 x 2000 x 605
IUS_10	FI10	800 x 2000 x 605	600 x 2000 x 605
IUS_12	FI12	1000 x 2000 x 605	Not available
IUS_13	FI13	1400 x 2000 x 605	Not available
IUS_14	FI14	2400 x 2000 x 605	Not available



As standard the IUS section includes the following:

- Input fuses (DC fuses)
- The NXI drive
- Service platform/module removal
- Outlet for power (for PC etc.)
- Control section and fixed external terminals, 70 pcs

As pre-engineered standard options we can provide the following:

- dU/dt (+ODU)
- Common mode filter (+OCM)
- SINE filter (+OSI)
- Input Switch with charging (+ISC)
- Input Switch, DC-disconnect (+ISD)
- Arc detection (+ADU)
- Motor fan control (+AMF)
- Motor heater feeder (+AMH)
- Mechanical break control (+AMB)
- Section light (+SLT)
- Top cabling (+COT)
- UL approved design and components (+NAR)
- Arc protection (+PAP)
- Enclosure heater (+ACH)
- Enclosure light (+ACL)

VACON® 8000 SOLAR INVERTER
A DRIVING FORCE IN SOLAR ENERGY

A DRIVING FORCE IN RENEWABLE ENERGY

Vacon was founded in Vaasa, Finland in 1993. It has a long history of producing high-quality inverters, power converters and AC drives for demanding renewable energy and industrial applications and operating environments. We have a solid foundation to lean on and we thrive on actively driving the industry forward.

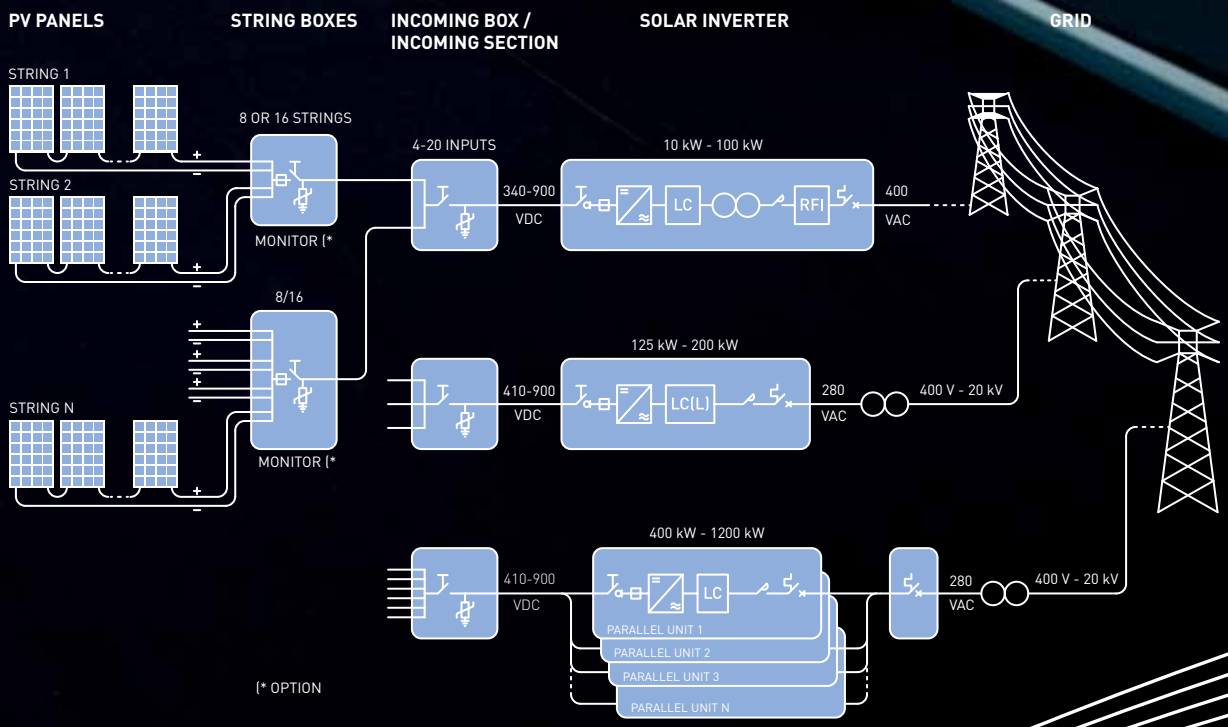
RELIABLE PERFORMANCE

To date, over 7000 MW of renewable peak power capacity has been enabled by Vacon inverters. To put these numbers into perspective, a typical nuclear power plant can produce up to 1000 MW of capacity. And with an R&D team dedicated solely to the development of new solar energy applications, we continue to strengthen the position of renewable energy as one of the cornerstones of our company strategy.

STRONG GLOBAL PRESENCE

Vacon is an established and international company with production on three different continents. A large and continuous flow of parts improves the availability of our products and solutions. We have a global service network: Vacon has offices in 27 countries and extensive partner network in nearly 90 locations.

In accordance with our long history of producing reliable solutions, all the VACON® 8000 SOLAR products are extensively tested before delivery.



VACON SOLAR OFFERING

HARNESSING THE SUN

Vacon's offering for the solar energy industry is not just limited to our inverter products. Based on our long experience in serving our customers in the renewable energy field, as well as other demanding industries, we can offer you the whole package from products to maintenance services and support for planning and commissioning.

Solar inverters, such as the VACON® 8000 SOLAR, are a vital part of the configuration between solar panels and the general grid. The function of an inverter is simply to convert the captured photovoltaic power into AC, and feed it into the grid.

The VACON 8000 SOLAR covers all the needs of the commercial, industrial and utility sectors. Our products have been designed with ease in mind. They are easy to install, use and maintain. The modular set-up and additional tools give you an enjoyable user experience with numerous benefits.

We take care of all your solar inverter needs. Our wide power range of solar inverters is supported by a variety of string connection boxes as well as medium voltage outdoor stations. We also understand how essential it is to be able to provide first-class commissioning- and maintenance services at any location where you decide to install your solar power plant.

APPROVALS

Country	Low voltage	Medium voltage
Germany	VDE 0126-1-1, VDE-AR-N 4105	BDEW 2008
France	EN 50438	Arrêté du 23 avril 2008
Italy	"Guida per le connessioni alla rete elettrica di Enel distribuzione" CEI 11-20, CEI 11-21	CEI 0-16
Spain	R.D. 1663/2000	P.O. 12.2; P.O. 12.3
Czech	EN 50438	
UK	EN 50438	
Belgium	EN 50438	
Australia	AS 4777.2; AS 4777.3	
Anti-Islanding	IEC-62116	

* Certification in progress, please check status from your local sales office

VACON® 8000 SOLAR 10-100 kW

VACON 8000 SOLAR 10-100 kW series is a compact enclosure-assembled product line with integrated isolation transformers for maximum worldwide grid compatibility. The little brother of the product family is ideally suited for smaller and decentralized installations. It is well suited for such purposes as rooftop installations.

The smaller power range of the VACON 8000 SOLAR 10-100 kW series does not make it any less handy than the larger products in the series. It is extremely fast to install and commission. It offers the same high quality, efficiency and reliability that you would expect from any Vacon product.

FEATURES

- Nine power ratings for optimum fit with PV-installation
- Wide DC-input range: 340-900 VDC
- Common 400 VAC grid connection
- Safety built in: AC- and DC-protections, Ground fault monitoring, Overload and overtemperature protection, IP21 steel enclosure
- Options available for DC-positive or –negative pole grounding, different communication set-ups and BOS equipment

BENEFITS

- High efficiency and reliability
- Fast installation and plug n' play commissioning
- Thin film compatibility
- Allows flexible string configurations (due to wide MPP range)
- Connectivity to Vacon remote monitoring system
- Wide range of grid certifications

Inverter type	Nominal output power **kW**	Nominal output current IAC **A**	Max no. of output connections	Recomm. max PV power **kW**	Max nominal input current **A**	Max allowed PV current Isc[b] **A**	Max no. of DC connections (1 MPPT)	Max. efficiency **%**	Euro efficiency **%**	Power cons. at night **W**	Inverter dimensions WxHxD **mm**	Inverter weight **kg**	Air flow requirement **m³/h**
NXV00104A2L	10	14,4	1	12	29	50	2	94,9	93,1	0	600X1481X600	220	300
NXV00154A2L	15	21,6	1	18	44	50	2	94,9	93,6	0	600X1481X600	220	300
NXV00204A2L	20	28,8	1	24	59	99	2	95,3	92,2	0	600X1481X600	300	425
NXV00254A2L	25	36,1	1	30	74	99	2	95,3	93,0	0	600X1481X600	300	425
NXV00304A2L	30	43,3	1	36	88	99	2	95,4	93,9	0	600X1481X600	300	425
NXV00404A2L	40	57,7	2	48	118	198	4	95,8	94,8	0	800X1881X600	550	700
NXV00504A2L	50	72,1	2	60	147	198	4	96,2	95,2	0	800X1881X600	550	700
NXV00804A2L	80	115	2	96	235	353	4	96,4	95,6	0	800X2281X600	850	800
NXV01004A2L	100	144	2	120	294	353	4	96,5	95,8	0	800X2281X600	850	800

INPUT

MPP voltage range	340 - 800 VDC
Max input voltage	900 VDC
Max open circuit voltage	850 VDC

OUTPUT

Nominal output voltage	400 V, 3 phase
Output frequency	50 / 60
Power factor	Adjustable 0,8-1 leading/lagging
AC overvoltage protection	Yes
AC current harmonics at rated power	<3%

AUX POWER

Aux Power Supply	internal 1ph, 230VAC, 50/60Hz

AMBIENT

Temperature range	-10 C° to 40 C°
Temperature derating	1,5% / 1C° up to 50 C°
Relative humidity	95%, no condensation allowed
Installation altitude	2000m [g]
Environment category	Indoor, conditioned
Pollution degree	PD2
Overvoltage category	AC (Mains) = OVCIII DC (Panel) = OVCII

SAFETY / PROTECTION

IP class	IP21
Ground fault monitoring	Yes
Overload behaviour	Power limiting
Over temperature behaviour	Power limiting
Forced stop	Yes
Circuit breaker AC side	Yes
Circuit breaker DC side	Yes

CONTROL INTERFACE

Communication	RS485 (Modbus RTU) Ethernet (Modbus TCP) GPRS
Signalling	3 Potential free contacts to indicate faults and alarms (programmable)

CERTIFICATES

EMC	EN 61000-6-2, EN 61000-6-4
Safety	EN-62109-1
Grid Codes 10-100kW	VDE 0126-1-1, VDE-AR-N 4105*, EN 50438 CEI 11-20, CEi 11-21*, R.D. 1633/2000 AS 4777.2, AS 4777.3 IEC-62116
Grid Codes 50-100kW	BDEW 2008 Arrëté du 23 avril 2008 Allegato 17. Terna Regolazione P.O. 12.2, P.O. 12.3

[b] Maximum input current withstand of the inverter enclosure.
[c] See manual for recommended cross sections of cables
[d] Efficiency measured at 340VDC
[g] Up to 3000m with derating of 1% per 100m. Hence 2600m would mean a derating of 6% of nominal output power. Note! EN-62109 certification is done only for European conditions up to 2000m

* Certification in progress, please check status from your local sales office

VACON® 8000 SOLAR 125-1200 kW

VACON 8000 SOLAR 125-1200 kW series is a rugged enclosure assembled product line. The parallel inverter concept enables both cost and power efficient installations up to MW range. This is your optimum choice for large centralized installations that cover a considerable area of land.

You can expect best-in-industry efficiency combined with the kind of ease and reliability that you would hope for in a product that is installed in remote areas. The VACON 8000 SOLAR 125-1200 kW series has been designed to be easy and fast to install and start up. For added convenience and ease, the design has also taken service needs into consideration, but thanks to its extreme reliability, that is a feature that you may never grow to appreciate.

FEATURES

- Multimaster-topology (>=400 kW)
- Wide DC-input range: 410-900 VDC
- Separate input (DC), inverter and output (AC) sections for safety and redundancy (>=400 kW)
- Safety built in: AC- and DC-protections, Ground fault monitoring, Overload and overtemperature protection, IP21 steel enclosure
- Options available for DC-positive or –negative pole grounding, different communication set-ups and BOS equipment
- Common DC- and AC-bus bars for safety and for minimizing BOS costs

BENEFITS

- Top of the industry efficiency
- Fast and easy commissioning and start up
- Additional reliability and redundancy
- Multimaster-topology increases life time and ensures top production yield
- Service friendly design
- Hot reconnect
- Thin film compatibility
- Available in MV Station
- Single configuration interface
- Connectivity to Vacon remote monitoring system
- Wide range of grid certifications
- Easy commissioning and start-up

TECHNICAL DATA

Inverter type	Nominal output power **kW**	Nominal output current IAC **A**	Max no. of output connections	Recomm. max PV power **kW**	Max nominal input current **A**	Max allowed PV current Isc[b] **A**	Max no. of DC connections (1 MPPT)	Max. efficiency **%**	Euro efficiency **%**	Power cons. at night **W**	Inverter dimensions WxHxD **mm**	Inverter weight **kg**	Air flow requirement **m³/h**
NXV01252A2T	125	256	2	150	305	353	4	96,8	95,2	0	800X2281X600	450	800
NXV02002A2T	200	412	4	240	488	613	4	98,6	97,6	0	800X2281X600	645	1000
NXV04002A2T	400	825	12[a]	480	976	1226	20	98,6	98,0	60	2800X2281X600	1675	2000
NXV06002A2T	600	1237	12[a]	720	1463	1839	20	98,6	98,2	60	3600X2281X600	2285	3000
NXV08002A2T	800	1650	12[a]	960	1951	2452	32	98,6	98,2	60	4600X2281X600	3160	4000
NXV10002A2T	1000	2062	12[a]	1200	2439	3065	32	98,6	98,2	60	5400X2281X600	3770	5000
NXV12002A2T	1200	2474	12[a]	1440	2926	3678	32	98,6	98,2	60	6200X2281X600	4380	6000

INPUT

MPP voltage range	410 - 800 VDC
Max input voltage	900 VDC
Max open circuit voltage	850 VDC

OUTPUT

Nominal output voltage	280 V, 3 phase
Output frequency	50 / 60
Power factor	Adjustable 0,8-1 leading/lagging
AC overvoltage protection	Yes
AC current harmonics at rated power	<3%
Step-up transformer requirement [h]	Neutral not connected and short circuit voltage (Z%): >= 6%

AUX POWER

Aux Power Supply [f]	1ph, 230VAC, 50/60Hz, 25A
Auxiliary power fuse	25A

AMBIENT

Temperature range	-10 C° to 40 C°
Temperature derating	1,5% / 1C° up to 50 C°
Relative humidity	95%, no condensation allowed
Installation altitude	2000m [g]
Environment category	Indoor, conditioned
Pollution degree	PD2
Overvoltage category	AC (Mains) = OVCIII DC (Panel) = OVCII

SAFETY / PROTECTION

IP class	IP21
Ground fault monitoring	Yes
Overload behaviour	Power limiting
Over temperature behaviour	Power limiting
Forced stop	Yes
Circuit breaker AC side	Yes [e]
Circuit breaker DC side	Yes

CONTROL INTERFACE

Communication	RS485 (Modbus RTU) Ethernet (Modbus TCP) GPRS
Signalling	3 Potential free contacts to indicate faults and alarms (programmable)

CERTIFICATES

EMC	EN 61000-6-2, EN 61000-6-4
Safety	EN-62109-1
Grid Codes 125-200kW	VDE 0126-1-1, EN 50438, CEI 11-20, R.D. 1633/2000, AS 4777.2, AS 4777.3, IEC-62116
Grid Codes 125-1200kW	BDEW 2008, Arrëté du 23 avril 2008, Allegato 17. Terna Regolazione P.O. 12.2, P.O. 12.3

[a] If AC Cubicle is left out, then 4 per inverter
[b] Maximum input current withstand of the inverter enclosure
[c] See manual for recommended cross sections of cables
[d] Efficiency measured at 410 VDC with external power supply for auxiliary components
[e] >=400kW Units includes outgoing AC cubicle with circuit breaker. This can optionally be left out and will decrease the width and weight 600mm & 250kg for 400-600kW units and 600mm & 365kg for 800-1200kW respectively. Note! If AC cubicle is left out, then AC breaker functionality has to be taken care of during stop sleep state or inverter's LC filter capacitors will stay permanently connected to the grid.
[f] Auxiliary power supply required for inverters >=400kW. Note! UPS recommended
[g] Up to 3000m with derating of 1% per 100m. Hence 2600m would mean a derating of 6% of nominal output power. Note! EN-62109 certification is done only for European conditions up to 2000m
[h] Not included in delivery

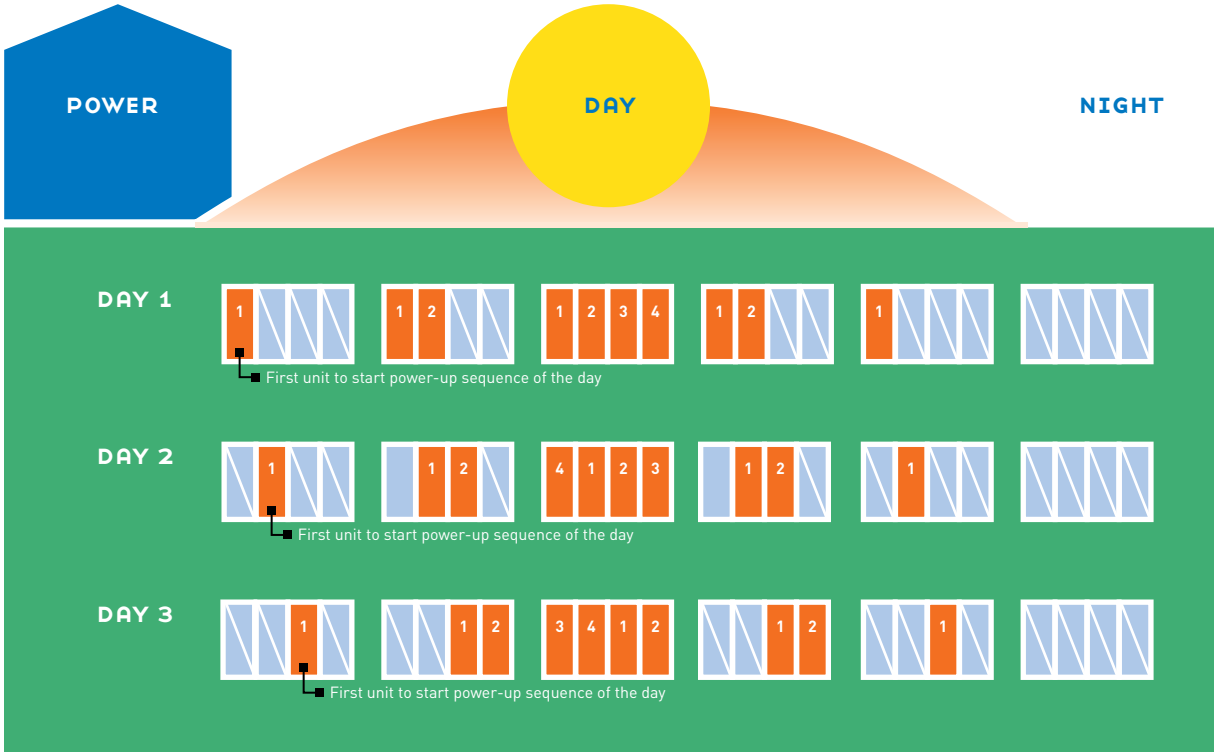
VACON® 8000 SOLAR WITH MULTIMASTER: KEEPS YOUR SUN SHINING EVEN DURING SERVICE

EASE AND RELIABILITY THROUGH MODULARITY

The Solar Multimaster is a unique concept that improves efficiency, reliability and functionality in all large-scale applications. The concept allows a series of one to twelve separate inverter units to be connected together in sequence. This means that only the optimal needed number of inverter modules is powered up for minimal power loss. By rotating the inverters in use we can ensure reduced and equal runtime, thereby ex- tending the entire set-ups overall lifetime.

The entire set-up is centrally controlled via the touch screen on the control unit. This modular approach creates numerous advantages compared to conventional single inverter set-ups. In addition to allowing for optimisation according to sunlight, the modularity allows for repairs and maintenance to be carried out without complete shutdowns. The charging fuse disconnectors allow single units to be safely connected and disconnected while the set-up is up and running.

BY ROTATING INVERTER UNITS IN USE WE ENSURE EQUAL USAGE AND EXTEND THEIR LIFETIME



X Power/№ of active inverter units.

40% LOWER WEAR AND TEAR OF EACH INVERTER MODULE

The 1 MW VACON 8000 SOLAR Multimaster consists of 5 parallel inverter modules that are started up only when the available power from solar panels require it. In practice, during mornings, evenings and cloudy days only some of the units are active. This reduces the running hours of each module by 40% on a typical installation site. Reduced running hours will result in a longer lifetime and a lower failure rate.

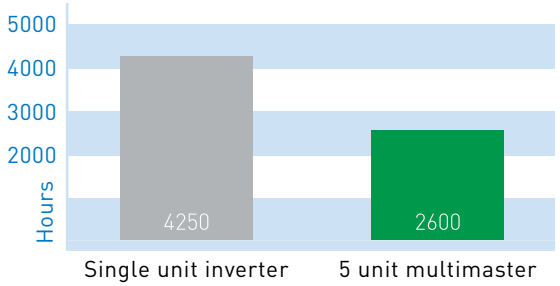
BETTER AVAILABILITY THROUGH REDUNDANCY

If one inverter module in the 1 MW VACON 8000 SOLAR is not operating due to maintenance work or unit failure, the loss of production is only 4%. Typically only 4% of the accumulated energy per year is generated with peak capacity provided by the 5th module. This means that with the VACON 8000 SOLAR you will reach 99% availability even if one of the modules is down for 3 months. The modules are installed in individual enclosure sections. In case of a failure in one of the enclosures, the other modules are protected and the failure is isolated into only one section. The amount of spare parts needed to guarantee fast service is also smaller and less expensive due to the lower power per module.

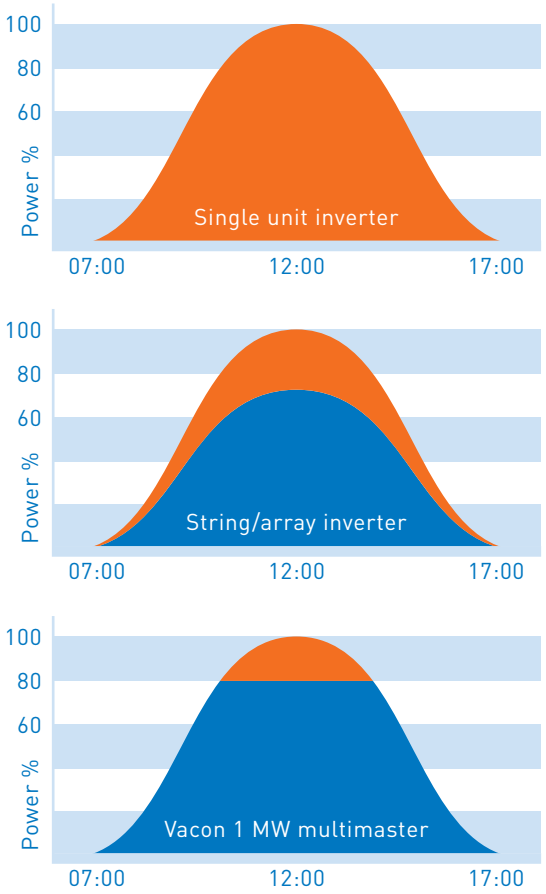
SIMPLE TRANSFORMER DESIGN

Vacon has patented a switching algorithm that minimizes the circulating currents between inverters and the transformer. This allows you to use a transformer with single secondary winding when connected to the VACON 8000 SOLAR with Multimaster.

OPERATIONAL HOURS



ENERGY LOSS COMPARISON



Energy loss percentage resulting from a single module being switched off (time span 7-17 hrs)

VACON® 8000 SOLAR MV STATION

VACON 8000 SOLAR MV Station ensures that, when converting sun energy into electrical power, environmental factors don't stop you from getting the best results possible. VACON 8000 SOLAR Inverters require shelter from the elements in order to perform. By choosing VACON 8000 SOLAR MV Station, you receive everything you need to convert solar energy into electricity, all in one convenient turnkey package.

PROTECTION FROM THE ELEMENTS

In order to set up a solar farm that is to have a major impact on the grid, it has to have two things – sunlight and space. This often means that solar farms are positioned in places where there is a lack of buildings to store the inverters. That's where VACON 8000 SOLAR MV Station can help. Designed to act as a comprehensive turnkey solution, it utilizes the functionality and electrical performance of VACON Multimaster technology to offer maximum efficiency at all times.

WE WILL TAKE CARE OF EVERYTHING

VACON 8000 SOLAR MV Station is designed with the customer in mind. As well as offering environmental protection to your VACON 8000 SOLAR inverters, you'll also reap rewards from how easy it is to use. Instead of having to commission a complex infrastructure to house your solar farm, just contact Vacon and we'll do the rest. VACON 8000 SOLAR MV Station comes with power ranging from 400 kW to 1200 kW that can be tailored around your needs. We can even build the enclosure to your requirements – where you want it to blend subtly into the surrounding environment or painted bright pink, we'll deliver it just how you want.

TECHNICAL DATA

VACON 8000 SOLAR	Maximum PV power **kW**	Max. PV current ISC **A**	Max no. of DC inputs (1 MPPT)	Nominal power **kW**	Max. efficiency **%**	**%**	Inverter dimensions WxHxD **mm**	Inverter weight **kg**
400MV	480	1226	20	400	98.6	98,0	6700X3100X2800	30000
600MV	720	1839	20	600	98.6	98.2	6700X3100X2800	30000
800MV	960	2452	32	800	98.6	98,2	7800X3100X2800	36000
1000MV	1200	3065	32	1000	98.6	98,2	7800X3100X2800	36000
1200MV	1440	3678	32	1200	98.6	98,2	7800X3100X2800	36000

INPUT

MPPT voltage range	410-800 VDC
Max. input voltage	900 VDC

OUTPUT

Nominal voltage	20 kV (other voltages at request)
Output frequency	50 / 60 Hz
Power factor	Adjustable 0,8-1 inductive/ capacitive
AC current harmonics	<3%

AMBIENT

IP class	IP54
Temperature range	-10 to 40 °C
Temperature derating	1,5% / 1 °C up to 50 °C
Relative humidity	15% to 95%, condensation not allowed
Maximum installation altitude	2000 m

AUXILIARY POWER

External auxiliary power supply	1 ph, 230 VAC, 50 / 60 Hz, 10 A
Auxiliary power fuse	25 A

SAFETY / PROTECTION

Ground fault monitoring	Yes
Overload behavior	Power limiting
Over temperature behavior	Power limiting
Circuit breaker AC side	Yes
Circuit breaker DC side	Yes

MEDIUM VOLTAGE

Medium voltage transformer	Dry type
Transformer over temperature protection	Yes
Transformer over load protection	Switchgear with fuses
Medium voltage output connection	Ring connection, two switchgears

OPTIONS

Internal auxiliary power supply	Optional
Medium voltage output connection	Star connection
Monitoring system	Monitoring through web portal, SMS messages, e-mail messages

For certifications, see page 7

FEATURES

- Power range of 400 kW to 1200 kW
- Multimaster functionality and electrical performance
- Provides additional environmental protection for VACON 8000 SOLAR Inverter IP21 enclosures

BENEFITS

- Turnkey delivery in an optimized structure
- Short delivery and installation
- Easy to monitor and maintain
- Suitable for EPC customers

VACON® 8000 SOLAR INVERTER MODULES

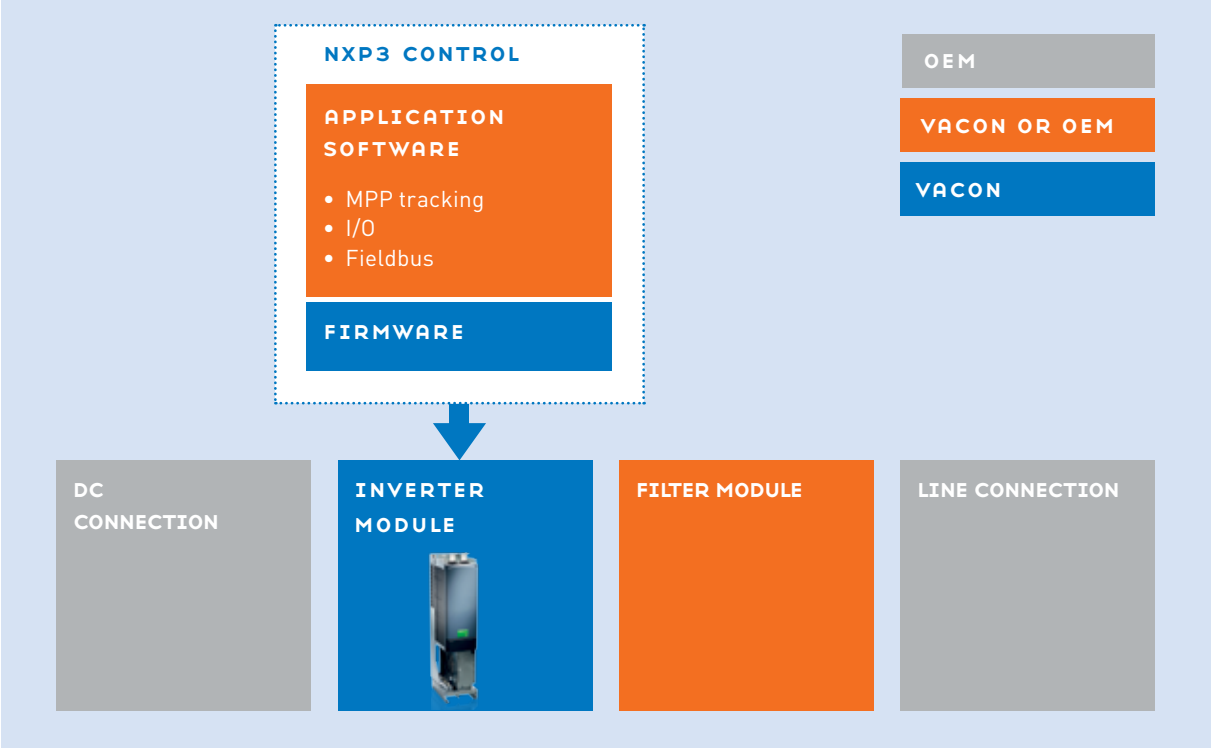
In addition to full solar inverter solutions, Vacon also offers a range of key individual solar components to our customers. All our components come with the same benefits as they do in comprehensive Vacon solar solutions i.e. excellent reliability, efficiency, and full grid code support.

SUNSHINE INTO POWER

Inverting solar energy has one major obstacle in its way – to successfully harness power from a PV source into the grid, it is essential that the voltage and frequency is constantly controlled. The amount of energy a photovoltaic system produces is dependent on variables such as cloud cover, the angle of the sun and ambient temperature. We take this into account by decoupling the voltage and current harvested from the Sun to those fed into the grid. This means the PV array can remain at its optimum operating point at any given time and, with the help of state-of-the-art power electronics, voltage and frequency being fed into the grid can be controlled according to grid requirements.

SOLAR INVERTER MODULE

Solar inverter modules utilize close-looped control to feed energy into the grid. Combining these two components with a filter module produces a comprehensive, readily connectable Vacon solar inverter system, with the option of expansion according to the customer's needs. Connectivity to communication networks such as Modbus and Profibus allows the user to constantly monitor and maintain the system to ensure they get the most out of their Vacon Solar module solution. In addition, there as an IEC61131-3 compatible software tool available for the customer's specific application requirements.



Topology example of a PV inverter system for photovoltaic systems based on Vacon modules for solar inverters. Customers have an option to build their own application software and select the filter, although Vacon can offer both for maximum performance and optimization. Engineering support for solution tailoring is also available.

Module	Device frame	Power kW	Max. current DC A	Current AC A	Min. voltage DC V	Voltage AC V
SXA0145	FI10	145	354	299	410	280
SXA0186	FI10	186	454	324	410	280
SXA0200	FI10	200	488	412	410	280

HIGH-PERFORMANCE CONTROL

Vacon has a high-performance NXP3 control that is perfect for solar applications. The micro controller provides exceptional processing and calculating power, while low harmonic control is available in open- and closed-loop control modes. The Vacon control features built-in PLC functionality without the need for any additional hardware and all customer- specific functionality can be integrated to cut costs and improve performance. The same control is used in all Vacon solar modules, allowing the maximum utilization of control features over a wide power and voltage range.

VOLTAGE MEASUREMENT

To ensure that voltage is under control, it has to measured constantly. By sensing the amplitude, phase position and phase angle of the grid voltage, the inverter synchronizes to transmit as much energy as is required at any given time. Vacon has designed a board which enables superior performance during demanding grid conditions like in low voltage ride-through situations.

TOOLS MAKE PLANNING AND USE EASIER

REMOTE MONITORING FOR VACON® 8000 SOLAR

The remote monitoring function allows you to follow the system status and power generation of your inverters online. This function is especially important for inverters in remote sites. Remote monitoring functions can create considerable savings over time by reducing travel related costs for regular check-ups and maintenance.

The remote monitoring of the VACON 8000 SOLAR Inverters produces a data archive (daily, monthly and yearly). When combined with Vacon's remote monitoring stringboxes, it is possible to monitor individual string intensity for diagnostic purposes. This way bad strings can be found and serviced in order to achieve the highest possible energy production. The system delivers an immediate SMS alarm message to minimize downtime, and provides a report on all the latest events.

STRING BOX FOR 8 STRINGS

Type code	Strings	Max voltage	Fuse/ string	MC3 connector	Remote monitoring	IP
STG 08	8	1000 V	10 A	-	-	54
STG 08+ASM	8	1000 V	10 A	-	Yes	54
STG 08+IMC	8	1000 V	10 A	Yes	-	54

MONITORING BOX

Type code	Nº of inverter nodes	Nº string box nodes / inverter	Max. Nº modbus nodes	IP
STG 00	99	99	230	54

PLC TOUCH SCREEN PANEL

The PLC touch screen panel on the control unit provides a simple and clear user interface for the entire system. By using the panel, you can monitor the status of the entire system. You can see the actual power generated in graphical form and choose to view daily, weekly or even monthly figures. Regardless of the number of units in your system, you can use one single touch screen to adjust or control set-up. The touch screen is available as standard in 400 – 1200 kW units.

TYPE CODE KEYS

VACON® 8000 SOLAR 10-200 kW

VACON NXV - 0010 - 4 - A - 2 - L - A1A2D7B5XX

NXV	**Product range** **VACON NXV** = Solar power inverter
0010	**Nominal power** **e.g. 0010** = 10 kW, 0100 = 100 kW
4	**4** = Galvanic isolation transformer, output 3 x 400 VAC **2** = No galvanic isolation transformer, output 3 x 280 VAC
A	**Control keypad and display on the enclosure** **A** = Alpha-numeric (default) **B** = No local keypad **F** = Dummy keypad **G** = Graphical keypad
2	**Enclosure class** **2** = IP21
L	**EMC emission level** **L** = Fulfils standard EN 61800-3, 2nd environment, restricted distribution **T** = Fulfils standard EN 61800-3 for IT networks
A1 A2 D7 B5 XX	**Options, monitoring** **00** = not used **C2** = Modbus RTU **CI** = Modbus TCP

VACON® 8000 SOLAR 400-1200 kW

VACON NXV - 1000 - 2 - A - 2 - T - A1A2D7D2CI

NXV	**Product range** **VACON NXV** = Solar power inverter
1000	**Nominal power** **e.g. 0400** = 400 kW, 1200 = 1200 kW
2	**2** = No galvanic isolation transformer, output 3 x 280 VAC
A	**Control keypad and display on the enclosure** **A** = Alpha-numeric (default) **B** = No local keypad **F** = Dummy keypad **G** = Graphical keypad
2	**Enclosure class** **2** = IP21
T	**EMC emission level** **T** = Fulfils standard EN 61800-3 for IT networks
A1 A2 D7 D2 CI	

VACON® SOLAR SERVICES

Vacon has a comprehensive service network in nearly 90 locations worldwide. Offered services are available either directly from Vacon service centers or through authorized Vacon service partners. All service centers and partners are trained to service all Vacon products and can be relied upon to give expert technical support. This service network enables us to guarantee timely and proficient service to all our customers throughout the lifecycle of their Vacon products and/or solutions. Vacon offers three different levels of service policy. All three are available to all solar industry customers.

1

STANDARD WARRANTY POLICY (5 years)

- The Vacon Standard Warranty Policy is granted free of charge to all VACON® 8000 SOLAR Inverters, offering users protection against unexpected failures for 5 years
- In order to maintain warranty beyond 24 months maintenance is required in accordance with the maintenance schedule

2

EXTENDED SERVICE POLICY

(Comprehensive warranty up to 20 years)

- Vacon offers its Extended Service Policy to all solar customers. The Extended Service Policy is always a service package tailored according to the customer's requirements and offers a full 20 years warranty coverage with 5 year terms
- The Extended Service Policy is a contractual document between the customer and Vacon. For more information contact your nearest Vacon sales office
- The Extended Service Policy is rendered with Proactive Maintenance and Extended Warranty Services:

Proactive Maintenance

- Active replacement of parts before the estimated end of their lifecycle
- Maintenance schedule defines the inspections, checks and replacements required
- Risk of unexpected failures is substantially reduced
- Environmental Assessment verifies the operational conditions

Extended Warranty Service

- Service provider covers the risk of unexpected failures and ensures the usability of the inverter
- In case of unexpected failures, costs of parts and labor incurred during replacement are covered

3

GENERAL SERVICE POLICY

- Customers that have not opted for an Extended Service Policy are still able to receive services for commissioning, maintenance and repair and spare parts
- For the Standard Warranty to remain valid, the following services must be ordered and carried out in accordance to the maintenance schedule

- Vacon Solar Commissioning
- Proactive Maintenance
- Repair and Spare Part Services

* Vacon also offers additional services to meet rule, regulation or law changes that require modifications, changes etc. to the solar inverters.

REFERENCES

CASE:

HEALTH CITY FITNESS CENTER MERKSEM, BELGIUM

This case, in Merksem, Belgium is an exemplary success story for Vacon. Health City is a fitness center group with facilities in Belgium, The Netherlands and Germany. The Merksem center's environmental concerns and interest in renewable energy resulted in an on-site solar installation of 60 kW in total, consisting of 2 times 30 kW.

The original installed PV inverters, when put online, were found to cause disturbances in the wireless heart monitoring systems, used in cardiac training and safe intensive workouts. The customers complained that the equipment didn't work as intended and the inverters had to be switched off during such fitness sessions. The situation could not be allowed to continue.

The system integrator contacted Vacon wanting to know whether the VACON 8000 SOLAR inverter could be the solution. Based on Vacon's experience with drives in sensitive environments, Vacon was confident that it could offer a solution for this particular case.

Initially one VACON 8000 SOLAR 30 kW unit was shipped to Merksem in order to test it for this particular case. The wireless heart monitoring devices worked perfectly, even when the Vacon inverter was enabled. The results were very satisfying. The system integrator found a solution for the special needs of a sensitive environment and the Health City Fitness Center in Merksem is now able to get a return on their investment, without the risk of any disturbance in their wireless heart monitoring systems.

A second VACON 8000 SOLAR 30 kW unit is about to replace the other inverter that still gets switched off every time the heart monitoring system is used.

CASE:

HIMIESA TEXTILE YARN
ALICANTE, SPAIN

Located on the sunny Mediterranean area of Alicante (Spain), Himiesa is one of those companies that has managed to combine tradition and innovation in the manufacturing of textile yarns. This has helped them become one of the leading companies on the market.

With a clear concern for the environment and an aim for reducing both CO2 emissions and energy costs, the company opted decisively for photovoltaic solar energy to achieve these goals. From the beginning they had strong conviction that they should trust the essential part of power generation to a solvent and consolidated company such as Vacon.

Entrusting the execution of the project to Electroaldesa, an important system integrator in Spain, Vacon was present in all the stages of the project, adapting to the customer's changes and needs. Vacon's wide portfolio of product and features as well as their staff's passionate attitude played a key role during the project along with Vacon's continuous support for the pre and post-sales. The choice was clear: Vacon was outlined as the preferential supplier from the beginning by the managing team of the Himiesa.

On a sunny Mediterranean day, 1.200 kW from thin film solar modules installed on the roof, feed 2 twin NXV0600 units of the VACON 8000 SOLAR Inverter, spilling all the available solar power into the electrical network. The Multimaster configuration assures maximum efficiency in any solar condition.

VACON® 8000 WIND
A DRIVING FORCE IN WIND ENERGY

FACING THE WIND

TECHNOLOGY AND EXPERTISE

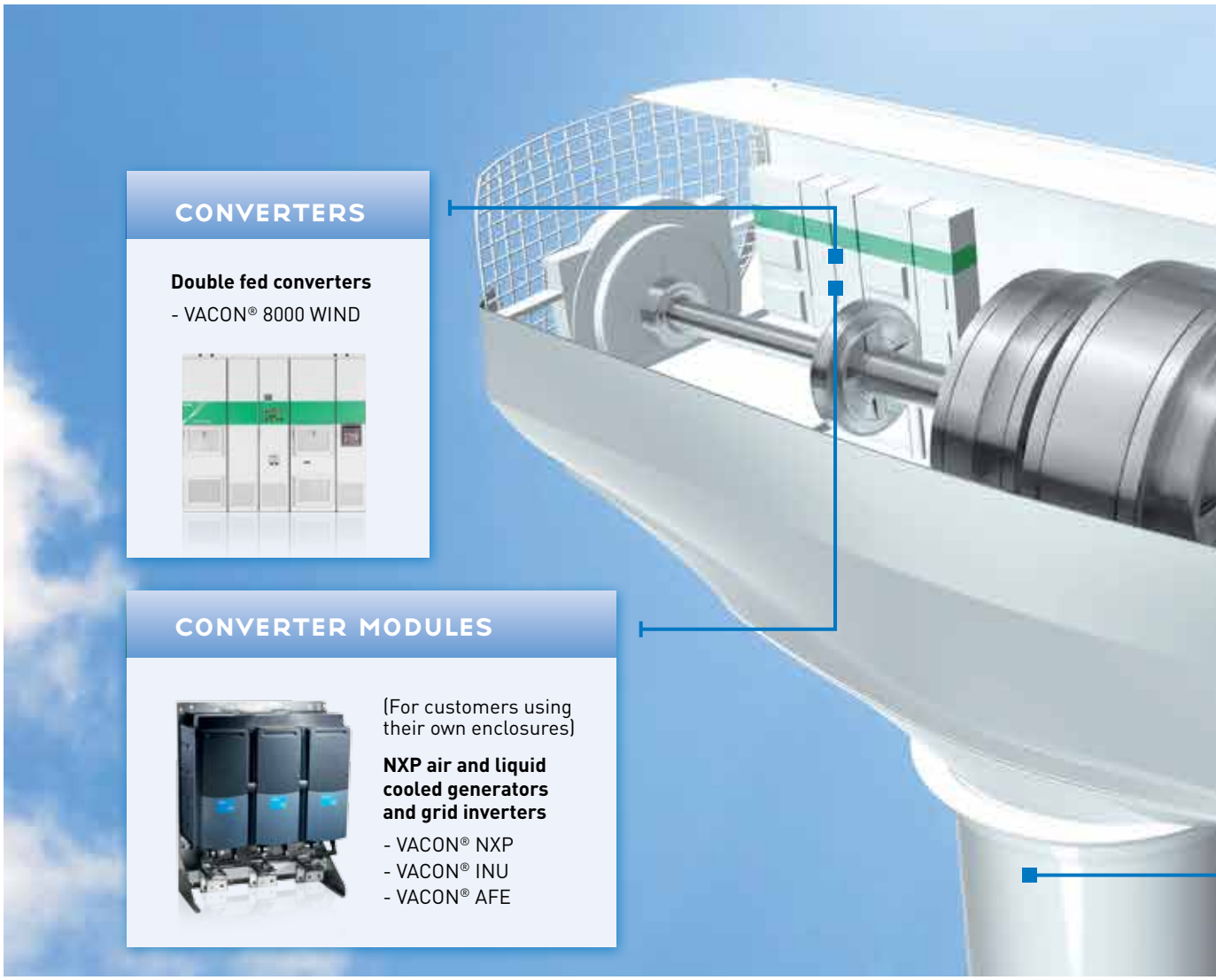
With our first deliveries to the wind energy sector dating back to before the new millennium, we are proud to say we have a long history, extensive expertise and the technology necessary to connect power from renewable sources to a national grid.

A SOLUTION WITH SERVICES

In addition to high-quality equipment and components, a service that is based on understanding our customer's business and needs is at the core of our offering. By having a team of professionals that can provide a customised solution, whether you're an machine builder or a system integrator, we ensure that the service we provide goes much further than just component sales. The service and support we offer also spans the entire lifecycle of the products we provide.

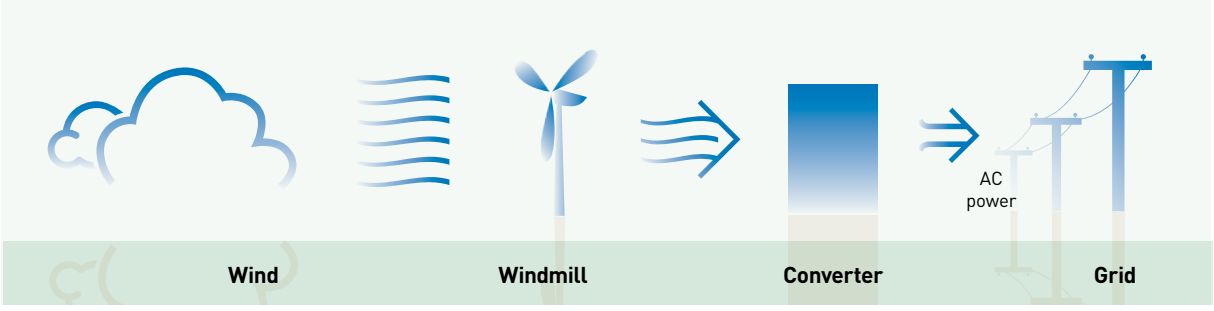
VACON OFFERING

Our inverters are already a significant part of full power converters in various individual windmills. In addition we are able to offer complete double fed windmill converters and drives with application support for windmill yaw control, pitch control and other auxiliary controls. We approach each new customer with equal enthusiasm and aim to provide all customers with a tailor-made solution for their specific needs.



WIND ENERGY – AN INVESTMENT INTO THE FUTURE

Renewable energy demand is growing hand in hand with the ever-increasing concerns we have regarding the environment and global warming in particular. Environmental concerns, sustainable development and green values are hot topics of discussion, which have had a direct impact on the growth rate of the wind energy market. In addition to the knowledge of the environmental effects of burning fossil fuels for energy, we are also painfully aware of the fact that those resources are quickly diminishing. The need to permanently search out alternative and sustainable sources of energy is inevitable. Wind, as far as energy production is concerned, is a truly renewable and clean source. It is also the furthest developed and most established of these truly renewable sources. Consumers and people in the energy industry alike are realising this, and the market is expected to continue growing well into the future.



Modern windmills can be used to convert energy from wind into usable electricity for the electricity grid. Vacon products, like the VACON 8000 Wind, are essential parts of windmill installations that convert the kinetic energy produced by the rotating blades into AC power.

DRIVES FOR YAW, PITCH AND AUXILIARY CONTROLS

AC drives for a range of various applications

- VACON® NXL
- VACON® NXS
- VACON® NXP

VACON WIND – APPLICATIONS AND SOLUTIONS

PRODUCTS AND APPLICATIONS

Vacon produces high performance quality inverters, drives and power converter solutions for wind energy applications. Our comprehensive offering is easily tailored to suit your specific technical and branding needs. We can provide anything from single converters and auxiliary drives components to complete converter unit solutions like the VACON 8000 Wind, which is used especially in double fed induction generators (DFIG) as a converter for controlling and adjusting power.

In addition to the essential windmill converter solutions, Vacon has products in its portfolio that consist of numerous other individual applications and control functions within a windmill. These functions include e.g. yaw control, pitch control and other auxiliary controls.

GRID-CODE COMPLIANCE

We also have wide experience of and the tools for building grid-code compliance systems, low voltage ride-throughs, micro-grid functionality and fieldbus interfaces for windmill control systems helping to ensure your windmill power investment.

SERVICE

Having highly skilled and motivated personnel means that you not only get products of the highest standard, but have local and global 24/7 support available for the commissioning, maintenance and service of your investment during its entire lifecycle.

VACON® 8000 WIND – A COMPREHENSIVE CONVERTER SOLUTION

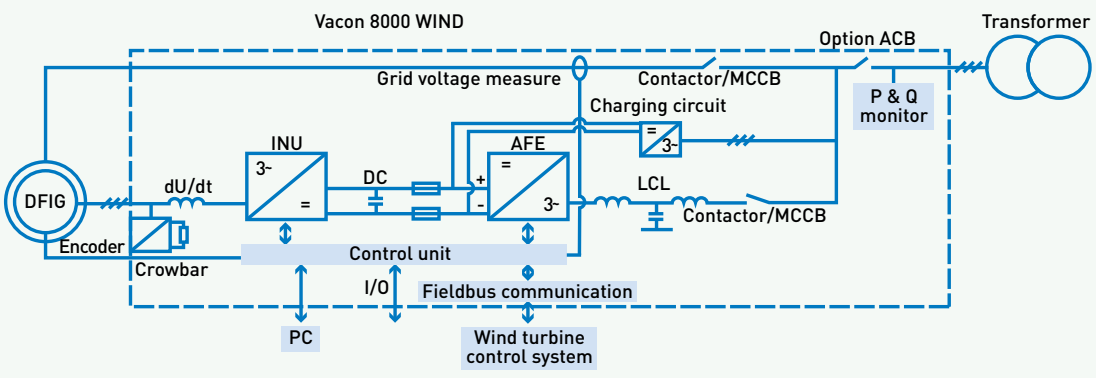
FEATURES

- Wide speed range of the generator from subsynchronous to oversynchronous
- High power quality
- Active and reactive power control
- Heavy-duty active crowbar
- Wide temperature characteristics
- Automatic grid synchronization
- Low voltage ride-through
- Wide range of fieldbus communications
- Advanced monitoring tools
- Internal fault protection
- Optional arc protection
- Optional lightning protection

BENEFITS

- Produces high-quality power
- Reliable and durable (low maintenance)
- High level of automation and connectivity
- Easily expandable and customizable solution
- Easy monitoring and control
- Expert service and support available

MAIN CIRCUIT DIAGRAM



VACON® 8000 WIND - TECHNICAL DATA

RATED POWER	1.5 MW	2 MW
DIMENSIONS W x H x D (mm)	2406 x 2000 x 605*	2606 x 2000 x 605*
GRID RATED CURRENT	634 A	634 A
GRID MAXIMUM CURRENT	698 A	698 A
ROTOR RATED CURRENT	590 A	920 A
ROTOR SIDE MAXIMUM CURRENT	649 A	1012 A
GRID VOLTAGE	690 VAC, -10%...+10%	
GRID FREQUENCY	45-66 Hz	
SWITCHING FREQUENCY	1.5 — 3.6 kHz	
SPEED FEEDBACK	Incremental encoder	
TORQUE CORRESPONDING TIME	≤10 ms	
AMBIENT OPERATING TEMPERATURE	-10˚C — +40˚C**	
STORAGE ENVIRONMENT TEMPERATURE	-40˚C — +70˚C	
COOLING MODE	Air cooling	
ALTITUDE	≤1000 m***	
IP CLASSES	IP23/IP54	
FEATURES	Internal crowbar and crowbar resistor Internal input LCL and output filters Wide range of fieldbuses Automatic synchronization Overvoltage, overcurrent, input phase monitor	

OPTIONS	**DESCRIPTION**
+WCB	Main breaker (ACB)
+WPS	220V Aux. control power supply (UPS)
+WCC	ACB (stator) + MCCB (rotor)
+PAP	Arc protection system
+PLT	Lightning protection
+AT3	4 kVA auxiliary transformer

FIELDBUS OPTIONS	**DESCRIPTION**
OPT-C2	RS485 (Multiprotocol), Note: Modbus, N2
OPT-C3	Profibus DP
OPT-C4	Lonworks
OPT-C5	Profibus DP (D9-type connector)
OPT-C6	CanOpen (Slave)
OPT-C7	DeviceNet
OPT-C8	RS485, Note: Modbus, N2
OPT-CF	CAN/Euromap
OPT-CI	Modbus/TCP

* D = 781 mm with fan housing
** If the ambient operating temperature exceeds +40˚C, the load capacity of the converter decreases.
*** If the altitude exceeds 1000 m, the load capacity of the converter decreases.

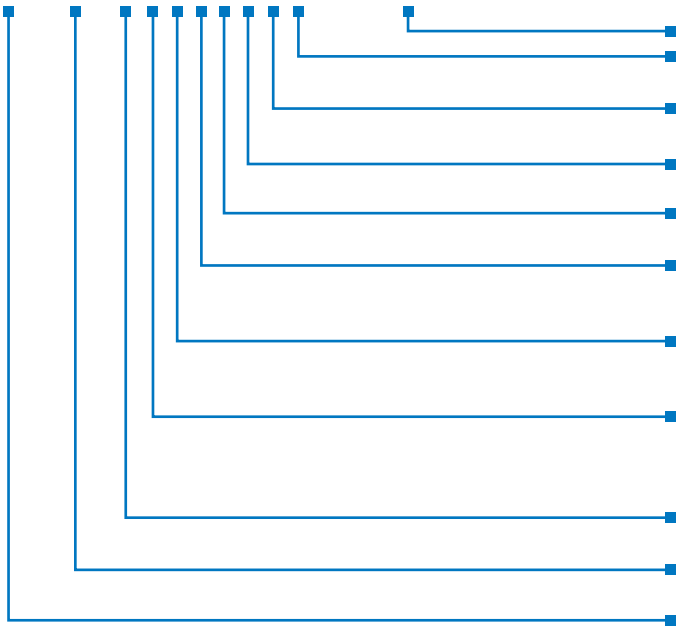
For further information, please contact Vacon.

SIZES AND RATINGS

ORDER TYPE CODE	**IP PROTECTION**	**DIMENSIONS W x H x D (mm)***	**WEIGHT (kg)**
NXE15006G2L1RSG_	IP23	2406 x 2000 x 605	2000
NXE15006G5L1RSG_	IP54	2406 x 2000 x 605	2000
NXE20006G2L1RSG_	IP23	2606 x 2000 x 605	2100
NXE20006G5L1RSG_	IP54	2606 x 2000 x 605	2100

TYPE CODE KEY

NXE OOOO 6 A 2 L 1 R S G OOOOOOOOOO + OPTIONS



Basic I/0 option boards
Control
G = Standard for NXE and varnished PCBs
Cooling
S = Standard air-cooled
Supply
R = Regenerative low-harmonic
Crowbar
1 = crowbar
EMC
L = Fulfils standard EN 61800-3, 2nd environment
T = Fulfils standard EN 61800-3, IT Networks
Enclosure class
2 = IP23
5 = IP54
Control keypad and display on the enclosure door
A = Standard
B = No local keypad
G = Graphic display
Nominal mains voltage
6 = 525-690 V (3 phases)
DFIG nominal power
e.g.1500 = 1.5 MW
Product range
NXE = VACON 8000 Wind

VACON® PC TOOLS
AND APPLICATION SOFTWARE

OPTIMIZE YOUR DRIVE YOUR WAY WITH VACON SOFTWARE TOOLS

VACON® PROGRAMMING

Machine builders or OEMs can achieve a high level of machine performance by optimizing the application with our new VACON Programming software tools. These licensed tools feature a built-in PLC functionality based on IEC61131-3. You can simply program and secure your own control logic into the drive and use its intelligence and IO resources for performing other machine related tasks.

COMMISSIONING MADE EASY WITH VACON® LIVE

VACON Live is a PC tool which communicates directly with the VACON 100 drive via Ethernet or through a USB-to-RS485 interface. This makes for particularly easy installation, commissioning and maintenance.

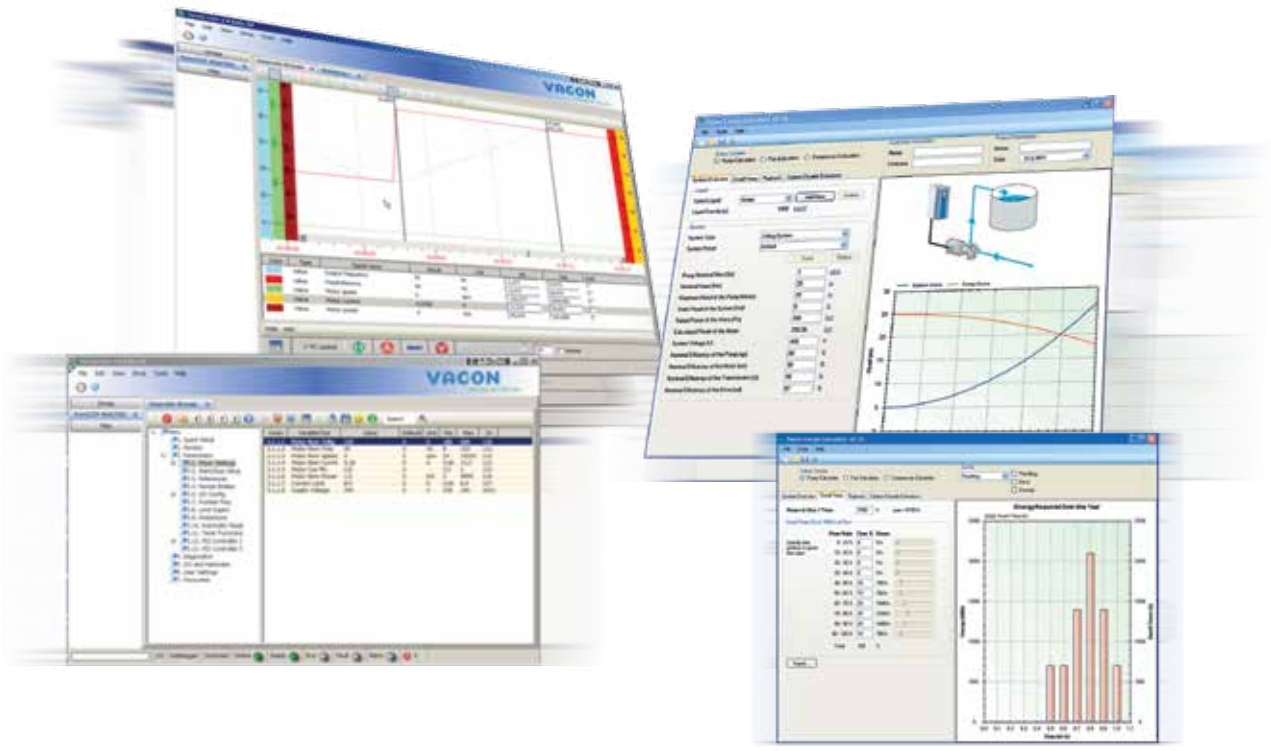
Drive values, as well as process-related values can be graphically monitored in real time. Parameters can be edited, saved for back-up and compared with defaults or a back-up file. You only need to send one service info file to your service provider for quick support. A service info file contains parameters and other data such as history of faults and alarms, as well as drive hardware and software details. Drive software and language support files can be loaded to the drive using VACON Loader software, which is included in the VACON Live tool.

VACON® SAVE

Energy costs account for the majority of your installation's lifetime costs. With VACON Save you can calculate your energy savings in kWh when you implement a VACON 100 to the pumps and fans in your processes. While displaying savings in your own currency, it will also estimate the short payback time of your VACON 100 purchases as well as the reductions in carbon dioxide emissions in your country.

VACON® HARMONICS

VACON 100 has built-in harmonics filtering. You can estimate the harmonics and power quality of your operations quickly using our VACON Harmonics tool. It illustrates the total harmonic effect of your existing or intended drives in your supply networks, so that you can plan for the effective solution in compliance with local harmonic standards.



ADDITIONAL FEATURES

- Export service info option which includes parameters, fault history, drive information, firmware information and more
- Create User Groups for common parameters across multiple size drives
- Compare drive parameters to default settings or a saved set of parameters
- Connect to multiple drives via Ethernet
- Name individual drives for easy identification
- Vacon Live automatically searches for PC tool updates

VACON LOADER

- Free Firmware and Software loading application bundled with Vacon Live
- Load firmware updates containing fixes or new features to the Vacon 10 and Vacon 100 HVAC
- Load special Vacon applications to the Vacon 10 and Vacon 100 HVAC
- Load custom application software to the Vacon 10 and Vacon 100 HVAC
- Update functions of the Vacon Micro Communication Adapter (MCA) for Vacon 10

KEY BENEFITS

Economical

- Save on operating & maintenance costs
- Reduce downtime
- Optimize energy savings
- Minimize costs due to harmonic disruptions

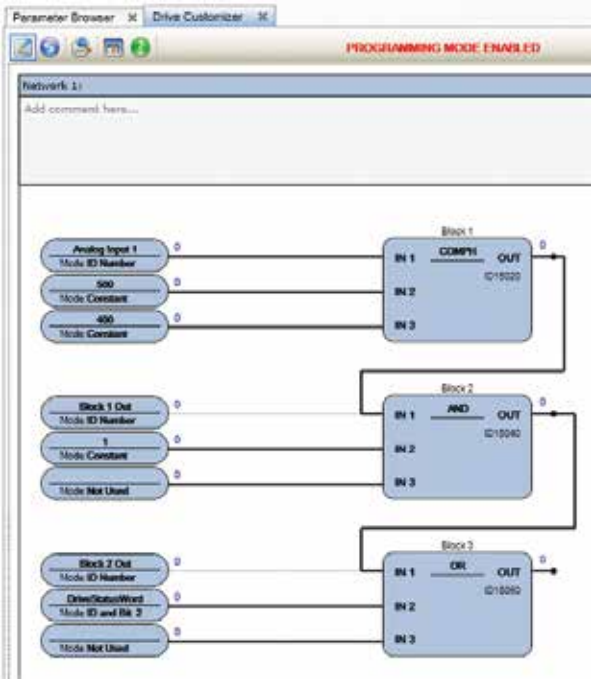
Easy

- Simple to configure and use
- Customize on field with Block Programming
- Easy commissioning & maintenance
- Meet harmonic standards the easy way

DRIVE CUSTOMIZER - VACON® 100 AND VACON® 100 FLOW

DRIVE CUSTOMIZER

- User interface for the built-in function block programming
- Easy on site drive customization with VACON Live
- 10 Programmable Function Blocks
- Library of 39 different function blocks (AND, OR, ADD, Fault_Status, etc.)
- Funtion blocks are executed at 10ms program cycle
- Program is stored in the drive parameters and can be copied to other drives with parameter file.



NCDRIVE FOR THE VACON® NX FAMILY

The NCDrive is a versatile commissioning and maintenance tool for Vacon. The tool provides four main windows for different purposes: parameter, monitor, operating and diagnostic window. Moreover, there is a data logger and trend recorder for the VACON NXP drives.

PARAMETER WINDOW

- Parameter values are visible with the parameter name, default value and its minimum and maximum limits
- Parameters can be uploaded or downloaded to/from Vacon AC drives
- Parameters can be edited online or offline. In the online mode, the changes take place immediately in Vacon AC drives
- Parameters can be saved on a computer hard disk in text or Excel format for back-up purposes
- The parameters in Vacon AC drives or in a file can be compared with the parameters in any other parameter file in the computer

MONITOR WINDOW

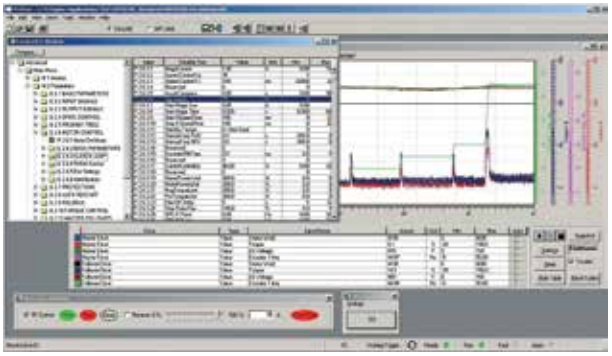
- Monitoring of eight signals in graphical format on the same time axis
- Minimum sample time of 50 ms with RS232 and of 1 ms with CAN communication
- Minimum and maximum scaling can be modified any time
- Graphical screen can be saved onto the hard disk. It can also be exported in BMP or Excel format.
- The monitoring data can be triggered on condition to debug specific problems.

DIAGNOSTIC WINDOW

- Active faults in Vacon AC drives with associated signal values at the time of fault such as frequency, current, and more
- Fault history with associated signal values at the time of each fault. The last 30 faults can be viewed.

OPERATING WINDOW

- Vacon AC drives can be controlled from the NCDrive and motor can be run as required
- Run, Stop, Fault reset, Coast stop, Direction reverse through simple graphical buttons
- Speed/frequency reference can be set directly, or by using the scroll bar
- Status indication for ready, running, fault, alarm, active control place and datalogger status in the task bar



SPECIAL FEATURES FOR VACON® NXP

DATALOGGER WINDOW

- Data logged in the drive for eight signals with a minimum sample time of 1 ms
- NCDrive can, for instance, be used to set the signals, trigger condition, and so forth
- The triggered data saved in the drive can be uploaded in graphical form, and can also be exported as BMP or Excel

TREND RECORDER WINDOW

- The data can be saved continuously for longer periods, typically for hours, onto the hard disk
- The saved trend data can be opened any time in graphical format and scrolled through the time axis
- Available only for the VACON NXP via the CAN bus interface

OTHER FEATURES

- Real-time clock setting in the VACON NXP
- Parameter, monitor, diagnostic, data logger and trend data can be printed
- Application file database can be generated from the drive
- Firmware and application variables can be monitored for advanced debugging
- Service info keeps the complete information of the drive including hardware, software details, hour counters, parameter settings, and a fault logger

NCLOAD, LOADING TOOL

The NCLoad is an easy-to-use service tool for downloading applications, language packages, option board software, and system software to Vacon AC drives. The graphical user interface provides an easy point-and-click selection of applications to be downloaded. After a successful download, the drive will be reset, and the custom application is ready to use.

You can download multiple applications to Vacon AC drives and activate the one that is required at the given moment. All hardware, software and option board details are readily available for viewing via the NCLoad. The NCDrive uses a simple RS232 communication cable between the PC and Vacon AC drive. A fast and multidrop CAN communication can be used with the VACON NXP. The CAN bus cable can be connected to a PC using a USB-to-CAN interface or a CAN-to-Ethernet interface.

SPECIAL VACON® NX FAMILY APPLICATIONS

The Vacon NX Family is built on an open application architecture which allows additional functions and capabilities to be added as well as allowing default settings and limits of parameters to be adjusted. Vacon also makes available to the public many special applications to provide solutions for common industries.

VACON NXS APPLICATIONS

ASFIFF08 Standard Lift Application
The 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.

In the application, constant speeds are presented in [m/s] and also in [Hz], acceleration and deceleration are presented in [m/s2] and jerks are presented in [ms]. 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 NXS or NXP frequency converter.

ASFIF09 Multi-Master PFC (WATER PACKAGE)
The application is designed to achieve an even wear of the pumps connected to the motors/drives by regularly changing the regulating order of the drives. The application supports max. 3 devices to work in parallel. One drive is leading and regulating (PID) while the others are either stand-by or running at the speed producing the nominal flow in the system.

The autochange of the regulating drive/pump can be performed during run without any notice in the pressure in the pipes. This means also that each drive can become the regulating drive of the system.

Due to the fact that all 3 devices are controlled by its own drive, the system will be controlled even if one or two of the drives are tripped.

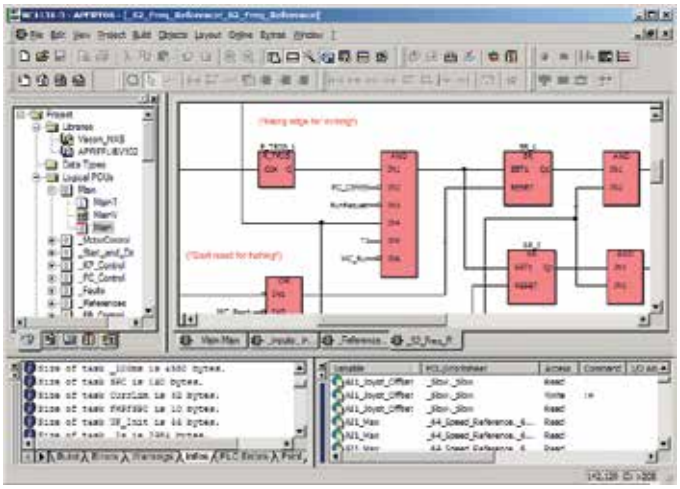
VACON NXP APPLICATIONS

APFIFF33 NXP Lift application
Same function as in APFIFF08 Standard lift application but with PM motor support added.

APFIFF09 Marine
Specially designed for Marine segment, but can be used in any demanding application.

Additional functions (compared MP application):
- Most NXP performance features are available
- Advanced power limit functions can be utilized
- Power limits by DI or from fieldbus for both Motoring and Generating side.
- Master Follower function for steering propeller and double winding motors
- Different Torque limits for motoring and generating side
- Cooling monitor input from heat exchange unit
- Brake monitoring input and actual current monitor for immediate brake close.
- Separate speed control tuning for different speeds and loads
- Inching function two different reference
- Possibility to connect FB Process data's to any parameter and some monitoring values
- Identification parameter can be adjust manually
- Analogue input 3 and 4 can control any parameter by ID number
- Support for four analogue outputs

PROFESSIONAL APPLICATION DEVELOPMENT



The VACON® NC61131-3 Application Programming Suite consists of tools that offer all that is necessary for making professional and efficient applications. This suite enables you to adapt Vacon AC drives to your application-specific requirements.

The VACON NC61131-3 Application Programming Suite supports many programming languages which are based on the IEC61131-3 standard. An entire application can be done in a few easy steps by using a specific tool for each programming phase. The Application Programming Suite offers a graphical programming environment for the functional design of an application.

NC61131-3, BLOCK PROGRAMMING TOOL

The NC61131-3 is a block programming tool to make a graphical presentation of the application. The application is made with the user-selected programming language (Function Block Diagram, Structured Text, Sequential Function Chart, or Ladder Diagram). The user selects the necessary functions and function blocks from the library to the worksheet and wires them together in order to define the desired functionality for the application.

The tool incorporates a wide range of IEC features. The PLC type of logic can be programmed with Boolean functions, timers, counters, comparators and flip-flops. In addition, frequency-converter-related functions can be created by using scaling, ramp control, PI(D) control, and more can be added. These features ensure that the drive control and the PLC control can be combined, and external equipment (e.g. small PLCs with control logic) are no longer necessary.

The NC61131-3 also has a new online debugging feature. It displays all the internal variables of the application with their status.

NCDEF, DEFINITION TOOL

The NCDef is a tool to make local control panel definitions for an application. The NCDef is a link between the logic program and keypad layout. This tool is used for creating parameters, variables, references and special buttons for the AC drive. If you want to show text instead of numerical values for a parameter, the tool offers an option to define unique value-to-text conversion pairs.

The NCDef also assists in customizing the menu groups for easy and clear parameter and variable reading via a local control panel. The menu groups can be modified, deleted or added as required.

PURCHASING NC61131-3

A License Fee is required to obtain a copy of NC61131-2 for VACON NXS and VACON NXP. Training is also required and is not included in the price of the NC61131-3 License Fee. Please contact your local Vacon Sales Representative for more information.

The VACON® Documentation Wizard is a technical documentation tool, which creates a complete set of drawings for each customer. The VACON Documentation Wizard provides diagrams and drawings of the Vacon NXC with various kinds of combinations of standard options.

VACON DOCUMENTATION WIZARD COMPLETES VACON NXC DOCUMENTATION AUTOMATICALLY

By using the new easy-to-use tool, you are able to build up the right kind of documentation for the customer. The tool covers nearly all the possible NXC options. You only need to enter the product information, i.e. a type code, and the required variations and extra equipment (plus codes) into the user interface field, and the tool will automatically generate the documentation.

FAST AND RELIABLE

Vacon NXC can be confi gured and built in various ways. There is a large number of different combinations in terms of current ratings and voltage, enclosure class, terminals, cabling, input and output options, etc. There are almost twenty different types and all of them include several alternatives. Whenever you need layout diagrams, circuit diagrams, terminal diagrams, wiring lists, part lists, cable lists or interconnect diagrams, you can create the drawings with the Vacon Documentation Wizard. You can also be sure that the drawings include the latest information.

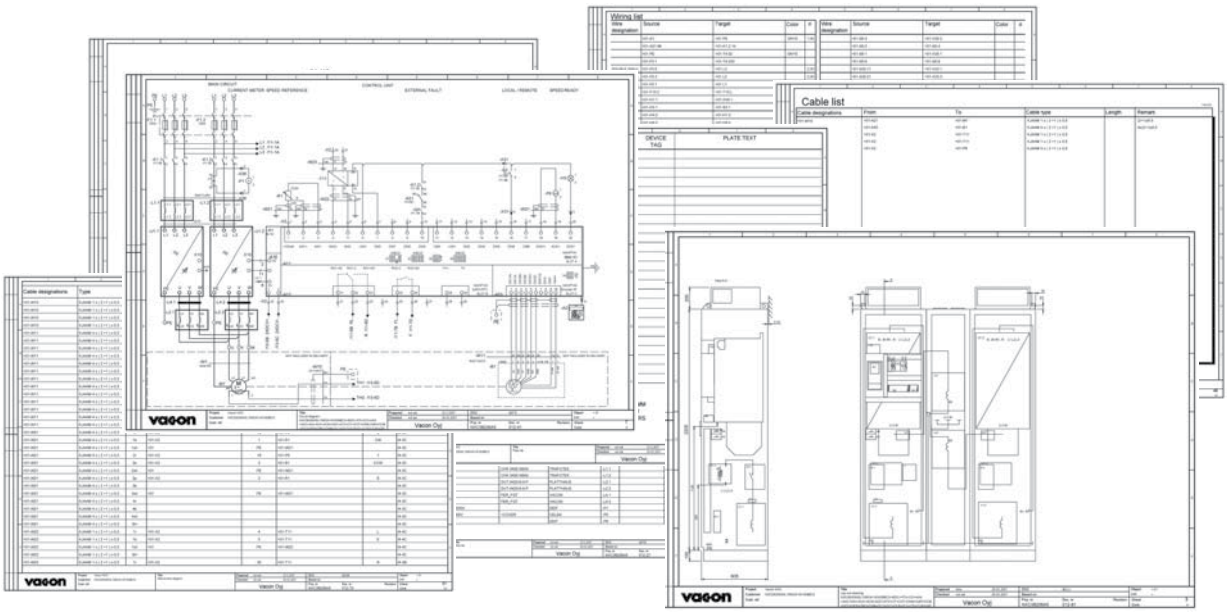
NEW AND EFFICIENT TOOL FOR SALES PEOPLE

The Vacon Documentation Wizard is available upon request for Vacon partners. It is very easy to use the tool: just enter the Vacon extranet (www.extra.vacon.com), write down some basic information and choose what formats of documentation you would prefer. The available language versions are currently English, Finnish, Swedish, Spanish, German and French. Additional language versions can easily be made available. For further information, please contact: wizard@vacon.com.

FORMATS

- DWG (AutoCAD) drawings
- DXF (AutoCAD) drawings
- Portable Document Format (pdf)
- E-plan project (prj)

WITH LOTS OF INTELLIGENCE INSIDE



Type designation code for example drawings above:

NXC08206A5L1SSGA1A3A5B8C3+MDC+IFD+ICO+AAA+AAC+AAI+ACH+ACS+ADC+AT2+CIT+COT+DAM+DAR+DCM+DCO+DEP+DRO+DVM+DLD+DLF+DLR+DLV+TID+TUP+GPL

For further information, please refer to the Vacon NXC product brochure.

NXC TYPE DESIGNATION CODE

Family	Current	Voltage	HMI	IP	EMC	Chopper	PU	Special	Pboard	Option boards
NXC	0520	5	A	2	L	0	S	S	F	A1A3000000

"+" CODES

Auxiliary equipment (A group)
+AMF Motor fan control
+AMH Motor heater feeder
+AMB Mechanical brake control
+AMO Motor operator for +ICB
+ACH Cabinet heater
+ACL Cabinet light
+ACR Control relay
+AAI Analog signal isolator
+AAA Aux. contact (ctrl voltage)
+AAC Aux. contact (input device)
+AT1 Aux. voltage transformer 200 VA
+AT2 Aux. voltage transformer 750 VA
+AT3 Aux. voltage transformer 2500 VA
+AT4 Aux. voltage transformer 4000 VA
+ADC Power supply 24 VDC 10 A
+ADS 230 VAC customer socket

Control terminal options (T groups)
+TIO Basic I/O wired to external terminals
+TID Additional terminals +TIO
+TUP Terminals for 230 VAC control voltage

Door-mounted options (D group)
+DLV Pilot light (control voltage on)
+DLD Pilot light (DO1)
+DLF Pilot light (FLT)
+DLR Pilot light (RUN)
+DCO Main contactor operation switch
+DRO Local / Remote operation switch
+DEP Emergency stop push-button
+DRP Reset push-button
+DAM Analog meter (AO1)
+DAR Potentiometer for reference
+DCM Analog meter + current trafo
+DVM Analog voltage meter + switch

General options (G group)
+G40 400 mm empty cabinet
+G60 600 mm empty cabinet
+G80 800 mm empty cabinet
+GPL 100 mm base

Cabling options (C group)
+CIT Input (mains) cabling from top
+COT Output (motor) cabling from top

Input device options (I group)
+ILS Load switch
+IFD Switch fuse and fuses
+ICB Circuit breaker (MCCB)
+ICO Input contactor
+IFU Input fuses

Main circuit options (M group)
+MDC DC/ Brake chopper terminals in cabinet

Output filter options (O group)
+OCM Common mode filters
+ODU du/dt filter
+OSI Sine wave filter

Protection devices (P group)
+PTR External thermistor relay
+PES Emergency stop (cat 0)
+PED Emergency stop (cat 1)
+PAP Arc protection
+PIF Insulation fault sensor


VHCON

VACON® PROACTIVE MAINTENANCE SERVICES

TAKING CARE OF YOUR PROCESS

KEY BENEFITS:

- Extend the lifetime of your AC drive
- Gain reliable process operation
- Minimize unexpected downtime
- Save on operational costs
- Increase profit margin
- Optimize your total cost of ownership

TAKING CARE OF YOUR PROCESS

Unnecessary downtime is something that all process businesses want to avoid. A break in production, even if it only lasts a few hours, can cause significant financial damage and harm a company's business relations.

Vacon offers a wide variety of services for Vacon products, including proactive maintenance services and proactive maintenance kits to help optimize your process and total cost of ownership. We help you predict needed maintenance actions in time and prevent any unexpected disturbances in your AC drives and inverters during their lifecycle and your process. By actively maintaining your Vacon products, you will extend their lifetime and performance level.

PROACTIVE MAINTENANCE SERVICE

Vacon proactive maintenance services are based on our solid knowledge of AC drives and inverters. We have over 15 years of experience in R&D, manufacturing and maintenance of world-class products across various industry segments.

Our goal is to help our customers succeed with their processes in the best possible way. Therefore our proactive maintenance services are fully customized and carried out on-site. All maintenance actions are planned in cooperation with you.

How it works
Vacon proactive maintenance services starts with our service experts inspecting the unit and process environment according to Vacon's type specified maintenance checklist. All counter readings are stored and the latest software revisions updated.

You will receive a detailed maintenance report listing all the maintenance work completed and recommendations for the future.

Even though proactive maintenance is mainly carried out on-site, it can also be performed in conjunction with other maintenance work at your nearest Vacon service center.

PROFITABLE MAINTENANCE

By maintaining your Vacon products in accordance with the recommended maintenance plan, their lifetime can be significantly extended. The operation of your AC drives and inverters will be more reliable and unexpected downtime minimized. The bottom-line effect is reduced operational costs and increased margins.

VACON PROACTIVE MAINTENANCE PROGRAM LIST

Our Service experts can guide you regarding the best maintenance action for your Vacon products.

	Inspection intervals	Service schedule	Proactive maintenance actions
Environmental, cabling and connections	**Service is always performed in commissioning phase of product and continues according to service schedule. Environmental conditions will be documented in commissioning. E.g. heat, dust, moisture, vibration etc.**		
Conditions of installation environment	1 year	1 year	Check that installation and environmental conditions are within Vacon specification . E.g. heat, dust, moisture, vibration etc. Corrective actions based on findings.
Cleaning	1 year	1 year	Product will be cleaned with an antistatic vacuum cleaner if necessary.
Cleanliness of cooling tunnel	1 year	1 year	The cleanliness of the cooling tunnel will be checked / evaluated. Cleaning if necessary.
Air filters	3 months	3 months in demanding environment	The inspection and replacement intervals of filters depend on the environment. Replace at least once a year.
Sealings	1 year	Based on inspection	Check enclosure and drive sealings. Check cable bushing visually. Corrective actions based on findings.
Visual inspection of cablings	1 year	1 year	Visual inspection for possible damages etc., e.g. vibration. Actions based on inspection.
Tightness of connections	1 year	1 year	Cable and wire connections to be checked and tighten.
Drive	**Service is performed based on service schedule. The actions and recommendations will be documented.**		
Main DC cooling fans Main AC cooling fans and fan capacitors Internal cooling fans for electronics"	1 year	5 years	Replace parts according to service schedule or based on maintenance report recommendation.
DC-link capacitors		8 years in demanding environment or heavy load 12 years in typical environment or normal load	The expected life time of the capacitor is determined based on load and the temperature of the environment. Replace parts according to service schedule.
Product upgrades	1 year	1 year	Manufacturer offers product upgrades.
Printed circuit boards	1 year	12 years in typical environment	The printed circuit boards to be checked for contamination and possible corrosion. In case of contamination or corrosion printed circuit boards to be changed.
Recommended reforming interval for electrolytic DC-link capacitors (spare parts and products in storage)	1 year	1 year	Reforming must be done once a year for products and spare part capacitors in storage. Please consult manufacturer.
Enclosure	**Service is performed based on service schedule. The actions and recommendations will be documented.**		
Auxiliary devices (contactors, switches, relays, push buttons, indicators, heater, cooler etc.)	1 year	According to manufacturer information.	Replace parts according to service schedule or based on maintenance report recommendation.
Liquid cooling system	**Service is performed based on service schedule. The actions and recommendations will be documented.**		
Coolant inhibitor	1 year	2 years	Add inhibitor according to instructions.
Coolant	2 years	6 years	Check and change coolant according to service schedule.
Coolant pipes, connections, Vacon HX, pump, valves, actuator, heat exchanger, expansion tank	1 year	Based on inspection	Check for signs of leakage, de-airing, operation of valves and flow. Check pressure and temperature of the system. Compare to previous measurements.
Documenentation of actions	**In case Vacon authorized service is carrying proactive maintenance all actions and recommendations are documented and document is given to customer.**		
Saving of system and applications software	System and application software will be documented and current parameter settings saved.		
Analysis of inspection reports	A maintenance report, including recommendations for future repair / maintenance actions, will be created.		

Note! Service schedules are based on the manufacturers specifications and recommendations. Inspection should be carried out according to the inspection interval recommended by the manufacturer to guarantee the highest availibility of your product. Please consult the manufacturer for detailed maintenance information and instructions.

Inspection interval is a period of time after commissioning or time after previous inspection.

Service schedule is a period of time after commissioning or time after previous proactive maintenance action.

VACON MAINTENANCE KITS

contain all the necessary drive or inverter parts for performing scheduled or proactive maintenance or product upgrades.

MAINTENANCE KITS

Vacon maintenance kits contain all the necessary drive or inverter parts for performing scheduled or proactive maintenance or product upgrades.

These parts, including fans and filters, are subject to high wear and tear. By having a Vacon maintenance kit on hand, you'll ensure that all required parts and components are available when and where you need them. Regular maintenance extends unit lifetime.

FAN KITS FOR VACON NX PRODUCTS

The frequency of maintenance for cooling fans depends on the environment, temperature and cleanliness of the air. Fans and fan capacitors should be checked regularly, once every year and replaced every 5 years.

The advised check-up interval is shorter if the fans are located in areas with environmental impurities and particle matter like metal dust, wood, textiles etc., which can damage bearings or unbalance the rotor.

Vacon proactive maintenance actions	Inspection interval	Service schedule
Main cooling fans + fan capacitor, electronic cooling fans	1 year	5 years

AC FAN KITS AVAILABLE:

- 60S00554 AC Maintenance fan kit for FR8
- 60S00555 AC Maintenance fan kit for FR8 168-205A
- 60S00556 AC Maintenance fan kit for FR9
- 60S00557 AC Maintenance fan kit for FR10
- 60S00558 AC Maintenance fan kit for FR11
- 60S00559 AC Maintenance fan kit for FR12
- 60S00560 AC Maintenance fan kit for FR13/FI13
- 60S00561 AC Maintenance fan kit for FR14/FI14
- 60S00562 AC Maintenance fan kit for FI9/FI10
- 60S00563 AC Maintenance fan kit for FI12

Kits include: main cooling fans, fan capacitors, electronic cooling fans, internal fan(s), asic board fans and installation parts.

VACON OFFERING

We offer maintenance fan kits for Vacon NX products as well as air flow filter kits for Vacon NXC products. All fans for units and filters for enclosures can be ordered with one spare part code. Spare parts are available from the Vacon service center network.

AIR FLOW FILTER KITS FOR VACON NXC PRODUCT

Enclosure air flow filters play a huge part in ensuring that the compact and enclosed products function reliably, and should thus be maintained regularly. The filters should be checked every 3 months, depending on the cleanliness of the environment they operate in.

Kits include all filters used in the enclosure.

Vacon proactive maintenance actions	Inspection interval	Service schedule
Enclosure air flow filter	3 months	3 months – 1 year

FILTER KITS AVAILABLE:

- 60S00537 NXC filter kit for FR9 and FR10 enclosures
- 60S00538 NXC filter kit for FR11 enclosures
- 60S00539 NXC filter kit for FR11 enclosures
- 60S00540 NXC filter kit for FR12 enclosures
- 60S00541 NXC filter kit for FR13 enclosures
- 60S00542 NXC filter kit for FR13 enclosures
- 60S00543 NXC filter kit for FR14 enclosures
- 60S00544 NXC filter kit for FI10+FI12 and FI13 enclosures
- 60S00545 NXC filter kit for FR14 enclosures
- 60S00546 NXC filter kit for FI9 and FI10 enclosures
- 60S00547 NXC filter kit for FI13 enclosures
- 60S00548 NXC filter kit for FI13+FI14 enclosures
- 60S00549 NXC filter kit for +ODU

HOW TO ORDER

VACON NXC

6-pulse supply 380-500V

	60S00537	60S00538	60S00539	60S00540	60S00541	60S00542	60S00543	60S00544	60S00545	60S00546	60S00547	60S00548	60S00549
NXC 0261 5 A 2 H 0 SSF	X												X
NXC 0300 5 A 2 H 0 SSF	X												X
NXC 0385 5 A 2 L 0 SSF	X												X
NXC 0460 5 A 2 L 0 SSF	X												X
NXC 0520 5 A 2 L 0 SSF	X												X
NXC 0590 5 A 2 L 0 SSF		X											X
NXC 0650 5 A 2 L 0 SSF		X											X
NXC 0730 5 A 2 L 0 SSF			X										X
NXC 0820 5 A 2 L 0 SSF				X									X
NXC 0920 5 A 2 L 0 SSF				X									X
NXC 1030 5 A 2 L 0 SSF				X									X
NXC 1150 5 A 2 L 0 SSF					X								
NXC 1300 5 A 2 L 0 SSF						X							
NXC 1450 5 A 2 L 0 SSF						X							
NXC 1770 5 A 2 L 0 SSF								X					
NXC 2150 5 A 2 L 0 SSF								X					

6-pulse supply 500-690V

	60S00537	60S00538	60S00539	60S00540	60S00541	60S00542	60S00543	60S00544	60S00545	60S00546	60S00547	60S00548	60S00549
NXC 0125 6 A 2 L 0 SSF	X												X
NXC 0144 6 A 2 L 0 SSF	X												X
NXC 0170 6 A 2 L 0 SSF	X												X
NXC 0208 6 A 2 L 0 SSF	X												X
NXC 0261 6 A 2 L 0 SSF	X												X
NXC 0325 6 A 2 L 0 SSF	X												X
NXC 0385 6 A 2 L 0 SSF	X												X
NXC 0416 6 A 2 L 0 SSF	X												X
NXC 0460 6 A 2 L 0 SSF		X											X
NXC 0502 6 A 2 L 0 SSF		X											X
NXC 0590 6 A 2 L 0 SSF			X										X
NXC 0650 6 A 2 L 0 SSF				X									X
NXC 0750 6 A 2 L 0 SSF				X									X
NXC 0820 6 A 2 L 0 SSF				X									X
NXC 0920 6 A 2 L 0 SSF					X								X
NXC 1030 6 A 2 L 0 SSF					X								X
NXC 1180 6 A 2 L 0 SSF					X								
NXC 1500 6 A 2 L 0 SSF									X				
NXC 1900 6 A 2 L 0 SSF									X				
NXC 2250 6 A 2 L 0 SSF									X				

12-pulse supply 380-500V

	60S00537	60S00538	60S00539	60S00540	60S00541	60S00542	60S00543	60S00544	60S00545	60S00546	60S00547	60S00548	60S00549
NXC 0385 5 A 2 L 0 TSF	X												X
NXC 0460 5 A 2 L 0 TSF	X												X
NXC 0520 5 A 2 L 0 TSF	X												X
NXC 0590 5 A 2 L 0 TSF		X											X
NXC 0650 5 A 2 L 0 TSF		X											X
NXC 0730 5 A 2 L 0 TSF			X										X
NXC 0820 5 A 2 L 0 TSF				X									X
NXC 0920 5 A 2 L 0 TSF				X									X
NXC 1030 5 A 2 L 0 TSF				X									X
NXC 1150 5 A 2 L 0 TSF					X								
NXC 1300 5 A 2 L 0 TSF							X						
NXC 1450 5 A 2 L 0 TSF							X						
NXC 1770 5 A 2 L 0 TSF								X					
NXC 2150 5 A 2 L 0 TSF								X					

12-pulse supply 500-690V

	60S00537	60S00538	60S00539	60S00540	60S00541	60S00542	60S00543	60S00544	60S00545	60S00546	60S00547	60S00548	60S00549
NXC 0261 6 A 2 L 0 TSF	X												X
NXC 0325 6 A 2 L 0 TSF	X												X
NXC 0385 6 A 2 L 0 TSF	X												X
NXC 0416 6 A 2 L 0 TSF	X												X
NXC 0460 6 A 2 L 0 TSF		X											X
NXC 0502 6 A 2 L 0 TSF		X											X
NXC 0590 6 A 2 L 0 TSF			X										X
NXC 0650 6 A 2 L 0 TSF				X									X
NXC 0750 6 A 2 L 0 TSF				X									X
NXC 0820 6 A 2 L 0 TSF				X									X
NXC 0920 6 A 2 L 0 TSF					X								X
NXC 1030 6 A 2 L 0 TSF					X								X
NXC 1180 6 A 2 L 0 TSF					X								
NXC 1500 6 A 2 L 0 TSF									X				
NXC 1900 6 A 2 L 0 TSF									X				
NXC 2250 6 A 2 L 0 TSF									X				

VACON NXC, LOW-HARMONIC DRIVE

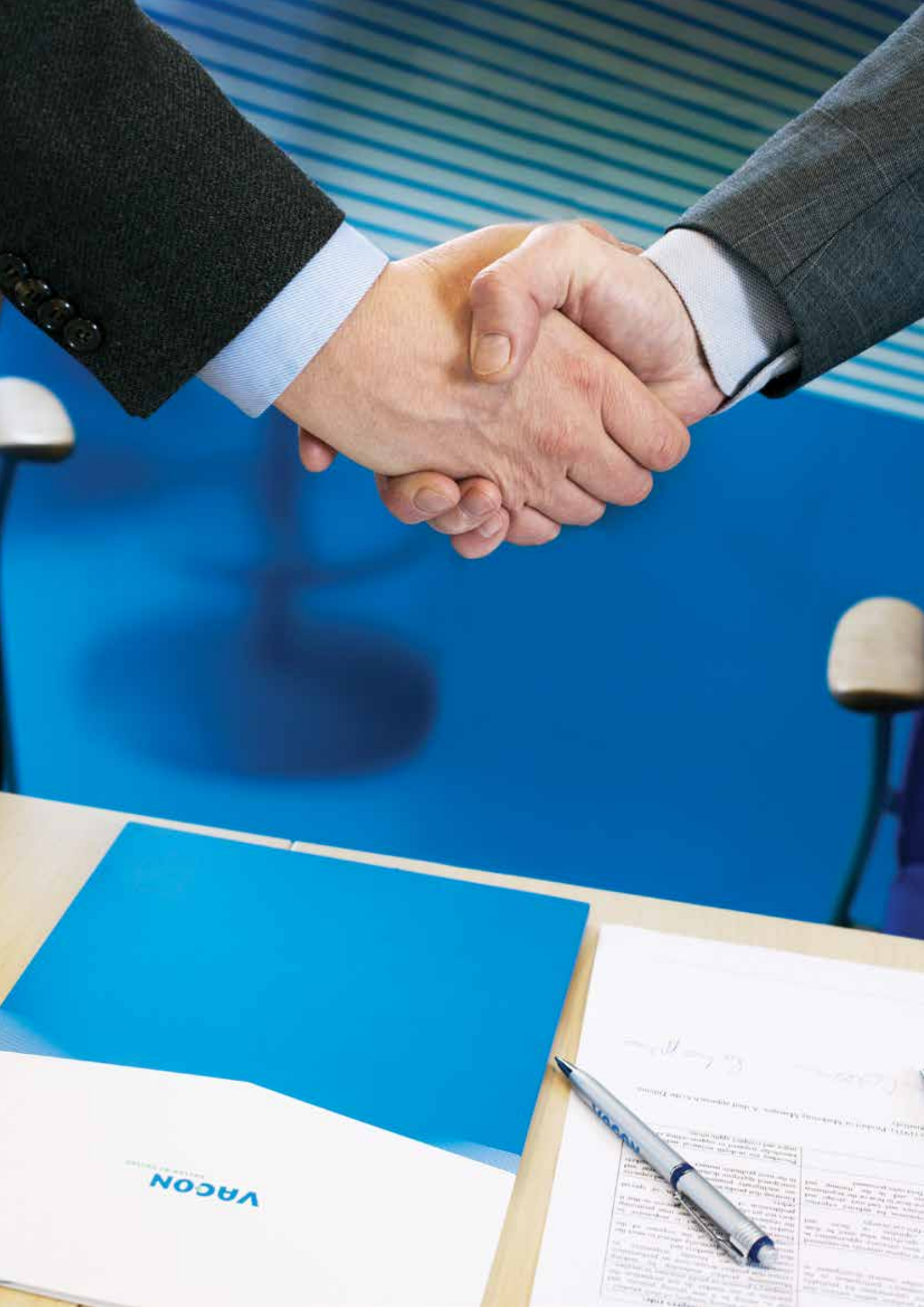
380-500V

	60S00537	60S00538	60S00539	60S00540	60S00541	60S00542	60S00543	60S00544	60S00545	60S00546	60S00547	60S00548	60S00549
NXC 0261 5 A 2 L 0 RSF									X				
NXC 0300 5 A 2 L 0 RSF									X				
NXC 0385 5 A 2 L 0 RSF									X				
NXC 0460 5 A 2 L 0 RSF									X				
NXC 0520 5 A 2 L 0 RSF									X				
NXC 0650 5 A 2 L 0 RSF							X						
NXC 0730 5 A 2 L 0 RSF							X						
NXC 0820 5 A 2 L 0 RSF							X						
NXC 0920 5 A 2 L 0 RSF							X						
NXC 1030 5 A 2 L 0 RSF							X						
NXC 1150 5 A 2 L 0 RSF										X			
NXC 1300 5 A 2 L 0 RSF										X			
NXC 1450 5 A 2 L 0 RSF										X			
NXC 1770 5 A 2 L 0 RSF											X		
NXC 2150 5 A 2 L 0 RSF											X		
NXC 2700 5 A 2 L 0 RSF											X		

525-690V

	60S00537	60S00538	60S00539	60S00540	60S00541	60S00542	60S00543	60S00544	60S00545	60S00546	60S00547	60S00548	60S00549
NXC 0125 6 A 2 L 0 RSF									X				
NXC 0144 6 A 2 L 0 RSF									X				
NXC 0170 6 A 2 L 0 RSF									X				
NXC 0208 6 A 2 L 0 RSF									X				
NXC 0261 6 A 2 L 0 RSF									X				
NXC 0325 6 A 2 L 0 RSF									X				
NXC 0385 6 A 2 L 0 RSF									X				
NXC 0416 6 A 2 L 0 RSF									X				
NXC 0460 6 A 2 L 0 RSF							X						
NXC 0502 6 A 2 L 0 RSF							X						
NXC 0590 6 A 2 L 0 RSF							X						
NXC 0650 6 A 2 L 0 RSF							X						
NXC 0750 6 A 2 L 0 RSF							X						
NXC 0820 6 A 2 L 0 RSF							X						
NXC 0920 6 A 2 L 0 RSF										X			
NXC 1030 6 A 2 L 0 RSF										X			
NXC 1180 6 A 2 L 0 RSF										X			
NXC 1500 6 A 2 L 0 RSF											X		
NXC 1900 6 A 2 L 0 RSF											X		
NXC 2250 6 A 2 L 0 RSF											X		

60S00549 USED ONLY WITH +ODU OPTION


VACON

VACON® TRAINING

DEVELOP YOUR IN-HOUSE EXPERTISE

KEY BENEFITS:

- Wide training portfolio
- Various training methods
- Standard and customized courses
- Professional training partners

TRAINING FOR OPTIMAL RESULTS

Great results are achieved by doing the right things at the right time. Proper training provides the tools to help you make the right business decisions and get the most out of your Vacon products at every phase of the lifecycle. We at Vacon are proud that our products and service offering are globally recognized. Likewise, our expertise in AC drives, solar inverters, wind power converters and service, also extends to training.

Project Stage	Who benefits from training?
Investment & Procurement	Consultant & sales engineer Distributor & reseller
Engineering	Engineering Automation & application engineering
Installation	Enclosure Builders Electricians Technical supervisors
Start-Up	Commissioning engineers
Operate & Maintain	Operator Electricians Process supervisors & managers Maintenance personnel

SUPPORTING MULTIPLE LEARNING PATHS

We offer relevant training to support a variety of individuals who are involved at different stages of the project and product lifecycle.

SOMETHING FOR EVERYONE

We offer a wide training portfolio for people involved in various tasks, with differing backgrounds and responsibilities. By supporting multiple learning paths, we also ensure that individuals receive the relevant training at the appropriate stages of the project and product lifecycle. We provide product & service related training courses, industry/application specific training, engineering and tool courses etc.

KRZYSZTOF KANIA

"For me, programming with practical hands-on exercises is the best way to learn and to memorize what I have learned."

EFFECTIVE LEARNING METHODS

We also acknowledge that the ways people learn vary. Combining traditional classroom training with practical exercises helps our students put theory into practice in memorable way.

COURSE INFORMATION & ONLINE REGISTRATION

You can find the nearest training locations and course schedules at **www.vacon.com/training.** Our website also provides more detailed course programs and online registration. And if you can't come to us for training, we'll come to you: tailored on-site courses are available.

TRAINING COURSE

Standard training courses provide you with the skills needed to optimize Vacon products throughout the lifecycle. Courses can also comprise more extensive learning paths.

For specific needs we offer customized training to meet your requirements or a combination of standard course modules.

TRAINING PARTNERS

Vacon also has professional training partners who are authorized to provide Vacon courses and offer high-quality training in accordance with our standards.

CUSTOMER REFERENCE

Krzysztof Kania, Sales, Commissioning and Programming Engineer at Telko-Poland Ltd. participated in the Vacon Programming Tool course in January 2012.

"After completing this Programming Tool course andthe relevant testing, I was immediately able to put my new skills to work for one of our OEM customers. They required a modified application for the Vacon 20, which I was able to successfully program using the tool. Without this training, we wouldn't have been able to meet our client's expectations," Mr. Kania reports.

Training types

- Product Training
- Service Training
- Technology Training
- Engineering and Tools Courses
- Industry/Application Training

Training methods

- Classroom Lectures
- Laboratory Exercises
- Practical Exercises
- Web Training

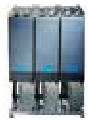
APPENDIX

PRODUCT OVERVIEW

	VACON 10	VACON 20	VACON 20 CP	VACON 20 X	VACON 100 HVAC
	IP20 / IP21  Simplicity and efficiency in a compact drive	IP20 / IP21  Compact size with a wide power range	IP00  Unique cooling possibilities	IP66  Performance under pressure	IP00 / IP21 / IP54  The dedicated drive for indoor climate control
1AC 110-120 VAC	0.25 - 1.1 kW	0.25 - 1.1 kW	-	-	-
1AC 208-240 VAC	0.25 - 2.2 kW	0.25 - 2.2 kW	-	-	-
3AC 208-240 VAC	0.25 - 2.2 kW	0.25 - 11 kW	0.37 - 4 kW	0.37 - 4 kW	0.55 - 90 kW
3AC 380-480 VAC	0.37 - 5.5 kW	0.37 - 18.5 kW	0.75 - 7.5 kW	0.75 - 7.5 kW	1.1 - 160 kW
3AC 380-500 VAC	-	-	-	-	-
3AC 600 VAC	0.75 - 5.5 kW	0.75 - 5.5 kW	-	-	-
3AC 525 - 690 VAC	-	-	-	-	-
Overloadability	1,5 - IN	1,5 - IN	1,5 - IN	1,5 - IN	1,1 - IL
Ambient operating temperature	-10 (no frost) ...+50°C (+40°C for some types, side-by-side installation and IP21 option)	-10 (no frost) ...+50°C (+40°C for some types, side-by-side installation and IP21 option)	-10(no frost) ...+70°C	-10 (no frost)...+40°C (+50°C with derating)	-10°C (no frost)...+40°C (50°C with derating 1.5% per degree /°C)
Brake chopper	Yes Standard: 3-ph MI2-MI3 units Not in MI1	Yes Standard: 3-ph MI2-MI3 units Not in MI1 and in 1-ph models	Yes	Yes	-
Varnished Boards	Standard	Standard	Standard	Standard	Standard
Flange Mounting	-	Option: MI4 - MI5	-	-	Option: MR4-MR7 Factory option: MR8-MR9
Drive supply switch	-	-	-	Yes	Option: MR4 - MR7
Real time clock	-	-	-	-	Yes, option: RTC battery
AI analogue inputs	1 - 0-10V, 1 - 0(4)-20mA	1 - 0-10V, 1 - 0-10V / 0(4)-20mA	2 - 0-10V / 0(4)-20mA	2 - 0-10V / 0(4)-20mA	2 - 0-10V / 0(4)-20mA
AO analogue inputs	1 - 0(4)-20mA	1 - 0-10V / 0(4)-20mA	1 - 0-10V	1 - 0-10V	1 - 0-10V / 0(4)-20mA
DI digital inputs	6	6 (2 pulse train inputs)	6	6	6
DO digital outputs	1 (Open collector)	1 (Open collector)	1 (Open collector)	1 (Open collector)	-
RO relay outputs	1 - NO, 1 - NO/NC	1 - NO, 1 - NO/NC	1 - NO, 1 - NO/NC	1 - NO, 1 - NO/NC	+SBF2: 2 - NO/NC, Therm. +SBF3: 2 - NO/NC, 1 - NO
Expansion slot for I/O and Fieldbus	-	1 Slot	1 Slot	1 Slot	3 Slots, 1 Slot used as standard +SBF2/3
Standard Onboard Communication Protocol	RS 485	RS 485	RS 485	RS 485	Industrial Ethernet and RS 485
Fieldbus Communication	-	-	-	-	-
Modbus RTU	Standard	Standard	Standard	Standard	Standard
Metasys N2	-	-	-	-	Standard
Profibus DP	-	Option OPT-E3/5	Option OPT-E3/5	Option OPT-E3/5	-
DeviceNet	-	Option OPT-E7	Option OPT-E7	-	-
CANOpen	-	Option OPT-E6	Option OPT-E6	Option OPT-E6	-
BACnet MSTP	-	-	-	-	Standard
LonWorks	-	-	-	-	Option OPT-C4
Modbus/TCP	-	-	-	Option OPT-CI	Standard
BACnet IP	-	-	-	-	Standard
Ethernet/IP	-	-	-	-	-
Profinet IO	-	-	-	-	-
STO	-	-	Standard, EN/IEC61800-5-2 STO SIL3, EN ISO 13849-1 PL "e" Category 4, EN62061: SIL3, IEC61508: SIL3	Standard, EN/IEC61800-5-2 STO SIL3, EN ISO 13849-1 PL "e" Category 4, EN62061: SIL3, IEC61508: SIL3	-
SS1	-	-	-	-	-
Thermistor input	-	Option (OPT-B2)	Option (OPT-B2)	Option (OPT-B2)	Standard (+SBF2)
ATEX Thermistor input	-	-	-	-	-
Tool for SW update and drive monitoring	Vacon Live	Vacon Live	Vacon Live	Vacon Live	Vacon Live
Tool for application tailoring	-	Vacon Programming	Vacon Programming	Vacon Programming	-
Other PC tools	Vacon Save	Vacon Save	Vacon Save	Vacon Save	Vacon Save

	VACON 100 FLOW	VACON100 X	VACON 100	VACON NXL	VACON NXS
	IP00 / IP21 / IP54  Intelligent process control	IP66  A decentralized drive like no other	IP00 / IP21 / IP54  100 reasons to choose from	MF2-MF3: IP20; MF4-MF6: IP21, IP54  Robust and ready for heavy use	IP21 / IP54  Flexible drives for any application
1AC 110-120 VAC	-	-	-	-	-
1AC 208-240 VAC	-	-	-	0.37 - 1.5 kW	-
3AC 208-240 VAC	0.55 - 90 kW	1,1 - 15 kW	0.55 - 90 kW	0.75 - 2.2 kW	0.75 - 90 kW
3AC 380-480 VAC	-	1.1 -37/30 kW (IL/IH)	-	-	-
3AC 380-500 VAC	1.1 - 160 kW	1.1 -37/30 kW (IL/IH)	1.1 - 160 kW	0.55 - 2,2 kW , IP 20 1.1 kW - 30 kW, IP 21, IP54	1.1 - 400 kW
3AC 600 VAC	-	-	-	-	-
3AC 525 - 690 VAC	-	-	-	-	3 - 560 kW
Overloadability	1,1 - IL	1,5 - IN	1,1 - IL, 1,5 - IH	1,1 - IL, 1,5 - IH	1,1 - IL, 1,5 - IH
Ambient operating temperature	´-10°C (no frost)...+40°C (50°C with derating 1.5% per degree /°C)	–10°C (no frost) ...+40°C (+60°C with derating) (–40°C with artic mode option)	–10°C (no frost)...+50°C: IH –10°C (no frost)...+40°C: IL (50°C with derating 1.5% per degree /°C)	–10°C (no frost)...+50°C: IH –10°C (no frost)...+40°C: IL	–10°C (no frost)...+50°C: IH (≥FR10 +40°C) –10°C (no frost)...+40°C: IL
Brake chopper	-	Standard	Yes Standard: MR4-MR6 Option: MR7-MR9	Yes MF3-MF6 units Not in MF2	Yes Standard: FR4-FR6 (30kW) Option: FR7 - FR11
Varnished Boards	Standard	-	Standard	Option	Option
Flange Mounting	Option: MR4-MR7 Factory option: MR8-MR9	Option: note motor mounting flange	Option: MR4-MR7 Factory option: MR8-MR9	Option	Option: FR4-FR9
Drive supply switch	Option: MR4 - MR7	Option: MR4 - MR7	Option	Option: MR4 - MR7	-
Real time clock	Yes, option: RTC battery	Yes, option: RTC battery	Yes, option: RTC battery	Yes, option: RTC battery	-
AI analogue inputs	2 - 0-10V / 0(4)-20mA	2 - 0-10V / 0(4)-20mA	2 - 0-10V / 0(4)-20mA	2 - 0-10V / 0(4)-20mA	2 - 0-10V / 0(4)-20mA MF2-MF3: AI1 not programmable
AO analogue inputs	1 - 0-10V / 0(4)-20mA	2 - 0-10V / 0(4)-20mA	2 - 0-10V / 0(4)-20mA	1 - 0(4)-20mA	1 - 0-10V / 0(4)-20mA
DI digital inputs	6	1 - 0-10V / 0(4)-20mA	1 - 0-10V / 0(4)-20mA	3	6
DO digital outputs	-	6	6	-	1 (Open collector)
RO relay outputs	+SBF3: 2 - NO/NC, 1 - NO standard +SBF4: 2 - NO/NC, Therm.	-	-	1 - NO/NC	5 Slots, 2 used as standard
Expansion slot for I/O and Fieldbus	3 Slots	2 Slots	3 Slots	2 Slots	2 Slots
Standard Onboard Communication Protocol	Industrial Ethernet and RS 485	Industrial Ethernet and RS 485	Industrial Ethernet and RS 485	RS 485 Modbus (N2)	-
Fieldbus Communication	-	-	-	-	-
Modbus RTU	Standard	Standard	Standard	Standard	Option OPT-C2/8
Metasys N2	Standard	Standard	Standard	Option OPT-C2/8	Option OPT-C2/8
Profibus DP	Option OPT-E3/5	Option OPT-E3/5	Option OPT-E3/5	Option OPT-C3/5	Option OPT-C3/5
DeviceNet	Option OPT-E7	Option OPT-E7	Option OPT-E7	Option OPT-C7	Option OPT-C7
CANOpen	Option OPT-E6	Option OPT-E6	Option OPT-E6	Option OPT-C6	Option OPT-C6
BACnet MSTP	Standard	Standard	Standard	Option OPT-CJ	Option OPT-CJ
LonWorks	Option OPT-C4	Option OPT-C4	Option OPT-C4	Option OPT-C4	Option OPT-C4
Modbus/TCP	Standard	Standard	Standard	Option OPT-CI	Option OPT-CI
BACnet IP	Standard	Standard	Standard	-	-
Ethernet/IP	On-board factory option +FBIE)	On-board factory option +FBIE)	On-board factory option +FBIE)	Option OPT-CQ	Option OPT-CQ
Profinet IO	On-board factory option +FBIE)	On-board factory option +FBIE)	On-board factory option +FBIE)	Option OPT-CP	Option OPT-CP
STO	Option OPT-BJ-V (Slot E only): EN/IEC 61800-5-2 STO SIL3, EN ISO 13849-1 PL"e" Category 3, EN 62061: SILCL3, IEC 61508: SIL3.	Standard, EN/IEC61800-5-2 STO SIL3, EN ISO 13849-1 PL "e" Category 4, EN62061: SIL3, IEC61508: SIL3	Option OPT-BJ (Slot E only): EN/IEC 61800-5-2 STO SIL3, EN ISO 13849-1 PL"e" Category 3, EN 62061: SILCL3, IEC 61508: SIL3.	-	-
SS1	Option OPT-BJ-V: EN /IEC 61800-5-2 Safe Stop 1 (SS1) SIL2, EN ISO 13849-1 PL"d" Category 3, EN /IEC62061: SILCL2, IEC 61508: SIL2.	-	Option OPT-BJ: EN /IEC 61800-5-2 Safe Stop 1 (SS1) SIL2, EN ISO 13849-1 PL"d" Category 3, EN /IEC62061: SILCL2, IEC 61508: SIL2.	-	-
Thermistor input	Option +SBF4	Standard	-	Option (OPT-AI)	Standard (OPT-A3)
ATEX Thermistor input	Option +S_BJ: 94/9/EC, CE 0537 Ex 11 (2) GD	-	-	-	-
Tool for SW update and drive monitoring	Vacon Live	Vacon Live	-	-	-
Tool for application tailoring	Drive customizer	Vacon Programming and Drive customizer	Vacon Programming and Drive customizer	Vacon Programming	Vacon Programming
Other PC tools	Vacon Save	Vacon Save	Vacon Save	Vacon Save	Vacon Save

PRODUCT OVERVIEW

	VACON NXP Air-Cooled	VACON NXP Liquid Cooled	VACON NXP Common DC Bus	VACON NXC
	IP00 / IP21 / IP54  Delivering pure power	IP00  Powerful performance with a high tech cooling design	IP00  Maximum flexibility for multidrive solutions	IP21 / IP54  The compact and flexible cabinet drive
1AC 110-120 VAC	-	-	-	-
1AC 208-240 VAC	-	-	-	-
3AC 208-240 VAC	0.55 - 90 kW	-	-	-
3AC 380-480 VAC	-	-	-	-
3AC 380-500 VAC	1.1 - 1200 kW	7.5 - 5150 kW	System dependent Single INU unit up to 2700A (~1,5MW)	160 - 1200 kW, 6 pulse & 12 pulse
3AC 600 VAC	-	-	-	-
3AC 525 - 690 VAC	3 - 2000 kW	110 kW - 5300 kW	System dependent Single INU unit up to 2250A (~2,25MW)	250 - 2000 kW, 6 pulse & 12 pulse
Overloadability	1,1 - IL, 1,5 - IH	1,0 - Ith, 1,1 - IL cont., 1,5 - IH cont.	1,1 - IL, 1,5 - IH (INU)	1,1 - IL, 1,5 - IH
Ambient operating temperature	–10°C (no frost)...+50°C: IH (≥FR10 +40°C) –10°C (no frost)...+40°C: IL	–10°C (no frost)...+50°C (at Ith); The NX liquid cooled drives must be used in an heated indoor controlled environment.	–10°C (no frost)...+40°C +40°C...+50°C with derating 1,5% for each 1°C	–10°C (no frost)...+40°C (+35°C) +40°C(+35°C)...+50°C with derating 1,5% for each 1°C
Brake chopper	Yes Standard: FR4-FR6 (30kW) Option: FR7 - FR11	Standard: CH3 400V Option: CH72 400V/690V 6-p. and CH74 400V/690V 6-p & 12-p. Separate brake chopper unit (BCU)	Separate brake chopper unit (BCU)	-
Varnished Boards	Standard (power unit only): FR7-14 Option: FR4-6	Standard (power unit only)	Standard (power unit only)	Standard (power unit only)
Flange Mounting	Option: FR4-FR9	-	-	-
Drive supply switch	-	-	-	Option
Real time clock	-	-	-	-
AI analogue inputs	2 - 0-10V / 0(4)-20mA (OPT-A1)	2 - 0-10V / 0(4)-20mA (OPT-A1)	2 - 0-10V / 0(4)-20mA (OPT-A1)	2 - 0-10V / 0(4)-20mA
AO analogue inputs	1 - 0-10V / 0(4)-20mA (OPT-A1)	1 - 0-10V / 0(4)-20mA (OPT-A1)	1 - 0-10V / 0(4)-20mA (OPT-A1)	1 - 0-10V / 0(4)-20mA
DI digital inputs	6 (OPT-A1)	6 (OPT-A1)	6 (OPT-A1)	6
DO digital outputs	1 (Open collector) (OPT-A1)	1 (Open collector) (OPT-A1)	1 (Open collector) (OPT-A1)	1 (Open collector)
RO relay outputs	1 - NO/NC, 1 - NO, Therm. (OPT-A3)	1 - NO/NC, 1 - NO, Therm. (OPT-A3)	1 - NO/NC, 1 - NO, Therm. (OPT-A3)	1 - NO/NC, 1 - NO, Therm. (OPT-A3)
Expansion slot for I/O and Fieldbus	5 Slots, 2 used as standard	5 Slots, 2 used as standard	5 Slots, 2 used as standard	
Standard Onboard Communication Protocol	-	-	-	-
Fieldbus Communication	-	-	Applies for INU	-
Modbus RTU	Option OPT-C2/8	Option OPT-C2/8	Option OPT-C2/8	Option OPT-C2/8
Metasys N2	Option OPT-C2/8	Option OPT-C2/8	Option OPT-C2/8	Option OPT-C2/8
Profibus DP	Option OPT-C3/5	Option OPT-C3/5	Option OPT-C3/5	Option OPT-C3/5
DeviceNet	Option OPT-C7	Option OPT-C7	Option OPT-C7	Option OPT-C7
CANOpen	Option OPT-C6	Option OPT-C6	Option OPT-C6	Option OPT-C6
BACnet MSTP	Option OPT-CJ	Option OPT-CJ	Option OPT-CJ	Option OPT-CJ
LonWorks	Option OPT-C4	Option OPT-C4	Option OPT-C4	Option OPT-C4
Modbus/TCP	Option OPT-CI	Option OPT-CI	Option OPT-CI	Option OPT-CI
BACnet IP	-	-	-	-
Ethernet/IP	Option OPT-CQ	Option OPT-CQ	Option OPT-CQ	Option OPT-CQ
Profinet IO	Option OPT-CP	Option OPT-CP	Option OPT-CP	Option OPT-CP
STO	Option OPT-AF: EN/IEC 61800-5-2 STO SIL2, EN ISO 13849-1 PL"d" Category 3, EN 62061: SILCL2, IEC 61508: SIL2.	Option OPT-AF: EN/IEC 61800-5-2 STO SIL2, EN ISO 13849-1 PL"d" Category 3, EN 62061: SILCL2, IEC 61508: SIL2.	Option OPT-AF: EN/IEC 61800-5-2 STO SIL2, EN ISO 13849-1 PL"d" Category 3, EN 62061: SILCL2, IEC 61508: SIL2.	Option OPT-AF: EN/IEC 61800-5-2 STO SIL2, EN ISO 13849-1 PL"d" Category 3, EN 62061: SILCL2, IEC 61508: SIL2.
SS1	Option OPT-AF: EN /IEC 61800-5-2 Safe Stop 1 (SS1) SIL2, EN ISO 13849-1 PL"d" Category 3, EN / IEC62061: SILCL2, IEC 61508: SIL2.	Option OPT-AF: EN /IEC 61800-5-2 Safe Stop 1 (SS1) SIL2, EN ISO 13849-1 PL"d" Category 3, EN / IEC62061: SILCL2, IEC 61508: SIL2.	Option OPT-AF: EN /IEC 61800-5-2 Safe Stop 1 (SS1) SIL2, EN ISO 13849-1 PL"d" Category 3, EN / IEC62061: SILCL2, IEC 61508: SIL2.	EN /IEC 61800-5-2 Safe Stop 1 (SS1) SIL2, EN ISO 13849-1 PL"d" Category 3, EN / IEC62061: SILCL2, IEC 61508: SIL2.
Thermistor input	Option (OPT-A3)	Option (OPT-A3)	Option (OPT-A3)	Standard (OPT-A3)
ATEX Thermistor input	Option OPT-AF: 94/9/EC, CE 0537 Ex 11 (2) GD	Option OPT-AF: 94/9/EC, CE 0537 Ex 11 (2) GD	Option OPT-AF: 94/9/EC, CE 0537 Ex 11 (2) GD	"Option OPT-AF: 94/9/EC, CE 0537 Ex 11 (2) GD"
Tool for SW update and drive monitoring	NCDrive and NCLoad	NCDrive and NCLoad	NCDrive and NCLoad	NCDrive and NCLoad
Tool for application tailoring	Vacon Programming	Vacon Programming	Vacon Programming	Vacon Programming
Other PC tools	Vacon Save and Vacon Harmonics Simulator	Vacon Save and Vacon Harmonics Simulator	Vacon Save and Vacon Harmonics Simulator	Vacon Save

	VACON NXC Low Harmonic	VACON NXP Grid Converter	VACON NXP System Drive
	IP21 / IP54  Clean and regenarative power saves money	IP00  Cleaner power for ports and ships	 Complex solutions made simple
1AC 110-120 VAC	-	-	-
1AC 208-240 VAC	-	-	-
3AC 208-240 VAC	-	-	-
3AC 380-480 VAC	-	-	-
3AC 380-500 VAC	160 - 1200 kW, THDi <5%	160 - 1750 kW	System dependent Single INU unit up to 2700A (~1,5MW)
3AC 600 VAC	-	-	-
3AC 525 - 690 VAC	250 - 2000 kW, THDi <5%	200 - 1750 kW	System dependent Single INU unit up to 2250A (~2,25MW)
Overloadability	1,1 - IL, 1,5 - IH	1,1 - IL, 1,5 - IH	1,1 - IL, 1,5 - IH
Ambient operating temperature	–10°C (no frost)...+40°C (+35°C) +40°C(+35°C)...+50°C with derating 1,5% for each 1°C	Air cooled NXP Grid converter: –10°C (no frost)...+40°C (+35°C) +40°C(+35°C)...+50°C with derating 1,5% for each 1°C Liquid cooled NXP Grid converter: –10°C (no frost)...+50°C (at Ith); The NX liquid cooled drives must be used in an heated indoor controlled environment.	–10°C (no frost)...+35°C +35°C...+50°C with derating 1,5% for each 1°C
Brake chopper	Optional external brake chopper	-	Optional external brake chopper
Varnished Boards	Standard (power unit only)	Standard (power unit only)	Standard (power unit only)
Flange Mounting	-	-	-
Drive supply switch	Standard	-	optional
Real time clock	-	-	-
AI analogue inputs	2 - 0-10V / 0(4)-20mA	2 - 0-10V / 0(4)-20mA (OPT-A1)	2 - 0-10V / 0(4)-20mA
AO analogue inputs	1 - 0-10V / 0(4)-20mA	1 - 0-10V / 0(4)-20mA (OPT-A1)	1 - 0-10V / 0(4)-20mA
DI digital inputs	6	6 (OPT-A1)	6
DO digital outputs	1 (Open collector)	1 (Open collector) (OPT-A1)	1 (Open collector)
RO relay outputs	1 - NO/NC, 1 - NO, Therm. (OPT-A3)	1 - NO/NC, 1 - NO, Therm. (OPT-A3)	1 - NO/NC, 1 - NO, Therm. (OPT-A3)
Expansion slot for I/O and Fieldbus	-	-	-
Standard Onboard Communication Protocol	-	-	-
Fieldbus Communication	-	-	-
Modbus RTU	Option OPT-C2/8	Option OPT-C2/8	Option OPT-C2/8
Metasys N2	Option OPT-C2/8	Option OPT-C2/8	Option OPT-C2/8
Profibus DP	Option OPT-C3/5	Option OPT-C3/5	Option OPT-C3/5
DeviceNet	Option OPT-C7	Option OPT-C7	Option OPT-C7
CANOpen	Option OPT-C6	Option OPT-C6	Option OPT-C6
BACnet MSTP	Option OPT-CJ	Option OPT-CJ	Option OPT-CJ
LonWorks	Option OPT-C4	Option OPT-C4	Option OPT-C4
Modbus/TCP	Option OPT-CI	Option OPT-CI	Option OPT-CI
BACnet IP	-	-	-
Ethernet/IP	Option OPT-CQ	Option OPT-CQ	Option OPT-CQ
Profinet IO	Option OPT-CP	Option OPT-CP	Option OPT-CP
STO	Option OPT-AF: EN/IEC 61800-5-2 STO SIL2, EN ISO 13849-1 PL"d" Category 3, EN 62061: SILCL2, IEC 61508: SIL2.	Option OPT-AF: EN/IEC 61800-5-2 STO SIL2, EN ISO 13849-1 PL"d" Category 3, EN 62061: SILCL2, IEC 61508: SIL2.	Option OPT-AF: EN/IEC 61800-5-2 STO SIL2, EN ISO 13849-1 PL"d" Category 3, EN 62061: SILCL2, IEC 61508: SIL2.
SS1	EN /IEC 61800-5-2 Safe Stop 1 (SS1) SIL2, EN ISO 13849-1 PL"d" Category 3, EN /IEC62061: SILCL2, IEC 61508: SIL2.	Option OPT-AF: EN /IEC 61800-5-2 Safe Stop 1 (SS1) SIL2, EN ISO 13849-1 PL"d" Category 3, EN /IEC62061: SILCL2, IEC 61508: SIL2.	EN /IEC 61800-5-2 Safe Stop 1 (SS1) SIL2, EN ISO 13849-1 PL"d" Category 3, EN /IEC62061: SILCL2, IEC 61508: SIL2.
Thermistor input	Standard (OPT-A3)	Option (OPT-A3)	Standard (OPT-A3)
ATEX Thermistor input	"Option OPT-AF: 94/9/EC, CE 0537 Ex 11 (2) GD"	"Option OPT-AF: 94/9/EC, CE 0537 Ex 11 (2) GD"	"Option OPT-AF: 94/9/EC, CE 0537 Ex 11 (2) GD"
Tool for SW update and drive monitoring	NCDrive and NCLoad	NCDrive and NCLoad	NCDrive and NCLoad
Tool for application tailoring	Vacon Programming	Vacon Programming	Vacon Programming
Other PC tools	Vacon Save	Vacon Save and Vacon Harmonics Simulator	Vacon Save

IP RATINGS (IEC 60529)

IP RATING TABLE

SOLIDS		LIQUIDS	
0	No protection	0	No protection
1	Protected against objects > 50mm (hands)	1	Protection against dripping water or condensation
2	Protected against objects > 12mm (fingers)	2	Protection against water spray 15 degree from vertical
3	Protected against objects > 2.5mm (tools/ wires)	3	Protection against water spray 60 degree from vertical
4	Protected against objects > 1mm (small tools)	4	Protection against water spray from all directions
5	Protected against dust, limited ingress	5	Protection against low pressure jets of water
6	Totally protected against dust	6	Protected against high pressure water jets and heavy seas
7	N/A	7	Protection against the effects of immersion (6 inches to 3.3 feet)
8	N/A	8	Protected against immersion

IP AND UL TYPE RATINGS COMPARISON

IP Rating	UL Type Rating	Vacon Drive
IP00, IP20	Open Chassis (UL Open Type)	VACON 10, VACON 20, VACON 20 Cold Plate, VACON NXP IP00 Modules, VACON 100 IP00 Modules
IP21	UL Type 1	VACON NXS, VACON NXP, VACON 100, VACON 100 FLOW, VACON 100 HVAC, VACON 10 (with UL Type 1 Conversion Kit), VACON 20 (with UL Type 1 Conversion Kit)
IP54	UL Type 12	VACON 100, VACON 100 FLOW, VACON 100 HVAC
IP66	UL Type 4X	Vacon X Series (125HP and Above)
UL Type 4X	IP66	VACON 100 X, VACON 20 X

UL Type ratings (and NEMA ratings) are not equivalent to the IP Ratings used for international evaluations as described in IEC60529. The drive manufacturer must specify which IP rating and which NEMA/UL Type rating applies for each drive family. NEMA enclosures are classified by type (e.g., Type 1, Type 4, etc.). IP enclosures employ a two-digit system to classify enclosures. The first digit defines the degree of protection provided against contact with solid objects and the second digit defines the protection level against water (e.g., IP54). The higher the number, the more protection provided.

PRODUCT SELECTION QUIDE BY INDUSTRIAL APPLICATIONS

	VACON PRODUCTS TO BE CONCIDERED										
	Typical kW Range	Load Type	Load Braking	VACON 10	VACON 20	VACON 100 HVAC	VACON 100 FLOW	VACON 100	VACON NXS	VACON NXP	VACON NXC
AUTOMOTIVE TESTING											
ChassisTesters	100-400	HO	x							x	x
Conveyors	5-250	HO						x	x	x	x
Engine Testers	50-400	HO	x							x	x
Fans	5-400	LO					x		x		
Pumps	5-400	LO					x		x		
Transmission Testing	5-400	HO	x							x	x
CEMENT											
Conveyors/Feeders	10-150	HO						x	x	x	
Fans	10-400	LO					x		x	x	
Kilns	150-400	HO								x	x
Packers/Separators	150-400	HO								x	x
Pumps	10-500	LO					x		x		x
FOOD											
Capper	5-100	HO			x			x	x		
Centrifuge	10-200	HO	x					x	x		
Conveyers	1-25	HO			x			x	x		
Extruder	5-100	HO			x			x	x	x	
Fans	10-100	LO					x		x		
Kettle Cooker	10-200	HO						x	x		
Mixers	1-400	HO			x			x	x		
Pumps	10-100	LO			x		x		x		
Seamer	5-50	HO			x			x	x		
Slicer	5-50	HO			x			x	x		
GLASS											
Float Liners	50-250	HO						x	x		
Rubber Tire Gantry Cranes	20-300	HO	x					x	x	x	
Quay Cranes	25-400	HO						x	x	x	
METALS											
Adjustment Drives	1-25	HO	x							x	
Coiler(s)	100-400	HO	x							x	x
Conveyors	10-400	HO								x	x
Crop Shear	100-400	HO	x							x	x
Fans-boilers, Oven	150-400	LO								x	x
Helper Rolls	5-25	HO	x							x	
Low Hp Auxiliary Drives	15-400	HO	x							x	x
Material Handling	5-50	HO	x							x	
Pumps & Fans	5-300	LO								x	x
Runout Tables (multi-mtr)	100-400	HO	x							x	x
Slitters & Trimmers	10-100	HO	x							x	
Table Drives	10-400	HO	x							x	x
MINING											
Conveyors	100-400	HO	x							x	x
Fans	10-400	LO								x	x
Grinders, Crushers	100-400	HO	x							x	x
Pumps	10-400	LO								x	x
Compressors	10-250	LO								x	
Grinding/Roller mills	5-400	HO	x							x	x
Flotation machines	1-160	HO								x	
Feeders	5-132	HO								x	

PRODUCT SELECTION QUIDE BY INDUSTRIAL APPLICATIONS

	VACON PRODUCTS TO BE CONCIDERED										
	Typical HP Range	Load Type	Load Braking	VACON 10	VACON 20	VACON 100 HVAC	VACON 100 FLOW	VACON 100	VACON NXS	VACON NXP	VACON NXC
PULP AND PAPER											
Boiler Fans	50-400	LO								x	x
Calenders	25-800	HO	x							x	
Dry End Paper Machine	5-400	HO								x	x
Fans & Pumps	20-400	LO								x	x
Paper Converting-Transport	3-150	HO	x							x	
Paper Rolls	2-25	HO	x							x	
Pumps: Feed, Couch Pit Liquor, Water	5-400	LO								x	x
Pumps-Thickeners, Fans, Decker, Washer	5-400	HO								x	x
Screw Conveyors	15-400	HO								x	x
Slitters	5-50	HO								x	x
Wet End Paper Machine	100-400	HO	x							x	
Winder Auxiliaries	5-100	HO	x							x	x
Winder Drums	50-400	HO	x							x	x
Winder/Unwind	100-400	HO	x							x	x
PETROCHEMICAL											
Beam Pump (Pump Jack)	5-400	HO	x					x	x	x	x
Compressors	50-400	LO					x		x		x
Progressive Cavity Pump	5-400	HO						x	x	x	x
RUBBERS AND PLASTICS											
Calenders, Mills	25-400	HO	x					x	x	x	x
Compressors	10-400	HO					x		x		x
Conveyors	1-100	HO						x	x	x	
Extruders, Mixers	5-400	HO						x	x		x
Fans	10-400	LO					x		x		x
Pelletizers	25-400	HO						x	x	x	x
Process-Transport Rolls	1-400	HO	x					x	x	x	x
TEXTILE											
Fans	5-400	HO					x		x		x
Fiber Spinning	1-400	HO								x	x
Range Drives	50-400	HO								x	x
Transport Rolls	10-400		x							x	x
WATER AND WASTEWATER											
Chemical Feed Pumps	1-150	HO					x		x		
Fans	5-400	HO				x	x		x		x
Fresh Water Pumps	10-400	HO					x		x		x
Heating & Ventilation	5-400	HO					x		x		x
Lift Stations	5-400	LO					x		x		x
Slurry Pumps	5-400	HO					x		x		x
Waste Water Pumps	10-400	HO					x		x		x

HO: High Overload. Overload 150% 1min/10min. **LO:** Low Overload. Overload 110% 1min/10min.

In case of closed loop application (high accuracity applications) use always VACON® NXP series. Recommendation does not take stance on supply voltage, IP enclosure classification nor cooling method. Common DC bus, regenerative and low harmonic systems are commonly used in heavy industry applications such as metal, pulp and paper and mining industries. VACON® NXP liquid cooled, low harmonic models are commonly used in Marine and Offshore segment.

PRODUCT SELECTION QUIDE BY INDUSTRIAL APPLICATIONS

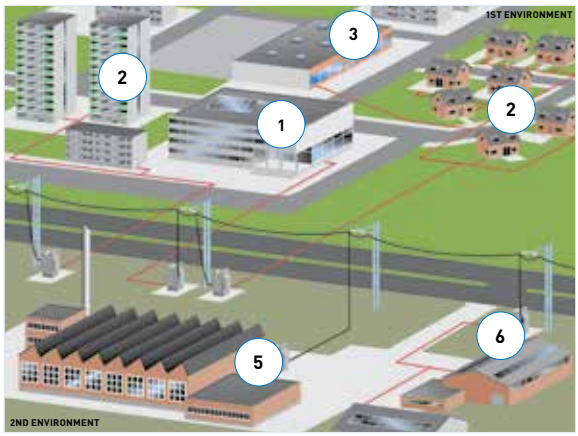
	VACON PRODUCTS TO BE CONCIDERED										
	Typical HP Range	Load Type	Load Braking	VACON 10	VACON 20	VACON 100 HVAC	VACON 100 FLOW	VACON 100	VACON NXS	VACON NXP	VACON NXC
MARINE AND OFFSHORE											
Main propulsion	100 - 5300	HO								x	x
Thrusters	100 - 2000	HO								x	x
Steering gear	5-75	HO								x	x
Winches	10-132	HO	x							x	x
Pipe laying tensioners	100-630	HO	x							x	
Loading hatches	10-250	HO								x	
Pumps	1-800	LO							x	x	x
Dredging pumps	400-2000	HO							x	x	x
Ballast pumps	100-800	HO							x	x	x
Static converters	50 - 2000	HO								x	x
Shore supply systems	500 - 5000	HO								x	x
Ventilation, HVAC, Fans	1-160	LO							x	x	x
Lifts	4-30	HO	x					x	x	x	
Cranes	10-630	HO	x							x	
Compressors	5-250	LO						x	x	X	
BUILDING AUTOMATION											
Fans	1-132	LO				x					
Pumps	1-200	LO					x				
Compressors	1-90	LO					x				
Elevators	4-15	HO	x					x	x	x	
Escalators	4-15	HO	x						x	x	
CHEMICAL											
Fans	1-630	LO					x		x		
Pumps	1-800	LO					x		x		x
Compressors	5-250	LO					x		x		x
Mixers	5-132	HO						x	x	x	
Conveyors	5-250	HO						x	x	x	
WOOD											
Chipping canter	55-160	HO						x		x	
Conveyors	1-75	HO						x	x		
Drying kilns	15-160	LO				x	x		x		
Sorters/turn tables	1-90	HO			x			x	x		
TYPICAL ORIGINAL EQUIPMENT MANUFACTURING (OEM)											
Elevators	4-30	HO	x						x	x	
Door opening systems	1-11	HO		x	x						
Escalators	4-30	HO	x					x	x	x	
Construction hoist	15-160	HO	x					x	x	x	
Crane hoist	1-400	HO	x							x	x
Crane travelling	1-55	HO		x	x			x	x		
Compressors	5-1000	LO					x		x		x
Conveyor systems	1-400	HO		x	x			x	x	x	
Bottling machines	1-22	HO		x	x			x	x		
Wood hadling machines	1-160	HO						x	x	x	
Machine Tools (CNC)	1-15	HO		x	x			x	x	x	
Centrifuges	1-90	HO	x		x			x	x	x	
Textile machines	1-22	HO		x	x			x	x	x	
Tunnel boring machines	100-1000	HO								x	
Winders	1-250	HO	x	x	x			x	x	x	x
Extruders	5-250	HO			x			x	x		
Pump systems	1-630	LO		x	x		x		x		x
Air conditioning systems	1-75	LO		x	x	x	x				

PRODUCT RANGE SELECTION GUIDE BY INDUSTRIAL APPLICATIONS

The product family standard EN/IEC61800-3 sets limits for both emissions and immunity to radio frequency disturbances. The environment has been divided into the first and second environments, in practice, public and industrial networks, respectively.

Radio Frequency Interference (RFI) filters are typically required to meet the EN61800-3 standard. These filters are integrated in the VACON® 10, VACON® 20, VACON® 20 Cold Plate, VACON® 20 X, VACON® 100, VACON® 100 HVAC, VACON® 100 FLOW, VACON® 100 X, VACON® NXS, VACON® NXP and VACON® NXC as standard.

The units in the mechanical sizes MR4-MR7 (100 series)and FR4-FR6 (NX series) are also available with extremely low-emission EMC filters (EN/IEC61800-3 Category C1). Category C1 solutions are sometimes requested in very sensitive locations such as hospitals.

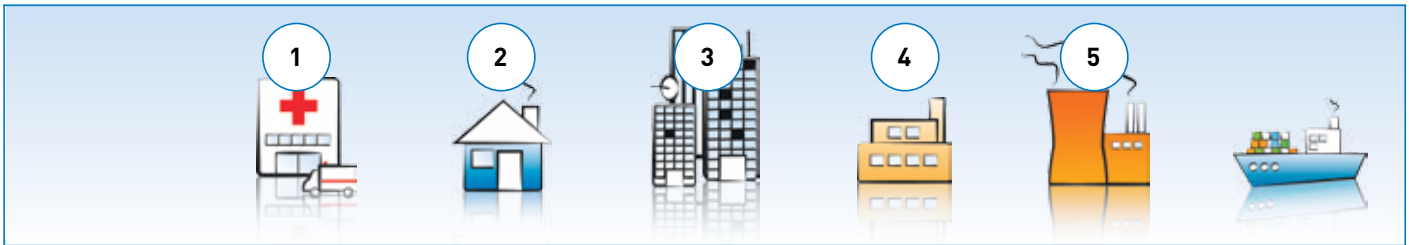


EN/IEC61800-3 EMC STANDARD. CATEGORY DEFINITION

Category	Definition
C1 (C)	PDS rated voltage less than 1000V, intended for use in the first environment
C2 (H)	PDS of rated voltage less than 1000V, which neither a plug in device nor a movable device, and when used in the first
C3 (L)	PDS of rated voltage less than 1000V, intended for use in the second environment and not intended for use in the first environment
C4 (T)	PDS of rated voltage equal to or above 1000V, or rated current equal to or above 400A, or intended for use in complex systems

Reference: IEC, International Standard. Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods
Standard: IEC 61800-3: 2004+A1:2011 PDS: Power Drive System (including AC drive and motor)

EMC SELECTION TABLE ACCORDING TO EN/IEC61800-3



VACON NXP EMC	Hospital	Residential Area	Commercial	Light Industry Area	Heavy Industry	Marine
Category C1 (C)	OPTIONAL					
Category C2 (H)	REQUIREMENT	REQUIREMENT	REQUIREMENT	OPTIONAL	OPTIONAL	
Category C3 (L)				REQUIREMENT	REQUIREMENT	
Category C4 (T)					REQUIREMENT (IT*)	REQUIREMENT (IT*)

* IT network i.e. floating ground system

VACON PRODUCTS AND EMC STANDARD CATEGORIES

EN/IEC61800-3	VACON 10	VACON 20	VACON 20 X	VACON 100 HVAC	VACON 100 FLOW	VACON 100	VACON 100 X	VACON NXS	VACON NXP	VACON NXC
Category C1 (C)[3				X[1	X[1	X[1		X[2	X[2	
Category C2 (H)	X	X	X	X	X	X	X	X	X	
Category C2 (L)	X	X	X	X	X	X	X	X	X	X
Category C2 (T)	X	X	X	X	X	X	X	X	X	X

[1 Fulfils 61800-3 Category C1 conductive emission/immunity. Up to 105 A. Optional filter [2 Category C1 up to 61 A. Optional filter
[3 Marking used in NX product range

Many of Vacon electronic drive products and accessories meet CE, UL, cUL, and C-Tick standards. Products that meet specified standards are identified in this catalog.

The European Community – The CE mark is the official marking for electronic products and equipment sold or put into service anywhere in the European Community. It signifies that the product meets all safety and environmental requirements defined under European Directives.

Underwriters Laboratories Inc. – When a product carries this mark, it means UL found that representative samples of this product met UL's safety requirements. These requirements are primarily based on UL's own published Standards of Safety.

Underwriters' Laboratories of Canada – UL introduced this new Listing Mark in early 1998. It indicates compliance with both Canadian and U.S. requirements. Products with this type of mark have been evaluated for both U.S. and Canadian safety requirements, which have somewhat different safety requirements.

Underwriters' Laboratories has a reciprocal agreement with the Canadian Standards Association where the cUL mark is considered equivalent to the CSA mark for meeting Canadian Safety Standards.

The Canadian Standards Association (CSA) – a non-government, non-profit association that operates internationally to set standards for products and services through testing, certification, and inspections for safety and performance. CSA enhances public safety and health while contributing to environmental preservation.

Australian Compliance – C-Tick is the mark of compliance with testing/evaluation standards in Australia, as developed by a number of organizations, including the Australian Communication Authority.

GOST-R certify that the product meets valid norms of GOST R system or Technical Regulations of the Russian Federation. To obtain of this certificate the tests of samples are necessary. These test are made on accredited laboratories by GOSSTANDARD. (Russian Governmental Standards Organization)

The KC mark is mandatory for certain types of electrical products in Korea. The KCC mark was unified to KC (Korea Certification) mark since Jan. 24th, 2011. Certification logo was changed from KCC mark to KC mark.

If you have any questions regarding agency approvals, please contact your local Vacon sales representative.

GLOSSARY

A–C

AC (Alternating Current)
A type of current in which the flow of electrons alternates back and forth as the voltage force alternates between pushing and pulling on electrons.

Acceleration
A change in velocity as a function of time. Acceleration usually refers to increasing speed of the motor, and deceleration to decreasing speed. Speed is directly proportional to frequency.

Accuracy
A measure of the difference between expected position and actual position of a motor or mechanical system. Motor accuracy is usually specified as an angle representing the maximum deviation from expected position.

Ambient Temperature
The temperature of the cooling medium, usually air, immediately surrounding the motor or another device.

Analog I/O
A type of I/O that may have a value within a set range.

Analog Input
An input to the drive consisting of a variable signal for dynamic adjustment of a setting. Typically either speed or Torque reference.

Analog Output
An output from a controller that is variable voltage or current in relationship to a real-time parameter.

Angular Accuracy
The measure of shaft positioning accuracy on a servo or stepping motor.

Back EMF
The voltage generated when a permanent magnet motor is rotated. This voltage is proportional to motor speed and is present regardless of whether the motor winding(s) are energized or de-energized.

BACnet
BACnet is a communications protocol for building automation and control networks, designed to allow for applications such as heating, ventilating, and air-conditioning control, lighting control, access control, and fire detection systems and their associated equipment to be controlled from a central console.

Breakaway Torque
The torque required to start a machine in motion. Almost always greater than the running torque.

Brushless Motor
Class of motors that operate using electronic commutation of phase currents, rather than electromechanical (brush-type) commutation. Brushless motors typically have a permanent magnet rotor and a wound stator.

Bypassing
A means of switching control of the motor from the drive to a starter.

Canbus
A network used in products with multiple microcontrollers that need to communicate with each other.

Switching Frequency
The rate of change of the PWM signal as measured at the motor terminals. Carrier is twice the switching frequency.

CE Mark
The European requirements for equipment sold within the EU. Drives have to comply with the Low Voltage directive and the EMC portions of the specifications.

Class B Insulation
An insulation specification. Class B insulation is rated to an operating (internal) temperature of 130°C.

Class F Insulation
An insulation specification. Class F insulation is rated to an operating (internal) temperature of 155°C.

Class H Insulation
An insulation specification. Class H insulation is rated to an operating (internal) temperature of 180°C.

Closed Loop
A broadly applied term, relating to any system in which the output is measured and compared to the input. The output is then adjusted to reach the desired condition. Typical feedback is for speed, pressure, temperature and position.

Closed Loop Vector
A common term referring to the control of an AC motor to produce full torque across the entire speed range of the motor down to and including zero speed. This is only accomplished with the addition of a feedback device on the motor shaft.

Cogging
A term used to describe non-uniform angular velocity. Cogging appears as jerkiness, especially at low speeds.

Constant power
A load in applications where the amount of work to be done is independent of speed and torque, or that requires constant tension.

Constant Torque
Loads in applications where the amounts of force needed is independent of speed, and are the most common in industrial applications.

Continuous Rated Current (I_{CR}) (A)
The maximum allowable continuous current a motor can handle without exceeding the motor temperature limits.

Continuous Rated Torque (T_{CR}) (Nm)
The maximum allowable continuous torque a motor can handle without exceeding the motor temperature limits.

Continuous Stall Current (I_{CS}) (A)
Amount of current applied to a motor (at locked rotor conditions), which results in rated temperature rise. Refer also to definition of "Continuous Stall Torque."

Continuous Stall Torque (T_{CS}) (Nm)
The amount of torque at zero speed, which a motor can continuously deliver without exceeding its thermal rating.

Converter
An electrical circuit that changes AC power to DC power.

Current
The actual flow, and strength of flow, of electrons. Shown in amperes or Amps.

Current at Peak Torque (IPK) (A)
The amount of input current required to develop "peak torque." This is often outside the linear torque/current relationship.

Current, Rated
The maximum allowable continuous current a motor can handle without exceeding motor temperature limits.

DC (Direct Current)
A type of current in which electrons flow in one continual direction.

DeviceNet®
The DeviceNet® network is an open low-level network that provides connections between simple industrial devices (such as sensors and actuators) and higher-level devices (such as PLC controllers and computers).

D-Flange Mounting
This type of mount has clearance holes on the flange, and the mounting bolts stick out through the flange from the motor side. This mount is common in cases where the motor is integral to the machine.

Digital I/O A type of I/O which can be either on or off.

Digital Input An input to a controller to activate a feature such as direction preset speeds or auxiliary functions.

Digital Output An output from a controller to show the status of the controller's operation. Typically shows when a condition is true or false.

Diode Rectifier Similar to SCRs, but diodes do not have a gate and thus cannot be controlled. Diodes only allow the positive portion of AC power to pass through the converter. Most AC drives use diodes.

Drive An electronic device that controls torque, speed and/or position of an AC or brushless motor.

Duty Cycle For a repetitive cycle, the ratio of on time to total cycle time. Duty cycle (%) = [On time / (On time + Off time)] x 100%.

Dynamic Braking A means of braking when a motor acts as a generator and the drive dissipates the excess energy.

EPROM Electronic Programmable Read Only Memory

EEPROM Erasable Electronic Programmable Read Only Memory

Efficiency The ratio of power output to power input.

Enclosure An outer covering that protects electrical devices that comprise the control aspects of the drive.

Encoder A feedback device which converts mechanical motion into electronic signals. The most commonly used, rotary encoders, output digital pulses corresponding to incremental angular motion. For example, a 1000-line encoder produces 1000 pulses every mechanical revolution. The encoder consists of a glass or metal wheel with alternating transparent and opaque stripes, detected by optical sensors to produce the digital outputs. Metal tooth gears and magnetic pickups are commonly used as well.

Ethernet A local-area network (LAN) architecture developed by Xerox Corporation in cooperation with DEC and Intel in 1976. Ethernet uses a bus or star topology and supports data transfer rates of 10 Mbps. A newer version of Ethernet, called 100Base-T (or Fast Ethernet), supports data transfer rates of 100 Mbps. And the newest version, Gigabit Ethernet supports data rates of 1 gigabit (1,000 megabits) per second.

E-trAC® Family name of AC drives built by TB Wood's

Feedback A signal which is transferred from the output back to the input for use in a closed loop system.

Feedback Devices Sensors on the motor, or on a process line, that monitor actual performance. Transducers and encoders are examples.

Field Test A means of determining the nature of the load, if it is not obvious.

Flux Vector (closed loop vector) A common term referring to the control of an AC motor to produce full torque across the entire speed range of the motor down to and including zero speed. This is only accomplished with the addition of a feedback device on the motor shaft.

Four Quadrant
Refers to a motion system that can operate in all four quadrants; i.e., velocity in either direction and torque in either direction. This means that the motor can accelerate, run, and decelerate in either direction.

Frequency
A reference to how often AC changes polarity, and is measured in units of Hertz (or cycles per second).

Frequency Resolution
The increment of control provided within the design of the controller. In most AC drives, the analog resolution is stated as a number of bits used in the microprocessor. The higher the bit count, the better the resolution.
In units with a digital keypad, the resolution is in how small of an increment the Hertz can be adjusted. Typically in either 0.01 or 0.05 Hz steps.

Frequency Stability
The long-term variance of the speed signal to the motor. Provided in a percentage of commanded signal. For example, 0.1% over 24h +/- 10°C change.

Frequency-Switching
The rate at which the output power devices are turned on and off as part of the Inverter section of the drive. See also PWM Frequency and Carrier Frequency.

Friction
A resistance to motion caused by contact with a surface. Friction can be constant with varying speed (Coulomb friction) or proportional to speed (viscous friction).

Harmonics
A special type of noise resulting from AC drives sinusoidal waves with higher frequencies than the main power supply, which are transmitted back to the AC line.

Holding Torque
Sometimes called static torque, holding torque specifies the maximum external torque that can be applied to a stopped, energized motor without causing the rotor to rotate. Generally used as a figure of merit when comparing motors.

IEC
The International Electro-technical Commission, which writes international standards for electrical devices.

IEEE
The Institute of Electrical and Electronic Engineers, which is an association that writes standards.

Inductance (L) (mH = millihenries)
The electrical equivalent to mechanical inertia; that is, the property of a circuit, which has a tendency to resist current flow when no current is flowing, and when current is flowing has a tendency to maintain that current flow. Line/Load reactors are an example of how this characteristic helps suppress spikes and surges over and above the norm.

Inductance (Mutual)
Mutual inductance is the property that exists between two current-carrying conductors or coils when magnetic lines of force from one link with those of the other. The basis for how a transformer works.

Inertia
The property of an object to resist change in velocity unless acted upon by an outside force. Higher inertia objects require larger torque to accelerate and decelerate. Inertia is dependent upon the mass and shape of the object.

Inertial Match
For most efficient operation, the system-coupling ratio should be selected so that the reflected inertia of the load is equal to the rotor inertia of the motor.

Injection Braking
A means of braking an AC motor by sending DC voltage to the motor to create a non-rotating magnetic field.

Insulated Gate Bipolar Transistor (IGBT)
A transistor used in AC drives to generate AC power from DC power through a control strategy called Pulse Width Modulation (PWM). IGBTs have replaced standard bipolar transistors over the years because of their higher efficiencies and higher switching frequencies that help with quiet motor operation.

Insulation Class
The rating assigned to the maximum temperature capability of the insulating components in a motor or other piece of equipment.

Inverter
A component of an AC drive that takes the regulated DC power and changes it back into a form of regulated (controlled) AC power. Also a common term used for an AC Drive.

I/O
Input/Output

IrDA
Infrared Data Association Standards

Load
The equipment being driven by the motor.

Load Cells
A type of feedback device that provides signals based upon characteristics of the connected application. Usually measures weight or force.

LonWorks
Enables control of several processes at once and allows convenient keypad programming. LONWORKS is a registered trademark of Echelon Corporation.

Metasys (N2)
An open system since 1992 used in many different applications. It allows communication through device level networks at the factory floor, cell level networks (field buses) at the manufacturing level and 10/100 Ethernet for upward communications

Mid-range Instability
A phenomenon in which a step motor can fall out of synchronism due to a loss of torque at mid-range speeds. The torque loss is due to the interaction of the motor's electrical characteristics and the driver's electronics. Some drivers have circuitry to eliminate or reduce the effects of mid-range instability.

MODBUS®
MODBUS Protocol is a messaging structure developed by Modicon in 1979. It is used to establish master-slave/client-server communication between intelligent devices and transfer discrete/ analog I/O and register data between control devices.

MODBUS® RTU
MODBUS network using RTU (Remote Terminal Unit) Mode. This mode uses greater character density to allow better data throughput than ASCII for the same baud rate. Each message must be transmitted in a continuous stream.

NEMA
The National Electrical Manufacturers Association, which creates standards followed in the USA. The organization that sets standards for motors and other industrial electrical equipment.

Noise
Disruptions in a power or control system. Can be high or low frequency based an use of line suppression devices such as reactors, or controls devices such as shielded or twisted cable can help minimize its effect.

NTC (Negative Temperature Coefficient)
A negative temperature coefficient thermistor is used to detect and protect a motor winding from exceeding its maximum temperature rating. Resistance of the device decreases with an increase in temperature.

Open Loop Vector
A type of AC regulator that controls motor speed without feedback devices, regulates the current output to the motor, and controls the rotor/shaft speed by controlling the frequency of the magnetic flux in the stator. Also referred to as sensorless vector.

Open-Loop
A system in which there is no feedback. Motor motion is expected to faithfully follow the input command. Typical control scheme for both Volts per Hertz and Sensorless Vector Control.

Overload Capacity
The ability of a drive to withstand currents above its continuous rating.

Packaging
The metal or plastic enclosure protecting the internal drive components.

Phases
A phase carry alternating current. In a 3-phase system, three circuit conductors carry three alternating currents of the same frequency, which reach their instantaneous peak values at one third of a cycle from each other. Taking one current as the reference, the other two currents are delayed in time by one third and two thirds of one cycle of the electric current. This delay between phases has the effect of giving constant power transfer over each cycle of the current and also makes it possible to produce a rotating magnetic field in an electric motor.

PI Control
Proportional-Integral-acting control.

PID
A Proportional-Integral-Derivative controller (PID) is a standard feedback loop component in industrial control applications. It measures an "output" of a process and controls an "input", with a goal of maintaining the output at a target value, which is called the "set point".

Poles
Refers to the number of magnetic poles arranged on the rotor of the motor. In an AC motor, the number of poles has a direct relationship to the base speed of the motor.

Power
1. The rate at which work is done. In motion control, power is equal to torque multiplied by speed.
2. The rate of doing work or expending energy. It may be written as: Power (watts) = force x distance/time. Expressed in electrical terms it is voltage x current = power (watts)

Power Factor
Ratio of true power (kW) to apparent power (kVA).

PROFIBUS DP
A performance optimized version of PROFIBUS, specifically dedicated to time-critical communication between automation systems and distributed peripherals.

PSLC
Programmable Sequence Logic Controller allows the user to implement complex functions and limits based upon speed and load as well as other thresholds along with assigning desired ramps and dwell times.

PTC (Positive Temperature Coefficient)
A positive temperature coefficient thermistor is used to detect and protect a motor winding from exceeding its maximum temperature rating. Resistance of the device increases with an increase in temperature.

Pull-out Torque
The maximum friction loads, at a particular inertial load, that can be applied to the shaft of a synchronous motor (running at constant speed) and not cause it to lose synchronism.

Pulse Width Modulation (PWM)
A control strategy which uses Insulated Gate Bipolar Transistors to approximate an AC power supply by switching a DC supply voltage on and off at fixed frequencies. The length of the on/off interval or voltage waveform is variable.

Rated Current
The amount of current flowing through the drive/motor when under full load.

Reference
The analog or digital signal given to a Drive for either speed or torque command.

Regeneration
The action during motor braking in which the motor acts as a generator and takes kinetic energy from the load, converts it to electrical energy, and returns it to the controller.

Regenerative Braking
A form of dynamic braking in which the power is fed back into the main AC line, rather than dissipated in resistors.

Regulator
The control portion of the drive that determines what voltage and current is supplied to the motor, and the circuit through which power is supplied to the motor.

Repeatability
The degree to which a parameter such as position or velocity can be duplicated.

Resistance
The "frictional" force in wires opposing the flow of current.

Resistance, Hot (RH) (Ohms line-to-line)
The motor's terminal resistance value specified at the hot winding temperature, which is at the motor's maximum rated temperature.

Resolution
The smallest increment into which a parameter can be broken down. For example, a 1000 line encoder has a resolution of 1/1000 of a revolution.

Resolver
An electromagnetic feedback device that converts angular shaft position into analog signals. These signals can be processed in various ways, such as with an RDC (resolver-to-digital converter) to produce digital position information. There are two basic types of resolvers: transmitter and receiver. A transmitter-type is designed for rotor primary excitation and stator secondary outputs. Position is determined by the ratio of the sine output amplitude to cosine output amplitude. A receiver-type is designed for stator primary excitations and rotor secondary output. Position is determined by the phase shift between the rotor output signal and one of the primary excitation signals.

Resonance
Oscillatory behavior caused by mechanical limitations. This behavior is usually thought of as continuous.

Ringing Oscillation of a system following a sudden change in state. Usually will diminish over time.

Rotor The moving part of the motor.

Sensorless Vector A control scheme used in AC drives to assist the motor in developing full torque capacity over the largest speed range. A motor model designed into the software of the drive makes assumptions based on commanded speed and current to calculate rotor position. These calculations are used to adjust the PWM signal and thus voltage and frequency to the motor.

Servo A high-performance control utilizing similar control scheme to a Flux Vector drive but coupled with a low-inertia PM motor.

Settling Time The time required for a parameter to stop oscillating or ringing and reach its final value.

Shaft The part of the rotor that extends outside of the motor case and connects to the equipment to be rotated.

Shock Loading A load that produces extremely high peak torque for very short duration. This type of load is associated with conveyorized grinding, crushing and separation processes.

Speed Describes the linear or rotational velocity of a motor or other object in motion.

Speed Range The designed operational limits of an AC drive motor combination. Typically stated as a ratio such as 20:1 to indicate base frequency down to 1/20th of its base speed (1800 to 90 rpm).

Speed Regulation The ability to have the load run at the precise speed it is commanded. Usually requires a feedback device and software within the control to look at the commanded speed and the actual speed and make the necessary adjustment.

Stall Torque The amount of torque developed with voltage applied and shaft locked, or not rotating. Also known as locked-rotor torque.

Stator The non-moving part of the motor. Specifically, it is the iron core with the wire winding in it that is pressed into the frame shell. The winding pattern determines the voltage constant of the motor.

Synchronized A synchronous motor rotating at a speed corresponding correctly to the applied frequency is said to be synchronized. Load torque in excess of the motor's capacity (rated torque) will cause a loss of synchronism.

Synchronous Speed The rotational speed of an AC motor if the rotor and the stator are exactly at the same point in time. This speed assumes no slip is occurring.

Tachometer A device that monitors the actual speed of the motor. Feedback signal is usually an analog DC signal rated at so many volts per 1000 RPM.

TCP Transmission Control Protocol, is one of the main protocols in TCP/IP networks. Whereas the IP protocol deals only with packets, TCP enables two hosts to establish a connection and exchange streams of data. TCP guarantees delivery of data and also guarantees that packets will be delivered in the same order in which they were sent.

TCP/IP See above.

Thermal Protection A thermal sensing device mounted to the motor to protect it from overheating. This is accomplished by disconnecting the motor phases from the drive in an over-temperature condition.

Thermal Resistance (Rth) (°C/watt) An indication of how effectively a unit rids itself of heat; a measure of temperature rise per watts lost.

Thermostat A temperature sensitive pilot duty device mounted on the interior of the motor to protect it from overheating.

Torque Measure of angular force that produces rotational motion. This force is defined by a linear force multiplied by a radius. Torque is an important parameter of any motion control system. Formula: Torque = 9,550 x kW/RPM

Torque Constant (KT = NM/A) An expression of the relationship between input current and output torque. For each ampere of current, a fixed amount of torque is produced.

Torque-Braking (Dynamic Braking) The amount of braking capacity designed into the drive for stopping a regenerative load or torque required to stop the load.

Torque-Starting The amount of torque it takes to accelerate the load to full speed.

Torque-to-Inertia Ratio Defined as the motor's holding torque divided by the inertia of its rotor. The higher the ratio, the higher a motor's maximum acceleration capability will be.

User/Operator Interface A means of allowing an operator to program control references to the drive/motor system, and to monitor motor and drive operating conditions.

Variable Torque Load Loads in applications that exhibit both increases in torque and power as speed increases.

Variable Voltage Control A reference to drives because they manipulate the voltage supplied to the motor.

Velocity The change in position as a function of time. Velocity has both a magnitude and sign.

Voltage The force that pushes or pulls electrons, causing them to flow.

Voltage Spikes A type of noise in which large quantities are suddenly transmitted across the line.

Volts Per Hertz A type of AC control scheme that controls the frequency of AC power output to the motor, and does not use feedback devices.

1. General

To the extent not otherwise agreed in writing, these general terms and conditions of sale ("General Terms") shall apply to all Contracts, offers and order confirmations regarding Vacon's sale of its Products to any Purchaser of such Products.

2. Definitions

The following definitions shall apply to these General Terms:

(i) **"Confidential Information"** shall mean any techno logical and technical know-how, inventions, product data, processes, designs, drawings, specifications, economic information and any other information, which is marked or notified as being confidential or should, in the exercise of reasonable judgment under the circumstances, be considered as confidential.

(ii) **"Contract"** shall mean any contract or agreement between the Parties regarding the sale and purchase of Products.

(iii) **"High Speed Product"** shall mean any Product that is capable of controlling motor operating at the frequency rate of 600 Hz or above.

(iv) **"IPR"** shall mean any patent, utility model, design patent, design, software, copyright, trademark, know-how, trade secrets and any other intellectual property right.

(v) **"Party"** shall mean Vacon or the Purchaser separately and "Parties" shall mean Vacon and the Purchaser jointly.

(vi) **"Products"** shall mean frequency converters, power converters and inverters, their spare and/or replacement parts as well as optional devices and accessories and other products sold and delivered by Vacon.

(vii) **"Purchaser"** shall mean any entity purchasing Products from Vacon.

(viii) **"Service Provider"** shall mean any Subsidiary of Vacon or an independent service provider authorized by Vacon to provide services relating to the Products on behalf of Vacon.

(ix) **"Subsidiary"** shall mean any company that is directly or indirectly controlled by Vacon Plc. Control means the power to direct management and policies through ownership, voting rights, contract or otherwise.

(x) **"Third Party Components"** shall mean third party software and/or components which Vacon has licensed or otherwise sourced from a third party to be used as part of Products.

(xi) **"Vacon"** shall mean Vacon Plc or its Subsidiary selling the Product to the Purchaser.

3. Validity of Quotations and Formation of Contract

3.1 Written quotations by Vacon are valid for thirty (30) days unless otherwise stated in the quotation or terminated earlier by written notice. Oral quotations, unless accepted by the Purchaser, expire at the end of the day they are made.

3.2 Each Contract shall be concluded by a separate written agreement between the Parties or by a written confirmation by Vacon of the Purchaser's order. In the case of accepting an oral quotation, a written Contract must be executed within thirty (30) days from the acceptance, otherwise the price and delivery terms may be subject to re-negotiation.

3.3 The Purchaser's orders are binding upon the Purchaser when received by Vacon and upon Vacon when confirmed by it in writing. Vacon's confirmation of the Purchaser's order is conditional on the Purchaser's acceptance of these General Terms. Acceptance of delivery of Products without prior objection to these General Terms shall constitute such acceptance.

4. Termination and Cancellation

4.1 Any order by the Purchaser may be terminated by the Purchaser only by written notice and upon payment of reasonable termination charges, including but not limited to all costs incurred by Vacon until the termination notice is received by Vacon and any and all profit loss sustained by Vacon as a result of such termination.

4.2 Vacon shall have the right to cancel any confirmed order and/or Contract at any time by written notice with immediate effect if the Purchaser (i) breaches any provisions of the Contract and fails to correct such breach within fourteen (14) days from the notice by Vacon demanding such correction, or (ii) enters into any proceeding under law for the relief of debtors, is declared bankrupt, fails to pay its invoices when due or otherwise becomes insolvent.

5. Delivery Term and Transfer of Title

5.1 The Products will be delivered, and are priced, Ex Works (Incoterms, the latest effective version) at Vacon's production site, unless otherwise agreed in the Contract.

5.2 Title to the Products will pass to the Purchaser when the sales price has been paid in full to Vacon.

6. Prices and Payment Term

6.1 The prices for Products are as agreed in the Contract and are exclusive of VAT and other similar taxes and public charges. Unless otherwise agreed in the Contract, all prices are subject to change without notice. In the event of a price change, the effective date of the change will be the date of the new price or price list, letter or electronic notification. New pricing will be applied in all quotations made by Vacon and in orders confirmed by Vacon after such effective date.

6.2 Unless otherwise agreed, the Products will be invoiced on the date of shipment. Payments shall be made within thirty (30) days from the date of Vacon's invoice.

6.3 If the Purchaser fails to make any payment in due time, Vacon may, at its discretion, consider the Contract breached, claim all unpaid amounts, claim interest for delayed payment(s) and cancel or suspend any pending deliveries to the Purchaser. Unless otherwise agreed, the delay interest is fifteen per cent (15 %) per annum, however, not more than the highest permitted interest rate under the mandatory provisions of the applicable law.

7. Warranty

7.1 Vacon hereby warrants that the Products
(i) will comply with the specifications jointly and specifically agreed to by the Parties, or, in the absence of such jointly and specifically agreed specifications, Vacon's standard specifications in effect at the time of manufacture, and that
(ii) the Products, as originally delivered by Vacon, are free from defects in material and workmanship.

7.2 Vacon shall not be responsible for any defects due to the Purchaser's negligence or misuse, modification or rework, combination, incorrect installation, commissioning or maintenance, unauthorized dismantling, abnormal or exceptional working, installation, commissioning or operation conditions, or the Purchaser's failure to adhere to Vacon's instructions and specifications. Neither shall Vacon be responsible for (i) normal wear and tear, (ii) for defects arising from the use of spare parts other than those approved by Vacon, or (iii) for damages arising from the Purchaser's failure to ensure information security in the environment where the Products are used.

7.3 The warranty period is

- eighteen (18) months from the date of shipment of the Product from Vacon; or
- twelve (12) months from the commissioning thereof; whichever occurs first;
- or such longer warranty period as required by the mandatory provisions of the applicable law.

7.4 The warranty period for repaired or replaced Product or its part shall be equivalent to the remaining warranty period of the originally delivered Product or three (3) months from the repair or replacement of such Product or its part, whichever is longer.

7.5 Provided that the Purchaser has notified in writing Vacon (or its Service Provider as provided for in section 7.6 below) of the defect within five (5) working days after discovery of the defect and within the above warranty period, Vacon shall, at its discretion, (i) either repair the defective Product, (ii) replace the defective Product by an equivalent non-defective Product, or (iii) refund the purchase price of the defective Products. In case Vacon decides to replace the defective Products and requests the return of such defective Products, the Purchaser shall refrain from any actions preventing or interfering with a proper analysis of the cause of the defect, store the defective Products in proper conditions and deliver the defective Products to Vacon (or its Service Provider, as the case may be) within five (5) working days from Vacon's request. Vacon shall reimburse the transportation costs arising from the return of defective Products under the warranty herein provided that the forwarding agent recommended by Vacon has been used. Vacon is not responsible for any additional costs and expenses caused by the dismantling, installation or commissioning of a repaired or replaced Product, travelling, accommodation, daily allowances or time used for travelling by the authorized service personnel.

7.6 All communication relating to claims shall be between the Purchaser and the Service Provider and possible returns of defective Products shall be made by the Purchaser to such Service Provider.

7.7 The warranties above and in section 9.2 are exclusive and are in lieu of all other warranties, whether written or oral, implied or statutory. VACON AND THE PURCHASER HEREBY WAIVE ANY WARRANTY OF MERCHANTABILITY AND WARRANTY OF FITNESS FOR A PARTICULAR USE. Vacon shall not be liable for any other activity and/or cost than those set forth in section 7.5 above.

8. Purchaser's Warranties

8.1 The Purchaser hereby represents and warrants that if the Contract covers any High Speed Products, the Purchaser shall comply with all applicable provisions (if any) of the Council Regulations (EC) setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items, and other applicable control regime as valid from time to time.

8.2 The Purchaser further represents and warrants that any Products shall not be used, nor transferred to third parties to be applied, in connection with a nuclear facility nor in production, development, handling, operation, maintenance, storage, detection, identification or dissemination chemical, biological or nuclear weapons or other nuclear explosive devices or the development, production, maintenance or storage of missiles capable of delivering such weapons.

8.3 Vacon retains the right to redeem the Products (without any compensation to the Purchaser) in case the information provided by the Purchaser or otherwise regarding the end user of the Product seems, at the sole discretion of Vacon, to be false.

9. Intellectual Property Rights

9.1 The sale and delivery of any Products to the Purchaser shall not transfer, confer or grant to the Purchaser any IPR to the Products or related documents, save the right of normal use and/or sale of Product and related documents in the Purchaser's ordinary business.

9.2 Vacon hereby warrants that the Products, as delivered, do not infringe upon any IPR of third parties in the country of delivery. In case of any infringement, or anticipated infringement, the Purchaser shall immediately notify Vacon in writing thereof, empower Vacon to defend the case and give Vacon any support requested. Vacon may, at its sole discretion, either (i) replace the infringing Product with a non-infringing Product that materially corresponds to the agreed specification of the relevant Product, (ii) acquire to the Purchaser a royalty-free license to use the Product, or (iii) redeem the infringing Product and return the corresponding sales price. The warranty and remedies above are the sole remedies available to the Purchaser in case of a possible infringement of third party IPRs.

10. Third Party Components

Vacon's delivery may contain Third Party Components. Vacon shall be entitled, at its sole discretion and at any time, to add, remove or replace any Third Party Components in any Product. All IPRs to the Third Party Components shall belong to such third party.

Vacon or the third party will grant the Purchaser a limited, non-exclusive and non-transferable license to use the Third Party Component solely in connection with the use of Product and subject to such third party's license and other delivery terms and conditions. Vacon neither assumes any liability nor gives any warranty of any kind for the Third Party Components and the Purchaser shall entirely satisfy itself with the warranty and indemnity, if any, granted by such Third Party Component supplier.

11. Force Majeure

Vacon shall not be liable to the Purchaser for failing to fulfill its obligations as a result of circumstances beyond its reasonable control, including without limitation fire, explosion, accident, strike, lockout, flood, drought, embargo, war (whether declared or not), riot, natural disasters or acts of the public enemy, action of any governmental authority, general shortage of material or transportation, or the delay or non-performance of a sub-contractor due to the above reasons.

12. Confidentiality

Each Party shall, during the term of the Contract and thereafter, hold in confidence and not disclose to any third party any Confidential Information which has been disclosed to it by the other Party in connection with the Contract or otherwise learned by it in connection with the delivery of the Products. The Parties shall not use any Confidential Information for any other purpose than for the proper performance of the Contract and the delivery of the Products. The above obligations of confidentiality and non-use shall not apply to Confidential Information which the receiving Party by written records demonstrate (i) was in its possession prior to the first receipt thereof from the disclosing Party, and/or (ii) which becomes a matter of public knowledge without a breach of the confidentiality obligation hereunder, and/or (iii) which is obtained from a third party under circumstances permitting its disclosure to others.

13. Limitation of Liability

Each Party's maximum liability to the other for damages arising from the sale and purchase of Products shall never exceed the net invoiced value of the relevant Product. In no event shall either Party be liable to the other for loss of production, loss of profits, business, revenue, data or goodwill, cost of capital, losses arising from plant shut down, labor charges or other consequential, incidental, indirect, special or punitive damages. The aforesaid limitations of liability shall not, however, apply in cases where damages are caused by (i) willful misconduct or gross negligence, (ii) culpable injury to life, body or health, (iii) defects which have maliciously been concealed or whose absence has been specifically guaranteed or (iv) personal injury or damages to property when there is strict liability under the applicable mandatory product liability laws for such damages.

14. Severability

The provisions of these General Terms are intended to be severable. If any provision or part thereof is held invalid, then the rest of the General Terms shall remain in full force and effect.

15. Governing Law and Dispute Resolution

15.1 These General Terms as well as any other terms of the Contract shall be governed by the laws of the country/state in which the contracting Vacon entity is located, without, however, giving effect to the rules on conflict of laws within such jurisdiction. The Vienna (UN) Convention on Contracts for the International Sale of Goods shall not apply.

15.2 Any dispute, controversy or claim arising out of or relating to the Contract, or the breach, termination or validity thereof shall be finally settled by arbitration. The arbitration shall be governed by (i) the Commercial Arbitration Rules of the American Arbitration Association ("AAA") for disputes governed by U.S. law, (ii) the Arbitration Rules of the China International Economic and Trade Arbitration Commission ("CIETAC") for disputes governed by Chinese law, or (iii) by the Rules of Arbitration of the International Chamber of Commerce ("ICC") for disputes governed by any other law than those mentioned above. The place of arbitration shall be Vacon's domicile, and the arbitration shall be conducted in the English language. Notwithstanding the foregoing, (i) Vacon shall, however, be entitled to lodge claims concerning the collection of outstanding debts in any court having jurisdiction over the Purchaser; and (ii) the parties agree that nothing herein shall be construed to prevent parties from seeking injunctive relief for immediate and irreparable harm in such circumstances where such equitable relief is necessitated and no immediate adequate remedy at law is available.

VACON PLC GENERAL TERMS AND CONDITIONS FOR THE SALE OF SERVICES

1. General

To the extent not otherwise agreed in writing, these general terms and conditions ("General Terms") shall apply to any Contracts, offers and order confirmations regarding Vacon's sale of its Services to any Purchaser of such Services.

Vacon´s separate General Terms and Conditions for the Sale of Products shall be applied to the sale of Products when such Products are sold separately or sold, repaired or replaced or otherwise provided to the Purchaser as part of or in connection with Services, subject, however, to the provision in section 6.4 below.

2. Definitions The following definitions shall apply to these General Terms:

(i) "Confidential Information" shall mean any technological and technical know-how, inventions, product data, processes, designs, drawings, specifications, economic information and any other information, which is marked or notified as being confidential or should, in the exercise of reasonable judgment under the circumstances, be considered as confidential.

(ii) "Contract" shall mean any contract or agreement between the Parties regarding the sale and purchase of Services.

(iii) "IPR" shall mean any patent, utility model, design patent, design, software, copyright, trademark, know-how, trade secrets and any other intellectual property right.

(iv) "Other Charges" shall mean costs, such as but not limited to, travelling, daily allowances and accommodation costs, transportation costs, handling fee, extra circumstantial costs, packaging costs, material and tools costs or any other costs arising from or relating to the performance of the Services.

(v) "Party" shall mean Vacon or the Purchaser separately and "Parties" shall mean Vacon and the Purchaser jointly.

(vi) "Product(s)" shall mean frequency converters, power converters and inverters, their spare and/or replacement parts as well as optional devices and accessories and other products sold and delivered by Vacon separately or in connection with the Services.

(vii) "Purchaser" shall mean any entity purchasing Services from Vacon.

(viii) "Service Provider" shall mean any Subsidiary of Vacon or an independent service provider authorized by Vacon to provide services relating to the Services on behalf of Vacon.

(ix) "Service(s)" shall mean maintenance, repair or commissioning of the application of Products, training or any other kind of services related to Vacon´s Products provided by the Service Provider to the Purchaser. Any engineering services shall, however, be subject to a separate written agreement between the Parties.

(x) "Subsidiary" shall mean any company that is directly or indirectly controlled by Vacon

Plc. Control means the power to direct management and policies through ownership, voting rights, contract or otherwise.

(xi) "Vacon" shall mean Vacon Plc or its Subsidiary selling the Services to the Purchaser.

3. Validity of Quotations and Formation of Contract

3.1 Written quotations by Vacon are valid for thirty (30) days unless otherwise stated in the quotation or terminated earlier by written notice. Oral quotations, unless accepted by the Purchaser, expire at the end of the day they are made.

3.2 Each Contract shall be concluded by a separate written agreement between the Parties or by a written confirmation by Vacon of the Purchaser's order. In the case of accepting an oral quotation, a written Contract must be executed within thirty (30) days from the acceptance, otherwise the prices, delivery dates and other such terms may be subject to re-negotiation.

3.3 The Purchaser's orders are binding upon the Purchaser when received by Vacon and upon Vacon when confirmed by it in writing. Vacon's confirmation of the Purchaser's order is conditional on the Purchaser's acceptance of these General Terms. Acceptance of delivery of Services without prior objection to these General Terms shall constitute such acceptance.

4. Changes to Delivery Dates, Termination or Cancellation

4.1 Any changes to confirmed delivery dates proposed by either Party due to reasons other than circumstances described in section 11 (Force Majeure) are subject to a prior written approval by the other Party. Said approval may be conditional upon an agreement between the Parties regarding the compensation of additional costs incurred by a Party due to such proposed change.

4.2 Any order by the Purchaser may be terminated by the Purchaser only by written notice and upon payment of reasonable termination charges, including but not limited to all costs incurred by Vacon until the termination notice is received by Vacon and any and all profit loss sustained by Vacon as a result of such termination.

4.3 Vacon shall have the right to cancel any confirmed order and/or Contract at any time by written notice with immediate effect if the Purchaser (i) breaches any provisions of the Contract and fails to correct such breach within fourteen (14) days from the notice by Vacon demanding such correction, or (ii) enters into any proceeding under law for the relief of debtors, is declared bankrupt, fails to pay its invoices when due or otherwise becomes insolvent.

5. Performance of Services

5.1 The Services will be performed at locations and at times set forth in the Contract.

5.2 In the event of an urgent Service request from the Purchaser, the terms and practical details for the performance of Services may be agreed orally between the Parties. Such orally agreed terms and details shall be confirmed in writing, e.g. by email, as soon as practically possible.

6. Prices and Payment Term

6.1 The prices and Other Charges for Services are as agreed in an offer by Vacon accepted by Purchaser, or an order by the Purchaser confirmed by Vacon or in the Contract and are exclusive of VAT and other similar taxes and public charges.

6.2 The Services and Other Charges will be priced based on Vacon´s price list, as valid from time to time, in a case there is no written Contract between the Parties or otherwise offered by Vacon.

6.3 Unless otherwise agreed, all prices and costs are subject to change without notice. In the event of a price change, the effective date of the change will be the date of the new price or price list, letter or electronic notification. New pricing will be applied in all quotations made by Vacon and in orders confirmed by Vacon after such effective date.

6.4 Unless otherwise agreed, the Services will be invoiced after the performance of the Services. Payments shall be made within thirty (30) days from the date of Vacon's invoice. If Products sold to the Purchaser as part of or in connection with Services are invoiced on the same invoice as the Services, the same payment term shall apply to such Products.

6.5 If the Purchaser fails to make any payment in due time, Vacon may, at its discretion, consider the Contract breached, claim all unpaid amounts, claim interest for delayed payment(s) and cancel or suspend any pending performance of Services to the Purchaser. Unless otherwise agreed, the delay interest is fifteen per cent (15 %) per annum, however, not more than the highest permitted interest rate under the mandatory provisions of the applicable law.

7. Liability and Warranty

7.1 Vacon hereby warrants that the Services are performed in a professional manner by a person with adequate experience and expertise for the task. Further, the Services shall fulfil the requirements and characteristics set forth in the Contract. Services are performed by using Vacon's own working methods and instructions.

7.2 Vacon shall not be responsible for any failures in the performance of Services due to the Purchaser's negligence or misuse, modification or rework, combination, incorrect installation, commissioning or maintenance, unauthorized dismantling, abnormal or exceptional working, installation, commissioning or operation conditions, or the Purchaser's failure to adhere to Vacon's instructions and specifications. Neither shall Vacon be responsible for failure to perform the Services if it is not (i) safe for the personnel of Vacon or the Service Provider to carry out the Services at an agreed location or (ii) practically possible due to wear and tear of Products, or the use of spare parts other than those approved by Vacon, or (iii) the Purchaser's failure to ensure information security in the environment where the Services are performed or utilized.

7.3 Vacon´s liability for the Purchaser for possible errors, defects or any other shortcomings in the sale or delivery of Services shall be limited in all cases to remedying of such errors according to section 7.4.

7.4 Provided that the Purchaser has notified in writing Vacon (or its Service Provider as provided for in section 7.5 below) of the defect in the performance of Service within five (5) working days after discovery of the defect, not, however, later than after three (3) months from the delivery of the Service in question, Vacon shall, at its discretion, either re-perform the Services or refund the purchase price of the failed Services.

7.5 All communication relating to claims based on Services provided by any Service Provider shall be between the Purchaser and such Service Provider.

7.6 The warranties above in section 7.1 are exclusive and are in lieu of all other warranties, whether written or oral, implied or statutory VACON AND THE PURCHASER HEREBY WAIVE ANY WARRANTY OF MERCHANTABILITY AND WARRANTY OF FITNESS FOR A PARTICULAR USE. Vacon shall not be liable for any other activity and/or cost than those set forth in section 7.4 above.

8. Purchaser's Warranties and Responsibilities

8.1 The Purchaser hereby represents and warrants that it shall comply with all applicable provisions (if any) of the Council Regulations (EC) setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items, and other applicable control regime as valid from time to time.

8.2 The Purchaser shall deliver the data and materials agreed to be provided by the Purchaser as well as other items in a form following Vacon's instructions.

8.3 The Purchaser shall be responsible for the instructions, data and material provided by it. The Purchaser shall also be liable for the use of such data and materials for the Services performed by Vacon or its Service Provider.

8.4 The Purchaser shall obtain and maintain at all times sufficient general liability and property insurance coverage.

9. Intellectual Property Rights

The sale and delivery of any Services to the Purchaser shall not transfer, confer or grant to the Purchaser any IPR to the Services, Products or related documents, save the right of normal use of related documents in the Purchaser's ordinary business.

10. Service Providers

Vacon shall be entitled, at its sole discretion and at any time to use Service Providers to perform the Services on behalf of Vacon. Vacon shall be responsible for the performance of such Service Providers as for its own. Vacon shall, however, not be responsible for any acts or omissions by such Service Providers under or relating to contracts executed directly by and between the Purchaser and the Service Provider.

11. Force Majeure

11.1 Vacon shall not be liable to the Purchaser for failing to fulfill its obligations as a result of circumstances beyond its reasonable control, including without limitation fire, explosion, accident, strike, lockout, flood, drought, embargo, war (whether declared or not), riot, natural disasters, sudden sickness of a person carrying out the Service in question or acts of the public enemy, action of any governmental authority, general shortage of material or transportation, or the delay or non-performance of a sub-contractor due to the above reasons.

11.2 If it has become evident that the fulfillment of the Contract will be delayed for more than four (4) months due to a force majeure event, each Party shall be entitled to cancel the Contract to the extent it is reasonable, by notifying the other Party thereof in writing without either Party having the right to claim damages.

12. Confidentiality

Each Party shall, during the term of the Contract and thereafter, hold in confidence and not disclose to any third party any Confidential Information which has been disclosed to it by the other Party in connection with the Contract or otherwise learned by it in connection with the delivery of the Services. The Parties shall not use any Confidential Information for any other purpose than for the proper performance of the Contract and the delivery of the Services. The above obligations of confidentiality and non-use shall not apply to Confidential Information which the receiving Party by written records demonstrate (i) was in its possession prior to the first receipt thereof from the disclosing Party, and/or (ii) which becomes a matter of public knowledge without a breach of the confidentiality obligation hereunder, and/or (iii) which is obtained from a third party under circumstances permitting its disclosure to others.

13. Limitation of Liability

Each Party's maximum liability to the other for damages arising from the sale and purchase of Services shall never exceed the net invoiced value of the relevant Service. In no event shall either Party be liable to the other for loss of production, loss of profits, business, revenue, data or goodwill, cost of capital, losses arising from plant shut down, labor costs or other consequential, incidental, indirect, special or punitive damages. The aforesaid limitations of liability shall not, however, apply in cases where damages are caused by (i) willful misconduct or gross negligence, or (ii) culpable injury to life, body or health.

14. Severability The provisions of these General Terms

are intended to be severable. If any provision or part thereof is held invalid, then the rest of the General Terms shall remain in full force and effect.

15. Governing Law and Dispute Resolution

15.1 These General Terms as well as any other terms of the Contract shall be governed by the laws of the country/state in which the contracting Vacon entity is located, without, however, giving effect to the rules on conflict of laws within such jurisdiction. The Vienna (UN) Convention on Contracts for the International Sale of Goods shall not apply.

15.2 Any dispute, controversy or claim arising out of or relating to the Contract, or the breach, termination or validity thereof shall be finally settled by arbitration. The arbitration shall be governed by (i) the Commercial Arbitration Rules of the American Arbitration Association ("AAA") for disputes governed by U.S. law, (ii) the Arbitration Rules of the China International Economic and Trade Arbitration Commission ("CIETAC") for disputes governed by Chinese law, or (iii) by the Rules of Arbitration of the International Chamber of Commerce ("ICC") for disputes governed by any other law than those mentioned above. The place of arbitration shall be Vacon's domicile, and the arbitration shall be conducted in the English language. Notwithstanding the foregoing, (i) Vacon shall, however, be entitled to lodge claims concerning the collection of outstanding debts in any court having jurisdiction over the Purchaser; and (ii) the Parties agree that nothing herein shall be construed to prevent Parties from seeking injunctive relief for immediate and irreparable harm in such circumstances where such equitable relief is necessitated and no immediate adequate remedy at law is available.

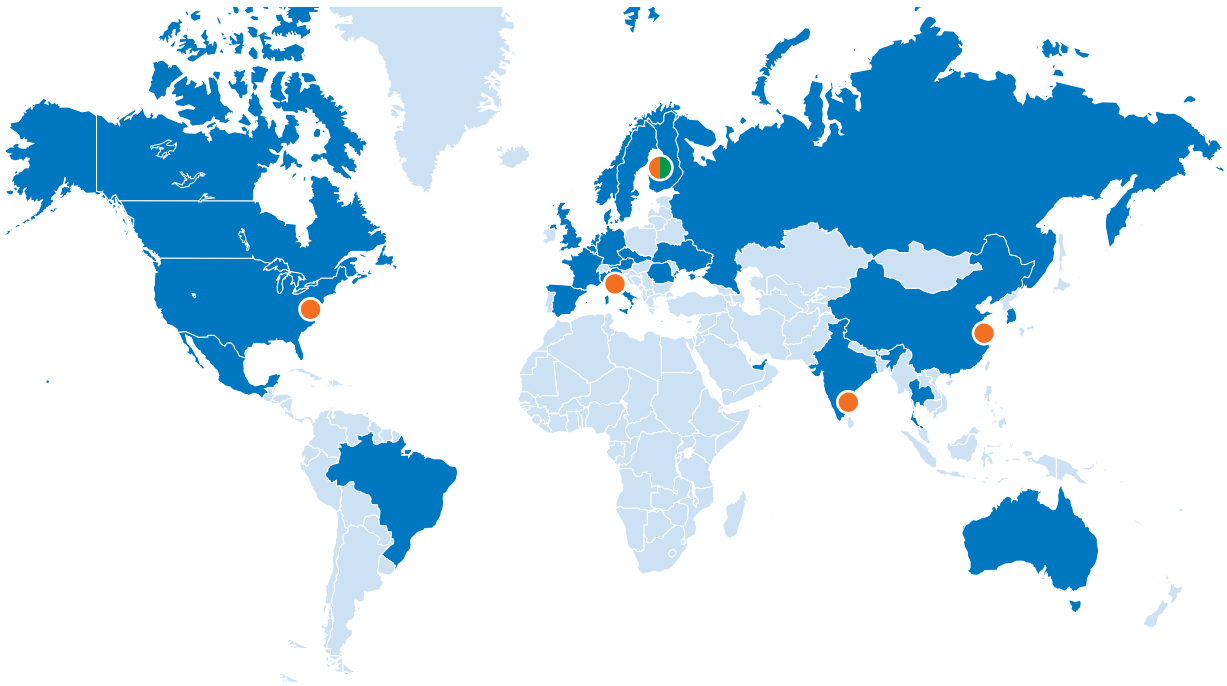
16. Amendment of the General Terms

Vacon reserves the right to amend these General Terms by notifying the Purchaser and delivering the amended terms and conditions to the Purchaser before the terms and conditions come into force. If the Purchaser objects to the entry into force of such amended terms and conditions, the Purchaser shall notify Vacon thereof in writing within fourteen (14) days of the receipt of the amended terms and conditions. In that case the current terms and conditions shall continue to be applied to the Contract between Vacon and the Purchaser and, unless the Parties agree otherwise in writing, the Contract between the Parties shall terminate after thirty (30) days from the receipt of the Purchaser´s notification by Vacon.

VACON AT YOUR SERVICE

Vacon is driven by a passion to develop, manufacture and sell the best AC drives and inverters in the world — and to provide customers with efficient product life-cycle services. Our AC drives offer optimum process control and energy efficiency for electric motors. Vacon inverters play a key role when energy is produced from renewable sources. Vacon has production and R&D facilities in Europe, Asia and North America, and sales and service operations in nearly 90 countries.

VACON — TRULY GLOBAL



● Production and R&D ● Vacon PLC ■ Vacon own sales offices ■ Served by Vacon partner

MANUFACTURING
and R&D on 3 continents

VACON SALES AND SERVICE
in nearly 30 countries

SALES AND SERVICE PARTNERS
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