WE ARE DRIVES

VACON® NXP LIQUID COOLED

DRIVE CENTRE DC
Industrial Automation Systems Integrators

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www.drivecentre.ca

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 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.

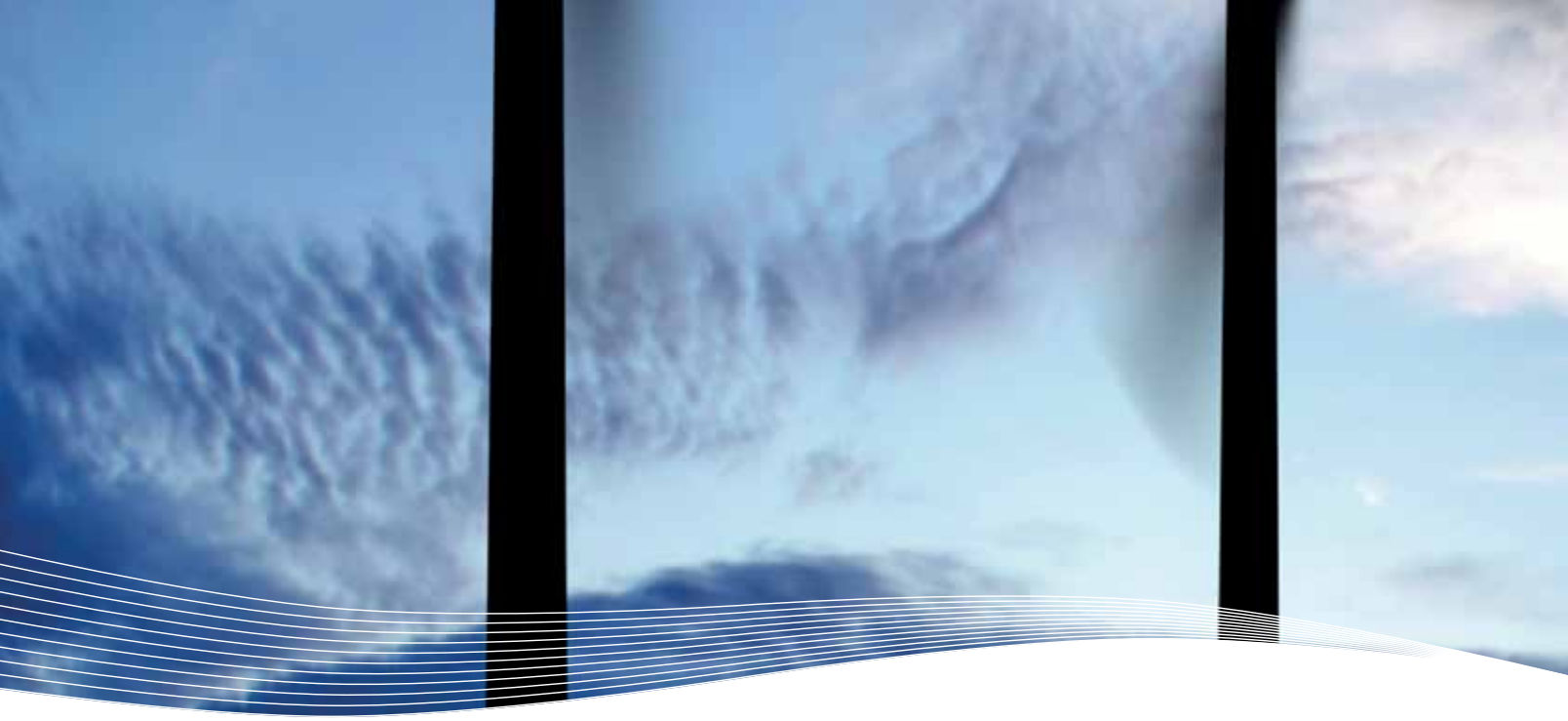
SAVING FUEL AT SEA

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 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.



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 switchgears 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 with 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.

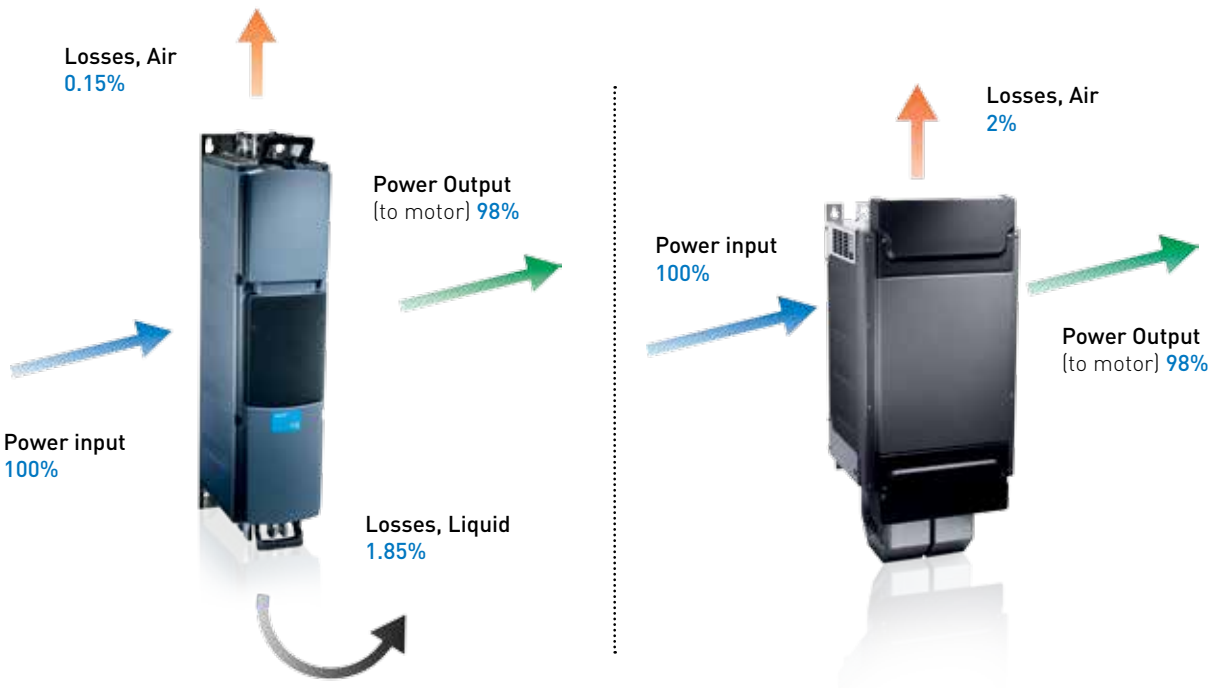
EXCLUSIVELY DESIGNED FOR LIQUID COOLING

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.

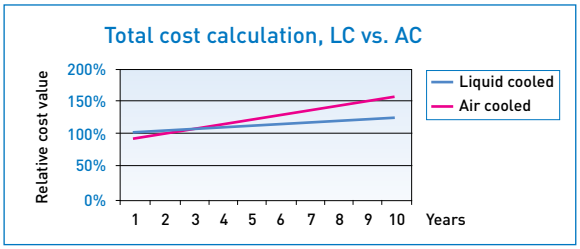
A DRIVING FORCE IN WIND ENERGY

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
- 70 % 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 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.

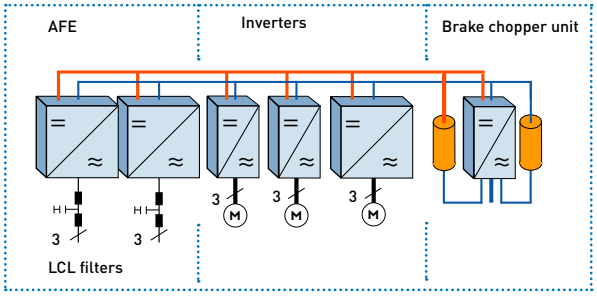
An internal brake chopper is available as standard for our smallest unit CH3. For CH72 (only 6-pulse) and CH74, it is available as internal option while in all other sizes the brake chopper is available as option and installed externally.

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.

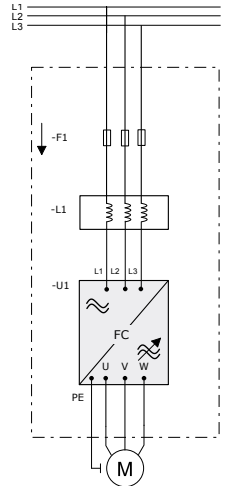
A regenerative common DC bus system



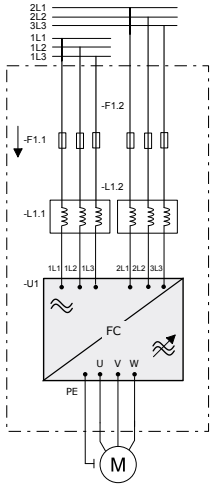
PURE PERFORMANCE

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 implemented in various applications across a wide spectrum of industries.

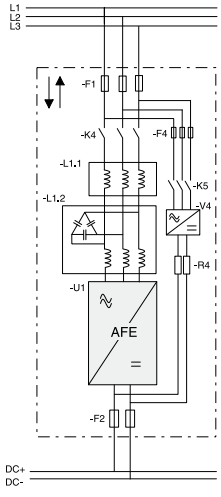
TYPICAL DEVICE CONFIGURATIONS



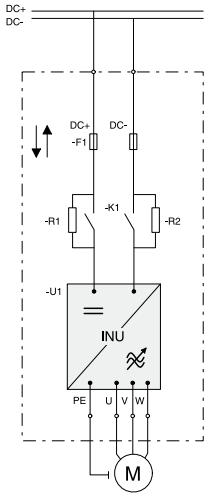
6-pulse frequency converter unit



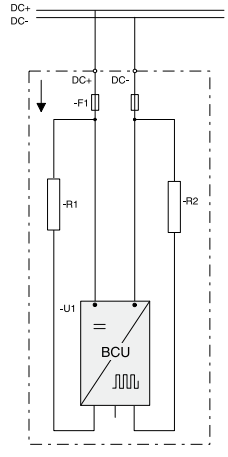
12-pulse frequency converter unit



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.

FUNCTIONAL SAFETY AND RELIABILITY

MARINE APPROVALS

With over 15 years of experience across a wide range of Marine & Offshore AC drives applications, Vacon 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.

VACON NXP LIQUID COOLED ENCLOSED DRIVE

Vacon also offers high power liquid cooled engineered drive packages. For example, a single NXP CH64 cabinet 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 cabinet 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 cabinet 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.

RATING AND DIMENSIONS

MAINS VOLTAGE 525-690 VAC

AC-Drive Type	Rated Current			Electrical Output Power		Chassis	Dimensions WxHxD W/O Cooling Skid [in]
	Thermal ITH [A]	Cont. I_L [A]	Cont. I_H [A]	Motor at I_{TH} (525 VAC) [kW]	Motor at I_{TH} (690 VAC) [kW]		
0820_6	820	745	547	560	800	Ch64	78.41 x 82.67* x 35.43
0920_6	920	836	613	650	850	Ch64	78.41 x 82.67* x 35.43
1030_6	1030	936	687	700	1000	Ch64	78.41 x 82.67* x 35.43
1180_6	1180	1073	787	800	1100	Ch64	78.41 x 82.67* x 35.43
1300_6	1300	1182	867	900	1200	Ch64	78.41 x 82.67* x 35.43
1500_6	1500	1364	1000	1000	1400	Ch64	78.41 x 82.67* x 35.43
1700_6	1700	1545	1133	1150	1550	Ch64	78.41 x 82.67* x 35.43

*IP54 (Type 12) +3.94in (H)

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 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

LIQUID TO LIQUID HEAT EXCHANGERS

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 drive's control 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 cabinet solutions
- Cooling circuit equipped with threaded joints or flanges
- Heavy industry PVC-C pipework, which is excellent as it is lightweight and prevents 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 cabinet
- 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
Cabinets	VEDA, Rittal	VEDA, Rittal	VEDA, Rittal	Rittal

* l = maximum distribution distance with specific DN diameter

VACON NXP LIQUID COOLED FREQUENCY CONVERTERS, 6-PULSE & 12-PULSE[1], MAINS VOLTAGE 400-500 VAC

AC drive type 6-pulse IP00			Drive output current			Motor shaft power		Power loss c/a/T*) [kW]	Chassis	Choke type 6-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]			
NXP	0016	5A0N1SWS	16	15	11	7.5	11	0.4/0.2/0.6	CH3	CHK0023N6A0
NXP	0022	5A0N1SWS	22	20	15	11	15	0.5/0.2/0.7		CHK0023N6A0
NXP	0031	5A0N1SWS	31	28	21	15	18.5	0.7/0.2/0.9		CHK0038N6A0
NXP	0038	5A0N1SWS	38	35	25	18.5	22	0.8/0.2/1.0		CHK0038N6A0
NXP	0045	5A0N1SWS	45	41	30	22	30	1.0/0.3/1.3		CHK0062N6A0
NXP	0061	5A0N1SWS	61	55	41	30	37	1.3/0.3/1.5		CHK0062N6A0
NXP	0072	5A0N1SWS	72	65	48	37	45	1.2/0.3/1.5	CH4	CHK0087N6A0
NXP	0087	5A0N1SWS	87	79	58	45	55	1.5/0.3/1.8		CHK0087N6A0
NXP	0105	5A0N1SWS	105	95	70	55	75	1.8/0.3/2.1		CHK0145N6A0
NXP	0140	5A0N1SWS	140	127	93	75	90	2.3/0.3/2.6		CHK0145N6A0
NXP	0168	5A0N1SWS	168	153	112	90	110	4.0/0.4/4.4	CH5	CHK0261N6A0
NXP	0205	5A0N1SWS	205	186	137	110	132	5.0/0.5/5.5		CHK0261N6A0
NXP	0261	5A0N1SWS	261	237	174	132	160	6.0/0.5/6.5		CHK0261N6A0
NXP	0300	5A0N0SWF	300	273	200	160	200	4.5/0.5/5.0	CH61	CHK0400N6A0
NXP	0385	5A0N0SWF	385	350	257	200	250	6.0/0.5/6.5		CHK0400N6A0
NXP	0460	5A0N0SWF	460	418	307	250	315	6.5/0.5/7.0	CH72	CHK0520N6A0
NXP	0520	5A0N0SWF	520	473	347	250	355	7.5/0.6/8.1		CHK0520N6A0
NXP	0590	5A0N0SWF	590	536	393	315	400	9.0/0.7/9.7		CHK0650N6A0
NXP	0650	5A0N0SWF	650	591	433	355	450	10.0/0.7/10.7		CHK0650N6A0
NXP	0730	5A0N0SWF	730	664	487	400	500	12.0/0.8/12.8		CHK0750N6A0
NXP	0820	5A0N0SWF	820	745	547	450	560	12.5/0.8/13.3	CH63	CHK0820N6A0
NXP	0920	5A0N0SWF	920	836	613	500	600	14.4/0.9/15.3		CHK1030N6A0
NXP	1030	5A0N0SWF	1030	936	687	560	700	16.5/1.0/17.5		CHK1030N6A0
NXP	1150	5A0N0SWF	1150	1045	766	600	750	18.5/1.2/19.7		CHK1150N6A0
NXP	1370	5A0N0SWF	1370	1245	913	700	900	19.0/1.2/20.2	CH74	3 x CHK0520N6A0
NXP	1640	5A0N0SWF	1640	1491	1093	900	1100	24.0/1.4/25.4		3 x CHK0650N6A0
NXP	2060	5A0N0SWF	2060	1873	1373	1100	1400	32.5/1.8/34.3		3 x CHK0750N6A0
NXP	2300	5A0N0SWF	2300	2091	1533	1250	1500	36.3/2.0/38.3		3 x CHK0820N6A0
NXP	2470	5A0N0SWF	2470	2245	1647	1300	1600	38.8/2.2/41.0	2 x CH74	6 x CHK0520N6A0
NXP	2950	5A0N0SWF	2950	2681	1967	1550	1950	46.3/2.6/48.9		6 x CHK0520N6A0
NXP	3710	5A0N0SWF	3710	3372	2473	1950	2450	58.2/3.0/61.2		6 x CHK0650N6A0
NXP	4140	5A0N0SWF	4140	3763	2760	2150	2700	65.0/3.6/68.6		6 x CHK0750N6A0
2 x NXP	2470	5A0N0SWF	4700	4300	3100	2450	3050	73.7/4.2/77.9	4 x CH74	12 x CHK0520N6A0
2 x NXP	2950	5A0N0SWF	5600	5100	3700	2900	3600	88/5/93		12 x CHK0520N6A0
2 x NXP	3710	5A0N0SWF	7000	6400	4700	3600	4500	110.6/5.7/116.3		12 x CHK0650N6A0
2 x NXP	4140	5A0N0SWF	7900	7200	5300	4100	5150	123.5/6.9/130.4		12 x CHK0750N6A0

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.

NOTE: Contact your local Vacon Sales Representative for more precise sizing and selection in all other cases.

***) 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.

[1]: Contact your local Vacon Sales Representative for inquiries about 12-pulse solutions.

VACON NXP LIQUID COOLED FREQUENCY CONVERTERS, 6-PULSE & 12-PULSE[1], MAINS VOLTAGE 525-690 VAC

AC drive type 6-pulse			Drive output current			Motor shaft power		Power loss c/a/T*) [kW]	Chassis	Choke type 6-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]			
NXP	0170	6A0T0SWF	170	155	113	110	160	5.5/0.2/5.7	CH61	CHK0261N6A0
NXP	0208	6A0T0SWF	208	189	139	132	200	6.5/0.3/6.8		CHK0261N6A0
NXP	0261	6A0T0SWF	261	237	174	160	250	6.5/0.3/6.8		CHK0261N6A0
NXP	0325	6A0T0SWF	325	295	217	200	300	7.5/0.4/7.9	CH72	CHK0400N6A0
NXP	0385	6A0T0SWF	385	350	257	250	355	9.0/0.5/9.5		CHK0400N6A0
NXP	0416	6A0T0SWF	416	378	277	250	355	9.4/0.5/9.9		CHK0520N6A0
NXP	0460	6A0T0SWF	460	418	307	300	400	10.0/0.5/10.5		CHK0520N6A0
NXP	0502	6A0T0SWF	502	456	335	355	450	12.0/0.6/12.6		CHK0520N6A0
NXP	0590	6A0T0SWF	590	536	393	400	560	13.0/0.7/13.7	CH63	CHK0650N6A0
NXP	0650	6A0T0SWF	650	591	433	450	600	16.0/0.8/16.8		CHK0650N6A0
NXP	0750	6A0T0SWF	750	682	500	500	700	18.0/0.9/18.9		CHK0750N6A0
NXP	0820	6A0T0SWF	820	745	547	560	800	19.0/1.0/20.0	CH74	3 x CHK0400N6A0
NXP	0920	6A0T0SWF	920	836	613	650	850	21.3/1.2/22.5		3 x CHK0400N6A0
NXP	1030	6A0T0SWF	1030	936	687	700	1000	22.0/1.1/23.1		3 x CHK0400N6A0
NXP	1180	6A0T0SWF	1180	1073	787	800	1100	25.0/1.3/26.3		3 x CHK0400N6A0
NXP	1300	6A0T0SWF	1300	1182	867	900	1200	31.0/1.6/32.6		3 x CHK0520N6A0
NXP	1500	6A0T0SWF	1500	1364	1000	1050	1400	38.0/1.9/39.9		3 x CHK0520N6A0
NXP	1700	6A0T0SWF	1700	1545	1133	1150	1550	38.0/1.9/39.9		3 x CHK0650N6A0
NXP	1850	6A0T0SWF	1850	1682	1233	1250	1650	39.6/2.0/41.6	2 x CH74	6 x CHK0400N6A0
NXP	2120	6A0T0SWF	2120	1927	1413	1450	1900	45.0/2.4/47.4		6 x CHK0400N6A0
NXP	2340	6A0T0SWF	2340	2127	1560	1600	2100	55.8/2.9/58.7		6 x CHK0400N6A0
NXP	2700	6A0T0SWF	2700	2455	1800	1850	2450	68.4/3.4/71.8		6 x CHK0520N6A0
NXP	3100	6A0T0SWF	3100	2818	2066	2150	2800	68.4/3.4/71.8		6 x CHK0520N6A0
2 x NXP	1850	6A0T0SWF	3500	3200	2300	2400	3150	75.2/3.8/79	4 x CH74	12 x CHK0400N6A0
2 x NXP	2120	6A0T0SWF	4000	3600	2700	2750	3600	85.5/4.6/90.1		12 x CHK0400N6A0
2 x NXP	2340	6A0T0SWF	4400	4000	2900	3050	3950	106/5.5/111.5		12 x CHK0400N6A0
2 x NXP	2700	6A0T0SWF	5100	4600	3400	3500	4600	130/6.5/136.5		12 x CHK0520N6A0
2 x NXP	3100	6A0T0SWF	5900	5400	3900	4050	5300	130/6.5/136.5		12 x CHK0520N6A0

[1]: Contact your local Vacon Sales Representative for inquiries about 12-pulse solutions.

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

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]		
NXP	0016	5A0T1IWS	16	15	11	7.5	11	0.4/0.2/0.6	CH3
NXP	0022	5A0T1IWS	22	20	15	11	15	0.5/0.2/0.7	
NXP	0031	5A0T1IWS	31	28	21	15	18.5	0.7/0.2/0.9	
NXP	0038	5A0T1IWS	38	35	25	18.5	22	0.8/0.2/1.0	
NXP	0045	5A0T1IWS	45	41	30	22	30	1.0/0.3/1.3	
NXP	0061	5A0T1IWS	61	55	41	30	37	1.3/0.3/1.5	
NXP	0072	5A0T0IWS	72	65	48	37	45	1.2/0.3/1.5	CH4
NXP	0087	5A0T0IWS	87	79	58	45	55	1.5/0.3/1.8	
NXP	0105	5A0T0IWS	105	95	70	55	75	1.8/0.3/2.1	
NXP	0140	5A0T0IWS	140	127	93	75	90	2.3/0.3/2.6	
NXP	0168	5A0T0IWS	168	153	112	90	110	2.5/0.3/2.8	CH5
NXP	0205	5A0T0IWS	205	186	137	110	132	3.0/0.4/3.4	
NXP	0261	5A0T0IWS	261	237	174	132	160	4.0/0.4/4.4	
NXP	0300	5A0T0IWF	300	273	200	160	200	4.5/0.4/4.9	CH61
NXP	0385	5A0T0IWF	385	350	257	200	250	5.5/0.5/6.0	
NXP	0460	5A0T0IWF	460	418	307	250	315	5.5/0.5/6.0	CH62
NXP	0520	5A0T0IWF	520	473	347	250	355	6.5/0.5/7.0	
NXP	0590	5A0T0IWF	590	536	393	315	400	7.5/0.6/8.1	
NXP	0650	5A0T0IWF	650	591	433	355	450	8.5/0.6/9.1	
NXP	0730	5A0T0IWF	730	664	487	400	500	10.0/0.7/10.7	
NXP	0820	5A0T0IWF	820	745	547	450	560	12.5/0.8/13.3	CH63
NXP	0920	5A0T0IWF	920	836	613	500	600	14.4/0.9/15.3	
NXP	1030	5A0T0IWF	1030	936	687	560	700	16.5/1.0/17.5	
NXP	1150	5A0T0IWF	1150	1045	766	600	750	18.4/1.1/19.5	
NXP	1370	5A0T0IWF	1370	1245	913	700	900	15.5/1.0/16.5	CH64
NXP	1640	5A0T0IWF	1640	1491	1093	900	1100	19.5/1.2/20.7	
NXP	2060	5A0T0IWF	2060	1873	1373	1100	1400	26.5/1.5/28.0	
NXP	2300	5A0T0IWF	2300	2091	1533	1250	1500	29.6/1.7/31.3	
NXP	2470	5A0T0IWF	2470	2245	1647	1300	1600	36.0/2.0/38.0	2 x CH64
NXP	2950	5A0T0IWF	2950	2681	1967	1550	1950	39.0/2.4/41.4	
NXP	3710	5A0T0IWF	3710	3372	2473	1950	2450	48.0/2.7/50.7	
NXP	4140	5A0T0IWF	4140	3763	2760	2150	2700	53.0/3.0/56.0	
2 x NXP	2470	5A0T0IWF	4700	4300	3100	2450	3050	69.1/3.9/73	4 x CH64
2 x NXP	2950	5A0T0IWF	5600	5100	3700	2900	3600	74.4/4.6/79	
2 x NXP	3710	5A0T0IWF	7000	6400	4700	3600	4500	90.8/5.2/96	
2 x NXP	4140	5A0T0IWF	7900	7200	5300	4100	5150	101.2/5.8/107	

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]		
NXP	0170	6A0T0IWF	170	155	113	110	160	4.5/0.2/4.7	
NXP	0208	6A0T0IWF	208	189	139	132	200	5.5/0.3/5.8	CH61
NXP	0261	6A0T0IWF	261	237	174	160	250	5.5/0.3/5.8	
NXP	0325	6A0T0IWF	325	295	217	200	300	6.5/0.3/6.8	
NXP	0385	6A0T0IWF	385	350	257	250	355	7.5/0.4/7.9	
NXP	0416	6A0T0IWF	416	378	277	250	355	8.0/0.4/8.4	CH62
NXP	0460	6A0T0IWF	460	418	307	300	400	8.5/0.4/8.9	
NXP	0502	6A0T0IWF	502	456	335	355	450	10.0/0.5/10.5	
NXP	0590	6A0T0IWF	590	536	393	400	560	10.0/0.5/10.5	
NXP	0650	6A0T0IWF	650	591	433	450	600	13.5/0.7/14.2	CH63
NXP	0750	6A0T0IWF	750	682	500	500	700	16.0/0.8/16.8	
NXP	0820	6A0T0IWF	820	745	547	560	800	16.0/0.8/16.8	
NXP	0920	6A0T0IWF	920	836	613	650	850	18.0/0.9/18.9	
NXP	1030	6A0T0IWF	1030	936	687	700	1000	19.0/1.0/20.0	
NXP	1180	6A0T0IWF	1180	1073	787	800	1100	21.0/1.1/22.1	CH64
NXP	1300	6A0T0IWF	1300	1182	867	900	1200	27.0/1.4/28.4	
NXP	1500	6A0T0IWF	1500	1364	1000	1050	1400	32.0/1.6/33.6	
NXP	1700	6A0T0IWF	1700	1545	1133	1150	1550	38.0/1.9/39.9	
NXP	1850	6A0T0IWF	1850	1682	1233	1250	1650	34.2/1.8/36.0	
NXP	2120	6A0T0IWF	2120	1927	1413	1450	1900	37.8/2.0/39.8	
NXP	2340	6A0T0IWF	2340	2127	1560	1600	2100	48.6/2.5/51.1	2 x CH64
NXP	2700	6A0T0IWF	2700	2455	1800	1850	2450	57.6/3.0/60.6	
NXP	3100	6A0T0IWF	3100	2818	2066	2150	2800	68.4/3.4/71.8	
2 x NXP	1850	6A0T0IWF	3500	3200	2300	2400	3150	75.2/3.8/79	
2 x NXP	2120	6A0T0IWF	4000	3600	2700	2750	3600	85.5/4.6/90.1	
2 x NXP	2340	6A0T0IWF	4400	4000	2900	3050	3950	106/5.5/111.5	4 x CH64
2 x NXP	2700	6A0T0IWF	5100	4600	3400	3500	4600	130/6.5/136.5	
2 x NXP	3100	6A0T0IWF	5900	5400	3900	4050	5300	130/6.5/136.5	

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

VACON NXA LIQUID COOLED ACTIVE FRONT-END, DC BUS VOLTAGE 465-800 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]	400 VAC mains I_{th} (kW)	500 VAC mains I_{th} (kW)	400 VAC mains I_L (kW)	500 VAC mains I_L (kW)		
NXA	0168	5A0T02WS	168	153	112	113	142	103	129	2.5/0.3/2.8	CH5
NXA	0205	5A0T02WS	205	186	137	138	173	125	157	3.0/0.4/3.4	
NXA	0261	5A0T02WS	261	237	174	176	220	160	200	4.0/0.4/4.4	
NXA	0300	5A0T02WF	300	273	200	202	253	184	230	4.5/0.4/4.9	CH61
NXA	0385	5A0T02WF	385	350	257	259	324	236	295	5.5/0.5/6.0	
NXA	0460	5A0T02WF	460	418	307	310	388	282	352	5.5/0.5/6.0	CH62
NXA	0520	5A0T02WF	520	473	347	350	438	319	398	6.5/0.5/7.0	
NXA	0590	5A0T02WF	590	536	393	398	497	361	452	7.5/0.6/8.1	
NXA	0650	5A0T02WF	650	591	433	438	548	398	498	8.5/0.6/9.1	
NXA	0730	5A0T02WF	730	664	487	492	615	448	559	10.0/0.7/10.7	
NXA	0820	5A0T02WF	820	745	547	553	691	502	628	10.0/0.7/10.7	CH63
NXA	0920	5A0T02WF	920	836	613	620	775	563	704	12.4/0.8/12.4	
NXA	1030	5A0T02WF	1030	936	687	694	868	631	789	13.5/0.9/14.4	
NXA	1150	5A0T02WF	1150	1045	767	775	969	704	880	16.0/1.0/17.0	
NXA	1370	5A0T02WF	1370	1245	913	923	1154	839	1049	15.5/1.0/16.5	CH64
NXA	1640	5A0T02WF	1640	1491	1093	1105	1382	1005	1256	19.5/1.2/20.7	
NXA	2060	5A0T02WF	2060	1873	1373	1388	1736	1262	1578	26.5/1.5/28.0	
NXA	2300	5A0T02WF	2300	2091	1533	1550	1938	1409	1762	29.6/1.7/31.3	

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)		
NXA	0170	6A0T02WF	170	155	113	150	198	137	180	4.5/0.2/4.7	CH61
NXA	0208	6A0T02WF	208	189	139	184	242	167	220	5.5/0.3/5.8	
NXA	0261	6A0T02WF	261	237	174	231	303	210	276	5.5/0.3/5.8	
NXA	0325	6A0T02WF	325	295	217	287	378	261	343	6.5/0.3/6.8	CH62
NXA	0385	6A0T02WF	385	350	257	341	448	310	407	7.5/0.4/7.9	
NXA	0416	6A0T02WF	416	378	277	368	484	334	439	8.1/0.4/8.4	
NXA	0460	6A0T02WF	460	418	307	407	535	370	486	8.5/0.4/8.9	
NXA	0502	6A0T02WF	502	456	335	444	584	403	530	10.0/0.5/10.5	
NXA	0590	6A0T02WF	590	536	393	522	686	474	623	10.0/0.5/10.5	CH63
NXA	0650	6A0T02WF	650	591	433	575	756	523	687	13.5/0.7/14.2	
NXA	0750	6A0T02WF	750	682	500	663	872	603	793	16.0/0.8/16.8	
NXA	0820	6A0T02WF	820	745	547	725	953	659	866	16.0/0.8/16.8	CH64
NXA	0920	6A0T02WF	920	836	613	814	1070	740	972	17.8/1.0/18.4	
NXA	1030	6A0T02WF	1030	936	687	911	1197	828	1088	19.0/1.0/20.0	
NXA	1180	6A0T02WF	1180	1073	787	1044	1372	949	1247	21.0/1.1/22.1	
NXA	1300	6A0T02WF	1300	1182	867	1150	1511	1046	1374	27.0/1.4/28.4	
NXA	1500	6A0T02WF	1500	1364	1000	1327	1744	1207	1586	32.0/1.6/33.6	
NXA	1700	6A0T02WF	1700	1545	1133	1504	1976	1367	1796	38.0/1.9/39.9	

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

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]		
NXB	0031	5A0T08WS	2*31	25.7	19.5	62	49	37	0.7/0.2/0.9	CH3
NXB	0061	5A0T08WS	2*61	13.1	9.9	122	97	73	1.3/0.3/1.5	
NXB	0087	5A0T08WS	2*87	9.2	7.0	174	138	105	1.5/0.3/1.8	CH4
NXB	0105	5A0T08WS	2*105	7.6	5.8	210	167	127	1.8/0.3/2.1	
NXB	0140	5A0T08WS	2*140	5.7	4.3	280	223	169	2.3/0.3/2.6	
NXB	0168	5A0T08WS	2*168	4.7	3.6	336	267	203	2.5/0.3/2.8	CH5
NXB	0205	5A0T08WS	2*205	3.9	3.0	410	326	248	3.0/0.4/3.4	
NXB	0261	5A0T08WS	2*261	3.1	2.3	522	415	316	4.0/0.4/4.4	
NXB	0300	5A0T08WF	2*300	2.7	2.0	600	477	363	4.5/0.4/4.9	CH61
NXB	0385	5A0T08WF	2*385	2.1	1.6	770	613	466	5.5/0.5/6.0	
NXB	0460	5A0T08WF	2*460	1.7	1.3	920	732	556	5.5/0.5/6.0	CH62
NXB	0520	5A0T08WF	2*520	1.5	1.2	1040	828	629	6.5/0.5/7.0	
NXB	0590	5A0T08WF	2*590	1.4	1.1	1180	939	714	7.5/0.6/8.1	
NXB	0650	5A0T08WF	2*650	1.2	1.0	1300	1035	786	8.5/0.6/9.1	
NXB	0730	5A0T08WF	2*730	1.1	0.9	1460	1162	833	10.0/0.7/10.7	

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]		
NXB	0170	6A0T08WF	2*170	6.5	4.9	340	372	282	4.5/0.2/4.7	CH61
NXB	0208	6A0T08WF	2*208	5.3	4	416	456	346	5.5/0.3/5.8	
NXB	0261	6A0T08WF	2*261	4.2	3.2	522	572	435	5.5/0.3/5.8	
NXB	0325	6A0T08WF	2*325	3.4	2.6	650	713	542	6.5/0.3/6.8	CH62
NXB	0385	6A0T08WF	2*385	2.9	2.2	770	845	643	7.5/0.4/7.9	
NXB	0416	6A0T08WF	2*416	2.6	2	832	913	693	8.1/0.4/8.4	
NXB	0460	6A0T08WF	2*460	2.4	1.8	920	1010	767	8.5/0.4/8.9	
NXB	0502	6A0T08WF	2*502	2.2	1.7	1004	1100	838	10.0/0.5/10.5	

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 NX OPTIONS 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 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

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

1) Only 6 pulse drives

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.

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

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/Open Frame 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/ 40 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**