ENGINEERING
TOMORROW

Selection Guide | VACON® 20 | VACON® 20 Cold Plate | 1/3 HP to 25 HP

Flexible and **easy to use** compact AC drives

FAST
set-up and installation

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VACON® 20 – possibilities and performance

The 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 the 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

The VACON® 20 is available in all common voltages in the range of 105-600 V. Combined with a wide power range up to 18.5 kW /25 HP. The 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 the VACON® 20 we have done our best to cut cycle times and maximize the control performance of the drive. The built-in RS485 interface offers a cost effective and simple serial control interface for the drive. With optional modules, the VACON® 20 can be connected to almost any fieldbus system including CANOpen, DeviceNet and PROFIBUS DP.

Fast installation and set-up

The 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 the 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

Typical applications:

- Pumps and fans
- Conveyors
- Packaging, processing and washing machines

Technical highlights:

- Wide power range up to 18.5 kW/25 HP
- High performance and functionality
- Full I/O + option board support
- Fast installation and setup
- Built-in choke as option in ≥16A types
- Induction and permanent magnet (PM) motor support

Ratings and dimensions

Supply voltage	AC drive type	Power		Motor current		Enclosure size	Dimensions W x H x D		Weight	
		kW	HP	I_N [A]	1.5 x I_N [A]		mm	inches	kg	lb
105-120 VAC, 1-phase (North America only)	**VACON0020-1L-0001-1-R02**	0.25	0.35	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-R02	0.37	0.5	2.4	3.6					
	VACON0020-1L-0003-1-R02	0.55	0.75	2.8	4.2					
	VACON0020-1L-0004-1-R02	0.75	1	3.7	5.6					
	VACON0020-1L-0005-1-R02	1.1	1.5	4.8	7.2	MI3	100 x 255 x 109	3.94 x 10.04 x 4.29	1.0	2.18
208-240 VAC, 1-phase	**VACON0020-1L-0001-2-R02**	0.25	0.35	1.7	2.6	MI1	66 x 160 x 98	2.60 x 6.30 x 3.90	0.5	1.21
	VACON0020-1L-0002-2-R02	0.37	0.5	2.4	3.6					
	VACON0020-1L-0003-2-R02	0.55	0.75	2.8	4.2					
	VACON0020-1L-0004-2-R02	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-R02	1.1	1.5	4.8	7.2					
	VACON0020-1L-0007-2-R02	1.5	2	7	10.5					
	VACON0020-1L-0009-2-R02	2.2	3	9.6	14.4	MI3	100 x 255 x 109	3.94 x 10.04 x 4.29	1.0	2.18
208-240 VAC, 3-phase	**VACON0020-3L-0001-2-R02**	0.25	0.35	1.7	2.6	MI1	66 x 160 x 98	2.60 x 6.30 x 3.90	0.5	1.21
	VACON0020-3L-0002-2-R02	0.37	0.5	2.4	3.6					
	VACON0020-3L-0003-2-R02	0.55	0.75	2.8	4.2					
	VACON0020-3L-0004-2-R02	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-R02	1.1	1.5	4.8	7.2					
	VACON0020-3L-0007-2-R02	1.5	2	7	10.5					
	VACON0020-3L-0011-2-R02	2.2	3	11	16.5	MI3	100 x 255 x 109	3.94 x 10.04 x 4.29	1.0	2.18
	VACON0020-3L-0012-2-R02	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-R02	4	5	17.5	26.3					
	VACON0020-3L-0025-2-R02	5.5	7.5	25	37.5					
	VACON0020-3L-0031-2-R02	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-R02	11	15	38	57					
380-480 VAC, 3-phase	**VACON0020-3L-0001-4-R02**	0.37	0.5	1.3	2.0	MI1	66 x 160 x 98	2.60 x 6.30 x 3.90	0.5	1.21
	VACON0020-3L-0002-4-R02	0.55	0.75	1.9	2.9					
	VACON0020-3L-0003-4-R02	0.75	1	2.4	3.6					
	VACON0020-3L-0004-4-R02	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-R02	1.5	2	4.3	6.5					
	VACON0020-3L-0006-4-R02	2.2	3	5.6	8.4					
	VACON0020-3L-0008-4-R02	3	4	7.6	11.4	MI3	100 x 255 x 109	3.94 x 10.04 x 4.29	1.0	2.18
	VACON0020-3L-0009-4-R02	4	5	9	13.5					
	VACON0020-3L-0012-4-R02	5.5	7.5	12	18.0					
	VACON0020-3L-0016-4-R02	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-R02	11	15	23	34.5					
	VACON0020-3L-0031-4-R02	15	20	31	46.5	MI5	165 x 414 x 202	6.5 x 16.3 x 8	10	22
	VACON0020-3L-0038-4-R02	18.5	25	38	57					
520-600 VAC, 3-phase (North America only)	**VACON0020-3L-0002-7-R02**	0.75	1	1.7	2.6	MI3	100 x 255 x 109	3.94 x 10.04 x 4.29	1.0	2.18
	VACON0020-3L-0003-7-R02	1.5	2	2.7	4.1					
	VACON0020-3L-0004-7-R02	2.2	3	3.9	5.9					
	VACON0020-3L-0006-7-R02	4	5	6.1	9.2					
	VACON0020-3L-0009-7-R02	5.5	7.5	9	13.5					

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.
The 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. The 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. The 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

The VACON® 20 Cold Plate utilizes the advanced control concept of the 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

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 according to SIL3
- High performance and functionality
- High ambient temperature rating up to 70 °C
- Induction and permanent magnet (PM) motor
- Integrated brake resistor for MS2 frame size
- Status LED lights on drive
- Expansion slot for I/O or fieldbus
- Handheld text keypad with copy function
- Single plug I/O connector for OEMs

Ratings and dimensions

Supply voltage	AC drive type	Power		Motor current		Enclosure 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, 1-phase	VACON0020-1L-0004-2-CP	0.75	1	3.7	5.6	MS2	133 x 164.5 x 79.5	5.23 x 6.43 x 3.13	2	4.4
	VACON0020-1L-0005-2-CP	1.1	1.5	4.8	7.2					
	VACON0020-1L-0007-2-CP	1.5	2	7	10.5					
208-240 VAC, 3-phase	VACON0020-3L-0004-2-CP	0.75	1	3.7	5.6	MS2	133 x 164.5 x 79.5	5.23 x 6.43 x 3.13	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	10.5					
	VACON0020-3L-0011-2-CP	2.2	3	11	16.5	MS3	161 x 246 x 83	6.34 x 9.69 x 3.27	3	6.6
	VACON0020-3L-0012-2-CP	3	4	12	18.0					
	VACON0020-3L-0017-2-CP	4	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 164.5 x 79.5	5.23 x 6.43 x 3.13	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	5	7.6	11.4					
	VACON0020-3L-0009-4-CP	4	6	9.0	13.5	MS3	161 x 246 x 83	6.34 x 9.69 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					

Tailoring the software

VACON® Programming

The 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® 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

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

MCA adapter

I/O Configuration

Terminal		Description	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*	■	■
5	GND		■	■
6	24 V_{out}	Max. 50 mA / CP 100 mA	■	■
7	GND/DIC*		■	■
8	DI1	0-+30 V R_i = 12 kΩ Cold Plate R_i = 4 kΩ	■	■
9	DI2		■	■
10	DI3		■	■
13	DOC	Digital output common	■	■
14	DI4	0-+30 V R_i = 12 kΩ Cold Plate R_i = 4 kΩ	■	■
15	DI5		■	■
16	DI6		■	■
18	AO	Analogue output	0-10V / 0(4)-20mA*	0-10V
20	DO	Open collector, max. load 48 V/50 mA	■	■
22	RO 13 - CM	Relay output 1	■	■
23	RO 14 - NO		■	■
24	RO 22 - NC	Relay output 2	■	■
25	RO 21 - CM		■	■
26	RO 24 - NO		■	■
A	A - RS485	Modbus RTU	■	■
B	B - RS485	Modbus RTU	■	■
	STO	Inputs S1, G1, S2, G2 Feedback F+/F-		■

* Selectable

Option board mounting kit

Keypad door mounting kit

IP21/NEMA1 kit

Type code key

VACON 0020	–	3L	–	0009	–	4	–	CP	–	R02	+	OPTION CODES
Product		Input phase		Curent rating		Voltage rating		Version		Regional Modifi-cation		+ Options

Technical data

Mains connection	Input voltage U_{in}	105...120 V, -15 %...+10 % 1-phase (not for VACON 20CP) 208...240 V, -15 %...+10 % 1-phase 208...240 V, -15 %...+10 % 3-phase 380...480 V, -15 %...+10 % 3-phase 520...600 V, -15 %...+10 % 3-phase (not for VACON 20CP)
	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 105...120 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, (520...600 V model default 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 (not needed for VACON 20CP) 380-480 V: EMC level C2: with an internal +EMC2 option (not needed for VACON 20CP)
Approvals	EN61800, C-Tick, Gost R, CB, CE, UL, cUL, KC (not all versions, see unit nameplate for more detailed approvals)	

Separately delivered options code	Description	Suitability	
		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	■	
ENC-QPES-MIx-10	10pcs PE kit MI1-MI5. x=1,2,3,4,5	■	
VACON-ADP-MCAA	MCA RS422 adapter w/ parameter copy	■	
CAB-USB/RS-485	USB to RS485 cable for PC	■	■
VACON-ADP-MCAA-KIT	Kit with VACON-ADP-MCAA and CAB-USB/RS485	■	
VACON-ADP-PASSIVE	Passive RS422 adapter	■	
VACON-PAN-HMDR-TMX-MC03	VACON® 20 door mounting kit with text keypad and VACON-ADP-PASSIVE	■	
CAB-RJ45P-2M	2m RJ45 cable for door mounting kit	■	
CAB-RJ45P-3M	3m RJ45 cable for door mounting kit	■	
CAB-RJ45P-6M	6m RJ45 cable for door mounting kit	■	
CAB-RJ45P-15M	15m RJ45 cable for door mounting kit	■	
VACON-PAN-HMDR-TMX-MC03-2M	VACON® 20 door mounting kit with VACON-PAN-HMDR-TMX-MC03 and CAB-RJ45P-2M	■	
VACON-PAN-HMDR-TMX-MC03-3M	VACON® 20 door mounting kit with VACON-PAN-HMDR-TMX-MC03 and CAB-RJ45P-3M	■	
VACON-PAN-HMDR-TMX-MC03-6M	VACON® 20 door mounting kit with VACON-PAN-HMDR-TMX-MC03 and CAB-RJ45P-6M	■	
VACON-PAN-HMDR-TMX-MC03-15M	VACON® 20 door mounting kit with VACON-PAN-HMDR-TMX-MC03 and CAB-RJ45P-15M	■	
CAB-HMI2M-MC05-X	MC05 IP66 HMI cable l=2m for -X keypads option		■
CAB-HMI5M-MC05-X	MC05 IP66 HMI cable l=5m for -X keypads option		■
VACON-PAN-HMDR-MC03	Complete IP54 keypad door kit+3m cable+adapater	■	■
VACON-PAN-HMTX-MC06-CP	Handheld/magnetic fixing IP66 text keypad w/ cable, l=1m/39,37 inches	■	■
PAN-HMWM-MK02	Keypad wall-mounting kit	■	■

Option boards	Description
I/O boards D- and E-slot compatible	
OPT-B1-V	6 x DI / DO, programmable
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	1x RO, 5x DI (42-240VAC)
OPT-BF-V	1 x AO, 1 x DO, 1 x RO
OPT-BH-V	3 x temp sensors (PT100, PT1000, NI1000, KTY84-130, KTY84-150, KTY84-131)
OPT-BK-V	AS-interface option board
Fieldbus boards	
OPT-E3-V	PROFIBUS DP, screw terminals
OPT-E5-V	PROFIBUS DP, sub-D9 connector
OPT-E6-V	CANopen
OPT-E7-V	DeviceNet
OPT-E9-V	2-port Ethernet (Modbus TCP, PROFINET RT)
OPT-EC-V	EtherCAT
OPT-C3-V	PROFIBUS DP
OPT-C5-V	PROFIBUS DP (D9 type connector)
OPT-C6-V	CANopen
OPT-C7-V	DeviceNet
OPT-CI-V	Modbus TCP/IP
OPT-CJ-V	BACnet MS/TP
OPT-CP-V	PROFINET I/O
OPT-CQ-V	EtherNet/IP

Factory installed options code	Description	Suitability	
		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		■
+LS60	60 Hz defaults on motor control	■	■
Application software			
=+A1051	VACON® 20 PFC Application	■	■

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A better tomorrow is **driven by drives**

Danfoss Drives is a world leader in variable speed control of electric motors.
We offer you unparalleled competitive edge through quality, application-optimized products and a comprehensive range of product lifecycle services.

You can rely on us to share your goals. Striving for the best possible performance in your applications is our focus. We achieve this by providing the innovative products and application know-how required to optimize efficiency, enhance usability, and reduce complexity.

From supplying individual drive components to planning and delivering complete drive systems; our experts are ready to support you all the way.

You will find it easy to do business with us. Online, and locally in more than 50 countries, our experts are never far away, reacting fast when you need them.

You gain the benefit of decades of experience, since 1968. Our low voltage and medium voltage AC drives are used with all major motor brands and technologies in power sizes from small to large.

VACON® drives combine innovation and high durability for the sustainable industries of tomorrow.

For long lifetime, top performance, and full-throttle process throughput, equip your demanding process industries and marine applications with VACON® single or system drives.

- Marine and Offshore
- Oil and Gas
- Metals
- Mining and Minerals
- Pulp and Paper
- Energy
- Elevators and Escalators
- Chemical
- Other heavy-duty industries

VLT® drives play a key role in rapid urbanization through an uninterrupted cold chain, fresh food supply, building comfort, clean water and environmental protection.

Outmaneuvering other precision drives, they excel, with remarkable fit, functionality and diverse connectivity.

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- Water and Wastewater
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- Material Handling
- Textile

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Danfoss Drives, 4401 N. Bell School Rd., Loves Park, IL 61111, Tel. +1 800 432-6367, +1 815 639-8600, Fax +1 815 639-8000
Danfoss Drives, 8800 W. Bradley Rd., Milwaukee, WI 53224, Tel. +1 800 621-8806, +1 414 355-8800, Fax +1 414 355-6117
Danfoss Drives, 1100 South Service Road – Unit 116, Stoney Creek, ON L8E 0C5, Tel. +1 800 432-6367, +1 905 643-5401, Fax +1 905 643-0400
www.danfossdrives.com, E-mail: salesinformation@danfoss.com

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