Flexible and easy to use compact AC drives

FAST
set-up and installation
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

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>AC drive type</th>
<th>Power</th>
<th>Motor current</th>
<th>Enclosure size</th>
<th>Dimensions W x H x D</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>105-120 VAC, 1-phase (North America only)</td>
<td>VACON0020-1L-0001-1-R02</td>
<td>0.25</td>
<td>0.35</td>
<td>1.7</td>
<td>MI2</td>
<td>90 x 195 x 102</td>
</tr>
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<td>105-120 VAC, 1-phase (North America only)</td>
<td>VACON0020-1L-0002-1-R02</td>
<td>0.37</td>
<td>0.5</td>
<td>2.4</td>
<td>MI3</td>
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<td>1.7</td>
<td>MI1</td>
<td>66 x 160 x 98</td>
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<tr>
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<td>208-240 VAC, 3-phase</td>
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</table>
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

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<th>Power</th>
<th>Motor current</th>
<th>Enclosure size</th>
<th>Dimensions W x H x D</th>
<th>Weight</th>
</tr>
</thead>
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<td>208-240 VAC, 1-phase</td>
<td>VACON0020-1L-0004-2-CP</td>
<td>0.75 kW</td>
<td>1 HP</td>
<td>3.7 A</td>
<td>MS2</td>
<td>133 x 164.5 x 79.5</td>
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<tr>
<td>VACON0020-1L-0005-2-CP</td>
<td>1.1 kW</td>
<td>1.5 HP</td>
<td>4.8 A</td>
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<td>2.4 A</td>
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<td>10 HP</td>
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</table>
Tailoring the software

VACON® Programming
The VACON® 20 product’s built-in PLC functionality and programming is in accordance with IEC61131-3. 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.

I/O Configuration

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
<th>VACON® 20</th>
<th>VACON® 20 CP</th>
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<td>1</td>
<td>0+10 Vref</td>
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<td>2</td>
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<td>0-10V</td>
<td>0-10V / 0(4)-20mA*</td>
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<td>3</td>
<td>GND</td>
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<td>4</td>
<td>A12</td>
<td>0-10V / 0(4)-20mA*</td>
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<td>24 Vaux</td>
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<td>GND/DIC*</td>
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<td>DI1</td>
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<td>Cold Plate R = 4 kΩ</td>
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<td>9</td>
<td>DI2</td>
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<tr>
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<td>DOC</td>
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<td>15</td>
<td>DI5</td>
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<td>Cold Plate R = 4 kΩ</td>
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<td>DI6</td>
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<tr>
<td>18</td>
<td>AO</td>
<td>Analogue output</td>
<td>0-10V / 0(4)-20mA*</td>
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<td>20</td>
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<td>RO13-OM</td>
<td>Relay output 1</td>
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<td>RO14-NO</td>
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<td>RO22-NC</td>
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<td>Modbus RTU</td>
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<td>STO</td>
<td>Inputs S1, G1, S2, G2 Feedback F+/F-</td>
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</tbody>
</table>

* Selectable

Type code key

VACON 0020 – 3L – 0009 – 4 – CP – R02 + OPTION CODES

+ Options

IP21/NEMA1 kit

MCA adapter

Option board mounting kit

Keypad door mounting kit

IP21/NEMA1 kit
### Technical data

#### Mains connection
- **Input voltage**  
  - U<sub>in</sub>  
  - 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** 2 x U<sub>in</sub> with 105...120 V drives
- **Output current**  
  - Continuous rated current IN at rated ambient temperature  
  - Overload 1.5 x IN max. 1 min/10 min
- **Starting current** 2 x IN 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 TN with brake chopper in 3-phase version sizes MS2-3, MI2-5  
  - 30 % x TN with DC-braking. Dynamic flux braking available in all types

#### Ambient conditions
- **Ambient operating temperature** –10 °C (no frost)...+50 °C: rated loadability IN (1L-0009-2, 3L-0007-2, 3L-0011-2 and with options ENC-IP21-MIx and ENC-IN01-MIx ambient max +40 °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 models** -10 °C...+70 °C
- **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
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Suitability</th>
</tr>
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<tbody>
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<td>ENC-SLOT-MC03-13</td>
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<td>VACON® 20</td>
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<tr>
<td>ENC-SLOT-MC03-45</td>
<td>Option board mounting kit VACON® 20 MI4-MI5</td>
<td>VACON® 20</td>
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<tr>
<td>ENC-IP21-Mix</td>
<td>IP21 cover MI1-MI3</td>
<td>VACON® 20</td>
</tr>
<tr>
<td>ENC-IP63-Mix</td>
<td>NEMA 1 Kit MI1-MI3</td>
<td>VACON® 20CP</td>
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<tr>
<td>ENC-QPES-Mix-10</td>
<td>10pcs PE kit MI1-MI3</td>
<td>VACON® 20</td>
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<tr>
<td>VACON-ADP-MCAA</td>
<td>MCA RS422 adapter w/ parameter copy</td>
<td>VACON® 20CP</td>
</tr>
<tr>
<td>CAB-USB-RS-485</td>
<td>USB to RS485 cable for PC</td>
<td>VACON® 20CP</td>
</tr>
<tr>
<td>VACON-ADP-MCAA-KIT</td>
<td>Kit with VACON-ADP-MCAA and CAB-USB/RS485</td>
<td>VACON® 20CP</td>
</tr>
<tr>
<td>VACON-ADP-PASSIVE</td>
<td>Passive RS422 adapter</td>
<td>VACON® 20CP</td>
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<tr>
<td>VACON-ADP-MCAA</td>
<td>VACON® 20 door mounting kit with text keypad and VACON-ADP-PASSIVE</td>
<td>VACON® 20CP</td>
</tr>
<tr>
<td>CAB-RJ45P-2M</td>
<td>2m R45 cable for door mounting kit</td>
<td>VACON® 20CP</td>
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<td>CAB-RJ45P-3M</td>
<td>3m R45 cable for door mounting kit</td>
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<td>CAB-RJ45P-6M</td>
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<td>VACON® 20CP</td>
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<td>VACON® 20CP</td>
</tr>
</tbody>
</table>

#### I/O boards (D- and E-slot compatible)
- **OPT-B1-V**  
  - 6 x DI / DO, programmable
- **OPT-B2-V**  
  - 2 x relay output + thermostat
- **OPT-B4-V**  
  - 1 x AO, 2 x AO (isolated)
- **OPT-B5-V**  
  - 3 x relay output
- **OPT-B9-V**  
  - 1 x 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, NTC100, KTY84-130, KTY84-150, KTY84-131)
- **OPT-BK-V**  
  - AS-interface option board

#### DeviceNet boards
- **OPT-AD2-V**  
  - PROFIBUS-DP, screw terminals
- **OPT-AE2-V**  
  - PROFIBUS-DP, sub-D9 connector
- **OPT-AF2-V**  
  - CANopen
- **OPT-AJ2-V**  
  - DeviceNet
- **OPT-AJ3-V**  
  - DeviceNet
- **OPT-AJ4-V**  
  - Modbus TCP/IP
- **OPT-AJ5-V**  
  - BACnet MS/TP
- **OPT-AJ6-V**  
  - PROFINET I/O
- **OPT-AJ7-V**  
  - EtherCAT

#### Fieldbus boards
- **OPT-AJ8-V**  
  - DeviceNet
- **OPT-AJ9-V**  
  - DeviceNet
- **OPT-AJ10-V**  
  - Modbus TCP/IP
- **OPT-AJ11-V**  
  - BACnet MS/TP
- **OPT-AJ12-V**  
  - PROFNET I/O
- **OPT-AJ13-V**  
  - EtherCAT
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