**IoT / Industry 4.0 Ready**

The high performance TOSHIBA VF-AS3 achieves high speed/real time network communication via embedded Ethernet without any optional devices, ready to meet the requirement of modern automation with IoT and Industry 4.0. Also, VF-AS3 with TOSHIBA excellent motor control technology and hardware design helps for all your applications.

**High-performance Drive**

**TOSVERT VF-AS3**

**Variable Speed Drive for Industry**

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**IoT / Industry 4.0 Ready**

**Compatible with**

the World's Main Standards

(EC Directive(CE marking), UL, CSA)

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**Voltage class**

- 3ph-240V class (IP20/IP00)
- 3ph-480V class (IP20/IP00)
- 3ph-480V class (IP55)

**Applicable motor capacity (kW)**:

- **HD**: 0.4 0.75 1.5 2.2 4.0 5.5 7.5 11 15 18.5 22 30 37 45 55 75 90 110 132 160 200 220 280

- **ND**: 0.75 1.5 2.2 4.0 5.5 7.5 11 15 18.5 22 30 37 45 55 75 90 110 132 220 250 280 315

**Frame size**:

- A1 A2 A3 A4 A5 A6
- A1 A2 A3 A4 A5 A6 A7 A8
- A1E A2E A3E A4E A5E

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* A1 to A8 and A1E to A5E show three sizes of the drives

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Built-in Dual Ethernet Port
The VF-AS3 has an embedded Ethernet dual port adaptor that can be used in the following Modbus TCP and EtherNet/IP. The adaptor provides a set of services at the Ethernet and TCP/IP level.
The dual Ethernet port adaptor offers an embedded Web server which offers comfortable displaying and commissioning functions directly from a standard web browser.
The VF-AS3 supports the following Automatic IP address assignment via BOOTP and DHCP and Diagnostics and configuration via integrated Web server.

Web Server
The VF-AS3 has an embedded Web Server function, and it can be easily accessed and manage the operating condition remotely from your PC or Smart Phone/tablet devices. It can be monitored by standard web browser without any special software.
The widgets can be customized easily. The integrated web server is ideally suited for applications in which no special software or version dependencies are desired.
The product supports the following functions on Web server:
• Drive monitor
• Drive parameters read/write
• Trip history viewer
• Network parameter setting
• Administration function
• TCP/IP statistics monitor

Remote Sensor Monitoring
The sensor which is equipped in the machine and equipment, can be connected with VF-AS3 and the status can be monitored by network communication.

IoT Systems Solution
-Ideal for Plant & Process Control Application
The VF-AS3 can be connected with various devices through local area network, wireless network, and the Internet. It achieves data collection to know operational status and analyze system failure.
This IoT-Ready function increase productivity and reduce total cost.

QR Code®
For the advanced information and the event of drive fault, VF-AS3 displays the QR Code®(*1), which will provide immediate access to a dedicated web link for support and maintenance.

Video Guidance
For the installation, setup and maintenance, the video guidance is available with web support.

Real Time Clock - Calendar/Time Stamp function
The VF-AS3 has RTC (Real Time Clock) built-in. The calendar (work day, holiday, etc.) can be easily set by parameters.
Output terminal signal is ON at the day of the week, hour and minute set as “work day-time” by parameters.
The output terminal signal can be used as machine operation, pattern operation, and my function in the drive.
Ideal for various applications.
The VF-AS3 has various functions dedicated to various applications. The VF-AS3 will be the ideal choice for a wide variety of uses.

For Oil & Gas / Mining Industry
Jack pumps / Compressor / Conveyor / Crushers

Multi ratings – excellent motor control performance
The VF-AS3 has the multi ratings and can drive for various application with HD(150%~60sec) and ND(120%~60sec). It is available for both heavy-load application and light-load application. The starting torque with sensor-less vector control is 200% with 0.3Hz or more. The VF-AS3 achieves high starting torque and high accuracy regenerative torque at low frequency.

Easy to set up with Auto-tuning function
The VF-AS3 has the Auto-tuning function that automatically optimizes the drive parameters. The moment of inertia of machine and equipment can also be set easily by Auto-tuning function.

PM motor drive
PM motor drive technology has been implemented in VF-AS3 as a standard feature. The VF-AS3 can control both induction and permanent magnetic synchronous motors with/without feedback sensor, allowing them to use for the variety of purposes.

The VF-AS3 can drive both interior permanent magnetic motor (IPM) and surface permanent magnetic motor (SPM).

For Water & Wastewater Industry
Fan / Pump / Centrifuges

Multi pump control – maximum 10 pumps
The VF-AS3 can drive multiple pump motors (maximum ten pumps) and save the power of water pump system by controlling each pump appropriately, realizing great cost reduction. Each pump is connected to commercial power via magnetic contactor which is controlled by relay output signal of the drive. There are 3 relay output terminals on the drive. Furthermore, two I/O extensions can be inserted to the drive. Each I/O extension has 3 relay output terminals, and thus a maximum of 9 relay output terminals can be used.

Space-saving and cost reduction by four embedded PID controllers
VF-AS3 has four built-in PID controllers: two for drives (motors) and other two for other devices including heaters and valves. The built-in PID controllers are available at the same time for many purposes. It can help reduce cost and space because it can omit additional external PID controllers. The PID functions include temperature or pressure control of fan and pump, speed control of a winder, stop position control, etc.

For Conveyor / Crane Industry
Transportation machine / Conveyor / Crushers / Compressor

Embedded positioning control
VF-AS3 has sensor / sensor-less position control with point to point, Pulse input and Orientation, which is suitable for applications such as processing machine for high precision control.

Excellent flexibility by My Function (logic function)
My function adds programming capability to the drive's input/output signals without external relays or PLC (programmable logic controller). The function makes it possible to reduce the space and cost required for the system.

My function has the relay sequence function that combines logic operation functions. The relay sequence function enables the drive to perform itself in 52 steps (4 steps x 7 units + 24 steps) without PLC. The processing speed is faster than control with PLC as the function uses internal data and signals directly.

For Chemical / Pharmaceutical Industry
Pumps / Mixers / Compressor / Centrifuges / Fans

Enhanced environment resistance
• Comply with the chemicals (3C3)/dust (3S3) standards of IEC60721-3-3. (Frame size A6 or smaller)
• Can be used at an altitude of up to 4800 m. (Frame size A6 or smaller)
• The inverter is operable at an ambient temperature of -15 to +60°C. (Frame size A7, A8: -10 to +60°C)
• The design expectancy life time of the cooling fan, smoothing aluminum electrolytic capacitor for power circuit, and aluminum electrolytic capacitor for control circuit are ten years. (Fan of frame size A7, A8: Five years)

* Average ambient temperature 40°C, load factor 80% or less, 24-hour and 365 days operation
All-in-One. Improvement in Usability.

The VF-AS3 allows various functions without external options. The VF-AS3 realizes improvement in usability and cost reduction.
Not necessary to prepare optional devices separately.

Reliable safety function

The VF-AS3 has STO (Safe Torque Off) function as standard and is highly reliable to cut off output in an emergency.
The STO function brings the machine safely into a no-torque state and prevents it from starting accidently.
It complies with safety standard IEC 61800-5-2 and also achieves SIL3 level in IEC 61508 : 2010.
In addition, the following safety functions are available as options:
- SS1 (Safe Stop 1)
- SOS (Safe Operating Stop)
- SS2 (Safe Stop 2)
- SBC (Safe Brake Control)
- SLS (Safety-Limited Speed)
- SDI (Safe Direction)

Harmonics reduction

The VF-AS3 is very friendly to a power supply system and peripheral equipment. The built-in dual DC reactor(1) suppresses harmonic current and improves power factor.
VF-AS3 complies with IEC61000-3-12 and achieves total harmonic distortion (THD) ≦ 48% without external reactor.
(480V Class only)
(1) Frame size A7,A8: Attached DCL

High-frequency noise reduction

The built-in EMC filter suppresses high frequency noise. The filter is ideal for sites such as commercial facilities, offices and factories where attentions must be paid to peripheral devices.
The VF-AS3 complies with EMC directive of IEC61800-3 Category C2/C3 without external filter.
(480V Class only)

Various options

If more additional options are required, cassette-type options for network, extended terminal block, sensor feedback, and safety function can be added easily.

Detachable control terminal block

Detachable terminal block allows you to use the current control wiring when replacing the drive. It also makes maintenance much easier.

Detachable operation panel

The operation panel is detachable and easy to attach an external control console with door mounting kit. The optional panel is not required.
The protection level of the keypad is enclosed type with door mounting kit, which means dust-proof and wash-down capable.
The touch wheel has high sensitivity, which allows easy, smooth operation.

Wide, multi-language LCD screen (HMI)

The wide LCD screen (240 x 160 dots) displays multiple items at the same time, allowing easy setting of parameters.
If the VF-AS3 trips, the panel will turn red in back light color, and it’s easy to recognize.
The panel can be displayed in multiple languages including German, Italian, Spanish, French, Portuguese, Russian, Chinese and Japanese as well as English.

Built-in EMC Filter

Built-in UL Type1 kit

Example of generated frequency noise data

Detachable control terminal block

Detachable operation panel

Touch wheel

Cassette-type options

Slots for options
Basic functions

Each “setup item” that determines the control characteristics of the drive is called a “parameter”.
For example, to change the acceleration time, you choose the acceleration time parameter (titled “ACC”).

Easy mode
To enter the Easy mode, press the F1 to F4 key of Easy marking on the panel.
In this mode, you can set ten of the basic parameters.

Setting mode
In this mode, you can set all parameters.
For details of parameters, refer to the Instruction Manual.

### Standard specifications

#### 204 V class: ND rating

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage class</td>
<td>240 V class</td>
</tr>
<tr>
<td>Frame size</td>
<td>A1</td>
</tr>
<tr>
<td>Applicable motor (kW)</td>
<td>0.4</td>
</tr>
<tr>
<td>Applicable motor (HP)</td>
<td>0.55</td>
</tr>
<tr>
<td>Type</td>
<td>Form</td>
</tr>
<tr>
<td></td>
<td>240F</td>
</tr>
<tr>
<td>Applicable power supply (kVA)*1</td>
<td>0.7</td>
</tr>
<tr>
<td>Required power supply capacity (kVA)*2</td>
<td>0.7</td>
</tr>
<tr>
<td>Voltage-frequency</td>
<td>3-phase 200 V to 240 V - 50/60 Hz</td>
</tr>
<tr>
<td>Allowable fluctuation voltage</td>
<td>Voltage 1 V/10 Hz 2,600 V ± 2%, Frequency ± 5%</td>
</tr>
</tbody>
</table>

#### 240 V class: ND rating

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage class</td>
<td>240 V class</td>
</tr>
<tr>
<td>Frame size</td>
<td>A1</td>
</tr>
<tr>
<td>Applicable motor (kW)</td>
<td>0.75</td>
</tr>
<tr>
<td>Applicable motor (HP)</td>
<td>1</td>
</tr>
</tbody>
</table>

### Standard specifications

#### 240 V class: ND rating

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage class</td>
<td>240 V class</td>
</tr>
<tr>
<td>Frame size</td>
<td>A1</td>
</tr>
<tr>
<td>Applicable motor (kW)</td>
<td>0.75</td>
</tr>
<tr>
<td>Applicable motor (HP)</td>
<td>1</td>
</tr>
</tbody>
</table>

For details on extended parameters, advanced parameters and communication parameters, please visit our web site (http://www.inverter.co.jp/)

High-performance Drive TOSVERT VF-AS3

1. Capacity is calculated at 220 V for the 240 V class.
2. Indicates rated output current setting when the PWM carrier frequency parameter (P) is 4 kHz for frame size A1 to A5, 2.5 kHz for frame size A6.
3. Lower limit of voltage for 240 V class is 180 V when the inverter is used continuously (load of 100%).
4. Required power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and wires).
5. Contact your Toshiba distributor for detail.
### High-performance Drive TOSVERT VF-AS3

#### 480 V class: ND rating

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Voltage class</strong></td>
<td>480 V class</td>
</tr>
<tr>
<td><strong>Frame size</strong></td>
<td>A1, A2, A3, A4</td>
</tr>
<tr>
<td><strong>Applicable motor (kW)</strong></td>
<td>0.5, 0.75, 1.5, 2.2, 4.0, 5.5, 7.5, 11, 15, 18.5, 22, 25, 30, 40, 50</td>
</tr>
<tr>
<td><strong>Applicable motor (HP)</strong></td>
<td>1, 2, 3, 5, 7.5, 10, 15, 20, 25, 30, 40, 50, 60</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Type</strong></th>
<th>VFAS3-</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Form</strong></td>
<td>4008PC, 4007PC, 4005PC, 4002PC, 4003PC, 4004PC, 4010PC, 4100PC, 4108PC, 4200PC, 4300PC, 4303PC, 4307PC</td>
</tr>
<tr>
<td><strong>Output capacity (kW)</strong></td>
<td>1.1, 1.5, 2.2, 4.0, 5.5, 7.5, 10, 15, 20, 25, 30, 40, 50</td>
</tr>
<tr>
<td><strong>Output current (A)</strong></td>
<td>1.5, 2.2, 4.0, 5.5, 7.5, 10, 15, 20, 25, 30, 40, 50, 60</td>
</tr>
<tr>
<td><strong>Overload current rating</strong></td>
<td>150%-1 minute, 180%-2 s</td>
</tr>
<tr>
<td><strong>Dynamic braking circuit</strong></td>
<td>Built-in</td>
</tr>
<tr>
<td><strong>Dynamic braking resistor</strong></td>
<td>External braking resistor (Optional)</td>
</tr>
<tr>
<td><strong>Voltage-frequency</strong></td>
<td>3-phase 380 V to 480 V - 50/60 Hz</td>
</tr>
<tr>
<td><strong>Allowable fluctuation</strong></td>
<td>Voltage 323 V to 528 V**, Frequency ± 5%</td>
</tr>
<tr>
<td><strong>Required power supply capacity (kW)</strong></td>
<td>0.7, 1.4, 2.6, 3.9, 6.6, 8.5, 11.4, 16.6, 22.3, 27.3, 32.7, 44.3, 53.9</td>
</tr>
<tr>
<td><strong>Degree of protection</strong> (IEC60529)</td>
<td>IP20</td>
</tr>
<tr>
<td><strong>Cooling method</strong></td>
<td>Forced air-cooled</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>RAL7016 / RAL7035</td>
</tr>
<tr>
<td><strong>EMC filter</strong></td>
<td>Built-in filter C2-50m (Carrier frequency: 4.0 kHz), C3-150m (4.0 kHz)</td>
</tr>
<tr>
<td><strong>External filter</strong></td>
<td>C2-150m (Carrier frequency: 4.0 kHz), C3-300m (4.0 kHz)</td>
</tr>
</tbody>
</table>

---

#### 480 V class: HD rating

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Voltage class</strong></td>
<td>480 V class</td>
</tr>
<tr>
<td><strong>Frame size</strong></td>
<td>A1, A2, A3, A4</td>
</tr>
<tr>
<td><strong>Applicable motor (kW)</strong></td>
<td>0.75, 1.5, 2.2, 4.0, 5.5, 7.5, 11, 15, 18.5, 22, 25, 30, 40, 50, 60</td>
</tr>
<tr>
<td><strong>Applicable motor (HP)</strong></td>
<td>1, 2, 3, 5, 7.5, 10, 15, 20, 25, 30, 40, 50, 60</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Type</strong></th>
<th>VFAS3-</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Form</strong></td>
<td>4004PC, 4007PC, 4010PC, 4022PC, 4037PC, 4100PC, 4105PC, 4110PC, 4132PC, 4150PC, 4200PC, 4220PC, 4305PC, 4308PC, 4320PC, 4340PC, 4370PC</td>
</tr>
<tr>
<td><strong>Output capacity (kW)</strong></td>
<td>1.1, 1.5, 2.2, 4.0, 5.5, 7.5, 10, 15, 20, 25, 30, 40, 50, 60</td>
</tr>
<tr>
<td><strong>Output current (A)</strong></td>
<td>1.5, 2.2, 4.0, 5.5, 7.5, 10, 15, 20, 25, 30, 40, 50, 60</td>
</tr>
<tr>
<td><strong>Overload current rating</strong></td>
<td>120%-1 minute, 135%-2 s</td>
</tr>
<tr>
<td><strong>Dynamic braking circuit</strong></td>
<td>Built-in</td>
</tr>
<tr>
<td><strong>Dynamic braking resistor</strong></td>
<td>External braking resistor (Optional)</td>
</tr>
<tr>
<td><strong>Voltage-frequency</strong></td>
<td>3-phase 380 V to 480 V - 50/60 Hz</td>
</tr>
<tr>
<td><strong>Allowable fluctuation</strong></td>
<td>Voltage 323 V to 528 V**, Frequency ± 5%</td>
</tr>
<tr>
<td><strong>Required power supply capacity (kW)</strong></td>
<td>1.2, 2.4, 3.4, 6.1, 8.3, 10.9, 15.6, 21.3, 26.4, 31.4, 42.0, 52.4, 63.2</td>
</tr>
<tr>
<td><strong>Degree of protection</strong> (IEC60529)</td>
<td>IP20</td>
</tr>
<tr>
<td><strong>Cooling method</strong></td>
<td>Forced air-cooled</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>RAL7016 / RAL7035</td>
</tr>
<tr>
<td><strong>EMC filter</strong></td>
<td>Built-in filter C2-50m (Carrier frequency: 4.0 kHz), C3-150m (4.0 kHz)</td>
</tr>
<tr>
<td><strong>External filter</strong></td>
<td>C2-150m (Carrier frequency: 4.0 kHz), C3-300m (4.0 kHz)</td>
</tr>
</tbody>
</table>

---

#### Additional Information

1. Capacity in calculated at 440 V for the 480 V class.
2. Indicates rated output current setting when the PWM carrier frequency (parameter F300) is 4 kHz for frame size A1 to A5, 2.5 kHz for frame size A6 to A8.
3. Lower limit of voltage 480 V class is 342 V when the inverter is used continuously (load of 100%).
4. Required power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and wires).
5. Contact your Toshiba distributor for details.
### Common Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control system</td>
<td>Sinusoidal PWM control</td>
</tr>
<tr>
<td>Output voltage adjustment</td>
<td>Adjustable within the range of 50 - 330 V (240 V class) and 50 - 660 V (480 V class) by correcting the supply voltage</td>
</tr>
<tr>
<td>Output frequency range</td>
<td>Setting between 0.01 - 580 Hz. Default max. frequency is set to 0.01 - 80 Hz. Maximum frequency adjustment (30 to 5900Hz)</td>
</tr>
<tr>
<td>Minimum setting steps of frequency</td>
<td>0.01 Hz: operation panel input (60 Hz base), 0.03 Hz: analog input (60 Hz base, 11 kHz to 10 Vdc)</td>
</tr>
<tr>
<td>Frequency accuracy</td>
<td>Analog input: ±0.2% of the maximum output frequency (at 25±1°C) Digital input: ±0.01% to ±0.02 Hz of the output frequency</td>
</tr>
<tr>
<td>Voltage/frequency characteristics</td>
<td>V/f constant, variable torque, automatic torque boost, vector control, PM motor control, base frequency adjustment 1, 2, 3, and 4 (15 - 5900Hz) V/f 5-point arbitrary setting, torque boost adjustment (0 - 30%), start frequency adjustment (0 - 10 Hz), stop frequency adjustment (0 - 30 Hz)</td>
</tr>
<tr>
<td>Frequency setting signal</td>
<td>5 kHz potentiometer (possible to connect to 1 - 10 kHz-rated potentiometer) 0 - 10Vdc (input impedance Zin: 31.5 kΩ) 10 - 100Vdc (Zin: 31.5 kΩ) 4 - 20mA (Zin: 250 Ω)</td>
</tr>
<tr>
<td>Terminal block frequency command</td>
<td>The characteristic can be set arbitrarily by two-point setting, compatible with 7 types of input, analog input (RPI, RX, RI, A4, A5), and pulse input (S4, S5)</td>
</tr>
<tr>
<td>Frequency jump</td>
<td>Three frequency can be set, setting of jump frequency and width</td>
</tr>
<tr>
<td>Upper and lower limit frequencies</td>
<td>Upper limit frequency: 0 to max. frequency, lower limit frequency: 0 to upper limit frequency</td>
</tr>
<tr>
<td>PWM carrier frequency</td>
<td>Frame size A1 to A4: adjustable between 1.0 - 1.6 kHz Frame size A5 to A6: adjustable between 1.0 - 8.0 kHz</td>
</tr>
<tr>
<td>PID control</td>
<td>Adjustment of proportional gain, integral time, differential time and delay filter. Multis PID and external PID control.</td>
</tr>
<tr>
<td>Torque control</td>
<td>Voltage command input specifications: -10 - +10 Vdc</td>
</tr>
<tr>
<td>Real Time Clock (RTC)</td>
<td>Current time (year, month, day, hour, minute), Timezone, Daylight saving time, 4 work days and 20 holidays can be set by parameters</td>
</tr>
<tr>
<td>Acceleration/deceleration time</td>
<td>0.01 - 6000 sec. Selectable from among acceleration/deceleration times 1, 2, 3 and 4. Automatic acceleration/deceleration function. S pattern acceleration/deceleration and 2 pattern adjustable.</td>
</tr>
<tr>
<td>DC braking</td>
<td>Adjustment of braking start frequency (S = [FH]Hz, braking (0 - 100%) and braking time (0.02 - 25.5 sec.). With emergency off braking function and motor shaft fan control function.</td>
</tr>
<tr>
<td>Forward run/reverse run</td>
<td>Forward run with On of the terminal [F], Reverse run with Off of the terminal [F] (Default setting). Coast stop with Off of the terminal assigned (st-ind by function). Emergency off by panel operation or terminal.</td>
</tr>
<tr>
<td>Jog run</td>
<td>Jog run, if selected, allows jog operation from the operation panel. Jog run operation by terminal block is possible by setting the parameters.</td>
</tr>
<tr>
<td>Preset speed operation</td>
<td>By changing the combination of the terminals [B1], [B2], [B3], [B4], [B5] set frequency + 31-speed operation, Selectable between acceleration/deceleration time, torque limit and V/f by set frequency.</td>
</tr>
<tr>
<td>Retry</td>
<td>Capable of restarting after a check of the power circuit elements in case the protective function is activated. Max. 10 times selectable arbitrary. Waking time adjustment (0 - 10 sec.)</td>
</tr>
<tr>
<td>Soft start</td>
<td>Automatic load reduction control at overloading (Default: OFF)</td>
</tr>
<tr>
<td>Cooling fan ON/OFF</td>
<td>The cooling fan will be stopped automatically to assure long life when unnecessary.</td>
</tr>
<tr>
<td>Lockout key operation/Password setting</td>
<td>Lock or unlock the key operation and parameter setting. Lock parameter setting with a password.</td>
</tr>
<tr>
<td>Regenerative power ride-through control</td>
<td>Possible to keep the motor running using its regenerative energy in case of a momentary power failure. (Default: OFF)</td>
</tr>
<tr>
<td>Auto-restart operation</td>
<td>Possible to restart the motor in coasting in accordance with its speed and direction. (Default: OFF)</td>
</tr>
<tr>
<td>Simplified pattern operation</td>
<td>Possible to select each 8 patterns in 2 groups from 15-speed operation frequency. Max. 16 types of operation possible. Terminal operation/repeat operation possible.</td>
</tr>
<tr>
<td>Commercial inverter switching</td>
<td>Possible to switch operation by commercial power supply or inverter</td>
</tr>
<tr>
<td>Light-load high-speed operation</td>
<td>Increases the operating efficiency of the machine by increasing the rotational speed of the motor when it is operated under light load.</td>
</tr>
<tr>
<td>Drop function</td>
<td>When two or more inverters are used to operate a single load, this function prevents load from concentrating on one inverter due to unbalance.</td>
</tr>
<tr>
<td>Override function</td>
<td>External input signal adjustment is possible to the operation frequency command value.</td>
</tr>
<tr>
<td>Protective function</td>
<td>Stall prevention, current limit, overcurrent, overvoltage, short circuit on the load side, ground fault on the load side, undervoltage, momentary power failure (15 ms or more), non-stop control at momentary power failure, overvoltage, overload protection, arm overload at starting, overcurrent and overload at braking resistor, overheat, emergency off.</td>
</tr>
<tr>
<td>Electronic thermal characteristic</td>
<td>Switchable between standard motor/constant torque motor, adjustment of overload protection and stall prevention level.</td>
</tr>
<tr>
<td>Reset</td>
<td>Reset by 1a contact closed (or 1b contact opened), or by operation panel. Or power supply OFF/ON. This function is also used to save and clear trip records.</td>
</tr>
</tbody>
</table>

### Control Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input/output terminal function</td>
<td>Possible to select positive logic or negative logic with programmable input/output terminal function menu. 2 or 3 function can be assigned for some terminals. (Default setting: positive logic)</td>
</tr>
<tr>
<td>Sink/source switching</td>
<td>Possible to switch between minus common (CC) and plus common (PS4) for digital input terminal. (Default setting: external power supply)</td>
</tr>
<tr>
<td>Failure detection signal</td>
<td>1c contact output (250Vac-2A (cos φ=1), 30Vac-2A (Resistive), 250Vac-1A (cos φ=0.4), 30Vac-1A (Resistive), 10Vac-1A (R/Pms=50%))</td>
</tr>
<tr>
<td>Relay output</td>
<td>2×1a contact output (250Vac-2A (cos φ=1), 30Vac-2A (Resistive), 250Vac-1A (cos φ=0.4), 30Vac-1A (Resistive), 10Vac-1A (R/Pms=50%))</td>
</tr>
<tr>
<td>Low speed, Acc/Dec completed signal output</td>
<td>Digital output (24 Vdc, max. 50 mA)</td>
</tr>
<tr>
<td>Output for frequency meter/Opt for ammeter</td>
<td>Analog output for meter: 1 mA dc full-scale dc ammeter 0 - 20 mA (4 - 20 mA) output: DC ammeter (allowable load resistance: 500 Ω or less) 0 - 20 mA output: DC voltmeter (allowable load resistance: 1 kΩ or more)</td>
</tr>
<tr>
<td>Pulse train frequency output</td>
<td>Pulse train output (Up to 30 kpps, duty 50%)</td>
</tr>
<tr>
<td>Communication function</td>
<td>Ethernet standard 2-channel equipped (connector: RJ45) IEEE802.3/EtherCAT (Fast Ethernet) 1/100Mbps: Auto negotiation RS485 standard 2-channel equipped (connector: RS485) PROFINET, DeviceNet, PROFIBUS-DP, EtherCAT are optional.</td>
</tr>
<tr>
<td>Use environments</td>
<td>Indoor use. Altitude: 4000m or less for frame size A1 to A6, 3500m or less for frame size A7 and A8 (current redundancy necessary when above 1000 m). Place not exposed to direct sun light and free of corrosive and explosive gases.</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-15 to +60°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-15 to +60°C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>5 to 95% (free from condensation)</td>
</tr>
<tr>
<td>Vibration</td>
<td>Frame size A1 to A5: 5.9 m/s²(0.65G) or less, A6 to A8: 2.9 m/s²(0.3G) or less</td>
</tr>
</tbody>
</table>

*1: Digital input terminals (of which 6 are optional) are programmable digital input terminals, and they may make it possible to arbitrarily select from 176 types of signals.

*2: Programmable ON/OFF output terminals make it possible to arbitrarily select from 256 types of signals.

*3: Programmable analog output terminals make it possible to arbitrarily select from 54 types of signals.

*4: This function protects inverters from overcurrent due to output circuit ground fault.

*5: -10 to +60°C for frame size A7 and A8. Remove operation panel of the inverter when above 50°C.

*6: Current must be reduced by 1% for each 100m over 1000m. e.g. 95% at 2000m, 85% at 3000m

*7: Temperature applicable for a short term. e.g. during transportation.
External dimensions

frames A1 to A8 with dimensions and specifications

Input voltage:
- 3-phase 240 V
- 3-phase 480 V

Applicable motor capacity (kW):
- 0.4, 0.75, 1.5, 2.2, 2.2, 4.0, 4.5, 5.5, 7.5, 11, 15, 18.5, 22

Drive type-form:
- 2004P
- 4004PC
- 4007PC
- 4015PC
- 4022PC
- 4037PC
- 4055PC
- 4075PC
- 4110PC
- 4150PC
- 4185PC
- 4220PC

Dimension (mm):
- W1, H1

Approx. mass (kg):
- 4.5, 4.5, 4.5, 4.5, 4.5, 4.5, 4.5, 4.5, 4.5, 4.5, 4.5, 4.5, 4.5

Note:
*1: W1 and H1 are the mounting dimensions of the drive.
*2: Value in ( ) includes attached DC reactor.
**Standard connection diagrams**

- **Standard connection diagram:** SINK logic (common: CC)
- **Standard connection diagram:** Source logic (common: P24)

**Power supply**
- SINK logic: VFAS3-2200PC to 2280KPC
- Source logic: VFAS3-4004PC to 4132KPC

**Terminal functions**

**Power terminal**
- Grounding terminal for inverter case.
- Connect to power to comply with OVC2 (Over Voltage Category 2).
- Isolation transformer is necessary when connecting to power supply (OVC3).

**Control terminal**
- The reset signal is activated by ON Set [F647: Control power option failure detection] to back up the control power supply.
- To supply control power from an external power supply for backing up the control power supplied from the inverter, an optional control power supply unit (CPS002Z) is required.
- When a braking resistor (optional) is mounted, a braking unit (optional) is also required for models VFAS3-2450P, 2550P and VFAS3-4900PC to 4132KPC.

**Standard connection diagram**

- **Input/output Function**
  - **Input**
    - Multifunction programmable relay contact input. In the default setting, when the slide switch [SW1] is set to the source side, it can be used as 24 Vdc power input. When the slide switch [SW1] is set to the sink side, it can be used as a common terminal for digital input terminals [PA] and [PB]. Frame size A8
  - Multifunction programmable digital input. In the default setting, preset speed operation is performed with ON, and pulse train output can be switched.
  - Multifunction programmable digital input. In the default setting, forward run is performed with ON and deceleration and deceleration stop with OFF.
  - Multifunction programmable digital input. In the default setting, deceleration and deceleration stop with OFF. Digital input.
  - Analog input with 0 - 10 Vdc. It can be switched to PTC input, etc. with [F108: Terminal RR input select]. 0 - 10 Vdc (input impedance: 31.5 kΩ)
  - Analog input with -10 to +10 Vdc. -10 to +10 Vdc (input impedance: 31.5 kΩ)
  - Digital input.
  - Analog input without 0 - 10 Vdc. This can be switched to 4 - 20 mAdc (0 - 20 mAdc)

- **Output**
  - Multifunction programmable relay contact output. It is not assigned in the default setting. The function can be set with FF3 (Terminal FF function).
  - Multifunction programmable relay output. Max. contact capacity 20 A (sink logic) and 10 A (source logic)
  - Multifunction programmable relay contact output. It is not assigned in the default setting. The function can be set with FF3 (Terminal FF function).
  - 10 Vdc/200 mA (200 mA in total with P24)
  - 10 Vdc power output for analog input setting. 10 Vdc (allowable load current: 10 mAdc)
  - Digital output.
  - 10 Vdc power output for digital input setting. 10 Vdc (allowable load current: 10 mAdc)
  - Multifunction programmable digital/pulse train output. With [F686: Terminal FM switching], meter option (0 - 1 mA), current (0 - 20 mA) output, and voltage (0 - 10 V) output can be switched.
  - Multifunction programmable analog output. 0 - 10 Vdc output with default setting. With [F681: Terminal FM switching], meter option (0 - 1 mA), current (0 - 20 mA) output, and voltage (0 - 10 V) output can be switched.
  - 10 Vdc. 10 Vdc (input impedance: 31.5 kΩ)
  - PLC output. When the slide switch [SW1] is set to the sink side or source side, it can be used as 24 Vdc power output. 24 Vdc - 200 mA (200 mA in total with P24)
  - PLC output. When the slide switch [SW1] is set to the PLC side, it can be used as a common terminal for digital input terminals [PA] and [PB]. Frame size A8

**Terminal options**
- Terminal function names. For details, refer to lows.com.
For drive users

When studying how to use our drives

**Notes**

**Leakage current**

This drive uses high-speed switching devices for PWM control. When a relatively long cable is used for power supply to a drive, current may leak from the cable or the motor to the ground because of its capacitance, adversely affecting peripheral equipment. The intensity of such a leakage current depends on the PWM carrier frequency, the lengths of the input and output cables, etc., of the drive. To prevent current leakage, it is recommended to take the following measures.

**Effects of leakage current**

The measures against the effects of leakage current are as follows:

1. **Measures to prevent the malfunction of ELCBs**
   - Leakage current which increases when a drive is used may pass through the following routes:
     - Route (1) ... Leakage due to the capacitance between the ground and the noise filter
     - Route (2) ... Leakage due to the capacitance between the ground and the drive
     - Route (3) ... Leakage due to the capacitance between ground and the cable connecting the drive and the motor
     - Route (4) ... Leakage due to the capacitance of the cable connecting the motor and a drive in another power distribution line

   To prevent current leakage, it is recommended to take the following measures:
   - **(1) Separate the grounding line of the drive from that of the affected electric and electronic systems.**
   - **(2) Decrease the PWM carrier frequency of the drive.**
   - **(3) Ground (shield) the power circuit wires with metallic conduits.**
   - **(4) Use the shortest possible wires to connect the drive to the motor.**

   On 400V models, noise can be greatly reduced as they have a built-in EMC noise filter on their input side.

2. **External signal**
   - A relay is rated for low currents. Mount a surge absorber on the excitation coil of the relay.
   - When using the control circuit, use shielded wires or twisted pair cables.
   - Install ELCB or MCCB with an electric leak detector on the drive's power supply input to protect the wiring.
   - Avoid turning the ELCB or MCCB on and off frequently to turn on/off the motor.
   - To prevent an automatic restart after the power interruption or overload relay has tripped, or actuation of the protective circuit, install a magnetic contactor in the power supply.
   - The drive is provided with a failure detection relay (F1), so that, if its contacts are connected to the operation circuit of the magnetic contactor on the primary side, the magnetic contactor will be activated if power is supplied to the drive with the protective circuit of the drive is activated.
   - To prevent the motor trip by the remaining magnetic contactor, use an MCCB equipped with a leakage trip-free device for opening the primary circuit when the drive protective circuit is activated.

3. **Power supply**
   - Do not turn off the motor frequency. Turn OFF the control terminals F1 (F1-G) before activating the power supply. (If the secondary-side contactor is turned ON in advance, a large current may flow in the drive, causing damage and failure.)
   - A magnetic contactor may be installed to change the motor or change to the commercial power supply when the drive is stopped. Always use an interlock with the magnetic contactor in this situation so that the commercial power supply is not applied to the drive's output terminals.

4. **Ground-fault relay**
   - When implementing a ground-fault circuit breaker (ELCB) in the same or another power distribution line:
     - **(1) Decrease the PWM carrier frequency of the drive.**
     - **(2) Install ground-fault relays with a high-frequency protective function in both the same and other lines.**
     - When ELCBs are used, the PWM carrier frequency needs to be increased to operate the drive.

   - When connecting multiple drives to a single ELCB, use an ELCB with a high-current sensitivity or reduce the number of drives connected to the ELCB.

   - When implementing a ground-fault relay:
     - **(1) Decrease the PWM carrier frequency of the drive.**
     - **(2) Install ground-fault relays with a high-frequency protective function in both the same and other lines.**
     - When ELCBs are used, the PWM carrier frequency needs to be increased to operate the drive.

   - When considering power supply by other electric and electronic systems:
     - **(1) Separate the grounding line of the drive from that of the affected electric and electronic systems.**
     - **(2) Decrease the PWM carrier frequency of the drive.**

   - When considering power supply by other electric and electronic systems:
     - **(1) Separate the grounding line of the drive from that of the affected electric and electronic systems.**
     - **(2) Decrease the PWM carrier frequency of the drive.**

   - When using magnetic contactors:
     - **(1) As a rule, if a magnetic contactor is installed between the drive and the motor, do not turn OFF while running.**
     - **(2) When driving several motors simultaneously.**
     - **(3) The drive can be used without a magnetic contactor. In this case, use an MCCB equipped with a leakage trip-free device for opening the primary circuit when the drive protective circuit is activated.

External signal

1. **Use a relay rated for low currents.**
2. **Mount a surge absorber on the excitation coil of the relay.**
3. **When using the control circuit, use shielded wires or twisted pair cables.**
4. **Install ELCB or MCCB with an electric leak detector on the drive’s power supply input to protect the wiring.**
5. **Avoid turning the ELCB or MCCB on and off frequently to turn on/off the motor.**
6. **To prevent an automatic restart after the power interruption or overload relay has tripped, or actuation of the protective circuit, install a magnetic contactor in the power supply.**
7. **The drive is provided with a failure detection relay (F1), so that, if its contacts are connected to the operation circuit of the magnetic contactor on the primary side, the magnetic contactor will be activated if power is supplied to the drive with the protective circuit of the drive is activated.**
8. **To prevent the motor trip by the remaining magnetic contactor, use an MCCB equipped with a leakage trip-free device for opening the primary circuit when the drive protective circuit is activated.**

Power factor improvement capacitors

Do not install a power factor improvement capacitor on the input or output side of the drive.

Installation of input AC rectors

These devices are used to improve the input power factor and suppress high-harmonic currents.

1. **When the power supply capacity is 500kVA or more, and it is 10 times or more the drive capacity;**
2. **When the drive is connected to a power distribution system as a thyristor-committed control equipment.**
3. **When the drive is connected to another power distribution system as the final distribution system.**

Application to standard motor

**Vibration**

When a motor is operated with an industrial drive, it experiences more vibrations than when it is operated by the commercial power supply. The vibration can be reduced to a negligible level by securing the motor and machine to the base firmly.

Reduction gear, belt, chain

Note that the lubrication capability of a reducer or a converter used as the interface of the motor and the load machine may affect at low speeds.

Frequency

Before setting the maximum frequency to 60 Hz or more, confirm that this operating range is acceptable for the motor.

Application to special motors

**Braking motor**

When using a braking motor, if the braking circuit is directly connected to the drive’s output terminals, the brake cannot be released because of the lowest starting voltage. Therefore, when using a braking motor, connect the braking circuit to the drive’s power-supply side, as shown on the below. Usually, braking motors produce larger noise in low speed ranges.

Gear motor

When using an industrial drive to drive a gear motor, inquire of the motor manufacturer about its continuous operation range, since low-speed operation of a geared motor may lead to damaging overheating.

Toshiba Premium Gold Motor (High-efficiency power-saving motor)

Drive operation of Toshiba Premium Gold Motor is the best solution for saving energy. This is because these motors have improved efficiency, power factor, and noise/vibration reduction characteristics when compared to standard motors.

Pole-changing motor

When changing the motor speed, increase the number of poles to reduce noise/vibration. In this case, the motor speed must be varied in step.

High-pole-count motors

Note that high-pole count motors (more poles), which may be used for fans, etc., have higher rated current than 4-pole motors.

The current ratings of multiple motors are relatively high. So, when selecting a drive, you must pay special attention to its current rating so that the current rating of the motor is below that of the drive.

Single-phase motor

Because single-phase motors are equipped with a centrifugal switch and capacitors for starting, they cannot be driven by a drive.
### For drive users

#### Selecting peripheral and wiring sizes devices for HD rating

<table>
<thead>
<tr>
<th>Voltage class (V)</th>
<th>Drive Type-form</th>
<th>Input Current (A)</th>
<th>Operational current (A)</th>
<th>AC1</th>
<th>DC Terminal</th>
<th>Braking resistor/Braking coil (optional)</th>
<th>Grounding wire</th>
<th>Drive Terminal Screw size</th>
</tr>
</thead>
<tbody>
<tr>
<td>240V</td>
<td>VFAS3-2004P</td>
<td>1.8</td>
<td>1.5</td>
<td>1.5</td>
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<td>28</td>
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</tbody>
</table>

#### Selecting peripheral and wiring sizes devices for ND rating

<table>
<thead>
<tr>
<th>Voltage class (V)</th>
<th>Drive Type-form</th>
<th>Input Current (A)</th>
<th>Operational current (A)</th>
<th>AC1</th>
<th>DC Terminal</th>
<th>Braking resistor/Braking coil (optional)</th>
<th>Grounding wire</th>
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<td>28</td>
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<td>M5</td>
</tr>
</tbody>
</table>

### Selecting the Capacity (model) of the Drive

**Selection**

- If the application of the motor capacity listed in the standard specifications.

**Assumptions**

- Acceleration and deceleration times of a drive are set individually. In any case, however, they should be set longer than their respective values determined by the following equations.

#### Allowabletorque characteristics

When a drive is driven by a drive, its operation is restricted by the drive's overload current rating, so the starting characteristics are different from those obtained from conventional power supply operation. The acceleration and deceleration times of a drive can be set individually. The cooling becomes less effective at low speed, so the torque must be reduced according to the following equations.

**Starting characteristics**

When a standard motor is combined with a drive to perform variable speed operation, the motor becomes less effective at low speed, so the torque must be reduced according to the following equations.

**Starting characteristics**

When a standard motor is combined with a drive to perform variable speed operation, the motor becomes less effective at low speed, so the torque must be reduced according to the following equations.

- When driving a high-pole motor, special motor, or multiple motors in parallel, select such a drive that the sum of the motor rated current multiplied by 1.05 to 1.1 is less than the drive's rated output current value.

- When a motor is driven by a drive, its operation is restricted by the drive's overload current rating, so the starting characteristics are different from those obtained from conventional power supply operation.

- When a motor is driven by a drive, its operation is restricted by the drive's overload current rating, so the starting characteristics are different from those obtained from conventional power supply operation.

- When driving a high-pole motor, special motor, or multiple motors in parallel, select such a drive that the sum of the motor rated current multiplied by 1.05 to 1.1 is less than the drive's rated output current value.

**Starting characteristics**

When a standard motor is combined with a drive to perform variable speed operation, the motor becomes less effective at low speed, so the torque must be reduced according to the following equations.
Peripheral devices

Harmonic current and influence to power supply

Harmonics are defined as sinusoidal waves that is multiple frequency of commercial power supply (50Hz or 60Hz). Commercial power supply including harmonics has a distorted waveform. Some electrical and electronic devices produce distorted waves in their rectifying and smoothing circuits on the input side. Harmonics produced by a device influence other electrical equipment and facilities in some cases (for example, overheating of phase advancing capacitors and reactors).

Insert type options

This drive is equipped with two optin slots (A, B) as standard. The option adaptor (option) can be mounted.

Table of optional devices

- **I/O extension 1**
  - Name: ETB013Z
  - Specification: 1x digital input, 2x digital output, 2x analog input
  - Type/form: ETB013Z
  - Slot availability: A, B, C
- **I/O extension 2**
  - Name: ETB014Z
  - Specification: 1x relay
  - Type/form: ETB014Z
  - Slot availability: A, B, C
- **Digital encoder**
  - Name: VEC008Z
  - Specification: Resolver Closed loop operation is possible by combining with a motor equipped with a sensor
  - Type/form: VEC008Z
  - Slot availability: A
- **CANopen**
  - Name: CANopen
  - Specification: CANopen interface
  - Type/form: VEC009Z
  - Slot availability: A, B, C

Function of I/O extension

- **Multifunction programmable contact input**
  - Name: ETB013Z
  - Specification: Multifunction programmable contact input: 6 points
  - Type/form: ETB013Z
  - Slot availability: A
- **Multifunction programmable open collector output**
  - Name: ETB014Z
  - Specification: Multifunction programmable open collector output: 2 points
  - Type/form: ETB014Z
  - Slot availability: A

Function sensor feedback

- **Sensor type**
  - Name: VEC008Z
  - Specification: Incremental rotary encoder
  - Sensor type: VEC008Z

How to install

- **Option slot A, B**
  - Name: Option Slot A, B
  - Specification: Option slot A, B
  - Type/form: Option Slot A, B
  - Slot availability: A, B
- **Option slot C**
  - Name: Option Slot C
  - Specification: Option slot C
  - Type/form: Option Slot C
  - Slot availability: C

Note: The depth of the drive increases about 44mm when the option is mounted.

---

**Insert type options**

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Specification</th>
<th>Type/form</th>
<th>Slot availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O extension 1</td>
<td>ETB013Z</td>
<td>1x digital input, 2x digital output, 2x analog input</td>
<td>ETB013Z</td>
<td>A, B, C</td>
</tr>
<tr>
<td>I/O extension 2</td>
<td>ETB014Z</td>
<td>1x relay</td>
<td>ETB014Z</td>
<td>A, B, C</td>
</tr>
<tr>
<td>Digital encoder</td>
<td>VEC008Z</td>
<td>Resolver Closed loop operation is possible by combining with a motor equipped with a sensor</td>
<td>VEC008Z</td>
<td>A</td>
</tr>
<tr>
<td>CANopen</td>
<td>CANopen</td>
<td>CANopen interface</td>
<td>VEC009Z</td>
<td>A, B, C</td>
</tr>
</tbody>
</table>

**Function of I/O extension**

- **Multifunction programmable contact input**
  - Name: ETB013Z
  - Specification: Multifunction programmable contact input: 6 points
  - Type/form: ETB013Z
  - Slot availability: A
- **Multifunction programmable open collector output**
  - Name: ETB014Z
  - Specification: Multifunction programmable open collector output: 2 points
  - Type/form: ETB014Z
  - Slot availability: A

**Function sensor feedback**

- **Sensor type**
  - Name: VEC008Z
  - Specification: Incremental rotary encoder
  - Sensor type: VEC008Z

**How to install**

- **Option slot A, B**
  - Name: Option Slot A, B
  - Specification: Option slot A, B
  - Type/form: Option Slot A, B
  - Slot availability: A, B
- **Option slot C**
  - Name: Option Slot C
  - Specification: Option slot C
  - Type/form: Option Slot C
  - Slot availability: C

Note: The depth of the drive increases about 44mm when the option is mounted.
## External options for HD rating

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Current (A)</th>
<th>Model</th>
<th>Drive type-forms</th>
<th>Dimensions (mm)</th>
<th>Connection diagram</th>
</tr>
</thead>
</table>

## External options for ND rating

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Current (A)</th>
<th>Model</th>
<th>Drive type-forms</th>
<th>Dimensions (mm)</th>
<th>Connection diagram</th>
</tr>
</thead>
</table>

## Input AC reactor

### Connection diagram

- **AC reactor**
- **MCCB**
- **MC**
- **Control power supply unit**

### External dimensions

- **Figure A**: Dimensions (mm) for external dimensions
- **Figure B**: Connection diagram

---

### High-performance Drive TOSVERT VF-AS3

- **VFAS3-2015P (HD)**
- **VFAS3-2022P (ND)**
- **VFAS3-2185P (HD)**
- **VFAS3-2202P (ND)**

---

### Table of Models and Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Rating</th>
<th>Drive type-forms</th>
<th>Dimensions (mm)</th>
<th>Connection diagram</th>
<th>Termination</th>
</tr>
</thead>
</table>

---

### Table of Motor Specifications

<table>
<thead>
<tr>
<th>Motor (kW)</th>
<th>Drive type-forms</th>
<th>Input AC reactor</th>
<th>DC reactor</th>
<th>Braking unit</th>
<th>Motor-end surge voltage</th>
</tr>
</thead>
</table>

---

### Table of Applicable Motors

<table>
<thead>
<tr>
<th>Motor (kW)</th>
<th>Drive type-forms</th>
<th>Input AC reactor</th>
<th>DC reactor</th>
<th>Braking unit</th>
<th>Motor-end surge voltage</th>
</tr>
</thead>
</table>

---

### Table ofbraking resistors

<table>
<thead>
<tr>
<th>Motor (kW)</th>
<th>Drive type-forms</th>
<th>Input AC reactor</th>
<th>DC reactor</th>
<th>Braking unit</th>
<th>Motor-end surge voltage</th>
</tr>
</thead>
</table>

---

### Table of Motor-end surge voltage suppression filters

<table>
<thead>
<tr>
<th>Motor (kW)</th>
<th>Drive type-forms</th>
<th>Input AC reactor</th>
<th>DC reactor</th>
<th>Braking unit</th>
<th>Motor-end surge voltage</th>
</tr>
</thead>
</table>

---

### Table of Flange mounting kits

<table>
<thead>
<tr>
<th>Motor (kW)</th>
<th>Drive type-forms</th>
<th>Input AC reactor</th>
<th>DC reactor</th>
<th>Braking unit</th>
<th>Motor-end surge voltage</th>
</tr>
</thead>
</table>

---

### Table of Refer to P.27 for selection

- **VFAS3-2015P (HD)**
- **VFAS3-2022P (ND)**
- **VFAS3-2185P (HD)**
- **VFAS3-2202P (ND)**

---

### Table of Ring terminal

- **VFAS3-2015P (HD)**
- **VFAS3-2022P (ND)**
- **VFAS3-2185P (HD)**
- **VFAS3-2202P (ND)**

---
Motor end surge voltage suppression filter (Only 480V class)

Countermeasure of motor end surge voltage
At the system of operation of the 480V class motor by the voltage type PWR drive with using super high-speed switching devices(JGBT), the degradation of insulation of motor wiring may be occurred by the length conditions of the cable, laid down of the cable and the constants of the cable. In this case, the following countermeasures are suggested.

1) Use of the enhanced insulation type of motor.
2) Suppress the surge voltage by AC reactors in the load side or surge suppression filter.

Note 1) To be installed floor horizontal mounting.
Note 2) To be used that carrier frequency is 15kHz or less, and output frequency is 60Hz or less.

3) Suppress the surge voltage by AC reactors in the load side or surge suppression filter.
In this case, the following countermeasures are suggested.

1) Use of the enhanced insulation type of motor.
2) Suppress the surge voltage by AC reactors in the load side or surge suppression filter.

Note 1) To be installed floor horizontal mounting.
Note 2) To be used that carrier frequency is 15kHz or less, and output frequency is 60Hz or less.

4) The braking resistors are designed for indoor type. Please use them with drip cover in case of water drop. But please note it is not for water proof protection type.

Note 3) Please make a short circuit between the 2/T1 and 6/T3 of the thermal relay.

Braking resistor

Braking resistor (PBR)

Braking resistor (DGP600)

Note 1) Please twist the wire by 10 cm pitch. The distance between resistor power wiring and the control wiring should be over 20 cm.

Note 2) The rating shows the synthetic resistor value (Ohm) and the synthetic resistor power (Watt). The word in the parentheses shows the composition of resistor elements.

Note 1) Note 2)
### HD rating

<table>
<thead>
<tr>
<th>Voltage class</th>
<th>Drive type form</th>
<th>Minimum allowable dissipation (W)</th>
<th>PBR</th>
<th>DG6H50</th>
</tr>
</thead>
<tbody>
<tr>
<td>480V</td>
<td>7.4 VFAS3-2370</td>
<td>(1080W-7.5Ω)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11 VFAS3-2015P</td>
<td>(270W-1.5Ω)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>55 VFAS3-2450P</td>
<td>(90W-2.5Ω)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>110 VFAS3-4110K</td>
<td>(150W-2.5Ω)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 VFAS3-4150PC</td>
<td>(150W-2.5Ω)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>22 VFAS3-4220PC</td>
<td>(122W-2.5Ω)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>250 VFAS3-4200K</td>
<td>(122W-3.75Ω)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>300 VFAS3-4004PC</td>
<td>(122W-3.75Ω)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>37 VFAS3-2370P</td>
<td>(1080W-1Ω)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>75 VFAS3-2550P</td>
<td>(540W-2.5Ω)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.5 VFAS3-2007P</td>
<td>(90W-1Ω)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>800W class 1.5kW</td>
<td>1.75kW class 3.5kW class 5kW class</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>800W class 1.5kW</td>
<td>1.75kW class 3.5kW class 5kW class</td>
<td></td>
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<tr>
<td></td>
<td>800W class 1.5kW</td>
<td>1.75kW class 3.5kW class 5kW class</td>
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<td>800W class 1.5kW</td>
<td>1.75kW class 3.5kW class 5kW class</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>800W class 1.5kW</td>
<td>1.75kW class 3.5kW class 5kW class</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Braking unit

- **PBB7-4132K**: Mechanically mounted on the bottom side of the drive. Approx. mass 27kg.
- **PBB7-4201K**: Mechanically mounted on the left-hand side of the drive. Approx. mass 30kg.

### Selection of braking resistor

1. **HD rating**: This is used for the quick deceleration, the frequent deceleration stop or shortening the deceleration time at the large inertia load. This resistor consumes the regenerative energy when regenerative braking operation.
2. **Voltage**: 480V
3. **Selection of braking resistor**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>0.75 VFAS3-2007P</th>
<th>0.75 VFAS3-4004PC</th>
<th>1.5 VFAS3-4007PC</th>
<th>110 VFAS3-2015P</th>
<th>4.0 VFAS3-4022PC</th>
<th>7.5 VFAS3-4055PC</th>
<th>4.0 VFAS3-4037PC</th>
<th>0.4 VFAS3-4004PC</th>
<th>7.5 VFAS3-2075P</th>
<th>5.5 VFAS3-2055P</th>
</tr>
</thead>
<tbody>
<tr>
<td>240V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>480V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Note

1. The continuous regenerative load flow on an elevator.
2. Selection of braking resistor.
3. Precaution of deceleration stop by using braking resistors.
4. The necessary power in case of deceleration from 60Hz at one time per 120 seconds periods at 30 seconds deceleration time for the 10 times of the motor inertia. Please contact our agency when large inertia or quick deceleration operation.
5. The braking resistors are designed for indoor type. Please use them with drip cover in case of water drop. But please note it is not for water proof protection type.
Flange mounting kit
This option enables the heatsink parts of the backside of the drive that generate much heat to be located at the outside of the panel. This is effective for the small sizing of the totally-enclosed box by reducing the heat values inside the box.

<table>
<thead>
<tr>
<th>Model</th>
<th>Drive type-form</th>
<th>External dimension diagram</th>
<th>Approx. mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOT018Z</td>
<td>VFAS3-2004P to VFAS3-2022P</td>
<td>A</td>
<td>1.3</td>
</tr>
<tr>
<td>FOT019Z</td>
<td>VFAS3-4004PC to VFAS3-4037PC</td>
<td>B</td>
<td>1.5</td>
</tr>
<tr>
<td>FOT020Z</td>
<td>VFAS3-4110P to VFAS3-4185PC</td>
<td>C</td>
<td>1.9</td>
</tr>
<tr>
<td>FOT021Z</td>
<td>VFAS3-4220PC to VFAS3-4370PC</td>
<td>D</td>
<td>6.8</td>
</tr>
<tr>
<td>FOT022Z</td>
<td>VFAS3-4450PC to VFAS3-4750PC</td>
<td>E</td>
<td>9.4</td>
</tr>
<tr>
<td>FOT023Z</td>
<td>VFAS3-4900PC to 4132KPC</td>
<td>F</td>
<td>15.5</td>
</tr>
<tr>
<td>FOT014Z</td>
<td>VFAS3-4200KPC to VFAS3-4280KPC</td>
<td>G</td>
<td>4.4</td>
</tr>
<tr>
<td>FOT015Z</td>
<td>VFAS3-4200KPC to VFAS3-4280KPC with using PB7-4200K</td>
<td>H</td>
<td>4.9</td>
</tr>
</tbody>
</table>

Door mounting kit

Type-form: SBP010Z
Mounting on the cabinet

Panel cutout dimension

LED Extension panel
Type-form: RKP002Z (it also parameter copy function)

USB communication conversion unit
Type-form: USB001Z
Drive can be managed and setting on a PC

USB communication conversion unit cable
*1: USB communication conversion unit cable. Type-form (drive side): CAB0011 (1m), CAB0013 (3m), CAB0015 (5m)
*2: Cable is USB cable (USB1.1/2.0 A-B connect type) for PC side.
**Control power supply unit (Model: CPS002Z)**

- **External dimensions**
  - Figure showing dimensions and layout of the unit.

- **Connection diagram**
  - Diagram showing connections and labels.

**Operation panel (Model: CBVR-7B1)**

- **External dimensions**
  - Figure showing dimensions and layout of the panel.

- **Connection diagram**
  - Diagram showing connections and labels.

**Frequency meter <QS-60T (80Hz-1mAdc)>**

- **External dimensions**
  - Figure showing dimensions and layout of the meter.

- **Connection diagram**
  - Diagram showing connections and labels.

**FRH-KIT**

- **Potentiometer<RV30YN-20S-B302>**
  - Figure showing dimensions and layout of the potentiometer.

- **Potentiometer panel**
  - Figure showing dimensions and layout of the panel.

- **Potentiometer knob<K-3>**
  - Figure showing dimensions and layout of the knob.

**Totally enclosed box type for IP55 / UL type 12**

**IP55 / UL type 12 protection for direct mounting on wall.**

- **Standard specification**
  - Table with specifications including voltage, current, and protection levels.

**High-performance Drive TOSVERT VF-AS3**

- **Totally enclosed box type for IP55 / UL type 12**
  - Figure C showing dimensions and layout of the box.
For users of the products: Our variable speed drives are designed to control the speeds of three-phase motors for general industry.

**Precautions**

* Please read the instruction manual before installing or operating the drive unit.
* This product is intended for general purpose uses in industrial application. It cannot be used applications where may cause big impact on public uses, such as power plant and railway, and equipment which endanger human life or injury, such as nuclear power control, aviation, space flight control, traffic, safety device, amusement, or medical.

It may be considerable whether to apply, under the special condition or an application where strict quality control may not be required. Please contact our headquarters, branch, or local offices printed on the front and back covers of this catalogue.

* When exporting Toshiba variable speed drive separately or combined with your equipment, please be sure to satisfy the objective conditions and inform conditions listed in the export control policies, so called Catch All restrictions, which are set by the Ministry of Economy, Trade and Industry of Japan, and the appropriate export procedures must also be taken.

* Please use our product in applications where do not cause serious accidents or damages even if product is failure, or please use in environment where safety equipment is applicable or a backup circuit device is provided outside the system.

* Please do not use our product for any load other than three-phase motors.

* None of Toshiba, its subsidiaries, affiliates or agents, shall be liable for any physical damages, including, without limitation, malfunction, anomaly, breakdown or any other problem that may occur to any apparatus in which the Toshiba variable speed drive is incorporated or to any equipment that is used in combination with the Toshiba variable speed drive. Nor shall Toshiba, its subsidiaries, affiliates or agents be liable for any compensatory damages resulting from such utilization, including compensation for special, indirect, incidental, consequential, punitive or exemplary damages, or for loss of profit, income or data, even if the user has been advised or apprised of the likelihood of the occurrence of such loss or damages.

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