

# TOSHIBA AS3 AC Drives – Introduction

## Overview

The legendary Toshiba AS3 adjustable speed drive is a high-performance VFD with embedded Ethernet communications. The drive is ideal for applications that require high torque control with induction or permanent magnet motors. The AS3 drive provides embedded multi-PID pump control for use in heavy automation industries such as oil and gas, mining and minerals, chemical, water and wastewater.

The AS3 adjustable speed drive is designed with an emphasis on built-in communications, allowing users to access real time data and refined controls to maximize system performance with standard built-in dual-port Ethernet.

In addition to the built-in Ethernet, the AS3 offers an optional EtherCAT card. In all, the AS3 drive has access to EtherNet/IP, Modbus TCP, Modbus RTU, and EtherCAT communications.

A standard embedded webserver allows for quick access to Ethernet/IP setup, parameters, and real-time monitoring for diagnostics. The webserver can be accessed via standard browsers on PC, tablets, and smart phones.

Use logic type programming without an external PLC through the "My Function" features accessed through parameters or ASD Pro software.

Toshiba drives are designed to work with motors up to 300 feet away with no added load reactors. Pair with Toshiba SD series AC motors for an extended 3 year warranty.

## Features

- 380 to 460 VAC at 1/2 to 300 hp
- Dual rating through parameter change (Heavy Duty and Normal Duty)
  - Heavy Duty: 150% overload for 60 seconds
  - Normal Duty: 120% overload for 60 seconds
- 8 programmable digital inputs
- 3 programmable digital outputs:
  - 1 Form-C relay
  - 2 Form-A dry contact relays



- 3 programmable analog inputs:
  - 4 to 20 mA
  - 0 to 10 VDC
  - -10 to a+10 VDC
- 2 programmable analog outputs (both can be set the same):
  - 4 to 20mA
  - 0 to 10 VDC
- Two-wire/Four-wire RS-485 connectivity
- Embedded dual Ethernet/IP
- Built-in Dynamic Braking up to 100hp (HD) or 125hp (ND)
- Built-in DC reactor and EMC filter
- Three option card slots
- Highly advanced keypad:
  - Capacitive wheel
  - Intuitive menus
  - Multiple languages
- Real-time clock for past trip monitoring or calendar functionality
- Embedded webserver
- QR code display for additional parameter information and fault troubleshooting
- Multi-PID control with sleep function
- Detachable terminal strip for Safe Torque Off (STO) functionality compliant with IEC 61800-5-2 and SIL3 level in IEC61508
- UL Type 1 up to 100hp (HD) or 125hp (ND)
- NEMA 1 enclosure
- NEC® 2005 Motor Overload Retention (no external motor overloads required)
- **3 year warranty** when paired with Toshiba motors

## Environmental

- Operating temperature: 14° to 122°F (-10° to +50°C) or up to 140°F (+60°C) with derate
- Altitude: up to 1000 meters without derate
- Humidity: 95% non-condensing

## Accessories

### Keypads

- Remote keypad mounting hardware

### Communication Modules

- EtherCAT comm module
  - CoE protocol
  - 2 RJ45 ports

### Expansion Modules

- 120VAC Input Option Card
  - Analog input: 3-channel, current/voltage
  - Analog output: 2-channel, current/voltage
  - Discrete input: 6-point
  - Discrete output: 3-point, relay
- Line driver encoder module

### Software

- Free ASD Pro Software for drive configuration and monitoring

## Typical Applications

- Pumps
- Fans
- Compressors
- Centrifuges
- Conveyors
- Mixers
- Oil well Pump Jacks
- Crushers
- Cranes
- Hoists

## Selecting the Proper Drive Rating

Selecting the Proper Drive Rating																			
<b>Determine Motor Voltage and Full-Load Amperage (FLA)</b>																			
Motor voltage and FLA are specified on the nameplate of the motor. <i>NOTE: FLA of motors that have been rewound may be higher than stated.</i>																			
<b>Determine Motor Overload Requirements</b>																			
Many applications experience temporary overload conditions due to starting requirements or impact loading. Most AC drives are designed to operate at 150% overload for 60 seconds. If the application requires an overload greater than 150% or longer than 60 seconds, the AC drive must be oversized. <i>NOTE: Applications that require replacement of existing motor starters with AC drives may require up to 600% overload.</i>																			
<b>Determine Application Type: Heavy Duty or Normal Duty</b>																			
This torque requirement has a direct effect on which drive to select. Normal Duty applications are generally easier to start (typically fans and pumps). Most other applications outside fans and pumps fall into the Heavy Duty category (machine control, conveyors, etc.). If you are unsure of the application, assume Heavy Duty. The specification, derating, and selection tables are generally organized by Heavy Duty and Normal Duty.																			
<b>Installation Altitude</b>																			
AC drives rely on air flow for cooling. As the altitude increases, air becomes less dense and this drop in density decreases the cooling properties of the air. Therefore, the AC drive must be oversized to compensate for the decrease in cooling. Toshiba AS3 drives are designed to operate at 100% capacity at altitudes up to 1000 meters [3281ft]. <i>NOTE: For use above 1000m [3281ft], the AC drive must be derated as described below.</i>																			
<b>Derate Output Current Based on Altitude Above 1000 Meters [3281 feet]</b>																			
<ul style="list-style-type: none"> <li>• If the AC drive is installed at an altitude of 0–1000m [3281ft], follow normal operation restrictions.</li> <li>• If installed at an altitude of 1000–4000m [3281–13123 ft], decrease 1% of the rated voltage (460V for 380–460V models) for every 100m [328ft] increase in altitude.</li> <li>• Maximum altitude is 4000m [13123ft]. If installation at an altitude higher than 4000m [13123ft] is required, please contact AutomationDirect.</li> </ul>																			
<p><b>Derating for Altitude</b></p> <table border="1"> <caption>Derating for Altitude Data</caption> <thead> <tr> <th>Altitude (m)</th> <th>Output Current Rating (%)</th> </tr> </thead> <tbody> <tr><td>0</td><td>100</td></tr> <tr><td>1000</td><td>100</td></tr> <tr><td>1500</td><td>95</td></tr> <tr><td>2000</td><td>90</td></tr> <tr><td>2500</td><td>85</td></tr> <tr><td>3000</td><td>80</td></tr> <tr><td>3500</td><td>75</td></tr> <tr><td>4000</td><td>70</td></tr> </tbody> </table>		Altitude (m)	Output Current Rating (%)	0	100	1000	100	1500	95	2000	90	2500	85	3000	80	3500	75	4000	70
Altitude (m)	Output Current Rating (%)																		
0	100																		
1000	100																		
1500	95																		
2000	90																		
2500	85																		
3000	80																		
3500	75																		
4000	70																		

<b>Determine Maximum Enclosure Internal Temperature</b>	
AC drives generate a significant amount of heat and can cause the internal temperature of an enclosure to exceed the rating of the Toshiba AS3 drive, even when the ambient temperature is less than 122°F [50°C]. Enclosure ventilation and/or cooling may be required to reduce maximum internal temperature to 122°F [50°C] or less. Ambient temperature measurements/calculations should be made for the maximum expected temperature. <i>NOTE: For use above 122°F [50°C], the AC drive must be derated as described below.</i>	
<b>For all Toshiba AS3 Drives, Frames A1-A8</b>	
<b>Drive Derating by Carrier Frequency and Temperature</b>	
<b>Derating</b>	
Drive ratings are based on default carrier frequency and 40°C ambient temperature. Depending on the way in which the drive is installed, the ambient temperature and the carrier frequency setting, you may need to reduce the drive's continuous output current. Most drives can be used up to 50°C with no derating if lower carrier frequencies are used.	
Derating graphs for each model based on carrier frequency and ambient temperature are located in the load reduction manual. Consult this manual for proper sizing - <a href="https://cdn.automationdirect.com/static/manuals/toshiba/loadmanual.pdf">https://cdn.automationdirect.com/static/manuals/toshiba/loadmanual.pdf</a>	

**TOSHIBA****AS3 AC Drives – Selection****Toshiba AS3 Drive Model Selection Tables**

NOTE: For all model specifications, HD = Heavy Duty, ND = Normal Duty

Toshiba AS3 Specifications – Frame Size A1								
Model Name		VFAS3-4004PC	VFAS3-4007PC	VFAS3-4015PC	VFAS3-4022PC	VFAS3-4037PC		
Price		\$545.00	\$617.00	\$669.00	\$722.00	\$866.00		
Frame Size		A1						
Dimensional Drawing		PDF	PDF	PDF	PDF	PDF		
Output Rating	HD	Max Motor Output	hp	0.5	1	2	3	5
			kW	0.4	0.75	1.5	2.2	4.0
		Rated Output Capacity <sup>1</sup>	kVA	1.1	1.7	3.0	4.3	7.1
		Rated Output Current <sup>2</sup>	A	1.5	2.2	4.0	5.6	9.3
		Overload Current Rating	150% for 1 minute, 180% for 2 seconds					
	ND	Max Motor Output	hp	1	2	3	5	7.5
			kW	0.75	1.5	2.2	4.0	5.5
		Rated Output Capacity <sup>1</sup>	kVA	1.7	3.0	4.3	7.1	9.7
		Rated Output Current <sup>2</sup>	A	2.2	4.0	5.6	9.3	12.7
		Overload Current Rating	120% for 1 minute, 135% for 2 seconds					
Output Voltage		3-phase 380V to 480V (the maximum output voltage is equal to the input supply voltage)						
Input Rating	HD	Power Supply Capacity <sup>3</sup>	kVA	0.7	1.4	2.6	3.9	6.6
	ND	Power Supply Capacity <sup>3</sup>	kVA	1.2	2.4	3.4	6.1	8.3
	Rated Voltage/Frequency		3-phase 380 to 480 VAC, 50/60 Hz					
	Allowable Fluctuation <sup>4</sup>		Voltage 323V to 528V, Frequency ±5%					
Dynamic Braking Circuit		Built-in						
Dynamic Braking Resistor		Optional external braking resistor						
EMC Filter (IEC51800-3) <sup>5</sup>		Category C2 (motor cable length: 50m or less) Category C3 (motor cable length: 150m or less)						
DC Reactor		Built-in						
IE2 Efficiency - Relative Power Loss								
Weight (kg [lb])		6.8 [15.00]	6.8 [15.00]	6.35 [14.00]	6.8 [15.00]	6.8 [15.00]		
Color		RAL7106/RAL7035						
Cooling Method		Forced air-cooled						
Cooling Fan Noise (dB) <sup>6</sup>		58						
IP Rating		IP20						
Enclosure Rating (UL50)		Type 1						
<p>1 - Capacity is calculated at 440V for the 480V class</p> <p>2 - Indicates rated output current when setting &lt;F300: Carrier Frequency&gt; to 4kHz</p> <p>3 - Required power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and wires)</p> <p>4 - Lower limit of voltage for 480V class is 342V when the inverter is used continuously (load of 100%)</p> <p>5 - Under &lt;F300&gt; setting to 4kHz</p> <p>6 - These are reference noise values and not guaranteed</p>								

**TOSHIBA****AS3 AC Drives – Selection****Toshiba AS3 Drive Model Selection Tables, *continued***

NOTE: For all model specifications, HD = Heavy Duty, ND = Normal Duty

<b>Toshiba AS3 Specifications – Frame Sizes A2/A3</b>								
<b>Model Name</b>		<b>VFAS3-4055PC</b>	<b>VFAS3-4075PC</b>	<b>VFAS3-4110PC</b>	<b>VFAS3-4150PC</b>	<b>VFAS3-4185PC</b>		
<b>Price</b>		\$1,056.00	\$1,312.00	\$1,706.00	\$2,132.00	\$2,624.00		
<b>Frame Size</b>		A2		A3				
<b>Dimensional Drawing</b>		<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>		
<b>Output Rating</b>	<b>HD</b>	<b>Max Motor Output</b>	<i>hp</i>	7.5	10	15	20	25
			<i>kW</i>	5.5	7.5	11	15	18.5
		<b>Rated Output Capacity<sup>1</sup></b>	<i>kVA</i>	9.7	12.6	17.9	24.2	29.9
		<b>Rated Output Current<sup>2</sup></b>	<i>A</i>	12.7	16.5	23.5	31.7	39.2
		<b>Overload Current Rating</b>	150% for 1 minute, 180% for 2 seconds					
	<b>ND</b>	<b>Max Motor Output</b>	<i>hp</i>	10	15	20	25	30
			<i>kW</i>	7.5	11	15	18.5	22
		<b>Rated Output Capacity<sup>1</sup></b>	<i>kVA</i>	12.6	17.9	24.2	29.9	35.3
		<b>Rated Output Current<sup>2</sup></b>	<i>A</i>	16.5	23.5	31.7	39.2	46.3
		<b>Overload Current Rating</b>	120% for 1 minute, 135% for 2 seconds					
<b>Output Voltage</b>		3-phase 380V to 480V (the maximum output voltage is equal to the input supply voltage)						
<b>Input Rating</b>	<b>HD Power Supply Capacity<sup>3</sup></b>	<i>kVA</i>	8.5	11.4	16.6	22.3	27.3	
	<b>ND Power Supply Capacity<sup>3</sup></b>	<i>kVA</i>	10.9	15.6	21.3	26.4	31.4	
	<b>Rated Voltage/Frequency</b>		3-phase 380 to 480 VAC, 50/60 Hz					
	<b>Allowable Fluctuation<sup>4</sup></b>		Voltage 323V to 528V, Frequency $\pm$ 5%					
<b>Dynamic Braking Circuit</b>		Built-in						
<b>Dynamic Braking Resistor</b>		Optional external braking resistor						
<b>EMC Filter (IEC51800-3)<sup>5</sup></b>		Category C2 (motor cable length: 50m or less) Category C3 (motor cable length: 150m or less)						
<b>DC Reactor</b>		Built-in						
<b>IE2 Efficiency - Relative Power Loss</b>								
<b>Weight (kg [lb])</b>		10.9 [24.00]	10.9 [24.00]	16.7 [36.80]	17.3 [38.1]	17.5 [38.5]		
<b>Color</b>		RAL7106/RAL7035						
<b>Cooling Method</b>		Forced air-cooled						
<b>Cooling Fan Noise (dB)<sup>6</sup></b>		58						
<b>IP Rating</b>		IP20						
<b>Enclosure Rating (UL50)</b>		Type 1						
<p>1 - Capacity is calculated at 440V for the 480V class</p> <p>2 - Indicates rated output current when setting &lt;F300: Carrier Frequency&gt; to 4kHz</p> <p>3 - Required power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and wires)</p> <p>4 - Lower limit of voltage for 480V class is 342V when the inverter is used continuously (load of 100%)</p> <p>5 - Under &lt;F300&gt; setting to 4kHz</p> <p>6 - These are reference noise values and not guaranteed</p>								

**TOSHIBA****AS3 AC Drives – Selection****Toshiba AS3 Drive Model Selection Tables, *continued***

NOTE: For all model specifications, HD = Heavy Duty, ND = Normal Duty

Toshiba AS3 Specifications – Frame Sizes A4/A5									
Model Name		VFAS3-4220PC	VFAS3-4300PC	VFAS3-4370PC	VFAS3-4450PC	VFAS3-4550PC	VFAS3-4750PC		
Price		\$2,755.00	\$3,313.00	\$4,395.00	\$5,313.00	\$5,838.00	\$7,215.00		
Frame Size		A4			A5				
Dimensional Drawing		<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>		
Output Rating	HD	Max Motor Output	hp	30	40	50	60	75	100
			kW	22	30	37	45	55	75
		Rated Output Capacity <sup>1</sup>	kVA	35.3	46.9	56.8	67.1	80.8	111
			A	46.3	61.4	74.5	88.0	106	145
		Overload Current Rating	150% for 1 minute, 180% for 2 seconds						
	ND	Max Motor Output	hp	40	50	60	75	100	125
			kW	30	37	45	55	75	90
		Rated Output Capacity <sup>1</sup>	kVA	46.9	56.8	67.1	80.8	111	132
			A	61.5	74.5	88.0	106	145	173
		Overload Current Rating	120% for 1 minute, 135% for 2 seconds						
Output Voltage	3-phase 380V to 480V (the maximum output voltage is equal to the input supply voltage)								
Input Rating	HD	Power Supply Capacity <sup>3</sup>	kVA	32.7	44.3	53.9	65.6	79.5	108
	ND	Power Supply Capacity <sup>3</sup>	kVA	42.0	52.4	63.2	77.0	103	125
	Rated Voltage/Frequency		3-phase 380 to 480 VAC, 50/60 Hz						
	Allowable Fluctuation <sup>4</sup>		Voltage 323V to 528V, Frequency ±5%						
Dynamic Braking Circuit		Built-in							
Dynamic Braking Resistor		Optional external braking resistor							
EMC Filter (IEC51800-3) <sup>5</sup>		Category C2 (motor cable length: 50m or less)			Category C3 (motor cable length: 150m or less)				
DC Reactor		Built-in							
IE2 Efficiency - Relative Power Loss									
Weight (kg [lb])		37.2 [82.0]	37.2 [82.0]	37.2 [82.0]	71.7 [158.0]	73.9 [163.0]	73.9 [163.0]		
Color		RAL7106/RAL7035							
Cooling Method		Forced air-cooled							
Cooling Fan Noise (dB) <sup>6</sup>		58							
IP Rating		IP20							
Enclosure Rating (UL50)		Type 1							
<p>1 - Capacity is calculated at 440V for the 480V class</p> <p>2 - Indicates rated output current when setting &lt;F300: Carrier Frequency&gt; to 4kHz</p> <p>3 - Required power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and wires)</p> <p>4 - Lower limit of voltage for 480V class is 342V when the inverter is used continuously (load of 100%)</p> <p>5 - Under &lt;F300&gt; setting to 4kHz</p> <p>6 - These are reference noise values and not guaranteed</p>									

**TOSHIBA****AS3 AC Drives – Selection****Toshiba AS3 Drive Model Selection Tables, *continued***

NOTE: For all model specifications, HD = Heavy Duty, ND = Normal Duty

Toshiba AS3 Specifications – Frame Sizes A6/A7/A8								
Model Name			VFAS3-4900PC	VFAS3-4110KPC	VFAS3-4132KPC	VFAS3-4160KPC	VFAS3-4200KPC	
Price			\$9,183.00	\$10,429.00	\$12,593.00	\$15,348.00	\$17,906.00	
Frame Size			A6		A7		A8	
Dimensional Drawing			<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	<a href="#">PDF</a>	
Output Rating	HD	Max Motor Output	hp	125	150	200	250	300
			kW	90	110	132	160	200
		Rated Output Capacity <sup>1</sup>	kVA	132	161	191	239	295
		Rated Output Current <sup>2</sup>	A	173	211	250	314	387
		Overload Current Rating	150% for 1 minute, 180% for 2 seconds					
	ND	Max Motor Output	hp	150	200	250	350	400
			kW	110	132	160	220	250
		Rated Output Capacity <sup>1</sup>	kVA	161	191	230	325	367
		Rated Output Current <sup>2</sup>	A	211	250	302	427	481
		Overload Current Rating	120% for 1 minute, 135% for 2 seconds					
Output Voltage			3-phase 380V to 480V (the maximum output voltage is equal to the input supply voltage)					
Input Rating	HD	Power Supply Capacity <sup>3</sup>	kVA	133	155	181	225	275
	ND	Power Supply Capacity <sup>3</sup>	kVA	155	181	214	296	335
	Rated Voltage/Frequency			3-phase 380 to 480 VAC, 50/60 Hz				
Allowable Fluctuation <sup>4</sup>			Voltage 323V to 528V, Frequency ±5%					
Dynamic Braking Circuit			External DBU required		Built-in		External DBU required	
Dynamic Braking Resistor			Optional external braking resistor					
EMC Filter (IEC51800-3) <sup>5</sup>			Category C3 (motor cable length: 150m or less)			Category C3 (motor cable length: 50m or less)		
DC Reactor			Built-in			External top mount		
IE2 Efficiency - Relative Power Loss								
Weight (kg [lb])			103 [227.0]	103 [227.0]	103 [227.0]	193.7 [427.0]	223.6 [493.0]	
Color			RAL7106/RAL7035					
Cooling Method			Forced air-cooled					
Cooling Fan Noise (dB) <sup>6</sup>			58					
IP Rating			IP20					
Enclosure Rating (UL50)			Type 1		Open <sup>7</sup>		Open	
<p>1 - Capacity is calculated at 440V for the 480V class</p> <p>2 - Indicates rated output current when setting &lt;F300: Carrier Frequency&gt; to 2.5 kHz</p> <p>3 - Required power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and wires)</p> <p>4 - Lower limit of voltage for 480V class is 342V when the inverter is used continuously (load of 100%)</p> <p>5 - Under &lt;F300&gt; setting to 2.5 kHz</p> <p>6 - These are reference noise values and not guaranteed</p> <p>7 - NEMA Type 1 with option</p>								



# TOSHIBA AS3 AC Drives – Specifications

## Toshiba AS3 Drive Model Selection Tables, *continued*

Toshiba AS3 General Specifications (Applicable to All Models)		
Control Specifications	<b>Control System</b>	Sinusoidal PWM control
	<b>Output Frequency Range</b>	Setting between 0.01 and 590 Hz. Default frequency is set to 0.01 to 50/60 Hz. Maximum frequency adjustment: 30 to 590 Hz.
	<b>Minimum Setting Steps of Frequency</b>	0.01 Hz: operation panel input (60Hz base). 0.03 Hz: analog input (60Hz base, 11 bit / 0–10 VDC)
	<b>Frequency Accuracy</b>	Analog input: $\pm 0.2\%$ of the maximum output frequency (at $25\pm 10^\circ\text{C}$ , bias gain fine-tunable) Digital input: $\pm 0.01\% \pm 0.022$ Hz of the output frequency
	<b>Voltage/Frequency Characteristics</b>	V/f constant, variable torque, automatic torque boost, vector control, base frequency adjustment 1, 2, 3, and 4 (15–590 Hz). V/f 5-point arbitrary setting, torque boost adjustment (0–30%), start frequency adjustment (0–10 Hz), stop frequency adjustment (0–30 Hz)
	<b>Frequency Setting Signal</b>	3k $\Omega$ potentiometer (possible to connect to 1–10 k $\Omega$ -rated external potentiometer) <ul style="list-style-type: none"> <li>• 0–10 VDC (input impedance Z<sub>in</sub>: 31.5 k<math>\Omega</math>)</li> <li>• -10 to +10 VDC (input impedance Z<sub>in</sub>: 31.5 k<math>\Omega</math>)</li> <li>• 4–20mA DC (input impedance Z<sub>in</sub>: 250<math>\Omega</math>)</li> </ul>
	<b>Terminal Block Frequency Command</b>	The characteristic can be set arbitrarily by two-point setting. Compliant with 7 types of input: <ul style="list-style-type: none"> <li>• Analog input: [RR], [RX], [II], [AI4], [AI5]</li> <li>• Pulse input: [S4], [S5]</li> </ul>
	<b>Frequency Jump</b>	Three frequencies can be set. Setting of jump frequency and width.
	<b>Upper and Lower Limit Frequencies</b>	Upper limit frequency: 0 to max. frequency Lower limit frequency: 0 to upper limit frequency
	<b>PWM Carrier Frequency</b>	Frame size A1 to A4: adjustable between 1.0 and 16 kHz Frame size A5 to A8: adjustable between 1.0 and 8 kHz
	<b>PID Control</b>	Adjustment of proportional gain, integral time, differential time, and delay filter. Multi-PID and external PID control.
	<b>Torque Control</b>	Voltage command input specification: -10 to +10 VDC
	Operation Specifications	<b>Real Time Clock</b>
<b>Acceleration/Deceleration Time</b>		0.01–6000 seconds, selectable from amount acceleration/deceleration times 1, 2, 3, and 4. Automatic acceleration/deceleration function. S-pattern acceleration/deceleration 1 and 2 pattern adjustable.
<b>DC Braking</b>		Adjustment of braking start frequency (0 to <FH>Hz), braking (0–100%), and braking time (0–25.5 seconds), with emergency off braking function and motor shaft fix control function.
<b>Forward Run/Reverse Run</b>		Forward run with ON of the terminal [F], Reverse run with ON of the terminal [R] (default setting). Coast to stop with OFF of the terminal assigned Stand-by function. Emergency OFF by panel operation or terminal.
<b>Jog Run</b>		Jog run, if selected, allows jog operation from the operation panel. Jog run operation by terminal block is possible by setting the parameters.
<b>Preset Speed Operation</b>		By changing the combination of the terminals [S1], [S2], [S3], [S4], [S5] set frequency +31-speed operation. Selectable between acceleration/deceleration time, torque limit, and V/F by set frequency.
<b>Retry</b>		Capable of restarting after a check of the power circuit elements in case the protective function is activated. Maximum 10 times selectable arbitrarily. Waiting time adjustment (0–10 seconds).
<b>Soft Stall</b>		Automatic load reduction control at overloading. (Default: OFF)
<b>Cooling Fan ON/OFF Management</b>		The cooling fan will stop automatically when not needed to extend fan life.
<b>Lockout Key Operation</b>		Key lock selectable of RUN key, HAND/AUTO key, emergency stop/reset by STOP key, or all keys on operation panel, with/without password.
<b>Regenerative Power Ride-through Control</b>		Ability to keep the motor running using its regenerative energy in case of a momentary power failure. (Default: OFF)
<b>Auto-restart</b>		Ability to restart the motor while coasting in accordance with its speed and direction. (Default: OFF)
<b>Simplified Pattern Operation</b>		Ability to select each 8 patterns in 2 groups from 15-speed operation frequency. Maximum of 16 types of operations possible. Terminal operation/repeat operation possible.
<b>Commercial Power/Inverter Switching</b>		Ability to switch operation by commercial power supply or inverter.
<b>Light-load High-speed Operation</b>		Improves the efficiency of the machine by increasing the motor speed when it is running under light load.
<b>Droop Function</b>		When two or more inverters are used to operate a single load, this function prevents load from concentrating on one inverter due to unbalance.
<b>Override Function</b>		External input signal adjustment is possible to the frequency command value.
Protective Function		<b>Protective Function</b>
	<b>Electronic Thermal Characteristic</b>	Switchable between standard motor/constant torque motor, adjustment of overload protection and stall prevention level.
	<b>Reset</b>	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.

# TOSHIBA AS3 AC Drives – Specifications

## Toshiba AS3 Drive Model Selection Tables, *continued*

Toshiba AS3 General Specifications (Applicable to All Models)			
Display Function	LCD Screen	<b>Alarms</b>	Stall prevention during run, overvoltage limit, overload, undervoltage on power supply side, DC circuit undervoltage, setting error, in retry, upper limit, lower limit (control power supply option undervoltage), operation panel disconnection.
		<b>Causes of Failures</b>	Overcurrent, overvoltage, overheat, short circuit on the load side, ground fault on the load side, inverter overload, arm short-circuit at starting, overcurrent on the load side at starting, cooling fan fault, CPU fault, EEPROM fault, RAM fault, ROM fault, communication error. The following items are selectable: braking resistor overcurrent/overload, emergency off, undervoltage, undercurrent, overtorque, motor overload, input phase failure, output phase failure.
		<b>Monitoring Function</b>	Output frequency, frequency command, forward run/reverse run, output current, DC voltage, output voltage, compensated frequency, terminal input/output information, CPU version, past trip history, cumulative operation time, feedback frequency, torque, torque command, torque current, exiting current, PID feedback value, motor overload factor, inverter overload factor, PBR overload factor, PBR load factor, input power, output power, peak output current, peak DC voltage, RR input, II input, RX input, AI4 input, AI5 input, FM output, AM output, expansion I/O card option CPU version, integral input power, integral output power, communication option reception counter, communication option abnormal counter.
		<b>Free Unit Display</b>	Display of optional units other than output frequency (motor speed, line speed, etc.), current ampere/%switch, voltage volt/%switch.
		<b>Automatic Edit Function</b>	Automatically searches for parameters that are different from the default setting parameters, making it easy to find changed parameters.
		<b>User Default Setting</b>	User parameter settings can be saved as default settings. Allows resetting the parameters to the user-defined parameter settings.
	LED	<b>Charge Display</b>	Displays power circuit capacitor charging.
Interface Specification	<b>Digital Input</b>	8 digital input terminals (+6 optional) are programmable digital input, and the signal functions are arbitrarily selected from 204 types (including positive/negative logic selection). 3 functions can be assigned for some terminals. The input level complies with IEC61131-2 logic type 1.	
	<b>Digital Output</b>	3 digital output terminals (2 of which are optional) are programmable digital outputs, and the signal functions are arbitrarily selected from 262 types (including positive/negative logic selection). 2 functions can be assigned for some terminals. Output capacity is 24VDC, 50mA.	
	<b>Sink/Source Logic Setting</b>	Ability to select minus common (CC) or plus common (P24) for digital inputs by mechanical switch. (Default setting: external power supply)	
	<b>Pulse Train Frequency Input</b>	Can be assigned on digital input ([S4] and [S5]) terminals (up to 30 kpps), can be used as PG input.	
	<b>Pulse Train Frequency Output</b>	Can be assigned on digital output [FP] terminal (up to 30 kpps, duty 50%).	
	<b>Relay Output (Failure detection relay)</b>	1c contact and five 1a contacts (3 of which are optional) relays are programmable output, and the signal functions are arbitrarily selected from 262 types. Output capacity is 250VAC/2A or 30VDC/2A at maximum. Fault detection output is assigned on 1c contact relay by default.	
	<b>Frequency Command Input</b>	5 analog input terminals (2 of which are optional) are frequency command inputs. The input level depends on each terminal (0–10V, ±10V, 0–20/4–20 mA, or PTC).	
	<b>Output for Frequency Meter / Output for Ammeter</b>	2 analog output terminals are programmable analog outputs, and the signal functions are arbitrarily selected from 54 types. The output levels are also programmable (1mA DC full-scale milli-ammeter, 0–20mA, 4–20mA, or 0–10V).	
	<b>Control Power Supply</b>	2 output: 10V/10mA and 24V/200mA with current limiter 1 output: control supply back up function (24VDC/1A)	
	<b>Functional Safety</b>	Safe Torque Off complies with IEC61800-5-2	
	<b>Communication Function</b>	Embedded Ethernet (dual port with switch): EtherNet/IP, Modbus-TCP, Webserver Embedded RS485 (2 channel): Toshiba inverter protocol, Modbus-RTU Optional: EtherCAT	
Environments	<b>Use Environments</b>	Indoor use. Do not expose to direct sunlight or corrosive gas, flammable gas, explosive gas, oil mist, or non-conductive or conductive dust. <sup>2</sup>	
	<b>Ambient Temperature</b>	-15 to 60°C (-10 to 60°C for frame size A7 and A8) <sup>3</sup> • Frame size A1 to A5: current reduction, remove the top cover when above 50°C • Frame size A6: current reduction when above 50°C • Frame size A7 and A8: current reduction when above 50°C	
	<b>Storage Temperature</b>	-25°C to +70°C (temperature applicable for a short term)	
	<b>Relative Humidity</b>	5 to 95% non-condensing	
	<b>Altitude</b>	4800m or less for TN/TT system (frame size A1 to A6) 3800m or less for IT system (frame size A1 to A6) 3000m or less for TN/TT/IT system (frame size A7 and A8) 2000m or less for corner-earthed system (all frame sizes). Current reduction is required for use above 1000m regardless of frame size. <sup>4</sup>	
	<b>Vibration<sup>5</sup></b>	5.9 m/s <sup>2</sup> (0.6G) or less (10–55 Hz) for frame sizes A1 to A5. 2.9 m/s <sup>2</sup> (0.3G) or less (10–55 Hz) from frame sizes A6 to A8.	
<p>1 - This function protects inverters from overcurrent due to output circuit ground fault.</p> <p>2 - Frame sizes A1 to A6 products are intended for use under the following environmental conditions defined by IEC60721-3-3 Ed.2.2 (2002) - Conditions of chemically active substances: 3C3 - Conditions of mechanically active substances: 3S3</p> <p>3 - Remove inverter's operation panel when above 50°C. For detail of current reduction, see "Instruction manual for Load Reduction" (E6582116)</p> <p>4 - Current must be reduced by 1% for each 100m over 1000m (90% at 2000m, 80% at 3000m, etc.)</p> <p>5 - Test condition: IEC60068-2-6, IEC60068-2-27</p>			



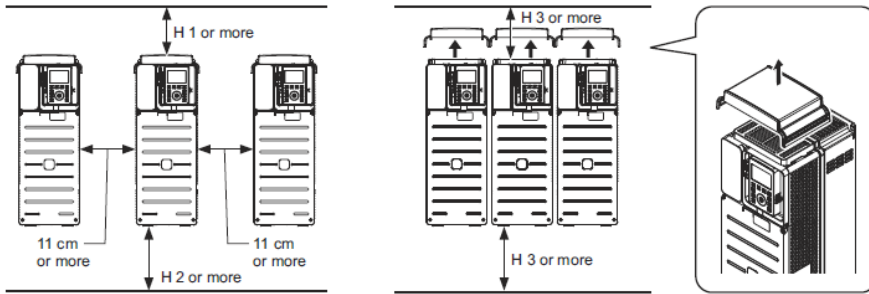
# TOSHIBA AS3 AC Drives – Specifications

## Toshiba AS3 Drive Model Selection Tables, *continued*

AS3 Motor Control (Applicable to All Models)					
Motor Control	Motor Type	Control Mode Description	Start Torque	Speed Control Range (Turndown/Accuracy)	
	Induction Motor (IM)	V/F Constant		150% @ 6Hz	1:10
		Variable Torque		150% @ 6Hz	1:10
		Auto Torque Boost		150% @ 3Hz	1:20
		Vector Control 1		200% @ 0.3Hz	1:200
		Energy Savings		150% @ 3Hz	1:20
		Dynamic Energy Savings		150% @ 3Hz	1:20
		V/f 5-point setting		150% @ 6Hz	1:10
		PG feedback control		200% @ 0Hz	1:1000
		Vector Control 2 (torque)		200% @ 0.3Hz	1:200
		PG feedback vector control (torque)		200% @ 0Hz	1:1000
	Permanent Magnet AC Motor (PM)	PM Motor Control		150% @ 0.6Hz	1:100
		PG feedback PM Motor Control		150% @ 0Hz	1:1000

# TOSHIBA AS3 AC Drives – Specifications

## Minimum Clearances and Air Flow for Toshiba AS3 Series Drives



AS3 Minimum Mounting Clearances*				
Model Number	Frame Size	H1 cm [in]	H2 cm [in]	H3 cm [in]
VFAS3-2004PC to VFAS3-4750PC	A1-A5	10	10	10
VFAS3-4900PC to VFAS3-4132KPC	A6	25	25	25
VFAS3-4160KPC	A7	15	15	25
VFAS3-4200KPC	A8	20	15	25

\* Failure to follow the minimum mounting clearances may cause the fan to malfunction and cause a heat dissipation problem.

Toshiba AS3 Loss Ratings and Temperatures								
Frame Size	Model Number	Duty	Motor Capacity (kW)	Drive Calorific Value <sup>1</sup> (W)	Inner Side Calorific Value <sup>2</sup> (W)	Forced air-cooled Required Ventilation Amount (m <sup>3</sup> /min)	Sealed Cabinet Necessary Heat Discharge Surface Quantity (m <sup>2</sup> )	Standby Power <sup>3</sup> (W)
A1	VFAS3-4004PC	ND	0.7	56	26	0.32	1.13	14
		HD	0.4	47	24	0.27	0.94	
	VFAS3-4007PC	ND	1.5	79	28	0.45	1.58	
		HD	0.7	54	25	0.30	1.07	
	VFAS3-4015PC	ND	2.2	100	30	0.57	2.00	
		HD	1.5	72	27	0.41	1.44	
VFAS3-4022PC	ND	3.7	140	33	0.79	2.80		
	HD	2/2	1-0	20	-/62	2.18		
VFAS3-4037PC	ND	5.5	192	37	1.09	3.83		
	HD	3.7	136	32	0.77	2.72		
A2	VFAS3-4055PC	ND	7.5	233	45	1.32	4.66	16
		HD	5.5	188	40	1.07	3.77	
	VFAS3-4075PC	ND	11	323	53	1.84	6.47	
		HD	7.5	224	43	1.27	4.47	
A3	VFAS3-4110PC	ND	15	455	62	2.58	9.10	19
		HD	11	310	50	1.76	6.20	
	VFAS3-4150PC	ND	18.5	557	70	3.16	11.14	
		HD	15	414	58	2.35	8.27	
	VFAS3-4185PC	ND	22	603	71	3.42	12.06	
		HD	18.5	493	62	2.80	9.85	
A4	VFAS3-4220PC	ND	30	770	94	4.37	15.40	28
		HD	22	537	75	3.05	10.73	
	VFAS3-4300PC	ND	37	939	107	5.33	18.78	
		HD	30	704	88	4.00	14.09	
	VFAS3-4370PC	ND	45	1101	123	6.25	22.02	
		HD	37	818	98	4.64	16.36	
A5	VFAS3-4450PC	ND	55	1094	132	6.21	21.88	22
		HD	45	827	107	4.70	16.55	
	VFAS3-4550PC	ND	75	1589	175	9.02	31.75	
		HD	55	1028	125	5.84	20.56	
	VFAS3-4750PC	ND	90	1827	199	10.37	36.54	
		HD	75	1388	156	7.88	27.75	

1 - Case of 100% load operation. The heat loss for the optional external devices (input reactor, radio noise reduction filters, etc.) is not included in the calorific values in the table.

2 - This value is power dissipated inside the enclosure when using Flange mounting kit.

3 - This value is power consumption when power is on without motor output, cooling fans, or I/O options.

# TOSHIBA AS3 AC Drives – Specifications

## Minimum Clearances and Air Flow, *continued*

Toshiba AS3 Loss Ratings and Temperatures								
Frame Size	Model Number	Duty	Motor Capacity (kW)	Drive Calorific Value <sup>1</sup> (W)	Inner Side Calorific Value <sup>2</sup> (W)	Forced air-cooled Required Ventilation Amount (m <sup>3</sup> /min)	Sealed Cabinet Necessary Heat Discharge Surface Quantity (m <sup>2</sup> )	Standby Power <sup>3</sup> (W)
A6	VFAS3-4900PC	ND	110	2920	309	16.58	58.40	60
		HD	90	1925	272	10.92	38.48	
	VFAS3-4110KPC	ND	132	3457	358	19.62	69.13	
		HD	110	2228	298	12.65	44.57	
	VFAS3-4132KPC	ND	160	4013	405	22.78	80.26	
		HD	132	2738	343	15.54	54.77	
A7	VFAS3-4160KPC	ND	220	5404	452	30.68	108.08	62
		HD	160	3820	350	19.87	70.00	
A8	VFAS3-4200KPC	ND	250	6279	606	35.64	125.58	72
		HD	200	4930	493	25.59	90.17	

1 - Case of 100% load operation. The heat loss for the optional external devices (input reactor, radio noise reduction filters, etc.) is not included in the calorific values in the table.

2 - This value is power dissipated inside the enclosure when using Flange mounting kit.

3 - This value is power consumption when power is on without motor output, cooling fans, or I/O options.

# TOSHIBA AS3 AC Drives – Specifications

## Toshiba AS3 Brake Specifications

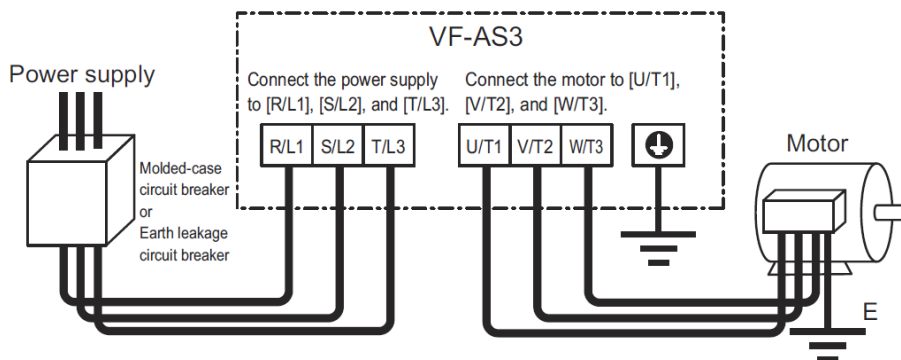
Dynamic braking absorbs the motor regeneration energy when the motor is decelerated faster than it would if it was allowed to coast to a stop. The regeneration energy is dissipated by braking resistors. All drives have the braking function built-in and do not require a separate dynamic braking unit. The recommended NEMA 1 type brake resistors available at AutomationDirect for each drive model are listed in the table below.

Toshiba AS3 Brake Specifications									
Voltage (V)	Drive Part Number	HP (HD)	DC Voltage	125% Braking Torque @ 10% Duty Cycle					
				Drive Braking Capacity - Max Torque			NEMA1 Resistors with Thermal Switch		
				Minimum Resistor	Max Total Brake Current (A)	Peak Power (kW)	Part #	Quantity	Total Brake Current (A)
460	<a href="#">VFAS3-4004PC</a>	0.5	790	78.0	10.1	8.0	<a href="#">BR-N1-240W250</a>	1	3.2
	<a href="#">VFAS3-4007PC</a>	1.0					<a href="#">BR-N1-240W150</a>	1	5.3
	<a href="#">VFAS3-4015PC</a>	2					<a href="#">BR-N1-500W200</a>	1	4.0
	<a href="#">VFAS3-4022PC</a>	3		31.2	25.3	20.0	<a href="#">BR-N1-500W130</a>	1	6.1
	<a href="#">VFAS3-4037PC</a>	5					<a href="#">BR-N1-720W85</a>	1	9.3
	<a href="#">VFAS3-4055PC</a>	8		22.3	35.4	28.0	<a href="#">BR-N1-1K2W50</a>	1	15.8
	<a href="#">VFAS3-4075PC</a>	10.0					<a href="#">BR-N1-1K7W30</a>	1	26.3
	<a href="#">VFAS3-4110PC</a>	15		15.6	50.6	40.0	<a href="#">BR-N1-2K3W26</a>	1	30.4
	<a href="#">VFAS3-4150PC</a>	20					<a href="#">BR-N1-2K8W25</a>	1	31.6
	<a href="#">VFAS3-4185PC</a>	25		12.0	65.8	52.0	<a href="#">BR-N1-4K0W16P0</a>	1	49.4
	<a href="#">VFAS3-4220PC</a>	30.0					<a href="#">BR-N1-4K7W14P7</a>	1	53.7
	<a href="#">VFAS3-4300PC</a>	40		7.9	100.0	79.0	<a href="#">BR-N1-6K5W06P4</a>	1	123.4
	<a href="#">VFAS3-4370PC</a>	50					<a href="#">BR-N1-10K8W04P3</a>	1	183.7
	<a href="#">VFAS3-4450PC</a>	60		2.5	316.0	249.6			
	<a href="#">VFAS3-4550PC</a>	75							
	<a href="#">VFAS3-4750PC</a>	100.0							

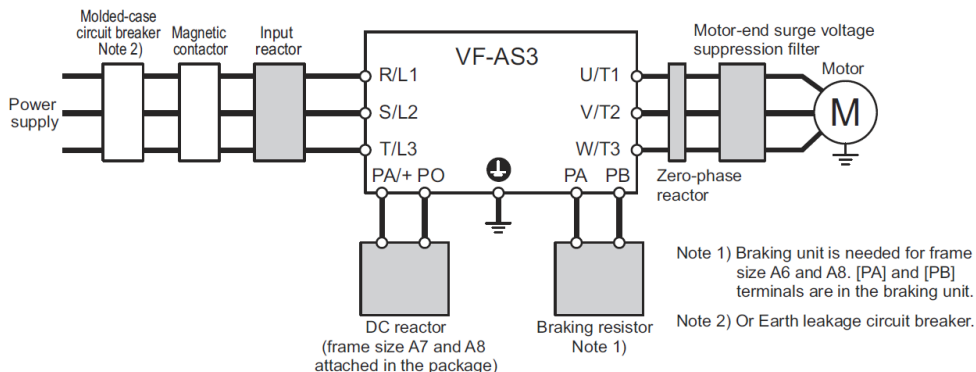
# TOSHIBA AS3 AC Drives – Basic Wiring Diagrams

## Control Wiring Diagrams

### Connection to Power Supply and Motor



### Connection to Peripheral Devices

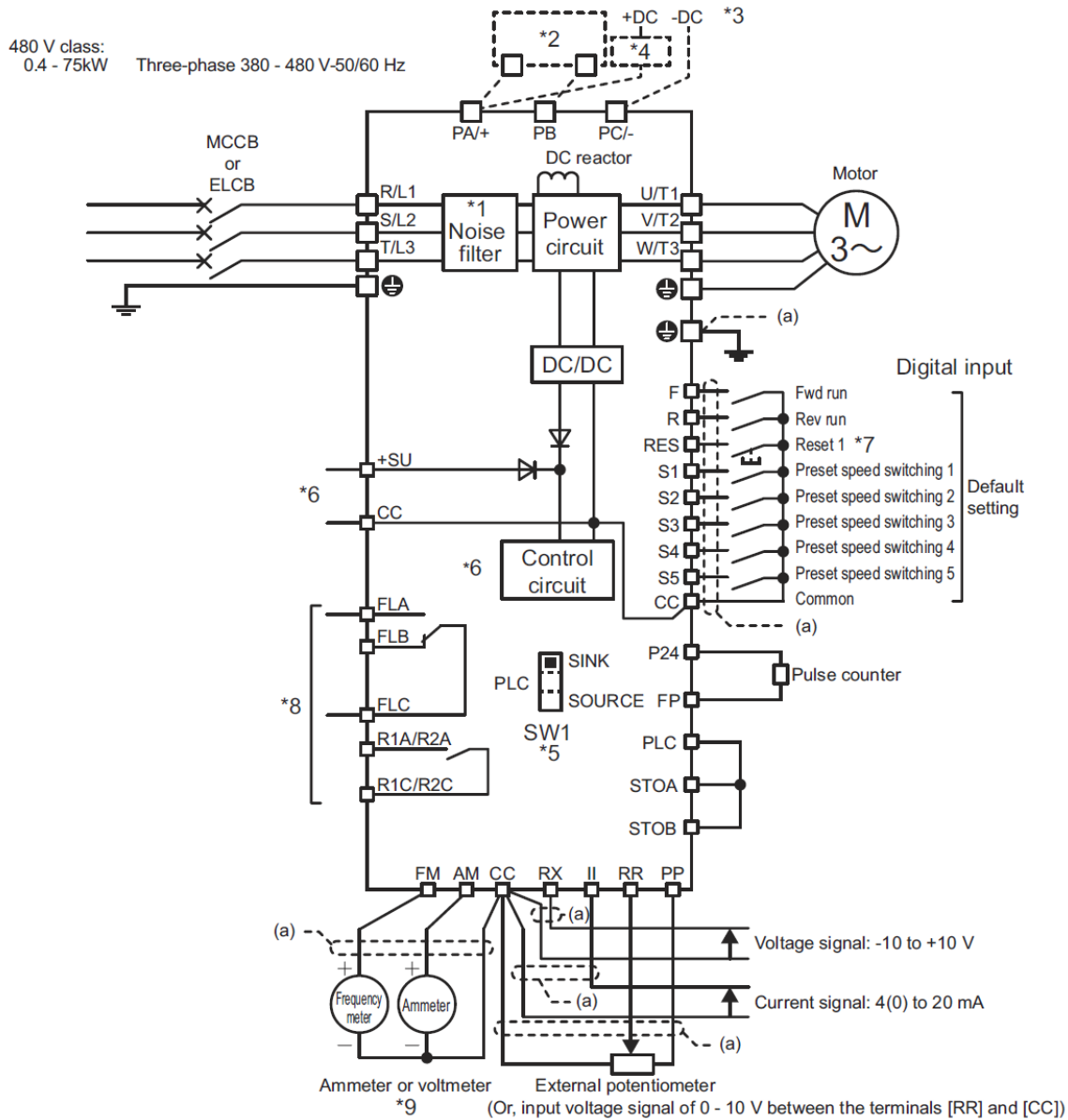


### Wire Sizes

Toshiba AS3 Wire Sizes				
Applicable Motor (kW) [Normal Duty]	Model Number	Power Circuit (mm <sup>2</sup> )		Grounding Wire (mm <sup>2</sup> )
		Input	Output	
0.75 – 4.0	VFAS3-4004PC, VFAS3-4007PC, VFAS3-4015PC, VFAS3-4022PC,	1.5	1.5	2.5
5.5	VFAS3-4037PC	1.5	2.5	2.5
7.5	VFAS3-4055PC	2.5	4	2.5
11	VFAS3-4075PC	4	6	4
15	VFAS3-4110PC	6	10	10
18.5	VFAS3-4150PC	10	10	10
22	VFAS3-4185PC	10	16	16
30	VFAS3-4220PC	16	25	16
37	VFAS3-4300PC	25	35	16
45	VFAS3-4370PC	35	35	16
55	VFAS3-4450PC	50	50	25
75	VFAS3-4550PC	70	95	50
90	VFAS3-4750PC	95	120	70
110	VFAS3-4900PC	50x2	50x2	95
132	VFAS3-4110KPC	70x2	70x2	95
160	VFAS3-4132KPC	95x2	95x2	120
220/250	VFAS3-4160KPC, VFAS3-4200KPC	150x2	150x2	150

## Control Wiring Diagram: Full I/O

Frame Size A1 to A5: Sinking



**Notes:**

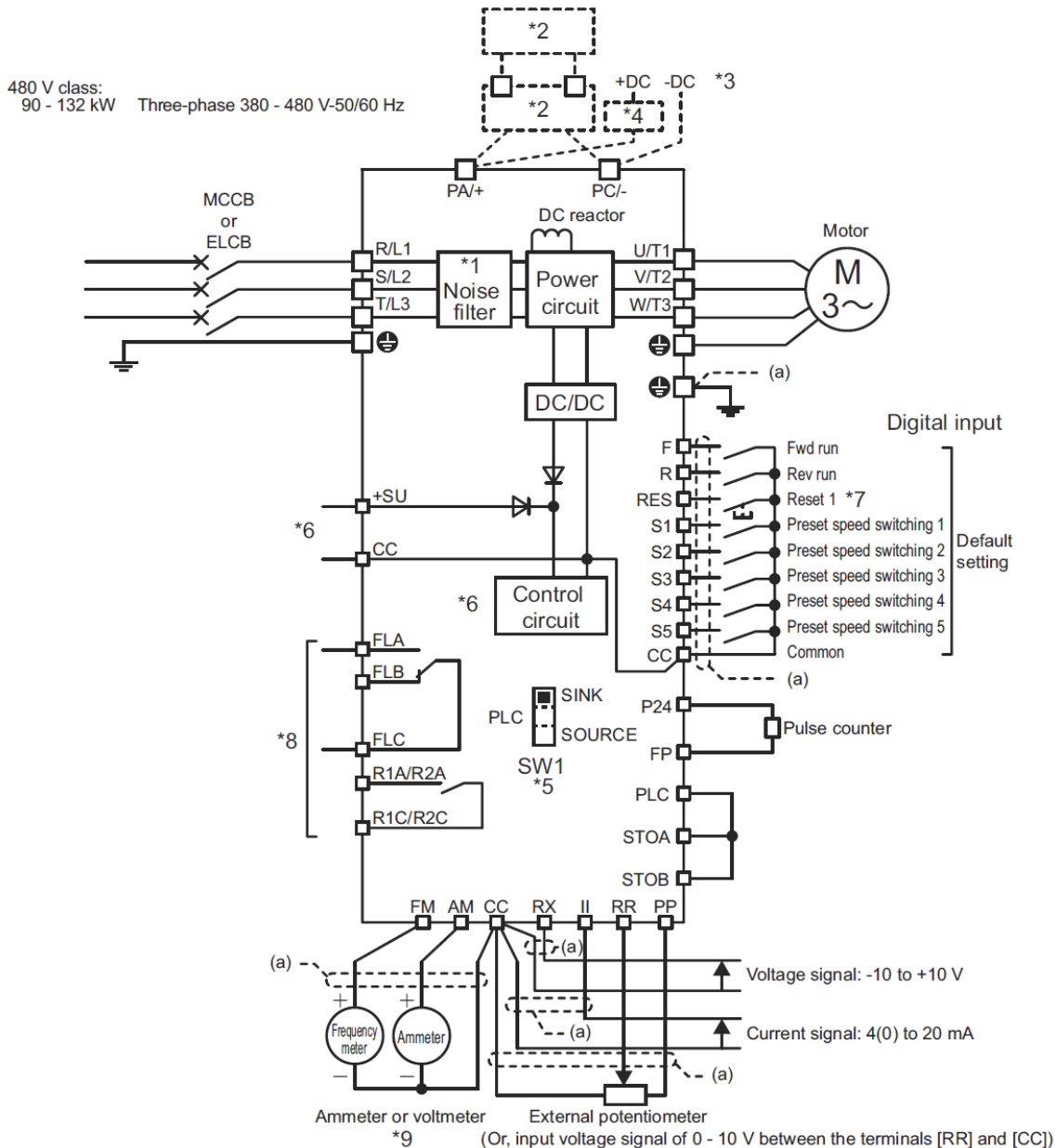
1. EMC filter is built-in.
2. External braking resistor (option).
3. To supply DC power, connect to the terminals [PA/+] and [PC/-].
4. If using drive VFAS3-4220PC to VFAS3-4750PC with a DC power supply, a circuit to suppress inrush current is required. For details, refer to manual "DC Power Supply Connect to Inverter" (E6582156).
5. For the switch function, refer to section 2.3.5 of the AS3 Instruction Manual.
6. To supply control power from an external power supply for backing up the control power supplied from the drive, an optional control power supply unit (CPS002Z) is required. In this case, it is used in conjunction with the drive internal power supply. Set <F647: Control power option failure detection> to back up the control power supply. Refer to section 6.30.20 of the AS3 Instruction Manual for details.
7. The reset signal is activated by ON > OFF trigger input.
8. Connect to power to comply with OVC2 (Over Voltage Category 2). Isolation transformer is necessary when connecting to power supply (OVC3).
9. Calibration is required when connecting a meter. Refer to section 5.2.6 of the AS3 Instruction Manual.



# TOSHIBA AS3 AC Drives – Basic Wiring Diagrams

## Control Wiring Diagram: Full I/O

Frame Size A6: Sinking



**Notes:**

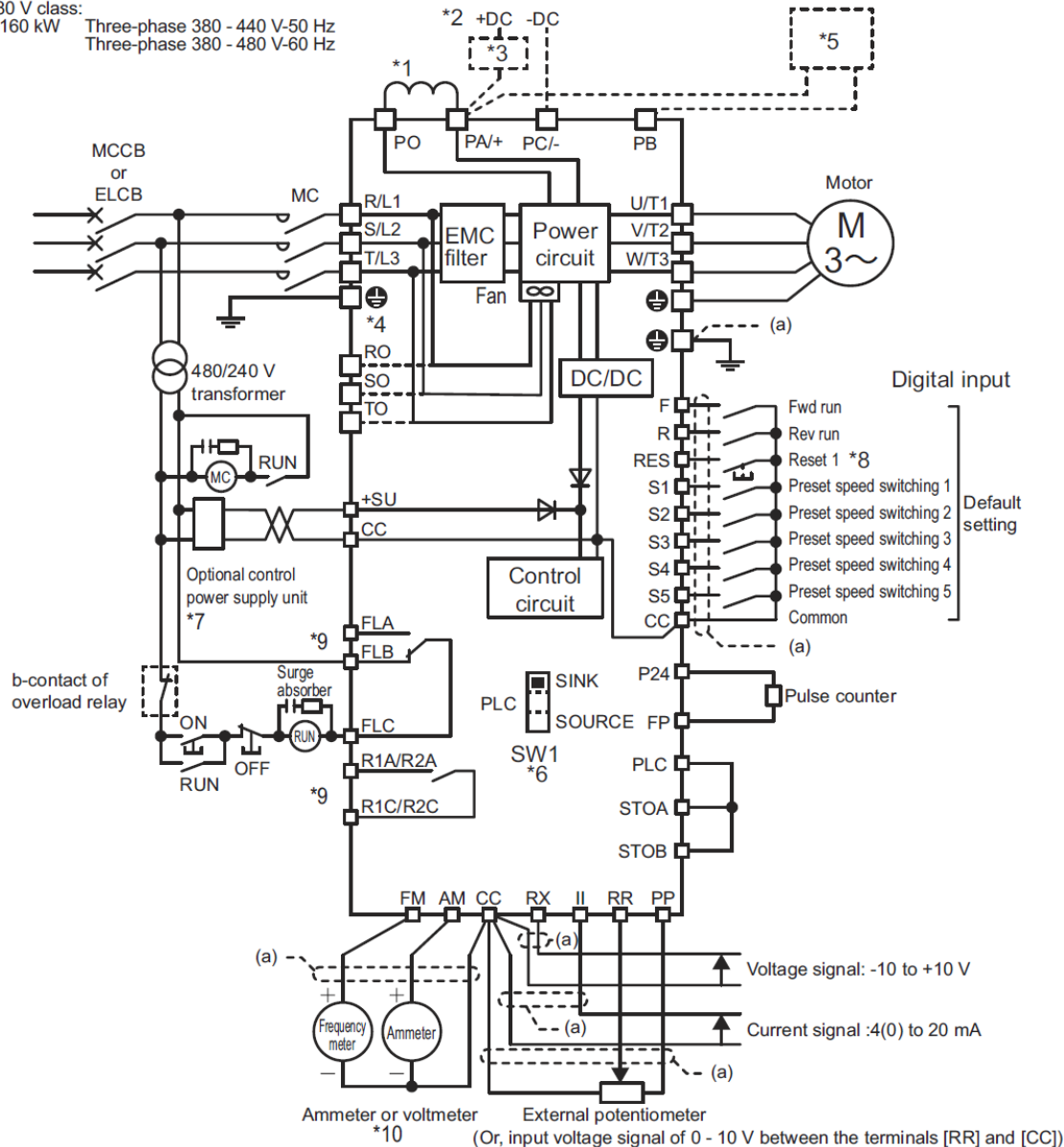
- EMC filter is built-in.
- When an optional braking resistor is mounted, a braking unit is also required.
- To supply DC power, connect to the terminals [PA/+] and [PC/-].
- If using the drive with a DC power supply, a circuit to suppress inrush current is required. For details, refer to manual "DC Power Supply Connect to Inverter" (E6582156).
- For the switch function, refer to section 2.3.5 of the AS3 Instruction Manual.
- To supply control power from an external power supply for backing up the control power supplied from the drive, an optional control power supply unit (CPS002Z) is required. In this case, it is used in conjunction with the drive internal power supply. Set <F647: Control power option failure detection> to back up the control power supply. Refer to section 6.30.20 of the AS3 Instruction Manual for details.
- The reset signal is activated by ON > OFF trigger input.
- Connect to power to comply with OVC2 (Over Voltage Category 2). Isolation transformer is necessary when connecting to power supply (OVC3).
- Calibration is required when connecting a meter. Refer to section 5.2.6 of the AS3 Instruction Manual.

# TOSHIBA AS3 AC Drives – Basic Wiring Diagrams

## Control Wiring Diagram: Full I/O

### Frame Size A7: Sinking

Power supply  
 480 V class:  
 160 kW Three-phase 380 - 440 V-50 Hz  
 Three-phase 380 - 480 V-60 Hz



**Notes:**

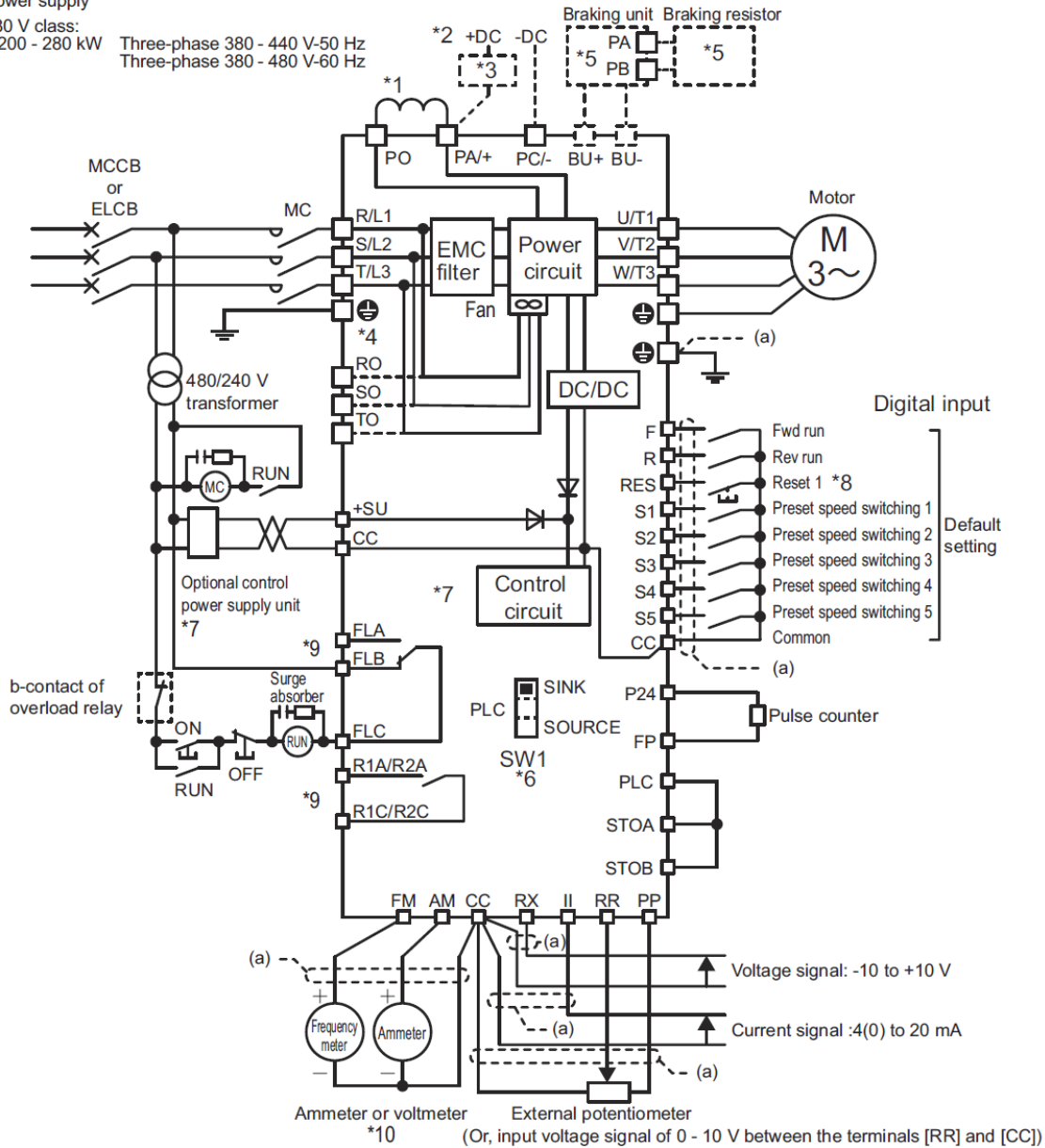
1. Mount the attached DC reactor between the terminals [P0] and [PA/+].
2. To supply DC power, connect to the terminals [PA/+] and [PC/-]. In this case, a DC reactor is not required.
3. If using the drive with a DC power supply, a circuit to suppress inrush current is required. For details, refer to manual "DC Power Supply Connect to Inverter" (E6582156).
4. When the drive is used with a DC power supply, a separate three-phase power input for cooling fan is required. See manual "DC Power Supply Connect to Inverter" (E682156) for details.
5. Optional external braking resistor.
6. For the switch function, refer to section 2.3.5 of the AS3 Instruction Manual
7. To supply control power from an external power supply for backing up the control power supplied from the drive, an optional control power supply unit (CPS002Z) is required. In this case, it is used in conjunction with the drive internal power supply. Set <F647: Control power option failure detection> to back up the control power supply. Refer to section 6.30.20 of the AS3 Instruction Manual for details.
8. The reset signal is activated by ON > OFF trigger input.
9. Connect to power to comply with OVC2 (Over Voltage Category 2). Isolation transformer is necessary when connecting to power supply (OVC3).
10. Calibration is required when connecting a meter. Refer to section 5.2.6 of the AS3 Instruction Manual.

## Control Wiring Diagram: Full I/O

### Frame Size A8: Sinking

Power supply  
480 V class:  
200 - 280 kW

Three-phase 380 - 440 V-50 Hz  
Three-phase 380 - 480 V-60 Hz



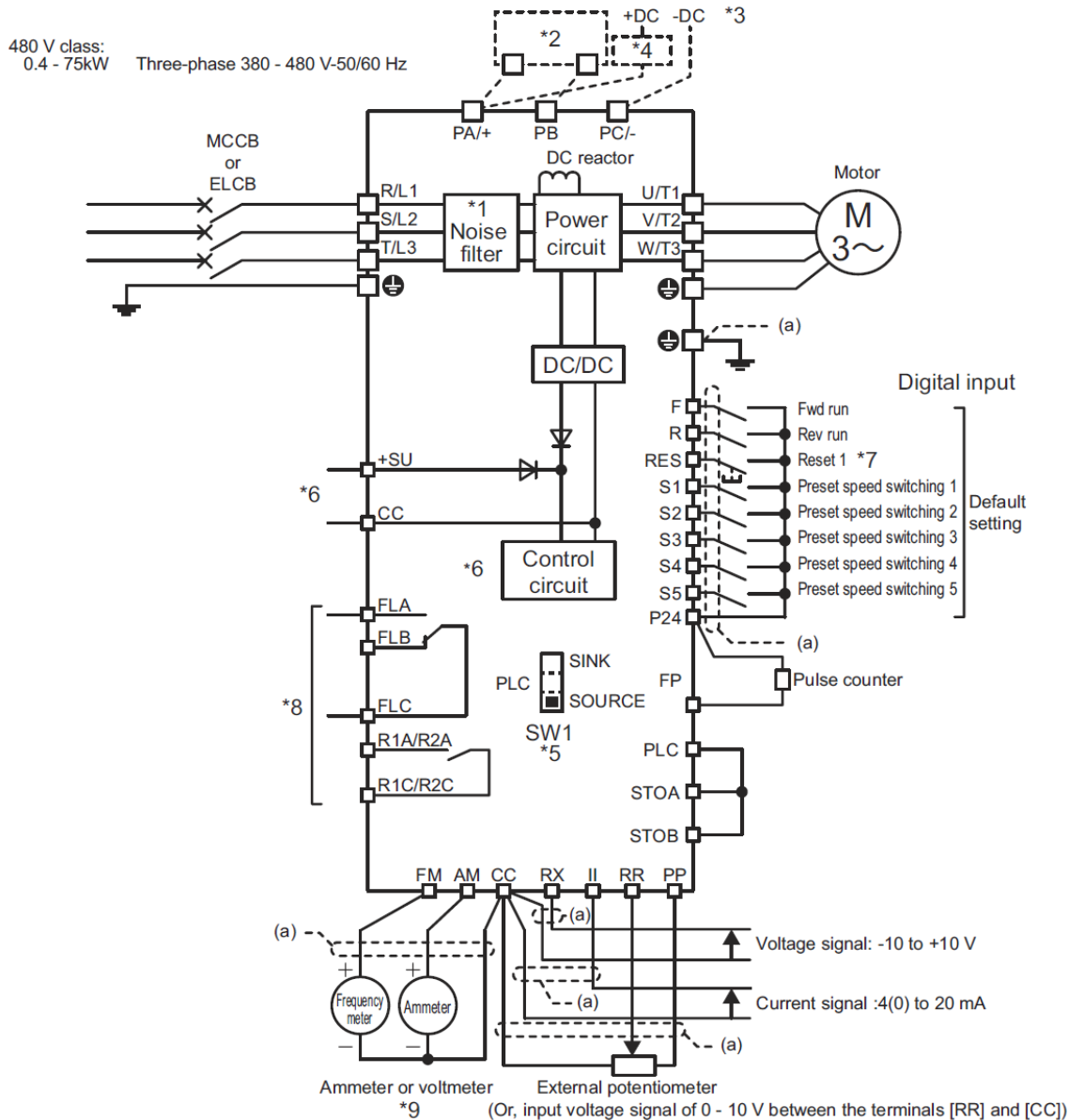
**Notes:**

1. Mount the attached DC reactor between the terminals [P0] and [PA/+].
2. To supply DC power, connect to the terminals [PA/+] and [PC/-]. In this case, a DC reactor is not required.
3. If using the drive with a DC power supply, a circuit to suppress inrush current is required. For details, refer to manual "DC Power Supply Connect to Inverter" (E6582156).
4. When the drive is used with a DC power supply, a separate three-phase power input for cooling fan is required. See manual "DC Power Supply Connect to Inverter" (E682156) for details.
5. When an optional braking resistor is used, a braking unit is also required.
6. For the switch function, refer to section 2.3.5 of the AS3 Instruction Manual
7. To supply control power from an external power supply for backing up the control power supplied from the drive, an optional control power supply unit (CPS002Z) is required. In this case, it is used in conjunction with the drive internal power supply. Set <F647: Control power option failure detection> to back up the control power supply. Refer to section 6.30.20 of the AS3 Instruction Manual for details.
8. The reset signal is activated by ON > OFF trigger input.
9. Connect to power to comply with OVC2 (Over Voltage Category 2). Isolation transformer is necessary when connecting to power supply (OVC3).
10. Calibration is required when connecting a meter. Refer to section 5.2.6 of the AS3 Instruction Manual.

# TOSHIBA AS3 AC Drives – Basic Wiring Diagrams

## Control Wiring Diagram: Full I/O

Frame Size A1 to A5: Sourcing



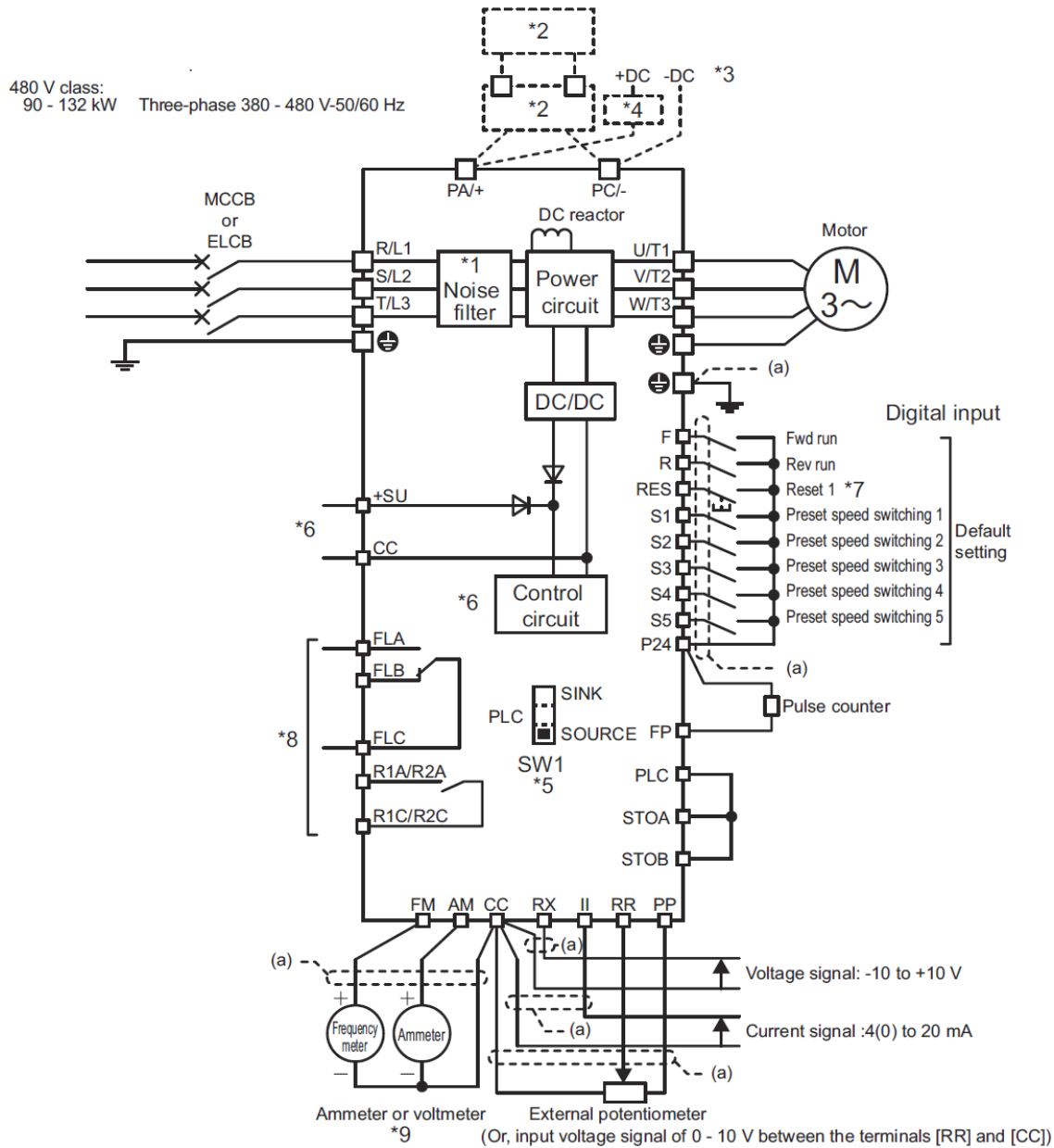
**Notes:**

1. EMC filter is built-in.
2. External braking resistor (option).
3. To supply DC power, connect to the terminals [PA/+] and [PC/-].
4. If using drive VFAS3-4220PC to VFAS3-4750PC with a DC power supply, a circuit to suppress inrush current is required. For details, refer to manual "DC Power Supply Connect to Inverter" (E6582156).
5. For the switch function, refer to section 2.3.5 of the AS3 Instruction Manual.
6. To supply control power from an external power supply for backing up the control power supplied from the drive, an optional control power supply unit (CPS002Z) is required. In this case, it is used in conjunction with the drive internal power supply. Set <F647: Control power option failure detection> to back up the control power supply. Refer to section 6.30.20 of the AS3 Instruction Manual for details.
7. The reset signal is activated by ON > OFF trigger input.
8. Connect to power to comply with OVC2 (Over Voltage Category 2). Isolation transformer is necessary when connecting to power supply (OVC3).
9. Calibration is required when connecting a meter. Refer to section 5.2.6 of the AS3 Instruction Manual.

# TOSHIBA AS3 AC Drives – Basic Wiring Diagrams

## Control Wiring Diagram: Full I/O

Frame Size A6: Sourcing



**Notes:**

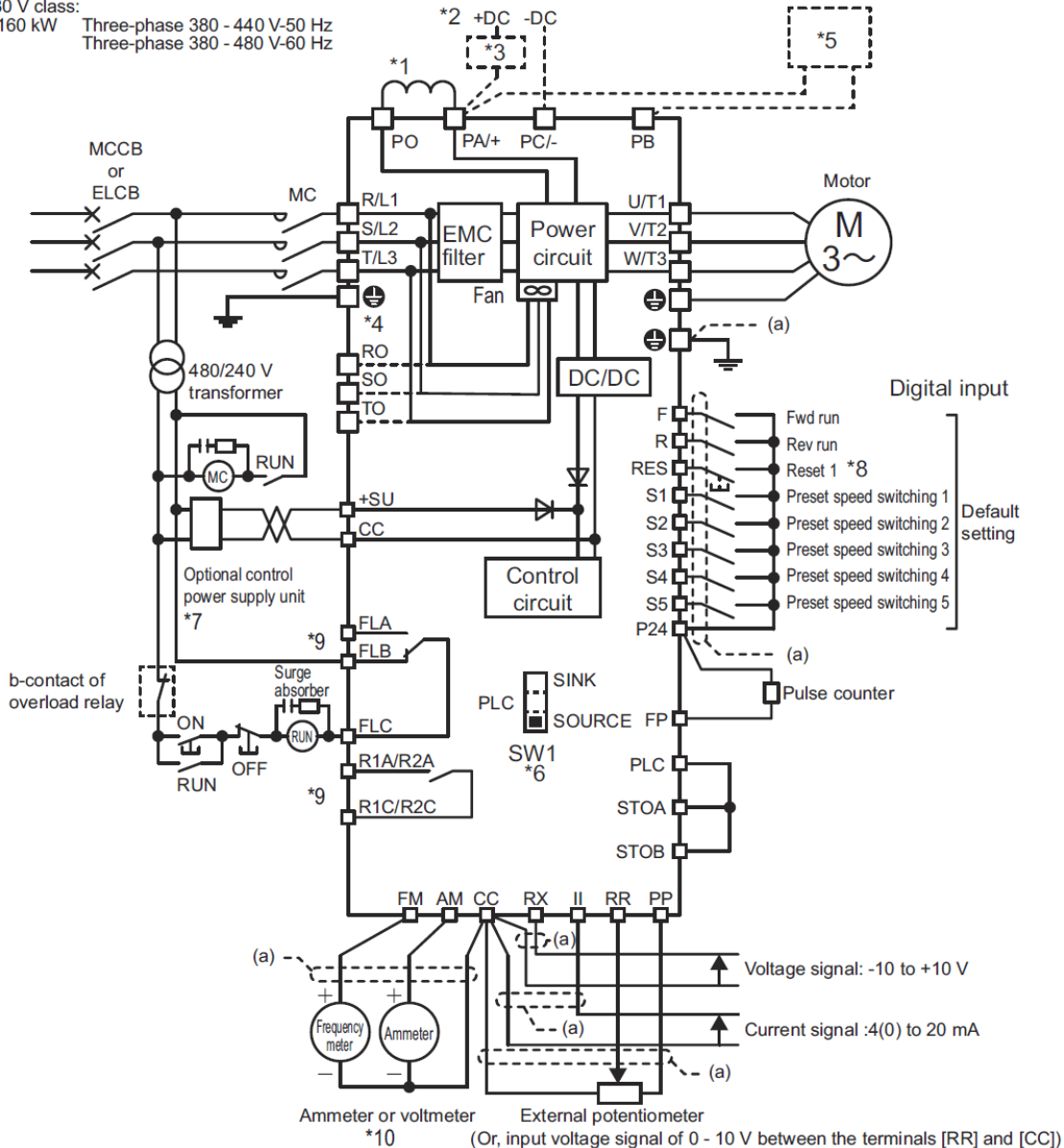
1. EMC filter is built-in.
2. When an optional braking resistor is mounted, a braking unit is also required.
3. To supply DC power, connect to the terminals [PA/+] and [PC/-].
4. If using the drive with a DC power supply, a circuit to suppress inrush current is required. For details, refer to manual "DC Power Supply Connect to Inverter" (E6582156).
5. For the switch function, refer to section 2.3.5 of the AS3 Instruction Manual.
6. To supply control power from an external power supply for backing up the control power supplied from the drive, an optional control power supply unit (CPS002Z) is required. In this case, it is used in conjunction with the drive internal power supply. Set <F647: Control power option failure detection> to back up the control power supply. Refer to section 6.30.20 of the AS3 Instruction Manual for details.
7. The reset signal is activated by ON > OFF trigger input.
8. Connect to power to comply with OVC2 (Over Voltage Category 2). Isolation transformer is necessary when connecting to power supply (OVC3).
9. Calibration is required when connecting a meter. Refer to section 5.2.6 of the AS3 Instruction Manual.

# TOSHIBA AS3 AC Drives – Basic Wiring Diagrams

## Control Wiring Diagram: Full I/O

### Frame Size A7: Sourcing

Power supply  
 480 V class:  
 160 kW Three-phase 380 - 440 V-50 Hz  
 Three-phase 380 - 480 V-60 Hz



**Notes:**

1. Mount the attached DC reactor between the terminals [P0] and [PA/+].
2. To supply DC power, connect to the terminals [PA/+] and [PC/-]. In this case, a DC reactor is not required.
3. If using the drive with a DC power supply, a circuit to suppress inrush current is required. For details, refer to manual "DC Power Supply Connect to Inverter" (E6582156).
4. When the drive is used with a DC power supply, a separate three-phase power input for cooling fan is required. See manual "DC Power Supply Connect to Inverter" (E682156) for details.
5. Optional external braking resistor.
6. For the switch function, refer to section 2.3.5 of the AS3 Instruction Manual
7. To supply control power from an external power supply for backing up the control power supplied from the drive, an optional control power supply unit (CPS002Z) is required. In this case, it is used in conjunction with the drive internal power supply. Set <F647: Control power option failure detection> to back up the control power supply. Refer to section 6.30.20 of the AS3 Instruction Manual for details.
8. The reset signal is activated by ON > OFF trigger input.
9. Connect to power to comply with OVC2 (Over Voltage Category 2). Isolation transformer is necessary when connecting to power supply (OVC3).
10. Calibration is required when connecting a meter. Refer to section 5.2.6 of the AS3 Instruction Manual.

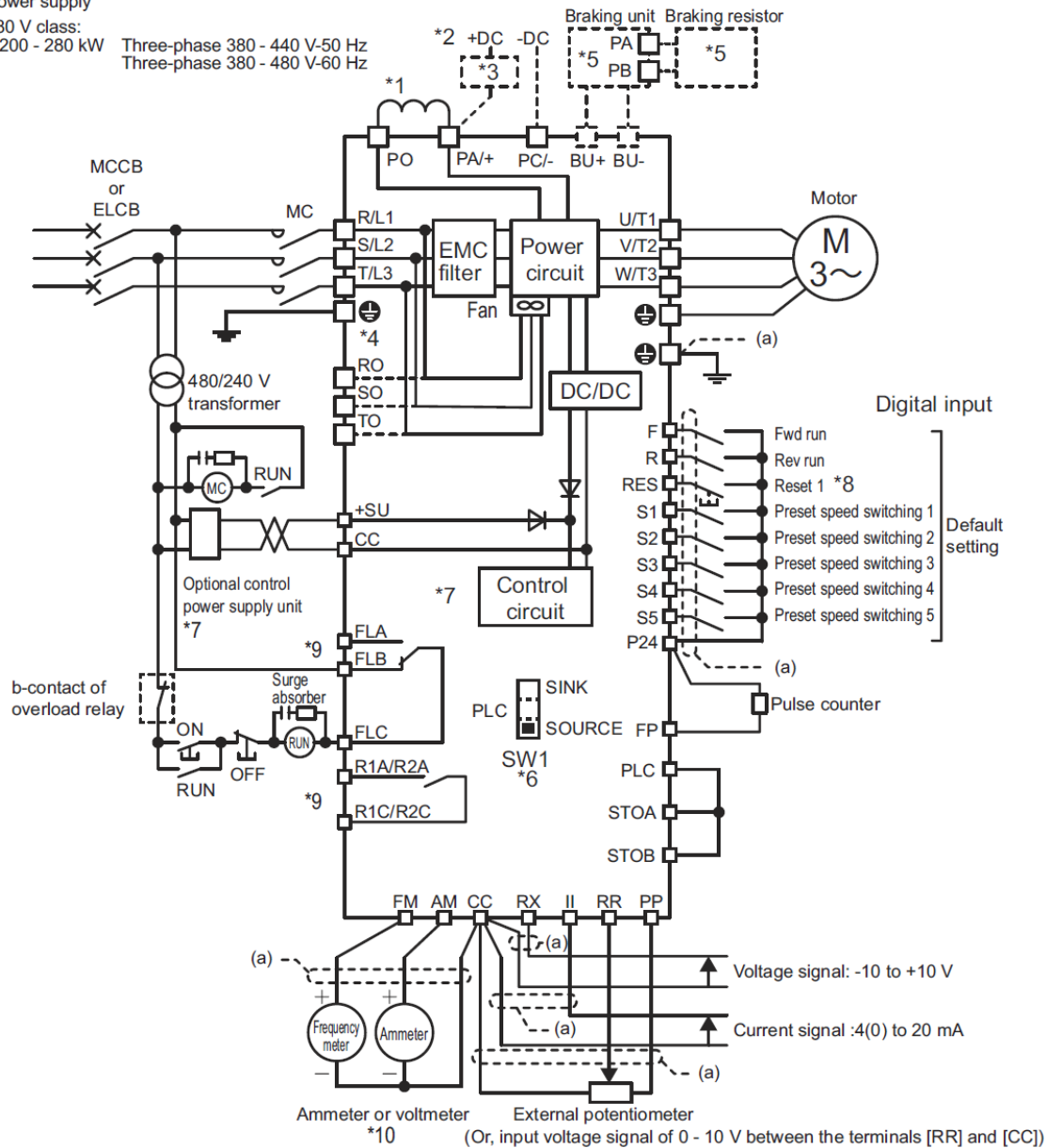


## Control Wiring Diagram: Full I/O

### Frame Size A8: Sourcing

Power supply  
480 V class:  
200 - 280 kW

Three-phase 380 - 440 V-50 Hz  
Three-phase 380 - 480 V-60 Hz

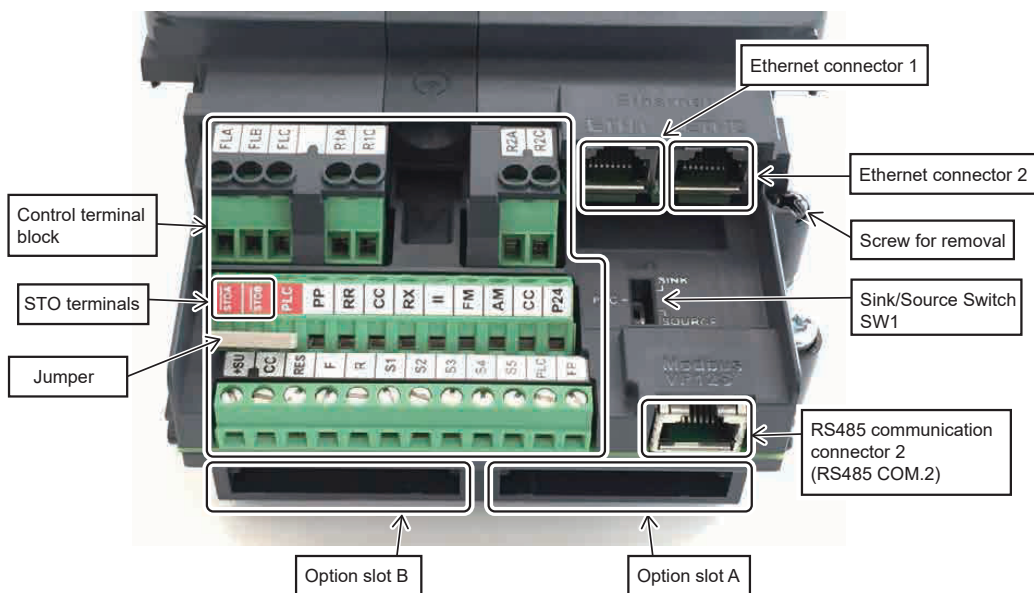


**Notes:**

1. Mount the attached DC reactor between the terminals [P0] and [PA/+].
2. To supply DC power, connect to the terminals [PA/+] and [PC/-]. In this case, a DC reactor is not required.
3. If using the drive with a DC power supply, a circuit to suppress inrush current is required. For details, refer to manual "DC Power Supply Connect to Inverter" (E6582156).
4. When the drive is used with a DC power supply, a separate three-phase power input for cooling fan is required. See manual "DC Power Supply Connect to Inverter" (E682156) for details.
5. When an optional braking resistor is used, a braking unit is also required.
6. For the switch function, refer to section 2.3.5 of the AS3 Instruction Manual
7. To supply control power from an external power supply for backing up the control power supplied from the drive, an optional control power supply unit (CPS002Z) is required. In this case, it is used in conjunction with the drive internal power supply. Set <F647: Control power option failure detection> to back up the control power supply. Refer to section 6.30.20 of the AS3 Instruction Manual for details.
8. The reset signal is activated by ON > OFF trigger input.
9. Connect to power to comply with OVC2 (Over Voltage Category 2). Isolation transformer is necessary when connecting to power supply (OVC3).
10. Calibration is required when connecting a meter. Refer to section 5.2.6 of the AS3 Instruction Manual.

## Control Terminals

The control terminal block is common to all drive types and is located on the lower side of the operation panel. It connects wiring between the drive and an external control device. The control terminal block is detachable.



### Control Terminal Torque and Wire Strip Length

Torque and Wire Strip Length						
Location	Screw Size	Torque		Strip Length (mm)	Screwdriver Size	
		N·m	lb·in		Width (mm)	Thickness
Relay	M3	0.5	4.4	11	3.5	0.5
Except Relay (2nd)	M3	0.5	4.4	6 or 7	3.5	0.5
Except Relay (1st)	M3	0.5	4.4	6	3.5	0.5

### Wire Size

Torque and Wire Strip Length							
Location	Conductor	Using One Wire		Using Two Wires		Using Two Wires with Twin Ferrule	
		mm <sup>2</sup>	AWG	mm <sup>2</sup>	AWG	mm <sup>2</sup>	AWG
Relay	Solid Wire	0.14–2.5	26–14	2x0.14 to 2x0.75	26–18	–	–
	Stranded Wire					2x0.5 to 2x1.5	20–16
Except Relay (2nd)	Solid Wire		26–16	2x0.14 to 2x0.75		–	–
	Stranded Wire					2x0.5 to 2x1.5	20–18
Except Relay (1st)	Solid Wire	–	–				
	Stranded Wire	2x0.5 to 2x1.5	20–18				

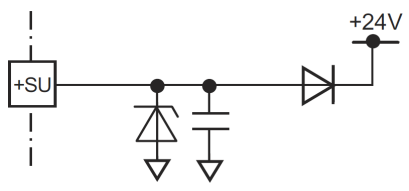
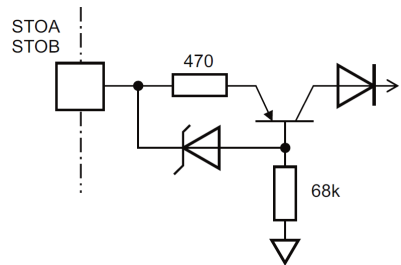
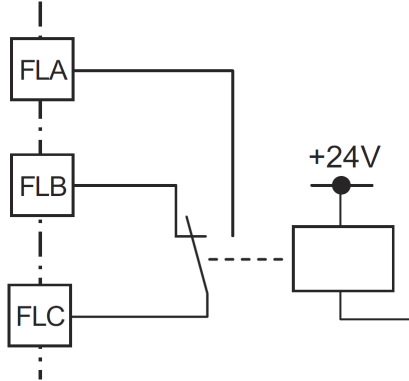
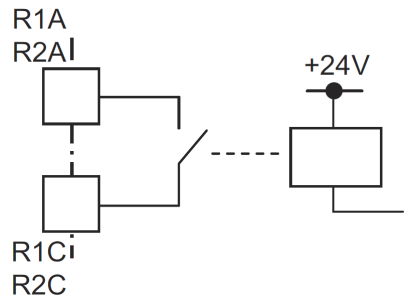
## Control Terminals

AS3 Control Terminal Functions				
Terminal	Type	Function	Electrical Specifications	Internal Circuit
F	Input	Multifunction programmable digital input. By default, forward run is performed with ON and deceleration stop with OFF.	Digital input: • 24VDC/5mA or less  Compliant with IEC61131-2 logic type 1: • Sink logic: ON<10V, 16V<OFF • Source logic: OFF <5V, 11V<ON  Sink logic and source logic can be switch with the slide switch [SW1]	
R		Multifunction programmable digital input. By default, reverse run is performed with ON and deceleration stop with OFF.		
RES		Multifunction programmable digital input. By default, this drive protective function is reset by ON→OFF. It has no effect when the drive is in a normal condition.		
S1		Multifunction programmable digital input. By default, preset speed operation is performed with ON.		
S2		Multifunction programmable digital input. By default, preset speed operation is performed with ON.		
S3		Multifunction programmable digital input. By default, preset speed operation is performed with ON.		
S4	Input	Multifunction programmable digital input. By default, preset speed operation is performed with ON with <F146: Terminal S4 input select>, digital input, pulse train input, and PG input can be switched.	Digital input: • 24VDC/5mA or less  Compliant with IEC61131-2 logic type 1: • Sink logic: ON<10V, 16V<OFF • Source logic: OFF <5V, 11V<ON  Sink logic and source logic can be switch with the slide switch [SW1]	
S5		Multifunction programmable digital input. By default, preset speed operation is performed with ON. With <F147: Terminal S5 input select>, digital input, pulse train input, and PG input can be switched.		
CC	Common to Input/Output	An equipotential terminal of the control circuit. It is allocated in three positions.	N/A	
PP	Output	Voltage reference output for potentiometer.	10VDC (allowable load current: 10mA DC)	
FP		Multifunction programmable digital/pulse train output. With <F669: Terminal FP switching>, digital output and pulse train output can be switched.	Digital output: • 24 VDC/50mA  Pulse train output: • Up to 30kpps (duty 50%)	

## Control Terminals, *continued*

AS3 Control Terminal Functions				
Terminal	Type	Function	Electrical Specifications	Internal Circuit
RR	Input	Analog input with 0–10 VDC. It can be switched to PTC input, etc., with <F180: Terminal RR input select>.	0–10 VDC (input impedance: 31.5 kΩ)	
RX		Analog input with -10 to +10 VDC. With <F107: Terminal RX input voltage select>, it can be switched to 0–10 VDC.	-10 to +10 VDC (input impedance: 31.5 kΩ)	
II		Analog current input with 0–20 mA DC. The current can be changed to 4–20 mA, etc., with parameter setting.	0–20 mA DC (input impedance: 250Ω)	
FM	Output	Multifunction programmable analog output. 0–10 VDC <sup>1</sup> 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.	0–10 VDC (allowable load resistance: 1kΩ or more)	
AM		Multifunction programmable analog output. 0–10 VDC output by default. With <F686: Terminal AM switching>, meter option (0–1 mA), current (0–20 mA) output, and voltage (0–10 V) output can be switched.	4–20 mA DC (0–20 mA DC) (allowable load resistance: 500Ω or less)	
PLC	Output	When the slide switch [SW1] is set to the sink side or source side, it can be used as a 24VDC power output.	24VDC/200mA (200mA in total with [P24]). Compliant with IEC61131-2.	
	Input	When the slide switch [SW1] is set to the PLC side, it can be used as a common terminal for digital input terminal.	–	
P24	Output	24VDC power output.	24VDC/200mA (200mA in total with [PIC]). Compliant with IEC61131-2.	

## Control Terminals, *continued*

AS3 Control Terminal Functions				
Terminal	Type	Function	Electrical Specifications	Internal Circuit
<b>+SU</b>	<b>Input</b>	DC power supply to operate the control circuit. Connect a control power supply option or 24VDC power supply between [+SU] and [CC]	24VDC, current 1A or more	
<b>STOA</b>		STO function that complied with IEC61800-5-2 (this is different function from programmable digital input). Function is deactivated by shorting the terminals [STOA]-[STOB]-[PLC] with a shorting bar at factory. [STOA] and [STOB] should be set to the same level (both HIGH or both LOW). When STO is activated while motor is running, motor will coast to stop. Under this condition, even if STO is deactivated, motor does not run unless RUN command is turned OFF and then ON again. For details, refer to Safety Function manual (E6582067)	Compliant with IEC61131-2 logic type 1 (Rated voltage: 24VDC): • Activate <5V, 11V<Deactivate	
<b>STOB</b>				
<b>FLA</b>	<b>Output</b>	Multifunction programmable relay contact output. Operation of the protection function of the drive is detected in the default setting. The contact across [FLA]-[FLC] is closed and [FLB]-[FLC] is opened during protection function operation.	Maximum contact capacity: • 250VAC (OVCII), -2A (cos $\phi$ =1) • 30VDC, 2A (at resistive load) • 250VAC (OVCII), -1A (cos $\phi$ =0.4) • 30VDC, 1A (L/R=7ms)	
<b>FLB</b>				
<b>FLC</b>				
<b>R1A</b>		Multifunction programmable relay contact output. A low-speed signal is output in the default setting.	Minimum contact capacity: • 24VDC, 5mA  Life • 100,000 times	
<b>R1C</b>				
<b>R2A</b>		Multifunction programmable relay contact output. It is not assigned by default. The function can be set with <F134: Terminal R2 function>.		
<b>R2C</b>				

**NEMA 1 Conduit Boxes**

<b>AS3 – Conduit Box Selection Table</b>					
<b>Drive</b>		<b>Conduit Box*</b>			<b>Description</b>
<b>Model</b>	<b>Frame</b>	<b>Part #</b>	<b>Price</b>	<b>Drawing</b>	
VFAS3-4900PC VFAS3-4110KPC VFAS3-4132KPC	A6	<a href="#"><b><i>NEM1306Z</i></b></a>	\$1,147.00	<a href="#">PDF</a>	AS3 series conduit box, NEMA1
VFAS3-4160KPC	A7	<a href="#"><b><i>NEM1112Z</i></b></a>	\$853.00	<a href="#">PDF</a>	
VFAS3-4200KPC	A8	<a href="#"><b><i>NEM1113Z</i></b></a>	\$1,151.00	<a href="#">PDF</a>	
* Conduit Box Kits include mounting hardware; box base, box cover, bushings, and screws. Conduit box dimensions are shown in the drawing link.					

Optional Conduit Box Kits can be ordered separately for frames A6 through A8. These kits bolt onto the bottom of the applicable AS3 drive to provide a convenient connection point for conduit entry, allowing the larger AS3 drives to achieve a NEMA 1/UL type 1 environmental protection rating. Especially useful for AS3 drives mounted outside of an electrical control panel.

**Example AS3 Conduit Box**

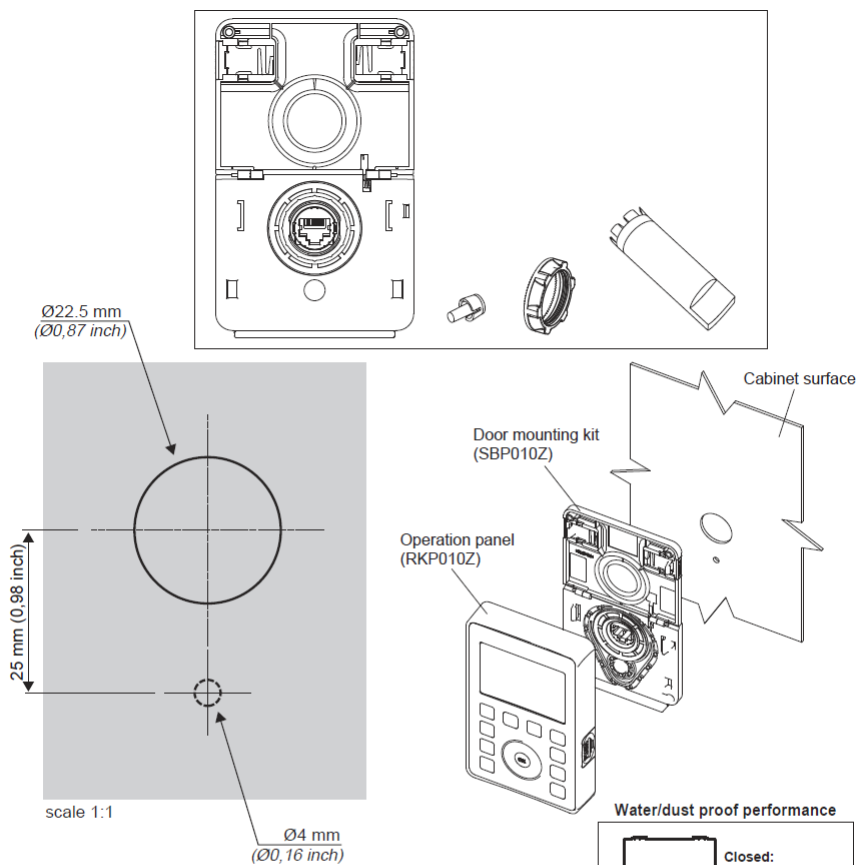


## Keypad Mount

The SBP010Z keypad mount allows the AS3 keypad to be remote mounted on a door while retaining the keypad's IP65 rating.



AS3 Keypad Mount			
Part	Price	Description	Drawing
<a href="#">SBP010Z</a>	\$66.00	Toshiba AS3 series keypad mount, for use with Toshiba AS3 series drive keypads. Mounting hardware included. Requires Ethernet (RJ45) cable.	<a href="#">PDF</a>



### Water/dust proof performance

	<b>Closed:</b> IP65 UL type12
	<b>Open:</b> No protection *Close the door to improve the performance
	<b>With operation panel:</b> IP65 UL type12

<b>CAUTION</b>	
 Prohibited	<ul style="list-style-type: none"> <li>Do not detach the operation panel from the inverter when the power is ON. This will result in failure. Please detach the operation panel after turning the power off.</li> </ul>

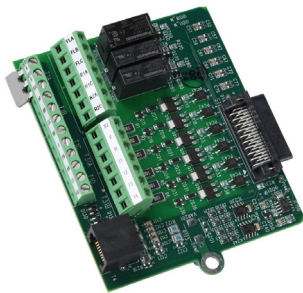
## Optional I/O Cards

Three option cards are available for the Toshiba AS3 drive series.

- The AS3-ACI module replaces the standard 24VDC inputs with 120VAC digital inputs
- The VEC008Z line driver encoder module
- The IPE003Z EtherCAT communications module

The Toshiba AS3 drive supports installation of up to three modules at a time. Please see the AS3 Instruction Manual for details.

Toshiba AS3 Drives I/O and Communication Cards					
Part Number	Price	Description	Features/Specifications	Placement*	AS3 Drive
<b><u>AS3-ACI</u></b>	\$230.00	Toshiba AS3 series relay/analog combo module, Analog Input: 3-channel, current/voltage, Analog Output: 2-channel, current/voltage, Discrete Input: 6-point, Discrete Output: 3-point, relay, (1) Form C (SPDT) relay, (2) Form A (SPST) relays.	Replaces the standard terminal board that comes with the AS3 drive. <ul style="list-style-type: none"> <li>• Relay/analog combo module</li> <li>• Input: 3-channel, current/voltage</li> <li>• Analog output: 2-channel, current/voltage</li> <li>• 120VAC Discrete input: 6-point</li> <li>• Discrete output: 3-point relay</li> </ul>	PCB replacement	All
<b><u>VEC008Z</u></b>	\$132.00	Toshiba AS3 series encoder module, line driver (differential) encoder input. For use with Toshiba AS3 series AC drives. Requires 15-pin D-sub HD15 male connector (sold separately).	Provides PG feedback for differential line driver output type encoders. <ul style="list-style-type: none"> <li>• Pulse frequency: 300kHz or less (duty: 50% ± 10%)</li> <li>• Power supply voltage: Pin3 (24V), Pin7 (12V), Pin15 (5V)</li> <li>• Maximum load of power supply: Pin3 (24V)-100mA, Pin7 (12V)-100mA, Pin15 (5V)-250mA</li> <li>• Connector: D subminiature connector (DE-15/HD15)</li> <li>• Recommended cable: 100m or less multi-layer shielded cable, AWG26 for signal line, AWG20 for power supply</li> </ul>	AS3 drive, Slot B	All
<b><u>IPE003Z</u></b>	\$394.00	Toshiba communication module, EtherCAT CoE protocol, 2 ports, (2) Ethernet (RJ45) port(s). For use with Toshiba AS3 series AC drives.	Enables EtherCAT communications for the AS3 drive. Drive is controlled by two profiles (CiA402 V3 or TOSHIBA). Also supports BECKHOFF software TwinCAT V2.x. <ul style="list-style-type: none"> <li>• Connector: RJ45 x 2</li> <li>• Supports CoE protocol only</li> <li>• Baud rate: 100Mbps</li> <li>• Command reception time: 5ms</li> <li>• 4 communication status LEDs and 2 link status LEDs</li> </ul>	AS3 drive, Slot A	All

**AS3-ACI****VEC008Z****IPE003Z**

**TOSHIBA****AS3 AC Drives – Software****ASD Pro Drive Configuration Software – Available for *FREE* Download**

Toshiba ASD Pro Drive Configuration Software			
Part Number	Price*	Description	For AS3 Drive
<b>ASD-PRO</b>	Free download	Toshiba AS3 series Windows configuration software, free download only. For use with Toshiba AS3 series AC drives. Requires USB-485M serial adapter or Ethernet.	All

**ASD Pro Drive Configuration Software**

The ASD Pro software enhances the programmability of the Toshiba AS3 drive by allowing the user to control the drive and monitor parameter settings and performance variables from a personal computer (PC) via serial or Ethernet communication.

**Functions**

- Create, Edit, and Upload/Download drive configurations
- Program logic "My Function" sequencer
- Edit drive configurations
- Archive/store multiple drive configurations on your PC
- View real time key operating parameters, plot up to 5 values at once
- Log data information
- Start/Stop drive and switch directions, when drive is set up for remote operation
- View drive trip/alarm record

**TOSHIBA**  
**ASD Pro**

**Computer System Requirements**

ASD Pro will run on Windows PCs with:

- Available USB or Ethernet port
- USB to RS485 adapter

