

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 +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																	
Determine Motor Voltage and Full-Load Amperage (FLA)																	
Motor voltage and FLA are specified on the nameplate of the motor. NOTE: FLA of motors that have been rewound may be higher than stated.																	
Determine Motor Overload Requirements																	
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. NOTE: Applications that require replacement of existing motor starters with AC drives may require up to 600% overload.																	
Determine Application Type: Heavy Duty or Normal Duty																	
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.																	
Installation Altitude																	
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]. NOTE: For use above 1000m [3281ft], the AC drive must be derated as described below.																	
Derate Output Current Based on Altitude Above 1000 Meters [3281 feet]																	
<ul style="list-style-type: none"> If the AC drive is installed at an altitude of 0–1000m [3281ft], follow normal operation restrictions. 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. Maximum altitude is 4000m [13123ft]. If installation at an altitude higher than 4000m [13123ft] is required, please contact AutomationDirect. 																	
<p style="text-align: center;">Derating for Altitude</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>2000</td><td>90</td></tr> <tr><td>3000</td><td>80</td></tr> <tr><td>4000</td><td>70</td></tr> <tr><td>4000</td><td>60</td></tr> <tr><td>4500</td><td>60</td></tr> </tbody> </table>		Altitude (m)	Output Current Rating (%)	0	100	1000	100	2000	90	3000	80	4000	70	4000	60	4500	60
Altitude (m)	Output Current Rating (%)																
0	100																
1000	100																
2000	90																
3000	80																
4000	70																
4000	60																
4500	60																

Determine Maximum Enclosure Internal Temperature	
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. NOTE: For use above 122°F [50°C], the AC drive must be derated as described below.	
For all Toshiba AS3 Drives, Frames A1-A8	
Drive Derating by Carrier Frequency and Temperature	
Derating	
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 - https://cdn.automationdirect.com/static/manuals/toshiba/loadmanual.pdf	

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 ¹		kVA	1.1	1.7	3.0	4.3	7.1
		Rated Output Current ²		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 ¹		kVA	1.7	3.0	4.3	7.1	9.7
		Rated Output Current ²		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 ³	kVA	0.7	1.4	2.6	3.9	6.6
ND		Power Supply Capacity ³	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 ⁴			Voltage 323V to 528V, Frequency ±5%						
Dynamic Braking Circuit				Built-in					
Dynamic Braking Resistor				Optional external braking resistor					
EMC Filter (IEC51800-3) ⁵				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) ⁶				58					
IP Rating				IP20					
Enclosure Rating (UL50)				Type 1					
1 - Capacity is calculated at 440V for the 480V class									
2 - Indicates rated output current when setting <F300: Carrier Frequency> to 4kHz									
3 - Required power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and wires)									
4 - Lower limit of voltage for 480V class is 342V when the inverter is used continuously (load of 100%)									
5 - Under <F300> setting to 4kHz									
6 - These are reference noise values and not guaranteed									

Toshiba AS3 Drive Model Selection Tables, *continued*

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

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

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				PDF	PDF	PDF	PDF	PDF	PDF	
Output Rating	HD	Max Motor Output		hp	30	40	50	60	75	100
				kW	22	30	37	45	55	75
		Rated Output Capacity ¹		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 ¹		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 ³	kVA	32.7	44.3	53.9	65.6	79.5	108
ND		Power Supply Capacity ³	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 ⁴			Voltage 323V to 528V, Frequency ±5%							
Dynamic Braking Circuit				Built-in						
Dynamic Braking Resistor				Optional external braking resistor						
EMC Filter (IEC51800-3) ⁵				Category C2 (motor cable length: 50m or less) Category C3 (motor cable length: 150m 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) ⁶				58						
IP Rating				IP20						
Enclosure Rating (UL50)				Type 1						
1 - Capacity is calculated at 440V for the 480V class										
2 - Indicates rated output current when setting <F300: Carrier Frequency> to 4kHz										
3 - Required power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and wires)										
4 - Lower limit of voltage for 480V class is 342V when the inverter is used continuously (load of 100%)										
5 - Under <F300> setting to 4kHz										
6 - These are reference noise values and not guaranteed										

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				PDF	PDF	PDF	PDF	PDF	
Output Rating	HD	Max Motor Output		hp	125	150	200	250	300
				kW	90	110	132	160	200
		Rated Output Capacity ¹		kVA	132	161	191	239	295
				A	173	211	250	314	387
		Rated Output Current ²		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 ¹		kVA	161	191	230	325	367
				A	211	250	302	427	481
		Rated Output Current ²				211	250	302	427
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 ³		kVA	133	155	181	225	275
	ND	Power Supply Capacity ³		kVA	155	181	214	296	335
	Rated Voltage/Frequency				3-phase 380 to 480 VAC, 50/60 Hz				
	Allowable Fluctuation ⁴				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) ⁵				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) ⁶				58					
IP Rating				IP20					
Enclosure Rating (UL50)				Type 1			Open ⁷	Open	
1 - Capacity is calculated at 440V for the 480V class									
2 - Indicates rated output current when setting <F300: Carrier Frequency> to 2.5 kHz									
3 - Required power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and wires)									
4 - Lower limit of voltage for 480V class is 342V when the inverter is used continuously (load of 100%)									
5 - Under <F300> setting to 2.5 kHz									
6 - These are reference noise values and not guaranteed									
7 - NEMA Type 1 with option									

TOSHIBA AS3 AC Drives – Specifications

Toshiba AS3 Drive Model Selection Tables, *continued*

Toshiba AS3 General Specifications (Applicable to All Models)		
Control Specifications	Control System	Sinusoidal PWM control
	Output Frequency Range	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.
	Minimum Setting Steps of Frequency	0.01 Hz: operation panel input (60Hz base). 0.03 Hz: analog input (60Hz base, 11 bit / 0–10 VDC)
	Frequency Accuracy	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
	Voltage/Frequency Characteristics	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)
	Frequency Setting Signal	3k Ω potentiometer (possible to connect to 1–10 k Ω -rated external potentiometer) • 0–10 VDC (input impedance Zin: 31.5 k Ω) • -10 to +10 VDC (input impedance Zin: 31.5 k Ω) • 4–20mA DC (input impedance Zin: 250 Ω)
	Terminal Block Frequency Command	The characteristic can be set arbitrarily by two-point setting. Compliant with 7 types of input: • Analog input: [RR], [RX], [II], [AI4], [AI5] • Pulse input: [S4], [S5]
	Frequency Jump	Three frequencies can be set. Setting of jump frequency and width.
	Upper and Lower Limit Frequencies	Upper limit frequency: 0 to max. frequency Lower limit frequency: 0 to upper limit frequency
	PWM Carrier Frequency	Frame size A1 to A4: adjustable between 1.0 and 16 kHz Frame size A5 to A8: adjustable between 1.0 and 8 kHz
	PID Control	Adjustment of proportional gain, integral time, differential time, and delay filter. Multi-PID and external PID control.
	Torque Control	Voltage command input specification: -10 to +10 VDC
	Real Time Clock	The following can be set by parameters: • Current time (Year, month, date, hour, minute) • Timezone • Daylight saving time • 4 working days • 20 holidays
Operation Specifications	Acceleration/Deceleration Time	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.
	DC Braking	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.
	Forward Run/Reverse Run	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.
	Jog Run	Jog run, if selected, allows jog operation from the operation panel. Jog run operation by terminal block is possible by setting the parameters.
	Preset Speed Operation	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.
	Retry	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).
	Soft Stall	Automatic load reduction control at overloading. (Default: OFF)
	Cooling Fan ON/OFF Management	The cooling fan will stop automatically when not needed to extend fan life.
	Lockout Key Operation	Key lock selectable of RUN key, HAND/AUTO key, emergency stop/reset by STOP key, or all keys on operation panel, with/without password.
	Regenerative Power Ride-through Control	Ability to keep the motor running using its regenerative energy in case of a momentary power failure. (Default: OFF)
	Auto-restart	Ability to restart the motor while coasting in accordance with its speed and direction. (Default: OFF)
	Simplified Pattern Operation	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.
	Commercial Power/Inverter Switching	Ability to switch operation by commercial power supply or inverter.
	Light-load High-speed Operation	Improves the efficiency of the machine by increasing the motor speed when it is running under light load.
	Droop Function	When two or more inverters are used to operate a single load, this function prevents load from concentrating on one inverter due to unbalance.
	Override Function	External input signal adjustment is possible to the frequency command value.
Protective Function	Protective Function	Stall prevention, current limit, overcurrent, overvoltage, short circuit on the load side, ground fault on the load side ¹ , undervoltage, momentary power failure (15ms or more), non-stop control at momentary power failure, overload protection, arm short-circuit at starting, overcurrent on the load side at starting, overcurrent and overload at braking resistor, overheat, emergency off.
	Electronic Thermal Characteristic	Switchable between standard motor/constant torque motor, adjustment of overload protection and stall prevention level.
	Reset	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	Alarms	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.
		Causes of Failures	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.
		Monitoring Function	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.
		Free Unit Display	Display of optional units other than output frequency (motor speed, line speed, etc.), current ampere/%switch, voltage volt/%switch.
		Automatic Edit Function	Automatically searches for parameters that are different from the default setting parameters, making it easy to find changed parameters.
		User Default Setting	User parameter settings can be saved as default settings. Allows resetting the parameters to the user-defined parameter settings.
	LED	Charge Display	Displays power circuit capacitor charging.
Interface Specification	Digital Input		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.
	Digital Output		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.
	Sink/Source Logic Setting		Ability to select minus common (CC) or plus common (P24) for digital inputs by mechanical switch. (Default setting: external power supply)
	Pulse Train Frequency Input		Can be assigned on digital input ([S4] and [S5]) terminals (up to 30 kpps), can be used as PG input.
	Pulse Train Frequency Output		Can be assigned on digital output [FP] terminal (up to 30 kpps, duty 50%).
	Relay Output (Failure detection relay)		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.
	Frequency Command Input		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).
	Output for Frequency Meter / Output for Ammeter		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).
	Control Power Supply		2 output: 10V/10mA and 24V/200mA with current limiter 1 output: control supply back up function (24VDC/1A)
	Functional Safety		Safe Torque Off complies with IEC61800-5-2
	Communication Function		Embedded Ethernet (dual port with switch): EtherNet/IP, Modbus-TCP Webserver (non-secure HTTP) Embedded RS485 (2 channel): Toshiba inverter protocol, Modbus-RTU Optional: EtherCAT
Environments	Use Environments		Indoor use. Do not expose to direct sunlight or corrosive gas, flammable gas, explosive gas, oil mist, or non-conductive or conductive dust. ²
	Ambient Temperature		-15 to 60°C (-10 to 60°C for frame size A7 and A8) ³ • 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
	Storage Temperature		-25°C to +70°C (temperature applicable for a short term)
	Relative Humidity		5 to 95% non-condensing
	Altitude		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. ⁴
	Vibration ⁵		5.9 m/s ² (0.6G) or less (10–55 Hz) for frame sizes A1 to A5. 2.9 m/s ² (0.3G) or less (10–55 Hz) from frame sizes A6 to A8.
1 - This function protects inverters from overcurrent due to output circuit ground fault.			
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			
3 - Remove inverter's operation panel when above 50°C. For detail of current reduction, see "Instruction manual for Load Reduction" (E6582116)			
4 - Current must be reduced by 1% for each 100m over 1000m (90% at 2000m, 80% at 3000m, etc.)			
5 - Test condition: IEC60068-2-6, IEC60068-2-27			

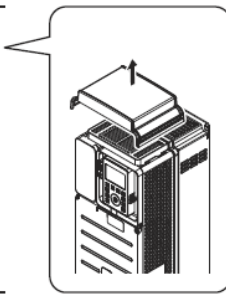
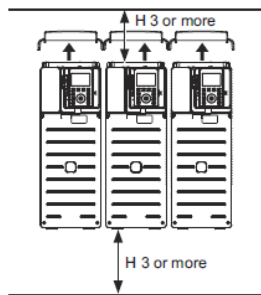
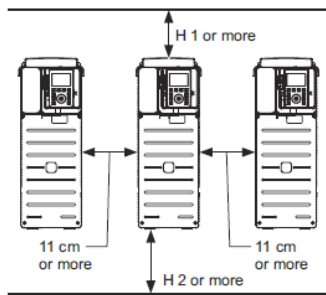
TOSHIBA AS3 AC Drives – Specifications

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 ¹ (W)	Inner Side Calorific Value ² (W)	Forced air-cooled Required Ventilation Amount (m ³ /min)	Sealed Cabinet Necessary Heat Discharge Surface Quantity (m ²)	Standby Power ³ (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	
A2	VFAS3-4037PC	ND	5.5	192	37	1.09	3.83	16
		HD	3.7	136	32	0.77	2.72	
	VFAS3-4055PC	ND	7.5	233	45	1.32	4.66	
		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	
	VFAS3-4110PC	ND	15	455	62	2.58	9.10	
		HD	11	310	50	1.76	6.20	
A3	VFAS3-4150PC	ND	18.5	557	70	3.16	11.14	19
		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	
	VFAS3-4220PC	ND	30	770	94	4.37	15.40	
		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	
A4	VFAS3-4370PC	ND	45	1101	123	6.25	22.02	28
		HD	37	818	98	4.64	16.36	
	VFAS3-4450PC	ND	55	1094	132	6.21	21.88	
		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	
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 ¹ (W)	Inner Side Calorific Value ² (W)	Forced air-cooled Required Ventilation Amount (m ³ /min)	Sealed Cabinet Necessary Heat Discharge Surface Quantity (m ²)	Standby Power ³ (W)
A6	<u>VFAS3-4900PC</u>	ND	110	2920	309	16.58	58.40	60
		HD	90	1925	272	10.92	38.48	
	<u>VFAS3-4110KPC</u>	ND	132	3457	358	19.62	69.13	
		HD	110	2228	298	12.65	44.57	
	<u>VFAS3-4132KPC</u>	ND	160	4013	405	22.78	80.26	
		HD	132	2738	343	15.54	54.77	
A7	<u>VFAS3-4160KPC</u>	ND	220	5404	452	30.68	108.08	62
		HD	160	3820	350	19.87	70.00	
A8	<u>VFAS3-4200KPC</u>	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.

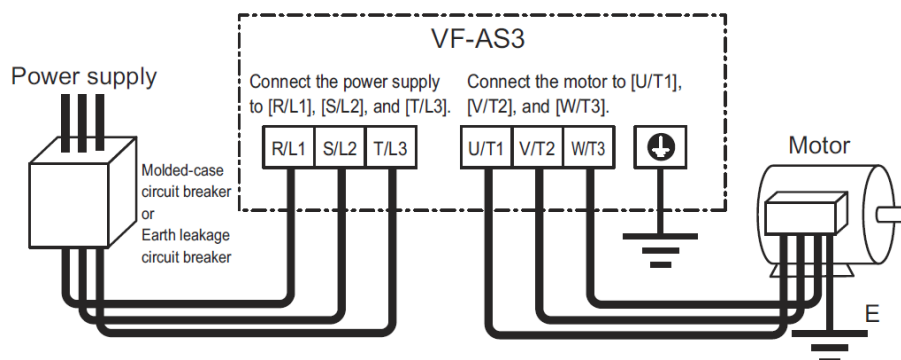
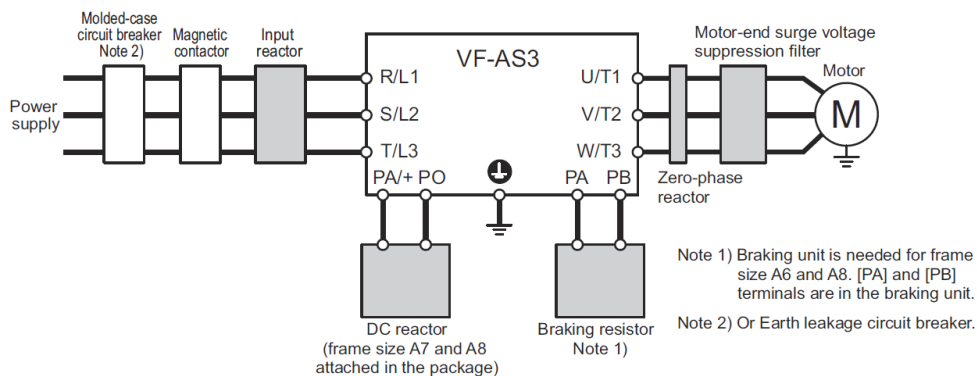
3 - This value is power consumption when power is on without motor output, cooling fans, or I/O options.

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	VFAS3-4004PC	0.5	790	78.0	10.1	8.0	BR-N1-240W250	1	3.2
	VFAS3-4007PC	1.0					BR-N1-240W150	1	5.3
	VFAS3-4015PC	2					BR-N1-500W200	1	4.0
	VFAS3-4022PC	3		31.2	25.3	20.0	BR-N1-500W130	1	6.1
	VFAS3-4037PC	5					BR-N1-720W85	1	9.3
	VFAS3-4055PC	8					BR-N1-1K2W50	1	15.8
	VFAS3-4075PC	10.0		22.3	35.4	28.0	BR-N1-1K2W50	1	15.8
	VFAS3-4110PC	15					BR-N1-1K7W30	1	26.3
	VFAS3-4150PC	20					BR-N1-1K7W30	1	26.3
	VFAS3-4185PC	25		15.6	50.6	40.0	BR-N1-2K3W26	1	30.4
	VFAS3-4220PC	30.0					BR-N1-2K8W25	1	31.6
	VFAS3-4300PC	40					BR-N1-4K0W16P0	1	49.4
	VFAS3-4370PC	50		12.0	65.8	52.0	BR-N1-4K7W14P7	1	53.7
	VFAS3-4450PC	60					BR-N1-4K7W14P7	1	53.7
	VFAS3-4550PC	75					BR-N1-6K5W06P4	1	123.4
	VFAS3-4750PC	100.0		7.9	100.0	79.0	BR-N1-6K5W06P4	1	123.4
							BR-N1-10K8W04P3	1	183.7
							BR-N1-10K8W04P3	1	183.7

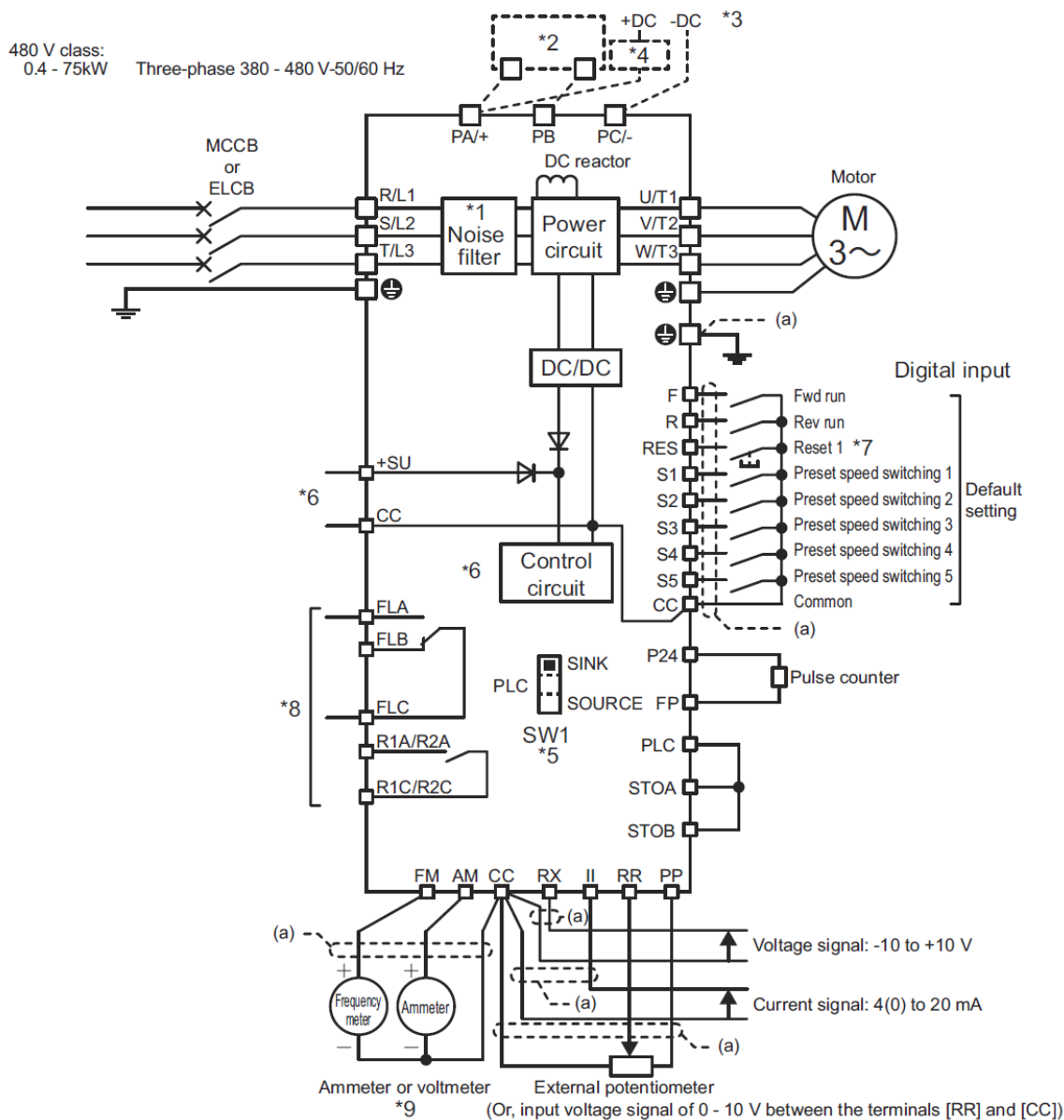
Control Wiring Diagrams**Connection to Power Supply and Motor****Connection to Peripheral Devices****Wire Sizes**

Toshiba AS3 Wire Sizes				
Applicable Motor (kW) [Normal Duty]	Model Number	Power Circuit (mm ²)		Grounding Wire (mm ²)
		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

TOSHIBA AS3 AC Drives – Basic Wiring Diagrams

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.

AS3 AC Drives – Basic Wiring Diagrams

TOSHIBA AS3 AC Drives – Basic Wiring Diagrams

Control Wiring Diagram: Full I/O

Frame Size A7: Sinking

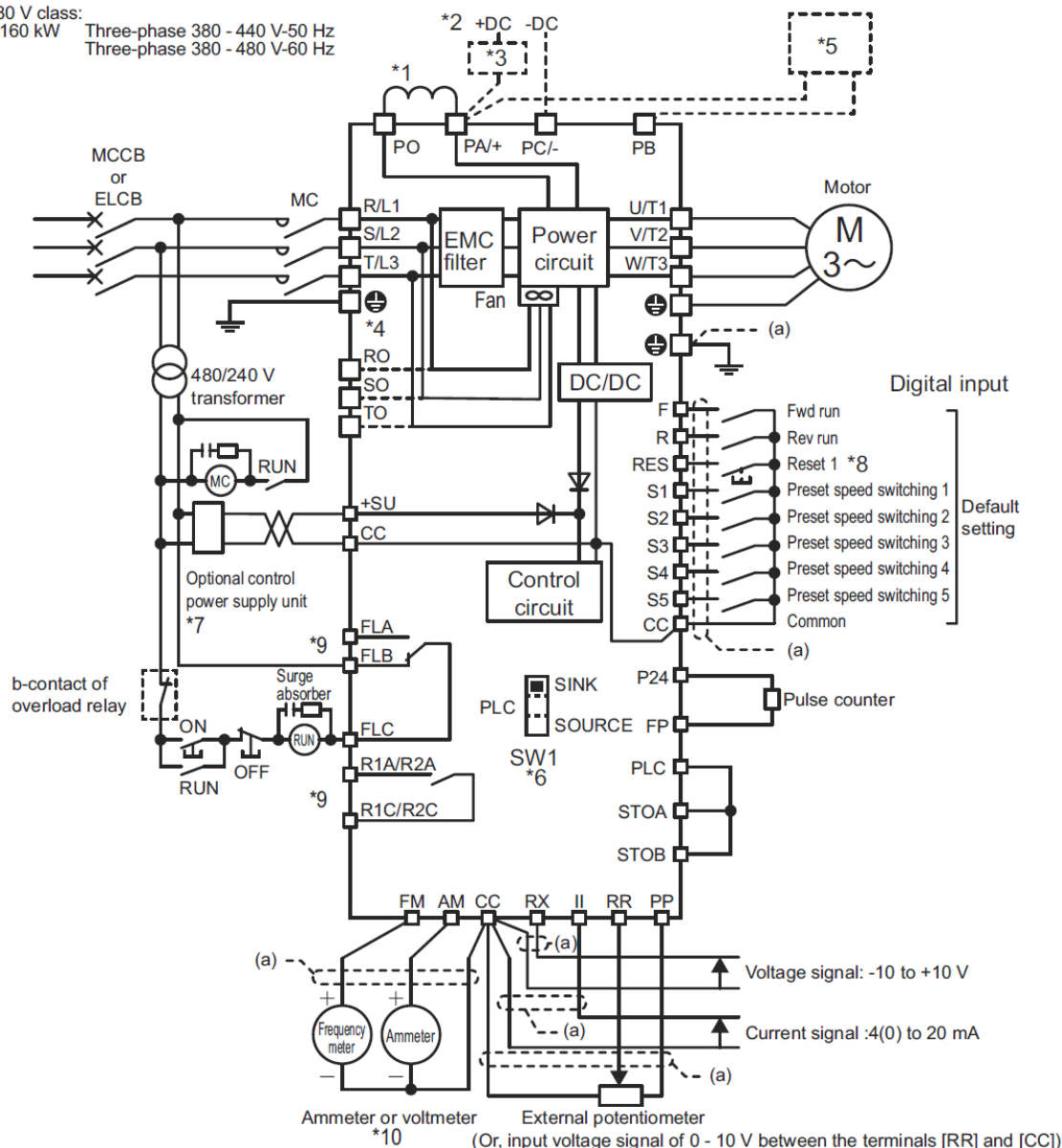
Power supply

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.

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AS3 AC Drives – Basic Wiring Diagrams

Control Wiring Diagram: Full I/O

Frame Size A8: Sinking

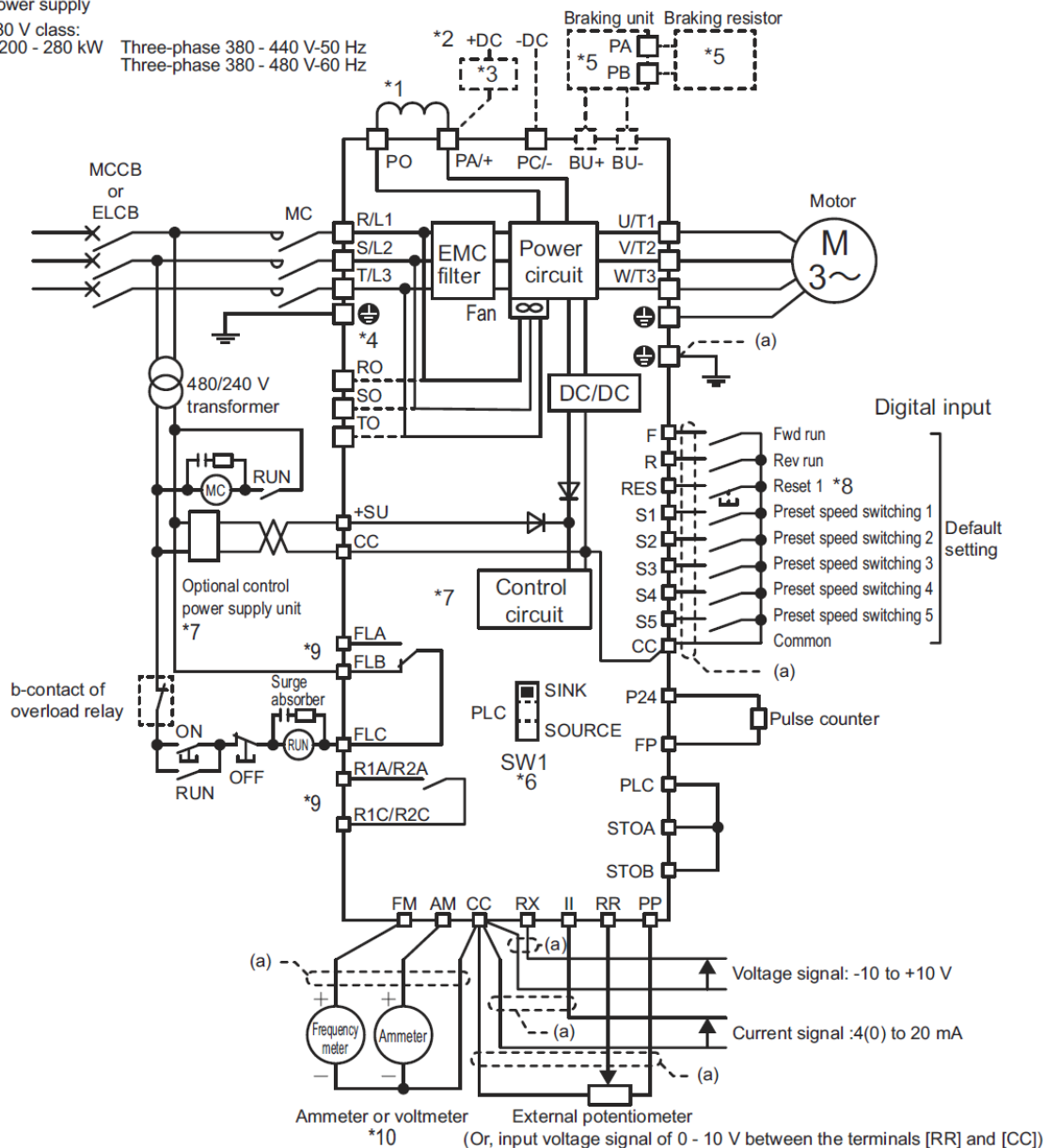
Power supply

480 V class:

200 - 280 kW

Three-phase 380 - 440 V-50 Hz

Three-phase 380 - 480 V-60 Hz



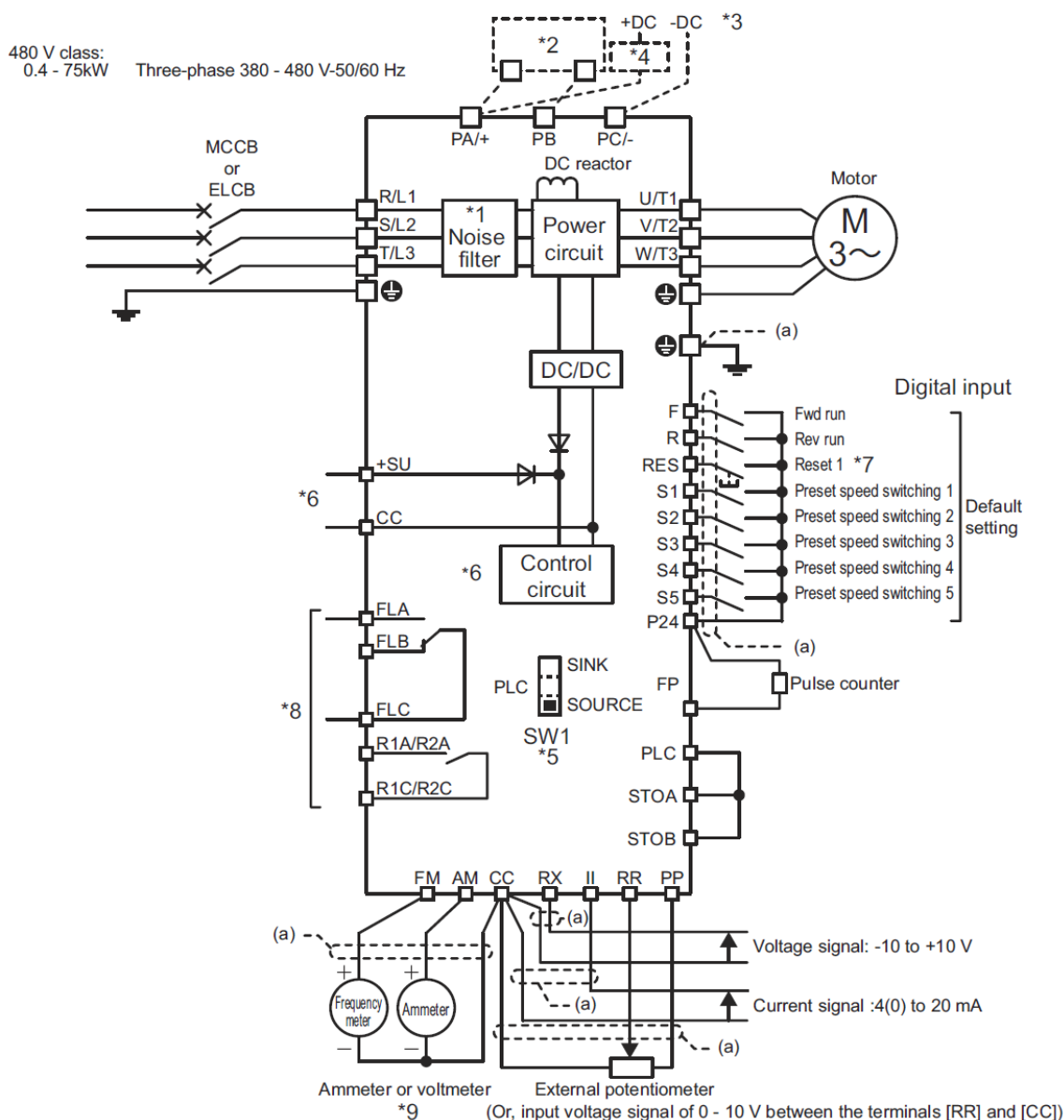
Notes:

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



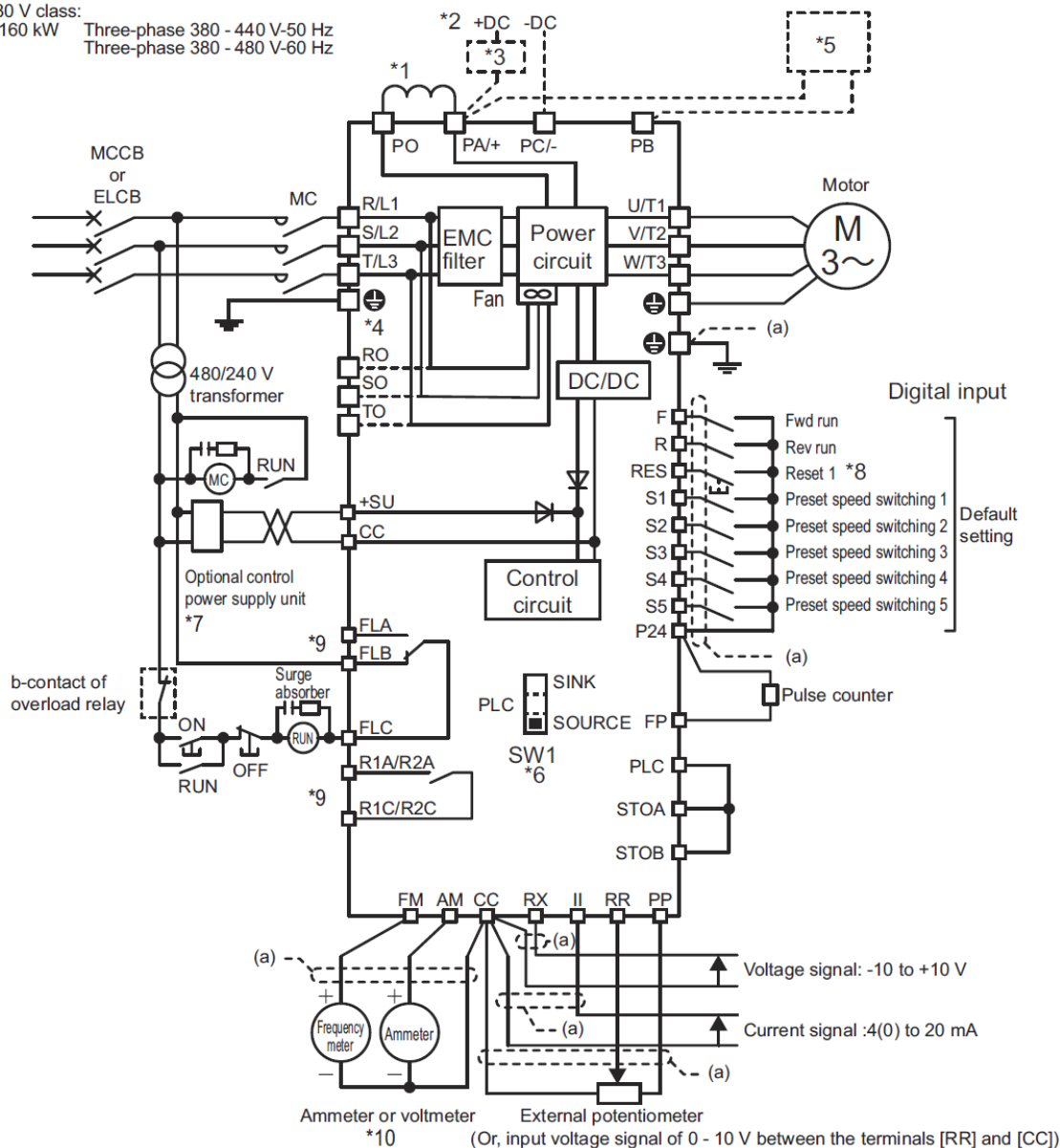
Notes:

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 A7: Sourcing**

Power supply

480 V class:

160 kW Three-phase 380 - 440 V-50 Hz
Three-phase 380 - 480 V-60 Hz**Notes:**

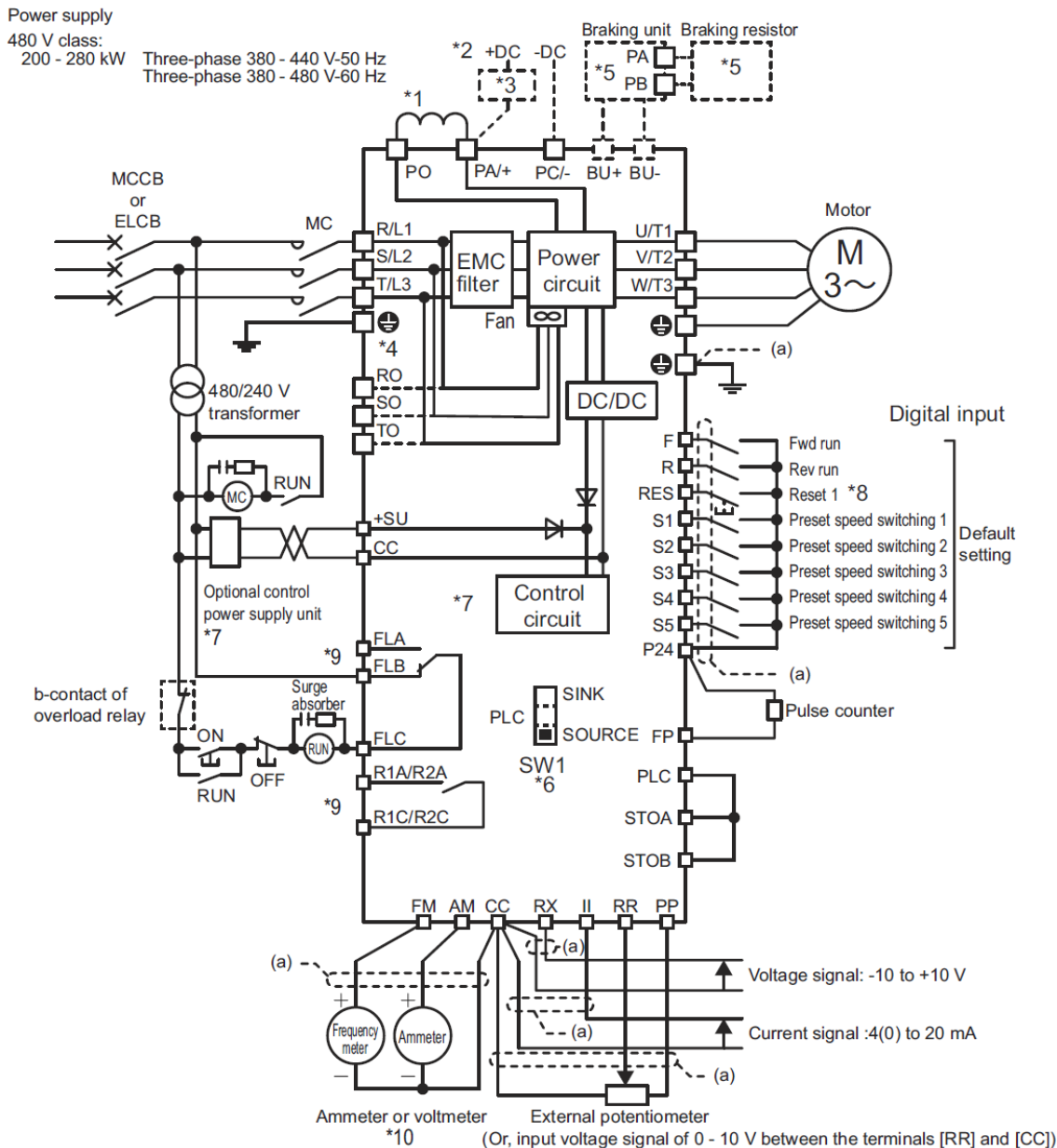
1. Mount the attached DC reactor between the terminals [P0] and [PA/+].
2. To supply DC power, connect to the terminals [PA/+] and [PC/-]. In this case, a DC reactor is not required.
3. If using the drive with a DC power supply, a circuit to suppress inrush current is required. For details, refer to 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.

TOSHIBA

AS3 AC Drives – Basic Wiring Diagrams

Control Wiring Diagram: Full I/O

Frame Size A8: Sourcing

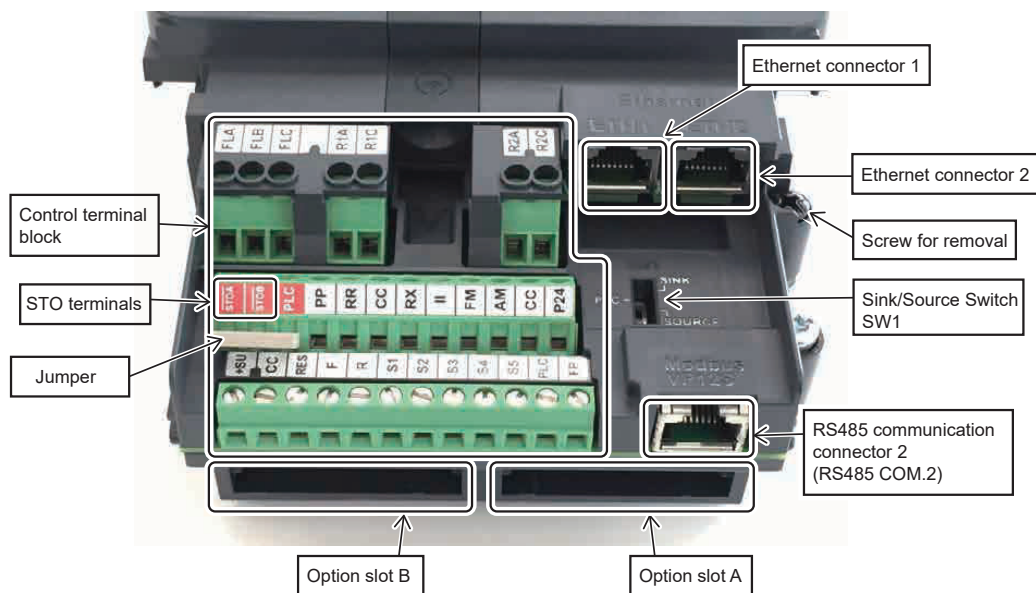


Notes:

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 ²	AWG	mm ²	AWG	mm ²	AWG
Relay	Solid Wire	0.14–2.5	26–14	2x0.14 to 2x0.75	26–18	–	–
	Stranded Wire			2x0.14 to 2x1.0		2x0.5 to 2x1.5	20–16
Except Relay (2nd)	Solid Wire		26–16	2x0.14 to 2x0.75		–	–
	Stranded Wire			2x0.14 to 2x0.75		2x0.5 to 2x1.5	20–18
Except Relay (1st)	Solid Wire			2x0.14 to 2x0.75		–	–
	Stranded Wire			2x0.14 to 2x0.75		2x0.5 to 2x1.5	20–18

AS3 AC Drives – Control Connection

Control Terminals

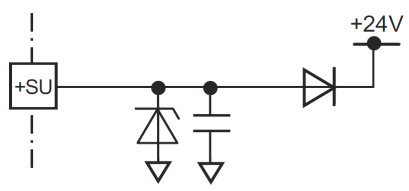
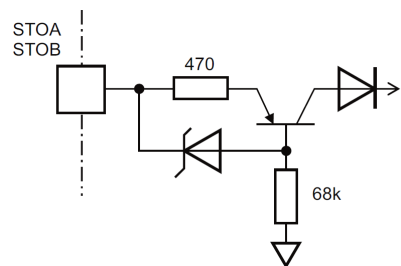
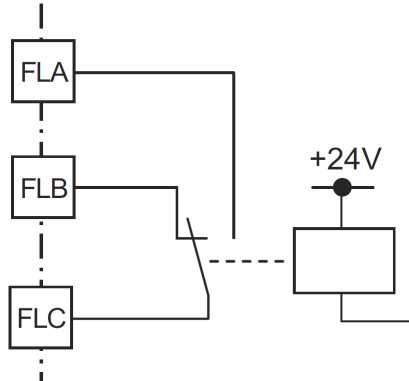
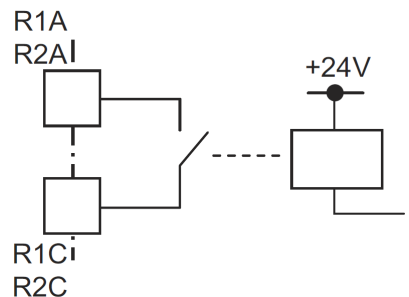
AS3 Control Terminal Functions				
Terminal	Type	Function	Electrical Specifications	Internal Circuit
F	Input	Multifunction programmable digital input. By default, forward run is performed with ON and deceleration stop with OFF.	Digital input: • 24VDC/5mA or less Compliant with IEC61131-2 logic type 1: • 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] Pulse train and PG input: • Up to 30 kpps (duty 50%)	
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%)	

AS3 AC Drives – Control Connection

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 ¹ 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 [PLC]). Compliant with IEC61131-2.	

Control Terminals, *continued*

AS3 Control Terminal Functions						
Terminal	Type	Function	Electrical Specifications	Internal Circuit		
+SU	Input	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			
STOA		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): <ul style="list-style-type: none">Activate <5V,11V<Deactivate			
STOB						
FLA	Output	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: <ul style="list-style-type: none">250VAC (OVCII), -2A (cosΦ=1)30VDC, 2A (at resistive load)250VAC (OVCII), -1A (cosΦ=0.4)30VDC, 1A (L/R=7ms)			
FLB						
FLC						
R1A		Multifunction programmable relay contact output. A low-speed signal is output in the default setting.	Minimum contact capacity: <ul style="list-style-type: none">24VDC, 5mA			
R1C			Life <ul style="list-style-type: none">100,000 times			
R2A		Multifunction programmable relay contact output. It is not assigned by default. The function can be set with <F134: Terminal R2 function>.				
R2C						

NEMA 1 Conduit Boxes

AS3 – Conduit Box Selection Table					
Drive		Conduit Box*			Description
Model	Frame	Part #	Price	Drawing	
VFAS3-4900PC VFAS3-4110KPC VFAS3-4132KPC	A6	NEM1306Z	\$1,147.00	PDF	AS3 series conduit box, NEMA1
VFAS3-4160KPC	A7	NEM1112Z	\$853.00	PDF	
VFAS3-4200KPC	A8	NEM1113Z	\$1,151.00	PDF	
* 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.

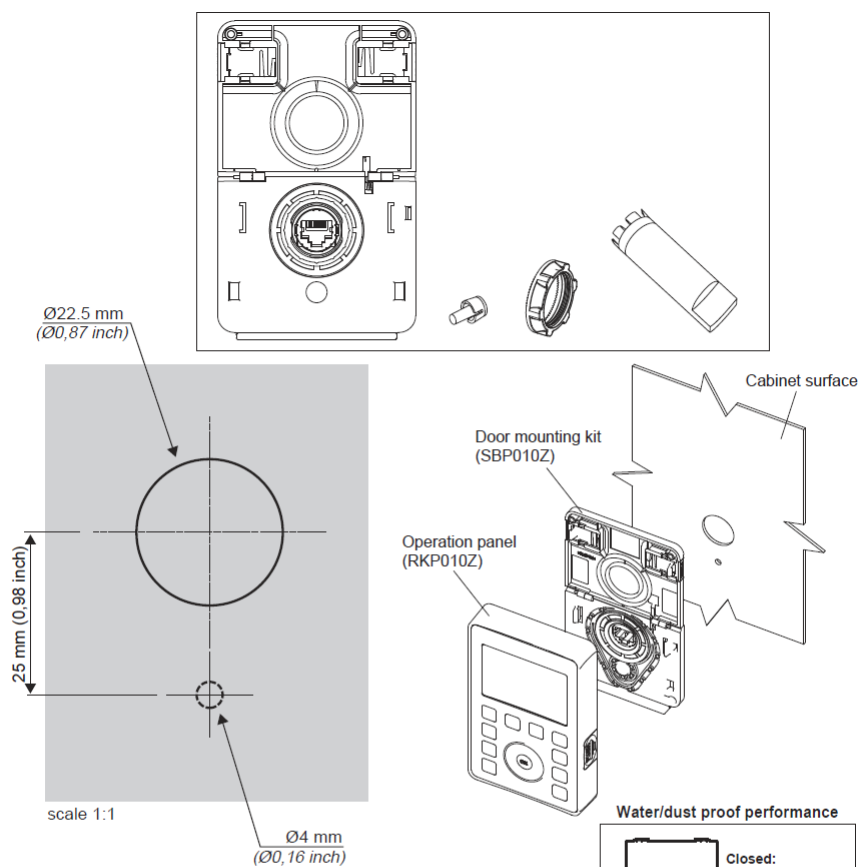
**Example AS3 Conduit Box**

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
SBP010Z	\$66.00	Toshiba AS3 series keypad mount, for use with Toshiba AS3 series drive keypads. Mounting hardware included. Requires Ethernet (RJ45) cable.	PDF



CAUTION	
 Prohibited	<ul style="list-style-type: none"> 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.

Water/dust proof performance

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

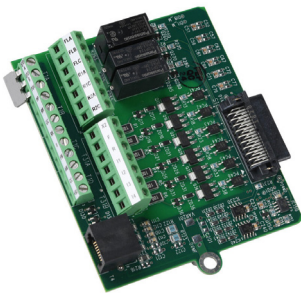
Optional I/O Cards

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
<u>AS3-ACI</u>	\$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"> • Relay/analog combo module • Input: 3-channel, current/voltage • Analog output: 2-channel, current/voltage • 120VAC Discrete input: 6-point • Discrete output: 3-point relay 	PCB replacement	All
<u>VEC008Z</u>	\$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"> • Pulse frequency: 300kHz or less (duty: 50% ±10%) • Power supply voltage: Pin3 (24V), Pin7 (12V), Pin15 (5V) • Maximum load of power supply: Pin3 (24V)-100mA, Pin7 (12V)-100mA, Pin15 (5V)-250mA • Connector: D subminiature connector (DE-15/HD15) • Recommended cable: 100m or less multi-layer shielded cable, AWG26 for signal line, AWG20 for power supply 	AS3 drive, Slot B	All
<u>IPE003Z</u>	\$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"> • Connector: RJ45 x 2 • Supports CoE protocol only • Baud rate: 100Mbps • Command reception time: 5ms • 4 communication status LEDs and 2 link status LEDs 	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
<u>ASD-PRO</u>	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

