TOSHIBA

Leading Innovation

2011 Industrial Catalog

DRIVES, PAC, PLCs

PRICING INFORMATION

- List pricing is subject to change at any time.
- All dimensions weights are approximate are subject to change without notice.
- Contact the appropriate department for consult factory items.
- Contact the appropriate department for multipliers, pricing on special features, or options not listed in this guide.
- Ensure that the product's amp rating is equal to or larger than the applied motor amp rating.
- All options may not work in conjunction with one another. Contact the appropriate department for compatibility.
- Unless otherwise specified, all ASDs are three-phase input three-phase output.
- See each device's Part Numbering Convention section for the required ordering information.
- Please see Toshiba's Terms Conditions at http://www.toshiba.com/ind/data/pages_files/TCofSale.pdf.

EXTENDED WARRANTY

Toshiba's standard warranty is 18 months from the date of shipment or one year from date of startup — whichever occurs first. This is a full parts labor warranty. Please refer to Toshiba's Standard Terms Conditions of Sale available on our website at www.toshiba.com/ind for more details.

Extended warranties are available on TIC motor-drive packages. When a purchase order is submitted for a motor-drive package to TIC, the ASD warranty will be extended to match the motor warranty for up to three years on parts labor when the **Motor-Drive Package Extended Warranty Request Form** is included. This extended warranty includes the following ASD products: G9, H9, GX7, HX7, Plus Pack. For motor-drive packages shipped from distributor stock: the distributor must submit this request form to the ASD department.

Extended warranties are also available on TIC motor-starter packages. When a purchase order is submitted for a motor-starter package to TIC, the Solid State Starter warranty will be extended to match the motor warranty for up to three years on parts labor when the **Motor-Starter Package Extended Warranty Request Form** is included. This extended warranty includes the following PAC products: TE, TD, TX. For motor-starter packages shipped from distributor stock: the distributor must submit this request form to the PAC Marketing department.

Extended warranties are also available from Toshiba as adders. The extended warranty must be on the same purchase order with the covered equipment. The adders are listed below:

Two-year warranty		Three-year warranty		Four-year warranty	
Parts only	1.5%	Parts only	4.0%	Parts only	7.5%
Parts labor	3.0%	Parts labor	8.0%	Parts labor	15.0%

Example: If total equipment cost is $30,000 a four-year parts labor warranty is required, multiply $30,000 by 0.15, which equals $4,500. Added to the original amount, the total order would equal $34,500.

DELIVERY

Toshiba International Corporation makes some of the finest adjustable speed drives value-added products in the market today — the right product, at the right price, delivered at the right time.

We offer engineered products options that can be ordered in a variety of configurations. The combination compatibility between different options can further impact delivery lead times.

Included in this price book are delivery guidelines that can be used to assist in determining the typical delivery of a standard or engineered product. Any item in stock is subject to prior sale. Please check with Customer Service for availability delivery schedules.

Deliveries of installed options are noted in the Options categories. Please note that most delivery times run concurrently. For instance, ordering the NEMA 4 option for an assembly unit will add six weeks to the delivery. Therefore, it would not be necessary to add two weeks to add a heater, as the most limiting time would be the NEMA 4 enclosure.

DRAWING REQUESTS

APPROVAL DRAWINGS

Please include a part number of DWG-APP to request approval drawings on any purchase order to Toshiba. For non-standard parts, a set of drawings will be provided for your approval three to four weeks after acceptance of the purchase order. standard product drawings will be available immediately for approval. Not all products in this price book are standard.

We will expect, in writing, a release for manufacture as submitted, revise release as noted, or revise resubmit for approval.

REFERENCE DRAWINGS

Please include a part number of DWG-REF to request approval drawings on any purchase order to Toshiba. For non-standard parts, a set of drawings will be provided for your reference three to four weeks after receipt of the purchase order. standard product drawings will be available immediately for approval. Not all products in this price book are standard.

Any changes made to reference drawings are considered a change request subject to change fees scrap charges.

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LOW VOLTAGE DRIVES

MEDIUM VOLTAGE DRIVES

POWER APPARATUS COMPONENTS

PROGRAMMABLE LOGIC CONTROLLERS

H9 ASD

The H9 adjustable speed drive is the most advanced heavy duty drive ever offered by Toshiba. It is a blend of a robust power platform & a state-of-the-art control scheme. With its dual 32-bit processor controls, the H9 provides the ability to operate the toughest of applications while still maintaining a high level of control.

SPECIFICATIONS

CONTROL

- **PWM Control** — Carrier Frequency User-Settable from 1.0 kHz to XX kHz (where XX = ASD-Dependent)
- **Input Signal Control** — Local Operation (EOI), Eight Programmable Discrete Input Terminals, Isolated 4 to 20 mADC or 0 to 10 VDC (V/I), ±10 VDC (RR), Remote Potentiometer (Any Analog Input Terminal), 15 Preset Speeds via Contact Closure, Communications via RS485
- **Input Signal Resolution** — EOI Input 0.01 Hz, Analog Terminal Input 0.1 Hz, Discrete Terminal, Digital Input, & Communications Input ±0.01% of Maximum Output Frequency
- **Output Frequency Precision** — Analog Terminal Input ±0.5% of Maximum Output Frequency, & Discrete & Digital Input ±0.01% of Maximum Output Frequency
- **Output Frequency Range** — 0.01 to 299 Hz
- **Output Voltage/Frequency Control Method** — Open & Closed-Loop Vector with Speed Torque Switching, Constant Torque, Variable Torque, Auto-Torque Boost, & Custom Five-Point Curve
- **Overload Rating** — ASD Output 100% Continuous & 120% for 60 Seconds
- **Braking** — DC Injection Braking & Dynamic Braking Available
  DC Injection Braking Frequency Settable from 0 to Maximum Frequency; Braking Amperage Settable from 0 to 100% of ASD Output; Braking Time Settable from 0 to 20 Seconds; Motor Shaft Stationary Control Available
  Dynamic Braking Resistor Value/Wattage Application-Specific & User-Settable; Braking Time, Stop Pattern, & Overload Level User-Set

OPERATION

- **Voltage/Frequency** — Single-Phase 200 to 240 VAC, 50/60 Hz; Three-Phase 200 to 240 VAC & Three-Phase 380 to 480 VAC; Adjustable Within 100% to 120% of Corrected Supply Voltage
- **Input Voltage Tolerance** — Voltage ±10%. Frequency ±2 Hz
- **Frequency Adjustability** — EOI Operation 0.1 Hz; Analog Input 0.2 Hz
- **Startup Frequency** — Adjustable from 0 to 10 Hz
- **Jump Frequencies** — Three User-Selected Frequencies & Associated B&widths
- **Acceleration/Deceleration** — 0.1 to 6000 Seconds Switchable Between Acceleration/Deceleration Time 1, 2, 3 or 4; Selectable as S-Pattern 1, 2, or Linear
- **Input Terminal Functions** — Eight Discrete Programmable Input Terminals Selectable as Sink or Source Logic
- **Output Terminal Functions** — Programmable; One Form-C & Two Form-A Outputs; Rated 115 VAC @ 2 A, 30 VDC @ 2 A
- **Retry Operation** — Auto-Reset of User Selected Faults after Main Circuit Check; Programmable up to Ten Retries
- **Regenerative Power Ride-Through Control** — Maintains Control Power in Case of Momentary Loss of Three-Phase Input Power Using Regenerative Energy from Motor
- **Auto-Restart/Catch a Spinning Motor** — In Event of Momentary Power Loss, Drive Reads Speed & Direction of Rotating Motor & Seamlessly Starts at Appropriate Speed
- **Protective Functions** — Stall Protection, Current Limit, Overcurrent, Output Short Circuit, Overvoltage, Overvoltage Limit, Undervoltage, Ground Fault, Input & Output Single-Phase, Overload, Motor Overload, Overtorque, Pre-Alarm, Dynamic Braking Resistor Overload, Auto-Tuning Error, Overheat, External Trip, Emergency Stop, & More
- **Motor Protection** — Programmable Electronic Thermal Protection; Adjustable from 10 to 100%

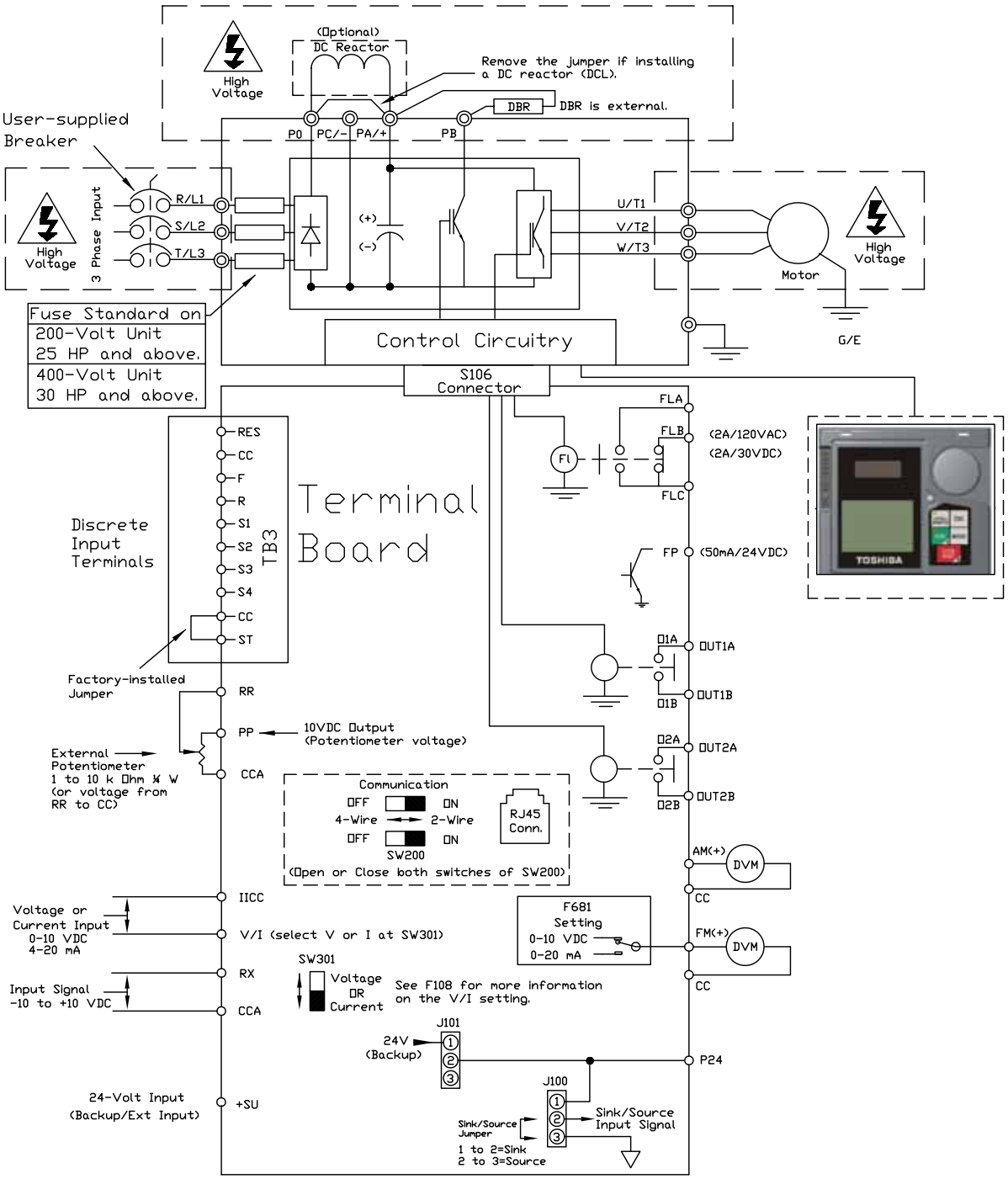
DISPLAY

- **EOI** — Backlit Plain-English LCD & Four-Digit Seven-Segment LED Display
- **Alarm & Fault Indications** — Indication of Stall Protection, Overvoltage, Overload, Undervoltage, Retry, & More
- **Status Monitoring** — Output Frequency, Frequency Comm&, Output Current, Output Voltage, DC Bus Voltage, Torque Current, Input Terminal Status, & More
- **Past Trip Monitoring** — Stores Last 20 Faults in Succession, Cumulative Time at Time of Trip, ASD Operation Status, Speed, Direction, Load, & More
- **Analog Output for Hz & Amps** — FM Terminal from 0 to 20 mA or 0 to 10 V, & AM Terminal from 0 to 20 mA
- **Indicator LEDs** — Run, Local, Run/Stop, & DC Bus Charge Status

ENVIRONMENT

- **Installation** — Indoor; Maximum Altitude 3300 ft (Without Derate); Not in Direct Sunlight; Protect from Corrosive &/or Explosive Gases & Vibrations in Excess of 0.6 G
- **Ambient Temperature** — 14° to 104°F (-10° to 40°C)
- **Humidity** — 95% Non-Condensing

TYPICAL CONNECTION DIAGRAM



TOSHIBA

H9 ASD POWER UNIT PRICING & DIMENSIONS

H9 230 V ASD POWER UNIT PRICING & DIMENSIONS									
VAC	HP	FLA	Model Number	List Price	Frame	Dimensions (in.)			Shipping Weight (lbs.)
						H	W	D	
230	0.75	3.2	VT130H9U2010	$1,550	2	11.2	5.2	6.1	8.0
	1	4.2	VT130H9U2015	$1,550					
	2	6.8	VT130H9U2025	$1,550					
	3	9.6	VT130H9U2035	$1,550	3	12.4	6.1	6.6	12.0
	5	15.2	VT130H9U2055	$1,600					
	7.5	22	VT130H9U2080	$1,900	4	15.0	6.9	6.6	17.0
	10	28	VT130H9U2110	$2,400					
	15	42	VT130H9U2160	$3,000	5B	19.3	9.1	7.6	38.0
	20	54	VT130H9U2220	$3,650					
	25	68	VT130H9U2270	$4,500					
	30	80	VT130H9U2330	$5,197	6	25.9	11.1	13.2	98.0
	40	104	VT130H9U2400	$7,087	7B	33.1	14.3	15.0	165
	50	130	VT130H9U2500	$11,000					
	60	154	VT130H9U2600	$13,500					
	75	192	VT130H9U2750	$15,400					
	100	248	VT130H9U210K	$18,600	9	51.7	14.6	17.6	321
	125	312	VT130H9U212K	$23,000	10	53.2	15.7	17.6	362

H9 460 V ASD POWER UNIT PRICING & DIMENSIONS									
VAC	HP	FLA	Model Number	List Price	Frame	Dimensions (in.)			Shipping Weight (lbs.)
						H	W	D	
460	1	2.1	VT130H9U4015	$1,455	2	11.2	5.2	6.1	9
	2	3.4	VT130H9U4025	$1,525					
	3	4.8	VT130H9U4035	$1,700					
	5	7.6	VT130H9U4055	$1,750	3	12.4	6.1	6.6	13.0
	7.5	11	VT130H9U4080	$2,000					
	10	14	VT130H9U4110	$2,635	4	15.0	6.9	6.6	14.0
	15	21	VT130H9U4160	$3,100	5A	15.1	8.3	7.6	14.0
	20	27	VT130H9U4220	$3,750					
	25	34	VT130H9U4270	$4,200	5B	19.3	9.1	7.6	36.0
	30	40	VT130H9U4330	$4,400					
	40	52	VT130H9U4400	$5,200	6	25.9	11.1	13.2	98.0
	50	65	VT130H9U4500	$6,700	7A	30.8	11.1	14.3	124
	60	77	VT130H9U4600	$7,900					
	75	96	VT130H9U4750	$8,800	8	36.1	14.3	15.3	185
	100	124	VT130H9U410K	$11,000					
	125	156	VT130H9U412K	$13,500					
	150	180	VT130H9U415K	$15,400	9	51.7	14.6	17.6	321
	200	240	VT130H9U420K	$18,600	10	53.2	15.7	17.6	362
	250	302	VT130H9U425K	$23,000	11	63.1	15.0	17.6	405
	300	361	VT130H9U430K	$27.000	12	68.5	18.9	17.6	594
	350	414	VT130H9U435K	$30,400					
	400	477	VT130H9U440K	$35,000	13	70.0	25.6	17.6	874

G9 ASD

The G9 low voltage adjustable speed drive is the most advanced, severe duty drive ever offered by Toshiba. Designed with the end-user in mind, this drive combines a rugged, proven power platform with the latest in power devices & an advanced micro-processor to provide users with a smarter, stronger, more reliable drive with flexible application control.

SPECIFICATIONS

CONTROL

- **PWM Control** — Carrier Frequency User-Settable from 1.0 kHz to XX kHz (Where XX = ASD-Dependent)
- **Input Signal Control** — Local Operation (EOI), Isolated 4 to 20 mADC or 0 to 10 VDC (V/I), ±10 VDC (RR), Remote Potentiometer (Any Analog Input Terminal), 15 Preset Speeds via Contact Closure, Communications via RS485
- **Input Signal Resolution** — EOI Input 0.01 Hz, Analog Terminal Input 0.1 Hz, Discrete Terminal, Digital Input, & Communications Input ±0.01% of Maximum Output Frequency
- **Output Frequency Precision** — Analog Terminal Input ±0.5% of Maximum Output Frequency, & Discrete & Digital Input ±0.01% of Maximum Output Frequency
- **Output Frequency Range** — 0.01 to 299 Hz
- **Output Voltage/Frequency Control Method** — Open & Closed-Loop Vector with Speed Torque Switching, Constant Torque, Variable Torque, Auto-Torque Boost, & Custom Five-Point Curve
- **Overload Rating** — ASD Output Continuous at 115% & 120 seconds at 150%; Exceptions: 110% Continuous for 230 V Above 50 HP & 460 V Above 100 HP; 60 Seconds at 150% for 230 V Above 50 HP & 460 V Above 100 HP
- **Braking** — DC Injection Braking & Dynamic Braking Available
  DC Injection Braking Frequency Settable from 0 to Maximum Frequency; Braking Amperage Settable from 0 to 100% of the ASD Output; Braking Time Settable from 0 to 20 Seconds; Motor Shaft Stationary Control Available
  Dynamic Braking Resistor Value/Wattage Application-Specific & User-Settable; Braking Time, Stop Pattern, & Overload level are User-Set

OPERATION

- **Voltage/Frequency** — Single-Phase 200 to 240 VAC, 50/60 Hz; Three-Phase 200 to 240 VAC & Three-Phase 380 to 480 VAC; Adjustable Within 100% to 120% of Corrected Supply Voltage
- **Input Voltage Tolerance** — Voltage ±10%; Frequency ±2 Hz
- **Frequency Adjustability** — EOI Operation 0.1 Hz; Analog Input 0.2 Hz
- **Startup Frequency** — Adjustable from 0 to 10 Hz
- **Jump Frequencies** — Three User-Selected Frequencies & Associated B&widths
- **Acceleration/Deceleration** — 0.1 to 6000 Seconds Switchable Between Acceleration/Deceleration Time 1, 2, 3 or 4; Selectable as S-Pattern 1, 2, or Linear
- **Input Terminal Functions** — Eight Discrete Programmable Input Terminals Selectable as Sink or Source Logic
- **Output Terminal Functions** — Programmable Outputs; One Form-C & Two Form-A; Rated 115 VAC @ 2 A, 30 VDC @ 2 A
- **Retry Operation** — Auto-Reset of User-Selected Faults after a Main Circuit Check; Programmable up to Ten Retries
- **Regenerative Power Ride-Through Control** —Maintains Control Power in Case of Momentary Loss of Three-Phase Input Power Using Regenerative Energy from Motor
- **Auto-Restart/Catch a Spinning Motor** — In Event of Momentary Power Loss, Drive Reads Speed & Direction of Rotating Motor & Seamlessly Starts at Appropriate Speed
- **Protective Functions** — Stall Protection, Current Limit, Overcurrent, Output Short Circuit, Overvoltage, Overvoltage Limit, Undervoltage, Ground Fault, Input & Output Single-Phase, Overload, Motor Overload, Overtorque, Pre-Alarm, Dynamic Braking Resistor Overload, Auto-Tuning Error, Overheat, External Trip, Emergency Stop, & More
- **Motor Protection** — Programmable Electronic Thermal Protection; Adjustable from 10 to 100% of ASD Rating or Settable to Specified Output Current

DISPLAY

- **EOI** — Backlit Plain-English LCD & Four-Digit Seven-Segment LED Display
- **Alarm & Fault Indications** — Indication of Stall Protection, Overvoltage, Overload, Undervoltage, Retry, & More
- **Status Monitoring** — Output Frequency, Frequency Comm&, Output Current, Output Voltage, DC Bus Voltage, Torque Current, Input Terminal Status, & More
- **Past Trip Monitoring** — Stores Last 20 Faults in Succession, Cumulative Time at Time of Trip, ASD Operation Status, Speed, Direction, Load, & More
- **Analog Output for Hz & Amps** — FM Terminal from 0 to 20 mA or 0 to 10 V & AM Terminal from 0 to 20 mA
- **Indicator LEDs** — Run, Local, Run/Stop, & DC Bus Charge Status

ENVIRONMENT

- **Installation** — Indoor; Maximum Altitude 3300 ft (Without Derate); Not in Direct Sunlight; Protect from Corrosive Gases, Explosive Gases, & Vibrations in Excess of 0.6 G
- **Ambient Temperature** — 14° to 104°F (-10° to 40°C)
- **Humidity** — 95% Non-Condensing

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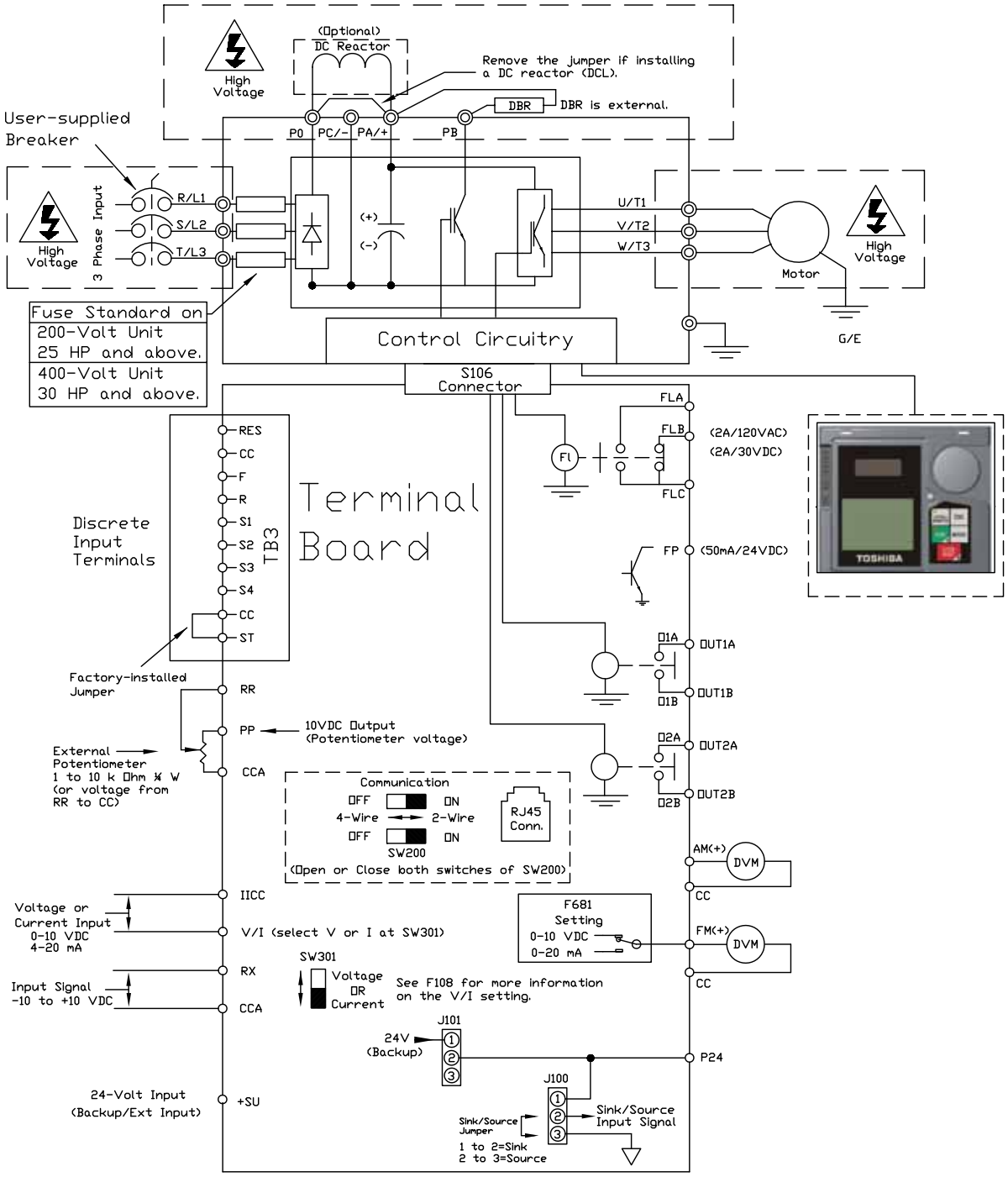
TYPICAL CONNECTION DIAGRAM



G9 ASD POWER UNIT PRICING & DIMENSIONS

G9 230 V ASD POWER UNIT PRICING & DIMENSIONS									
VAC	HP	FLA	Model Number	List Price	Frame	Dimensions (in.)			Shipping Weight (lbs.)
						H	W	D	
230	0.75	3.5	VT130G9U2010	$1,550	2	11.2	5.2	6.1	8.0
	1	4.2	VT130G9U2015	$1,550					
	2	6.9	VT130G9U2025	$1,550					
	3	10.0	VT130G9U2035	$1,550	3	12.4	6.1	6.6	12.0
	5	15.2	VT130G9U2055	$1,700					
	7.5	23.8	VT130G9U2080	$2,160	4	15.0	6.9	6.6	17.0
	10	28.6	VT130G9U2110	$2,565	5A	15.1	8.3	7.6	21.0
	15	46.8	VT130G9U2160	$3,285	5B	19.3	9.1	7.6	38.0
	20	57.2	VT130G9U2220	$4,050					
	25	76	VT130G9U2270	$5,400	6	25.9	11.1	13.2	97.0
	30	90	VT130G9U2330	$6,237	7B	33.1	14.3	15.0	165
	40	104	VT130G9U2400	$13,050					
	50	152	VT130G9U2500	$15,300					
	60	176	VT130G9U2600	$18,900					
	75	221	VT130G9U2750	$21,263	9	51.7	14.6	17.6	321
	100	285	VT130G9U210K	$25,515	10	53.1	14.8	17.6	362

G9 460 V ASD POWER UNIT PRICING & DIMENSIONS									
VAC	HP	FLA	Model Number	List Price	Frame	Dimensions (in.)			Shipping Weight (lbs.)
						H	W	D	
460	1	2.7	VT130G9U4015	$1,455	2	11.2	5.2	6.1	9
	2	3.6	VT130G9U4025	$1,525					
	3	5.0	VT130G9U4035	$1,700					
	5	9.1	VT130G9U4055	$2,050	3	12.4	6.1	6.6	12
	7.5	12.4	VT130G9U4080	$2,250	4	15.0	6.9	6.6	17
	10	15.3	VT130G9U4110	$2,790					
	15	24.0	VT130G9U4160	$3,600	5A	15.1	8.3	7.6	22
	20	28.6	VT130G9U4220	$4,500	5B	19.3	9.1	7.6	38
	25	35.7	VT130G9U4270	$5,580					
	30	42.0	VT130G9U4330	$6,660	6	25.9	11.1	13.2	96
	40	57.2	VT130G9U4400	$8,145	7A	30.8	11.1	14.3	124
	50	68.5	VT130G9U4500	$9,923					
	60	81.5	VT130G9U4600	$11,228	8	36.1	14.3	15.3	183
	75	100.8	VT130G9U4750	$13,050					
	100	138.7	VT130G9U410K	$15,300					
	125	179	VT130G9U412K	$18,900	9	51.7	14.6	17.6	321
	150	215	VT130G9U415K	$21,263	10	53.2	15.7	17.6	362
	200	259	VT130G9U420K	$25,515	11	63.1	15.0	17.6	405
	250	314	VT130G9U425K	$30,240	12	68.5	18.9	17.6	596
	300	387	VT130G9U430K	$37,800	13	70.0	25.6	17.6	860
	350	427	VT130G9U435K	$42,525					

H9/G9 OPTION INFORMATION & PRICING

HEAVY DUTY DYNAMIC BRAKING RESISTORS IN NEMA 1 ENCLOSURE						
VAC	HP	Model Number	List Price	Dimensions (in.)		
				H	W	D
230	0.75	PR00270P132	$140	5.0	14.0	4.0
	1	PR00271P132	$230			
	2	PR00272P132	$240			7.0
	3	PR00273P132	$290			
	5	PR00274P132	$390			13.0
	7.5	PR00275P132	$590		21.0	10.0
	10	PR00276P132	$680			13.0
	15	PR00277P132	$820		28.0	
	20	PR00278P132	$1,040	7.0	29.0	18.0
	25	PR00279P132	$1,070			
	30	PR00280P132	$1,620			
Delivery: Two to four weeks.						

Notes:
- Dynamic braking resistors have a powder-coated enclosure, terminal block, & normally-closed thermal switch.
- For 40 to 125 HP, consult factory for pricing.

HEAVY DUTY DYNAMIC BRAKING RESISTORS IN NEMA 1 ENCLOSURE						
VAC	HP	Model Number	List Price	Dimensions (in.)		
				H	W	D
460	1	PR00282P132	$190	5.0	14.0	4.0
	2	PR00283P132	$210	5.0	14.0	7.0
	3	PR00284P132	$280	5.0	14.0	7.0
	5	PR00285P132	$380	5.0	14.0	13.0
	7.5	PR00286P132	$550	5.0	21.0	10.0
	10	PR00287P132	$710	5.0	21.0	13.0
	15	PR00288P132	$1,070	5.0	28.0	13.0
	20	PR00289P132	$1,150	7.0	29.0	18.0
	25	PR00290P132	$1,660	7.0	29.0	18.0
	30	PR00291P132	$1,850	14.0	29.0	18.0
	40	PR00292P132	$2,130	14.0	29.0	18.0
	50	PR00293P132	$2,180	14.0	29.0	18.0
	60	PR00294P132	$2,320	14.0	29.0	18.0
	75	PR00295P132	$2,620	21.0	29.0	18.0
	100	PR00296P132	$3,850	28.0	29.0	18.0
	125	PR00297P132	$4,720	35.0	29.0	18.0
	150	PR00298P132	$5,660	42.0	29.0	18.0
	200	PR00299P132	$6,220	56.0	29.0	18.0
	250	PR00300P132	$7,960	49.0	29.0	18.0
	300	PR00301P132	$10,220	35.0	58.0	18.0
	350	PR00302P132	$16,430	35.0	58.0	16.0
Delivery: Two to four weeks.						

Notes:

- Dynamic braking resistors have a powder-coated enclosure, terminal block, and normally-closed thermal switch.

STANDARD DUTY DYNAMIC BRAKING RESISTORS IN NEMA 1 ENCLOSURE						
VAC	HP	Model Number	List Price	Dimensions (in.)		
				H	W	D
230	0.75	PR02010P132	$105	5.0	14.0	4.0
	1	PR02015P132	$110	5.0	14.0	4.0
	2	PR02025P132	$115	5.0	14.0	4.0
	3	PR02035P132	$120	5.0	14.0	4.0
	5	PR02055P132	$125	5.0	14.0	4.0
	7.5	PR02080P132	$180	5.0	21.0	4.0
	10	PR02110P132	$190	5.0	21.0	7.0
	15	PR02160P132	$260	5.0	28.0	7.0
	20	PR02220P132	$340	7.0	29.0	10.0
	25	PR02270P132	$345	7.0	29.0	10.0
	30	PR02330P132	$410	7.0	29.0	13.0
Delivery: Two to four weeks.						

Notes:
- Dynamic braking resistors have a powder-coated enclosure, terminal block, and normally-closed thermal switch.
- For 40 to 125 HP, consult factory for pricing.

STANDARD DUTY DYNAMIC BRAKING RESISTORS IN NEMA 1 ENCLOSURE						
VAC	HP	Model Number	List Price	Dimensions (in.)		
				H	W	D
460	1	PR04015P132	$105	5.0	14.0	4.0
	2	PR04025P132	$115	5.0	14.0	4.0
	3	PR04035P132	$120	5.0	14.0	4.0
	5	PR04055P132	$190	5.0	14.0	4.0
	7.5	PR04080P132	$200	5.0	14.0	4.0
	10	PR04110P132	$210	5.0	14.0	7.0
	15	PR04160P132	$270	5.0	14.0	7.0
	20	PR04220P132	$345	5.0	14.0	10.0
	25	PR04270P132	$350	5.0	14.0	13.0
	30	PR04330P132	$430	5.0	14.0	13.0
	40	PR04400P132	$580	5.0	21.0	10.0
	50	PR04500P132	$650	5.0	21.0	13.0
	60	PR04600P132	$730	5.0	21.0	13.0
	75	PR04750P132	$1,020	7.0	29.0	18.0
	100	PR0410KP132	$1,080	7.0	29.0	18.0
	125	PR0412KP132	$1,580	7.0	29.0	18.0
	150	PR0415KP132	$1,780	14.0	29.0	18.0
	200	PR0420KP132	$2,020	14.0	29.0	18.0
	250	PR0425KP132	$2,120	14.0	29.0	18.0
	300	PR0430KP132	$2,290	14.0	29.0	18.0
	350	PR0432KP132	$2,420	14.0	29.0	18.0

Notes:

- Dynamic braking resistors have a powder-coated enclosure, terminal block, and normally-closed thermal switch.

H9/G9 ASSEMBLY UNIT PART NUMBERING CONVENTION

The H9/G9 assembly unit combines the H9/G9 power unit with commonly used options such as manual bypass & input disconnects in an easy-to-install turn-key package. H9/G9 assembly units include a ground lug & door-mounted electronic operator interface.

Bypass units include an ASD/bypass selector switch, a bypass-start lighted push-button (red), & a bypass stop lighted push-button (green). They are used for system control & are all located on the enclosure door.

Ordering Information: Use the following part numbering convention to configure the H9/G9 assembly unit package when placing your order.

Example Part Number:	H9/G9	4	###/###K	AA	##

Series:
- H9 — H9 ASD
- G9 — G9 ASD

Voltage:
- 2 — 230
- 3 — 380
- 4 — 460
- A — 208
- B — 415
- C — 440

Model Number:

010 — 0.75 HP	500 — 50 HP
015 — 1 HP	600 — 60 HP
025 — 2 HP	750 — 75 HP
035 — 3 HP	10K — 100 HP
055 — 5 HP	12K — 125 HP
080 — 7.5 HP	15K — 150 HP
110 — 10 HP	20K — 200 HP
160 — 15 HP	25K — 250 HP
220 — 20 HP	30K — 300 HP
270 — 25 HP	35K — 350 HP
330 — 30 HP	40K — 400 HP
400 — 40 HP	

Style:
- AA — Includes motor circuit protector
- AE — Includes motor circuit protector, three-contactor bypass, & overload protection

H9 ASD ASSEMBLY UNIT PRICING & DIMENSIONS

H9 230 V ASD ASSEMBLY UNIT PRICING & DIMENSIONS								
VAC	HP	FLA	Model Number	List Price		Dimensions (in.)		
				AA	AE	H	W	D
230	0.75	9.6	H92010	$4,625	$5,683	36.0	24.0	10.0
	1	9.6	H92015	$4,625	$5,683			
	2	9.6	H92025	$4,625	$5,683			
	3	9.6	H92035	$4,783	$6,106			
	5	15.2	H92055	$4,933	$6,256			
	7.5	22	H92080	$5,233	$6,556	48.0		12.0
	10	28	H92110	$5,733	$7,056		36.0	20.0
	15	42	H92160	$6,492	$8,079			
	20	54	H92220	$7,142	$8,729			
	25	68	H92270	$8,627	$10,214			
	30	80	H92330	$8,994	$10,581	60.0		
	40	104	H92400	$12,351	$13,939			
	50	130	H92500	$17,667	$19,254	90.0		24.0
	60	154	H92600	$19,167	$22,341			
	75	192	H92750	$20,942	$24,116			
	100	248	H9210K	$24,234	$30,054		48.0	30.0
	125	312	H9212K	$28,702	$37,696			
Delivery: Five weeks for a basic assembly unit.								

H9 460 V ASD ASSEMBLY UNIT PRICING & DIMENSIONS								
VAC	HP	FLA	Model Number	List Price		Dimensions (in.)		
				AA	AE	H	W	D
460	1	7.6	H94015	$3,175	$4,233	36.0	24.0	10.0
	2	7.6	H94025	$3,175	$4,233			
	3	7.6	H94035	$3,175	$4,233			
	5	7.6	H94055	$4,925	$6,512			
	7.5	11	H94080	$5,333	$6,656			
	10	14	H94110	$5,968	$7,291	48.0		12.0
	15	21	H94160	$6,433	$7,756		36.0	20.0
	20	27	H94220	$7,083	$8,935			
	25	34	H94270	$7,692	$9,279			
	30	40	H94330	$7,892	$9,479			
	40	52	H94400	$8,692	$10,279			
	50	65	H94500	$9,667	$11,254			
	60	77	H94600	$12,027	$13,085	60.0		
	75	96	H94750	$14,514	$16,102			
	100	124	H9410K	$17,667	$19,254	90.0		24.0
	125	156	H9412K	$19,167	$22,341			
	150	180	H9415K	$20,942	$24,116			
	200	240	H9420K	$24,234	$30,054		48.0	30.0
	250	302	H9425K	$28,702	$37,696			
	300	361	H9430K	$32,937	$48,810			
	350	414	H9435K	$37,039	$51,325			
	400	477	H9440K	$43,491	$58,491			
Delivery: Five weeks for a basic assembly unit.								

G9 ASD ASSEMBLY UNIT PRICING & DIMENSIONS

G9 230 V ASD ASSEMBLY UNIT PRICING & DIMENSIONS								
VAC	HP	FLA	Model Number	List Price		Dimensions (in.)		
				AA	AE	H	W	D
230	0.75	3.5	G92010	$4,374	$5,432	36.0	24.0	10.0
	1	4.2	G92015	$4,425	$5,483			
	2	6.9	G92025	$4,575	$5,633			
	3	10.0	G92035	$4,883	$6,206			
	5	15.2	G92055	$5,033	$6,356			
	7.5	23.8	G92080	$5,493	$6,816	48.0		12.0
	10	28.6	G92110	$6,183	$7,506		36.0	20.0
	15	46.8	G92160	$7,142	$8,729			
	20	57.2	G92220	$7,992	$9,579			
	25	76	G92270	$10,127	$11,714			
	30	90	G92330	$10,727	$12,314	60.0		
	40	104	G92400	$20,214	$21,802			
	50	152	G92500	$23,667	$25,254	90.0		24.0
	60	176	G92600	$26,667	$29,841			
	75	221	G92750	$29,167	$32,341			
	100	285	G9210K	$33,984	$39,804		48.0	30.0
Delivery: Five weeks for a basic assembly unit.								

G9 460 V ASD ASSEMBLY UNIT PRICING & DIMENSIONS								
VAC	HP	FLA	Model Number	List Price		Dimensions (in.)		
				AA	AE	H	W	D
460	1	2.7	G94015	$4,630	$5,688	36.0	24.0	10.0
	2	3.6	G94025	$4,750	$5,808			
	3	5.0	G94035	$4,875	$5,933			
	5	9.1	G94055	$5,225	$6,812			
	7.5	12.4	G94080	$5,833	$7,156			
	10	15.3	G94110	$6,433	$7,756	48.0		12.0
	15	24.0	G94160	$7,333	$8,656		36.0	20.0
	20	28.6	G94220	$8,333	$10,185			
	25	35.7	G94270	$9,692	$11,279			
	30	42.0	G94330	$10,892	$12,479			
	40	57.2	G94400	$12,542	$14,129			
	50	68.5	G94500	$13,992	$15,579			
	60	81.5	G94600	$16,602	$17,660	60.0		
	75	101	G94750	$20,214	$21,802			
	100	139	G9410K	$23,667	$25,254	90.0		24.0
	125	179	G9412K	$26,667	$29,841			
	150	215	G9415K	$29,167	$32,341			
	200	259	G9420K	$33,984	$39,804		48.0	30.0
	250	314	G9425K	$39,302	$48,296			
	300	387	G9430K	$47,937	$63,810			
	350	427	G9435K	$53,889	$68,175			
Delivery: Five weeks for a basic assembly unit.								

H9/G9 ASSEMBLY UNIT OPTION INFORMATION & PRICING

230 V ASSEMBLY UNIT ENCLOSURE OPTIONS		
Part Number	**Description**	**Price**
NF	• 0.75 to 7.5 HP fan & filtered dust-inhibiting enclosure	$400
	• 10 to 25 HP fan & filtered dust-inhibiting enclosure	$1,000
	• 30 to 100 HP fan & filtered dust-inhibiting enclosure	$1,500
	• 125 HP fan & filtered dust-inhibiting enclosure	$2,500
N3	• 0.75 to 7.5 HP fan & filtered enclosure for outdoor use	$600
	• 10 to 25 HP fan & filtered enclosure for outdoor use	$2,000
	• 30 to 100 HP fan & filtered enclosure for outdoor use	$3,000
	• 125 HP fan & filtered enclosure for outdoor use	$5,000
Delivery: Add two weeks to basic assembly unit lead time.		
NC	• 0.75 to 7.5 HP NEMA 12 adder	$600
	• 10 to 15 HP NEMA 12 adder	$4,000
	• 20 to 50 HP NEMA 12 adder	$8,000
	• 60 to 100 HP NEMA 12 adder	$12,000
	• 125 HP NEMA 12 adder	$15,000
N4	• 0.75 to 7.5 HP NEMA 4 adder	$3,000
	• 10 to 25 HP NEMA 4 adder	$11,500
	• 30 to 50 HP NEMA 4 adder	$18,000
	• 60 to 100 HP NEMA 4 adder	$26,000
	• 125 HP NEMA 4 adder	$32,000
Delivery: Add six weeks to basic assembly unit lead time.		

460 V ASSEMBLY UNIT ENCLOSURE OPTIONS		
Part Number	**Description**	**Price**
NF	• 1 to 15 HP fan & filtered dust-inhibiting enclosure	$400
	• 20 to 50 HP fan & filtered dust-inhibiting enclosure	$1,000
	• 60 to 200 HP fan & filtered dust-inhibiting enclosure	$1,500
	• 250 to 400 HP fan & filtered dust-inhibiting enclosure	$2,500
N3	• 1 to 15 HP fan & filtered enclosure for outdoor use	$600
	• 20 to 50 HP fan & filtered enclosure for outdoor use	$2,000
	• 60 to 200 HP fan & filtered enclosure for outdoor use	$3,000
	• 250 to 400 HP fan & filtered enclosure for outdoor use	$5,000
Delivery: Add two weeks to basic assembly unit lead time.		
NC	• 1 to 15 HP NEMA 12 adder	$600
	• 20 to 30 HP NEMA 12 adder	$4,000
	• 40 to 100 HP NEMA 12 adder	$8,000
	• 125 to 200 HP NEMA 12 adder	$12,000
	• 250 to 400 HP NEMA 12 adder	$15,000
N4	• 1 to 15 HP NEMA 4 adder	$3,000
	• 20 to 30 HP NEMA 4 adder	$11,500
	• 40 to 100 HP NEMA 4 adder	$18,000
	• 125 to 200 HP NEMA 4 adder	$26,000
	• 250 to 400 HP NEMA 4 adder	$32,000
Delivery: Add six weeks to basic assembly unit lead time.		

NOTES:

P9 ASD

The Toshiba P9 low voltage adjustable speed drive is a revolution in pump control. By incorporating Toshiba's proprietary, ground-breaking Virtual Linear Pump (VLP) Technology, the P9 directly, precisely, and linearly controls pressure, temperature, or flow.

The P9 eliminates many obstacles users thought were an integral part of pump control and sets a new standard in ingenuity, performance, and ease-of-use for the pump industry.

SPECIFICATIONS

SPECIAL FEATURES/PROTECTION
- Proprietary VLP Technology; VLP Wizard
- Booster Pump Control - Across the line or via ASD
- Sensorless Operation
- Automatic Sleep Function
- Sealing Water Control Interlocks
- No Flow/Low NPSH Cut-Off
- Thrust Bearing Protection

CONTROL
- **PWM Control** — Carrier Frequency is User-settable from 1.0 kHz to XX kHz (Where XX = ASD-Dependent)
- **Input Signal Control** — Local Operation (EOI), Isolated 4 to 20 mADC or 0 to 10 VDC (V/I), ±10 VDC (RR), Remote Potentiometer (Any Analog Input Terminal), 15 Preset Speeds via Contact Closure, Communications via RS485
- **Input Signal Resolution** — Local Operation (EOI) 0.01; Analog Input 0.1
- **Output Frequency Precision** — Analog Terminal Input ±0.5% of Maximum Output Frequency; Discrete Input ±0.01% of Maximum Output Frequency
- **Output Frequency Range** — 0.0 to 299 Hz
- **Output Voltage/Frequency Control Method** — Open Closed-Loop Vector with Speed Torque Switching, Constant Torque, Variable Torque, Auto-Torque Boost, Custom Five-Point Curve
- **Overload Rating** — ASD Output 100% Continuous 120% for 60 Seconds
- **Braking** — DC Injection Braking Dynamic Braking Available; DC Injection Braking Frequency Settable from 0 to Maximum Frequency; Braking Amperage Settable from 0 to 100% of ASD Output; Braking Time Settable from 0 to 20 Seconds; Motor Shaft Stationary Control Available. Dynamic Braking Resistor vAlue/wattage Application-Specific User-Set; Braking Time, Stop Pattern, Overload Level User-Set

OPERATION
- **Voltage/Frequency —** Single-Phase 200 to 240 VAC, 50/60 Hz; Three-Phase 200 to 240 VAC 50/60 Hz; Three-Phase 380 to 480 VAC 50/60 Hz; Adjustable Within 100% to 120% of Corrected Supply Voltage
- **Input Voltage Tolerance** — Voltage ±10%; Frequency ±2 Hz
- **Voltage/Frequency Control** — Open/Closed-Loop Vector, Constant Torque, Variable Torque, Auto-Torque Boost, Auto-Energy Savings, Dynamic Auto-Energy Savings, Permanent Magnet Motor Control
- **Startup Frequency** — Adjustable within Range of 0 to 10 Hz
- **Jump Frequencies** — Three User-Selected Frequencies Associated Bandwidths
- **Acceleration/Deceleration** — 0.1 to 6000 Seconds; Switchable Between Acceleration/Deceleration Times 1, 2, 3 or 4; Selectable from S-Patterns 1 or 2
- **Retry Operation** — Auto-Reset of Certain Faults after a Main Circuit Check; Programmable up to 10 Retries

DISPLAY
- **Character Display** — Backlit Plain-English LCD Display Four-Digit Seven-Segment LED Display
- **Alarms, Faults, Protection** — Stall Protection, Overvoltage, Overload, Overheat, Undervoltage, Retry, More
- **Monitored Parameters** — Output Frequency, Frequency Command, Output Current, Output Voltage, DC Bus Voltage, Torque Current, Input Terminal Status, More
- **Monitored Performance Variables** — Analog Output Monitor; Selectable from FM Terminal 0 to 20 mA/0 to 10 VDC AM Terminal 0 to 20 mA
- **Past Trip Records** — Stores Last 20 Faults in Succession Along with Cumulative the at-Trip time; Stores ASD Operation Status, Speed, Direction, Load, More
- **Indicators** — LEDs for Run, Local Mode, Local Run/Stop, DC Bus Charge Status

ENVIRONMENT
- **Installation** — Indoor; Maximum Altitude 3300 ft (Without Derate); Not in Direct Sunlight; Protect from Corrosive Gases, Explosive Gases, Vibrations in Excess of 0.6 G
- **Ambient Temperature** — 14° to 104°F (-10° to 40°C)
- **Humidity** — 95% Non-Condensing

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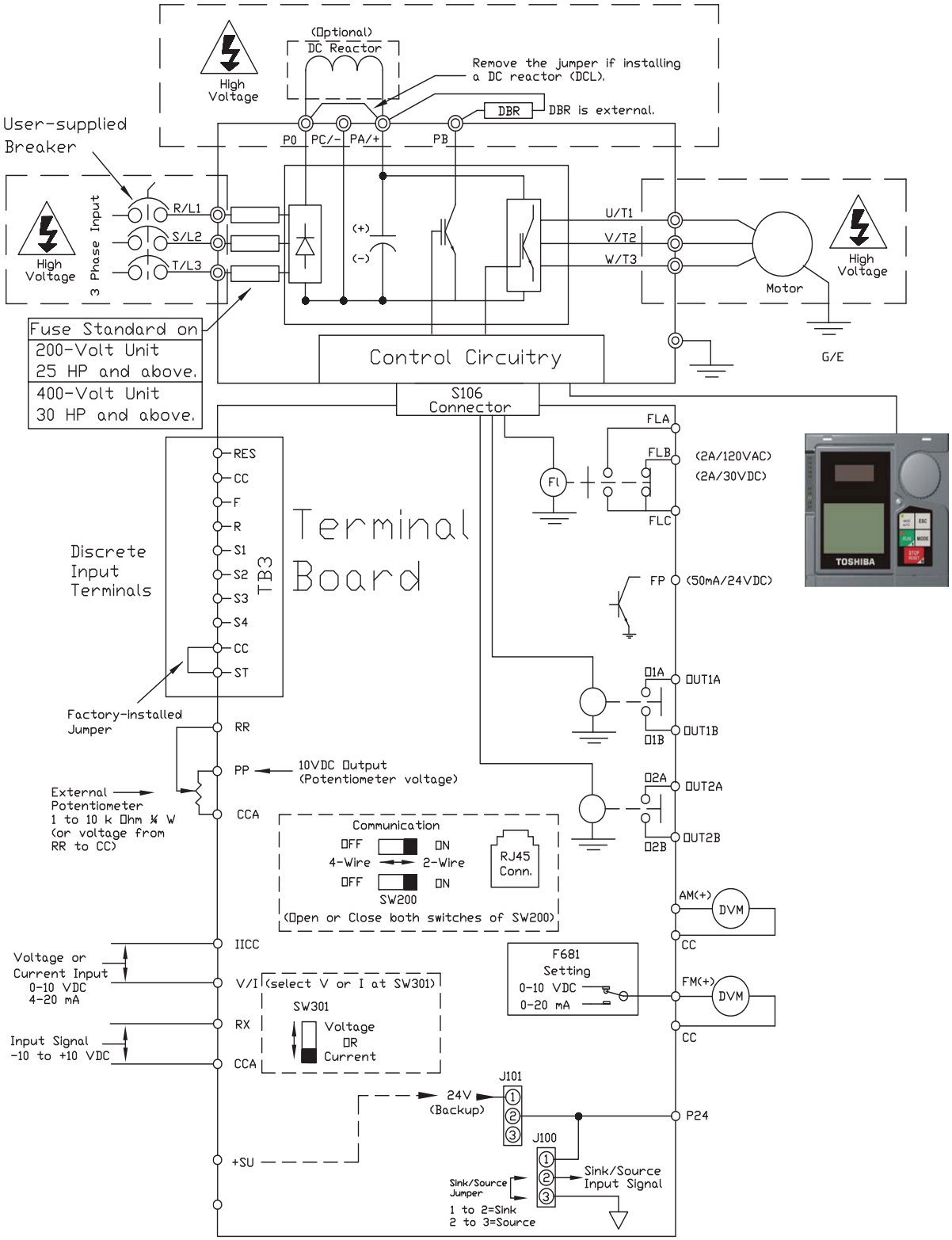
TYPICAL CONNECTION DIAGRAM



P9 ASD POWER UNIT PRICING & DIMENSIONS

P9 230 V ASD POWER UNIT PRICING & DIMENSIONS									
VAC	HP	FLA	Model Number	List Price	Frame	Dimensions (in.)			Shipping Weight (lbs.)
						H	W	D	
230	0.75	3.2	VT130P9U2010	$1,705	2	11.2	5.2	6.1	8.0
	1	4.2	VT130P9U2015	$1,705					
	2	6.8	VT130P9U2025	$1,705					
	3	9.6	VT130P9U2035	$1,705	3	12.4	6.1	6.6	12.0
	5	15.2	VT130P9U2055	$1,760					
	7.5	22	VT130P9U2080	$2,090	4	15.0	6.9	6.6	17.0
	10	28	VT130P9U2110	$2,640					
	15	42	VT130P9U2160	$3,300	5B	19.3	9.1	7.6	38.0
	20	54	VT130P9U2220	$4,015					
	25	68	VT130P9U2270	$4,950					
	30	80	VT130P9U2330	$5,717	6	25.9	11.1	13.2	98.0
	40	104	VT130P9U2400	$7,796	7B	33.1	14.3	15.0	165
	50	130	VT130P9U2500	$12,000					
	60	154	VT130P9U2600	$14,850					
	75	192	VT130P9U2750	$16,940					
	100	248	VT130P9U210K	$20,460	9	51.7	14.6	17.6	321
	125	312	VT130P9U212K	$25,300	10	53.2	15.7	17.6	362

P9 460 V ASD POWER UNIT PRICING & DIMENSIONS									
VAC	HP	FLA	Model Number	List Price	Frame	Dimensions (in.)			Shipping Weight (lbs.)
						H	W	D	
460	1	2.1	VT130P9U4015	$1,600	2	11.2	5.2	6.1	9
	2	3.4	VT130P9U4025	$1,735					
	3	4.8	VT130P9U4035	$1,870					
	5	7.6	VT130P9U4055	$1,925	3	12.4	6.1	6.6	13.0
	7.5	11	VT130P9U4080	$2,200					
	10	14	VT130P9U4110	$2,899	4	15.0	6.9	6.6	14.0
	15	21	VT130P9U4160	$3,410	5A	15.1	8.3	7.6	14.0
	20	27	VT130P9U4220	$4,125					
	25	34	VT130P9U4270	$4,620	5B	19.3	9.1	7.6	36.0
	30	40	VT130P9U4330	$4,840					
	40	52	VT130P9U4400	$5,720	6	25.9	11.1	13.2	98.0
	50	65	VT130P9U4500	$7,370	7A	30.8	11.1	14.3	124
	60	77	VT130P9U4600	$8,690					
	75	96	VT130P9U4750	$9,680	8	36.1	14.3	15.3	185
	100	124	VT130P9U410K	$12,100					
	125	156	VT130P9U412K	$14,850					
	150	180	VT130P9U415K	$16,940	9	51.7	14.6	17.6	321
	200	240	VT130P9U420K	$20,460	10	53.2	15.7	17.6	362
	250	302	VT130P9U425K	$25,300	11	63.1	15.0	17.6	405
	300	361	VT130P9U430K	$29,700	12	68.5	18.9	17.6	594
	350	414	VT130P9U435K	$33,440					
	400	477	VT130P9U440K	$38,500	13	70.0	25.6	17.6	874

P9 OPTION INFORMATION & PRICING

HEAVY DUTY DYNAMIC BRAKING RESISTORS IN NEMA 1 ENCLOSURE						
VAC	HP	Model Number	List Price	Dimensions (in.)		
				H	W	D
230	0.75	PR00270P132	$140	5.0	14.0	4.0
	1	PR00271P132	$230	5.0	14.0	4.0
	2	PR00272P132	$240	5.0	14.0	7.0
	3	PR00273P132	$290	5.0	14.0	7.0
	5	PR00274P132	$390	5.0	14.0	13.0
	7.5	PR00275P132	$590	5.0	21.0	10.0
	10	PR00276P132	$680	5.0	21.0	13.0
	15	PR00277P132	$820	5.0	28.0	13.0
	20	PR00278P132	$1,040	7.0	29.0	18.0
	25	PR00279P132	$1,070	7.0	29.0	18.0
	30	PR00280P132	$1,620	7.0	29.0	18.0
Delivery: Two to four weeks.						

Notes:

- Dynamic braking resistors have a powder-coated enclosure, terminal block, normally closed thermal switch.
- For 40 to 125 HP, consult factory for pricing.

HEAVY DUTY DYNAMIC BRAKING RESISTORS IN NEMA 1 ENCLOSURE						
VAC	HP	Model Number	List Price	Dimensions (in.)		
				H	W	D
460	1	PR00282P132	$190	5.0	14.0	4.0
	2	PR00283P132	$210	5.0	14.0	7.0
	3	PR00284P132	$280	5.0	14.0	7.0
	5	PR00285P132	$380	5.0	14.0	13.0
	7.5	PR00286P132	$550	5.0	21.0	10.0
	10	PR00287P132	$710	5.0	21.0	13.0
	15	PR00288P132	$1,070	5.0	28.0	13.0
	20	PR00289P132	$1,150	7.0	29.0	18.0
	25	PR00290P132	$1,660	7.0	29.0	18.0
	30	PR00291P132	$1,850	14.0	29.0	18.0
	40	PR00292P132	$2,130	14.0	29.0	18.0
	50	PR00293P132	$2,180	14.0	29.0	18.0
	60	PR00294P132	$2,320	14.0	29.0	18.0
	75	PR00295P132	$2,620	21.0	29.0	18.0
	100	PR00296P132	$3,850	28.0	29.0	18.0
	125	PR00297P132	$4,720	35.0	29.0	18.0
	150	PR00298P132	$5,660	42.0	29.0	18.0
	200	PR00299P132	$6,220	56.0	29.0	18.0
	250	PR00300P132	$7,960	49.0	29.0	18.0
	300	PR00301P132	$10,220	35.0	58.0	18.0
	350	PR00302P132	$16,430	35.0	58.0	16.0
Delivery: Two to four weeks.						

Notes:

- Dynamic braking resistors have a powder-coated enclosure, terminal block, normally closed thermal switch.

STANDARD DUTY DYNAMIC BRAKING RESISTORS IN NEMA 1 ENCLOSURE						
VAC	HP	Model Number	List Price	Dimensions (in.)		
				H	W	D
230	0.75	PR02010P132	$105	5.0	14.0	4.0
	1	PR02015P132	$110	5.0	14.0	4.0
	2	PR02025P132	$115	5.0	14.0	4.0
	3	PR02035P132	$120	5.0	14.0	4.0
	5	PR02055P132	$125	5.0	14.0	4.0
	7.5	PR02080P132	$180	5.0	21.0	4.0
	10	PR02110P132	$190	5.0	21.0	7.0
	15	PR02160P132	$260	5.0	28.0	7.0
	20	PR02220P132	$340	7.0	29.0	10.0
	25	PR02270P132	$345	7.0	29.0	10.0
	30	PR02330P132	$410	7.0	29.0	13.0
Delivery: Two to four weeks.						

Notes:

- Dynamic braking resistors have a powder-coated enclosure, terminal block, normally closed thermal switch.
- For 40 to 125 HP, consult factory for pricing.

STANDARD DUTY DYNAMIC BRAKING RESISTORS IN NEMA 1 ENCLOSURE						
VAC	HP	Model Number	List Price	Dimensions (in.)		
				H	W	D
460	1	PR04015P132	$105	5.0	14.0	4.0
	2	PR04025P132	$115	5.0	14.0	4.0
	3	PR04035P132	$120	5.0	14.0	4.0
	5	PR04055P132	$190	5.0	14.0	4.0
	7.5	PR04080P132	$200	5.0	14.0	4.0
	10	PR04110P132	$210	5.0	14.0	7.0
	15	PR04160P132	$270	5.0	14.0	7.0
	20	PR04220P132	$345	5.0	14.0	10.0
	25	PR04270P132	$350	5.0	14.0	13.0
	30	PR04330P132	$430	5.0	14.0	13.0
	40	PR04400P132	$580	5.0	21.0	10.0
	50	PR04500P132	$650	5.0	21.0	13.0
	60	PR04600P132	$730	5.0	21.0	13.0
	75	PR04750P132	$1,020	7.0	29.0	18.0
	100	PR0410KP132	$1,080	7.0	29.0	18.0
	125	PR0412KP132	$1,580	7.0	29.0	18.0
	150	PR0415KP132	$1,780	14.0	29.0	18.0
	200	PR0420KP132	$2,020	14.0	29.0	18.0
	250	PR0425KP132	$2,120	14.0	29.0	18.0
	300	PR0430KP132	$2,290	14.0	29.0	18.0
	350	PR0432KP132	$2,420	14.0	29.0	18.0
Delivery: Two to four weeks.						

Notes:
- Dynamic braking resistors have a powder-coated enclosure, terminal block, normally closed thermal switch.

P9 ASSEMBLY UNIT PART NUMBERING CONVENTION

The P9 assembly unit combines the P9 power unit with commonly used options such as manual bypass and input disconnects in an easy-to-install turn-key package. P9 assembly units include a ground lug and door-mounted electronic operator interface.

Bypass units include an ASD/Bypass selector switch, a Bypass-Start lighted push-button (red), and a Bypass-Stop lighted push-button (green). They are used for system control and are all located on the enclosure door.

Ordering Information: Use the following part numbering convention to configure the P9 assembly unit package when placing your order.

Example Part Number:	P9	4	###/###K	AA	BA
Series: P9 — P9 ASD					
Voltage: 2 — 230 3 — 380 4 — 460					
Model Number: 010 — 0.75 HP 015 — 1 HP 025 — 2 HP 035 — 3 HP 055 — 5 HP 080 — 7.5 HP 110 — 10 HP 160 — 15 HP 220 — 20 HP 270 — 25 HP 330 — 30 HP 400 — 40 HP 500 — 50 HP 600 — 60 HP 750 — 75 HP 10K — 100 HP 12K — 125 HP 15K — 150 HP 20K — 200 HP 25K — 250 HP 30K — 300 HP 35K — 350 HP 440K — 400 HP					
Style: AA — Includes motor circuit protector AE — Includes motor circuit protector, three-contactor bypass, and overload protection					

P9 ASD ASSEMBLY UNIT PRICING & DIMENSIONS

P9 230 V ASD ASSEMBLY UNIT PRICING & DIMENSIONS								
VAC	HP	FLA	Model Number	List Price		Dimensions (in.)		
				AA	AE	H	W	D
230	0.75	9.6	P92015	$5,088	$6,251	36.0	24.0	10.0
	1	9.6	P92015	$5,088	$6,251			
	2	9.6	P92025	$5,088	$6,251			
	3	9.6	P92035	$5,261	$6,717			
	5	15.2	P92055	$5,426	$6,882			
	7.5	22	P92080	$5,756	$7,212	48.0		12.0
	10	28	P92110	$6,306	$7,762		36.0	20.0
	15	42	P92160	$7,141	$8,887			
	20	54	P92220	$7,856	$9,602			
	25	68	P92270	$9,490	$11,235			
	30	80	P92330	$9,893	$11,639	60.0		
	40	104	P92400	$13,586	$15,333			
	50	130	P92500	$21,377	$21,179	90.0		24.0
	60	154	P92600	$21,084	$24,575			
	75	192	P92750	$23,036	$26,528			
	100	248	P9210K	$26,657	$33,059		48.0	30.0
	125	312	P9212K	$31,572	$41,466			

Delivery: Seven weeks.

P9 400 V ASD ASSEMBLY UNIT PRICING & DIMENSIONS								
VAC	HP	FLA	Model Number	List Price		Dimensions (in.)		
				AA	AE	H	W	D
460	1	7.6	P94015	$3,493	$4,656	36.0	24.0	10.0
	2	7.6	P94025	$3,493	$4,656			
	3	7.6	P94035	$3,493	$4,656			
	5	7.6	P94055	$5,418	$7,163			
	7.5	11	P94080	$5,866	$7,322			
	10	14	P94110	$6,565	$8,020	48.0		12.0
	15	21	P94160	$7,076	$8,532		36.0	20.0
	20	27	P94220	$7,791	$9,829			
	25	34	P94270	$8,461	$10,207			
	30	40	P94330	$8,681	$10,427			
	40	52	P94400	$9,561	$11,307			
	50	65	P94500	$10,634	$12,379			
	60	77	P94600	$13,230	$14,394	60.0		
	75	96	P94750	$15,965	$17,712			
	100	124	P9410K	$19,434	$21,179	90.0		24.0
	125	156	P9412K	$21,084	$24,575			
	150	180	P9415K	$23,036	$26,528			
	200	240	P9420K	$26,657	$33,059		48.0	30.0
	250	302	P9425K	$31,572	$41,466			
	300	361	P9430K	$36,231	$53,691			
	350	414	P9435K	$40,743	$56,458			
	400	477	P9440K	$47,840	$64,340			
Delivery: Seven weeks.								

NOTES:

AS1 ASD

The AS1 drive builds on Toshiba's history of supplying powerful, reliable and versatile drives. We have combined our best drive features with the latest technologies making the AS1 the new contender in the PWM control drive market.The AS1 features easy parameter settings, low noise, low harmonic distortion, and high performance for high torque applications.

SPECIFICATIONS

CONTROL

- **Discrete Input Terminal Functions** — Eight Programmable Discrete Inputs with Selectable Sink or Source Logic
- **PWM Control** — Carrier Frequency User-Settable from 1.0 kHz to XX kHz (Where XX = ASD-Dependent)
- **Input Signal Control** — Local Operation (EOI), 4 to 20 mADC or 0 to 10 VDC (VI/II), ±10 VDC (RR), Remote Potentiometer (Any Analog Input Terminal), 15 Preset Speeds via Contact Closure, Communications via RS485
- **Input Signal Resolution** — Local Operation (EOI) 0.1 Hz. Analog Input 0.2 Hz
- **Output Frequency Precision** — Analog Terminal Input ±0.5% of Maximum Output Frequency; Discrete Input ±0.01% of Maximum Output Frequency
- **Output Frequency Range —** 0.0 to 500 Hz
- **Output Voltage/Frequency Control Method** — Open Closed-Loop Vector, Constant Torque, Variable Torque, Auto-Torque Boost, Auto-Energy Savings, Dynamic Auto-Energy Savings, Permanent Magnet Motor Control
- **Overload Rating** — ASD Output 100% Continuous 150% for 60 Seconds
- **Braking** — DC Injection Braking Dynamic Braking Available
  DC Injection Braking Frequency Settable from 0 to Maximum Frequency; Braking Amperage Settable from 0 to 100% of ASD Output; Braking Time Settable from 0 to 20 Seconds; Motor Shaft Stationary Control Available
  Dynamic Braking Built-In for Systems up to 250 HP (Optional if Above 250 HP); Resistor Value/Wattage Application-Specific User-Set; Braking Time, Stopping Pattern, Overload Level User-Set

OPERATION

- **Voltage/Frequency —** Single-Phase 200 to 240 VAC, 50/60 Hz; Three-Phase 200 to 690 VAC, 50/60 Hz; Adjustable within Range of 100% to 120% of Corrected Supply Voltage
- **Input Voltage Tolerance** — Voltage ±10%; Frequency ±5 Hz
- **Startup Frequency** — Adjustable from 0 to 10 Hz
- **Jump Frequencies** — Three User-Selected Frequencies Associated Bandwidths
- **Acceleration/Deceleration** — 0.1 to 6000 Seconds; Switchable Between Acceleration/Deceleration Times 1, 2, 3 or 4; Selectable as S-Pattern 1, 2, or Linear
- **Retry Operation** — Auto-Reset of User Selected Faults after Main Circuit Check; Programmable up to Ten Retries
- **Carrier Frequency** — Adjustable from 2 to 16.5 kHz; Default Setting 12 kHz

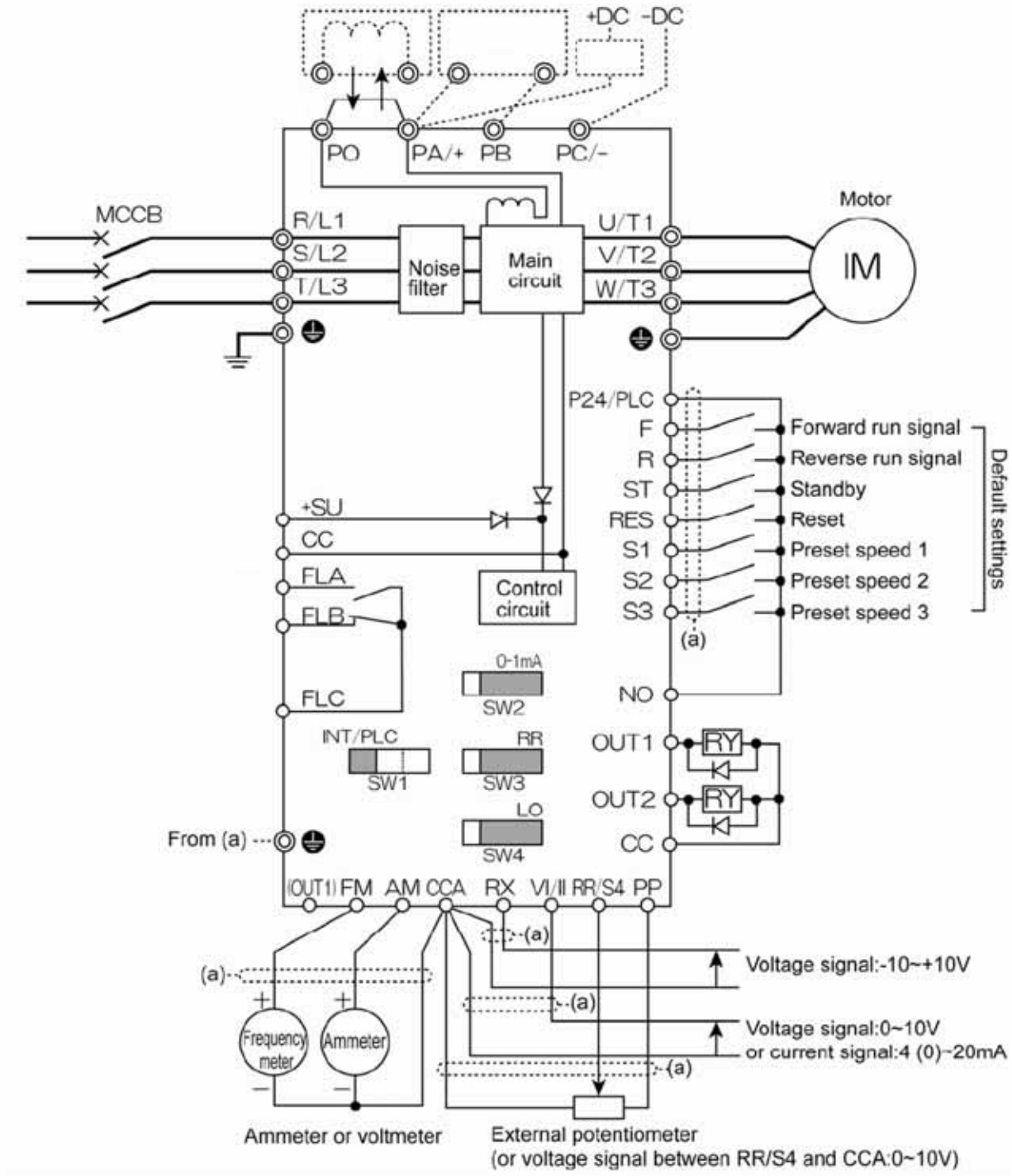
DISPLAY

- **Character Display** — Four-Digit Seven-Segment LED Display
- **Alarms, Faults, Protection** — Stall, Overvoltage, Overload, Overheat, Undervoltage, Retry, More
- **Monitored Parameters** — Output Frequency, Frequency Command, Output Current, Output Voltage, DC Bus Voltage, Torque Current, Input Terminal Status, More
- **Monitored Performance Variables** — Analog Output Monitor. Selectable from FM Terminal 0 to 20 mA/0 to 10 VDC AM Terminal 0 to 20 mA
- **Past Trip Records** — Stores the Last 4 Faults in Succession Along with Cumulative the At-Trip Times. Also Stores ASD Operation Status, Speed, Direction, Load, More
- **Indicators** — Run, Monitor Mode, Programming Mode,% or Hz Display, Active Digital Speed Setting, Active Local Run Key, Active Local Potentiometer, DC Bus Charge Status
- **Analog Output for Hz Amps** — Selectable from 0 to 1 mA, 4 to 20 mA, 0 to 20 mA, or 0 to 7.5 VDC

ENVIRONMENT

- **Installation** — Indoor; Maximum Altitude 3300 ft (Without Derate); Not in Direct Sunlight; Protect from Corrosive Gases, Explosive Gases, Vibrations in Excess of 0.6 G
- **Ambient Temperature** — 14° to 122°F (-10° to 50°C)
- **Humidity** — 95% Non-Condensing

TYPICAL CONNECTION DIAGRAM



AS1 UNIT PRICING & DIMENSIONS

AS1 230 V ASD PRICING & DIMENSIONS									
VAC	HP	FLA	Model Number	List Price	Frame	Dimensions (in.)			Shipping Weight (lbs.)
						H	W	D	
230	1	4.8	VFAS1-2007PL-HN	$750	2	10.0	5.5	6.0	10.0
	2	8.0	VFAS1-2015PL-HN	$840					
	3	11.0	VFAS1-2022PL-HN	$990	3	11.1	6.1	6.5	14.3
	5	17.5	VFAS1-2037PL-HN	$1,020					
	7.5	27.5	VFAS1-2055PL-HN	$1,396	4	12.6	6.9	6.5	18.0
	10	33.0	VFAS1-2075PL-HN	$1,710	5A	12.6	8.3	7.5	26.5
	15	54.0	VFAS1-2110PL-HN	$2,390	5B	15.7	9.1	7.5	53.0
	20	66.0	VFAS1-2150PL-HN	$2,700					
	25	75.0	VFAS1-2185PL-HN	$3,600	6	16.5	9.4	8.3	66.0
	30	88.0	VFAS1-2220PL-HN	$4,158					
	40	120	VFAS1-2300PL-HN	$6,570	7B	21.7	12.6	9.5	126
	50	144	VFAS1-2370PL-HN	$10,200					
	60	176	VFAS1-2450PL-HN	$12,600					
	75	221	VFAS1-2550P-HN	$15,505	9	36.2	12.2	14.6	220
	100	285	VFAS1-2750P-HN	$18,550	10	40.2	13.8	14.6	269

AS1 460 V ASD PRICING & DIMENSIONS									
VAC	HP	FLA	Model Number	List Price	Frame	Dimensions (in.)			Shipping Weight (lbs.)
						H	W	D	
460	1	2.3	VFAS1-4007PL-HN	$873	2	10.0	5.5	6.0	10.0
	2	4.1	VFAS1-4015PL-HN	$945					
	3	5.8	VFAS1-4022PL-HN	$1,020					
	5	10.5	VFAS1-4037PL-HN	$1,230	3	11.1	6.1	6.5	14.3
	7.5	14.3	VFAS1-4055PL-HN	$1,500	4	12.6	6.9	6.5	18.0
	10	17.6	VFAS1-4075PL-HN	$1,860					
	15	27.7	VFAS1-4110PL-HN	$2,400	5A	12.6	8.3	7.5	26.5
	20	33.0	VFAS1-4150PL-HN	$3,000	5B	15.7	9.1	7.5	53.0
	25	41.0	VFAS1-4185PL-HN	$3,720					
	30	48.0	VFAS1-4220PL-HN	$3,900	6	16.5	9.4	8.3	66.0
	40	66.0	VFAS1-4300PL-HN	$4,705	7A	21.7	9.4	9.5	95.0
	50	79.0	VFAS1-4370PL-HN	$6,200					
	60	94.0	VFAS1-4450PL-HN	$7,485	8	24.8	12.6	11.4	143
	75	116	VFAS1-4550PL-HN	$8,300					
	100	160	VFAS1-4750PL-HN	$10,200					
	125	179	VFAS1-4900PC-HN	$13,044	9	36.2	12.2	14.6	220
	150	215	VFAS1-4110KPC-HN	$14,796	10	40.2	13.8	14.6	269
	200	259	VFAS1-4132KPC-HN	$17,870	11	46.9	13.0	14.6	296
	250	314	VFAS1-4160KPC-HN	$21,835	12	46.9	16.9	14.6	405
	300	387	VFAS1-4200KPC-HN	$25,438	13	46.9	23.0	14.6	507
	350	427	VFAS1-4220KPC-HN	$28,849					
	450	550	VFAS1-4280KPC-HN	$39,765					

Notes:
- Frame 13 and higher units do not include dynamic braking circuit.
- This is available as an option kit.

AS1 575 600/690 V ASD PRICING & DIMENSIONS									
VAC	HP	FLA	Model Number	List Price	Frame	Dimensions (in.)			Shipping Weight (lbs.)
						H	W	D	
575	2	2.7	VFAS1-5015PM-HN	$1,932	5A	12.6	8.3	7.5	26.5
	3	3.9	VFAS1-5022PM-HN	$1,932					
	5	6.1	VFAS1-5040PM-HN	$2,040					
	7.5	9.0	VFAS1-5055PM-HN	$2,220					
	10	11.0	VFAS1-5075PM-HN	$2,364					
600/690	2	4.0	VFAS1-6022PL-HN	$4,140	6	16.5	9.4	8.3	66.0
	3	4.5	VFAS1-6030PL-HN	$4,212					
	5	7.5	VFAS1-6055PL-HN	$4,284					
	7.5	10.0	VFAS1-6075PL-HN	$4,344					
	10	13.5	VFAS1-6110PL-HN	$4,416					
	15	17.0	VFAS1-6150PL-HN	$4,476					
	20	22.0	VFAS1-6185PL-HN	$4,548					
	25	27.0	VFAS1-6220PL-HN	$4,608					
	30	32.0	VFAS1-6300PL-HN	$4,680					
	40	41.0	VFAS1-6370PL-HN	$6,408	8	24.8	12.6	11.4	143
	50	52.0	VFAS1-6450PL-HN	$6,948					
	60	62.0	VFAS1-6550PL-HN	$7,476					
	75	77.0	VFAS1-6750PL-HN	$8,016					
	100	99.0	VFAS1-6900PL-HN	$10,140					

Notes:

- For models 6022 to 6110, HP and FLA ratings are valid only at 690 V.
- For all others, HP and FLA ratings are valid only at 600 V.
- For models 6150 to 6900, HP and FLA ratings at 690 V are available in the manual.

AS1 ASD PRICING & DIMENSIONS (DC LINK REACTOR NOT INCLUDED)									
VAC	HP	FLA	Model Number	List Price	Frame	Dimensions (in.)			Shipping Weight (lbs.)
						H	W	D	
230	75	221	VFAS1-2550P-H1	$14,175	9	26.8	12.2	14.6	167
	100	285	VFAS1-2750P-H1	$17,010	10	30.8	13.8	14.6	200
460	125	179	VFAS1-4900PC-H1	$11,844	9	26.8	12.2	14.6	167
	150	215	VFAS1-4110KPC-H1	$13,466	10	30.8	13.8	14.6	200
	200	259	VFAS1-4132KPC-H1	$16,330	11	37.4	13.0	14.6	216
	250	314	VFAS1-4160KPC-H1	$20,160	12	37.4	16.9	14.6	243
	300	387	VFAS1-4200KPC-H1	$23,688	13	37.4	23.0	14.6	360
	350	427	VFAS1-4220KPC-H1	$26,649					
	450	550	VFAS1-4280KPC-H1	$35,850					
	550	671	VFAS1-4355KPC-H1	$51,040	14	45.3	34.6	14.6	640
	600	759	VFAS1-4400KPC-H1	$58,800					
	700	941	VFAS1-4500KPC-H1	$74,700	15	45.3	43.6	14.6	750
600/ 690	125	125	VFAS1-6110KPC-H1	$14,940	11	46.9	13.0	14.6	370
	150	144	VFAS1-6132KPC-H1	$16,008					
	200	192	VFAS1-6200KPC-H1	$22,680	13	46.9	23.0	14.6	470
	250	242	VFAS1-6250KPC-H1	$24,012					
	350	336	VFAS1-6315KPC-H1	$24,540					
	450	412	VFAS1-6400KPC-H1	$57,360	15	54.7	43.6	14.6	510
	550	528	VFAS1-6500KPC-H1	$63,360					
	700	672	VFAS1-6630KPC-H1	$65,760					

Notes:

- Frame 13 and higher units do not include dynamic braking circuit. This is available as an option kit.
- Current and HP ratings in this table are applicable only at 600 V. Consult operations manuals for 690 V current and HP ratings. The current ratings for units 6022 to 6110 are based on 690 V.
- Units with H1 at the end of the part number will require DC link reactors or an AC line reactor.

AS1 OPTION INFORMATION & PRICING

CONDUIT ADAPTERS				
Model Number	**Frame**	**List Price**	**Height Increase (in.)**	**Stand Alone AS1 IP rating**
NEM1101Z	2	$140	1.2	IP20
NEM1102Z	3	$140		
NEM1103Z	4	$150		
NEM1104Z	5A	$150	1.4	
NEM1105Z	5B	$155	1.5	
NEM1106Z	6	$155	2.4	
NEM1107Z	7A	$160	2.0	
NEM1117Z	7B	$350	1.9	
NEM1108Z	8	$185	5.4	
NEM1109Z	9	$850	9.8	IP00
NEM1110Z	10	$1,000	13.4	
NEM1111Z	11	$1,300		
NEM1112Z	12	$1,300	15.7	
NEM1113Z	13	$1,300		
NEM1115Z	14	$3,400	18.6	
NEM1116Z	15	$4,760		

Notes:

- AS1 units rated IP00 do not include a bottom cover.
- AS1 units rated IP20 include a bottom cover, but will not accept conduit connections at the drive enclosure.
- Stand alone AS1 power units are not NEMA 1 compliant.
- The optional conduit adapters listed above are NEMA 1 compliant.

FLANGE-MOUNT KITS		
Model Number	**Frame**	**List Price**
FOT001Z	2	$275
FOT002Z	3	$300
FOT003Z	4	$350
FOT004Z	5A	$400
FOT005Z	5B	$450
FOT006Z	6	$450
FOT007Z	7A	$500
FOT008Z	7B	$500
FOT009Z	8	$525
FOT010Z	9	$550
FOT011Z	10	$600
FOT012Z	11	$750
FOT013Z	12	$750
FOT014Z	13	$800
FOT015Z	13 + PB7	$800

Notes:

- The AS1 can be mounted in an enclosure with the heatsink out-the-back to reduce cooling needs and enclosure dimensions.
- Flange-mount kits are only available for Frame 13 and below.

COMMUNICATION CARDS, CLOSED-LOOP CARDS, KEYPADS, CABLES, COOLING		
Model Number	**Description**	**List Price**
RKP002Z	• Remote-mountable LED keypad has 20mm LEDs, the largest in its class, to ensure outstanding visibility • Designed to fit into panels for use as an extension panel or display • Can be used as a parameter copy capable of storing parameters for up to three models • One CAB001x-0A cable is necessary • Remote-mounting kit not necessary for door-mounting • Hardware included 	$225
RKP004Z	• Remote-mountble LCD keypad contains 23-character, eight-line display • Can be used for simple setup monitoring using jog dial • Snaps to front of drive or can be remote-mounted • Display language selectable between English Japanese (German, Italian, Spanish, Chinese will be available soon) • Remote-mounting requires SBP006Z remote-mounting kit, CNT001Z adapter (hand-held only), and CAB001x-0A cable. 	$300
CNT001Z	• RJ45 female/RJ45 adaptor • Connects RKP004Z keypad to AS1 front port via CAB001x-0A cables	
CAB0011-0A	• 1-meter cable for remote-mounting RKP00xZ keypads	$40
CAB0012-0A	• 2-meter cable for remote-mounting RKP00xZ keypads	$50
CAB0015-0A	• 5-meter cable for remote-mounting RKP00xZ keypads	$60
SBP006Z	• Mounting kit for RKP004Z LCD keypad maintains IP54 rating for IP54 LCD remote keypad • Can be used with SBP007Z for IP65 installations 	$60
SBP007Z	• IP65 door attaches to SBP006Z mounting kit for RKP004Z keypad 	$30
FAN003Z	• Control fan kit allows for 60°C operation with derate for Frame 6	$120
FAN004Z	• Control fan kit allows for 60°C operation with derate for Frame 7A	$125
FAN005Z	• Control fan kit allows for 60°C operation with derate for Frame 7B	$130

COMMUNICATION CARDS, CLOSED-LOOP CARDS, KEYPADS, CABLES, COOLING		
Model Number	**Description**	**List Price**
FAN006Z	• Control fan kit allows for 60°C operation with derate for Frame 8	$140

DYNAMIC BRAKING TRANSISTOR UNIT		
Model Number	**Description**	**List Price**
PB7-4200KZ	• Braking unit for VFAS1-4200KPC-Hx, VFAS1-4220KPC-Hx, VFAS1-4280KPC-Hx	$5,500
PB7-4400KZ	• Braking unit for VFAS1-4355KPC-Hx, VFAS1-4400KPC-Hx, VFAS1-4500KPC-Hx	$18,500
PB7-6300K	• Braking unit for VFAS1-6200KPC-Hx, VFAS1-62500KPC-Hx, VFAS1-6630KPC-Hx	$19,225
PB7-6400K	• Braking unit for VFAS1-6400KPC-Hx, VFAS1-6500KPC-Hx, VFAS1-6630KPC-Hx	$20,700

HEAVY DUTY DYNAMIC BRAKING RESISTORS IN NEMA 1 ENCLOSURE						
VAC	**HP**	**Model Number**	**List Price**	**Dimensions (in.)**		
				H	**W**	**D**
230	0.75	PR00270P132	$140	5.0	14.0	4.0
	1	PR00271P132	$230	5.0	14.0	4.0
	2	PR00272P132	$240	5.0	14.0	7.0
	3	PR00273P132	$290	5.0	14.0	7.0
	5	PR00274P132	$390	5.0	14.0	13.0
	7.5	PR00275P132	$590	5.0	21.0	10.0
	10	PR00276P132	$680	5.0	21.0	13.0
	15	PR00277P132	$820	5.0	28.0	13.0
	20	PR00278P132	$1,040	7.0	29.0	18.0
	25	PR00279P132	$1,070	7.0	29.0	18.0
	30	PR00280P132	$1,620	7.0	29.0	18.0

Notes:
- Dynamic braking resistors have a powder-coated enclosure, terminal block, and normally-closed thermal switch.

HEAVY DUTY DYNAMIC BRAKING RESISTORS IN NEMA 1 ENCLOSURE						
VAC	HP	Model Number	List Price	Dimensions (in.)		
				H	W	D
460	1	PR00282P132	$190	5.0	14.0	4.0
	2	PR00283P132	$210	5.0	14.0	7.0
	3	PR00284P132	$280	5.0	14.0	7.0
	5	PR00285P132	$380	5.0	14.0	13.0
	7.5	PR00286P132	$550	5.0	21.0	10.0
	10	PR00287P132	$710	5.0	21.0	13.0
	15	PR00288P132	$1,070	5.0	28.0	13.0
	20	PR00289P132	$1,150	7.0	29.0	18.0
	25	PR00290P132	$1,660	7.0	29.0	18.0
	30	PR00291P132	$1,850	14.0	29.0	18.0
	40	PR00292P132	$2,130	14.0	29.0	18.0
	50	PR00293P132	$2,180	14.0	29.0	18.0
	60	PR00294P132	$2,320	14.0	29.0	18.0
	75	PR00295P132	$2,620	21.0	29.0	18.0
	100	PR00296P132	$3,850	28.0	29.0	18.0
	125	PR00297P132	$4,720	35.0	29.0	18.0
	150	PR00298P132	$5,660	42.0	29.0	18.0
	200	PR00299P132	$6,220	56.0	29.0	18.0
	250	PR00300P132	$7,960	49.0	29.0	18.0
	300	PR00301P132	$10,220	35.0	58.0	18.0
	350	PR00302P132	$16,430	35.0	58.0	16.0
600/690	1 — 350	CF				

Notes:
- Dynamic braking resistors have a powder-coated enclosure, terminal block, and normally-closed thermal switch.

STANDARD DUTY DYNAMIC BRAKING RESISTORS IN NEMA 1 ENCLOSURE						
VAC	HP	Model Number	List Price	Dimensions (in.)		
				H	W	D
230	0.75	PR02010P132	$105	5.0	14.0	4.0
	1	PR02015P132	$110	5.0	14.0	4.0
	2	PR02025P132	$115	5.0	14.0	4.0
	3	PR02035P132	$120	5.0	14.0	4.0
	5	PR02055P132	$125	5.0	14.0	4.0
	7.5	PR02080P132	$180	5.0	21.0	4.0
	10	PR02110P132	$190	5.0	21.0	7.0
	15	PR02160P132	$260	5.0	28.0	7.0
	20	PR02220P132	$340	7.0	29.0	10.0
	25	PR02270P132	$345	7.0	29.0	10.0
	30	PR02330P132	$410	7.0	29.0	13.0

Notes:
- Dynamic braking resistors have a powder-coated enclosure, terminal block, and normally-closed thermal switch.
- For 40 to 125 HP, consult factory for pricing.

STANDARD DUTY DYNAMIC BRAKING RESISTORS IN NEMA 1 ENCLOSURE						
VAC	HP	Model Number	List Price	Dimensions (in.)		
				H	W	D
460	1	PR04015P132	$105	5.0	14.0	4.0
	2	PR04025P132	$115	5.0	14.0	4.0
	3	PR04035P132	$120	5.0	14.0	4.0
	5	PR04055P132	$190	5.0	14.0	4.0
	7.5	PR04080P132	$200	5.0	14.0	4.0
	10	PR04110P132	$210	5.0	14.0	7.0
	15	PR04160P132	$270	5.0	14.0	7.0
	20	PR04220P132	$345	5.0	14.0	10.0
	25	PR04270P132	$350	5.0	14.0	13.0
	30	PR04330P132	$430	5.0	14.0	13.0
	40	PR04400P132	$580	5.0	21.0	10.0
	50	PR04500P132	$650	5.0	21.0	13.0
	60	PR04600P132	$730	5.0	21.0	13.0
	75	PR04750P132	$1,020	7.0	29.0	18.0
	100	PR0410KP132	$1,080	7.0	29.0	18.0
	125	PR0412KP132	$1,580	7.0	29.0	18.0
	150	PR0415KP132	$1,780	14.0	29.0	18.0
	200	PR0420KP132	$2,020	14.0	29.0	18.0
	250	PR0425KP132	$2,120	14.0	29.0	18.0
	300	PR0430KP132	$2,290	14.0	29.0	18.0
	350	PR0432KP132	$2,420	14.0	29.0	18.0
600	1 — 350	Consult factory				

Notes:
- Dynamic braking resistors have a powder-coated enclosure, terminal block, and normally-closed thermal switch.
- Above options are not the same as options listed in the *AS1 Installation and Operation Manual.*

AS1 IP54 UNIT PART NUMBERING CONVENTION

The AS1 IP54 unit is rated with the European Ingress Protection (IP) system for classifying the degrees of protection provided for electrical equipment. These standards are designed to numerically rate an electrical product based on the level of protection that is available. By assigning number codes, the level of protection in the product can be easily and quickly identified. In the code IP54, IP identifies the standard, the 5 describes the level of protection from solids objects, and the 4 describes the level of protection from liquids.

The AS1 IP54 unit combines the AS1 power unit with commonly-used options such as manual bypass and input disconnects in an easy-to-install turn-key package. AS1 IP54 units include a ground lug, door-mounted electronic operator interface, and heat sink out the back.

Bypass units include an ASD/bypass selector switch, a bypass-start lighted push-button (red), and a bypass-stop lighted push-button (green). They are used for system control and are all located on the enclosure door.

Ordering Information: Use the following part numbering convention to configure the AS1 IP54 unit package when placing your order.

Example Part Number:	AS1	4	###/###K	AA	BA
Series: AS1 — AS1 ASD					
Voltage: 2 — 230 3 — 380 4 — 460 5 — 575 6 — 600/690					
Model Number for 230 460 V: 007 — 1 HP 015 — 2 HP 022 — 3 HP 037 — 5 HP 055 — 7.5 HP 075 — 10 HP 110 — 15 HP 150 — 20 HP 185 — 25 HP 220 — 30 HP 300 — 40 HP 370 — 50 HP 450 — 60 HP 550 — 75 HP 750 — 100 HP 900 — 125 HP 110K — 150 HP 132K — 200 HP 160K — 250 HP 200K — 300 HP 220K — 350 HP 280K — 400 HP	**Model Number for 600/690 V:** 007 — 1 HP 015 — 2 HP 022 — 3 HP 055 — 5 HP 075 — 7.5 HP 110 — 10 HP 150 — 15 HP 185 — 20 HP 220 — 25 HP 300 — 30 HP 370 — 40 HP 450 — 50 HP 550 — 60 HP 750 — 70 HP 900 — 100 HP 110K — 125 HP 132K — 150 HP 200K — 200 HP 250K — 250 HP 315K — 350 HP			
Style: AA — Includes motor circuit protector AE — Includes motor circuit protector, three					

AS1 IP54 UNIT PRICING & DIMENSIONS

IP54 230 V UNIT PRICING & DIMENSIONS										
VAC	HP	FLA	Model Number	List Price		Dimensions (in.)				
				AA	AE	H		W		D
						AA	AE	AA	AE	
230	1	4.8	AS12007	$6,200	$7,258	26.0	36.0	24.0		8.0
	2	8.0	AS12015	$6,450	$7,508					
	3	11.0	AS12022	$6,700	$8,023					
	5	17.5	AS12037	$6,900	$8,223					
	7.5	27.5	AS12055	$7,200	$8,523					
	10	33.0	AS12075	$9,100	$10,423					
	15	54.0	AS12110	$10,100	$11,687	38.0	48.0	30.0		10.0
	20	66.0	AS12150	$10,700	$12,287					
	25	75.0	AS12185	$12,200	$13,787					
	30	88.0	AS12220	$13,600	$15,187					
	40	120	AS12300	$16,900	$18,488	40.0	60.0	36.0		16.0
	50	144	AS12370	$19,500	$21,087					
	60	176	AS12450	$22,500	$25,674					
	75	221	AS12550	$27,000	$30,174	90.0		36.0		24.0
	100	285	AS12750	$33,000	$38,820					
Delivery: Five weeks.										

IP54 460 V UNIT PRICING & DIMENSIONS										
VAC	HP	FLA	Model Number	List Price		Dimensions (in.)				
				AA	AE	H		W		D
						AA	AE	AA	AE	
460	1	2.3	AS14007	$4,700	$5,758	26.0	36.0	24.0		8.0
	2	4.1	AS14015	$4,850	$5,908					
	3	5.8	AS14022	$4,900	$5,958					
	5	10.5	AS14037	$6,700	$8,287					
	7.5	14.3	AS14055	$7,200	$8,523					
	10	17.6	AS14075	$8,250	$9,573					
	15	27.7	AS11105	$8,625	$9,948					
	20	33.0	AS14150	$9,290	$11,142	38.0	48.0	30.0		10.0
	25	41.0	AS14185	$9,890	$11,477					
	30	48.0	AS14220	$10,700	$12,287					
	40	66.0	AS14300	$11,585	$13,172					
	50	79.0	AS14370	$12,665	$14,252					
	60	94.0	AS14450	$15,080	$16,138	40.0	60.0	36.0		16.0
	75	116	AS14550	$17,650	$19,238					
	100	160	AS14750	$18,890	$20,477					
	125	179	AS14900	$22,000	$25,174	90.0		36.0		24.0
	150	215	AS14110K	$27,500	$30,674					
	200	259	AS14132K	$32,000	$37,820					
	250	314	AS14160K	$38,000	$46,994					
	300	387	AS14200K	$43,000	$58,873			48.0	48.0	
	350	427	AS14220K	$44,000	$58,286					
	400	550	AS14280K	$51,000	$66,000				60.0	
Delivery: Five weeks.										

IP54 600/690 V UNIT PRICING & DIMENSIONS										
VAC	HP	FLA	Model Number	List Price		Dimensions (in.)				
				AA	AE	H		W		D
						AA	AE	AA	AE	
600/690	1	4.0	AS16007	$8,250	$9,308	CF		CF		CF
	2	4.0	AS16015	$8,250	$9,308					
	3	4.5	AS16022	$8,310	$9,368					
	5	7.5	AS16055	$9,550	$11,137					
	7.5	10.0	AS16075	$9,900	$11,223					
	10	13.5	AS16110	$10,900	$12,223					
	15	17.0	AS16150	$11,450	$12,773					
	20	22.0	AS16185	$11,600	$13,452					
	25	27.0	AS16220	$11,900	$13,487					
	30	32.0	AS16300	$12,100	$13,687					
	40	41.0	AS16370	$14,500	$16,087					
	50	52.0	AS16450	$15,400	$16,987					
	60	62.0	AS16550	$16,900	$17,958					
	75	77.0	AS16750	$20,200	$21,788					
	100	99.0	AS16900	$24,000	$25,587					
	125	125	AS16110K	$30,350	$33,524					
	150	144	AS16132K	$36,000	$39,174					
	200	192	AS16200K	$43,500	$49,319					
	250	242	AS16250K	$45,000	$53,994					
	350	336	AS16315K	$47,000	$56,916					
Delivery: Seven weeks.										

Notes:
- The 600 V AS1 IP54 units, 125 to 350 HP, include a 3% AC line reactor.

NOTES:

S11 ASD

The S11 drive is the next generation of micro drives. It provides maximum torque with precise speed control and features an easy-to-use, quiet, and compact design. A removable terminal board, larger terminals, bidirectional speed search, and PID control allow this drive to deliver reliable performance and extensive capabilities.

SPECIFICATIONS

CONTROL

- **Discrete Input Terminal Functions** — Eight Programmable Discrete Inputs with Selectable Sink or Source Logic
- **PWM Control** —Carrier Frequency from 2.0 kHz to 16 kHz
- **Input Signal Control** — Front Panel Operation (EOI), 4 to 20 mADC, 0 to 10 VDC (VIA/VIB), Remote Potentiometer (Any Analog Input Terminal), 15 Preset Speeds via Contact Closure, or Communications
- **Input Signal Resolution** — EOI Input 0.01 Hz, Analog Terminal Input 0.1 Hz, Discrete Terminal, Digital Input, Communications Input ±0.01% of Maximum Output Frequency
- **Output Frequency Precision** — Analog Terminal Input ±0.5% of Maximum Output Frequency; Discrete Input ±0.01% of Maximum Output Frequency
- **Output Frequency Range —** 0.5 to 500 Hz
- **Output Voltage/Frequency Control Method** — Open-Loop Vector, Constant Torque, Variable Torque, Auto-Torque Boost, Manual-Torque Boost, Automatic Energy Saving, Custom Five-Point Curve
- **Overload Rating** — ASD Output 100% Continuous 150% for 60 Seconds
- **Braking** — DC Injection Braking Dynamic Braking are Available
  DC Injection Braking Frequency Settable from 0 to Maximum Frequency; Braking Amperage Settable from 0 to 100% of the ASD Output; Braking Time Settable from 0 to 20 Seconds; Motor Shaft Stationary Control Available
  Dynamic Braking Resistor Value/Wattage Application-Specific User-Set Braking Time, Stopping Pattern, Overload Level User-Set
- **Size** — Compact

OPERATION

- **Voltage/Frequency —** Single-Phase 200 to 240 VAC, 50/60 Hz; Three-Phase 200 to 600 VAC 50/60 Hz; Adjustable within Range of 100% to 120% of Corrected Supply Voltage
- **Input Voltage Tolerance** — +10/-15%; Frequency ±5%
- **Voltage/Frequency Control** — Open/Closed-Loop Vector, Constant Torque, Variable Torque, Auto-Torque Boost, Auto-Energy Savings, Dynamic Auto-

  Energy Savings, Permanent Magnet Motor Control
- **Startup Frequency** — Adjustable within Range of 0.5 to 10 Hz
- **Jump Frequencies** — Three User-Selected Frequencies Associated Bandwidths
- **Acceleration/Deceleration** — 0.1 to 3200 Seconds, Switchable Between Acceleration/Deceleration Times 1, 2, or 3; Selectable from S-Patterns 1 or 2
- **Retry Operation** — Auto-Reset of User-Selected Faults after Main Circuit Check; Programmable up to 10 Retries

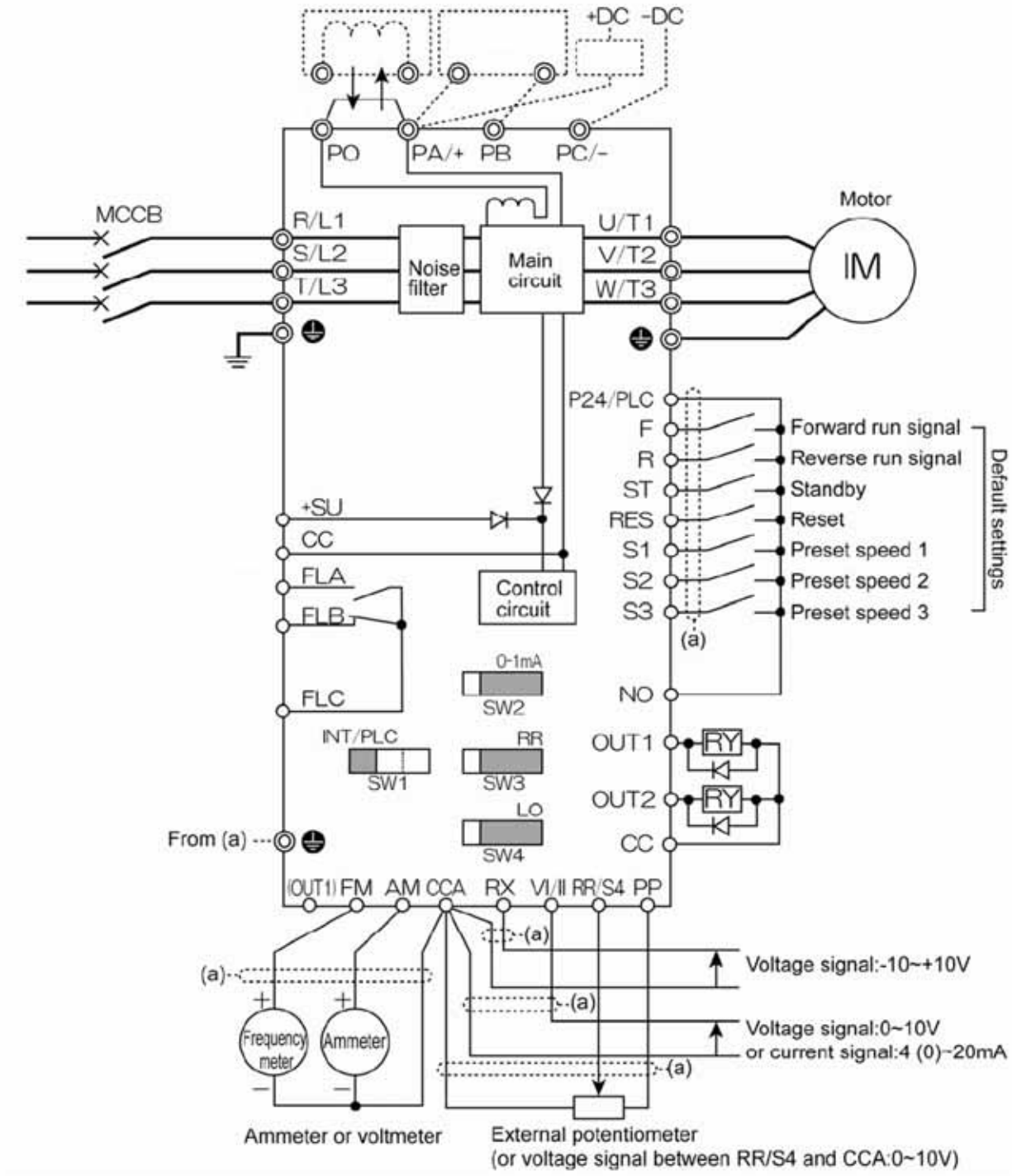
DISPLAY

- **EOI** — Four-Digit Seven-Segment LED Display
- **Alarm Fault Indications** — Indication of Stall Protection, Overvoltage, Overload, Undervoltage, Retry, More
- **Status Monitoring** — Output Frequency, Frequency Command, Output Current, Output Voltage, DC Bus Voltage, Torque Current, Input Terminal Status, More
- **Past Trip Monitoring** — Stores Last 4 Faults in Succession, Cumulative Time at Time of Trip, ASD Operation Status, Speed, Direction, Load, More
- **Analog Output for Hz Amps** — FM Terminal Settable to 0 to 1 mA, 4 to 20 mA, or 0 to 10 V; AM Terminal Settable to 0 to 20 mA
- **Indicator LEDs** — Run/Stop, Local, Monitor Mode, Program Mode, % or Hz, Run Speed, DC Bus Charge Status

ENVIRONMENTAL

- **Installation** — Indoor; Maximum Altitude 3300 ft; Not in Direct Sunlight; Protect from Corrosive Gases, Explosive Gases, Vibrations in Excess of 0.6 G
- **Ambient Temperature** — 14° to 122°F (-10° to 50°C).
- **Humidity** — 93% Non-Condensing

TYPICAL CONNECTION DIAGRAM



S11 POWER UNIT PRICING & DIMENSIONS

POWER UNIT PRICING & DIMENSIONS									
VAC	HP	FLA	Model Number	List Price	Frame	Dimensions (in.)			Shipping Weight (lbs.)
						H	W	D	
230 Single-phase	0.5	3.3	VFS11S-2004PL-WN	$429	A	5.7	2.8	5.1	2.2
	1	4.8	VFS11S-2007PL-WN	$454				5.5	2.6
	2	7.8	VFS11S-2015PL-WN	$543	B	5.6	4.1	5.9	3.1
	3	11	VFS11S-2022PL-WN	$635	C	7.2	5.5		4.8
230	0.5	3.3	VFS11-2004PM-WN	$402	A	5.7	2.8	4.7	2.0
	1	4.8	VFS11-2007PM-WN	$441				5.1	2.4
	2	7.8	VFS11-2015PM-WN	$571	B	5.6	4.1		2.6
	3	11	VFS11-2022PM-WN	$648				5.9	2.9
	5	17.5	VFS11-2037PM-WN	$883	C	7.2	5.5		4.8
	7.5	27.5	VFS11-2055PM-WN	$1,256	D	9.1	7.1	6.7	10.6
	10	33	VFS11-2075PM-WN	$1,376					10.8
	15	54	VFS11-2110PM-WN	$1,838	E	13.0	9.6	7.5	20.5
	20	66	VFS11-2150PM-WN	$2,334					21.1
460	1	2.3	VFS11-4007PL-WN	$570	B	5.6	4.1	5.9	3.3
	2	4.1	VFS11-4015PL-WN	$676					
	3	5.5	VFS11-4022PL-WN	$776	C	7.2	5.5		5.1
	5	9.5	VFS11-4037PL-WN	$935					5.5
	7.5	14.3	VFS11-4055PL-WN	$1,373	D	9.1	7.1	6.7	11.0
	10	17	VFS11-4075PL-WN	$1,424					11.2
	15	27.7	VFS11-4110PL-WN	$1,966	E	13.0	9.6	7.5	21.1
	20	33	VFS11-4150PL-WN	$2,328					
600	2	2.7	VFS11-6015P-WN	$747	B	5.6	4.1	5.9	2.9
	3	3.9	VFS11-6022P-WN	$834	C	7.2	5.5		4.6
	5	6.1	VFS11-6037P-WN	$974					4.8
	7.5	9	VFS11-6055P-WN	$1,792	D	9.1	7.1	6.7	10.3
	10	11	VFS11-6075P-WN	$1,994					
	15	17	VFS11-6110P-WN	$2,554	E	13.0	9.6	7.5	19.4
	20	22	VFS11-6150P-WN	$2,762					

POWER UNIT PRICING & DIMENSIONS (IP54 WITH DISCONNECT)									
VAC	HP	FLA	Model Number	List Price	Frame	Dimensions (in.)			Shipping Weight (lbs.)
						H	W	D	
230 Single - phase	1	4.8	VFS11S-2007PLE-WN	$1,224	1	9.4	8.3	7.0	8.8
	2	7.8	VFS11S-2015PLE-WN	$1,355	2	11.7	8.5	8.1	13.3
	3	11	VFS11S-2022PLE-WN	$1,525	3	13.4	9.1	8.7	13.5
230	1	4.8	VFS11-2007PME-WN	$1,211	1	9.4	8.3	7.0	8.8
	3	11	VFS11-2022PME-WN	$1,393	2	11.7	8.5	8.1	13.0
	5	17.5	VFS11-2037PME-WN	$1,772	3	13.4	9.1	8.7	16.8
460	2	4.1	VFS11-4015PLE-WN	$1,428	2	11.7	8.5	8.1	13.5
	3	5.5	VFS11-4022PLE-WN	$1,580	3	13.4	9.1	8.7	17.2
	5	9.5	VFS11-4037PLE-WN	$1,933					17.7

S11 OPTION INFORMATION & PRICING

CONDUIT ADAPTERS			
Model Number	**Frame**	**List Price**	**Height Increase (in.)**
NEM110Z	A	$70	2.7
NEM111Z		$70	
NEM120Z	B	$70	
NEM121Z	C	$70	
NEM130Z		$70	
NEM140Z	D	$70	3.8
NEM150Z	E	$70	3.9

Notes:
- Conduit adapters are only sold in multiples of four.
- Conduit adapters are mounted below the power terminal strips and replace the plastic plate provided with the drive.
- Conduit adapters provide mechanical strength and a location for a conduit connector.
- This allows wall-mounting of the S11 where NEMA 1 standards must be met.
- The height of the S11 will increase with the addition of the conduit adapter.

COMMUNICATION CARDS, CLOSED-LOOP CARDS, KEYPADS, CABLES, COOLING		
Model Number	**Description**	**List Price**
RS4003Z	• RS485 communications card replaces standard terminal strip • Provides reduced I/O connections compared with standard terminal strip 	$125
DEV001Z	• DeviceNet communications card replaces standard terminal strip • Provides reduced I/O connections compared with standard terminal strip 	$450
TOS-SN-1	• Remote-mount touch-pad includes 2-meter connection cable • M3 mounting hardware not included 	$225
RKP005Z	• Remote-mountable LED keypad with 20 mm LEDs to ensure outstanding visibility • Designed to be fit into panels for use as an extension panel or display • Can be used as a parameter copy • Capable of storing parameters for up to three drives • Requires one CAB00xx-0A cable • Remout-mount kit not necessary for door-mounting • Hardware included 	$225
S-OISA	• Remote-mount LCD touch-pad parameter writer (includes 2-meter connection cable) • Remote-mounting kit not necessary for door-mounting • Hardware included 	$250
ASD-CAB-PC	• RS232 to TTL cable for PC-to-ASD communications connects to standard terminal strip 	$65

Notes:
- All of the options listed above, communications and others, are not installed, but shipped separately.

HEAVY DUTY DYNAMIC BRAKING RESISTORS IN NEMA 1 ENCLOSURE						
VAC	HP	Model Number	List Price	Dimensions (in.)		
				H	W	D
230	0.5	S9-PBR-2004-HD	$120	5.0	14.0	7.0
	1	S9-PBR-2004-HD	$120			
	2	S9-PBR-2007-HD	$170			10.0
	3	S9-PBR-2022-HD	$220			13.0
	5	S9-PBR-2037-HD	$400		21.0	
	7.5	S9-PBR-2055-HD	$510		28.0	
	10	S9-PBR-2055-HD	$510			
	15	S9-PBR-2110-HD	$650	7.0	29.0	18.0
	20	S9-PBR-2110-HD	$650			
460	1	S9-PBR-4007-HD	$170	5.0	14.0	10.0
	2	S9-PBR-4022-HD	$400		21.0	13.0
	3	S9-PBR-4022-HD	$400			
	5	S9-PBR-4022-HD	$400			
	7.5	S9-PBR-4055-HD	$510		28.0	
	10	S9-PBR-4055-HD	$510			
	15	S9-PBR-4110-HD	$700	7.0	29.0	18.0
	20	S9-PBR-4110-HD	$700			
600	2	S5-PBR5120-HD	$750	5.0	21.0	13.0
	3	S5-PBR5120-HD	$750			
	5	S5-PBR5160-HD	$1,175		28.0	
	7.5	S5-PBR5220-HD	$1,245	7.0	29.0	18.0
	10	S5-PBR5270-HD	$1,685			
	15	S5-PBR5270-HD	$1,685			
	20	S5-PBR5270-HD	$1,685			
Delivery: Two to four weeks.						

STANDARD DUTY DYNAMIC BRAKING RESISTORS IN NEMA 1 ENCLOSURE						
VAC	HP	Model Number	List Price	Dimensions (in.)		
				H	W	D
230	0.5	S9-PBR-2004-LD	$90	5.0	14.0	4.0
	1	S9-PBR-2004-LD	$90			
	2	S9-PBR-2007-LD	$120			7.0
	3	S9-PBR-2022-LD	$170			10.0
	5	S9-PBR-2037-LD	$290		21.0	
	7.5	S9-PBR-2055-LD	$330			
	10	S9-PBR-2055-LD	$330			
	15	S9-PBR-2110-LD	$510		28.0	13.0
	20	S9-PBR-2110-LD	$510			
460	1	S9-PBR-4007-LD	$120	5.0	14.0	7.0
	2	S9-PBR-4022-LD	$220			13.0
	3	S9-PBR-4022-LD	$220			
	5	S9-PBR-4022-LD	$220			
	7.5	S9-PBR-4055-LD	$400		21.0	
	10	S9-PBR-4055-LD	$400			
	15	S9-PBR-4110-LD	$570	7.0	29.0	18.0
	20	S9-PBR-4110-LD	$570			
600	2	S5-PBR5120-LD	$190	5.0	14.0	7.0
	3	S5-PBR5120-LD	$190			
	5	S5-PBR5160-LD	$265			
	7.5	S5-PBR5220-LD	$380			10.0
	10	S5-PBR5270-LD	$400			13.0
	15	S5-PBR5270-LD	$400			
	20	S5-PBR5270-LD	$400			
Delivery: Two to four weeks.						

Notes:

- Above options are not the same as options listed in the *S11 Installation and Operation Manual*.

S11 EXTENDER BOX PART NUMBERING CONVENTION

The S11 extender box combines the S11 power unit with commonly used options such as manual bypass, input circuit breakers, and fused disconnect switches in an easy-to-install turn-key package. S11 extender box style configurations include:

EA — Input Motor Circuit Protector

EB — Input Fused Disconnect Switch

EC — Input Motor Circuit Protector, Manual Two-Contactor Bypass, Overload

ED — Input Fused Disconnect Switch, Manual Two-Contactor Bypass, Overload

EE — Input Motor Circuit Protector, Isolated, Manual Three-Contactor Bypass, Overload

EF — Input Fused Disconnect Switch, Isolated, Manual Three-Contactor Bypass, Overload

EG — Manual Two-Contactor Bypass, Overload

EH — Isolated Manual Three-Contactor Bypass, Overload

In addition, the S11 extender box includes a *LOC/REM* selector switch, round lug, and customer terminal block.

Note: Isolated three-contactor bypass units include *TEST OFF/ON* switch and *ASD/OFF/BYPASS* selector switch on the enclosure door for control.

Ordering Information: Use the following part numbering convention to configure the S11 extender box package when placing your order.

Example Part Number:	S11	4	###/S##	AA	##
Series: S11 — S11 ASD					
Voltage: 2 — 230 4 — 460 6 — 600					
Model Number: 004 — 0.5 HP 007 — 1 HP 015 — 2 HP 022 — 3 HP 037 — 5 HP 055 — 7.5 HP 075 — 10 HP 110 — 15 HP 150 — 20 HP	**Single-Phase Model Number:** S04 — 0.5 HP S07 — 1 HP S15 — 2 HP S22 — 3 HP				
Style: EA — Includes motor circuit protector EB — Includes fused disconnect switch EC — Includes EA EG features ED — Includes EB EG features EE — Includes EA features, isolation, EH features EF — Includes EB features, isolation, EH features EG — Includes manual two-contactor bypass overload protection EH — Includes manual three-contactor bypass overload protection					

S11 EXTENDER BOX UNIT PRICING & DIMENSIONS

NEMA 1 EXTENDER BOX UNIT PRICING & DIMENSIONS											
VAC	HP	FLA	Model Number	List Price				Dimensions (in.)			
				EA/EB	EC/ED/EH	EE/EF	EG	H		W	D
								EA/EB	EC/ED/EE/EF/EG/EH		
230 Single-phase	0.5	3.3	S112S04	$1,736	-	-	-	CF	-	-	-
	1	4.8	S112S07	$1,792	-	-	-	CF	-	-	-
	2	7.8	S112S15	$1,848	-	-	-	CF	-	-	-
	3	11	S112S22	$1,904	-	-	-	CF	-	-	-
230	0.5	3.3	S112004	$1,932	$2,300	$2,484	$2,208	33.3	43.3	12.0	12.0
	1	4.8	S112007	$1,988	$2,356	$2,540	$2,264				
	2	7.8	S112015	$2,033	$2,401	$2,585	$2,308				
	3	11	S112022	$2,348	$2,809	$3,039	$2,694				
	5	17.5	S112037	$2,479	$2,940	$3,170	$2,825				
	7.5	27.5	S112055	$2,828	$3,289	$3,519	$3,174				
	10	33	S112075	$3,083	$3,545	$3,774	$3,429				
	15	54	S112110	$4,039	$4,592	$4,869	$4,454	38.3	48.3	18.0	16.0
	20	66	S112150	$4,683	$5,236	$5,513	$5,098				
460	1	2.3	S114007	$2,078	$2,446	$2,630	$2,353	33.3	43.3	12.0	12.0
	2	4.1	S114015	$2,156	$2,524	$2,708	$2,432				
	3	5.5	S114022	$2,223	$2,592	$2,775	$2,499				
	5	9.5	S114037	$2,503	$3,055	$3,332	$2,918				
	7.5	14.3	S114055	$2,962	$3,424	$3,653	$3,308				
	10	17	S114075	$3,228	$3,689	$3,919	$3,574				
	15	27.7	S114110	$3,696	$4,157	$4,387	$4,042	38.3	48.3	18.0	16.0
	20	33	S114150	$4,163	$4,808	$5,131	$4,647				
Delivery: Five weeks.											

NEMA 1 EXTENDER BOX UNIT PRICING & DIMENSIONS											
VAC	HP	FLA	Model Number	List Price				Dimensions (in.)			
				EA/EB	EC/ED/EH	EE/EF	EG	H		W	D
								EA/EB	EC/ED/EE/EF/EG/EH		
600	2	2.7	S116015	$2,380	$2,748	$2,932	$2,656	33.3	43.3	12.0	12.0
	3	3.9	S116022	$2,447	$2,816	$2,999	$2,723				
	5	6.1	S116037	$2,727	$3,279	$3,556	$3,142				
	7.5	9	S116055	$3,186	$3,648	$3,877	$3,532				
	10	11	S116075	$3,508	$3,969	$4,199	$3,854				
	15	17	S116110	$3,920	$4,381	$4,611	$4,266	38.3	48.3	18.0	16.0
	20	22	S116150	$4,499	$5,144	$5,467	$4,983				
Delivery: Seven weeks.											

NOTES:

GX7 ASD

Toshiba's GX7 Series PWM adjustable speed drive is a severe duty drive built to handle all conventional applications in the industry, ranging from the simplest to the most complex. The GX7 Series offers flux-vector technology with or without encoder feedback. This drive maintains astoundingly tight control over both torque and speed with the industry's most user-friendly operator interface.

SPECIFICATIONS

CONTROL

- **Rectification** — Six-Pulse Diode Bridge; Meets IEEE 519 as Standard
- **Discrete Input Terminal Functions** — Eight Programmable Discrete Inputs with Selectable Sink or Source Logic
- **PWM Control** — Carrier Frequency is User-Settable from 0.5 kHz to 3.0 kHz
- **Input Signal Control** — Local Operation (EOI), Isolated 4 to 20 mADC or 0 to 10 VDC (VI/II), ±10 VDC (RR), Remote Potentiometer (Any Analog Input Terminal), 15 Preset Speeds via Contact Closure, Communications via RS232/ RS485
- **Input Signal Resolution** — EOI Input 0.01 Hz, Analog Terminal Input 0.02 Hz, Discrete Terminal, Digital Input, Communications Input ±0.01% of Maximum Output Frequency
- **Output Frequency Range —** 0.0 to 299 Hz
- **Output Voltage/Frequency Control Method** — Open Closed-Loop Vector with Speed Torque Switching, Constant Torque, Variable Torque, Automatic Energy Saving, Auto-Torque Boost, Manual-Torque Boost, Custom Five-Point Curve
- **Overload Rating** — ASD Output 110% Continuous; 130% for 120 Seconds
- **Braking** — DC Injection Braking Dynamic Braking Available
  DC Injection Braking Frequency Settable from 0 to 120 Hz; Braking Amperage Settable from 0 to 100% of ASD Output, Braking Time Settable from 0 to 10 Seconds, Motor Shaft Stationary Control Available
  Dynamic Braking Resistor Value/Wattage Application-Specific User-Set; Braking Time, Stopping Pattern, Overload Level are User-Set

COMMUNICATION FUNCTIONS

- **Communication Connectivity** — To Host Computer via RS232/RS485; Dedicated RS232/RS485 for Error-Free Remote Control Monitoring
- **Supported Communication Protocols** — Additional Tosline-F10, Tosline-S20, DeviceNet, Ethernet IP, Ethernet TCP/IP, Modbus+, Modbus RTU, Metasys N2

OPERATION

- **Acceleration/Deceleration** — 0.1 to 6000 Seconds Switchable Between Acceleration/Deceleration Time 1, 2, 3 or 4; Selectable as S-Pattern 1, 2, or Linear
- **Forward/Reverse Run** — Forward Run when F-CC Closed; Reverse Run when R-CC Closed; Reverse Run (Default) when Both Closed/Coast-Stop when ST-CC Opened; Emergency-Off from EOI or Terminal Block (S4-CC);
  Three-Wire Control (Fail-Proof) Motorized Speed Pot Programmable Functions; Jog Run From EOI in JOG Mode; Settable to Terminal Block Operation
- **Multi-Speed Run** — Up to 15 Preset Speeds Possible with Combinations of CC, S1, S2, S3, S4
- **Pattern Run** — Up to Four Groups of Eight Patterns Each; Settable to up 15 Preset Speed Values; Able to Run Maximum of 32 User-Selected Patterns
- **Stall/Limit** — Auto-Load/Torque Reduction Control During Overload (Default Setting: Off)

DISPLAY

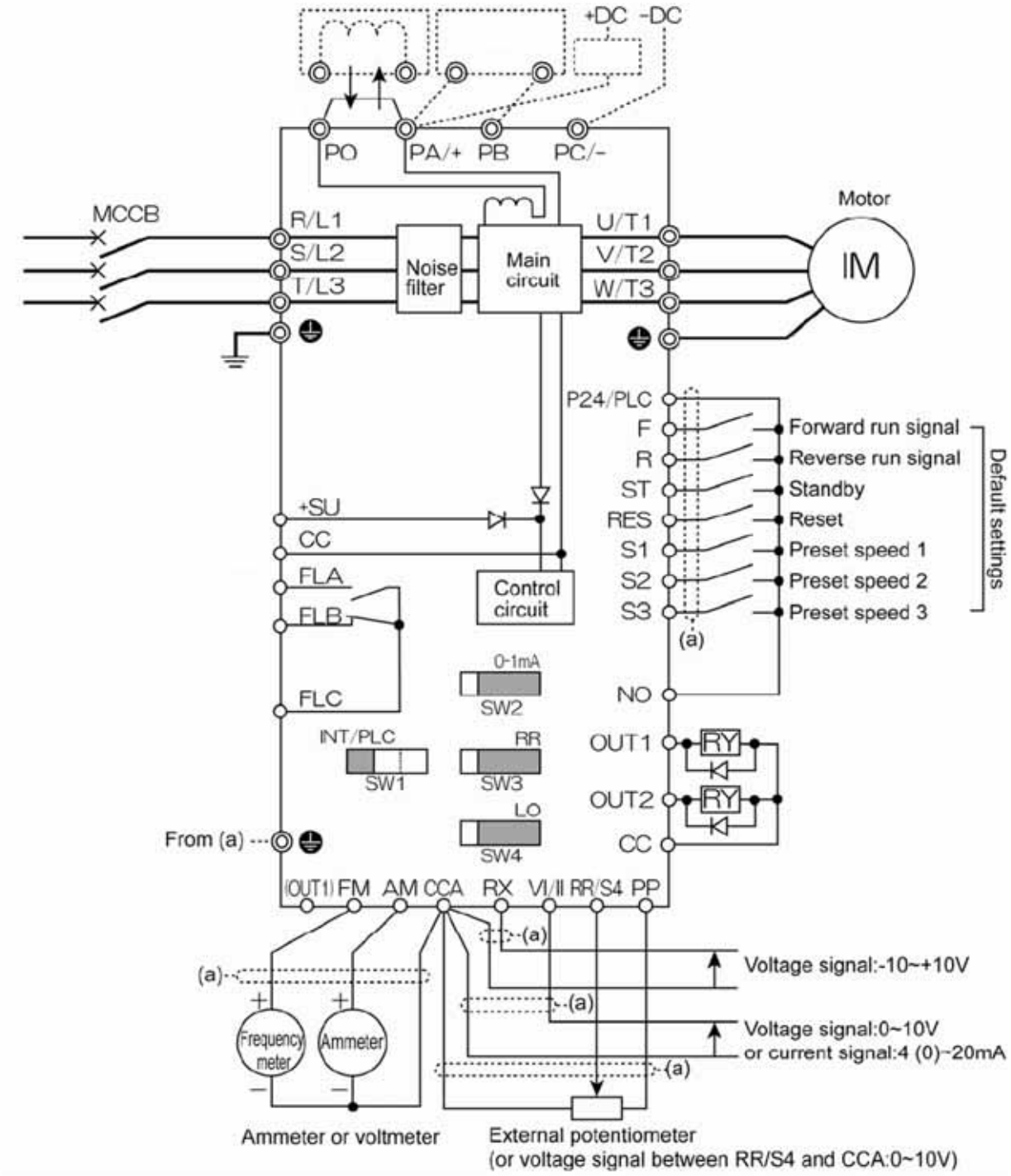
- **EOI** — Backlit Plain-English LCD Display
- **Alarm Fault Indications** — Overcurrent, Overvoltage, Heatsink Overheat, Load-Side Short Circuit, Load-Side Ground Fault, ASD Overload, Overcurrent During Startup, EEPROM Error, RAM Error, ROM Error, Communications Error, Arm Short for Each Phase, (Auto-Tuning, Emergency Stop, Undervoltage, Overtorque, Open-Output Phase, Motor Overload can be Selected or Deselected)
- **LED Charge Indicator** — Typeform-Specific Mounting
- **Protective Functions** — Stall Prevention, Current Limit, Overcurrent, Overvoltage, Load-Side Short Circuit, Load-Side Ground Fault, Undervoltage, Momentary Power Failure, Regeneration Power Ride-Through, Electronic Thermal Overload Protection (UL rated), Overcurrent During Startup, Heatsink Overheat, Emergency-Off, Open-Output Phase, Arm Short for Each Phase

ENVIRONMENTAL

- **Installation** — NEMA 1; Maximum Altitude 3300 ft; Not in Direct Sunlight; Protect from Corrosive /or Explosive Gases Vibrations in Excess of 0.6 G
- **Ambient Temperature** — 14° to 104°F (-10° to 40°C)
- **Humidity** — 95% Non-Condensing

c UL us

TYPICAL CONNECTION DIAGRAM



GX7 PART NUMBERING CONVENTION

The GX7 series ASD comes standard with an input circuit breaker in an easy to install turn-key package.

AA - Input Disconnect

GX7 ASDs include input fuses, ground lug, customer terminal block, door-mounted electronic operator interface, and a dynamic braking transistor.

Ordering Information: Use the following part numbering convention to configure the GX7 series package when placing your order.

Example Part Number:	GX7	4	##K/##L	AA	BA
Series: GX7 — GX7 ASD HX7E — HX7E ASD					
Voltage: 4 — 460 6 — 600 E — 690					
Model Number: 50K — 500 HP 60K — 600 HP 70K — 700 HP 80K — 800 HP 90K — 900 HP 10L — 1000 HP 12L — 1200 HP 14L — 1400 HP 15L — 1500 HP					
Style: AA — Includes input disconnect					

GX7 UNIT PRICING & DIMENSIONS

UNIT PRICING & DIMENSIONS								
VAC	HP	FLA	Model Number	List Price	Dimensions (in.)			Shipping Weight (lbs.)
					H	W	D	
600	500	481	GX7650KAA	$79,500	95.0	32.0	30.5	1500
	600	601	GX7660KAA	$89,500				
	700	698	GX7670KAA	$95,500				
	800	770	GX7680KAA	$110,000				
	900	866	GX7690KAA	$128,700	95.0	48.0	30.5	3200
	1000	962	GX7610LAA	$143,000				
	1200	1155	GX7612LAA	$170,500	95.0	59.5	30.5	3500
690	500	387	GX7E50KAA	$91,500	95.0	32.0	30.5	1500
	600	442	GX7E60KAA	$103,000				
	700	515	GX7E70KAA	$110,000				
	800	589	GX7E80KAA	$126,500				
	900	663	GX7E90KAA	$148,000	95.0	48.0	30.5	3200
	1000	736	GX7E10LAA	$164,500				
	1200	884	GX7E12LAA	$196,000				
690	500	387	HX7E50KAA	$84,000	95.0	32.0	30.5	1500
	600	442	HX7E60KAA	$95,000				
	700	515	HX7E70KAA	$101,000				
	800	589	HX7E80KAA	$116,500				
	900	663	HX7E90KAA	$136,000				
	1000	736	HX7E10LAA	$151,000				
	1200	884	HX7E12LAA	$180,000	95.0	48.0	30.5	3200
	1400	1031	HX7E14LAA	$210,000				
	1500	1104	HX7E15LAA	$225,000				
Delivery: 10 to 12 weeks.								

GX7 OPTION INFORMATION & PRICING

REPLACEMENT ALUMINUM-MESH AIR FILTER OPTIONS		
Part Number	**Description**	**Price**
PC67808P089	• Top-door, aluminum-mesh filter mounting bracket • Requires qty. of two, 8 to 32 x 1/2 self-tapping mounting	$50
PC50060G032	• Top-door, aluminum-mesh filter 6.75 x 15.75 x 0.25	$25
PC67801P312	• Bottom-door, aluminum-mesh filter • Mounting bracket • Requires qty. of five, 8 to 32 x 1/2 self-tapping mounting	$60
PC50060G037	• Bottom-door, aluminum-mesh filter 15.75 x 23.75 x 0.25	$30
PC67801P313	• Below-door, aluminum-mesh filter mounting bracket • Requires qty. of four, 8 to 32 x 1/2 self-tapping mounting	$55
PC50060G036	• Below-door aluminum-mesh filter 5.75 x 28.75 x 0.25	$30

Notes:
- These aluminum-mesh filters come standard on the GX7 drives.
- Spare parts discount applies to these filters.

NOTES:

W7 18-PULSE ASD

The W7 adjustable speed drive is an advanced AC drive featuring a patented 18-pulse autotransformer input for harmonic cancellation. The W7 includes a backlit graphical LCD screen, RS232/RS485 ports, and a programming/speed control encoder knob.

Standard features include input fuses, ground lug, customer terminal block, door-mounted electronic operator interface, *Power On* pilot light (white), *Run* pilot light (red), *Fault* pilot light (amber), *Hand/Off/Auto* selector switch, emergency-stop push-button, built-in real-time clock, and analog isolator (two isolated outputs and one isolated input).

SPECIFICATIONS

CONTROL

- **Three-Phase Input** — 18-Pulse Harmonic Cancellation
- **PWM Control** — Carrier Frequency Settable by the user from 0.5 kHz to XX kHz (where XX = ASD-Dependent)
- **Discrete Input Terminal Functions** — Eight Programmable Discrete Inputs with Selectable Sink or Source Logic
- **Input Signal Control** — Local Operation (EOI), Eight Programmable Discrete Input Terminals, Isolated 4 to 20 mADC or 0 to 10 VDC (VI/II), ±10 VDC (RR), Remote Potentiometer (Any Analog Input Terminal), 15 Preset Speeds via Contact Closure, Communications via RS485
- **Output Frequency Range** — 0.01 to 400 Hz
- **Input Signal Resolution** — Analog Terminal Input 0.2 Hz. EOI, Discrete Terminal, Digital Input, Communications Input ±0.01% of Maximum Output Frequency
- **Output Voltage/Frequency Control Method** — Constant V/f, Variable Torque, Auto-Torque Boost, True Torque Control, Auto-Energy Saving Control
- **Overload Rating** — ASD Output 100% Continuous; 120% for 60 Seconds

OPERATION

- **Acceleration/Deceleration** — 0.1 to 6000 Seconds; Switchable Between Acceleration/Deceleration Time 1, 2, 3 or 4; Selectable as S-Pattern 1, 2, or Linear
- **Forward/Reverse Run** — Forward Run when F-CC Closed; Reverse Run when R-CC Closed; Reverse Run (Default) when Both Closed/Coast-Stop when ST-CC Opened; Emergency-Off from EOI or Terminal Block (S4-CC); Three-Wire Control (Fail-Proof) Motorized Speed Pot Programmable Functions; Jog Run From EOI in JOG Mode. Settable to Terminal Block Operation
- **Multi-Speed Run** — Up to 15 Preset Speeds Possible with Combinations of CC, S1, S2, S3, S4
- **Pattern Run** — Up to Four Groups of Eight Patterns Each Settable to up 15 Preset Speed Values; Able to Run Maximum of 32 User-Selected Patterns
- **Stall/Limit** — Auto-Load/Torque Reduction Control During Overload (Default Setting: Off)
- **Set Point Control (PID)** — Proportional Gain, Integral Gain, Anti-Hunting Gain, Lag-Time Constant Adjustments, More

DISPLAY

- **EOI** — Backlit Plain-English LCD Display
- **Alarm Fault Indications** — Overcurrent, Overvoltage, Heatsink Overheat, Load-Side Short Circuit, Load-Side Ground Fault, ASD Overload, Overcurrent During Startup, EEPROM Error, RAM Error, ROM Error, Communications Error, Arm Short for Each Phase, (Auto-Tuning, Emergency Stop, Undervoltage, Overtorque, Open-Output Phase, Motor Overload can be Selected or Deselected)
- **LED Charge Indicator** — Typeform-Specific Mounting
- **Protective Functions** — Stall Prevention, Current Limit, Overcurrent, Overvoltage, Load-Side Short Circuit, Load-Side Ground Fault, Undervoltage, Momentary Power Failure, Regeneration Power Ride-Through, Electronic Thermal Overload Protection (UL rated), Overcurrent During Startup, Heatsink Overheat, Emergency-Off, Open-Output Phase, Arm Short for Each Phase

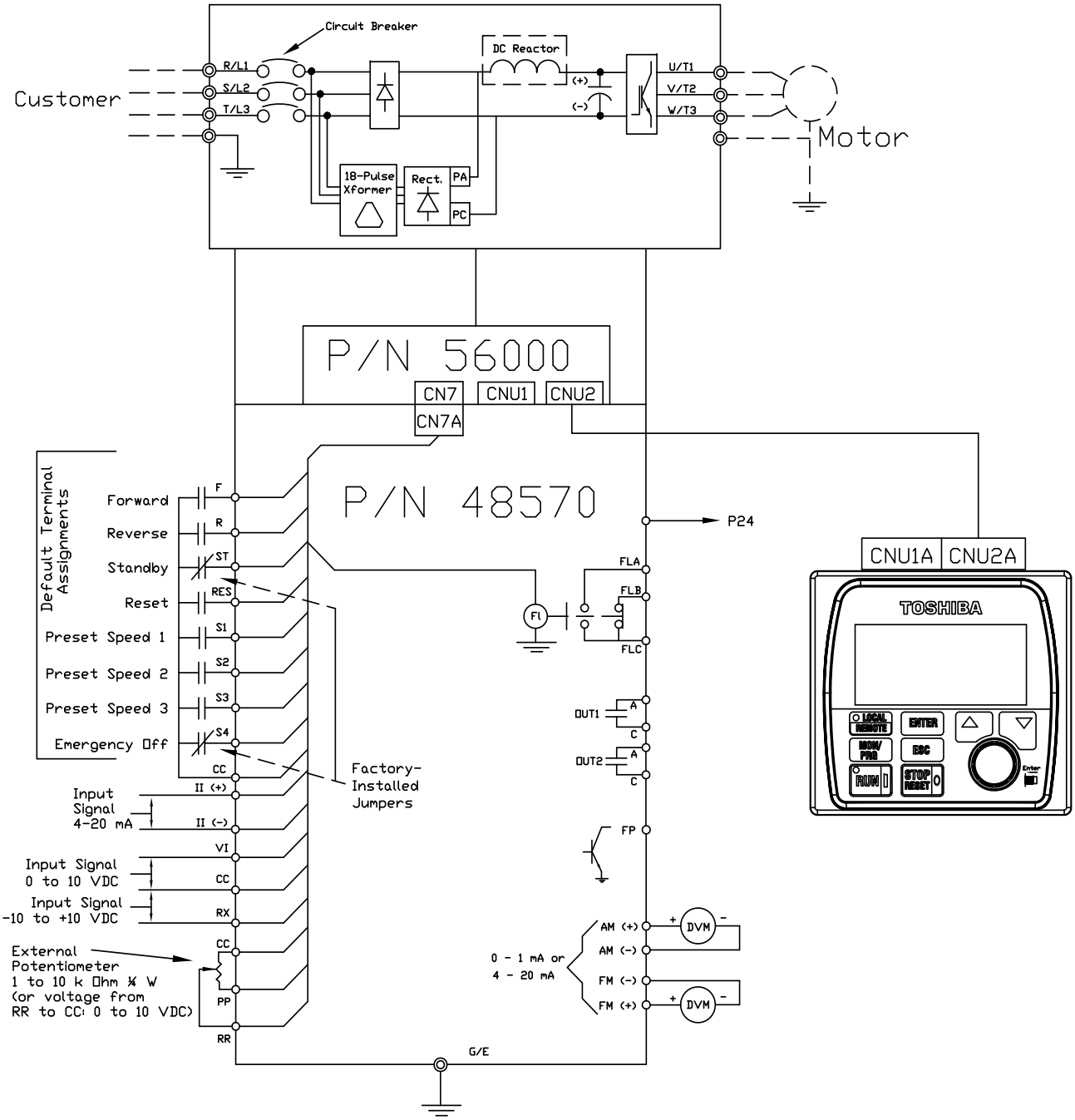
COMMUNICATION

- **Communication Connectivity** — To Host Computer via RS232/RS485. Dedicated RS232/RS485 for Error-Free Remote Control Monitoring
- **Supported Communication Protocols** — Additional Tosline-F10, Tosline-S20, DeviceNet, Ethernet IP, Ethernet TCP/IP, Modbus+, Modbus RTU, Metasys N2

ENVIRONMENTAL

- **Installation** — NEMA 1; Maximum Altitude 3300 ft; Not in Direct Sunlight; Protect from Corrosive Gases, Explosive Gases, Vibrations in Excess of 0.6 G
- **Ambient Temperature** — 14° to 104°F (-10° to 40°C)
- **Humidity** — 95% Non-Condensing

TYPICAL CONNECTION DIAGRAM



DO NOT CONNECT CC TO EARTH GROUND.

W7 PART NUMBERING CONVENTION

The W7 series ASD is available with commonlyused options such as manual bypass and input circuit breakers in an easy-to-install package.

AADW — Input circuit breaker
AEDW — Input circuit breaker, isolated manual (three) contactor bypass, overload
ASDW — Input circuit breaker, isolated manual solid state starter bypass, overload

The W7 ASD includes an auto-transformer, input fuses, ground lug, customer terminal block, door-mounted electronic operator interface, power-on pilot light (white), run pilot light (red), fault pilot light (amber), hand/off/auto selector switch, emergency stop push button, real-time clock, and analog isolator (two isolated outputs and one isolated input).

Isolated three-contactor bypass units include an ASD/Off/Bypass selector switch, ASD Test On/Off selector switch, bypass mode pilot light (red), and ASD mode pilot light (red). They are used for system control and are all located on the enclosure door.

Isolated Solid State Starter bypass units include a door-mounted solid state starter keypad, ASD/Off/Bypass selector switch, ASD Test On/Off selector switch, solid state starter mode pilot light (red), and ASD mode pilot light (red). They are used for system control and are all located on the enclosure door.

Ordering Information: Use the following part numbering convention to configure the W7 when placing your order.

This example is for a 100 HP, 460 V "AA" style integrated 18-pulse assembly with a circuit breaker.

Example Part Number:	W7	4	10K	AA	DW	

Series:
W7 ASD
W7B ASD

Voltage:
4 — 460
6 — 600
E — 690

Model Number:

220 — 20 HP	10K — 100 HP	35K — 350 HP
270 — 25 HP	12K — 125 HP	40K — 400 HP
330 — 30 HP	15K — 150 HP	50K — 500 HP
400 — 40 HP	17K — 175 HP	60K — 600 HP
500 — 50 HP	20K — 200 HP	70K — 700 HP
600 — 60 HP	25K — 250 HP	80K — 800 HP
750 — 75 HP	30K — 300 HP	

Style:
AA — Includes circuit breaker
AE — Includes circuit breaker, isolated three-contactor bypass, overload protection
AS — Includes circuit breaker, isolated solid-state bypass, overload protection

18-Pulse Transformer:
DW — Auto-transformer

Enclosure/Other Options:
Blank — NEMA 1 enclosure
NC — NEMA 12 enclosure

W7 UNIT PRICING & DIMENSIONS

W7 460 V ASD WITH NEMA 1 ENCLOSURE														
VAC	HP	FLA	Model Number	List Price			Dimensions (in.)							
							H			W			D	
				AADW	AEDW	ASDW	AA	AE	AS	AA	AE	AS		
460	20	27	W7B4220	$32,900	$34,900	$40,000	84	84	84	30	54	54	24	
	25	34	W7B4270	$33,400	$35,400	$40,500								
	30	42	W7B4330	$34,000	$37,000	$42,100								
	40	52	W7B4400	$34,540	$37,540	$43,070								
	50	65	W7B4500	$35,000	$39,000	$44,530								
	60	77	W7B4600	$37,000	$42,000	$48,400								
	75	96	W7B4750	$39,000	$44,000	$51,250	100	100	100					
	100	124	W7B410K	$42,000	$47,000	$55,400						60		
	125	156	W7B412K	$46,000	$52,000	$60,830								
	150	190	W7B415K	$49,000	$55,000	$64,250								
	200	240	W7B420K	$57,000	$64,000	$74,960								
	250	302	W7B425K	$64,000	$74,000	$86,000				42	66	72		
	300	370	W7B430K	$70,000	$86,000	$98,700						84		
	350	450	W7B435K	$80,000	$96,000	$111,300								
	400	480	W7B440K	$85,000	$103,000	$118,900								
	500	628	W7B450K	$110,000	$128,000	$146,300					72	114		
	600	740	W7460K	$127,500	$151,000	$173,700	105	CF	CF	76	CF	CF		
	700	879	W7470K	$147,000	$175,000	$199,500								
	800	960	W7480K	$168,000	$198,000	$232,900								

Notes:
- CF = Consult factory.
- HP rating is based on 600 V.

W7 600/690 V WITH NEMA 1 ENCLOSURE							
VAC	HP*	FLA	Model Number	List Price	Dimensions (in.)		
					H	W	D
600/690	75	77	W7B6750AADW	$55,200	100	30	24
	100	99	W7B610KAADW	$64,975			
	125	125	W7B612KAADW	$69,000			
	150	150	W7B615KAADW	$72,450			
	175	177	W7B617KAADW	$79,350			
	200	200	W7B620KAADW	$86,250			
	250	250	W7B625KAADW	$103,500		42	
	300	300	W7B630KAADW	$115,000			
	400	425	W7B640KAADW	$140,300			

W7 460 V WITH NEMA 12 ENCLOSURE													
VAC	HP	FLA	Model Number	List Price			Dimensions (in.)						
							H			W			D
				AADWNC	AEDWNC	ASDWNC	AA	AE	AS	AA	AE	AS	
460	75	96	W7B4750	$44,850	$50,600	$57,800	90	90	90	38	62	76	24
	100	124	W7B410K	$48,300	$54,050	$61,950							
	125	156	W7B412K	$52,900	$59,800	$68,740							
	150	190	W7B415K	$56,350	$63,250	$73,550				40	64	78	
	200	240	W7B420K	$65,550	$73,600	$84,300							
	250	302	W7B425K	$73,600	$85,100	$98,100				64	88	90	
	300	370	W7B430K	$80,500	$98,900	$112,700							
	400	480	W7B440K	$97,750	$118,450	$138,350							
	500	628	W7B450K	$126,500	$147,200	$167,700	94	94	94		94	136	

W7 OPTION INFORMATION & PRICING

GENERAL OPTIONS			
Model Number	Description	List Price	
		NEMA 1	NEMA 12
RCABINET18	• Right-mounting 18” wide enclosure with blank door	$2,800	CF
PC80150P018	• Subpanel for 18” cabinet	$500	$500
RCABINET24	• Right-mounting 24” wide enclosure with blank door	$3,200	CF
PC80150P017	• Subpanel for24” cabinet	$600	$600
RCABINET36	• Right-mounting 36” wide enclosure with blank door	$3,600	CF
PC80150P019	• Subpanel for 36” cabinet	$700	$700
LCABINET18	• Left-mounting 18” wide enclosure with blank door	$2,800	CF
PC80150P018	• Subpanel for 18” Cabinet	$500	$500
LCABINET24	• Left-mounting 24” wide enclosure with blank door	$3,200	CF
PC80150P017	• Subpanel for 24” cabinet	$600	$600
LCABINET36	• Left-mounting 36” wide enclosure with blank door	$3,600	CF
PC80150P019	• Subpanel for 36 “ cabinet	$700	$700

ADDITIONAL OPTIONS		
Option Code	Description	List Price
RI	• Control relay — IEC, 120 V, 2 A contacts	$100
M1	• Door-mounted volt amp meter package — IEC	$350
MA	• Door-mounted output amp meter	$200
MF	• Door-mounted output frequency meter	$200
MV	• Door-mounted output volt meter	$200
MX	• Door-mounted miscellaneous meter (order by description)	CF
PX	• Miscellaneous pilot light — IEC (specify function color)	$75
RT	• Door-mounted TIC-TPR6-14 relay — IEC (RTD monitor)	$2,800

MISCELLANEOUS OPTIONS		
Option Code	Description	List Price
BN	• Push-button — NEMA, 30 mm, heavy duty, oil tight	$300
LN	• Pilot light — NEMA, 30 mm, heavy duty, oil tight, P-T-T, 120 V LED with tansformer 6 V bulb (order by function indicator color)	$300
PN	• Speed-control potentiometer — NEMA, machine tool duty, 120 V, A600, 10 A contacts	$450
RN	• Control relay — NEMA, machine tool duty, 120 V, A600, 10 A contacts	$450
SN	• Selector switch — NEMA, 30 mm, heavy duty, oil tight, two- or three-position	$450

SYNC-XFER

Sync-Xfer is an exciting technological feature of the W7. With Sync-Xfer, the W7 determines the utility line characteristics and transfers the motor supply power from variable speed to fixed speed via contactors. Additionally, it can pick up a motor from utility power and return it to variable speed.

Sync-Xfer can have significantly lower system costs in applications where multiple motors are controlled with one ASD. For more details on Sync-Xfer, contact the Water/Wastewater group.

460V SYNC-XFER			
Option Code	**HP**	**Description**	**Budget List Price**
XF	100	• Sync-Xfer Solution	$2,750
		• Contactor section	$6,050
	125	• Sync-Xfer Solution	$3,000
		• Contactor section	$6,600
	150	• Sync-Xfer Solution	$4,250
		• Contactor section	$6,600
	200	• Sync-Xfer Solution	$4,750
		• Contactor section	$7,700
	250	• Sync-Xfer Solution	$5,250
		• Contactor section	$11,000
	300	• Sync-Xfer Solution	$5,250
		• Contactor section	$17,600
	400	• Sync-Xfer Solution	$6,250
		• Contactor section	$19,800
	500	• Sync-Xfer Solution	$7,500
		• Contactor section	$19,800
	600	• Sync-Xfer Solution	$12,000
		• Contactor section	$25,850
	700	• Sync-Xfer Solution	$12,500
		• Contactor section	$30,800
	800	• Sync-Xfer Solution	$13,000
		• Contactor section	$33,000

HX7 PLUS PACK ASD

The HX7 Plus Pack adjustable speed drive is designed to withstand the harshest conditions. It is a solid-state AC drive that ranges from 60 to 1500 HP, 380 to 480 V. The HX7 Plus Pack combines the robustness of Toshiba's plus pack technology with the sophistication of the 7-series control, making it a state-of-the-art PWM adjustable speed drive unique to the industry. The HX7 Plus Pack is engineered to provide tight speed control, while offering the industry?s most user-friendly operator interface.

SPECIFICATIONS

CONTROL

- **PWM Control**
- **Output Frequency** —0.01 to 299 Hz
- **Frequency Setting**— 0.01 Hz Operation Panel Input (60 Hz Base); 0.015 Hz Analog Input (60 Hz Base, 12-Bit/0 to 10 VDC)
- **Torque Setting** —250% of Rated Torque
- **Frequency Precision** —Analog Input ±0.2% of Max. Output Frequency (25°C, ±10°C); Digital Input ±0.01% of Max. Output Frequency (25°C, ±10°C)
- **Voltage/Frequency** —Constant V/f, Variable Torque, Auto-Torque Boost, True Torque Control, Auto-Energy Saving Control, Sensorless Vector Control, PG Feedback Control
- **Overload Ratings**—One Minute at 120%; 100% Continuous
- **Braking**—Dynamic Braking Circuitry External Resistor Optional

FREQUENCY SETTING SIGNALS

- **Input Signals** —1 to 10 kW Potentiometer Connections Provided; Also Standard 0 to 10 VDC, ±10 VDC, ±5 VDC (Zin=34 kW); 4 to 20 mA Input Standard (Zin=500 W)
- **Set Point Control (PID)**—Proportional Gain, Integral Gain, Anti-Hunting Gain, Lag-Time Constant Adjustments, Etc.

COMMUNICATION FUNCTIONS

- **Communication to Host Computer** via RS232/RS485; Panel Control Unit Connected via Dedicated RS232/RS485 to Allow for Problem-Free Remote Panel Applications
- **Communication Options** —Ethernet IP TCP/IP, Profibus, Tosline-F10, Tosline-S20, DeviceNet, Modbus+, Modbus RTU, Metasys N2
- **Acceleration/Deceleration**— 0.1 to 6000 Seconds; Switchable Between Acceleration/Deceleration Times 1 or 2 Selectable Pattern
- **Forward/Reverse Run**—Forward Run when F-CC Closed; Reverse Run when R-CC Closed; Reverse Run (Default) when Both Closed; Coast-Stop when ST-CC Opened; Emergency-Off from Operating Panel or Terminal Block (S4-CC); Three-Wire Control (Fail-Proof) Motorized Speed Pot Programmable Functions; Jog Run from Panel with JOG Mode Selection; Terminal Block Operation Possible with Parameter Settings
- **Multi-Speed Run** —Set Frequency Plus 15 Preset Speeds Possible with Combinations of CC, S1, S2, S3, S4
- **Stall/Limit** —Automatic Load/Torque Reduction Control During Overload (Default Setting: OFF)
- **Pattern Run** —Four Groups of Eight Patterns Each can be Set to 15 Preset Speed Values; Able to Run Maximum of 32 Different Patterns

DISPLAY

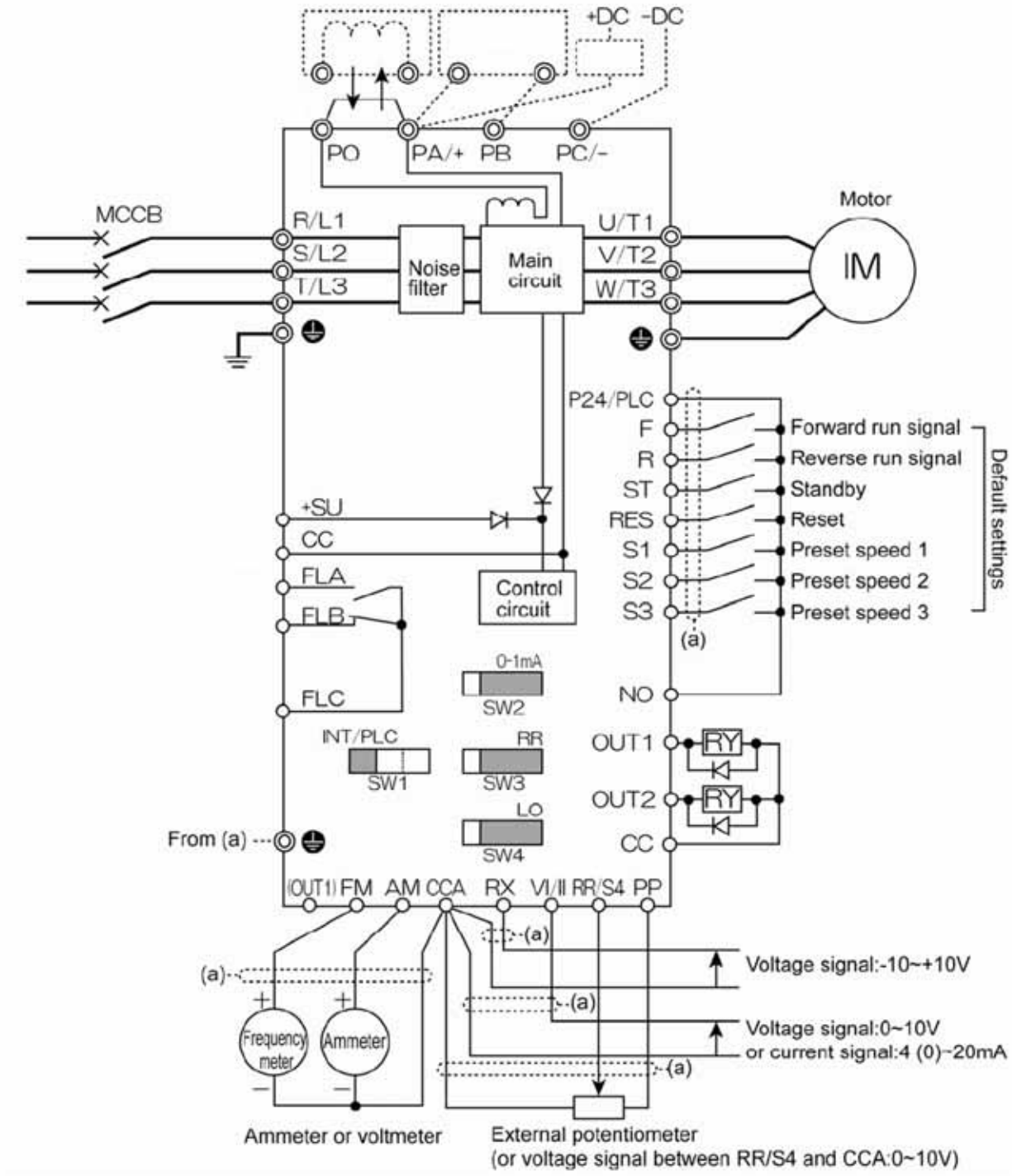
- **EOI** —Backlit Plain-English LCD Display
- **Alarm Fault Indications** —Overheat, Load-Side Short-Circuit, Load-Side Ground Fault, ASD Overload, Overcurrent During Start-Up, EEPROM Error, RAM Error, ROM Error, Communications Error, Arm Short For Each Phase, (Auto-Tuning, Emergency Stop, Undervoltage, Overtorque, Open-Output Phase, Motor Overload can be Selected or Deselected)
- **LED Charge Indicator**
- **Protective Functions** —Stall Prevention, Current Limit, Overcurrent, Overvoltage, Load-Side Short-circuit, Load-Side Ground Fault, Undervoltage, Momentary Power Failure, Regeneration Power Ride-Through, Electronic Thermal Overload Protection (UL Rated), Overcurrent During Startup, Heatsink Overheat, Emergency-Off, Open Output Phase, Arm Short for Each Phase

ENVIRONMENTAL

- **Ambient Temperature** —14° to 122°F (-10° to 50°C)
- **Humidity** —95% Non-Condensing (Space-Heater Kits Available)
- **Installation** —Altitudes up to 4500 ft. Without Derate; NEMA 1 NEMA 3R (Non-Ventilated) Enclosures

c UL us

TYPICAL CONNECTION DIAGRAM



HX7 PLUS PACK PART NUMBERING CONVENTION

The Plus Pack is a special configuration, larger horsepower, 7-series ASD. The NEMA 3R version is specifically designed for outdoor applications including white paint (indoor units are painted ANSI 61 grey). The Plus Pack has a 1.0 service factor.

Plus Packs include an auto-transformer, input fuses, ground lug, customer terminal block, door-mounted electronic operator interface, power-on pilot light (white), run pilot light (red), fault pilot light (amber), hand/off/auto-selector switch, emergency stop push button, real-time clock, and analog isolator (two isolated outputs one isolated input).

Example Part Number:	HX7+C	4	##0/##K/ ##L	CB	BA

Series:
HX7+C — HX7 Plus Pack Rev. C

Voltage:
4 — 460

Model Number:

660 — 60 HP	60K — 600 HP
830 — 75 HP	70K — 700 HP
11K — 100 HP	81K — 800 HP
16K — 150 HP	93K — 900 HP
20K — 200 HP	10L — 1000 HP
26K — 250 HP	12L — 1200 HP
39K — 350 HP	14L40 — 1400 HP
45K — 400 HP	15L40 — 1500 HP
51K40 — 500 HP	

Style:
CB — NEMA 3R, includes input circuit breaker
CB1 — NEMA 1, includes input circuit breaker
CC — NEMA 3R, includes 12-pulse input circuit breaker
CC1 — NEMA 1, includes 12-pulse input circuit breaker
CD — NEMA 3R, includes 18-pulse input circuit breaker

Notes:
- Plus Pack units do not include dynamic braking transistors as standard.
- Factory-authorized startup is required on all ASDs 400 HP and larger.
- Twelve-pulse drives require a 12-pulse phase-shifting transformer (not included).
- Dimensions weights are for estimation purposes only.
- Height dimensions listed include removable eyebolts base.
- Width dimensions listed include heat exchanger.
- Depth dimensions listed include door devices.
- 518, 1400, 1500 KVA Plus Packs rated 40°C maximum.

HX7 PLUS PACK UNIT PRICING & DIMENSIONS

NEMA 3R UNIT PRICING & DIMENSIONS									
VAC	HP	FLA	Model Number	List Price		Dimensions (in.)			Shipping Weight (lbs.)
				CB	CC	H	W	D	
460	60	79	HX7+C4660	$17,777	$19,277	81.5	25.0	35.0	1000
	75	100	HX7+C4830	$19,800	$21,400				
	100	133	HX7+C411K	$22,000	$23,750				
	150	196	HX7+C416K	$28,600	$30,600		31.5		
	200	241	HX7+C420K	$33,000	$35,750				
	250	313	HX7+C426K	$44,000	$47,000		46.0	42.0	1200
	350	469	HX7+C439K	$53,900	$57,700				
	400	546	HX7+C445K	$60,500	$64,500				
	500	623	HX7+C451K40*	$69,000	$73,000		61.0		1500
	600	722	HX7+C460K	$84,700	$90,700		90.0	48.0	2000
	700	842	HX7+C470K	$94,600	$101,850				
	800	980	HX7+C481K	$113,300	$120,800				
	900	1121	HX7+C493K	$123,000	$131,000				
	1000	1203	HX7+C410L	$150,700	$160,700				
	1200	1443	HX7+C412L	$172,700	$184,700	82.5	110.0		3500
	1400	1684	HX7+C414L40*	$185,000	$197,000				
	1500	1804	HX7+C415L40*	$200,000	$212,000				

Notes:

- Plus Pack units do not include dynamic braking transistors as standard.
- Factory-authorized startup is required on all ASDs 400 HP larger.
- Twelve-pulse drives require a 12-pulse phase-shifting transformer (not included).
- Dimensions weights are for estimation purposes only — height dimensions listed include removable eyebolts base; width dimensions listed include heat exchanger; depth dimensions listed include door devices.
- 518, 1400, 1500 KVA Plus Packs are rated 40 degrees celsius maximum.

18-PULSE NEMA 3R UNIT PRICING & DIMENSIONS (PHASE-SHIFTING TRANSFORMER INCLUDED)								
VAC	HP	FLA	Model Number	List Price	Dimensions (in.)			Shipping Weight (lbs.)
					H	W	D	
460	60	79	HX7+C4660CD	$42,000	81.5	70.0	35.0	1000
	75	100	HX7+C4830CD	$46,000				
	100	133	HX7+C411KCD	$54,650				
	150	196	HX7+C416KCD	$62,000				
	200	241	HX7+C420KCD	$71,800				
	250	313	HX7+C426KCD	$98,900		93.5	44.0	1200
	350	469	HX7+C439KCD	$114,500				
	400	546	HX7+C445KCD	$128,000				
	500	623	HX7+C451K40CD*	$158,000				1500
	600	722	HX7+C460KCD	$188,000		130.0	46.5	2000
	700	842	HX7+C470KCD	$210,560				

Notes:

- Plus Pack units do not include dynamic braking transistors as standard.
- Factory-authorized startup is required on all ASDs 400 HP and larger.
- Eighteen-pulse drives have an integrated 18-pulse phase-shifting transformer.
- Dimensions weights are for estimation purposes only — height dimensions listed include removable eyebolts and base; width dimensions listed include heat exchanger; depth dimensions listed include door devices.
- 518, 1400, 1500 KVA Plus Packs are rated 40 degrees celsius maximum.

NEMA 1 UNIT PRICING & DIMENSIONS									
VAC	HP	FLA	Model Number	List Price		Dimensions (in.)			Shipping Weight (lbs.)
				CB1	CC1	H	W	D	
460	250	313	HX7+C426K	$40,000	$43,000	81.5	37.0	40.0	1200
	350	469	HX7+C439K	$46,400	$50,200				
	400	546	HX7+C445K	$53,000	$57,000				
	500	623	HX7+C451K40*	$60,000	$64,000				1500
	600	722	HX7+C460K	$78,200	$84,200		72.0	46.0	2000
	700	842	HX7+C470K	$88,100	$95,350				
	800	980	HX7+C481K	$106,800	$114,300				
	900	1121	HX7+C493K	$116,500	$124,500				
	1000	1203	HX7+C410L	$125,000	$135,000				
	1200	1443	HX7+C412L	$145,000	$157,000	82.5	84.0		3500
	1400	1684	HX7+C414L40*	$165,000	$177,000				
	1500	1804	HX7+C415L40*	$185,000	$197,000				

Notes:

- Plus Pack units do not include dynamic braking transistors as standard.
- Factory-authorized startup is required on all ASDs 400 HP and larger.
- Twelve-pulse drives require a 12-pulse phase-shifting transformer (not included).
- Dimensions weights are for estimation purposes only — height dimensions listed include removable eyebolts base; width dimensions listed include heat exchanger; depth dimensions listed include door devices.
- 518, 1400, 1500 KVA Plus Packs are rated 40 degrees celsius maximum.

HEAVY DUTY PLUS PACK DYNAMIC BRAKING RESISTORS - NEMA TYPE 1 ENCLOSURE						
VAC	KVA	Model Number	Dimensions (in.) H X W X D			List Price
460	66	PR00292P132	14	29	18	$2,130
	83	PR00293P132	14	29	18	$2,180
	111	PR00294P132	14	29	18	$2,320
	163	PR00296P132	28	29	18	$3,850
	200	PR00297P132	35	29	18	$4,720
	260	PR00298P132	42	29	18	$5,660
	390	PR00299P132	56	29	18	$6,220
	454	PR00300P132	49	29	18	$7,960
	518	PR00300P132	49	29	18	$7,960
	600	PR00300P132	49	29	18	$7,960
	700	PR00300P132	49	29	18	$7,960
	815	PR00300P132	49	29	18	$7,960
	932	PR00300P132	49	29	18	$7,960
	1000	PR00300P132	49	29	18	$7,960
	1200	PR00300P132	49	29	18	$7,960
	1400	PR00300P132	49	29	18	$7,960
	1500	PR00300P132	49	29	18	$7,960
Delivery: Stock to four weeks.						

Notes:

- 600 KVA and larger size drives use the same size IGBT7.
- Larger HP units have limited braking capacity.

HX7 PLUS PACK OPTION INFORMATION & PRICING

INSTALLED ISOLATED BYPASSES		
Option Code	**Description**	**List Price**
AE	• 66 KVA isolated three-contactor bypass	$11,020
	• 83 KVA isolated three-contactor bypass	$11,950
	• 111 KVA isolated three-contactor bypass	$12,840
	• 163 KVA isolated three-contactor bypass	$14,570
	• 200 KVA isolated three-contactor bypass	$15,020
	• 260 KVA isolated three-contactor bypass	$27,240
	• 390 KVA isolated three-contactor bypass	$27,570
	• 454 KVA isolated three-contactor bypass	$29,910
	• 518 KVA isolated three-contactor bypass	$37,550
	• 600 KVA isolated three-contactor bypass	$37,770
	• 700 KVA isolated three-contactor bypass	$37,770
	• 815 KVA isolated three-contactor bypass	$37,770
Delivery: Add four weeks to basic plus pack lead time.		

Notes:
- Bypass are only available for 6-pulse drives. Consult factory for 932 KVA and larger size drives on option availability.
- Dimensions will be significantly affected with bypass adders.

INSTALLED DYNAMIC BRAKING TRANSISTORS		
Option Code	**Description**	**List Price**
DB	• 66 to 111 KVA IGBT7	$1,200
	• 163 to 200 KVA IGBT7	$1,500
	• 260 KVA IGBT7	$1,600
	• 390 to 518 KVA IGBT7	$2,000
	• 600 to 1500 KVA IGBT7	$3,000
Delivery: Add two weeks to basic plus pack lead time		

Notes:
- 600 KVA and larger size drives use the same size IGBT7.
- Larger units have limited braking capacity.

INSTALLED JUNCTION BOXES		
Option Code	**Description**	**List Price**
JB	• 66 to 111 KVA junction box	$1,350
	• 163 to 518 KVA junction box (standard on 518 KVA CB CC)	$2,225
	• 600 to 815 KVA junction box	$3,900
	• 932 to 1500 KVA junction box	$4,450

INSTALLED DC LINK REACTORS		
Option Code	**Description**	**List Price**
RD	• 163 KVA installed DC link reactor	$2,000
	• 200 KVA installed DC link reactor	$2,475
	• 260 KVA installed DC link reactor	$2,750
	• 390 KVA installed DC link reactor	$3,300
	• 454 KVA installed DC link reactor	$3,575
	• 518 KVA installed DC link reactor	$5,000
	• 600 KVA installed DC link reactor	$6,000
	• 700 KVA installed DC link reactor	$7,250
	• 815 KVA installed DC link reactor	$7,500
	• 932 KVA installed DC link reactor	$10,000
	• 1000 KVA installed DC link reactor	$11,000
	• 1200 KVAinstalled DC link reactor	$12,000
	• 1400 KVA installed DC link reactor	$14,000
	• 1500 KVA installed DC link reactor	$16,000
Delivery: Add two weeks to basic plus pack lead time.		

Notes:
- 66 to 111 KVA HX7 Plus Pack power units do not have DC link reactor option connection points.

INSTALLED RAYCAP SURGE SUPPRESSORS		
Option Code	**Description**	**List Price**
480-3D-03-3-00	• 6-pulse Raycap surge suppressor kit	$2,300
480-3D-03-6-00	• 12-pulse Raycap surge suppressor kit	$3,400
SS	• Installed Raycap surge suppressors for CB units	$3,000
	• Installed Raycap surge suppressors for CC units	$6,000

LOW VOLTAGE OPTIONS PRICING

H9, G9, P9, AS1 ASD OPTIONS

COMMUNICATION CARDS, CLOSED-LOOP CARDS, KEYPADS, CABLES, COOLING		
Part Number	**Description**	**Price**
DEV002Z	• DeviceNet communications option module snaps directly onto drive • Mounts behind drive keypad control panel 	$255
PDP002Z	• Profibus DP communications option module snaps directly onto drive • Mounts behind drive keypad control panel 	$300
MBP001Z	• ModBus Plus communications option module snaps directly onto drive • Mounts behind drive keypad control panel 	$400
MBE001Z	• ModBus TCP communications option module snaps directly onto drive • Mounts behind drive keypad control panel 	$600
ASD-G9ETH	• Ethernet IP communications option module snaps directly onto the drive • Mounts behind drive keypad control panel • Supports: - Ethernet IP - Modbus/TCP - Bacnet - Profinet IO 	$900
ETB003Z	• I/O terminal block can be added to enhance your system for extra compatibility with wide range of systems: - Four Discrete Inputs - One Open-Collector Outputs - One Thermal-Trip Input - Form-C Output (One Circuit) • Only one ETB003Z card can be used per drive 	$175

COMMUNICATION CARDS, CLOSED-LOOP CARDS, KEYPADS, CABLES, COOLING		
Part Number	**Description**	**Price**
ETB004Z	• I/O terminal block can be added to enhance your system for extra compatibility with a wide range of systems: - Four Discrete Inputs - One Open-Collector Outputs - One Thermal-Trip Input - Form-C Output (One Circuit) - Two Analog Inputs - Two Analog Outputs • Only one ETB004Z card can be used per drive 	$300
ETB006Z	• 120 V Logic Input Adapter wires into drive terminal block • Contains seven 120 VAC inputs that control discrete inputs • Compatible with H9/G9/P9 drives frames 6 above all AS1 drives	$145
ASD-CAB-USB	• RS485 to USB cable for PC to ASD communication • Can communicate with G9, H9, Q9, G7, H7, Q7, AS1 	$150
VEC004Z	• Type-2 • Push pull/open collector 12 V printed circuit board-connects/mounts internally to drive, behind drive keypad control panel 	$150
VEC005Z	• Type-2 • Push pull/open collector 15 V printed circuit board connects/mounts internally to drive, behind drive keypad control panel 	$150
VEC006Z	• Type-2 • Push pull/open collector 24 V printed circuit board connects/mount internally to drive, behind drive key-pad control panel 	$150
VEC007Z	• Type-1 • RS422 (line driver) 5 V encoder card printed circuit board connects/mounts internally to drive, behind drive keypad control panel 	$150
ASD-TB1-SIM9	• Input simulator replaces standard terminal strip on any G9/H9 drive • Emulates input output control signals of drive using switches, potentiometers, indicators 	$300
ASD-EOI-N4-G9	• NEMA 4 keypad • Keypad should not be exposed to direct sunlight 	$750

COMMUNICATION CARDS, CLOSED-LOOP CARDS, KEYPADS, CABLES, COOLING		
Part Number	**Description**	**Price**
ASD-MTG-KIT9	• Remote-mount kit for G9/H9 EOI Frame 2 to 5 • EOI extender cable ASD-CABxF is required not included with drive 	$300
ASD-MTG-KIT	• Remote-mount kit for G9/H9 EOI Frame 6 to 13 • EOI extender cable ASD-CABxF may be required if keypad is remote-mounted beyond reach of EOI cable provided with drive 	$100
ASD-BPC	• EOI panel cover provides dust protection when G9/H9 keypad has been remotely mounted or removed on Frame 6 to 13 	$85
ASD-CAB7F	• 7-foot EOI extender cable with ferrite cores	$45
ASD-CAB10F	• 10-foot EOI extender cable with ferrite cores	$65
ASD-CAB15F	• 15-foot EOI extender cable with ferrite cores	$75

GX7, W7, PLUS PACK ASD OPTIONS

INTERNAL COMMUNICATION/MULTI-FUNCTION CARDS		
Part Number	**Description**	**Price**
ASD-CAB-USB	• RS485 to USB cable for PC to the W7/W7B • Can also be used with HX7, G9, H9, Q9, AS1	$150
ASD-TB1-ACI	• 120 V Logic Input Board • Replaces terminal strip supplies dry contact closures to control W7/W7B 	$450
ASD-RTC	• Real-time clock option adds time date stamp on start, run, fault events • Stores up to 100 previous faults with operation data at time of fault 	$80
ASD-ISO-1	• Terminal strip signal isolator daughter board mounts onto factory terminal strip provides isolation of control board output circuit from AM/FM output from II input 	$300
ASD-MULTICOM-A	• Vector feedback card supports line driver, open-collector encoders, multiple network communication protocols, including: - Profibus - Modbus RTU - DeviceNet 	$1,520
ASD-MULTICOM-B	• Vector Feedback, Line driver, open-collector, pulse-speed command, process PID control 	$950
ASD-MULTICOM-F	• Tosline F10 communication board allows the drive to communicate with Toshiba T1, T2, T3 PLCs over twisted-pair cabling of Tosline F10 network 	$950

INTERNAL COMMUNICATION/MULTI-FUNCTION CARDS		
Part Number	**Description**	**Price**
ASD-MULTICOM-J	• Vector feedback, pulse-input speed command, position-control command, RX2 input, multi-function output terminal, alarm-code output terminal 	$950
ASD-MULTICOM-S	• Toshiba S20 communication board allows drive to communicate with Toshiba T2 T3 PLCs over fiber-optic Tosline S20 network 	$1,350
ASD-MULTICOM-X	• Extended terminal board provides: - Eight additional programmable digital inputs - Two analog outputs - Two programmable form-C contacts - 16-bit BCD control function 	$900
ASD-NANOCOM	• Multi-protocol communication interface provides RS485-based network connectivity (currently supports Modbus RTU Metasys N2) • Chip plugs directly into B-version of 7-series ASDs 	$350
ASD-MULTICARD	• Option card spacer necessary when installing more than one option card in drive 	$270

EXTERNAL GATEWAY OPTIONS

EXTERNAL COMMUNICATION OPTIONS		
Part Number	**Description**	**Price**
XLTR-200*	• Multi-protocol network gateway supports: - Modbus RTU - Metasys N2 - Siemens FLN • One unit connects up to three drives • Requires one CAB00xx-0A cable per drive 	$800
ETH-200*	• Multi-protocol network gateway supports: - Ethernet IP - Modbus TCP - Modbus RTU • One unit connects up to three drives • Requires one CAB00xx-0A cable per drive 	$1,100
EXT-PROFIBUS*	• Network gateway supports ProfibusDP • One unit connects up to two drives • Requires one CAB00xx-0A cable per drive 	$1,150
EXT-MODBUS+*	• Network gateway supports Modbus+ • One unit connects up to three drives • Requires one CAB00xx-0A cable per drive 	$1,450
DNET-100*	• Network gateway supports DeviceNet • One unit connects up to three drives • Requires one CAB00xx-0A cable per drive 	$1,050
CAB0011-0A	• 1-meter communication cable	$40
CAB0012-0A	• 2-meter communication cable	$50

EXTERNAL COMMUNICATION OPTIONS		
Part Number	**Description**	**Price**
CAB0015-0A	• 5-meter communication cable	$60
10456	• Standard plug 120 VAC:9 VDC power supply • Compatible with ICC gateways listed above	$95

Notes:

- * Options are available for 7-Series and S11 ASDs.

MILLENNIUM SERIES COMMUNICATION OPTIONS		
Part Number	**Description**	**Price**
DNET-1000*	• Network gateway that supports the following protocols: - DeviceNet - Modbus RTU - BACnet MS/TP - Metasys N2 	$1,350
ECAT-1000*	• Network gateway that supports the following protocols: - EtherCAT - Modbus RTU - BACnet MS/TP - Metasys N2 	$1,350
ETH-1000*	• Network gateway that supports the following protocols: - AB CSP (PCCC) - EtherNet/IP - BACnet/IP - BACnet MS/TP - Modbus/TCP - Modbus RTU - Profinet IO - Metasys N2 	$1,250
PBDP-1000*	• Network gateway that supports the following protocols: - Profibus DP - Modbus RTU - BACnet MS/TP - Metasys N2 	$1,350
XLTR-1000*	• Network gateway that supports the following protocols: - Modbus RTU - BACnet MS/TP - Metasys N2 	$800

• * Options are available for 7-Series and 9-Series ASDs. Please consult factory for installation/setup.

H9, G9, P9, AS1 ASD INSTALLED OPTIONS

INSTALLED COMMUNICATION CARDS, CLOSED-LOOP CARDS		
Part Number	**Description**	**Price**
CD	• DEV002Z DeviceNet communications option module snaps directly onto drive • Mounts behind drive keypad control panel 	$755
CF	• PDP002Z Profibus DP communications option module snaps directly onto drive • Mounts behind drive keypad control panel 	$800
CH	• MBP001Z ModBus Plus communications option module snaps directly onto drive • Mounts behind drive keypad control panell 	$900
CP	• MBE001Z ModBus TCP communications option module snaps directly onto drive • Mounts behind drive keypad control panel 	$1,100
CQ	• ASD-G9ETH Ethernet IP communications option module snaps directly onto drive • Mounts behind drive keypad control panel • Supports: - Ethernet IP - Modbus/TCP - Bacnet - Profinet IO 	$1,400
CE	• ETB003Z I/O terminal block can be added to enhance your system for extra compatibility with a wide range of systems: - Four Discrete Inputs - One Open-Collector Outputs - One Thermal-Trip Input - Form-C Output (One Circuit) • Only one ETB003Z card can be used per drive 	$675

INSTALLED COMMUNICATION CARDS, CLOSED-LOOP CARDS		
Part Number	**Description**	**Price**
CT	• ETB004Z I/O terminal block can be added to enhance your system for extra compatibility with a wide range of systems: - Four Discrete Inputs - One Open-Collector Outputs - One Thermal-Trip Input - Form-C Output (One Circuit) - Two Analog Inputs - Two Analog Outputs • Only one ETB004Z card can be used per drive 	$800
CN	• ETB006Z 120 V Logic Input Adapter wires into drive terminal block and has seven 120 VAC inputs that control discrete inputs (compatible with H9/G9/P9 drives frames 6 and above and all AS1 drives)	$645
CV*	• VEC004Z Type-2 • Push pull/open collector 12 V printed circuit board connects/mount internally to drive, behind drive keypad control panel 	$650
CV*	• VEC005Z Type-2 • Push pull/open collector 15 V printed circuit board connects/mount internally to drive, behind drive keypad control panel 	$650
CV*	• VEC006Z Type-2 • Push pull/open collector 24 V printed circuit board connects/mount internally to drive, behind drive keypad control panel 	$650
CU*	• VEC007Z Type-1 • RS422 (line driver) 5 V encoder card printed circuit board connects/mounts internally to drive, behind drive keypad control panel 	$650
Delivery: Add two weeks to basic assembly unit lead time.		

Notes:
• Please consult factory when selecting options CV CU.

GX7, W7, PLUS PACK ASD INSTALLED OPTIONS

INSTALLED GENERAL OPTIONS		
Part Number	**Description**	**Price**
CN	• 120 V Logic Input Board • Replaces terminal strip supplies dry contact closures to control W7/W7B 	$950
CR	• Real-time clock option adds a time date stamp on start, run, fault events • Stores up to 100 previous faults with operation data at time of fault • Standard in W7 ASD 	$580
X7	• Terminal strip signal isolator daughter board mounts onto factory terminal strip and provides isolation of control board output circuit from AM/FM output from the II input • Standard in W7 ASD 	$800

INSTALLED COMMUNICATION CARDS, CLOSED-LOOP CARDS		
Part Number	**Description**	**Price**
C1	• Installed (ASD-MULTICOM-A) vector feedback multi-protocol communications card supports line driver, open-collector encoders, multiple network communication protocols including: - Profibus - Modbus RTU - DeviceNet 	$2,020
C5	• Installed (ASD-MULTICOM-S) Toshiba S20 communication board allows drive to communicate with Toshiba T2 T3 PLCs over fiber-optic Tosline S20 network 	$1,850
C6	• Installed (ASD-MULTICOM-F) Tosline F10 communication board allows drive to communicate with Toshiba T1, T2, T3 PLCs over twisted-pair cabling of Tosline F10 network 	$1,450

INSTALLED COMMUNICATION CARDS, CLOSED-LOOP CARDS		
Part Number	**Description**	**Price**
CE	• Installed extended terminal board (ASD-MULTICOM-X) provides: - Eight additional programmable digital inputs - Two analog outputs - Two programmable form-C contacts - 16-bit BCD control function 	$1,400
CU	• Installed (ASD-MULTICOM-B) vector feedback, line driver, open-collector, pulse-speed command, process PID control 	$1,450
CV	• Installed (ASD-MULTICOM-J) vector feedback, pulse-input speed command, position-control command, RX2 input, multi-function output terminal, alarm-code output terminal 	$1,450

INSTALLED GATEWAY OPTIONS

INSTALLED EXTERNAL COMMUNICATION OPTIONS		
Part Number	**Description**	**Price**
CG*	• Multi-protocol network gateway supports Modbus RTU, Metasys N2, Siemens FLN • One unit connects up to three drives • Requires one CAB00xx-0A cable per drive 	$800
CQ*	• Multi-protocol network gateway supports: - Ethernet IP - Modbus TCP - Modbus RTU • One unit connects up to three drives • Requires one CAB00xx-0A cable per drive 	$1,100
CF*	• Network gateway supports ProfibusDP • One unit connects up to two drives • Requires one CAB00xx-0A cable per drive 	$1,150
CH*	• Network gateway supports Modbus+ • One unit connects up to three drives • Requires one CAB00xx-0A cable per drive 	$1,450
CD*	• Network gateway supports DeviceNet • One unit connects up to three drives • Requires one CAB00xx-0A cable per drive 	$1,050
CAB0011-0A	• 1-meter communication cable	$40
CAB0012-0A	• 2-meter communication cable	$50
CAB0015-0A	• 5-meter communication cable	$60

Notes:

- * Options are available for 7-Series and S11 ASDs.

COMMON INSTALLED ASD OPTIONS

INSTALLED BUTTONS		
Part Number	**Description**	**Price**
BA*	• Automatic bypass upon ASD fault for units with bypass	$600
B1	• Non-illuminated push-button • Black button for stop • Red button for start • Controls ASD only	$600
BJ*	• Jog push-button	$300
BX*	• Miscellaneous push-button	$300

Notes:
- * For NEMA-rated add $150 to list price.

INSTALLED SPACE HEATERS		
Part Number	**Description**	**Price**
HM*	• Motor space heater	$400
HS	• Cabinet anti-condensation space heater powered by incoming power • Activated when ASD is not running	$500
HT	• Cabinet space heater powered by incoming power • Thermostat controlled	$600
T2*	• 200 VA 120 V CPT for motor space heater power	$300
Delivery: Add two weeks to basic assembly unit lead time.		

Notes:
- * Voltage and wattage ratings required when specifying HM option.
- Motor Space Heater will be remotely powered by customer's power supply unless T2 option is also specified.
- Some motors may require CPT larger than 200 VA.

INSTALLED THERMAL-OVERLOAD RELAYS		
Part Number	**Description**	**Price**
LA	• 0.25 HP overload relay	$150
LB	• 0.33 HP overload relay	$150
LC	• 0.5 HP overload relay	$150
LD	• 0.75 HP overload relay	$150
LE	• 1 HP overload relay	$150
LF	• 1.5 HP overload relay	$150
LG	• 2 HP overload relay	$150
LH	• 3 HP overload relay	$150
LJ	• 5 HP overload relay	$150
LK	• 7.5 HP overload relay	$200

INSTALLED THERMAL-OVERLOAD RELAYS		
Part Number	**Description**	**Price**
LL	• 10 HP overload relay	$200
LM	• 15 HP overload relay	$200
LN	• 20 HP overload relay	$200
LP	• 25 HP overload relay	$200
LQ	• 30 HP overload relay	$250
LR	• 40 HP overload relay	$250
LS	• 50 HP overload relay	$250
LT	• 60 HP overload relay	$450
LU	• 75 HP overload relay	$450
LW	• 100 HP overload relay	$450
LY	• 125 HP overload relay	$450
LZ	• 150 HP overload relay	$450
L1	• 200 HP overload relay	$500
L2	• 250 HP overload relay	$500
L3	• 300 HP overload relay	$500
L4	• 350 HP overload relay	$500
L5	• 400 HP overload relay	$550
Delivery: Add two weeks to basic assembly unit lead time.		

INSTALLED METERS		
Part Number	**Description**	**Price**
M1	• Output voltage current meter package	$350
MA	• Output current meter	$200
ME	• Elapsed time meter	$200
MF	• Output frequency meter	$200
MV	• Output voltage meter	$200
MX	• Miscellaneous meter • Order by description	CF
RT	• RTD monitor/relay • 14 RTD inputs • Door-mount display • Accepts only PT100 RTDs	$4,400
Delivery: Add two weeks to basic assembly unit lead time.		

Notes:
- AM and FM analog outputs are used for meter display.
- Please consult factory for availability and pricing if more than 2 meters are needed, as additional transformers may be required.

INSTALLED PILOT LIGHTS		
Part Number	**Description**	**Price**
PA	• Pilot light for ASD mode indicator	$300
PB	• Pilot light for bypass mode indicator	$300
PF	• Pilot light for fault indicator (amber)	$300
PG	• Pilot light for stop indicator (green)	$300
PP	• Pilot light for power on indicator (white)	$300
PR	• Pilot light for run indicator (red)	$300
PX	• Pilot light for miscellaneous indicator • Specify at time of order	CF
Delivery: Add two weeks to basic assembly unit lead time.		

Notes:
- For NEMA-rated devices, consult factory for pricing.
- The discrete outputs OUT1, OUT2, and FLA/B/C are used to activate the pilot lights.
- For more than three active indicators, consult factory for pricing and availability of additional required hardware.

MISCELLANEOUS OPTIONS		
Part Number	**Description**	**Price**
X2	• Isolated 4 to 20 mA transducer connected to AM terminal	$550
X3	• Isolated 4 to 20 mA transducer connected to FM terminal	$550
X5	• Isolated 3 to 15 PSI transducer connected to VI terminal	$680
Delivery: Add two weeks to basic assembly unit lead time.		

Notes:
- DeviceNet, Modbus, and Profibus DP are trademarks of Allen Bradley, Open DeviceNet Vendors Association, AEG Schneider Automation, and Profibus Trade Organization, respectively.
- All of the options listed above, communications and others, are not installed, but shipped separately.

LINE REACTORS

Line reactors, also referred to as chokes, are passive-power conditioning devices. Reactors are most often applied to correct or prevent power-line problems inherent in ASD applications. When applied to the input of a drive, the line reactor is intended to protect the input of the drive from power-line problems or vice versa.

Applying line reactors is simple. There are two factors to consider when selecting the amperage percent impedance for an application. For amperage, the line reactor must meet or exceed the current flow requirements of the application. The percent impedance indicates the expected voltage drop across the reactor at full load. For instance, if the input voltage is 480 VAC a 5% impedance line reactor is applied, a 13.86 volt drop [(480 x .05)/1.73] will occur with a resultant 466 VAC output.

TYPICAL APPLICATIONS

INPUT

- Reducing reflected harmonics to the power-line
- High ratios between point of common coupling (PCC) ASD's power capacity
- Example: A pad-mounted transformer has a capacity of 1000 KVA, the ASD has a capacity of 11 KVA (10 HP) for a ratio of 90:1 (stiff line). Toshiba suggests that a line reactor be used where the ratio is greater than 20:1.

  Nuisance trips due to line voltage spikes can be minimized, as the line reactor will reduce the magnitude duration of the transients.

OUTPUT

- Adding inductance to a low impedance motor
- Excessively long motor lead-lengths must be addressed with a long lead length filter

230 V, 3% IMPEDANCE IN A NEMA 1 ENCLOSURE							
Amps	HP	Model Number	Dimensions H X W X D (in.)			Weight (lbs.)	List Price
4	0.75	101063	6.5	8.0	6.0	3	$265
6	1	101064	6.5	8.0	6.0	3	$280
8	2	101065	6.5	8.0	6.0	3	$285
12	3	101066	6.5	8.0	6.0	3	$300
16	5	101067	6.5	8.0	6.0	7	$375
25	7.5	101070	7.5	10.0	7.0	8	$420
35	10	101072	7.5	10.0	7.0	8	$460
55	15	101074	7.5	10.0	7.0	11	$510
80	20	101075	9.0	12.0	8.0	22	$680
110	40	101076	15.5	15.0	13.0	26	$880
130	50	101077	15.5	15.0	13.0	33	$1090
160	60	101078	15.5	15.0	13.0	47	$1,265
230 V, 6% IMPEDANCE IN A NEMA 1 ENCLOSURE							
3	0.75	PC34093P001	6.5	8.0	6.0	3	$265
6	1	PC34093P003	6.5	8.0	6.0	3	$300
8	2	PC34093P005	6.5	8.0	6.0	3	$300
12	3	PC34093P007	6.5	8.0	6.0	6	$310
16	5	PC34093P010	6.5	8.0	6.0	7	$365
25	7.5	PC34093P015	7.5	10.0	7.0	11	$465
35	10	PC34093P025	7.5	10.0	7.0	14	$495
55	15	PC34093P040	9.0	12.0	8.0	22	$660
80	20	PC34093P060	15.5	15.0	13.0	26	$880
110	40	PC34093P075	15.5	15.0	13.0	33	$1,100
130	50	PC34093P100	15.5	15.0	13.0	47	$1,180
160	60	PC34093P125	15.5	15.0	13.0	50	$1,375

Delivery: Three to five weeks.

230 V, 3% IMPEDANCE OPEN STYLE							
Amps	HP	Model Number	Dimensions H X W X D (in.)			Weight (lbs.)	List Price
4	0.75	PC34094P000	4.0	5.0	4.0	3	$160
6	1	PC34094P001	4.0	5.0	4.0	3	$165
8	2	PC34094P002	4.0	5.0	4.0	3	$175
12	3	PC34094P003	4.0	5.0	4.0	3	$195
16	5	PC34094P005	5.0	6.0	4.0	7	$275
25	7.5	PC34094P007	6.0	7.0	4.0	8	$290
35	10	PC34094P010	6.0	7.0	4.0	8	$300
55	15	PC34094P020	5.8	8.0	5.0	11	$350
80	20	PC34094P030	7.0	9.0	6.0	22	$465
110	40	PC34094P040	7.0	10.0	7.0	26	$655
130	50	PC34094P050	9.0	11.0	7.0	33	$725
160	60	PC34094P060	9.0	11.0	7.0	47	$905
230 V, 6% IMPEDANCE OPEN STYLE							
3	0.75	PC34095P001	4.0	4.3	3.0	3	$220
6	1	PC34095P003	4.0	4.3	3.0	3	$260
8	2	PC34095P005	4.0	5.0	4.0	3	$260
12	3	PC34095P007	5.0	7.0	5.0	6	$280
16	5	PC34095P010	5.0	6.0	4.0	7	$310
25	7.5	PC34095P015	5.8	8.0	5.0	11	$325
35	10	PC34095P025	5.8	8.0	5.0	14	$350
55	15	PC34095P040	7.0	9.0	6.0	22	$500
80	20	PC34095P060	9.0	11.0	6.0	31	$600
110	40	PC34095P075	9.0	11.0	7.0	39	$800
130	50	PC34095P100	9.0	11.0	8.0	48	$900
160	60	PC34095P125	9.0	11.0	8.0	50	$1,100
Delivery: Three to five weeks.							

460 V, 3% IMPEDANCE IN A NEMA 1 ENCLOSURE							
Amps	HP	Model Number	Dimensions H X W X D (in.)			Weight (lbs.)	List Price
3	1	PC34093P001	6.5	8.0	6.0	3	$265
4	2	PC34093P002	6.5	8.0	6.0	3	$265
6	3	PC34093P003	6.5	8.0	6.0	3	$300
12	7.5	PC34093P007	6.5	8.0	6.0	6	$310
16	10	PC34093P010	6.5	8.0	6.0	7	$365
18	10	101051	7.5	10.0	7.0	11	$420
25	15	PC34093P015	7.5	10.0	7.0	11	$465
35	20 to 25	PC34093P025	7.5	10.0	7.0	14	$495
45	30	PC34093P030	7.5	10.0	7.0	14	$550
55	40	PC34093P040	9.0	12.0	8.0	22	$660
80	50	PC34093P060	15.5	15.0	13.0	31	$880
110	60	PC34093P075	15.5	15.0	13.0	39	$1,100
130	75	PC34093P100	15.5	15.0	13.0	48	$1,180
160	100	PC34093P125	15.5	15.0	13.0	50	$1,375
200	125	PC34093P150	18.5	20.0	16.0	86	$1,585
250	150	PC34093P200	18.5	20.0	16.0	91	$1,905
300	200	101054	18.5	20.0	16.0	101	$2,090
360	250	PC34093P250	18.5	20.0	16.0	90	$2,200
420	300	PC34093P300	18.5	20.0	16.0	100	$2,365
480	350	PC34093P400	18.5	20.0	16.0	115	$2,575
600	400	PC34093P500	18.5	20.0	16.0	151	$3,080
750	500	101055	36.0	28.5	30.3	283	$4,840
850	700	101056	36.0	28.5	30.3	290	$5,280
950	800	101057	36.0	28.5	30.3	295	$5,830

Delivery: Three to five weeks.

460 V, 3% IMPEDANCE OPEN STYLE							
Amps	HP	Model Number	Dimensions H X W X D (in.)			Weight (lbs.)	List Price
3	1	PC34095P001	4.0	4.3	3.0	3	$220
4	2	PC34095P002	4.0	4.3	3.0	3	$220
6	3	PC34095P003	4.0	4.3	3.0	3	$260
8	5	PC34095P005	4.0	5.0	4.0	3	$260
12	7.5	PC34095P007	5.0	7.0	5.0	6	$280
16	10	PC34095P010	5.8	6.0	4.0	7	$310
25	15	PC34095P015	5.8	8.0	5.0	11	$325
35	20 to 25	PC34095P025	5.8	8.0	5.0	14	$350
45	30	PC34095P030	5.8	8.0	5.0	14	$450
55	40	PC34095P040	7.0	9.0	6.0	22	$500
80	50	PC34095P060	9.0	11.0	6.0	31	$600
110	60	PC34095P075	9.0	11.0	7.0	39	$800
130	75	PC34095P100	9.0	11.0	8.0	48	$900
160	100	PC34095P125	9.0	11.0	8.0	50	$1,100
200	125	PC34095P150	11.4	14.0	8.0	86	$1,200
250	150	PC34095P200	11.4	14.0	8.0	91	$1,600
300	200	PC34095P240	11.4	14.0	8.0	101	$1,800
360	250	PC34095P250	11.4	14.0	8.0	98	$1,900
420	300	PC34095P300	11.4	14.0	8.0	100	$2,000
480	350	PC34095P400	11.4	15.0	11.0	115	$2,300
600	400	PC34095P500	11.4	15.0	13.0	151	$2,750
750	500	CF	17.3	16.9	10.3	283	$4,200
850	700	CF	17.3	16.9	10.3	290	$4,700
950	800	CF	17.3	16.9	10.3	295	$5,300
Delivery: Three to five weeks.							

460 V, 5% IMPEDANCE IN A NEMA 1 ENCLOSURE							
Amps	HP	Model Number	Dimensions H X W X D (in.)			Weight (lbs.)	List Price
3	1	PC34096P001A	6.5	8.0	6.0	3	$270
4	2	PC34096P002	6.5	8.0	6.0	3	$270
6	3	PC34096P003	6.5	8.0	6.0	6	$330
12	7.5	PC34096P008	6.5	8.0	6.0	6	$375
16	10	PC34096P010	7.5	10.0	7.0	12	$495
18	10	101058	7.5	10.0	7.0	12	$505
25	15	PC34096P015	7.5	10.0	7.0	14	$515
35	20 to 25	PC34096P025	9.0	12.0	8.0	22	$685
45	30	PC34096P030	9.0	12.0	8.0	24	$750
55	40	PC34096P040	15.5	15.0	13.0	48	$1,130
80	50	PC34096P050	15.5	15.0	13.0	48	$1,130
110	60	PC34096P075	15.5	15.0	13.0	50	$1,265
130	75	PC34096P100	18.5	20.0	16.0	81	$1,485
160	100	PC34096P125	18.5	20.0	16.0	84	$1,650
200	125	PC34096P150	18.5	20.0	16.0	110	$1,870
250	150	PC34096P200	18.5	20.0	16.0	91	$2,380
300	200	PC34096P250	18.5	20.0	16.0	122	$2,555
360	250	PC34096P300	18.5	20.0	16.0	156	$2,750
420	300	101144	18.5	20.0	16.0	160	$3,080
480	350	PC34096P400	18.5	20.0	16.0	175	$3,740
600	400	101048	36.0	28.5	30.3	275	$4,425
750	500	PR00098P22	36.0	28.5	30.3	295	$5,325
850	700	101049	36.0	28.5	30.3	300	$5,900
950	800	101145	36.0	28.5	30.3	300	$6,700

Delivery: Three to five weeks.

460 V, 5% IMPEDANCE OPEN STYLE							
Amps	HP	Model Number	Dimensions H X W X D (in.)			Weight (lbs.)	List Price
3	1	PC34097P001A	4.0	5.0	4.0	3	$240
4	2	PC34097P002	4.0	5.0	4.0	4	$240
6	3	PC34097P003	5.0	7.0	5.0	6	$290
8	5	PC34097P005	5.0	7.0	5.0	6	$290
12	7.5	PC34097P008	5.0	7.0	5.0	6	$330
16	10	PC34097P010	5.8	8.0	5.0	12	$375
25	15	PC34097P015	5.8	8.0	5.0	14	$385
35	20 to 25	PC34097P025	7.0	9.0	6.0	22	$520
45	30	PC34097P030	7.0	9.0	6.0	24	$590
55	40	PC34097P040	9.0	11.0	6.0	32	$625
80	50	PC34097P060	9.0	11.0	7.0	48	$850
110	60	PC34097P075	11.4	15.0	8.0	50	$1,000
130	75	PC34097P100	11.4	15.0	8.0	81	$1,200
160	100	PC34097P125	11.4	15.0	8.0	84	$1,350
200	125	PC34097P150	11.4	15.0	8.0	110	$1,650
250	150	PC34097P200	11.4	15.0	10.0	115	$2,200
300	200	PC34097P250	11.4	15.0	11.0	122	$2,350
360	250	PC34097P300	11.4	15.0	11.0	156	$2,500
420	300	CF	11.4	15.0	13.0	160	$2,700
480	350	PC34097P400	11.4	15.0	13.0	175	$3,500
600	400	PC34097P450	17,3	16.9	10.3	275	$3,750
750	500	PC34097P500	17,3	16.9	10.3	295	$4,300
850	700	PC3497P700	17,3	16.9	10.3	300	$5,325
950	800	CF	17,3	16.9	10.3	305	$6,000
Delivery: Three to five weeks.							

575 V, 3% IMPEDANCE IN A NEMA 1 ENCLOSURE							
Amps	HP	Model Number	Dimensions H X W X D (in.)			Weight (lbs.)	List Price
8	5	101115	6.5	8.0	6.0	7	$265
12	10	101116	6.5	8.0	6.0	7	$290
18	15	101118	7.5	10.0	7.0	12	$410
25	20	101120	7.5	10.0	7.0	12	$420
27	25	101121	7.5	10.0	7.0	12	$440
35	30	101122	7.5	10.0	7.0	16	$465
45	40	101123	9.0	12.0	8.0	26	$530
55	50	101124	9.0	12.0	8.0	24	$565
80	60	101125	15.5	15.0	13.0	49	$825
80	75	101125	15.5	15.0	13.0	49	$825
110	100	101126	15.5	15.0	13.0	49	$1,102
130	125	101127	15.5	15.0	13.0	47	$1,190
160	150	101128	15.5	15.0	13.0	47	$1,265
200	200	101129	18.5	20.0	16.0	86	$1,375
250	250	101130	18.5	20.0	16.0	91	$1,510
575 V, 5% IMPEDANCE IN A NEMA 1 ENCLOSURE							
8	5	101094	6.5	8.0	6.0	7	$345
12	10	101095	7.5	10.0	7.0	8	$375
18	15	101097	7.5	10.0	7.0	12	$495
25	20	101099	9.0	12.0	8.0	17	$510
27	25	101100	9.0	12.0	8.0	17	$540
35	30	101101	9.0	12.0	8.0	23	$620
45	40	101102	15.5	15.0	13.0	26	$690
55	50	101103	15.5	15.0	13.0	33	$915
80	60	101104	15.5	15.0	13.0	49	$1,130
80	75	101104	15.5	15.0	13.0	49	$1,130
110	100	101105	18.5	20.0	16.0	53	$1,265
130	125	101106	18.5	20.0	16.0	88	$1,485
160	150	101107	18.5	20.0	16.0	95	$1,620
200	200	101108	18.5	20.0	16.0	110	$1,870
250	250	101109	18.5	20.0	16.0	115	$2,380
300	300	101110	18.5	20.0	16.0		$2,560

Delivery: Three to five weeks.

575 V, 3% IMPEDANCE OPEN STYLE					
Amps	HP	Model Number	Dimensions H X W X D (in.)	Weight (lbs.)	List Price
8	5	Consult factory			$265
12	10				$290
18	15				$410
25	20				$420
27	25				$440
35	30				$465
45	40				$530
55	50				$565
80	60				$825
80	75				$825
110	100				$1,102
130	125				$1,090
160	150				$1,265
200	200				$1,375
250	250				$1,510
575 V, 5% IMPEDANCE OPEN STYLE					
8	5	Consult factory			$345
12	10				$375
18	15				$495
25	20				$510
27	25				$540
35	30				$620
45	40				$690
55	50				$915
80	60				$1,130
80	75				$1,130
110	100				$1,265
130	125				$1,485
160	150				$1,620
200	200				$1,870
250	250				$2,380
Delivery: Three to five weeks.					

INSTALLED AC LINE REACTORS				
Option Code	230 V Power Rating	460 V Power Rating	3% Impedance List Price	5% Impedance List Price
R3/R5	-	1 HP	$360	$385
	0.75-1 HP	2 HP	$385	$440
	-	3 HP	$415	$495
	2 HP	5 HP	$440	$550
	3 HP	7.5 HP	$550	$660
	5 HP	10 HP	$605	$715
	7.5 HP	15 HP	$660	$825
	10 HP	20 HP	$715	$935
	-	25 HP	$770	$990
	15 HP	30 HP	$825	$1,045
	20 HP	40 HP	$880	$1,250
	25 HP	50 HP	$1,100	$1,320
	30 HP	60 HP	$1,375	$1,650
	40 HP	75 HP	$1,485	$1,760
	50 HP	100 HP	$1,650	$1,925
	60 HP	125 HP	$1,925	$2,200
	75 HP	150 HP	$2,200	$2,750
	100 HP	200 HP	$2,750	$3,025
	125 HP	250 HP	$3,000	$3,575
	-	300 HP	$3,300	$3,850
	-	350 HP	$3,800	$4,950
	-	400 HP	$4,000	$5,500
	-	500 HP	$6,000	$6,500
	-	600 HP	$7,000	$7,500
	-	700 HP	$8,000	$9,000
	-	800 HP	$9,000	$10,000
	-	900 HP	$12,000	$13,500
	-	1000 HP	$13,200	$14,500
	-	1200 HP	$14,400	$16,000
	-	1400 HP	$16,800	$18,500
	-	1500 HP	$19,200	$21,500

Delivery: Add two weeks to basic assembly unit lead time.

LONG LEAD FILTERS

Long lead filters are designed for applications with long motor leads between IGBT-switched variable frequency drives motors. Typical installations include deep wells, process lines, conveyor systems. Refer to the Operating Maintenance Manual for guidelines.

Long lead filters are current-rated devices. Therefore, know the total motor load on the ASD for proper application. They are to be wired directly to the drive installed adjacent to the output terminals. Installing the filters anywhere else in the circuit will negatively affect performance.

For 230 V applications, refer to the FLA rating or double the HP for proper sizing. For instance, a 20 HP/230 V application would require a 40 HP/460 V long lead filter. Refer to your operation manual for instructions on how to change the carrier frequency carrier frequency limitations.

460 V FOR MOTOR LEAD LENGTHS UP TO 3000 FT. 8 KHz MAXIMUM CARRIER FREQUENCY IN A NEMA 1 ENCLOSURE							
FLA	HP	Model Number	Dimensions H X W X D (in.)			Weight (lbs.)	List Price
4	1 to 2	PR00100P22	6.5	8.0	6.0	8	$730
6	3	PR00101P22	6.5	8.0	6.0	8	$750
8	5	PR00102P22	6.5	8.0	6.0	8	$775
12	7.5	PR00103P22	6.5	8.0	6.0	8	$795
16	10	PR00104P22	6.5	8.0	6.0	11	$805
25	15	PR00105P22	7.5	10.0	7.0	16	$870
35	20 to 25	PR00106P22	7.5	10.0	7.0	17	$895
45	30	PR00107P22	7.5	10.0	7.0	17	$915
55	40	PR00108P22	9.0	12.0	8.0	18	$1,005
80	50 to 60	PR00109P22	9.0	12.0	8.0	31	$1,290
110	75	PR00110P22	16	15.0	13.0	58	$1,760
130	100	PR00111P22	16	15.0	13.0	58	$1,925
160	125	PR00112P22	16	15.0	13.0	70	$2,145
200	150	PR00113P22	16	15.0	13.0	74	$2,230
250	200	PR00114P22	16	15.0	13.0	82	$2,255
300	250	PR00115P22	19	20.0	16.0	106	$2,420
360	300	PR00116P22	19	20.0	16.0	117	$2,695
480	350 to 400	PR00117P22	19	20.0	16.0	142	$3,850
600	450	PR00118P22	19	20.0	16.0	148	$4,400
750	500	CF	13	15	15	325	$10,500
Delivery: Three to five weeks.							

Notes:
- Consult factory for installed pricing.

MISCELLANEOUS OPTIONS		
Model Number	Description	List Price
PC25100P201	• 0 to 1 mA Input to 4 to 20 mA output isolation transducer • Mounts externally to ASD	$510
PC25100P203	• 3 to 15 PSI Input to 4 to 20 mA output transducer • Mounts externally to ASD	$580
PC25100P204	• 4 to 20 mA Input to 4 to 20 mA output isolation transducer • Mounts externally to ASD	$510
PC25100P205	• 0 to 3, 8, 10 VDC input to 4 to 20 mA output transducer • Mounts externally to ASD	$550
PC41270P001	• Speed pot, 10-Turn, 2.0 KΩ, 2 Watt	$220
101211	• Signal isolator module	$320
PC20011P805	• Socket base for signal isolator module	$8
Delivery: Stock to three weeks.		

Notes:
- Consult factory for installed pricing.

T300MVi — NEMA 1

The T300MVi medium voltage adjustable speed drive is the most advanced drive in the industry. No other drive in the market offers the latest PWM five-level design technology, which allows for a small footprint, reduced component count, and ultimately, lower costs. The T300MVi can be retrofitted into any installation using the existing motors and is compatible with all power systems. In addition, it incorporates all of the latest safety technology, making it one of the safest designs on the market.

SPECIFICATIONS

CONTROL

- 24-Pulse Input[1]
- Five-Level PWM Output[2]
- Soft Stall (Load Reduction Control During Overload Conditions)
- Auto-Restart
- Five-Cycle Ride-Through
- Power Supply Failure Restart with Gate Shutoff to 10 Seconds
- Sync Transfer Control
- V/Hz, Sensor-Less Vector, Closed-Loop Vector, CT, VT
- Acceleration/Deceleration 1 to 6000 Seconds
- 115% (Typical) Overload for 60 Seconds[3] (Higher Overload Rating Available; Consult Factory)

FREQUENCY SETTING SIGNAL

- Standard Rotary Encoder and Up/Down Arrows on EOI
- Two 0 to 10 VDC Input, 4 to 20 mA (Optional)
- Serial Communication Input

COMMUNICATIONS

- Communication Options: Tosline-F10, Tosline-S20, DeviceNet, Modbus TCP/IP, Modbus RTU, Ethernet, Profibus

STANDARDS

- ANSI
- NEMA
- UL/cUL

CONTROL INPUT & OUTPUT

- Eight 24 VDC Digital Inputs (120 VAC Optional)
- Six 24 VDC Digital Outputs (120 VAC Optional)
- Two 0 to 10 VDC Analog Inputs (4 to 20 mA Optional)
- Eight 0 to 10 VDC Analog Outputs (4 to 20 mA Optional)

PERFORMANCE

- IEEE 519-1992 Compliant 24-Pulse Operation — No Need for Filters
- Frequency Regulation ±0.5%
- Master-Follower Control (Optional)
- Sync-Xfer Technology (Optional)
- Typical Efficiency — 2400 V @ 98%; 4160 V @ 96.5%

EOI & FEATURES

- Backlit Full-English LCD Display
- Overheat, Load-Side Short-Circuit, Load-Side Ground Fault, ASD Overload, Overcurrent During Start-Up, EEPROM Error, RAM Error, ROM Error, Communications Error, Arm Short for Each Phase (Emergency Stop, Undervoltage, Overtorque, Open-Output Phase, Motor Overload can be Selected or Deselected)
- LED Charge Indicator
- Protective Functions : Stall Prevention, Current Limit, Overcurrent, Overvoltage, Load-Side Short-Circuit, Load-Side Ground Fault, Undervoltage, Momentary Power Failure, Regeneration Power Ride-Through, Electronic Thermal Overload Protection, Overcurrent During Startup, Heatsink Overheat, Emergency-Off, Open Output Phase, Arm Short for Each Phase

Notes:

1. 36-Pulse @ 4160 V, 7000 HP & Above; @ 6600 V, 5000 HP & Above
2. 2400 V Drives are Three-Level
3. For 1000, 2000, & 6000 HP @ 4160 V, Overload is 110%

PART NUMBERING CONVENTION

The T300MVi can be configured with commonly-used options for an easy-to-install, turn-key package. See the chart below for available configurations. Custom packages are available upon request. The T300MVi includes a ground lug and customer terminal block. Drawings supplied by CASD. The example, M3A44050SAAHS, shows a standard duty T300MVi, 500 HP, 4160 V input, 4160 V output with Input disconnect, cooling fan power, and motor heater control.

Example Part Number:	M3 M32	A	X	4	4	050	S	AA/AE	HS

Series:
M3 — 1st Generation
M32 — 2nd Generation

Input Frequency:
A — 60 Hz
B — 50 Hz

Type:
BLANK — For 2400 V, 3300 V, & 4160 V Drives Under Frame 4
P — For G4P & H4P
S — For 6600 V Drives
R — For Regen Module Drives

Input Voltage:

2 — 2400	6 — 6600	F — 12470
3 — 3300	C — 6900	G — 13200
4 — 4160	D — 8320	H — 13800
A — 4800	E — 12000	Z — OTHER

Output Voltage:

2 — 2400	4 — 4160	X — OTHER
3 — 3300	6 — 6600	

Output Rated Capacity

030 — 300 HP	150 — 1500 HP	500 — 5000 HP
040 — 400 HP	175 — 1750 HP	550 — 5500 HP
050 — 500 HP	200 — 2000 HP*	600 — 6000 HP*
060 — 600 HP	225 — 2250 HP	700 — 7000 HP
070 — 700 HP	250 — 2500 HP	800 — 8000 HP
080 — 800 HP	300 — 3000 HP	900 — 9000 HP
090 — 900 HP	350 — 3500 HP	10K — 10000 HP
10E — 1000 HP*	400 — 4000 HP	
125 — 1250 HP	450 — 4500 HP	

Duty Rating:
S — Standard (115% OL Rating)

Configuration:	ID:	CP:	BYP:
AA —	X	X	
AB —	X		
AC —		X	
AD —			
AE —	X	X	X
AF —	X		X
AG —		X	X
AH —			X

ID — Input Disconnect
CP — Cooling Fan Power
BYP — Isolated Across-the-Line Starter

Additional Functions: Options should be entered in alphabetical order. If smart part number is longer than two options, replace all options with a "-1." List all options with descriptions for ease of understanding

Notes:
- * 1000 HP, 2000 HP, & 6000 HP has 110% OL rating

T300MVI PRICING & DIMENSIONS

T300MVI — 2400 VAC OUTPUT											
HP	FLA	Model Number	Frame	List Price		Dimensions (in.)				Weight (lb)	
						H	W		D		
				AA	AE[1]		AA	AE		AA	AE
300	64	M32A22030S	A2	$223,000	$268,000	103.7	48	78	48	6,700	8,700
350	75	M32A22035S	A2	$230,000	$274,000	103.7	48	78	48	6,700	8,700
400	86	M32A22040S	A2	$231,000	$276,000	103.7	48	78	48	6,700	8,700
450	97	M32A22045S	A2	$234,000	$279,000	103.7	48	78	48	6,700	8,700
500	107	M32A22050S	A2	$227,000	$272,000	103.7	48	78	48	6,700	8,700
600	129	M32A22060S	B2	$262,000	$307,000	103.7	74	104	43.4	8,300	10,300
700	150	M32A22070S	B2	$263,000	$308,000	103.7	74	104	43.4	8,300	10,300
800	172	M32A22080S	B2	$271,000	$315,000	103.7	74	104	43.4	8,300	10,300
900	193	M32A22090S	B2	$276,000	$321,000	103.7	74	104	43.4	8,300	10,300
1000	215	M32A22100S	B2	$290,000	$334,000	103.7	74	104	43.4	8,300	10,300
1250	269	M32A22125S	D2	$363,000	$411,000	103.7	122	152	43.4	17,500	19,500
1500	322	M32A22150S	D2	$374,000	$422,000	103.7	122	152	43.4	17,500	19,500
1750	376	M32A22175S	D2	$399,000	$458,000	103.7	122	156	43.4	17,500	20,500
2000	430	M32A22200S	D2	$440,000	$499,000	103.7	122	156	43.4	17,500	20,500
2250	504	M32A22225S	4	$631,000	$700,000	103.7	222	258	49.5	33,000	36,000
2500	537	M32A22250S	4	$639,000	$709,000	103.7	222	258	49.5	33,000	36,000
3000	645	M32A22300S	4	$652,000	$721,000	103.7	222	258	49.5	33,000	36,000

1. Bypass Starter pricing is based on fixed contactors (not rack-out type).

Notes:

- HP ratings above are for typical 4-pole motors.
- Dimensions do not include space required for clearance for airflow, door operation, etc.
- Frames A2, B2, and D2 drives with redundant fan option will increase in height by 7” over the standard model.
- Weights and dimensions are subject to change.

T300MVi — 3300 VAC OUTPUT												
HP	FLA	Model Number	Frame	List Price		Dimensions (in.)					Weight (lb.)	
						H	W		D			
				AA	AE[1]		AA	AE	AA	AE	AA	AE
300	47	M32A33030S	A4µ	$295,000	$340,000	103.7	48	78	48	48	8,300	9,400
400	63	M32A33040S	A4µ	$300,000	$345,000	103.7	48	78	48	48	8,300	9,400
500	78	M32A33050S	A4	$303,000	$348,000	103.7	60	90	48	48	8,300	9,400
600	94	M32A33060S	A4	$304,000	$348,000	103.7	60	90	48	48	8,300	9,400
700	109	M32A33070S	A4	$323,000	$367,000	103.7	60	90	48	48	8,300	9,400
800	125	M3A33080S	1	$362,000	$410,000	103.7	122	152	43.4	43.4	12,500	13,600
900	141	M3A33090S	1	$362,000	$410,000	103.7	122	152	43.4	43.4	12,500	13,600
1000	156	M3A3310ES	1	$411,000	$459,000	103.7	122	152	43.4	43.4	12,500	13,600
1250	195	M3A33125S	1	$414,000	$462,000	103.7	122	152	43.4	43.4	12,500	13,600
1500	234	M3A33150S	1	$423,000	$471,000	103.7	122	152	43.4	43.4	12,500	13,600
1750	273	M3A33175S	2	$566,000	$614,000	103.7	164	194	49.5	49.5	16,500	17,600
2000	310	M3A33200S	2	$574,000	$622,000	103.7	164	194	49.5	49.5	16,500	17,600
2250	352	M3A33225S	3	$707,000	$766,000	103.7	174	210	49.5	49.5	22,500	25,300
2500	391	M3A33250S	3	$717,000	$776,000	103.7	174	210	49.5	49.5	22,500	25,300
3000	469	M3A33300S	4	$880,000	$949,000	103.7	222	258	49.5	49.5	30,000	32,800
3500	547	M3A33350S	4	$895,000	$964,000	103.7	222	258	49.5	49.5	30,000	32,800
4000	625	M3A33400S	4	$927,000	$996,000	103.7	222	258	49.5	49.5	30,000	32,800
4500	703	M3A33450S	4	$948,000	$1,020,000	103.7	222	273	49.5	49.5	30,000	32,800
5000	780	M3A33500S	G4P[2]	$1,320,000	$1,590,000	103.7	307.5	379.5	60	84	44,500	56,500
5500	858	M3A33550S	G4P	$1,320,000	$1,590,000	103.7	307.5	379.5	60	84	44,500	56,500
6000	936	M3A33600S	H4P[3]	$1,860,000	$2,130,000	103.7	402.5	474.5	60	84	69,500	81,500
7000	1092	M3AP33700S	H4P	$1,890,000	$2,170,000	103.7	402.5	474.5	60	84	69,500	81,500
8000	1240	M3AP33800S	H4P	$1,930,000	$2,200,000	103.7	402.5	474.5	60	84	69,500	81,500

1. Bypass Starter pricing is based on fixed contactors (not rack-out type)
2. Frame G4P — contact factory for update on UL status
3. Frame H4P — contact factory for update on UL status

Notes:
- HP ratings above are for typical 4-pole motors
- Dimensions do not include space required for clearance for airflow, door operation, etc.
- Frame 1 drives with redundant fan option will increase in height by 7” over the standard model
- Weights and Dimensions are subject to change

T300MVi — 4160 VAC OUTPUT												
HP	FLA	Model Number	Frame	List Price		Dimensions (in.)					Weight (lb.)	
						H	W		D			
				AA	AE[1]		AA	AE	AA	AE	AA	AE
300	37	M32A44030S	A4µ	$274,000	$318,000	103.7	48	78	48	48	8,300	9,400
400	50	M32A44040S	A4µ	$295,000	$340,000	103.7	48	78	48	48	8,300	9,400
500	62	M32A44050S	A4µ	$300,000	$345,000	103.7	48	78	48	48	8,300	9,400
600	74	M32A44060S	A4µ	$300,000	$345,000	103.7	48	78	48	48	8,300	9,400
700	87	M32A44070S	A4	$303,000	$348,000	103.7	60	90	48	48	8,300	9,400
800	99	M32A44080S	A4	$304,000	$349,000	103.7	60	90	48	48	8,300	9,400
900	112	M32A44090S	A4	$323,000	$367,000	103.7	60	90	48	48	8,300	9,400
1000	124	M32A4410ES*	A4	$328,000	$372,000	103.7	60	90	48	48	8,300	9,400
1250	155	M3A44125S	1	$362,000	$410,000	103.7	122	152	43.4	43.4	12,500	13,600
1500	186	M3A44150S	1	$411,000	$459,000	103.7	122	152	43.4	43.4	12,500	13,600
1750	217	M3A44175S	1	$414,000	$462,000	103.7	122	152	43.4	43.4	12,500	13,600
2000	248	M3A44200S*	1	$423,000	$471,000	103.7	122	152	43.4	43.4	12,500	13,600
2250	279	M3A44225S	2	$566,000	$614,000	103.7	164	194	49.5	49.5	16,500	17,600
2500	310	M3A44250S	2	$574,000	$622,000	103.7	164	194	49.5	49.5	16,500	17,600
3000	372	M3A44300S	3	$707,000	$766,000	103.7	174	210	49.5	49.5	22,500	25,300
3500	434	M3A44350S	3	$717,000	$776,000	103.7	174	210	49.5	49.5	22,500	25,300
4000	496	M3A44400S	4	$880,000	$949,000	103.7	222	258	49.5	49.5	30,000	32,800
4500	558	M3A44450S	4	$895,000	$964,000	103.7	222	258	49.5	49.5	30,000	32,800
5000	620	M3A44500S	4	$912,000	$981,000	103.7	222	258	49.5	49.5	30,000	32,800
5500	682	M3A44550S	4	$927,000	$996,000	103.7	222	258	49.5	49.5	30,000	32,800
6000	744	M3A44600S[2]	4	$948,000	$1,020,000	103.7	222	258	49.5	49.5	30,000	32,800
7000	868	M3AP44700S	G4P[3]	$1,320,000	$1,590,000	103.7	307.5	379.5	60	84	44,500	56,500
8000	992	M3AP44800S	H4P[4]	$1,860,000	$2,130,000	103.7	402.5	474.5	60	84	69,500	81,500
9000	1,110	M3AP44900S	H4P	$1,890,000	$2,170,000	103.7	402.5	474.5	60	84	69,500	81,500
10,000	1,240	M3AP4410KS	H4P	$1,930,000	$2,200,000	103.7	402.5	474.5	60	84	69,500	81,500

1 = Bypass starter pricing is based on fixed contactors, not rack-out type.
2 = Bypass full-load current limited to 720 A.
3 = Frame G4P, contact factory for update on UL status.
4 = Frame H4P, contact factory for update on UL status

Notes:.

- * 1000 HP, 2000 HP, and 6000 HP have 110% OL rating.
- HP ratings above are for typical 4-pole motors
- Frame 1 drives with redundant fan option will increase in height by 7” over the standard model
- Weights and Dimensions are subject to change

T300MVi — 6600 VAC OUTPUT												
HP	FLA	Model Number	Frame	List Price		Dimensions (in.)					Weight (lb.)	
						H	W		D			
				AA	AE		AA	AE	AA	AE	AA	AE
300	23	M3AS66030S	A6Sμ	$383,600	$446,000	103.7	108	CF	48	CF	CF	CF
350	27	M3AS66035S	A6Sμ	$402,780	$465,780	103.7	108	CF	48	CF	CF	CF
400	31	M3AS66040S	A6Sμ	$413,000	$476,000	103.7	108	CF	48	CF	CF	CF
450	35	M3AS66045S	A6Sμ	$417,130	$480,130	103.7	108	CF	48	CF	CF	CF
500	39	M3AS66050S	A6Sμ	$420,000	$482,000	103.7	108	CF	48	CF	CF	CF
600	47	M3AS66060S	A6Sμ	$422,100	$483,000	103.7	108	CF	48	CF	CF	CF
700	55	M3AS66070S	A6Sμ	$424,200	$487,000	103.7	108	CF	48	CF	CF	CF
800	63	M3AS66080S	A6Sμ	$425,600	$488,000	103.7	108	CF	48	CF	CF	CF
900	70	M3AS66090S	A6S	$452,200	$514,000	103.7	138	CF	48	CF	CF	CF
1000	78	M3AS6601ES	A6S	$459,200	$521,000	103.7	138	CF	48	CF	CF	CF
1250	98	M3AS66125S	A6S	$506,800	$574,000	103.7	138	CF	48	CF	CF	CF
1500	117	M3AS66150S	A6S	$575,400	$643,000	103.7	138	CF	48	CF	CF	CF
1750	137	M3AS66175S	B6S	$579,600	$646,000	103.7	176	CF	48	CF	CF	CF
2000	156	M3AS66200S	B6S	$592,200	$659,000	103.7	176	CF	48	CF	CF	CF
2250	176	M3AS66225S	B6S	$792,400	$859,000	103.7	176	CF	48	CF	CF	CF
2500	195	M3AS66250S	B6S	$803,600	$870,000	103.7	176	CF	48	CF	CF	CF
3000	234	M3AS66300S	B6S	$989,800	$1,080,000	103.7	176	CF	48	CF	CF	CF
3500	273	M3AS66350S	C6S	$1,003,800	$1,090,000	103.7	234	CF	60	CF	CF	CF
4000	313	M3AS66400S	C6S	$1,232,000	$1,330,000	103.7	234	CF	60	CF	CF	CF
4500	352	M3AS66450S	D6S	$1,253,000	$1,350,000	103.7	265	CF	60	CF	CF	CF
5000	391	M3AS66500S	D6S	$1,276,800	$1,380,000	103.7	265	CF	60	CF	CF	CF
5500	430	M3AS66550S	F6S	$1,297,800	$1,400,000	103.7	304.5	CF	60	CF	CF	CF
6000	469	M3AS66600S	F6S	$1,327,200	$1,430,000	103.7	304.5	CF	60	CF	CF	CF
7000	547	M3AS66700S	F6S	$1,848,000	CF	103.7	304.5	CF	60	CF	CF	CF

Notes:

- CF = consult factory.
- HP ratings above are for typical 4-pole motors.
- Dimensions do not include space required for clearance for airflow, door operation, etc.
- Weights and dimensions are subject to change.

T300MVi OPTION PRICING

50 HZ

For 50 Hz, add 15% to the list price. Contact factory for update on UL status.

Example 1:
60 Hz: 4160 V Input and 4160 V Output: M32A44050S; 500 HP — list price: $300,000
50 Hz: 4160 V Input and 4160 V Output: M32B44050S; 500 HP — list price: $300,000 plus 15% = $345,000

8 to 15 KV INPUT

The HV input option gives users the ability to input 8 to 15 kV primary voltages directly to the drive transformer. This option pricing is available only as a price adder to the -AA and -AB style units. Published standard dimensions will increase 74" or 26" on width based on the selection of HV equipment.

- 74" section includes fused input disconnect switch, input contactor, soft charge circuit and PTs. This arrangement mimics the standard -AA drive but with HV input
- 26" section is comprised of a soft charge circuit without PTs. Input disconnects and fusing is supplied by the user. This arrangement mimics the -AD drive but with HV input. In this configuration, the customer is to provide 2 PTs in open delta configuration (120-0-120V) for input voltage monitoring at ASD (100 VA) and also external power 120 V, single-phase, 60 Hz - rated at 1 KVA

Notes:
- For Frames A2 and B2 on 2400 V and Frame A4µ and A4 on 3300 V and 4160 V: maximum allowed input voltage is 6600 V
- No bypass is available with this feature
- The price of the drive will increase by 10% to accommodate the HV windings
- In case of HV Input: Frame A4µ and A4 ASD will be in Frame 1 ASD; Frame A2 or B2 ASD will be in Frame D2 ASD enclosure due to the increase in size of the transformer
- For above mentioned frames, select ASD as below:

MV Frame	HV Input Frame	Price
Frame A2	Frame D2	Use 1250 HP (Frame D2) price + selected HV input price
Frame B2	Frame D2	Use 1250 HP (Frame D2) price + selected HV input price
Frame A4µ & A4	Frame 1	Use 1250 HP (Frame 1) price + selected HV input price
Frame 1 to 4	No Change	Drive price x 110% + selected HV option price
Frame D2	No Change	Drive price x 110% + selected HV option price

Option Code	Frame Size	Description	Price
D through Z (see matrix)	Frames 1 to 4 and D2	Up to 15 kV input — includes fused input disconnect, input breaker, soft charge circuit, and PT (add 74" to width)	$85,700
	Frames G4P & H4P	Up to 15 kV input — includes fused input disconnect, input breaker, soft charge circuit, and PTs (add 74" to width)	$97,800
	Frames 1 to 4 and D2	Up to 15 kV input without disconnect, load break switch or PTs (add 26" to width)	$26,800

Example 1: 500 HP, 13.8 kV input with 4160 V output. This is a Frame A4µ rating but will be housed in a Frame 1 (122") enclosure. Use the 1250 HP price of $362,000 and add the 74" section at $85,700. Total list price equals $447,700. Overall dimension will be 196" (122" + 74"). Part number will be M3AH4060SAA.

Example 2: 2500 HP, 12.4 kV input with 4160 output, load break switch is customer-supplied. This is a Frame 2 drive at 164". The 26" section has no PT, so control power is supplied from a separate power supply. The T300MVi price is $574,000 plus 10%, which equals $631,400. The 26" section is $26,800, for a total list price of $658,200. Part number will be M3AF4205SAB.

SYNC-XFER

Sync-Xfer is an exciting technological feature of the T300MVi. With Sync-Xfer, the T300MVi determines the utility line characteristics and transfers the motor supply power from variable speed to utility power via contactors. Additionally, it can pick up a motor from utility power and return it to variable speed.

Sync-Xfer can have a significant impact in lowering a system's cost in applications where multiple motors are controlled by one T300MVi and/or used for soft-starting duty only. Contact CASD for more details.

To price a Sync-Xfer option, you only need to add one output reactor per T300MVi and one contactor section for each motor. For 7000 to 10,000 HP, consult the factory.

Add one reactor per drive and one contactor section frame per motor.

Option Code	Description	Price
2400 V/ 3300 V/ 4160 V	• Output reactor frame A4µ/A4/A2 • One per drive	$11,550
	• Contactor section frame A4µ/A4/A2 • Add 30” per section • One section per motor - Add one 15” cable pull section $15,000	$44,550
	• Output reactor frame 1/B2 • One per drive	$13,475
	• Contactor section frame 1/B2 • Add 30” per section • One section per motor - Add one 15” cable pull section $15,000	$48,000
	• Output reactor frame 2/D2 (1250-1500HP)	$16,170
	• Contactor frame 2/D2 (1250-1500HP) • Add 30” per motor • For multiple motors, select the required additional section from below	$48,000
	• For multiple sections (total bus current up to 1200 A) • Add 54” for power cable pull section (15”) + ASD feed LBS (24”) + ASD output pull section (15”)	$30,000
	• For multiple sections (total bus current > 1200 A, up to 3000 A) • Add 69” for power cable pull section (30”) + ASD feed LBS (24”) + ASD output pull section (15”)	$42,000
	• Output reactor frame 3/D2 (1750-2000HP)	$18,480
	• Contactor frame 3/D2 (1750-2000HP) • Add 36” per motor • For multiple motors, select the required additional section from below	$59,000
	• For multiple sections (total bus current up to 1200 A) • Add 66” for power cable pull section (15”) + ASD feed LBS (36”) + ASD output pull section (15”)	$30,000
	• For multiple sections (total bus current > 1200 A, up to 3000 A) • Add 81” for power cable pull section (30”) + ASD feed LBS (36”) + ASD output pull section (15”)	$42,000
	• Output reactor frame 4 • Maximum output current allowed is 720 A	$23,100
	• Contactor Frame 4 • Add 36” per motor • For multiple motors, select the required additional section from below	$69,220
	• For multiple sections (total bus current up to 1200 A) • Add 66” for power cable pull section (15”) + ASD feed LBS (36”) + ASD output pull section (15”)	$30,000
	• For multiple sections (total bus current >1200 A, up to 3000 A) • Add 88” for power cable pull section (30”) + ASD feed LBS (36”) + ASD output pull section (15”)	$42,000
	• Output reactor frame G4P	CF
	• Bypass section for motors	CF
	• Output reactor frame H4P	CF
	• Bypass section for motors	CF

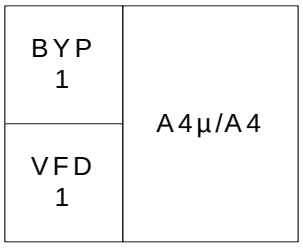
Option Code	Description	Price
6600 V	• Consult Factory	CF

Notes:

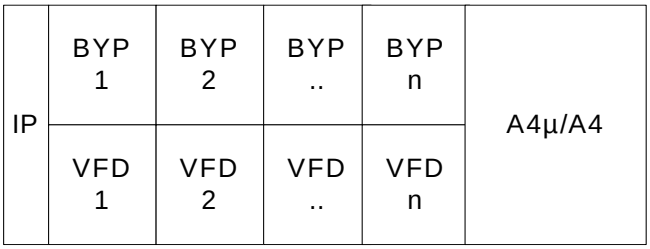
- In Sync-Xfer application, maximum bus current capacity is 3000 A
- Sync-Xfer lineups can be configured differently to meet site requirements; please consult factory. Above details are given as a primary guideline, not for construction. If the dimensions are critical, please consult factory.

TYPICAL LAYOUT FOR SYNC-XFER

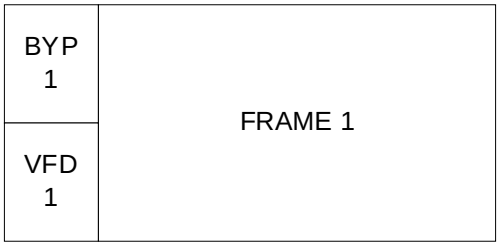
Frame A4µ/A4: Sync-Xfer Arrangement for Single Motor



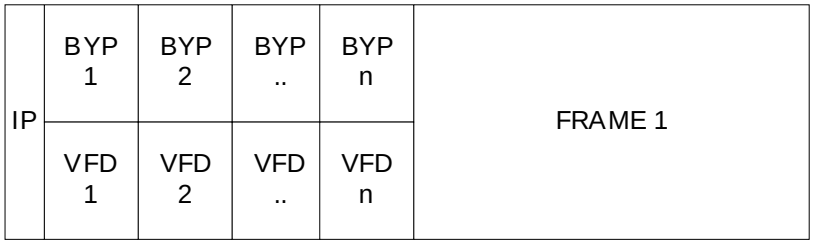
Frame A4µ/A4: Sync-Xfer Arrangement for Multiple Motors (max. 3000 Amps)



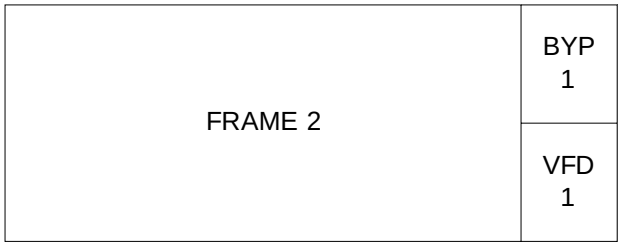
Frame 1: Sync-Xfer Arrangement for Single Motor



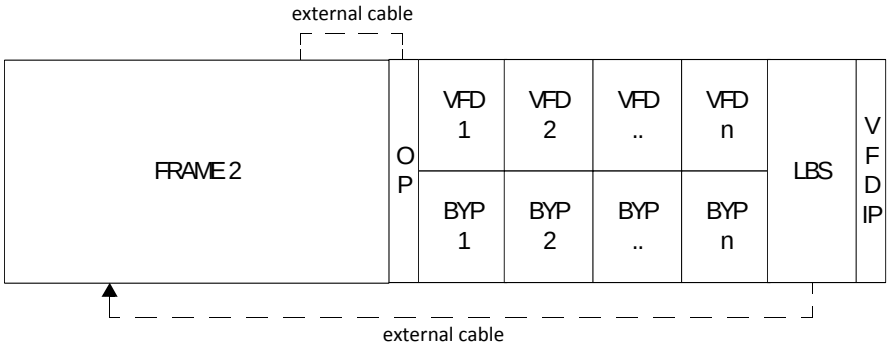
Frame 1: Sync-Xfer Arrangement for Multiple Motors (max. 3000 Amps)



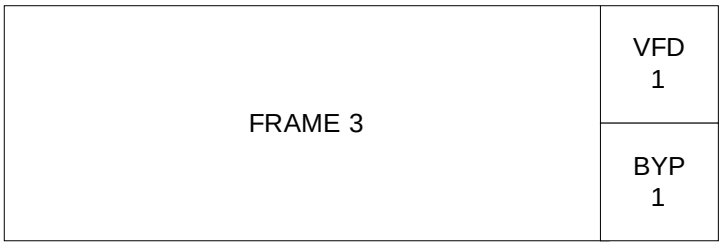
Frame 2: Sync-Xfer Arrangement for Single Motor



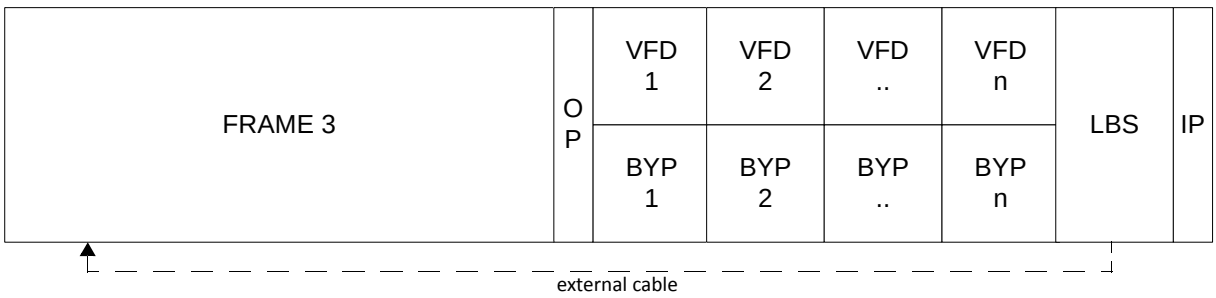
Frame 2: Sync-Xfer Arrangement for Multiple Motors (max. 3000 Amps)[1, 2]



Frame 3: Sync-Xfer Arrangement for Single Motor



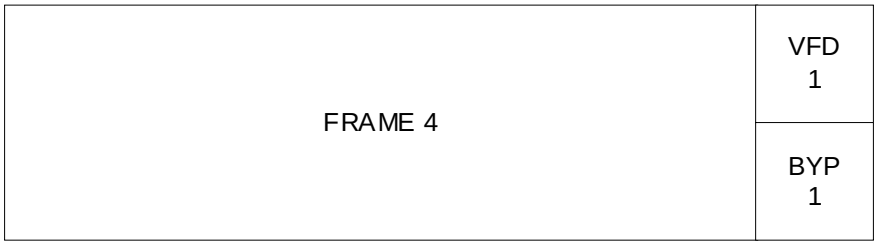
Frame 3: Sync-Xfer Arrangement for Multiple Motors (max 3000 Amps)[2]

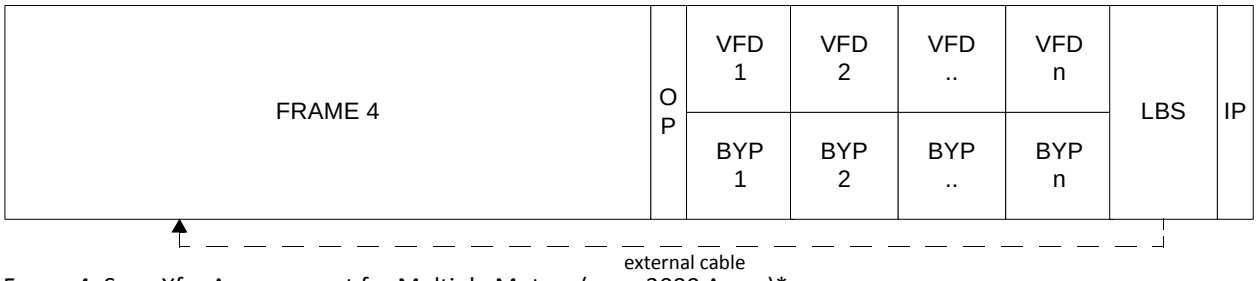


Notes:

- 1 = Additional 15” cabinet may be needed; Consult factory before ordering
- 2 = External cable by others

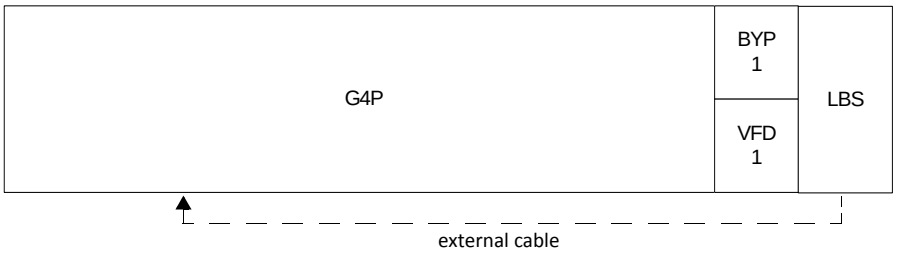
Frame 4: Sync-Xfer Arrangement for Single Motor

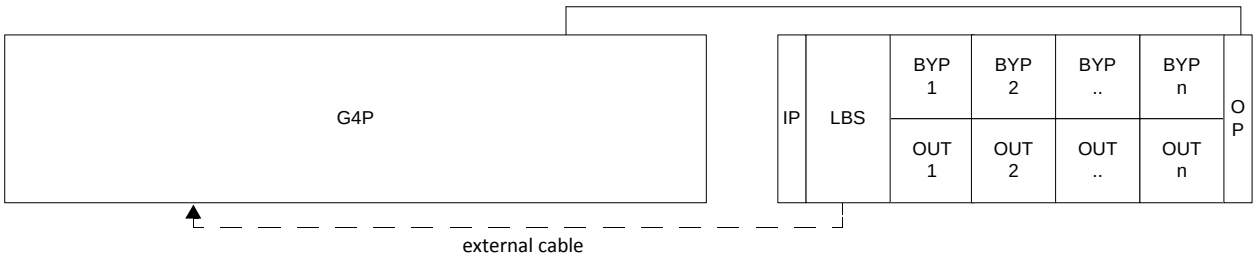




Frame 4: Sync-Xfer Arrangement for Multiple Motors (max. 3000 Amps)*

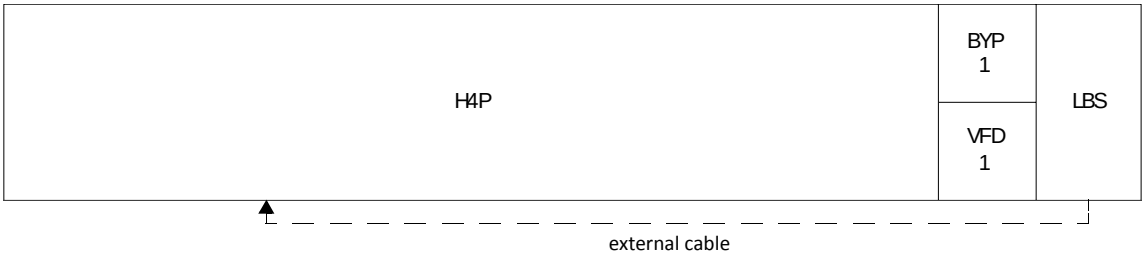
Frame G4P: Sync-Xfer Arrangement for Single Motor*



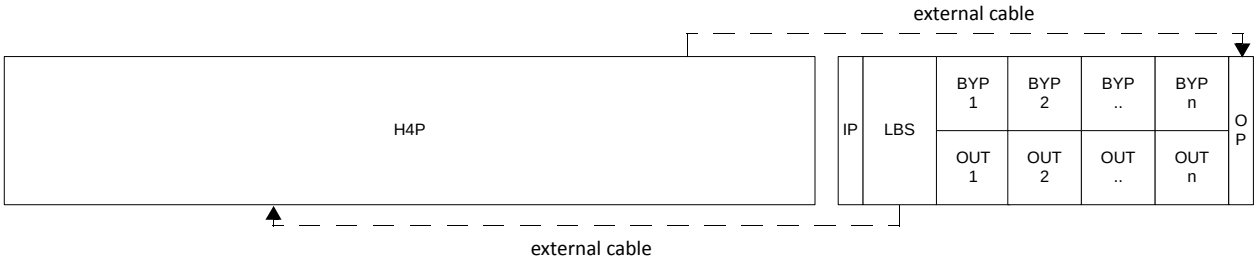


Frame G4P: Sync-Xfer Arrangement for Multiple Motors (max. 3000 Amps)*

Notes:
- * External cable by others



Frame H4P: Sync-Xfer Arrangement for Single Motor*



Frame H4P: Sync-Xfer Arrangement for Multiple Motors (max. 3000 Amps)*

Notes:

- * External cable by others

SOLID STATE STARTER BYPASS

The Toshiba JKSSS Plus Series digital, reduced-voltage, solid state starter is designed to be a superior method of providing soft-start control and protection for AC motors while in Bypass. Advantages include solid state construction, advanced motor protection, step-less acceleration, reduced inrush current, minimal maintenance, and high-duty cycle capability. Published dimensions will increase based on the size of additional equipment.

Option Code	Rating	Description	Price
BS	2400 V		
	300 to 450 HP	SSS Bypass — Adds 75” to Base Dimensions	$86,900
	500 to 900 HP		$96,200
	1000 to 1500 HP		$105,800
	1750 HP	SSS Bypass — Adds 123” to Base Dimensions	$129,200
	2000 to 2500 HP		$146,800
	3300 V		
	500 to 700 HP	SSS Bypass —Adds 75” to Base Dimensions	$91,000
	800 to 1500 HP		$97,500
	1750 to 2250 HP		$99,000
	2500 to 3500 HP	SSS Bypass —Adds 123” to Base Dimensions	$155,800
	4000 to 4500 HP		$163,600
	4160 V		
	500 to 900 HP	SSS Bypass — Adds 75” to Base Dimensions	$91,000
	1000 to 1750 HP		$97,500
	2000 to 2500 HP		$99,000
	3000 to 3500 HP	SSS Bypass — Adds 123” to Base Dimensions	$155,800
	4000 to 4500 HP		$163,600
	5000 to 6000 HP (max. 720 Amps)		$183,300

REDUCED VOLTAGE AUTO TRANSFORMER BYPASS

The reduced voltage autotransformer (RVAT) bypass provides the owner with a means of limiting the inrush current by reducing initial voltage supplied to the motor during starting, resulting in a mechanical soft-start. This option pricing is available only as a price adder to the AE style units. Published dimensions will increase based on the size of additional equipment.

Option Code	Rating	Description	Price
BT	300 to 800 HP, 2400 V 500 to 1750 HP, 4160 V	RVAT Bypass — Adds 72” to Base Dimensions	CF
	900 to 1750 HP, 2400 V 2000 to 3000 HP, 4160 V		CF
	2000 to 2500 HP, 2400 V 4000 to 5000 HP, 4160 V	RVAT Bypass — Adds 108” to Base Dimensions	CF

OUTPUT DV/DT FILTERS

An Output DV/DT Filter is recommended for lead lengths of 1000 to 2000 ft.

Option Code	Size	Description	Price
DV	2400 V		
	Frame A2	Output DV/DT Filter	$10,500
	Frame B2		$11,500
	Frame D2 (1250 to 1500 HP)		$12,500
	Frame D2 (1750 to 2000 HP)		$14,000
	Frame 4		$18,000
	3300 V		
	Frame A4µ/A4	Output DV/DT Filter	$10,500
	Frame 1		$11,500
	Frame 2		$12,500
	Frame 3		$14,000
	Frame 4		$18,000
	4160 V		
	Frame A4µ/A4	Output DV/DT Filter	$10,500
	Frame 1		$11,500
	Frame 2		$12,500
	Frame 3		$14,000
	Frame 4		$18,000
	Frame G4P		$28,000
	Frame H4P		$36,000

SINEWAVE OUTPUT FILTERS

A Sinewave output filter is recommended for lead lengths of 2000 ft. to 6 miles. Sinewave output filters are recommended in applications where a step-up transformer is used on the output of the drive.

Option Code	Size	Description	Price
SW	2400 V		
	Frame A2[1]	Sinewave output filter	$29,000
	Frame B2		$57,000
	Frame D2 (1250 to 1500 HP)		$83,000
	Frame D2 (1750 to 2000 HP)		$109,000
	Frame 4		$182,000
	3300 V		
	Frame A4µ/A4	Sinewave output filter	$15,000
	Frame 1		$29,000
	Frame 2[2]		$57,000
	Frame 3[3]		$83,000
	Frame 4[4]		$109,000
	4160 V		
	Frame A4µ/A4	Sinewave output filter	$15,000
	Frame 1		$29,000
	Frame 2[2]		$57,000
	Frame 3[3]		$83,000
	Frame 4[4]		$109,000
	Frame G4P[5]		$127,000
	Frame H4P[5]		$182,000

1 = The footprint of Frame A2 drive increases by 30”
2 = The footprint of Frame 2 drive increases by 42”
3 = The footprint of Frame 3 drive increases by 42”
4 = The footprint of Frame 4 drive increases by 60”
5 = The footprints of Frames G4P and H4P increase by 48” and 60” wide

REDUNDANT FANS

The redundant fan option includes Toshiba PLC for cycling fans at a set interval. A manual switch-over is possible via a door-mounted illuminated switch. Fans will cycle automatically upon fan failure without stopping the drive. A fan fault will be annunciated on the keypad.

Option Code	HP Range	Description	Price
FR	Frame A2 & B2	Redundant fans	$7,675
	Frame D2		$21,950
	Frame A4µ, A4 & 1		$7,675
	Frame 2 & 3		$21,950
	Frame 4		$32,775
	Frame G4P & H4P		$45,665

DRIVE & MOTOR SPACE HEATER

Option Code	HP Range	Description	Price
HS	Frame A2	Drive space heater internal 120 VAC power used	$2,200
	Frame B2		$3,200
	Frame D2		$4,400
	Frame A4µ, A4 & 1		$2,200
	Frame 2		$3,200
	Frame 3		$4,400
	Frame 4		$5,400
	Frame G4P & H4P		$8,500
HM	Power provided separately	Motor space heater control circuit — specify voltage; external power source @ 120 VAC	$900
HI	Power provided internally	Motor space heater control circuit — internal power source (500 W) maximum @ 120 VAC	$4,400
HIM	Power provided internally	Drive space heater + motor space heater	$12,000

PUSH-BUTTONS

Option Code	Description	Price
B1	IEC STYLE: Push-buttons/pilot lights	$300
BX	Miscellaneous push-button	CF

Notes:
- Mounted on drive enclosure.

COMMUNICATION INTERFACE

Option Code	Description	Price
C5	TOSLINE-S20LP communication card with FC connector (Tosline-S20 with F07 connector included on control board)	$2,533
CD	DeviceNet communication card — PC61910P080	$3,833
CF	Profibus communication card — 100066	$4,255
CR	Modbus RTU/Ethernet Communication Card — PC61910P079	$3,200

KEYED DOOR INTERLOCKS

Keyed door interlocks (kirk-key style) provide a mechanical interlock between contactors, disconnects and doors for personnel, and/or equipment safety. One key is provided for each interlock function. Keyed door interlocks are automatically provided on Frames 2, 3, 4, G4P, and H4P drives between the fused input disconnect switch and the transformer door. This prevents opening the transformer door without removing power from the input.

Keyed door interlocks can have other functions. All T300MVi ASDs can have an interlock between the drive's power-modules and the input disconnect. Frames A2, B2, D2, 0, and 1 require two locks, while the others require three locks. Other examples of interlocks would be for a redundant drive system where there is an output contactor for each drive with a tie contactor in between. A three-lock arrangement with two keys is appropriate when manually isolating one drive.

TIC archives and documents all keys for installed locks and registers keys with the lock manufacturer, allowing for broken or bent keys to be replaced quickly. *The end-user address is required.*

Option Code	Rating	Description	Price
KK	One-lock	Keyed door interlocks	$1,400
	Three-lock		$2,800
	Four-lock		$4,400
	Five-lock		$5,400

DOOR-MOUNTED EQUIPMENT

	METERS	
Option Code	**Description**	**Price**
M1	• Output volt and amp meter package	$5,000
M3	• Multilin 369, 12-channel RTD conitor & OL • Includes CTs	$11,000
M4	• Multilin 469, 12-channel RTD conitor & OL • Includes CTs	$22,000
MA	• Output Amp Meter • Using drive analog output	$400
ME	• Elapsed time meter	$400
MF	• Output frequency meter • Using drive analog output	$400
MV	• Output volt meter • Using drive analog output	$1,000
MX	• Miscellaneous meter • Specify function	CF
MQ	• Multilin PQM (Power Quality Meter) measures the following: KW, KVA, Power Factor, MWHr, KW Demand, KVA Demand, KVAR Demand, Amps Demand	$17,800
RT	• Door-mounted TIC-TPR6-14 relay — IEC (RTD monitor)	$2,800

	PILOT LIGHTS	
Option Code	**Description**	**Price**
PA	IEC STYLE: Pilot Light for ASD Mode Indication	$300
PB	IEC STYLE: Pilot Light for Bypass Mode Indication	$300
PF	IEC STYLE: Pilot Light for Fault Indication (Amber)	$300
PG	IEC STYLE: Pilot Light for Stop Indication (Green)	$300
PP	IEC STYLE: Pilot Light for Power On Indication (White)	$300
PR	IEC STYLE: Pilot Light for Run Indication (Red)	$300
PX	Miscellaneous Pilot Light — specify function	CF

	SPEED POTENTIOMETER & SWITCHES	
Option Code	**Description**	**Price**
S1	Speed Control Potentiometer	$450
S2	Speed Control Potentiometer with Local/Remote Switch	$650

SOFTWARE		
Option Code	**Description**	**Price**
CF	MVI-Tool — Windows-Based Programming and Diagnostics Software — includes cable	$6,070

MISCELLANEOUS OPTIONS		
Option Code	**Description**	**Price**
RX	Relay Outputs 115 V, 2 A, Form-C	$450
SP	24 VDC Power Supply 1-Amp Output Maximum	$780
X1	4 to 20 mA Isolation Transducer (Two Analog Inputs and Two Analog Outputs Available)	$1,440
CN	120 V Control Isolation (Eight Inputs Available)	$1,200

T300MVi SPARE PARTS KITS

Spare Parts Kits provide an easy and practical way to acquire the proper spare parts to handle most emergencies. Spare Parts Kits contain one of each circuit board, one low-voltage power supply, rectifier fuses, diodes, one set of control power fuses, four potential transformer fuses, three input fuses, and truck (Frame 2, 3, 4, G4P, H4P) when required.

Spare Parts Kits can be ordered with or without a Power Module. To order a Spare Parts Kits, please use the following numbering convention:

Example Part Number:	M3 M32	A	4	4	050	-1

Series:
M3 — 1st Generation
M32 — 2nd Generation

Input Frequency:
A — 60 Hz
B — 50 Hz

Input Voltage:
2 — 2400
3 — 3300
4 — 4160
A — 4800
6 — 6600

Output Voltage:
2 — 2400
3 — 3300
4 — 4160

4160 V Output:

030 — 300 HP	225 — 2250 HP
040 — 400 HP	250 — 2500 HP
050 — 500 HP	300 — 3000 HP
060 — 600 HP	350 — 3500 HP
070 — 700 HP	400 — 4000 HP
080 — 800 HP	450 — 4500 HP
090 — 900 HP	500 — 5000 HP
100 — 1000 HP	550 — 5500 HP
10E — 1000 HP	600 — 6000 HP
125 — 1250 HP	700 — 7000 HP
150 — 1500 HP	800 — 8000 HP
175 — 1750 HP	900 — 9000 HP
200 — 2000 HP	10K — 10000 HP

Power Module:
-1 (Included)

T300MVi SPARE PARTS KITS

For a more complete list of spare parts, please call CASD Marketing or see the T300MVi Instruction Manual. Input fuses will change as HP changes. Spare Parts Kits contain:

Item	2400 V Qty.	4160 V Qty.	Description	Part Number
1	1	1	GSD Board	HP-Specific
2	1	1	Control Board	PC61910P081M
3	1	1	XIO Board	PC61910P082C
4	1	1	Keypad	PC61910P116
5	1	1	I/F Board	PC61910P114A
6	1	1	Power Supply	GCI6720G282
7	1	1	GDI Board	PC61910P085A
8	1	1	PDM Board	PC61910P107A
9	1	1	Fan	PC50050P302
10	4	4	CPT Fuse	PC16109P902
11	3	3	Input Fuse	HP-Specific
12	6	18	Rectifier Fuse	HP-Specific
13	4	12	Diode Pack	HP-Specific
14	1	1	PM Lifting Mechanism	PM Lifting Mech (Frame 0 and 1)
15	1	1	PM Ramp	PM Ramp (Frames 2 to 4)
16	1	1	PM Truck	PM Truck (Frames 2 to 4)
17	1	1	PW, Tex Board	PC61910P123A*

Notes:

- * Power Tex Board part of 7000 to 10,000 HP Spare Parts Kit only.

Item	2400 V Qty.	4160 V Qty.	Description	Part Number
1	1	1	Power Module	HP-Specific

T300MVi SPARE PARTS KITS PRICING

Part Number	Price	Part Number	Price[1]
M3A22030 to M3A22050	$18,000	M3A22030-1 to M3A22050-1	$40,900
M3A22060 to M3A22100	$20,000	M3A22060-1 to M3A22100-1	$59,250
M3A22125 to M3A22175	$23,000	M3A22125-1 to M3A22175-1	$83,000
M3A22200 to M3A22300	$29,000	M3A22200-1 to M3A22300-1	$109,200
M3A44030 to M3A44100	$21,000	M3A44030-1 to M3A44100-1	$52,200
M3A44125 to M3A44200	$24,000	M3A44125-1 to M3A44200-1	$75,550
M3A44225 to M3A44250	$32,000	M3A44225-1 to M3A44250-1	$99,150
M3A44300 to M3A44350	$35,000	M3A44300-1 to M3A44350-1	$127,750
M3A44400 to M3A44600	$39,000	M3A44400-1 to M3A44600-1	$156,800
M3AP44700	$37,000	M3AP44700-1	$220,500[2]
M3AP44800 to M3AP4410M	$41,000	M3AP44800-1 to M3AP4410M-1	$274,600[2]

Notes:
- Prices valid when ordered along with drive.
- Parallel configuration. Contains two Power Modules in the kit (-1 Pricing column).

HEAT LOSS DATA (STANDARD DUTY DRIVE)

The T300MVi medium voltage drive utilizes IGBT technology to create a synthetic AC waveform to power standard 2400 and 4160 V motors. This waveform has inherent losses associated with it that must be accommodated. In the T300MVi, you can reasonably expect to see a 2% heat rejection to atmosphere @ 2400 V, and 3.5% heat rejection to atmosphere @ 4160 V. See the table below for typical heat losses in the T300MVi at full load. Expect losses to be linear with load.

Voltage	Basic Model	Motor HP	Motor kW	Output KVA	Losses	
					kW	BTU
2400	M32A22030S	300	233	268	8.1	27,551
	M32A22035S	350	272	313	9.4	31,919
	M32A22040S	400	311	357	10.7	36,623
	M32A22045S	450	350	402	12.1	41,327
	M32A22050S	500	389	447	13.4	45,695
	,M32A22060S	600	466	536	16.1	54,767
	M32A22070S	700	544	625	18.7	63,838
	M32A22080S	800	622	715	21.5	73,246
	M32A22090S	900	699	804	24.1	82,318
	M32A22100S	1000	777	893	26.8	91,390
	M32A22125S	1250	971	1116	33.5	114,237
	M32A22150S	1500	1166	1340	40.2	137,085
	M32A22175S	1750	1360	1563	46.9	159,932
	M32A22200S	2000	1554	1786	53.6	182,780
	M32A22225S	2250	1748	2010	60.3	205,627
	M32A22250S	2500	1943	2233	67.0	228,475
	M32A22300S	3000	2331	2680	80.4	274,169

Voltage	Basic Model	Motor HP	Motor kW	Output KVA	Losses	
					kW	BTU
4160	M32A44030S	300	233	268	8.2	27,849
	M32A44035S	350	272	313	9.5	32,511
	M32A44040S	400	311	357	10.9	37,172
	M32A44045S	450	350	402	12.3	41,834
	M32A44050S	500	389	447	13.6	46,495
	M32A44060S	600	466	536	16.3	55,699
	M3A44070S	700	544	625	19.0	65,022
	M3A44080S	800	622	715	21.8	74,345
	M3A44090S	900	699	804	24.5	83,548
	M3A44100S	1000	777	893	27.2	92,871
	M3A44125S	1250	971	1116	34.0	116,059
	M3A44150S	1500	1166	1340	40.8	139,366
	M3A44175S	1750	1360	1563	47.6	162,554
	M3A44200S	2000	1554	1786	54.4	185,742
	M3A44225S	2250	1748	2010	61.2	208,930
	M3A44250S	2500	1943	2233	68.0	232,237
	M3A44300S	3000	2331	2680	81.6	278,613
	M3A44350S	3500	2720	3126	95.2	325,108
	M3A44400S	4000	3108	3573	108.8	371,484
	M3A44450S	4500	3497	4019	122.4	417,979
	M3A44500S	5000	3885	4466	136.0	464,355
	M3A44550S	5500	4274	4913	149.6	510,850
	M3A444600S	6000	4662	5359	163.2	557,226
	M3AP44700S	7000	5439	6252	190.4	650,096
	M3AP44800S	8000	6216	7145	217.6	742,967
	M3AP44900S	9000	6993	8038	244.8	835,838
	M3AP4410KS	10000	7770	8931	272.0	928,709

NOTES:

REGEN MODULE

The standard T300MVi ASD is only capable of two quadrant operation. When the T300MVi is configured with the Regen module (T300MVi-R), it will be equipped with an active front end. Consult the factory for technical details.

Please note: existing T300MVi ASDs cannot be retrofitted to add the regenerative capability.

SPECIFICATIONS

CONTROL
- 100% Regeneration
- Five-Level PWM Output[1]
- Soft Stall (Load Reduction Control During Overload Conditions)
- Auto-Restart
- Five-Cycle Ride Through
- Power Supply Failure Restart
- Sync Transfer Control
- V/Hz, Sensor-Less Vector, Closed-Loop Vector, CT, VT
- Acceleration/Deceleration 1 to 6000 Seconds
- 115% (Typical) Overload for 60 Seconds[2] (Higher Overload Rating Available — Consult Factory)

FREQUENCY SETTING SIGNAL
- Standard Rotary Encoder and Up/Down Arrows on EOI
- Two 0 to 10 VDC Input, 4 to 20 mA (Optional)
- Serial Communication Input

COMMUNICATIONS
- Communication Options — Additional Tosline-F10, Tosline-S20, DeviceNet, Modbus TCP/IP, Modbus RTU, Ethernet, Profibus

STANDARDS
- IEC
- ANSI
- NEMA
- UL/cUL (in progress)

CONTROL INPUT OUTPUT
- Eight 24 VDC Digital Inputs (120 VAC optional)
- Six 24 VDC Digital Outputs (120 VAC optional)
- Two 0 to 10 VDC Analog Inputs (4 to 20 mA optional)
- Eight 0 to 10 VDC Analog Outputs (4 to 20 mA optional)

PERFORMANCE
- Frequency Regulation ±0.5%
- 2400V — NO Transformer needed
- Master-Follower Control (Optional)
- Sync-Xfer Technology (Optional)

EOI FEATURES
- Backlit Full-English LCD Display
- Overheat, Load-Side Short-Circuit, Load-Side Ground Fault, ASD Overload, Overcurrent During Start-Up, EEPROM Error, RAM Error, ROM Error, Communications Error, Arm Short for Each Phase (Emergency Stop, Undervoltage, Overtorque, Open-Output Phase, Motor Overload can be Selected or Deselected)
- LED Charge Indicator
- Protective Functions — Stall Prevention, Current Limit, Overcurrent, Overvoltage, Load-Side Short-Circuit, Load-Side Ground Fault, Undervoltage, Momentary Power Failure, Regeneration Power Ride-Through, Electronic Thermal Overload Protection (UL Rated), Overcurrent During Startup, Heatsink Overheat, Emergency-Off, Open Output Phase, Arm Short for Each Phase

Notes:
- 2400 V drives are three-level.
- For 1000 and 2000 HP @ 4160 V, overload is 100%.

PART NUMBERING CONVENTION

The T300 Regen can be configured with commonly-used options for an easy-to-install, turn-key package. See the chart below for available configurations. Custom packages are available upon request. The T300 Regen includes a ground lug and customer terminal block. Drawings supplied by CASD. The example, M3AR44050SAAHS, shows a standard duty T300 Regen, 500 HP, 4160 V input, 4160 V output with Input disconnect, cooling fan power, and motor heater control.

Example Part Number:	M32AR	A	X	4	4	050	S	AA/AE	HS

Series:
M32AR — Regeneration

Input Frequency:
A — 60 Hz
B — 50 Hz

Type:
BLANK — for 2400 V, 3300 V, and 4160 V drives under Frame 4
P — for G4P and H4P
S — for 6600 V drives
R — for Regen module drives

Input Voltage:

2 — 2400	6 — 6600	F — 12470
3 — 3300	C — 6900	G — 13200
4 — 4160	D — 8320	H — 13800
A — 4800	E — 12000	Z — OTHER

Output Voltage:

2 — 2400	4 — 4160	X — OTHER
3 — 3300	6 — 6600	

Output Rated Capacity

030 — 300 HP	10E — 1000 HP*	300 — 3000 HP
040 — 400 HP	125 — 1250 HP	350 — 3500 HP
050 — 500 HP	150 — 1500 HP	400 — 4000 HP
060 — 600 HP	175 — 1750 HP	450 — 4500 HP
070 — 700 HP	200 — 2000 HP*	500 — 5000 HP
080 — 800 HP	225 — 2250 HP	550 — 5500 HP
090 — 900 HP	250 — 2500 HP	600 — 6000 HP*

Duty Rating:
S — Standard (115% OL rating)

Configuration:	ID:	CP:	BYP:
AA —	X	X	
AB —	X		
AC —		X	
AD —			
AE —		X	X
AF —	X		X
AG —	X	X	X
AH —			X

ID — Input disconnect
CP — Cooling fan power
BYP — Isolated across-the-line starter

Additional Function:

- Options should be entered in alphabetical order.
- If the smart part number is longer than two options, replace all options with a "-1."
- List all options with descriptions for ease of understanding

- * 1000 HP, 2000 HP, and 6000 HP has 110% OL rating

T300 REGEN PRICING DIMENSIONS

T300 REGEN— 2400 VAC OUTPUT											
HP	FLA	Model Number	Frame	List Price		Dimensions (in.)				Weight (lb)	
						H	W		D		
				AA	AE[1]		AA	AE		AA	AE
300	64	M32AR22030	CF	$312,200	$375,200	103.7	96	126	48	9,000	10,100
350	75	M32AR22035	CF	$322,000	$383,600	103.7	96	126	48	9,000	10,100
400	86	M32AR22040	CF	$323,400	$386,400	103.7	96	126	48	9,000	10,100
450	97	M32AR22045	CF	$327,600	$390,600	103.7	96	126	48	11,500	12,600
500	107	M32AR22050	CF	$317,800	$380,800	103.7	96	126	48	11,500	12,600
600	129	M32AR22060	CF	$366,800	$429,800	CF	CF	CF	CF	11,500	12,600
700	150	M32AR22070	CF	$368,200	$431,200	CF	CF	CF	CF	11,500	12,600
800	172	M32AR22080	CF	$379,400	$441,000	CF	CF	CF	CF	11,500	12,600
900	193	M32AR22090	CF	$386,400	$449,400	CF	CF	CF	CF	24,000	25,100
1000	215	M32AR22100	CF	$406,000	$467,600	CF	CF	CF	CF	24,000	25,100
1250	269	M32AR22125	CF	$508,200	$575,400	CF	CF	CF	CF	24,000	26,800
1500	322	M32AR22150	CF	$523,600	$590,800	CF	CF	CF	CF	24,000	26,800
1750	376	M32AR22175	CF	$558,600	$641,200	CF	CF	CF	CF	44,000	46,800
2000	430	M32AR22200	CF	$616,000	$698,600	CF	CF	CF	CF	44,000	46,800
2250	504	M3AR22225	CF	$883,400	$980,000	CF	CF	CF	CF	44,000	46,800
2500	537	M3AR22250	CF	$894,600	$992,600	CF	CF	CF	CF	44,000	46,800
3000	645	M3AR22300	CF	$912,800	$1,009,400	CF	CF	CF	CF	44,000	46,800

1. Bypass Starter pricing is based on fixed contactors (not rack-out type)

Notes:
- CF = consult factory.
- Dimensions are estimates only, please consult factory.
- HP rating is based on typical 4-pole motor. Always use motor FLA rating to size drives. Consult factory for pricing.
- Consult factory for update on UL status.
- Frame A2, B2, D2, 0, and 1 drives with redundant fan option will increase in height by 7” over the standard model.

T300 REGEN— 3300 VAC OUTPUT											
HP	FLA	Model Number	Frame	List Price		Dimensions (in.)				Weight (lb)	
						H	W		D		
				AA	AE[1]		AA	AE		AA	AE
300	47	M32AR33030	A4R	$413,000	$476,000	103.7	96	126	43.4	11,500	12,600
400	63	M32AR33040	A4R	$420,000	$483,000	103.7	96	126	43.4	11,500	12,600
500	78	M32AR33050	A4R	$424,000	$487,000	103.7	96	126	43.4	11,500	12,600
600	94	M32AR33060	A4R	$425,000	$487,000	103.7	96	126	43.4	11,500	12,600
700	109	M32AR33070	A4R	$452,000	$514,000	103.7	96	126	43.4	11,500	12,600
800	125	M32AR33080	CF	$506,000	$574,000	CF	CF	CF	CF	17,000	18,100
900	141	M32AR33090	CF	$506,000	$574,000	CF	CF	CF	CF	17,000	18,100
1000	156	M32AR3310E	CF	$576,000	$643,000	CF	CF	CF	CF	17,000	18,100
1250	195	M32AR33125	CF	$579,000	$646,000	CF	CF	CF	CF	17,000	18,100
1500	234	M32AR33150	CF	$592,000	$659,000	CF	CF	CF	CF	17,000	18,100
1750	273	M32AR33175	CF	$792,000	$859,000	CF	CF	CF	CF	24,000	25,100
2000	310	M32AR33200	CF	$803,000	$870,000	CF	CF	CF	CF	24,000	25,100
2250	352	M32AR33225	CF	$989,000	$1,080,000	CF	CF	CF	CF	30,000	32,800
2500	391	M32AR33250	CF	$1,010,000	$1,090,000	CF	CF	CF	CF	30,000	32,800
3000	469	M32AR33300	CF	$1,240,000	$1,330,000	CF	CF	CF	CF	44,000	46,800
3500	547	M32AR33350	CF	$1,260,000	$1,350,000	CF	CF	CF	CF	44,000	46,800
4000	625	M32AR33400	CF	$1,300,000	$1,400,000	CF	CF	CF	CF	44,000	46,800
4500	703	M32AR33450	CF	$1,330,000	$1,430,000	CF	CF	CF	CF	44,000	46,800

1. Bypass Starter pricing is based on fixed contactors (not rack-out type)

Notes:

- CF = consult factory.
- Dimensions are estimate only, please consult factory.
- HP rating is based on typical 4-pole motor. Always use motor FLA rating to size drives. Consult factory for pricing.
- Consult factory for update on UL status.
- Frame A2, B2, D2, 0, and 1 drives with redundant fan option will increase in height by 7” over the standard model.

T300 REGEN— 4160 VAC OUTPUT											
HP	FLA	Model Number	Frame	List Price		Dimensions (in.)				Weight (lb)	
						H	W		D		
				AA	AE[1]		AA	AE		AA	AE
300	37	M32AR44030	A4R	$383,000	$446,000	103.7	96	126	48	11,500	12,600
400	50	M32AR44040	A4R	$413,000	$476,000	103.7	96	126	48	11,500	12,600
500	62	M32AR44050	A4R	$420,000	$482,000	103.7	96	126	48	11,500	12,600
600	74	M32AR44060	A4R	$420,000	$483,000	103.7	96	126	48	11,500	12,600
700	87	M32AR44070	A4R	$424,000	$487,000	103.7	96	126	48	11,500	12,600
800	99	M32AR44080	A4R	$425,000	$488,000	103.7	96	126	48	11,500	12,600
900	112	M32AR44090	A4R	$452,000	$514,000	103.7	96	126	48	11,500	12,600
1000	124	M32AR4410E*	A4R	$459,000	$521,000	103.7	96	126	48	11,500	12,600
1250	155	M32AR44125	CF	$506,000	$574,000	103.7	176	CF	CF	17,000	18,100
1500	186	M32AR44150	CF	$576,000	$643,000	103.7	176	CF	CF	17,000	18,100
1750	217	M32AR44175	CF	$579,000	$646,000	103.7	176	CF	CF	17,000	18,100
2000	248	M32AR44200*	CF	$592,000	$659,000	103.7	176	CF	CF	17,000	18,100
2250	279	M32AR44225	CF	$792,000	$859,000	103.7	234	CF	CF	24,000	25,100
2500	310	M32AR44250	CF	$803,000	$870,000	103.7	234	CF	CF	24,000	25,100
3000	372	M32AR44300	CF	$989,000	$1,080,000	103.7	265	CF	CF	30,000	32,800
3500	434	M32AR44350	CF	$1,010,000	$1,090,000	103.7	265	CF	CF	30,000	32,800
4000	496	M32AR44400	CF	$1,240,000	$1,330,000	103.7	304.5	CF	CF	44,000	46,800
4500	558	M32AR44450	CF	$1,260,000	$1,350,000	103.7	304.5	CF	CF	44,000	46,800
5000	620	M32AR44500	CF	$1,280,000	$1,380,000	103.7	304.5	CF	CF	44,000	46,800
5500	682	M32AR44550	CF	$1,300,000	$1,400,000	103.7	304.5	CF	CF	44,000	46,800
6000	744	M32AR44600*	CF	$1,330,000	$1,430,000	103.7	304.5	CF	CF	44,000	46,800

1. Bypass Starter pricing is based on fixed contactors (not rack-out type)

Notes:

- * 1000 HP, 2000 HP, and 6000 HP has 110% OL rating.
- CF = consult factory.
- Dimensions are estimates only, please consult factory.
- HP rating is based on typical 4-pole motor. Always use motor FLA rating to size drives. Consult factory for pricing.
- Consult factory for update on UL status.
- Frame A2, B2, D2, 0, and 1 drives with redundant fan option will increase in height by 7” over the standard model.

NOTES:

MTX NEMA 3R

The MTX NEMA 3R medium voltage ASD is one of the most innovative offerings by Toshiba to date. The MTX can be mounted virtually anywhere — in the jungle, the desert, or any in between, so the need to find suitable floor space is eliminated. It is rated for full-load operation at 50° C (122° F), and allows for the lowest cost of ownership on any 4160 V ASD, up to 3000 HP. The MTX is not just the world's only outdoor medium voltage drive; it is the toughest medium voltage drive in the industry —period.

SPECIFICATIONS

DESIGN
- 36-Pulse Design, IEEE-519 Compliant
- Control Power Included
- Up to 3000 HP, 4160 V
- Forced-Air Cooled Drive Cabinet
- Convention-Cooled Transformer
- NEMA 3R Cabinet

CONTROL
- Five-Level PWM Output
- Soft-Stall (Load-Reduction Control During Overload Conditions)
- V/Hz, Sensorless Vector, Closed-Loop Vector, CT, VT
- Acceleration/Deceleration 1 to 6000 Seconds
- 115% (Typical) Overload for 60 Seconds*(Higher Overload Rating Available, Consult Factory)

FREQUENCY SETTING SIGNALS
- Standard Rotary Encoder Up/Down Arrows on EOI
- Two 0 to 10 VDC Input, 4 to 20 mA (Optional)
- Serial Communication Input

COMMUNICATIONS
- Communication Options — Additional Tosline-F10, Tosline-S20, DeviceNet, Modbus TCP/IP, Modbus RTU, Ethernet, Profibus

STANDARDS
- ANSI
- NEMA
- UL/cUL

CONTROL INPUT OUTPUT
- Eight 24 VDC Digital Inputs (120 VAC Optional)
- Six 24 VDC Digital Outputs (120 VAC Optional)
- Two 0 to 10 VDC Analog Inputs (4 to 20 mA Optional)
- Eight 0 to 10 VDC Analog Outputs (4 to 20 mA Optional)

PERFORMANCE
- IEEE 519-1992 Compliant 36-Pulse Operation — No Need for Filters
- Frequency regulation ±0.5%
- Master-Follower Control (Optional)
- Sync-Xfer Technology (Optional)
- Typical Efficiency — 98%

EOI FEATURES
- Backlit Full-English LCD Display
- Overheat, Load-Side Short-Circuit, Load-Side Ground Fault, ASD Overload, Overcurrent During Start-Up, EEPROM Error, RAM Error, ROM Error, Communications Error, Arm Short for Each Phase (Emergency Stop, Undervoltage, Overtorque, Open-Output Phase, Motor Overload can be Selected or Deselected)
- LED Charge Indicator
- Protective Functions — Stall Prevention, Current Limit, Overcurrent, Overvoltage, Load-Side Short-Circuit, Load-Side Ground Fault, Undervoltage, Momentary Power Failure, Regeneration Power Ride-Through, Electronic Thermal Overload Protection (UL Rated), Overcurrent During Startup, Heatsink Overheat, Emergency-Off, Open Output Phase, Arm Short for Each Phase

ENVIRONMENT
- -25° to 50° C Ambient
- 3300 ft. ASL
- 95% Humidity Non-Condensing

Notes:
- * For 1000 and 2000 HP @ 4160 V, overload is 100%.

PART NUMBERING CONVENTION

The MTX can be configured with commonly-used options for an easy-to-install, turn-key package. See the chart below for available configurations. Custom packages are available upon request. The MTX includes ground lug and customer terminal block. Drawings supplied by CASD.

The example below, MTX44050SAAHS, shows a standard duty MTX, 500 HP, 4160 V input, 4160 V output with input disconnect, cooling fan power, and motor heat control.

Example Part Number:	MTX	A	4	4	050	S	AA	HS

Series:
MTX

Input Frequency:
A — 60 Hz
B — 50 Hz

Input Voltage:

2 — 2400	D — 8320
3 — 3300	E — 12000
4 — 4160	F — 12470
A — 4800	G — 13200
6 — 6600	H — 13800
C — 6900	Z — OTHER

Output Voltage:
3 — 3300
4 — 4160

4160 V Output:
050 — 500 HP
100 — 1000 HP
150 — 1500 HP
200 — 2000 HP
250 — 2500 HP
300 — 3000 HP

Duty Rating:
S — Standard (115% OL rating)

Configuration:	ID:	CP:	BYP:
AA —	X	X	
AE —	X	X	X

ID — Input disconnect
CP — Low voltage control power
BYP — Isolated across-the-line starter

Additional Function:
- See Options section.
- Options should be entered in alphabetical order.
- If the smart part number is longer than two options, replace all options with a "-1."
- List all options with descriptions for all equipment.

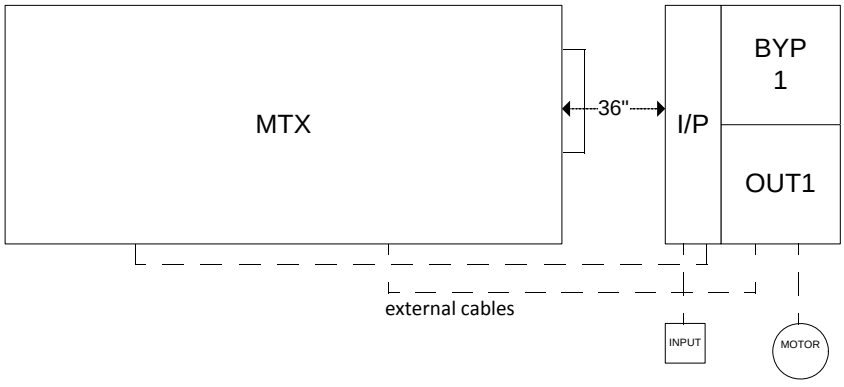
MTX PRICING DIMENSIONS

MTX 4160 VAC OUTPUT													
HP	FLA	Model Number	List Price		Dimensions (in.)						Weight (lb.)	
					H		W		D			
			AA	AE[1]	AA	AE	AA	AE	AA	AE	AA	AE
500	62	MTXA44050S	$466,000	$524,000	107	107	168	225	63	63	15,000	21,000
1000	124	MTXA44100S	$495,000	$553,000	107	107	168	225	63	63	15,000	21,000
1500	186	MTXA44150S	$574,000	$632,000	107	107	168	225	63	63	15,000	21,000
2000	248	MTXA44200S	$986,000	CF	110.75	CF	237.5	CF	70	CF	24,500	CF
2500	310	MTXA44250S	$1,020,000	CF	110.75	CF	237.5	CF	70	CF	24,500	CF
3000	372	MTXA44300S	$1,060,000	CF	110.75	CF	237.5	CF	70	CF	24,500	CF

1. Bypass starter pricing is based on fixed contactors (not rack-out type)

Notes:
- HP rating is based on a typical 4-pole motor.
- Always use motor FLA rating to size drives.
- Field interconnecting cable not included for bypass.
- For 2000 to 5000 HP, contact factory for update on UL status.
- For 3500 to 5000 HP, please consult factory for availability.

GENERAL ARRANGEMENT FOR BYPASS



Notes:
- Clearance is needed to the right for side-mounted heat exchanger.
- No clearance is needed when mounted on the left hand side.
- Cables interconnecting two sections are not included and need to be provided by others.

MTX OPTION PRICING

SYNC-XFER

Sync-Xfer is an exciting technological feature of the MTX. With Sync-Xfer, the MTX determines the utility line characteristics and transfers the motor supply power from variable speed to utility power via contactors. Additionally, it can pick up a motor from utility power and return it to variable speed.

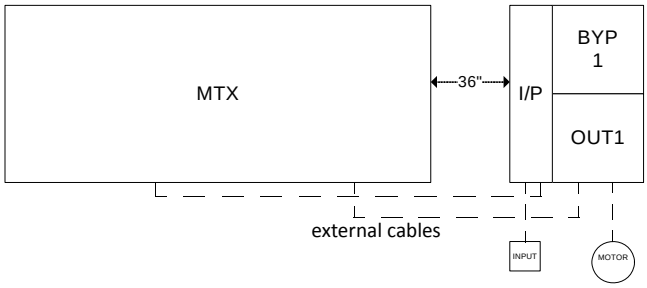
Sync-Xfer can have a significant impact in lowering a system's cost in applications where multiple motors are controlled with MV ASD, or where the ASD is used for soft-starting duty only. Contact CASD or your local distributor for more details.

To price a Sync-Xfer option, you only need to add one output reactor per MTX and one contactor section for each motor.

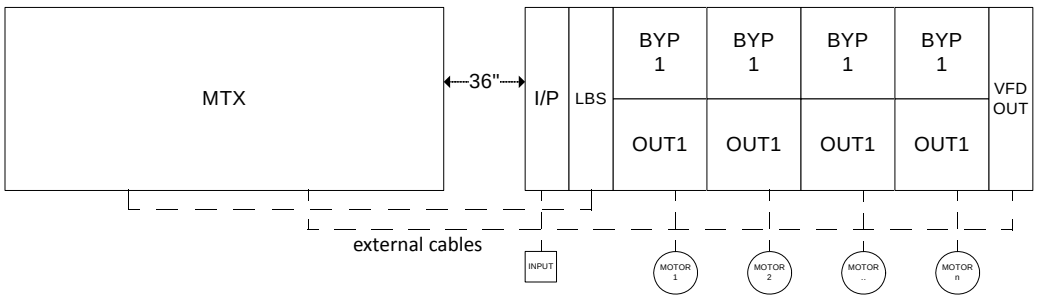
Option Code	Description	Price
	• Output reactor frame (500 to 1500 HP) • One per drive	$13,475
	• Must add first section (84") for input, LBS, output sections	$56,000
	• Contactor section (500 to 1500 HP) • Add 36" per section, one section per motor	$57,865
	• Output reactor frame (2000 to 3000 HP) • One per drive	$18,480
	• Must add first section (84") for input, LBS, output sections	$65,000
	• Contactor section (2000 to 3000 HP) • Add 42" per section, one section per motor	CF

Notes:
- Field interconnecting cable not included for bypass.

TYPICAL LAYOUT FOR SYNC-XFER



MTX 500 to 1500 HP: Sync-Xfer arrangement for single motor



MTX 500 to 1500 HP: Sync-Xfer arrangement for multiple motors (max. 3000 amps)

Notes:
- Please consult factory for lineup details on MTX 3000 frame.

8 TO 15 KV INPUT

The HV input option gives users the ability to input 8 to 15 kV primary voltages directly to the drive transformer. This option pricing is available only as a price adder to the -AA style unit. Published standard dimensions will increase 74" on width based on the selection of HV equipment.

- 74" section includes fused input disconnect switch, input contactor, soft charge circuit and PTs. This arrangement mimics the standard -AA drive but with HV input.
- Option price = drive price x 110% + $97,800
- Add 74" to the drive dimension.

Notes:
- UL/cUL in progress.
- No bypass is available with this feature.
- The price of the drive will increase by 10% to accommodate the HV windings.

Option Code	HP	Description	Price
D through Z (see matrix)	500 to 3000	• Up to 15 KV input • Includes: - Fused input disconnect - Input breaker - Soft charge circuit - PTs (add 74" to width)	$97,800

Example 1: 500 HP, 13.8 kV input with 4160 V output. Use the 500 HP price of $512,600 and add the 74" section at $97,800. Total list price equals $610,400. Overall dimension will be 242" (168" + 74"). Part number will be MTXAH44050SAA.

OUTPUT DV/DT FILTERS

An Output DV/DT Filter is recommended for lead lengths of 1000 to 2000 ft.

Option Code	Rating	Description	Price
DV	500 HP	• Output DV/DT filter	$11,500
	1000 HP		$11,500
	1500 HP		$11,500
	2000 HP		$14,000
	2500 HP		$14,000
	3000 HP		$14,000

SINEWAVE OUTPUT FILTERS

A Sinewave Output Filter is recommended for lead lengths of 2000 ft. to 6 miles. Sinewave Output Filters are recommended in applications where a step-up transformer is used on the output of the drive.

Option Code	Size	Description	Price
SW	500 HP	• Sinewave output filter	$21,035
	1000 HP		$24,165
	1500 HP		$29,000
	2000 HP		CF
	2500 HP		
	3000 HP		

DRIVE MOTOR SPACE HEATER

Option Code	Heater	Description	Price
HS	Drive space heater	• Internal power supply	$4,400
HM	Motor space heater control circuit	• Power provided separately • Specify voltage capacity @ 120 VAC	$900
HI	Motor space heater control circuit	• Power provided internally • Internal power source (500 W) maximum @ 120 VAC	$4,400

PUSH-BUTTONS

Option Code	Description	Price
B1	• IEC Style: push-buttons/pilot lights	$300
BX	• Miscellaneous push-button	CF

COMMUNICATION INTERFACE

Option Code	Description	Price
C5	• Tosline-S20LP communication card with FC connector • Tosline-S20 with F07 connector included on control board	$2,533
CD	• DeviceNet communication card — PC61910P080	$3,833
CF	• Profibus communication card — 100066	$4,255
CR	• Modbus RTU/Ethernet communication card — PC61910P079	$3,200

MTX SPARE PARTS KITS

To order a spare parts kit, please use the following numbering convention:

Example Part Number:	MTX	A	4	4	050

Series:
MTX

Input Frequency:
A — 60 Hz
B — 50 Hz

Input Voltage:
2 — 2400
3 — 3300
4 — 4160

Output Voltage:
3 — 3300
4 — 4160

4160 V Output:
050 — 500 HP
100 — 1000 HP
150 — 1500 HP
200 — 2000 HP
250 — 2500 HP
300 — 3000 HP

MTX SPARE PARTS KITS

Item	4160 V Qty.	Description	Part Number
1	8	IGBT, 3300 V, 400 A	PC40233P406
2	2	Diode, 3300 V, 400 A	PC40333P402
3	6	Rectifier	HP-Specific
4	4	PWB - RGM T300MV	PC61910P106A
5	1	PWB - CHG, DET, T300MV	PC61910P110A
6	2	PWB - IGBT Driver, Type G	PC41910P075G
7	2	PWB - IGBT Driver, Type H	PC61910P075H
8	1	Power Supply Assembly	GCI6720G282
9	1	PWB - GSD	HP-Specific
10	1	PWB - CTR, I Series, Type M	PC61910P081M
11	1	PWB - XIO, Wi Series	PC61910P082C
12	1	PWB - GDI, Wi Series, HCT	PC61910P085A
13	1	PWB - PDM	PC61910P116
14	1	PWB - Interface	PC61910P114A
15	2	CT Hall	HP-Specific
16	6	Rectifier Fuse	HP-Specific
17	3	Input Fuse	HP-Specific
18	2	CPT Fuse, E/2E 4.8 kV	PC16109P902
19	1	Fan	HP-Specific

MTX SPARE PARTS KITS PRICING

Part Number	List Price*
MTXA44050-1	$57,100
MTXA44100-1	$57,600
MTXA44150-1	$58,750
MTXA44200-1	$70,100
MTXA44250-1	$74,200
MTXA44300-1	$74,200

Notes:

- * Prices valid when ordered along with drive.

OTHER MEDIUM VOLTAGE DRIVE RELATED SERVICES

WITNESS TESTING

Two options are offered:

1. Standard Witness Test: The drive will be subjected to a quality control test witnessed by the customer. After manufacturing is complete, the drive is taken through a completeness, functionality, and operation test. Granting customer requests for non-standard tests are very limited. ASDs will be loaded to full current using a shorted reactor and the ASD will operate a non-coupled motor. Typical timeframe is one day per ASD.

2. Full-Load Testing: In place of the reactor test on standard test, the drive will be fully loaded either on a dynamometer (up to 1000 HP) or loaded by runback test. The functionality of the drive is tested. With this option, there is more latitude for the customer to request special testing. This test may take more than one day as setup time may be involved.

Description	Net Price
• Standard witness test (reactor)	$20,000
• Full-load test 600 to 1000 HP dynamometer testing or runback load test for higher capacities*	$30,000

Notes:
- *Runback load test: maximum 5000 HP at 75% continuous (maximum up to four hours) and 100% for 10 minutes.

STARTUP

The typical medium voltage drive requires four days of startup service by a factory-qualified/approved startup engineer/technician. Startup requires a three-week notice and an Onsite Service Request (available online) form is required to be filled. Please consult with the factory to determine the readiness requirements onsite for the service. If the service is extended beyond the pre-arranged timeframe due to reasons out of TIC's control, additional charges may apply. Please contact Field Service at 800-231-1412 ext. 3449 for more information.

The following table lists the net price for the continental U.S. and Canada. All startup services performed outside these countries will be billed per the standard field service rate schedule.

Part Number	Description	Net Price*
MVSTARTUP1	• Single day adder for Monday through Saturday - Excludes Sundays holidays - 7 a.m. to 5 p.m. - Living expenses included • Must be in conjunction with MVSTARTUP4 • Multiple drives, same site, same size, same application = two additional days per drive • Multiple drives, same site, different sizes, different applications = four additional days per drive	$1,795/day
MVSTARTUP2	• Single day adder for Sundays holidays - 7 a.m. to 5 p.m. - Living expenses included • Must be in conjunction with MVSTARTUP4	$3,250/day
MVSTARTUP3	• Stand-by day/holidays Sundays	$950/$1900
MVSTARTUP4	• Standard package up to four days onsite - Travel on Sunday or holidays not included - includes travel expenses Monday through Saturday - 7 a.m. to 5 p.m. - Based on 10 hours per day • Package for one drive only	$12,000
MVTRAINING3	• Standard training package up to three days onsite - Includes technical operational overview - Monday through Friday - 7 a.m. to 5 p.m.	$10,000
MVPREVENT2	• Standard package up to two days onsite - Travel on Sunday /or holidays not included - Includes travel expenses Monday through Saturday - 7 a.m. to 5 p.m. - Based on 10 hours per day • Package for one drive only; material not included	$7,800
MVPREVENT1	• Single day adder (excludes Sundays holidays) - Monday through Saturday - 7 a.m. to 5 p.m. • Multiple drives, same site, same size, same application = two additional days per drive; material not included	$1,795/day

Notes:
- *All prices are net andare subject to change.
- All services and packages are only available in the continental U.S. and Canada.
- For SYNC-XFER, please add one additional day for each additional motor line-up.

FIELD SERVICE RATES

Definition	Continental U.S. Canada[1]	International[1]
Services provided Monday through Friday from 7 a.m. to 5 p.m.	$140/hour	$150/hour
	Travel living expenses at cost	
Services provided Monday through Friday in excess of eight hours per day, before 7 a.m. or after 5 p.m.	$210/hour	$225/hour
	Travel living expenses at cost	
Services provided on Saturday	$210/hour	$225/hour
	Travel living expenses at cost	
Services provided on Sundays holidays	$280/hour	$300/hour
	Travel living expenses at cost	
Travel time Monday through Saturday	$100/hour Maximum eight hours per day, per direction	$100/hour Maximum 12 hours per day, per direction
Travel time Sunday holidays	$200/hour Maximum 10 hours per day, per direction	$200/hour Maximum 12 hours per day, per direction
Standby time[2] will be billed at the appropriate rate on the specific day of the week in which it occur; a minimum of eight hours will be billed for standby days	Per above rates	
Minimum billing per service request will be four hours at the rate for the specific day requested	Per above rates	

Notes:

- 1 = All prices are net and are subject to change.
- 2 = Standby time — an individual is requested to remain on site when their ability to provide direct support activities is impeded by others. Access to areas of the equipment and/or machine are not made available for checkout/troubleshooting by the service engineer. An individual is requested to remain at the customer's facility or close by an on "on-call" basis to provide support on site, if needed.

IEEE-519 LETTER OF CONFORMANCE

INDUSTRIAL DIVISION
13131 WEST LITTLE YORK ROAD
HOUSTON, TX 77041
PHONE: (800) 231-1412
FACSIMILE: (713) 466-8773

TOSHIBA

TOSHIBA INTERNATIONAL CORPORATION

Statement of Conformance IEEE 519, 1992

Toshiba guarantees that the T300MVi medium voltage adjustable speed drive product line will meet or exceed IEEE-519 per table 10.3 standards as advertised at the input to the drive to reduce harmonic distortion associated with AC adjustable frequency drives and other non-linear loads that employ the use of three-phase, six-pulse diode bridge rectifiers. During testing, the T300MVi's technologically advanced design has been proven to:

- Reduce current total harmonic distortion, as measured at the input terminals, to less than 5% at full load operation. This also substantially minimizes the total voltage distortion to less than 5% total and less than 3% for individual harmonics per IEEE 519 table 10.3
- Not become overloaded by upstream harmonic sources.
- Not resonate with other power system components due to its specially designed input topology.
- Present no compatibility problems with engine generator sets.

MEDIUM VOLTAGE WORKSHEET

Specification for Procurement 2400/3300/4160/6600 VAC Adjustable Speed Drive

PROJECT REFERENCE:		R.F.Q. REFERENCE	
SPEC. REFERENCE		DATE	

MOTOR DATA

HP/KW	
NEW/ EXISTING	
VOLTAGE (VOTLS)	
FLA (AMPS)	
SPEED (RPM)	
MOTOR LEAD LENGTH(FT)	
SERVICE FACTOR	
SPACE HEATER (VOLT/WATTS)	
RTD (MAKE/ QTY)	
INVERTER-DUTY	☐Yes ☐No
ENCODER	
CABLE DISTANCE FROM MOTOR TO ASD	

LOAD TYPE

VARIABLE TORQUE	☐
CONSTANT TORQUE	☐
REGENERATION	☐
FAN / PUMP	
OTHER	
SPEED RANGE	__Hz to__ Hz

BREAKAWAY TORQUE

0 to 100%	☐
101 to 150%	☐
% Overload Rating for 1 minute	

ENVIRONMENT

SITE LOCATION	
CONTROL ROOM MAX AMBIENT	°C
CONTROL ROOM MIN AMBIENT	°C
ELEVATION	Meters ASL
HUMIDITY NON-CONDENSING	%
DRIVE CABINET SPACE HEATER	☐Yes ☐No
SPACE HEATER TEST CIRCUIT	☐Yes ☐No
MOTOR SPACE HEATER CIRCUIT(EXTERNALLY POWERED)	☐Yes ☐No

DESIGN STANDARDS

UL	☐
cUL	☐
IEEE 519	☐
OTHER	____

SPEED REGULATION

0.5%, WITHOUT TACHO	☐
0.1% WITH TACHOMETER	☐
OTHER	____
MOTORING	☐
REGENERATION	☐
VOLTS / HZ SPEED CONTROL	☐
SENSORLESS VECTOR	☐
CLOSED LOOP VECTOR CONTROL	☐
MASTER FOLLOWER	☐
Speed Regulation without Encoder/ Resolver	____
Speed Regulation with Encoder/Resolver	____

SUPPLY SYSTEM VOLTAGE (± 10%)

2400 V	☐
3300 V	☐
4160 V	☐
6600 V	☐
Other _____ V	☐
LINE FREQUENCY	☐60Hz ☐50Hz

ENCLOSURE

NEMA 1	☐
NEMA 3R	☐
ELECTRICAL HOUSE	☐

POWER CABLE ENTRY	☐ TOP	☐BOTTOM
POWER CABLE EXIT	☐TOP	☐ BOTTOM
CONTROL CABLE ENTRY	☐ TOP	☐BOTTOM
CONTROL CABLE EXIT	☐TOP	☐ BOTTOM

OPTIONS

Kirk Key Interlocks	☐
Relay Outputs 115 V, 2 A, Form-C	☐
24 VDC Power Supply	☐
4 to 20 mA Isolated Analog Outputs ☐ Speed ☐ Current ☐ Voltage ☐ Load Other ____	☐
Control Power Backup 1 KVA,120V,TIC UPS	☐
Auxiliary Pilot Lights	☐
Auxiliary Pilot Lights Type	____
Auxiliary Push Buttons	☐
Auxiliary Push Buttons Type	____
Redundant Fan (3∅, 460V)	☐
Additional Controls (please attach control schematic)	

AUXILIARY EQUIPMENT

BYPASS STARTER	
ACROSS THE LINE	☐
RVAT	☐
SOLID STATE STARTER	☐
SYNCHRONOUS TRANSFER	
NUMBER OF MOTORS	____
INDOOR RATED SYNC.TRANSFER (GEAR)	
OUTDOOR RATED SYNC. TRANSFER (GEAR)	
GEAR SUPPLIED BY OTHERS	

COMMUNICATION OPTIONS

TOSLINE S20	☐
DEVICENET	☐
PROFIBUS	☐
ETHERNET	☐
MODBUS RTU/PLUS	☐
OTHER	____

MOTOR PROTECTION

RTD-TR6 RELAY	☐
MULTILIN 369	☐
MULTILIN 469	☐
RTD TYPE	_____

STARTUP (INCLUDED IN PRICE OF UNIT)	☐
ONSITE FACTORY TRAINING TESTING	☐
FACTORY TRAINING HOUSTON	☐

SPARES

SPARE PARTS KIT	☐Yes	☐No
SPARE POWER MODULE	☐Yes	☐No

SOFTWARE

PC INTERFACE SOFTWARE	☐Yes	☐No

TESTING

WITNESS TEST – QC RUNBACK	☐
WITNESS TEST DYNAMOMETER (UPTO 1250 HP)	☐
DRIVE/MOTOR COMBINED TEST AT MOTOR VENDOR'S FACILITY	☐

ADDITIONAL REQUIREMENTS

MEDIUM VOLTAGE CONTROLLERS

JK SERIES STARTERS, TRANSFORMER FEEDERS, CAPACITOR SWITCHING

The JK controller series is the result of extensive research development. It is currently being manufactured under ISO 9001 stards in the same manufacturing facility as Toshiba motors drives. The components are arranged to produce a streamlined space-saving unit, using no internal power cables in the full-voltage, type starters for easy maintenance.

These medium voltage controllers are available in full-voltage or reduced-voltage models for the control of induction, wound rotor, synchronous motors, transformers, or capacitors up to 6.6 kV for 400 series 4.8 kV for 720 series. All controllers are designed to meet NEMA Class E2 requirements. The 400 series controllers (full-voltage starters transformer feeders) are available in one two-high enclosures.

FEATURES

- Toshiba Medium Voltage Vacuum Contactors, 400 720 A Models
- Bolted Pressure-Isolation Switch Connections
- 30" Wide Footprint (Even in a Two-High Design) for 400 Series, 36" Wide for 700 series; Dimensions are Based on NEMA Type 1 12 Enclosure Ratings; For NEMA Type 3R, add 6" to Width
- Rigid 11-Gauge Steel Frame
- Front-Accessible Main Bus
- UL CUL*
- Current Transformers
- Current Limiting, High Interrupting Capacity, R-Rated Motor-Starting Fuses, E-Rated Transformer Capacitor Switching
- Start Stop Push-Buttons (Full-Voltage RVAT-Type)
- Mechanical Electrical Interlocks
- Run Off Pilot Lights (Full-Voltage RVAT-Type)
- Single-Phase Ammeter (Full-Voltage RVAT Type)
- Power-Control Transformer with Primary Secondary Fuses
- Drawout Version Stard with Solid-State Motor Protection (2E Relay); Three-Phase Overload Protection, Adjustable from Class 3 to 40, Manual Test Feature, Single-Phase Protection, LED Trip Indicator, Manual or Remote Reset (Auto-Reset Optional)
- Fixed Version Standard with Thermal Bi-Metallic Overload Relay

Notes:

- * = If UL or CUL is required, specify when ordering. Consult factory for applicable models and options.

ISOLATED LOW VOLTAGE COMPARTMENT

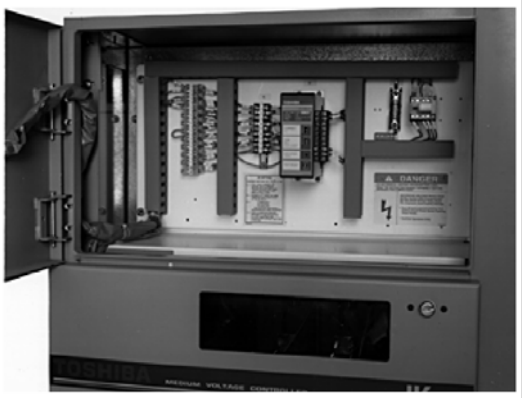
The low voltage section is oversized and set at a convenient height. This section is isolated from the medium voltage section.

FEATURES

- Motor Protection Relay: Toshiba 2E (RC820) Relay (Solid-State Overload/Single-Phase) or Bi-Metallic Overload
- Pilot Lights (Full-Voltage RVAT Starters)
- Push-Buttons (Full-Voltage RVAT Starters)
- Single-Phase Ammeter (Full-Voltage RVAT Starters)
- CPT Secondary Fuse(s)
- Terminal Control-Points for Customer Connections
- Timers (RVAT Starters)

OPTIONS

- Metering Metering Switches
- Ground-Fault Protection
- Phase-Sequence Protection (Std. on JKSSS)
- RTD Monitor/Relay (Std. on JKSSS)
- Multi-Function Protective Relay



VISIBLE, BOLTED PRESSURE, ISOLATION SWITCH

FEATURES

- Less Resistance
- Less Wear
- No Insertion Pressure
- Mechanical Interlocking System

REDUCED VOLTAGE AUTOTRANSFORMER (RVAT) CONTROLLERS

FEATURES

- Three Vacuum Contactors
- NEMA Medium Duty, Three-Winding Copper Wound Autotransformer with 50%, 65%, 80% Voltage Taps; Heavy Duty or Special Autotransformers Available Upon Request; Other Voltage Taps Available, Consult Factory
- Adjustable Solid-State Transition Timer
- Adjustable Solid-State Incomplete-Sequence Timer

JK SERIES SYNCHRONOUS MOTOR STARTERS

Full Voltage Non-Reversing

Full-voltage synchronous starters are the most economical synchronous motor control available. They are used where full motor-starting torque is acceptable where the associated inrush current is not detrimental to the power system. The advantages of using a synchronous motor include constant motor speed under varying loads, system power-factor improvement (can be operated at a leading power factor), high efficiency at low speeds.

Reduced Voltage Autotransformer

Autotransformer-type starters provide the highest starting torque per line ampere are totally automated closed-transitioned. They are used to reduce the starting power requirement where reduced starting torque is acceptable. Taps are provided at 50%, 65%, 80% of the line voltage. Special voltage taps are available upon request.

Solid State Reduced Voltage

Solid state starters provide reduced starting torque inrush current. For further details, see the JKSSS section.

Field Controls for Brush-Type Synchronous Motors

FEATURES

- DC Ammeter
- DC Voltmeter
- Field Discharge-Resistor
- Field Power-Supply with Surge Suppression Overload Protection Consisting of Multi-Tap Exciter Transformer with Primary Protection Heavy-Duty Field Rectifier with Primary Protection
- Pull-Out Relay
- Over-Excitation Relay
- Damper-Winding Protection
- Incomplete-Sequence Protection

Synchronous Options for Brush Brushless

FEATURES

- Power-Factor Meter
- Var/PF Control with Solid-State Exciter (SCR Type)

Field Controls for Brushless-Type Synchronous Motors

FEATURES

- DC Ammeter
- Field Application Timer
- Field Variac (AC side)
- Field Rectifier
- Pull-Out Relay
- Incomplete-Sequence Protection

JK400 SERIES STARTERS

Toshiba's JK400 series complies with NEMA, UL CSA standards and is available in full-voltage, non-reversing, and reversing configurations, as well as with autotransformer, multi-speed, synchronous, and wound rotor. Latched contactors are also available for transformer loads.

The JK400 series is available in the following enclosed ratings:

- Maximum 360 A
- 2300 to 6600 V
- Up to 5000 HP

The JK400 series full-voltage type starter is also available in a two-high configuration. The design has a common low-voltage compartment in the center of the structure separating the upper lower high-voltage compartments, which contain individual isolation switches, power fuses, control transformer, current transformers, vacuum contactors.

JK400 SERIES STARTERS CURRENT RATING					
Enclosure Type	Maximum Continuous Amps* 46" 60" One-High Controller		Maximum Continuous Amps* 90" One-High Controller or Lower Controller in a Two-High Stacked Arrangement		Maximum Continuous Amps* Upper Controller in a Two-High Stacked Arrangement
	Fixed Type	Drawout Type	Fixed Type	Drawout Type	Fixed Drawout Type
Type 1 Ventilated	360 A	360 A	360 A	360 A	320 A
Type 1 Non-Ventilated	320 A	360 A	320 A	360 A	280 A
Type 12 3R	310 A	310 A	310 A	310 A	280 A

Notes:

- * Actual limits based on your specific application parameters. All specifications subject to change without notice.

JK400 SERIES SHORT CIRCUIT WITHST CAPABILITY					
Interrupting Capacity (Symmetrical Amps)	Interrupting Capacity (Symmetrical mVA)	Short Time Capability 30 Seconds (Amps)	Short Time Capability 1 Second (Amps)	Dielectric Withst 1 Minute (KVAC)	Impulse Voltage Withst (kV)
50,000 @ 2.3 to 6.6 kV	200 @ 2.3 kV 350 @ 4.0 kV 400 @ 4.6 kV 570 @ 6.6 kV	2400	6000	18.2	60

JK400 SERIES APPLICATION TABLE									
Enclosed Max. Continuous Current (Amps)	Maximum Horsepower at Utilization Voltage								
	2300 V			4200 V			6600 V		
	Synchronous Motors		Induction Motors	Synchronous Motors		Induction Motors	Synchronous Motors		Induction Motors
	0.8 PF	1.0 PF		0.8 PF	1.0 PF		0.8 PF	1.0 PF	
360	1500	1750	1500	2500	3000	2500	4000	5000	4000
320	1250	1500	1250	2250	2500	2250	3500	4500	3500
310	1250	1500	1250	2000	2500	2000	3500	4000	3500
280	1000	1250	1000	1750	2250	1750	3000	3500	3000

Notes:

- For transformer and capacitor load-switching applications, consult factory.

JK700 SERIES STARTERS

Toshiba's JK7 series complies with NEMA, UL, and CSA stards and is available in full-voltage, non-reversing, and reversing configurations, as well as with autotransformer, multi-speed, synchronous, and wound rotor. Latched contactors are also available for transformer loads.

The JK7 series is available in the following enclosed ratings:

- 720 A
- 2300 to 4800 V
- Up to 6000 HP

JK700 SERIES STARTERS CURRENT RATING	
Enclosure Type	**Max. Continuous Amps***
Type 1 Ventilated	720
Type 1 Non-Ventilated	650
Type 12 3R	600

Notes:

- * Actual limits are based on your specific application parameters. All specifications subject to change without notice.

JK700 SERIES SHORT CIRCUIT WITHSTAND CAPABILITY					
Interrupting Capacity (Symmetrical Amps)	**Interrupting Capacity (Symmetrical mVA)**	**Short Time Capability 30 Seconds (Amps)**	**Short Time Capability 1 Second (Amps)**	**Dielectric Withst 1 Minute (KVAC)**	**Impulse Voltage Withst (kV)**
50,000 @ 2.3 to 4.6 kV	200 @ 2.3 kV 350 @ 4.0 kV 400 @ 4.6 kV	4320	8000	AC 13.25 DC 19	60

JK700 SERIES APPLICATION TABLE						
Enclosed Max. Continuous Current (Amps)	**Maximum Horsepower at Utilization Voltage**					
	2300 V			**4200 V**		
	Synchronous Motors		**Induction Motors**	**Synchronous Motors**		**Induction Motors**
	0.8 PF	**1.0 PF**		**0.8 PF**	**1.0 PF**	
720	3000	3500	3000	5500	6000	5500
650	2750	3000	2750	5000	5500	5000
600	2500	2750	2500	4500	5000	4500

JK SERIES INCOMING

The JK motor controller is available with various incoming options. For individual st-alone JK400 (One-High) JKSSS controllers, an incoming section is not required (for 350MCM shielded cable, single-phase). For JK700 controllers, an incoming section is recommended. Consult with Toshiba for multiple cables, maximum per phase.

An incoming disconnect device short-circuit protection is not required on individual controllers since the JK series includes an isolation switch main power fuses (for systems which can not provide over 50 KA short-circuit current).

For multiple controllers in a MCC line-up, various incoming options are available.

SELECTIONS

Incoming Pull Selection
An incoming cable-pull section provides the customer with ample room for either top or bottom cable entry. An incoming-pull section is applicable when there is an upstream main power disconnect switch short-circuit protection.

Load-Break Switch
A load-break switch is available where there is a need for a main power disconnect device on the incoming line. The disconnect can be provided non-fused, or with fuses when short-circuit protection is required. Disconnects are available in 600, 1200, 2000 A ratings. For higher continuous amp ratings, or where fuses are not available, a circuit breaker may be required.

Vacuum Circuit Breaker
A vacuum circuit breaker can be provided on the incoming line when short-circuit protection /or a disconnect means is required. Breakers are available in 1200, 2000, 3000 A ratings. A circuit breaker provides a remote, electrical means of opening closing the main power circuit, where the load-break switch is a manual device only. Besides increased breaker safety, other forms of protection can be provided, which include phase unbalance, loss of phase, ground fault, undervoltage, overvoltage, timed overcurrent, differential, etc.

FEATURES

Fused Disconnect
- Manual Operation
- Visible Disconnect
- Current Limiting, High Interrupting Capacity, E-Rated Fuses (900 E Maximum)

Vacuum Circuit Breaker
- Electrical Manual Operation
- Current Transformers
- Open Closed Operating Switch
- Open Closed Pilot Lights
- Tilt-Out Control Power Transformer
- Separate Medium Low Voltage Compartments

JKSSS SOLID STATE STARTERS

The JKSSS Plus series of motor starter is the result of extensive research development. The components in this new series are arranged to produce a tightly-designed unit. This streamlined, space-saving design (400 A only 30” wide) provides the ultimate in maintenance ease safety features.

These medium voltage solid-state starters are available for the control of induction, wound rotor, or synchronous motors, up to 4.2 kV. All starters are designed to meet NEMA Class E2 requirements.

SPECIFICATIONS

GENERAL FEATURES

- Soft Start
- 125% Continuous Duty
- 500% for 60 Seconds, 600% for 30 Seconds
- Digital Microprocessor Control
- LCD Display with Programming Keypad
- Toshiba Medium Voltage Vacuum Contactors for Bypass Input Isolation
- Current Transformers
- Current Limiting, High Interrupting Capacity, R-Rated Motor-Starting Fuses
- Two-Stage Solid-State Motor Protection — Starting: Programmable for Class 5 to 30, Running: Programmable for Class 5 to 30
- Power-Control Transformers with Primary Secondary Fuses
- NEMA Type 1 Enclosure, with 11 -Gauge Steel Frame
- Separate Medium Low Voltage Compartments
- Built-In Run/Test Circuit
- Mechanical Electrical Interlocks
- Visible, Bolted Pressure, Isolation Switch Features
- Less Resistance
- Less Wear
- No Insertion Point
- Mechanical Interlocking System

VISIBLE, BOLTED PRESSURE, ISOLATION SWITCH FEATURES

- Less Resistance
- Less Wear
- No Insertion Point
- Mechanical Interlocking System

OPTIONS

- NEMA Type 12 or 3R Enclosure
- 1200 or 2000 A Main Copper Bus
- Available in MCC Lineups with Other JK Series Starters (FVNR, FVR, RVAT, Synchronous, Etc.)
- PFC Contactor — Vacuum Contractor for Switching Power-Factor Correction Capacitor
- Manual (Full Voltage) Bypass Selection with 2E Protective Relay (Solid-State Overload/Single-Phase) or Bi-Metallic Overload

METERING

- Percent of FLA
- A, B, C Phase Current, Average Current
- Line Voltage (VAB, VBC, VCA)
- Ground-Fault Current (Optional)
- Remaining Thermal Register
- Thermal Capacity to Start
- Average Start Time/Time Since Last Start
- Average Start Current
- Line Frequency
- Phase Order
- Motor RPM, kW, KVA, KVAR, PF, MWHr
- KW Dem, KVA Dem, KVAR Dem, Amps Dem (All Date/Time Stamped)

Notes:

- * If UL or CUL is required, specify when ordering. Consult factory for applicable models options.

ISOLATED LOW VOLTAGE COMPARTMENT

The low voltage section is over-sized and at a convenient height. This section is isolated from the medium voltage section.

FEATURES
- Digital Control Module
- LCD Display (two lines) Status LEDs (Power, Run, Alarm, Trip, Aux. Relays)
- Programming Keypad (Non-Volatile Memory)

ADDITIONAL FEATURES
- Serial Communication Port: RS485 with Modbus RTU Protocol or RS232 with Windows® Interface
- Rugged Gate-Firing Circuit Using Ring Transformer
- Opto-Isolated Inputs
- Auxiliary Contacts: Form-C, 5 A @ 240 VAC Maximum
- Overload Reset: Selectable Manual or Automatic
- Two 4 to 20 mA Analog Outputs: Selectable from RPM, Hottest Non-Stator RTD, Hottest Stator RTD, RMS Current, Percent of Motor Load

ADJUSTMENTS
- Motor Full Load Ampere (FLA)
- Dual Adjustments: Two Independent Settings
- Initial Voltage: 0 to 100% of Nominal Voltage
- Current Limit: 200 to 500% of Motor FLA
- Acceleration Time: 1 to 120 Seconds
- Deceleration Time: 1 to 60 Seconds
- Three Custom Acceleration Curves
- Jog: 5 to 100% Voltage, 1 to 20 Seconds,
- Current: 100 to 500%
- Kick Start: 10 to 100% Voltage, 0.1 to 2 Seconds Coast Down (Back Spin) Lockout Timer: 1 to 60 Minutes
- Starts per Hour Lockout Timer: 1 to 10 Starts per Hour, 1 to 60 Minutes Between Start Attempts
- Undercurrent: 10 to 90%
- Overload Reset: Selectable Manual or Automatic

PROTECTIVE FEATURES
- Electronic Overload: Retentive Thermal Memory, Dynamic Reset Memory
- Phase Imbalance/Single-Phase
- Short-Circuit
- Ground Fault (Optional)
- RTD Temperature
- Phase Reversal/Phase Sequence
- Overcurrent
- Starts per Hour
- Shorted SCR
- Undercurrent/Loss of Load
- Starter Overtemperature
- Shorted SCR
- Undervoltage
- Overvoltage

MAINTENANCE DATA
- Fault Indications: Shorted SCR, Phase Loss, Shunt Trip, Phase Imbalance, Phase Rotation, Overload, Overtemp, Overcurrent, Short-Circuit, Load Loss, Ground Fault (Optional), Tach Acceleration Trip, Stator Phase-Trip, RTD Trip, or Any Trip
- Coast Down-Time
- Starts per Hour
- Time Between Starts
- Any Lockout
- Event History: Up to 60 Events. Data Includes Cause, Date, Time, Phase Ground Current

MICROPROCESSOR DIGITAL CONTROL UNIT (DCU)

PROGRAMMING KEYPAD
- Operator Control
- System/Motor Protection
- Statistical Data

LCD STATUS ALARM DISPLAY WITH TWELVE LEDs
- **POWER** — Indicates Control Power is Present
- **RUN** — Indicates Unit/Motor is Running
- **ALARM** — Lights in Conjunction with AUX 2 to indicate Event or Warn of Possible Critical Condition
- **TRIP** — Lights in Conjunction with AUX 1 to Indicate a Critical Condition has Occurred
- **AUX 1 to 8** — Auxiliary Unit Relays

JKSSS4 SOLID STATE STARTERS

Toshiba's JKSSS4 Plus series complies with NEMA, UL, cUL stards. It is available in the following enclosed ratings:

- Maximum 360 A
- 2300 to 4200 V
- Up to 3000 HP

JKSSS4 SERIES STARTERS CURRENT RATING	
Enclosure Type	**Max. Continuous Amps* 90" One-High Controller**
Type-1 Ventilated	360 A
Type-12 Ventilated w/Fans Type 12 Filters	310 A
Type-12 3R	300 A

Notes:

- * Actual limits based on your specific application. All specifications subject to change without notice.

JKSSS4 SERIES SHORT CIRCUIT WITHTSTAND CAPABILITY					
Interrupting Capacity (Symmetrical Amps)	**Interrupting Capacity (Symmetrical mVA)**	**Short Time Capability 30 Seconds (Amps)**	**Short Time Capability 1 Second (Amps)**	**Dielectric Withst 1 Minute (KVAC)**	**Impulse Voltage Withst (kV)**
50,000 @ 2.3 to 4.2 kV	200 @ 2.3 KV 350 @ 4.0 KV	2400	6000	18.2	60

JKSSS4 SERIES APPLICATION TABLE						
Enclosed Max. Continuous Current (Amps)	**Maximum Horsepower at Utilization Voltage**					
	2300 V			**4200 V**		
	Synchronous Motors		**Induction Motors**	**Synchronous Motors**		**Induction Motors**
	0.8 PF	**1.0 PF**		**0.8 PF**	**1.0 PF**	
360	1500	1750	1500	2500	3000	2500
310	1250	1500	1250	2000	2500	2000
300	1000	1250	1000	1750	2250	1750

Notes:

- Line reactors and MOVs are not required with TIC solid state starters.
- The starter is not affected by line capacitance, power source rating (mVA), multiple starters on the supply bus, or cable length.

JKSSS7 SOLID STATE STARTERS

Toshiba's JKSSS7 Plus series complies with NEMA stards. It is available in the following enclosed ratings:

- Maximum 720 A
- 2300 to 4200 V
- Up to 6,000 HP

JKSSS7 SERIES STARTERS CURRENT RATING	
Enclosure Type	**Max. Continuous Amps* 90" One-High Controller**
Type 1 Ventilated	720 A
Type 1 Non-Ventilated	650 A
Type 12 3R	600 A

Notes:
- * Actual limits based on your specific application.
- All specifications subject to change without notice.

JKSSS7 SERIES SHORT CIRCUIT WITHSTAND CAPABILITY					
Interrupting Capacity (Symmetrical Amps)	**Interrupting Capacity (Symmetrical mVA)**	**Short Time Capability 30 Seconds (Amps)**	**Short Time Capability 1 Second (Amps)**	**Dielectric Withst 1 Minute (kV)**	**Impulse Voltage Withst (kV)**
50,000 @ 2.3 to 4.2 kV	200 @ 2.3 kV 350 @ 4.0 kV	4320	8000	AC 13.25 DC 19	60

JKSSS7 SERIES APPLICATION TABLE						
Enclosed Max. Continuous Current (Amperes)	**Maximum Horsepower at Utilization Voltage**					
	2300 V			**4200 V**		
	Synchronous Motors		**Induction Motors**	**Synchronous Motors**		**Induction Motors**
	0.8 PF	**1.0 PF**		**0.8 PF**	**1.0 PF**	
720	3000	3500	3000	5500	6000	5500
650	2750	3000	2750	5000	5500	5000
600	2500	2750	2500	4500	5000	4500

Notes:
- Line reactors and MOVs are not required with TIC solid state starters.
- The starter is not affected by line capacitance, power source rating (MVA), multiple starters on the supply bus, or motor cable length.

PART NUMBERING CONVENTION

The JK series combines a fixed isolation switch with either a drawout or fixed contactor/main fuse assembly.

AVAILABLE OPTIONS

- **JK** — Withdrawable 400 A Fixed 720 A Contactor/Main Power Fuse Assembly
- **FK** — Fixed Type 400 A Contactor Power Fuses
- **JKSSS** — Reduced Voltage Solid-State Type with Fixed 400 A or 720 A Isolation Contactor
- **JKSSD** — Reduced Voltage Solid-State Type with Drawout 400 A Isolation Contactor

AVAILABLE CONTROLLER TYPES

- **FVNR** — Full Voltage Non-Reversing Type
- **FDR** — Transformer Feeder (As Stard Uses Latched-Type Contactor)
- **FVR** — Full-Voltage Reversing Type
- **RVAT** — Reduced-Voltage Autotransformer Type
- **SSS** — Reduced-Voltage Solid-State Type

Consult factory for other controller types that are available (i.e. reversing SSS, synchronous RVAT).
Ordering Information: Use the following part numbering convention to configure the JK Starter when placing your order. For transformer feeder application, select "ZZZ" under Motor Rating specify transformer KVA separately.

Example Part Number:	JK/FK/JKSSS	4	00	B	4	025	SH

Series

Contactor Rating:
4 — 400 A
7 — 720 A

Controller Type:
00 — FVNR
01 — FDR
10 — FVR
20 — RVAT
N/A — SSS

Enclosure Rating:
B — 1 (indoor)
K — 12 (outdoor)
E — 3R (outdoor)
A — 1 Gasketed (indoor)
Z — OTHER

Line Voltage:

2 — 2400	A — 4800
3 — 3300	B — 6600
4 — 4160	Z — OTHER

Motor Rating:

010 — 100 HP	045 — 450 HP	150 — 1500 HP	450 — 4500 HP
012 — 125 HP	050 — 500 HP	175 — 1750 HP	500 — 5000 HP
015 — 150 HP	060 — 600 HP	200 — 2000 HP	550 — 5500 HP
020 — 200 HP	070 — 700 HP	225 — 2250 HP	600 — 6000 HP
025 — 250 HP	080 — 800 HP	250 — 2500 HP	ZZZ — OTHER
030 — 300 HP	090 — 900 HP	300 — 3000 HP	
035 — 350 HP	100 — 1000 HP	350 — 3500 HP	
040 — 400 HP	125 — 1250 HP	400 — 4000 HP	

Additional Function:

- See Options section.
- Options should be entered in alphabetical order.
- If the smart part number is longer than two options, replace all options with a "-1."
- List all options with descriptions for all equipment

JK SERIES PRICING

JK FULL VOLTAGE NON-REVERSING (NEMA 1) CONTROLLER PRICING							
Nominal System Voltage[1]	HP[2]	Contactor Type	Model Number	Dimensions (in.)[3]			List Price
				H	W	D	
2300	75 to 800	400 A Fixed	FK400B2_	46	30	36	$18,900
	900 to 1500	400 A Fixed	FK400B2_	46	30	36	$19,900
	75 to 800	400 A Drawout	JK400B2_	46	30	36	$22,600
	900 to 1500	400 A Drawout	JK400B2_	46	30	36	$23,600
	1250 to 2250	720 A Fixed	JK700B2_	90	36	36	$37,600
	2500	720 A Fixed	JK700B2_	90	36	36	$39,600
4160	200 to 1500	400 A Fixed	FK400B4_	46	30	36	$18,900
	1750 to 3000	400 A Fixed	FK400B4_	46	30	36	$19,900
	200 to 1500	400 A Drawout	JK400B4_	46	30	36	$22,600
	1750 to 3000	400 A Drawout	JK400B4_	46	30	36	$23,600
	3000 to 4000	720 A Fixed	JK700B4_	90	36	36	$37,600
	4500 to 5000	720 A Fixed	JK700B4_	90	36	36	$39,600
6600	200 to 700	400 A Fixed	FK400BB_	46	30	36	$19,900
	750 to 2250	400 A Fixed	FK400BB_	46	30	36	$22,100
	2500 to 4500	400 A Fixed	FK400BB_	46	30	36	$22,300
	200 to 700	400 A Drawout	JK400BB_	46	30	36	$23,600
	75 to 2250	400 A Drawout	JK400BB_	46	30	36	$25,800
	2500 to 4500	400 A Drawout	JK400BB_	46	30	36	$26,000

Notes:

- 1 = For other system voltages (i.e. 3300 V), contact the factory.
- 2 = HP rating is based on a typical 4-pole motor. Always use motor FLA rating refer to application tables (i.e. ampere rating in the appropriate enclosure rating) to size starters.
- 3 = 46-inch tall one-high units can be supplied as a 60" tall enclosure with a larger low voltage compartment. Consult factory for price adder.

JK REDUCED VOLTAGE AUTOTRANSFORMER TYPE (NEMA 1) CONTROLLER PRICING							
Nominal System Voltage[1]	HP[2]	Contactor Type	Model Number	Dimensions (in.)			List Price
				H	W	D	
2300	100 to 350	400 A Drawout	JK420B2_	90	36	36	$38,200
	400	400 A Drawout	JK420B2040	90	36	36	$38,900
	500	400 A Drawout	JK420B2050	90	36	36	$40,500
	600	400 A Drawout	JK420B2060	90	36	36	$43,600
	700	400 A Drawout	JK420B2070	90	36	36	$43,900
	800	400 A Drawout	JK420B2080	90	36	36	$44,400
	900	400 A Drawout	JK420B2090	90	36	36	$45,200
	1000	400 A Drawout	JK420B2100	90	36	36	$47,800
	1250	400 A Drawout	JK420B2125	90	36	36	$48,400
	1500	400 A Drawout	JK420B2150	90	42	36	$56,900
	1750 to 2250	720 A Fixed	JK720B2_	90	72	36	$144,200
	2500	720 A Fixed	JK720B250	90	84	36	$174,300
4160	200	400 A Drawout	JK420B4020	90	36	36	$33,600
	300 to 400	400 A Drawout	JK420B4_	90	36	36	$34,600
	500	400 A Drawout	JK420B4050	90	36	36	$34,900
	600 to 700	400 A Drawout	JK420B4_	90	36	36	$37,700
	800 to 900	400 A Drawout	JK420B4_	90	36	36	$39,100
	1000	400 A Drawout	JK420B4100	90	36	36	$40,500
	1250	400 A Drawout	JK420B4125	90	36	36	$43,600
	1500	400 A Drawout	JK420B4150	90	42	36	$44,700
	2000	400 A Drawout	JK420B4200	90	42	36	$48,000
	2250	400 A Drawout	JK420B4225	90	42	36	$48,300
	2500	400 A Drawout	JK420B4250	90	42	36	$48,700
	3000	400 A Drawout	JK420B4300	90	42	36	$58,000
	3500 to 4000	720 A Fixed	JK420BB_	90	72	36	$144,200
	4500	720 A Fixed	JK420BB450	90	72	36	$149,600
	5000 to 5500	720 A Fixed	JK420BB_	90	84	36	$174,300

Notes:
- 1 = For other system voltages (i.e. 3300 V), contact the factory.
- 2 = HP rating is based on a typical 4-pole motor. Always use motor FLA rating refer to application tables (i.e. ampere rating in the appropriate enclosure rating) to size starters.

JK REDUCED VOLTAGE SOLID STATE STARTER (NEMA 1) PRICING							
Nominal System Voltage[1]	HP[2]	Contactor Type	Model Number	Dimensions (in.)			List Price
				H	W	D	
2300	100 to 250	400 A Fixed	JKSSS4-B2_	90	30	36	$51,200
	300 to 350	400 A Fixed	JKSSS4-B2_	90	30	36	$51,400
	400 to 500	400 A Fixed	JKSSS4-B2_	90	30	36	$51,700
	600 to 800	400 A Fixed	JKSSS4-B2_	90	30	36	$54,000
	900	400 A Fixed	JKSSS4-B2090	90	30	36	$59,600
	1000	400 A Fixed	JKSSS4-B2100	90	30	36	$62,900
	1250	400 A Fixed	JKSSS4-B2125	90	30	36	$63,200
	1500	400 A Fixed	JKSSS4-B2150	90	30	36	$70,200
	1750	720 A Fixed	JKSSS7-B2175	90	72	36	$95,000
	2000 to 2250	720 A Fixed	JKSSS7-B2_	90	72	36	$114,000
4160	200 to 400	400 A Fixed	JKSSS4-B4_	90	30	36	$51,200
	300 to 400	400 A Fixed	JKSSS4-B4_	90	30	36	$51,200
	500 to 700	400 A Fixed	JKSSS4-B4_	90	30	36	$53,300
	800 to 1000	400 A Fixed	JKSSS4-B4_	90	30	36	$55,900
	1250	400 A Fixed	JKSSS4-B4125	90	30	36	$58,400
	1500	400 A Fixed	JKSSS4-B4150	90	30	36	$59,900
	1750 to 2000	400 A Fixed	JKSSS4-B4_	90	30	36	$61,000
	2250 to 2500	400 A Fixed	JKSSS4-B4_	90	30	36	$62,700
	3000	720 A Fixed	JKSSS7-B4300	90	72	36	$66,800
	3500	720 A Fixed	JKSSS7-B4350	90	72	36	$124,300
	4000 to 4500	720 A Fixed	JKSSS7-B4_	90	72	36	$132,900
	5000 to 5500	720 A Fixed	JKSSS7-B4_	90	72	36	$154,500
	6000	720 A Fixed	JKSSS7-B4600	90	72	36	$157,900

Notes:
- 1 = For other system voltages (i.e. 3300 V), contact the factory.
- 2 = HP rating is based on a typical 4-pole motor. Always use motor FLA rating refer to application tables (i.e. ampere rating in the appropriate enclosure rating) to size starters.

JK SERIES FACTORY-INSTALLED MODIFICATIONS

MEDIUM VOLTAGE STARTER OPTIONS

PILOT DEVICES		
Part Number	**Description**	**Price**
B1	• Push-buttons: start stop. standard on FVNR RVAT, opt. on JKSSS	$400
BE	• Push-button: emergency stop, mushroom head (red)	$250
BR	• Push-button: "reset" overload relay	$200
BX#	• Push-button: specify function	CF
PB	• Pilot light: *Bypass Mode* indication (white) for JKSSS	$300
PF	• Pilot light: *Fault* indication (amber); protection relay trip indication	$300
PG	• Pilot light: *Stop* indication (green); standard on FVNR RVAT	$300
PP	• Pilot light: *Power On* indication (white)	$300
PR	• Pilot light: *Run* indication (red); standard on FVNR RVAT	$300
PX#	• Pilot light: miscellaneous; specify function	CF
SO	• Selector switch: *Off/On*	$300
SH	• Selector switch: *Hand/Off/Auto*	$300
SL	• Selector switch: *Local/Remote*	$300
SX2	• Selector switch: two-position/specify function	CF
SX3	• Selector switch: three-position/specify function	CF

PROTECTIVE RELAYS		
Part Number	**Description**	**Price**
-	• Solid-state protection relay (overload/phase failure) - 2E Relay • Standard with drawout contactor, IEEE device no. 46/51 • For JKSSS, see "Emergency Full Voltage Starting" option	STD
M2	• Solid-state protection relay (overload/phase failure) - 2E relay • For fixed contactor[1], IEEE device no. 46/51 • For JKSSS, see "Emergency Full Voltage Starting" option	$800
MG	• 2E relay option: zero-sequence ground fault (RC81A module)[8] • IEEE device no. 50G	$1,000
MR	• 2E option: substitute auto-reset relay[8] • IEEE device no. 46/51	$100
BR	• 2E option: manual-reset push-button on door[8]	$200
MX	• Multi-function motor protection relay	CF
MZ	• Ground Fault: zero-sequence ground fault, for JKSSS only • IEEE device no. 50G	$2,100

PROTECTIVE RELAYS		
Part Number	**Description**	**Price**
RT	• RTD monitor/relay, door-mounted, 14 RTD Inputs, Pt100 ohm only • IEEE device no. 49 • KSSS Includes 12 RTD Inputs standard	$4,400
V1	• Undervoltage relay (standrd on JKSSS) • IEEE device no. 27	$400
V2	• Overvoltage relay (standard on JKSSS) • EEE device no. 59	$400
V3	• Under, overvoltage relay (standard on JKSSS) • IEEE device no. 27/59	$800
-	• Incomplete sequence protection standard on applicable controllers • IEEE device no. 48	STD

CONTROL RELAYS		
Part Number	**Description**	**Price**
R22	• 4-pole: contact arrangement 2NO, 2NC	$360
R40	• 4-pole: contract arrangement 4NO	$360
R44	• 8-pole: contract arrangement 4NO, 4NC	$600
R62	• 8-pole: contract arrangement 6NO, 2NC	$600
R80	• 8-pole: contract arrangement 8NO	$600
TX	• Timing relay, solid state (specify time-range function)	$500

MISCELLANEOUS		
Part Number	**Description**	**Price**
HS	• Cubicle space heater (standard on type 3R enclosures)	$400
HT	• Thermostat (for cubicle space heater)	$400
D8	• Lighting arrestor - three-phase, station class (15” inc. sec. may be required)	$3,600
D9	• Surge capacitor (three-phase)	CF
T4	• Add 2nd PT/CPT, 100/300 to 500 VA (standard on SSS)[4]	$1,000
T8	• Additional CPT capacity (VA)	CF
-	• Device markers	STD
KK	• Key interlock	$1,400
L1	• Latched contactor (specify close trip voltages) • Includes AC/DC rectifier	$1,500
L2	• Capacitor trip device (for use on latched-type contactors)	$850
L3	• Blown-fuse trip mechanism* (UL not available if required)	$1,200

Notes:
- * For 360/400 A only.

METERING[7]		
Part Number	**Description**	**Price**
MA	• Ammeter, AC, single-phase monitoring (standard on full voltage RVAT)	$400
MT	• Ammeter switch (three-phase monitoring)	$500
MV	• Voltmeter (AC single-phase monitoring)	$1,000
MY	• Voltmeter (AC Single three-phase monitoring, includes: meter, three-phase switch, additional P.T)	$2,400
ME	• Elapsed time meter	$400
W1	• Wattmeter[5]	$3,000
W2	• Kilowatt hour meter (no demand meter)[5]	$3,400
W3	• Watts transducer (specify output)	$2,000

ENCLOSURE		
Part Number	**Description**	**Price**
-	• Type-1 general purpose (indoor)	STD
K	• Type-12 dust-tight (indoor) • One-high (46" 60"H) controller	$500
	• Type-12 dust-tight (indoor) • All 90" H cubicles (two-high controller, RVAT, SSS)	$1,000
KD	• Drip shield (for Type 1 or 12 enclosure)	$500
E	• Type-3R rainproof sleet-resistant (outdoor)[3, 6] • One-high (46" 60" H) controller	$4,300
	• Type-3R rainproof sleet-resistant (outdoor)[3, 6] • All 90" H cubicles (two-high controller, RVAT, SSS)	$6,800
-	• Incoming section	CF

SPECIAL OPTIONS FOR SOLID STATE STARTERS		
Part Number	**Description**	**Price**
F1	• Emergency Full Voltage Starting • Includes: - SSS/Bypass Selector Switch - Current Transformers - Class 10 Bi-Metallic Overload Relay	$1,200
F2	• Emergency Full Voltage Starting: • Includes: - SSS/Bypass Selector Switch - Current Transformers - Class 20 Bi-Metallic Overload Relay	$1,250
F3	• Emergency Full Voltage Starting • Includes: - SSS/Bypass Selector Switch - Current Transformers - Solid State Overload (2E Relay with Adjustable Trip Curves, Class 3 to 40)	$1,700

SPECIAL OPTIONS FOR SOLID STATE STARTERS		
Part Number	**Description**	**Price**
MZ	• Ground Fault : zero sequence, includes GF board sensor (ZCT) • IEEE device no. 50G	$2,100
D4	• Input Isolation contactor/power fuses change from fixed to drawout	$3,300
-	• Contactor for power correction capacitor switching	CF

Modification Notes:

#When ordering, add the color code.

1. Controllers with fixed- type main contactor comes stard with thermal bi-metallic overload relay 250 VA CPT (Exception: JKSSS).
2. Full-voltage RVAT-type controllers come with stard pilot lights (see individual controller description). This option is for additional lights on these controllers.
3. Price is per 90" H cubical (i.e. for one two-high structure, two starters in one 90" structure, add this price once to the combined price of the controllers). Price also includes cubicle space heater.
4. This option is not available if option H9 (which includes the second PT) is selected.
5. Must include additional PT; see option T4.
6. Price includes cubicle space heater. If a thermostat is required, add option HT.
7. JKSSS includes many metering features. See JKSSS section for further details.
8. Option M2 (2E relay) is required if it is not supplied as stard on the starter.

COLOR PB CAPS	COLOR PL LENS	COLOR CODE
Green	Green	G
Black	-	B
Red	Red	R
White	White	W
Yellow	Yellow	Y
Blue	Blue	B

JK SERIES ACCESSORIES

CATALOG NUMBER	ITEM	DESCRIPTION	LIST PRICE
LCV5010H20G01	JK Yoke	Carriage lifting attachment	$300
JK TOOL	Software	For JKSSS series	$700

Notes:

- JK lifting yoke is recommended for two-high FVNR RVAT-type controllers.
- Software for programming, commissioning, monitoring. Includes CD USB to RS485 converter.

NOTES:

VACUUM CONTACTORS

MEDIUM VOLTAGE JK OEM POWER CELLS

The JK OEM power cells are UL listed. This compact design can be used in either motor or distribution applications (2300 to 6600 V, 7200 V maximum). The design may be completely front-accessible.

OEM power cells are designed to replace existing air contactors or old vacuum contactor applications when used for motors or small distribution feeders. This kit provides you with state-of-the-art Toshiba vacuum technology a patented bolt-pressure isolation switch.

Customers can use their existing stard cubicles, wiring methods, components with these power cells allowing for valuable real-estate labor dollars to be saved.

FEATURES

- Toshiba Medium Voltage Vacuum Contactor, 400 A
- Drawout or Fixed-Type
- Patented, Bolted Pressure-Isolation Switch
- Less than 24" Wide, 29.3” High, Less than 33” Deep
- Available With or Without Main Power Fuse-Clips (Single or Double-Barrel)
- Front-Accessible
- Electrically Held or Latched-Type Versions

VISIBLE, BOLTED PRESSURE, ISOLATION SWITCH FEATURES

- Less Resistance
- Less Wear
- No Insertion Pressure
- Mechanical Interlocking System

JK OEM CELL APPLICATION TABLE				
System Voltage	**0.8 PF Ind./Syn. Motor**	**1 PF Syn. Motor**	**Three-Phase Transformer**	**Three-Phase Capacitor**
2.2 to 2.5 kV	1750 HP	2000 HP	1500 KVA	1500 KVAR
3 to 3.3 kV	2250 HP	2500 HP	2000 KVA	2000 KVAR
4 to 5 kV	3000 HP	3500 HP	3000 KVA	2000 KVAR
6 to 6.6 kV	4500 HP	5000 HP	4000 KVA	2000 KVAR

Notes:

- The above table is based on general-load data standard application.
- Lower limitations may apply on specific applications (i.e. applications above 3000-meter elevations).

JK OEM POWER CELL PRICING

MODEL NUMBER	DESCRIPTION	APPLICATION	LIST PRICE
GCV5084L03G01	• Fixed-type with single-barrel fuse clips	Motor HP rating up to 1500 HP	$7,200
GCV5084L03G02	• Fixed-type with d ouble-barrel fuse clips	Motor HP rating up to 3000 HP	$7,500
GCV5084L03G03	• Fixed-type for CPT/PT/CB	Includes bolted pressure - isolation switch for disconnecting CPT/PTs, provision to fix-mount 1 or 2 CPT/PTs with mounting provision for secondary low voltage circuit breaker	$5,200
GCV5084L03G04	• Fixed-type for CPT/PT/LS	Includes bolted-pressure isolation switch for disconnecting CPT/PTs, provision to fix-mount 1 or 2 CPT/PTs with limit switch	$5,200
GCV5084L04G00	• Drawout-type without fuse clips	Used when upstream protection is provided	$9,800
GCV5084L04G01	• Drawout-type with single-barrel fuse clips	Motor HP rating up to 1500 HP	$9,600
GCV5084L04G02	• Drawout-type with double-barrel fuse clips	Motor HP rating up to 3000 HP	$9,900
GCV5084L05G00	• Fixed latched-type without fuse clips	Used when upstream protection is provided	$8,400
GCV5084L05G01	• Fixed-latched-type with single-barrel fuse clips	For distribution loads (400 A maximum), transformer, or capacitor switching	$8,200
GCV5084L05G02	• Fixed-latched-type wit double-barrel fuse clips	For distribution loads (400 A maximum), transformer, or capacitor switching	$8,500
GCV5084L06G00	• Drawout-latched-type without fuse clips	Used when upstream protection is provided	$10,600
GCV5084L06G01	• Drawout-latched-type with single-barrel fuse clips	For distribution loads (400 A Maximum), transformer, or capacitor switching	$10,600
GCV5084L06G02	• Drawout-latched-type with double-barrel fuse clips	For distribution loads (400 A maximum), transformer, or capacitor switching	$10,900

LOW & MEDIUM VOLTAGE VACUUM CONTACTORS

Toshiba has been developing improving vacuum technology since 1962, as a result, is a leader in the manufacturing of vacuum contactors. Since then, Toshiba has produced over 230,000 low high-voltage vacuum contactors.

Using an electronics-controlled circuit with a compact design to ensure reliability, hling ease, safety, the new series of vacuum contactors are suitable for motor starters, transformer feeder, capacitor-switching applications.

FEATURES

- Environment-Resistant: Ideal for Use in High Dust Areas; Switching Arc is Contained Within Vacuum Bottle, Shielding Main Contacts
- Reduced Maintenance: Vacuum Bottle Contacts have Long Life with Virtually No Maintenance
- No External Surge Protection: Special Main Contact Materials Minimize Chopping Current; No Surge Suppressor/Arrester Required Except for Special Applications
- Designed for Safety: High Low Voltage Parts are Totally Separated by Insulated Barrier (Non-Flammable Molded Frame)
- Conformity Industrial Stards: Conforms to Latest International Stards such as UL, CSA, AS, BS, NEMA, IEC60470 (2000); Consult Factory on Each Series
- Electronic-Control Drive Unit: All Contactors Include Electronic Control of Operating Coil which offers Wide Control Voltage of 100 to 240 VAC 100 to 250 VDC, Anti-Chopping Feature Reduce Power Consumption
- Electrically Held or Latched-Type Versions (Medium Voltage Models)

CV-10H (13.8/15 KV) CONTACTOR

- New CV-10H (13.8/15 kV) Contactor: Contactor is Now Rated 400 Inductive 450 Thermal Amps, Available in Latched-Type Version; CV-10HA model is for Inductive Load-Switching (i.e. Motors Transformer Loads), CV-10HB Model has Specially-Designed Interrupters for Capacitor Switching
- Higher Interrupting-Performance: Afford a Wide Margin of Protective Coordination with Any Type of Power Fuse Resulting in Increased Electrical Safety Reliability

CV-10HA
(15 KV, 400 A)

VERTICAL MAGNETIC ARC DISPERSION SYSTEM

- Designed for Longer Wear: Unique Vertical Magnetic Arc Dispersion System, USA Patent (HCV-1KAU, HCV-6KAU, HCV-6KALU)

Axial Magnetic Field Interrupter - Arc Dispersion

LOW VOLTAGE VACUUM CONTACTOR SPECIFICATIONS

LOW VOLTAGE TECHNICAL DATA		
Model	**HCV-1JBU**	**HCV-1KAU**
Voltage	208 to 1500 V	
Operational current	600 A	720 A
Rated thermal current	600 A	720 A
Interrupting current	42,000 A	
Peak withstand current	-	85 KA
Short-circuit making/breaking current IEC 60470 (2000)	6000 A (100 times)	7200 A (100 times)
	6000 A (25 Times)	7200 A (25 Times)
Withstand overload current	3600 A for 30 seconds	4320 A for 30 seconds
	6000 A for 2 seconds	7200 A for 2 seconds
	9000 A for 1 seconds	10,800 A for 1 seconds
	30,000 A for 0.05 seconds	36,000 A for 0.05 seconds
Coordination with current-limiting fuses	50 KA	45 KA
Switching frequency	1200/hour	
Mechanical life*	2.5 million	
Electrical life*	250,000	
Impulse withstand	15 KV	
Dielectric strength	5.5 KV for 1 minute	
Closing time (@ 120 VAC)	60 to 80 ms	
Opening time (@ 120 VAC)	50 to 65 ms	
Arcing time	10 ms or less	
Pick-up voltage	85% hot to 70% cold AC or DC	
Drop-out voltage	20% or more of rated control voltage (cold)	

Notes:

- * Maximum required test; actual life under normal conditions is greater.

LOW VOLTAGE TECHNICAL DATA			
Model		**HCV-1JBU**	**HCV-6KAU**
Control voltage	Standard	100 to 240 VAC/DC	
Control circuit burden	Closing	1080 VA	
	Holding	50 VA	
Auxiliary contact ratings	Arrangement	3NO-3NC	
	Current	10 A (A600)	
	Voltage	600 VA maximum, 48 V minimum	
	VAC	720 VA (P.F. 0.35)	
	VDC	60 W (L/R 150 ms)	
Application conditions	Altitude without derating	Lower than 3300 ft. (1000 m)	
	Ambient	-5 to 40°C	
	Relative humidity	45 to 85%	
	Vibration	Maximum 20 Hz to 1 G	
	Shock	Maximum 30 G	
Weight in lbs. (kg)		59.5 (27)	61.7 (28)

LOW VOLTAGE APPLICATION TABLE				
Model	**System Voltage**	**Induction Motor**	**Three-Phase Transformer**	**Three-Phase Capacitor**
HCV-1JBU  (600 A)	208 V	200 HP	100 KVA	
	230 V	250 HP	200 KVA	200 KVAR
	380 V	300 HP	350 KVA	
	460 V	500 HP	400 KVA	400 KVAR
	575/600 V	600 HP	560 KVA	500 KVAR
	762/796 V	800 HP	720 KVA	
	1500 V	1600 HP	1400 KVA	1400 KVAR
HCV-1KAU  (720 A)	230 V	300 HP	240 KVA	250 KVAR
	380 V	450 HP	400 KVA	
	460 V	600 HP	480 KVA	500 KVAR
	575/600 V	700 HP	600 KVA	600 KVAR
	762/796 V	900 HP	800 KVA	
	1500 V	2000 HP	1500 KVA	1500 KVAR

Notes:
- The above table is based on general load data stard application.
- Lower limitations may apply on specific applications (i.e. applications above 3000 meter elevations).

ACCESSORIES
- Capacitor Trip Device; Used for Latched Contactor when DC Power is Not Available; Charges from AC Power, Supplies DC Power To Trip Coil
- Control Power Rectifier: Converts AC to DC Control Power for Trip Coil on Latched-Type Contactors
- Surge Suppressor: Three-Phase-Type NV60K304T1 for 3.6 to 7.2 kV NVK95K304T1 for 12 to 15 kV; Surge Suppressor Composed of Capacitor Series Resistor is an Excellent Protection Device; Features Suppression Decreased Surge Generation; Suitable for Protecting Motors Transformers Requiring Frequent Operations
- Mechanical Interlock: Used in a Reversing Starter to Mechanically Prevent Forward/Reverse Contactors from Closing Simultaneously (Not Available for CV-10 Series)

REVERSING CONTACTOR ASSEMBLY
- Low Voltage Vacuum Contactors, HCV-1JBU (600 A, 208 to 1500 V) HCV-1KAU (720 A, 208 to 1500 V) Available in Assembly for Reversing Motor Applications; Assembly Consists of Two Contactors on Common Baseplate with Mechanical Interlock; Line-Side Bus Jumpers with Incoming Mechanical Lugs Load-Side Cable Jumpers, Output Mechanical Lugs Also Included

MEDIUM VOLTAGE VACUUM CONTACTOR SPECIFICATIONS

MEDIUM VOLTAGE TECHNICAL DATA						
Model	**HCV-5HA**	**HCV-5HAL[1]**	**HCV-6KAU**	**HCV-6KALU[1]**	**CV-10HA(L)**	**CV-10HB(L)**
Voltage	2.4 to 6.6 KV (7.2 KV maximum)				12 to 15 kV	12 to 13.8 KV
Operational current	400 A		720 A		400 A	
Rated thermal current	450 A		800 A		450 A	
Interrupting current	7000 A (4.5 KA @ 7.2 KV)		7200 A		5 KA/4 KA	5 KA
Peak withstand current	15.8 KA		20 KA		12.5 KA	
Short-circuit making/ breaking current IEC 60470 (2000)	6.3 KA		8.0 KA		5 KA/4 KA	5 KA
	Open for 3 minutes, closed/open for 3 minutes, closed/open					
Class E1 mVA	25/50 (36/60)		30/60/85		120	
Class E2 mVA	200/400/570		200/400/600		1200	
Withstand overload current	2400 A for 30 seconds		4320 A for 30 seconds		1920 A for 30 seconds	
	4000 A for 12 seconds		-		-	
	6300 A for 2 seconds		8000 A for 1 second		8000 A for 1 second	
Overcurrent strength w/current limiting fuses (peak value)	85 KA (peak)				See coordination below	
Coordination w/ current-limiting fuses	-		-		Prospective short-circuit current 50 KA cut-off current 36 KA peak	
Switching frequency	1200/Hr.	300/Hr.	600/Hr.	300/Hr.	300/Hr.	120/Hr.
Mechanical life[2]	2.5-Million	250 - Thous	1-Million	200-Thous	250-Thous	
Electrical life[2]	250-Thous		200-Thous		100-Thous	
Impulse withstand	60 KV				75 KV	
Dielectric strength	22 KV, 1 minute				28 KV, 1 minute (42 kV)[3]	
Closing time (@ 120 VAC)	75 to 100 ms		80 to 100 ms		120 to 145 ms	
Opening time (@120 VAC)	20 to 30 ms		40 to 55 ms		30 to 40 ms	
Arcing time	10 ms or less					
Pick-up voltage	85% hot to 70% cold AC or DC					
Drop-out voltage	50% hot to 40% cold AC or DC					
Tripping voltage	60% or less of coil rating DC (Cold)					

MEDIUM VOLTAGE TECHNICAL DATA							
Model		**HCV-5HA**	**HCV-5HAL[1]**	**HCV-6KAU**	**HCV-6KALU[1]**	**CV-10HA(L)**	**CV-10HB(L)**
Control voltage	Standard	120 VAC, 50/60 Hz		115 to 240 VAC/ 125 to 250 VDC		100 to 240 VAC/ 125 to 250 VDC	
	Optional	240 VAC/125 VDC/ 250 VDC		-		-	
	Tripping	-	24, 32, 48, 125, 250 VDC	-	24, 32, 48, 125, 250 VDC	-	125 VDC
Control circuit burden	Closing	5.4 A peak @ 120 VAC 670 VA (AC), 700 W (DC)		6 to 7.0 A @ 120 VAC 840 VA (AC), 875 W (DC)		7.2 A peak @ 120 VAC 864 VA (AC) - 900 W (DC)	
	Holding	0.12 A Avg. @ 120 VAC 85 VA (AC), 85 W (DC)		0.8 to 1 A @ 120 VAC 48 VA		0.16 A Avg. @ 120 VAC 80 VA (AC), 90 W (DC)	
	Tripping[1]	4.8 A peak @125 VDC					
Auxiliary contact ratings	Arrangement	3NO-3NC	2NO-2NC	3NO-3NC	2NO-2NC	4NO-2NC	2NO-1NC
	Current	10 A (A600)					
	Voltage	600 VA maximum, 48 V minimum					
	AC	720 VA (P.F. 0.35)					
	DC	60 W (L/R 150 ms)					
Application conditions	Altitude w/o derating	Lower than 3300 ft (1000 m)					
	Ambient	-5° to 40°C					
	Relative humidity	45 to 85%					
	Vibration	Maximum 20 Hz to 1 G					
	Shock	Maximum. 30 G					
Weight in lbs. (kg)		43 (19.5)	44 (20.0)	60 (27)	62 (28)	88 (40)	91 (41)

Notes:
- 1 = Latched type.
- 2 = Maximum required test. Actual life under normal conditions is greater.
- 3 = Special withstand voltage (42 kV for 1 minute) available by request.

MEDIUM VOLTAGE APPLICATION TABLE					
Model	**System Voltage**	**0.8 PF Ind./ Syn Motor**	**1.0 PF Syn Motor**	**Three-Phase Transformer**	**Three-Phase Capacitor**
HCV-5HA(L) (400 A)	2.2 to 2.5 kV	1750 HP	2000 HP	1500 KVA	1500 KVAR
	3 to 3.3 KV	2250 HP	2500 HP	2000 KVA	2000 KVAR
	4 to 5 KV	3000 HP	3500 HP	3000 KVA	2000 KVAR
	6 to 6.6 KV	4500 HP	5000 HP	4000 KVA	2000 KVAR
HCV-6KA(L)U (720 A)	2.2 to 2.5 KV	2500 HP	3000 HP	2500 KVA	2000 KVAR
	3 to 3.3 KV	3000 HP	3500 HP	3500 KVA	2000 KVAR
	4 to 5 KV	4500 HP	5000 HP	4500 KVA	2000 KVAR
	6 to 6.6 KV	6000 HP	7000 HP	7000 KVA	2000 KVAR
CV-10HA(L) (320 A)	6.9 to 7.2 KV	3500 HP	4000 HP	3000 KVA	N/A
	10 to 12 KV	5500 HP	6000 HP	5500 KVA	
	13.8 KV	7000 HP	7500 HP	6500 KVA	
CV-10HB(L) (320 A continuous, 230 A breaking)	2.2 to 2.5 KV	N/A	N/A	N/A	1500 KVAR
	3 to 3.3 KV				2000 KVAR
	4 to 5 KV				2000 KVAR
	6 to 6.6 KV				3000 KVAR
	6.9 to 7.2 KV				3000 KVAR
	10 to 13.8 KV				5000 KVAR

Notes:
- The above table is based on general load data and standard application.
- Lower limitations may apply on specific applications (i.e. applications above 3000 meter elevations).

LOW & MEDIUM VOLTAGE VACUUM CONTACTOR PRICING

MODEL[1]	DESCRIPTION	APPLICATION	LIST PRICE
HCV-5HA	• 400 A, 2.3 to 7.2 KV • Non-Latched Type	Motors, distribution loads, transformer/capacitor switching	$4,000
HCV-5HAL-xx	• 400 A, 2.3 to 7.2 KV • Latched Type	Motors, distribution loads, transformer/capacitor switching	$4,800[2]
HCV-6KAU	• 720 A, 2.3 to 7.2 KV • Non-Latched Type	Motors, distribution loads, transformer/capacitor switching	$12,000
HCV-6KALU-xx	• 720 A, 2.3 to 7.2 KV • Latched Type	Motors, distribution loads, transformer/capacitor switching	$12,900[2]
CV-10HA	• 400 A, 10 to 15KV • Non-Latched Type	Motors, distribution loads, transformer	$11,700
CV-10HAL	• 400 A, 10 to 15 KV • Latched Type	Distribution loads, transformer switching	$13,000
CV-10HB	• 400 A, 10 to 13.8 KV • Non-Latched Type	Capacitor switching	$11,700
CV-10HBL	• 400 A, 10 to 13.8 KV • Latched Type	Capacitor switching	$13,000
HCV-1JBU	• 600 A, 208 to 1500 V • Non-Latched Type	Motors, distribution loads, transformer/capacitor switching	$5,000
HCV-1KAU	• 720 A, 208 to 1500 V • Non-Latched Type	Motors, distribution loads, transformer/capacitor switching	$9,400
HCVR-1JBU	• Reversing Contactor Assembly • 600 A, 208 to 1500 V • Non-Latched Type	Reversing motors	$14,700
HCVR-1KAU	• Reversing Contactor Assembly • 720 A, 208 to 1500 V • Non-Latched Type	Reversing motors	$21,400

Notes:
- 1 = For HCV-5HAL HCV-6KALU, replace “xx” in model number with close and trip voltage codes. First “x” is closing voltage, and second “x” is trip-coil voltage.
- 2 = For 24 V, 32 V 48 VDC trip, add $800 to list price shown in table. Adder includes auxiliary contact arc killer.

LATCHED CONTACTOR VOLTAGE CODES			
Close Voltage	**Code**	**Trip-Coil Voltage**	**Code**
1	120 VAC	1	125 VDC
2	240 VAC	2	250 VDC
3	125 VDC	3[2]	24 VDC
4	250 VDC	4[2]	32 VDC
		5[2]	48 VDC

LOW & MEDIUM VOLTAGE VACUUM CONTACTOR ACCESSORIES

MODEL NUMBER	DESCRIPTION	LIST PRICE
CIT-10QA	• Capacitor trip device • Used for latched-type vacuum contactor or vacuum circuit breaker when DC power is not available • Charges from AC power supplies DC power to trip coil 	$1,500
4Z9G0334G001	• AC/DC control power rectifier • Converts 120/240 VAC Input to 125/250 VDC to power trip coil on latched-type vacuum contactor or control power for a vacuum circuit breaker 	$300
NV60K304T1	• Surge suppressor • Three-phase CR surge suppressor for 3.3 to 7.2 KV system 	$2,500
NV95K304T1	• Surge suppressor • Three-phase CR surge suppressor for 10 to 15 KV system	$5,900
2C9G0059G002	• Mechanical interlock for HCV-5HA(L)	$640
2C9G0068G001	• Mechanical interlock for HCV-6KA(L)U	$1,000
3Z9G0119G001	• Latched-contactor modification kit for HCV-5HA HCV-6KAU • 125 VDC trip-coil	$700
3Z9G0119G002	• Latched-contactor modification kit for HCV-5HA HCV-6KAU; 250 VDC trip-coil	$700

MODEL NUMBER	DESCRIPTION	LIST PRICE
3Z9G0119G003	• Latched-contactor modification kit for HCV-5HA HCV-6KAU • 24 VDC trip-coil	$1,150
3Z9G0119G004	• Latched-contactor modification kit for HCV-5HA HCV-6KAU • 30/32 VDC trip-coil	$1,150
3Z9G0119G005	• Latched-contactor modification kit for HCV-5HA HCV-6KAU • 48 VDC trip-coil	$1,150
PC18330P671	• Latched-contactor auxiliary contact arc killer for HCV-5HAL HCV-6KAUL • Used with 24/32/48 VDC trip-coil models	$210
5P9A2593P001	• B9 lubricating grease (30 g tube)	Consult factory

LOW VOLTAGE SOLID STATE STARTERS

TE, TD TX SERIES SOLID STATE STARTERS

Toshiba now offers three low-voltage, digital solid state starter designs, adding the new TE series digital starter. The TE series is available from 18 to 1250 A. The TD advanced TX Series are available from 48 through 1250 A.

The solid state starters are programmable through an operator interface. The TE TD keypad includes a four-digit LED display status indicators. The TX keypad has an LCD display (two-line x 20-character display) status indicating lights. All models include electronic overload protection using real-time thermal modeling, which continuously calculates motor temperature even when the motor is not running, has retentive thermal memory. Thermal memory is maintained in brown-out or black-out conditions. The overload will not reset until there is sufficient motor thermal capacity available for a successful start.

STANDARD FEATURES

- Smooth, Step-Less Soft Start — Voltage Ramp/Current Limit
- Soft Stop: Deceleration/Pump Control
- Current Ratings — TE: 18 A to 1250 A, TD/TX: 32 to 1250 A
- Voltage Ratings: 200 to 600 VAC
- Overload Capacity: TD/TX 500% at 60 Sec.
- Overload Capacity: TD/TX 600% at 30 Sec.
- Overload Capacity: TE Stard Duty 350% at 30 Sec.
- Overload Capacity: TE Heavy Duty 500% at 30 Sec.
- Two or Three-Wire, Std. 120 VAC Control Voltage (TE TD Optional 230 VAC Control Voltage Available)

TE TD SERIES OPERATOR INTERFACE PANEL

- Four-Digit Display, Seven Function Keys, Eight Status LEDs: Power On, At Speed, Shunt Trip, Shorted SCR, Overcurrent, Phase Loss, Overtemperature, Overload

TE, TD TX SERIES PROTECTIVE FEATURES

- Phase Loss (Single-Phase)/Imbalance (5 to 30%)
- Electronic Overload (Individually Selectable Hot Cold Curves, Class 5 to 30)
- Shorted SCR
- Shorted Load
- Overtemperature
- Undercurrent (10 to 90% of Motor FLA)
- Overcurrent (50 to 300% of Motor FLA)
- Repetitive Starting

TE SERIES ADDITIONAL PROTECTIVE FEATURES

- Ground Fault

TX SERIES ADDITIONAL PROTECTIVE FEATURES

- Line Frequency
- Phase Reversal
- Ground Fault
- Overvoltage
- Undervoltage
- Optional Stator Bearing RTD Inputs (12 Maximum)

TE, TD TX SERIES ADJUSTMENTS

- Voltage Ramp Start: 1 to 120 Seconds
- Initial Voltage: 0 to 100%
- Current Limit: 200 to 600%
- Decel Ramp Time: 1 to 60 Seconds
- Stop Voltage: 0 to 100%
- Initial Deceleration Voltage Level: 0 to 100%
- Voltage Jog: 5 to 100% Voltage, 0.1 to 2 Seconds
- Current Jog: 100 to 500%
- Kick Start: 10 to 100% Voltage, 0.1 to 2 Seconds
- Starts per Hour: 1 to 10 Starts/Hour, 1 to 60 Minutes Between Start Attempts
- Coast-Down Lockout Timer: 1 to 60 Minutes
- Overload Reset: Manual or Automatic
- Dual Ramp Settings: Four Programmable Ramp Options
- Programmable Output Relays: TE TD have Three Relays, TX has Four Relays

TD SERIES METERING/COMMUNICATIONS

- Phase Currents (A, B, C)
- Remaining Thermal Capacity of Motor
- Elapsed Time (ETM)
- Run Cycle Counter
- Detailed Fault Codes Fault History (Last Three Faults)
- Lockout Time Remaining
- Real-Time Clock
- Modbus RTU RS485 Communications (Adapter Kit Required)

TE SERIES (ADDITIONAL TO TD SERIES)

- Ground Current
- Process Timer Remaining
- Time Clock Time Base

TX SERIES OPERATOR INTERFACE PANEL

- LCD Display (Two-Line x 20-Characters), Eight Function Keys, Eight LED Status Indicators

TX SERIES METERING/ COMMUNICATIONS

- Phase Currents (A, B, C)
- Ground Current
- Unbalance %
- Voltage (V_{AB}, V_{BC}, V_{CA})
- RPM
- Line Frequency
- Power Factor
- KVAR, kW, KVA
- Amps, kW KVAR Dem
- Remaining Thermal Capacity of Motor
- Required Thermal Capacity to Start
- Average Start Time
- Average Start Current
- RTD Data (12 RTDs), Optional
- Elapsed Time (ETM)
- Run Cycle Counter
- Detailed Fault History
- Lockout Time Remaining
- Real-Time Clock
- Event Recorder, Up to 60 Events
- Serial Communications: RS485 with Modbus RTU; Up to 247 Devices per Node; Full Operation, Status View Programming via Modbus; Windows®-Based Communications Software with RS232

OPTIONS

- Construction/Enclosures: Open Chassis or Enclosed Types Available; Stard Enclosure Types 1, 12, 3R, 4, 4X; For Other Types Consult Factory; For Non-Ventilated Enclosures (i.e. N-12), 120 A Units (TD007 TX007) Above Come Stard with Automatic Bypass (Includes Full-Rated Bypass Contactor); See Automatic Bypass Option for Further Information

- Non-Combination Type or Combination (With Circuit Breaker, Fusible or Non-Fusible Disconnect Switch): On Circuit-Breaker-Type, Shunt-Trip Provided to Trip Breaker For SCR Fault

- Door-Mounted Keypad/Display Panel (TD TX Models): As Stard, Panel-Mounted On Open Chassis Cover; If Ordering TD005, TD006, or TD007 Starter (Non-Combination, N-1 Enclosure No Factory Modifications), Starter is Open-Type/N-1 Enclosed Starter, Keypad Mounted on Cover; On Other Models, Viewing Window Provided Programming Must be Done With Door Open; Keypad Can be Door-Mounted as Option or Field-Install Kits can be Supplied

- Input Isolation Contactor (Air Magnetic or Vacuum Contactors Available)

- Automatic Bypass: Automatic Bypass Stard on all 120 A Above Models When Provided In Non-Ventilated Enclosures (i.e. Type 12, 3R, 4 4X); Automatic Bypass Allows Motor Switch From SCR Control to Across-the-Line to Eliminate Thryristor Heating During Continuous Running Operation; Bypass Operation Requires Addition of Bypass Contactor (Vacuum or Air-Type); Bypass Control Circuitry Stard on TD TX Chassis Units

- Manual Bypass: Selection Requires Addition of Overload Relay (Bi-Metallic or Solid State), In Addition to Bypass Contactor, Device to Perform Selection (i.e. Selector Switch)

TD SERIES COMBINATION TYPE STARTER

- Includes NEMA Type 12 Enclosure, Circuit Breaker, CPT Bypass Contactor

OPTIONS

For the following options, consult the factory for a quotation.

- Reversing Operation: Forward/Reverse Motor Control Available with Addition of Reversing Contactor

- Electronic DC Injection Braking: Quickly Stops Loads by Injecting DC Current Into AC Motor; Stard Duty/Heavy Duty Brakes Available

- Two-Speed: Operation of Two-Speed Motors Available for One or Two Winding Motors; Additional Contactors Required

TD TX SERIES PART NUMBERING CONVENTION

Ordering Information: Use the following part numbering convention to configure the solid state starter when placing your order. For additional factory installed options, add the appropriate option code on the end as in the example below. Example is a TD unit with a circuit breaker, 100 HP, 460 V, in a NEMA 12 enclosure.

Example Part Number:	TD/TX	1	08	K	C	Y	1

Series

Non-Comb. or W/CB:
- 0 — Non-comb.
- 1 — Circuit breaker

Chassis rating:
- 04 — 32 A
- 05 — 48 A
- 06 — 78 A
- 07 — 120 A
- 08 — 180 A
- 09 — 220 A
- 10 — 288 A
- 11 — 414 A
- 12 — 475 A
- 13 — 550 A
- 14 — 718 A
- 15 — 1006 A
- 16 — 1150 A
- 17 — 1250 A

Enclosure rating[1]:
- A — None (Open)
- B — 1
- C — 1A
- K — 12
- E — 3R
- G — 4
- W — 4X

Line voltage[2] @ 60 Hz
- B — 230 to 240
- C — 460 to 480
- D — 575 to 600
- F — 208
- H — 400

Line voltage[2] @ 50 Hz
- N — 200 to 220
- P — 400 to 440
- R — 380

Line Voltage[2] w/ open chassis no factory mod.
- N — 200 to 220
- C — 208 to 480
- D — 575 to 600

Motor rating[2]:
- K — 7.5 HP
- L — 10 HP
- M — 15 HP
- N — 20 HP
- P — 25 HP
- Q — 30 HP
- R — 40 HP
- S — 50 HP
- T — 60 HP
- V — 75 HP
- W — 100 HP
- Y — 125 HP
- Z — 150 HP
- A — 200 HP
- B — 250 HP
- C — 300 HP
- D — 350 HP
- E — 400 HP
- F — 450 HP
- G — 500 HP
- H — 600 HP
- J — 700 HP
- K — 800 HP
- L — 900 HP
- M — 1000 HP
- N — 1250 HP
- X — OTHER

Bypass/input Iso[2]:
- 0 — NONE
- 1 — Auto byp - air Ctt
- 2 — Man byp - VAC Ctt/2E OL
- 3 — Man byp - Air Ctt/2E OL
- 4 — Auto byp - VAC Ctt
- 5 — Iso - Air Ctt
- 6 — Iso - VAC Ctt
- 7 — Man byp - air Ctt/bi-metal OL

Notes:

- 1 = Enclosure Ratings:
  - 1 — NEMA Type 1, Indoor, General Purpose
  - 1A — Indoor, Gasketed, Dust-Protected with Fans Filters
  - 12 — NEMA Type 12, Indoor, Dust-Tight, Drip-Tight
  - 3R — NEMA Type 3R, Outdoor, Rain-Tight, Sleet-Resistant
  - 4 — NEMA Type 4, Indoor/Outdoor, Water-Tight, Dust-Tight
  - 4X — NEMA Type 4X, Indoor/Outdoor, Water-Tight, Dust-Tight, Corrosion-Resistant
- 2 = For no modifications or bypass, 120 VAC separate control, use open chassis enclosure code “A” in the part number, line voltage code “C” or “D” for TD, “D” for TX, no other codes.

TE SERIES PRICING

SOLID STATE STARTER PRICING — OPEN CHASSIS TYPE												
Model Number	Adjustable Range (Amps)	Max Motor FLA		Maximum HP								List Price
				208 V		230 V		460 V		575 V		
		HD	SD	HD	SD	HD	SD	HD	SD	HD	SD	
TE-18-BP	9 to 18	11	18	3	5	3	5	7.5	10	7.5	15	$1,570
TE-28-BP	14 to 28	21	28	5	7.5	5	7.5	15	20	15	25	$1,600
TE-39-BP	20 to 39	27	39	7.5	10	7.5	10	20	25	20	30	$1,650
TE-48-BP	24 to 48	40	48	10	10	10	15	25	30	25	40	$1,700
TE-62-BP	31 to 62	45	62	10	15	15	20	30	40	30	60	$1,720
TE-78-BP	39 to 78	55	78	15	20	20	25	40	50	40	75	$1,750
TE-92-BP	46 to 92	68	92	20	25	25	30	50	60	50	75	$2,100
TE-112-BP	56 to 112	80	112	25	30	30	40	50	75	50	100	$2,500
TE-150-BP	75 to 150	96	150	30	40	30	50	60	100	60	125	$3,200
TE-160-BP	80-160	125	160	40	50	40	60	75	125	75	150	$3,600
TE-210-BP	105 to 210	156	210	50	60	60	75	125	150	125	200	$4,600
TE-275-BP	138 to 275	220	275	60	75	75	100	150	200	150	250	$5,500
TE-361-BP	181 to 361	248	361	75	125	100	125	200	300	200	350	$5,900
TE-450-BP	225 to 450	400	450	125	150	150	150	300	350	300	450	$6,620
TE-550-BP	275 to 550	480	550	150	150	200	200	400	450	500	500	$8,350
TE-600-BP	300 to 600	600	600	200	200	250	250	500	500	600	600	$8,500
TE-862-BP	431 to 862	690	862	250	250	250	300	500	600	600	700	$12,250
TE-900-BP	450 to 900	800	900	250	300	300	350	600	700	600	900	$14,250
TE-1006-BP	503 to 1006	960	1006	300	350	400	400	800	800	900	1000	$24,000
TE-1250-BP	625 to 1250	1080	1250	350	450	450	500	900	1000	1000	1200	$29,500

Notes:

- Data is based on NEC Table 430-150, full-load current three-phase motors.
- Size soft starter based on actual motor nameplate FLA
- Heavy Duty Rating (HD) — 500% overload capacity for 30 seconds, 1.15 S.F., line start (A-T-L) full voltage bypass (except TE-1250-BP which is shunt duty rated only)
- Standard Duty Rating (SD) — 350% capacity for 30 seconds, 1.0 S.F., shunt rated bypass

TD SERIES PRICING

SOLID STATE STARTER PRICING — NON-COMBINATION TYPE									
Model Number	Chassis Max. Amps	Maximum HP				List Price			
						Open Chassis	Enclosure Type		
		208 V	230 V	460 V	575 V		1	12/3R[1]	4[1]
TD005	48[2]	10	15	30	40	$1,400[3]	-	$1,920	$2,130
TD006	78	15	20	40	50	$1,700[3]	-	$2,550	$2,770
TD006	78	20	25	50	60	$1,700[3]	-	$2,550	$2,770
TD007	120	25	30	60	75	$2,300[3]	-	$3,720	$4,150
TD007	120	30	40	75	100	$2,300[3]	$2,300[3]	$4,580	$5,100
TD008	180	40	50	100	125	$3,000	$4,580	$5,750	$6,100
TD008	180	50	60	125	150	$3,000	$4,580	$6,170	$6,600
TD009	220	60	75	150	200	$3,600	$5,200	$7,450	$7,770
TD010	288	75	100	200	250	$4,000	$5,960	$7,870	$8,600
TD011	414	100	125	250	300	$4,600	$6,700	$9,150	$10,100
TD011	414	125	150	300	350	$4,600	$6,700	$9,900	$10,850
TD012	476	-	-	350	400	$5,500	$8,200	$11,700	$12,980
TD013	550	150	200	400	500	$5,800	$8,610	$12,200	$13,300
TD014	718	200	250	500	600	$7,500	$11,700	$17,900	$19,700
TD015	1006	250	300	600	700	$9,000	$14,200	$19,200	$20,950
TD015	1006	300	350	700	800	$9,000	$14,200	$19,200	$20,950
TD016	1150	350	400	800	900	$15,000	$21,600	$40,600	$43,000
TD017	1250	400	450	900	1000	$19,000	$28,900	$47,900	CF
TD017	1250	450	500	1000	1250	$19,000	CF		

Notes:

- 1 = For TD007 to TD017, the NEMA 12, 3R, 4 price includes automatic bypass (air) contactor, full HP rated.
- 2 = Minimum motor FLA (chassis) setting is programmable down to 18 A.
- 3 = Unit has an integrated NEMA 1 chassis, but can also be used as a panel mount.
- CF = Consult factory.
- All units require 120 VAC control power. See option for control power transformer if desired
- Options accessories may affect overall dimensions. Consult factory for exact dimensions

SOLID STATE STARTER PRICING — COMBINATION CIRCUIT BREAKER TYPE								
Model Number	Chassis Max. Amps	Maximum HP				List Price		
						Enclosure Type		
		208 V	230 V	460 V	575 V	1	12/3R[1]	4[1]
TD105	48[2]	10	15	30	40	$3,400	$3,830	$4,470
TD106	78	15	20	40	50	$3,830	$4,260	$4,680
TD106	78	20	25	50	60	$3,830	$4,260	$4,680
TD107	120	25	30	60	75	$4,680	$5,430	$5,960
TD107	120	30	40	75	100	$5,530	$6,170	$6,800
TD108	180	40	50	100	125	$6,700	$7,240	$7,980
TD108	180	50	60	125	150	$7,120	$7,660	$8,400
TD109	220	60	75	150	200	$7,550	$8,600	$9,500
TD110	288	75	100	200	250	$9,270	$11,380	$12,500
TD111	414	100	125	250	300	$10,300	$12,200	$13,300
TD111	414	125	150	300	350	$10,960	$12,660	$13,900
TD112	476	-	-	350	400	$13,500	$18,200	$20,100
TD113	550	150	200	400	500	$14,200	$18,500	$20,400
TD114	718	200	250	500	600	$16,600	$23,400	$25,700
TD115	1006	250	300	600	700	$20,900	$27,200	$29,800
TD115	1006	300	350	700	800	$22,800	$30,800	$32,500
TD116	1150	350	400	800	900	$33,200	$44,300	$46,500
TD117	1250	400	450	900	1000	$38,200	$59,000	CF
TD117	1250	450	500	1000	1250	$49,300	$59,600	

Notes:

- 1 = For TD107 to TD117, the NEMA 12, 3R, 4 price includes automatic bypass (air) contactor, full HP rated.
- 2 = Minimum motor FLA (chassis) setting is programmable down to 18 A.
- CF = Consult factory.
- All units require 120 VAC control power. See option for control power transformer if desired
- Options accessories may affect overall dimensions. Consult factory for exact dimensions.
- Circuit breakers come stard with shunt-trip coil (120 VAC).

TX SERIES PRICING

SOLID STATE STARTER PRICING — NON-COMBINATION TYPE									
Model Number	Chassis Max. Amps	Maximum HP				List Price			
						Open Chassis	Enclosure Type		
		208 V	230 V	460 V	575 V		1	12/3R[1]	4[1]
TX005	48[2]	10	15	30	40	$3,000[3]	-	$3,620	$3,830
TX006	78	15	20	40	50	$3,300[3]	-	$4,260	$4,470
TX006	78	20	25	50	60	$3,300[3]	-	$4,260	$4,470
TX007	120	25	30	60	75	$3,900[3]	-	$5,430	$5,850
TX007	120	30	40	75	100	$3,900[3]	-	$6,300	$6,800
TX008	180	40	50	100	125	$4,600	$6,280	$7,500	$7,900
TX008	180	50	60	125	150	$4,600	$6,300	$7,900	$8,300
TX009	220	60	75	150	200	$5,200	$6,900	$9,200	$9,500
TX010	288	75	100	200	250	$5,600	$7,600	$9,600	$10,300
TX011	414	100	125	250	300	$6,200	$8,400	$10,900	$11,800
TX011	414	125	150	300	350	$6,200	$8,400	$11,600	$12,600
TX012	476	-	-	350	400	$7,100	$9,900	$13,400	$14,700
TX013	550	150	200	400	500	$7,400	$10,300	$13,900	$15,000
TX014	718	200	250	500	600	$9,100	$13,400	$19,600	$21,400
TX015	1006	250	300	600	700	$10,600	$15,900	$20,900	$22,700
TX015	1006	300	350	700	800	$10,600	$15,900	$20,900	$22,700
TX016	1150	350	400	800	900	$16,600	$23,300	$42,400	$44,800
TX017	1250	400	450	900	1000	$20,600	$30,700	$49,600	CF
TX017	1250	450	500	1000	1250	$20,600	CF		

Notes:

- 1 = For TX007 to TX017, the NEMA 12, 3R, 4 price includes automatic bypass (air) contactor, full HP rated.
- 2 = Minimum motor FLA (chassis) setting is programmable down to 18 A.
- 3 = Unit has an integrated NEMA 1 chassis, but can also be used as a panel mount.
- CF = Consult factory.
- All units require 120 VAC control power. See option for control power transformer if desired
- Options accessories may affect overall dimensions. Consult factory for exact dimensions

SOLID STATE STARTER PRICING — COMBINATION CIRCUIT BREAKER TYPE								
Model Number	Chassis Max. Amps	Maximum HP				List Price		
						Enclosure Type		
		208 V	230 V	460 V	575 V	1	12/3R[1]	4[1]
TX105	48[2]	10	15	30	40	$5,100	$5,500	$6,200
TX106	78	15	20	40	50	$5,530	$5,960	$6,400
TX106	78	20	25	50	60	$5,530	$5,960	$6,400
TX107	120	25	30	60	75	$6,400	$7,200	$7,700
TX107	120	30	40	75	100	$7,250	$7,900	$8,500
TX108	180	40	50	100	125	$8,400	$8,940	$9,680
TX108	180	50	60	125	150	$8,830	$10,300	$11,200
TX109	220	60	75	150	200	$9,250	$10,700	$11,600
TX110	288	75	100	200	250	$10,960	$13,000	$14,200
TX111	414	100	125	250	300	$12,000	$13,800	$15,000
TX111	414	125	150	300	350	$12,700	$14,400	$15,700
TX112	476	-	-	350	400	$15,300	$19,900	$21,800
TX113	550	150	200	400	500	$15,900	$20,500	$22,400
TX114	718	200	250	500	600	$18,300	$28,300	$31,500
TX115	1006	250	300	600	700	$22,700	$28,800	$32,500
TX115	1006	300	350	700	800	$24,500	$32,500	$34,200
TX116	1150	350	400	800	900	$34,900	$45,900	$48,200
TX117	1250	400	450	900	1000	$39,900	$60,700	CF
TX117	1250	450	500	1000	1250	$50,900	$61,300	

Notes:

- 1 = For TX107 to TX117, the NEMA 12, 3R, 4 price includes automatic bypass (air) contactor, full HP rated.
- 2 = Minimum motor FLA (chassis) setting is programmable down to 18 A
- CF = Consult factory.
- All units require 120 VAC control power. See option for control power transformer if desired
- Options accessories may affect overall dimensions. Consult factory for exact dimemsions
- Circuit breakers come stard with shunt-trip coil (120 VAC)

Modification Ordering Information: Use the following part numbering convention to configure the solid state starters when placing your order.

For additional factory installed options, add the appropriate option code to the end of the part number as shown in the example.

For a TD rated 100 HP, 460 V, type 12 enclosure, which comes stard with an automatic bypass contactor, include a control power transformer (460 V:120 V), H/Off/Auto selector switch, Run Off pilot lights.

TD108KCY1	D		0		K		6			
Starter Base Part No.	**Control Circuit**		**Pilot Device PB**		**Pilot Device SS**		**Pilot Device PL**		**Protective Device/Relay/Etc.**	
TD for a 100 HP, 460 V motor, with circuit breaker in N-12 enclosure	CODE	TYPE	CODE	TYPE	CODE	TYPE	CODE	TYPE	CODE	TYPE
	D	Std. capacity CPT	0	No push-button	K	H/O/A Switch	6	*Run/Off* pilot lights	Blank	No additional options

TD TX SERIES FACTORY-INSTALLED MODIFICATIONS

<table>
<tr><th colspan="3">MODIFICATION DESCRIPTION</th><th>MODEL</th><th>CODE</th><th>LIST PRICE</th></tr>
<tr><td colspan="3">• No bypass or input isolation contactor</td><td>ALL</td><td>0</td><td>-</td></tr>
<tr><td rowspan="18">• Bypass option
• Bypass contactor is full-HP Rated for Across-the-Line Starting)</td><td rowspan="18">• Manual bypass
• Allows emergency full voltage starting without SSS
• No pilot devices supplied as standard
• If door or internally-mounted device is required, add appropriate option (i.e. selector switch mod. code “E” or “M”, $100 adder)</td><td rowspan="13">• Bypass - air contactor bi-metallic overload</td><td>TD/TX_05</td><td rowspan="13">7</td><td>$450</td></tr>
<tr><td>TD/TX_06</td><td>$600</td></tr>
<tr><td>TD/TX_07</td><td rowspan="11">For N-1 enclosure, use N-12 price code, add $250

On N-12/ 3R/4/4X, add $250</td></tr>
<tr><td>TD/TX_08</td></tr>
<tr><td>TD/TX_09</td></tr>
<tr><td>TD/TX_10</td></tr>
<tr><td>TD/TX_11</td></tr>
<tr><td>TD/TX_12</td></tr>
<tr><td>TD/TX_13</td></tr>
<tr><td>TD/TX_14</td></tr>
<tr><td>TD/TX_15</td></tr>
<tr><td>TD/TX_16</td><td rowspan="2">Consult factory</td></tr>
<tr><td>TD/TX_17</td></tr>
<tr><td rowspan="5">• Bypass - vacuum contactor 2E solid state
• Overload for NEMA 1 enclosure, use NEMA 12 list price enclosure code, add modification list price
• For NEMA 12, 3R, 4, 4X, use appropriate enclosure code add modification list price shown</td><td>TD/TX_13</td><td rowspan="5">2</td><td>$5,000</td></tr>
<tr><td>TD/TX_14</td><td>$5,400</td></tr>
<tr><td>TD/TX_15 (720A max. FLA)</td><td>$5,400</td></tr>
</table>

MODIFICATION DESCRIPTION			MODEL	CODE	LIST PRICE
• Bypass option • Bypass contactor is full-HP Rated for Across-the-Line Starting)	• Manual bypass • Allows emergency full voltage starting without SSS • No pilot devices supplied as standard • If door or internally-mounted device is required, add appropriate option (i.e. selector switch mod. code "E" or "M", $100 adder	• Bypass - air contactor 2E solid state overload	TD/TX_05	3	$1,100
			TD/TX_06		$1,100
			TD/TX_07		For N-1 enclosure, use N-12 price code, add $720 On N-12/3R/4/4X, add **$720**.
			TD/TX_08		
			TD/TX_09		
			TD/TX_10		
			TD/TX_11		
			TD/TX_12		
			TD/TX_13		
			TD/TX_14		
			TD/TX_15		
			TD/TX_16		Consult factory
			TD/TX_17		
• Bypass option (bypass contactor is full-HP rated for across-the-line starting)	• Automatic bypass (uses SSS chassis internal solid state overload)	• Bypass - air contactor	TD/TX_05	0	Not required
			TD/TX_06		
			TD/TX_07	1	For N-1 enclosure, use N-12 price code Standard on N-12/3R/4/4X.
			TD/TX_08		
			TD/TX_09		
			TD/TX_10		
			TD/TX_11		
			TD/TX_12		
			TD/TX_13		
			TD/TX_14		
			TD/TX_15		
			TD/TX_16		
			TD/TX_17		
• Bypass option (bypass contactor is full-HP rated for across-the-line starting)	• Automatic bypass • Uses SSS chassis internal solid state overload	• Bypass - vacuum contactor • For NEMA 1 enclosure, use NEMA 12 list price enclosure code, add modification list price • For NEMA 12, 3R, 4, 4X, use appropriate enclosure code add modification list price shown	TD/TX_12	4	$3,250
			TD/TX_13		$4,400
			TD/TX_14		$4,700
			TD/TX_15 (720A max. FLA)		$4,700

MODIFICATION DESCRIPTION		MODEL	CODE	LIST PRICE
• Input isolation-contactor	• input air-contactor	TD/TX_05	5	$350
		TD/TX_06		$400
		TD/TX_07		$500
		TD/TX_08		$700
		TD/TX_09		$900
		TD/TX_10		$1,000
		TD/TX_11		$1,900
		TD/TX_12		$2,000
		TD/TX_13		$3,300
		TD/TX_14		$5,800
		TD/TX_15		$5,800
		TD/TX_16		$6,900
		TD/TX_17		C.F.
	• Input vacuum-contactor	TD/TX_11	6	$5,400
		TD/TX_12		$5,400
		TD/TX_13		$5,400
		TD/TX_14		$5,400
		TD/TX_15 (720A Max. FLA)		Consult Factory

Notes:
- Standard starter dimensions may be changed due to these modifications.

MODIFICATION DESCRIPTION			CODE	LIST PRICE
• Control circuit	• Separate control	120 VAC	A	NC
		230 VAC	B	
• Control power transformer • (120 VAC secondary with one secondary two primary fuses)[1]	• Standard capacity		D	$250
	• With 100 VA extra capacity		F	$350
	• With 200 VA extra capacity		H	$450
	• With 300 VA extra capacity		J	$600
	• With 400 VA extra capacity		L	$650
	• With 500 VA extra capacity		M	$750
	• With 1000 VA extra capacity		V	$1000

Notes:
- 1 = If other control voltage is required, consult factory.
- Standard starter dimensions may be changed due to these modifications.
- NC = No charge.

MODIFICATION DESCRIPTION				CODE	LIST PRICE
	Quantity	Color	Legend[1]		
• Pilot devices - PB (Push-button)	1	Black	*Start*	A	$200
			Stop	B	
			On	C	
			Off	D	
			Open	E	
			Close	F	
			Reset	G	
			Jog	H	
			Bypass	I	
		Red	*Stop*	K	
			Off	M	
	2	Black/red	*Start/Stop*	T	$400
			On/Off	U	
	3	Black/black/red	*For/Rev/Stop*	X	$600
			Hi/Lo/Stop	Y	
	None			0	

Notes:
- 1 = Legend plates are standard black with white lettering

MODIFICATION DESCRIPTION				CODE	LIST PRICE
• Pilot devices - SS (selector switch)	Position	Color	Legend[1]		
	2	Black	*Local/Remote*	A	$300
			Hand/Auto	B	
			For/Rev	C	
			Slow/Fast	D	
			SSS/Bypass	E	
			Man/Auto	F	
			Start/Stop	G	
			Off/On	H	
	3	Black	*For/Off/Rev*	I	
			Hi/Off/Lo	J	
			H/Off/Auto	K	
			SSS/Off/Bypass	M	
	None			0	

MODIFICATION DESCRIPTION				CODE	LIST PRICE
• Pilot devices - PL (pilot light)	Quantity	Color	Legend[1]		
	1	Red	*Run*	A	$300
			On	B	
			Off	C	
			Stop	D	
			Trip	E	
			Open	F	
			Close	G	
			Jog	H	
			Power On	J	
			SSS	K	
			Bypass	L	
			Fault	M	
	None			0	

Notes:
- 1 = Legend plates are standard black with white lettering.

MODIFICATION DESCRIPTION				CODE	LIST PRICE
Pilot devices - PL (pilot light)	Quantity	Color	Legend[1]		
	1	Green	*Run*	N	$300
			On	P	
			Off	Q	
			Stop	R	
			Open	T	
			Close	U	
			Jog	V	
		Amber	*Fault*	X	
			Reset	Y	
			Power On	Z	
			Trip	1	
		White	*Reset*	3	
			Power On	4	
	2	Red/green	*Run/Off*	6	$600
			On/Off	7	
		Green/red	*Run/Off*	8	
			On/Off	9	
		Red/red	*For/Rev*	#	
			Slow/Fast	%	
			SSS/Bypass	$	
	3	Red/red/green	*For/Rev/Off*	@	$900
			Hi/Lo/Off		
	None			0	

Notes:
- 1 = Legend plates are standard black with white lettering.

MODIFICATION DESCRIPTION				CODE	ENCLOSURE TYPE	LIST PRICE
• Protective devices • Control timing relays • Enclosure modifications	• For multi-motor control or manual bypass					
	• Thermal bi-metallic OLR - add OLR			A	ALL	$160
	• Solid state overload relay (2E) • For manual bypass, see bypass option			C	ALL	$720
	• 2E option: manual reset on door			H	ALL	$200
	• Door-mount keypad/display panel	TD TX		M	1	$480
					12, 3R, 4	$600
	• RTD monitor/relay - 14 RTD inputs, door-mount display	For TD or man. byp.		R	1, 12	$4400
	• RTD monitor/relay - maximum 12 RTD inputs	TX only		N	ALL	$2000
	• Undervoltage relay	Std. on TX		S	ALL	$400
	• Overvoltage relay	Std. on TX		T	ALL	$400
	• Under/overvoltage relay	Std. on TX		U	ALL	$800
	• Control relay - 4-pole • Specify function	NO	NC			
	• Contact configuration	2	2	Y	ALL	$360
		3	1	Z		
		4	0	1		
	• Control relay, 8-pole • Specify function	NO	NC			
	• Contact configuration	4	4	2	ALL	$600
		6	2	3		
		8	0	4		
	• Timing relay • Specify time range function			5	ALL	$500
	• Programmable • 24-hour, 7-day clock			9	ALL	$600
	• Lightning arrestor • Three-phase			#	ALL	$300
	• Surge capacitor			%	ALL	$240
	• Floor-mount stand where applicable			$	ALL	$400
	• Cubicle space heater			@	ALL	$400
	• Cubicle space heater with thermostat				ALL	$600
	• None			Leave blank		

TE SERIES ACCESSORIES

Part Number	Description	Model	List Price
TE-KP12-KIT2-1	• Remote display kit - NEMA 12 with 1-meter cable	TE-18 to TE-48	$220
TE-KP12-KIT2-2	• Remote display kit - NEMA 12 with 2-meter cable		$250
TE-KP12-KIT2-3	• Remote display kit - NEMA 12 with 3-meter cable		$270
TE-KP12-KIT-1	• Remote display kit - NEMA 12 with 1-meter cable	TE-62 above	$240
TE-KP12-KIT-2	• Remote display kit - NEMA 12 with 2-meter cable		$280
TE-KP12-KIT-3	• Remote display kit - NEMA 12 with 3-meter cable		$290
TE TOOL	• Software for programming, commissioning, monitoring • Includes CD USB to RS485 converter	All	$700

Notes:
- Remote display cable asembly includes connectors on each end.
- Starters do not come with lugs. Soft starters up to 60A rating are provided with terminal bus tabs as standard.

TD SERIES ACCESSORIES

Part Number	Description	List Price
TD-KPN1-1	• Remote display kit - NEMA type 1 with 1-meter cable	$160
TD-KPN1-2	• Remote display kit - NEMA 1 with 2-meter cable	$180
TD-KPN1-3	• Remote display kit - NEMA 1 with 3-meter cable	$200
TD-KP12-1	• Remote display kit - NEMA 12/4 with 1-meter cable	$280
TD-KP12-2	• Remote display kit - NEMA 12/4 with 2-meter cable	$300
TD-KP12-3	• Remote display kit - NEMA 12/4 with 3-meter cable	$320
TD-RS485-KIT-1	• RS485 communication kit • For TD Series Only • Kit includes 12-inch long cable	$400

TD & TX SERIES SPARE PARTS

Part Number	Chassis Model	Description	List Price (ea.)
101232	TD005-17 (120Vac Control)	• Main power/CPU circuit board kit • Includes both main power board CPU board assembled together	$1,750
101285	TX005-17	• Main power/CPU circuit board kit • Includes both main power board CPU boards assembled together	$4,400
101183	TD or TX005	• Thyristor (SCR) • For 48 A unit • Three required per starter	$260
101184	TD or TX006	• Thyristor (SCR) • For 78 A unit • Three required per starter	$370
101185	TD or TX007	• Thyristor (SCR) • For 120 A unit • Three required per starter	$375
101186	TD or TX008	• Thyristor (SCR) • For 180 A unit • Six required per starter	$380
101187	TD or TX009-10	• Thyristor (SCR) • For 220 288 A units • Six per starter	$385
101188	TD or TX011-15	• Thyristor (SCR) • For 414-718A units • Six required per starter	$930
101190	TD or TX016-17	• Thyristor (SCR) • For 1150 1250 A units • Six per starter	$1,720
101235	TD005-17	• Keypad/display panel	$240
101262	TX005-17	• Keypad communications board* • Circuit board only	$2,100

Notes:
- * Does not include keypad membrane. For membrane, consult factory.
- Use spare parts discount.

TE SERIES DIMENSIONS WEIGHTS

Model	Open-Chassis Type			
	Dimensions Inches (mm)			Approx.Wt. lbs (kg)
	H	W	D	
TE-18-BP to TE-48-BP	8.75 (216)	8.00 (203)	6.66 (169)	13 (5.9)
TE-62-BP to TE-112-BP	14.00 (355.6)	8.00 (203)	6.68 (170)	23 (10.4)
TE-150-BP to TE-160-BP	19.21 (487.9)	8.00 (203)	6.68 (170)	33 (15)
TE-210-BP	28.50 (712.4)	12.50 (317.5)	9.04 (223)	130 (59)
TE-275-BP				140 (63.5)
TE-361-BP to TE-450-BP				145 (65.8)
TE-550-BP to TE-600-BP	28.50 (712.4)	12.50 (317.5)	9.04 (223)	165 (74.8)
TE-862-BP to TE-900-BP	44.13 (1120)	25.5 (647.7)	11.86 (301)	315 (143)
TE-1006-BP	46.56 (1182)	28.2 (716)	13.00 (330)	550 (250)
TE-1250-BP	46.56 (1182)	28.2 (716)	13.00 (330)	750 (340)

TD TX SERIES DIMENSIONS WEIGHTS

MAX HP AT 460 V	MODEL	OPEN-CHASSIS TYPE				NON-COMBINATION TYPE N-1 (WITH CPT, NO BYPASS)		
		Dimensions (in.)			Wt. (lb.)	Dimensions (in.)		
		H	W	D		H	W	D
30	TD/TX005	16	10	10	31.4	30	24	13
50	TD/TX006	16	10	10	34.8	30	24	13
60	TD/TX007	16	10	10	35	30	24	13
75	TD/TX007	16	10	10	35	30	24	13
100	TD/TX008	20	20.12	12	85	30	24	13
125	TD/TX008	20	20.12	12	85	30	24	13
150	TD/TX009	27	20.12	11.2	85	42	30	13
200	TD/TX010	27	20.12	11.2	97	42	30	13
250	TD/TX011	29.5	20.12	11.5	120	42	30	13
300	TD/TX011	29.5	20.12	11.5	120	42	30	13
350	TD/TX012	29.5	20.12	11.5	120	42	30	13
400	TD/TX013	29.5	20.12	11.5	120	42	30	13
500	TD/TX014	45	33	12.75	410	48	36	16
600	TD/TX015	45	33	12.75	410	48	36	16
800	TD/TX016	33	33	15.2	893	90	48	24
1000	TD/TX017	33	33	15.2	893	90	48	24

MAX HP AT 460 V	MODEL	NON-COMBINATION TYPE N-1/12/3R (w/CPT, AIR BYPASS)			NON-COMBINATION TYPE N-1/12/3R (w/CPT, VAC BYPASS)		
		Dimensions (in.)			Dimensions (in.)		
		H	W	D	H	W	D
30	TD/TX005[1]	30	24	16			
50	TD/TX006[1]	30	24	16			
60	TD/TX007	30	24	16			
75	TD/TX007	30	24	16			
100	TD/TX008	48	36	16	48	36	16
125	TD/TX008	48	36	16	48	36	16
150	TD/TX009	60	36	16	60	36	16
200	TD/TX010	60	36	16	60	36	16
250	TD/TX011	60	36	16	60	36	16
300	TD/TX011	60	36	16	72[2]	48	16
350	TD/TX012	60	36	16	72[2]	48	16
400	TD/TX013	60	36	16	72[2]	48	16
500	TD/TX014	90	48	24	90	48	24
600	TD/TX015	90	48	24	90	48	24
800	TD/TX016	90	48	24	Not available		
1000	TD/TX017	90	48	24			

Notes:
- 1 = TD/TX005, TD/TX006 as standard do not come with or need an automatic bypass contactor.
- 2 = Includes floor-stand kit as standard. Add 12” for total height (i.e. 84” tall).

MAX HP AT 460 V	MODEL	COMBINATION TYPE (CIRCUIT BREAKER N-1 (WITH CPT, NO BYPASS)			COMBINATION TYPE (CIRCUIT BREAKER) N-12/3R (WITH CPT, AIR BYPASS)		
		Dimensions (in.)			Dimensions (in.)		
		H	W	D	H	W	D
30	TD/TX105[1]	30	24	13	30	24	16
50	TD/TX106[1]	30	24	13	30	24	16
60	TD/TX107	30	24	13	30	24	16
75	TD/TX107	30	24	13	30	24	16
100	TD/TX108	42	30	13	48	36	16
125	TD/TX108	42	30	13	48	36	16
150	TD/TX109	42	30	13	60	36	16
200	TD/TX110	48	36	16	60	36	16
250	TD/TX111	48	36	16	60	36	16
300	TD/TX111	48	36	16	60	36	16
350	TD/TX112	48	36	16	60	36	16
400	TD/TX113	48	36	16	72[2]	48	16
500	TD/TX114	72[2]	60	20	90	48	24
600	TD/TX115	72[2]	60	20	90	48	24
800	TD/TX116	90	72	24	90	72	24
1000	TD/TX117	Consult factory			90	72	24

Notes:

- 1 = TD/TX005, TD/TX006 as standard do not come with or need an automatic bypass contactor.
- 2 = Includes floor-stand kit as standard. Add 12” for total height (i.e. 84” tall).

MAX HP AT 460 V	MODEL	COMBINATION TYPE (CIRCUIT BREAKER) N-12/3R (WITH CPT, VACUUM BYPASS)		
		Dimensions (in.)		
		H	W	D
100	TD/TX108	48	36	16
125	TD/TX108	48	36	16
150	TD/TX109	60	36	16
200	TD/TX110	60	36	16
250	TD/TX111	60	36	16
300	TD/TX111	72*	48	16
350	TD/TX112	72*	48	16
400	TD/TX113	72*	48	16
500	TD/TX114	90	48	24
600	TD/TX115	90	48	24
800	TD/TX116	Not available		
1000	TD/TX117			
100	TD/TX108	48	36	16

Notes:
- * Includes floor-stand kit as standard. Add 12” for total height (i.e. 84” tall).

VACUUM CIRCUIT BREAKERS

Toshiba's quality and state-of-the-art vacuum technology combine to provide a full range of voltages and interrupting ratings with the highest reliability and service for worldwide applications. Toshiba's VK, HVK, VZ, HV6, VHA, and VJB series circuit breakers provide centralized control and protection of equipment and circuits in a compact design.

FEATURES

- Compact & Lightweight; High Insulation Characteristics Produced by Evacuating Envelope which Contains Contacts, Allows Small Contact Gap & Low Operating Force; Permits Extremely Light/Compact Construction; Breakers Produce Less Shock with Simplified Operation & Installation
- Wide Variety Selection; Vacuum Breakers Available in Fixed or Drawout Style, Manual or Motor Operated
- Designed for Safety; Electrical & Mechanical Interlocks Prevent Mis-Operation; Breakers Do Not Require Oil or Other Fluids for Arc Extinction; No Emission Products which can Cause Explosion or Environmental Hazard High Reliability; Vacuum Circuit Breakers Produced Under Integrated Quality Control System Ranging; Interrupters ("Heart" of Vacuum Circuit Breakers) Produced to Ensure High Reliability by Assembling in Modern Clean Room by Using High Vacuum Degassing Furnaces
- Excellent Breaking Performance; Vacuum Circuit Breakers Appropriate for High-Speed Breaking & Rapid Reclosing; Vacuum Enclosure Sealed to Prevent Breaking Performance Being Affected by External Atmosphere
- Conformity Industrial Standards; Conforms to Latest International Standards such as UL, CSA, AS, BS, NEMA, & IEC60470 (2000); Consult factory on Each Series
- Minimized Maintenance/Inspection; No need for Inspection or Replacement of Contacts Since Sealed in Envelope; Operating Mechanism Offers Easy Maintenance & Long Life; Front-Mounted with Circuit Control Components on Printed Circuit Board, for Easy Maintenance/Inspection

Axial Magnetic Field Interrupter

VK/HVK SERIES VACUUM CIRCUIT BREAKERS

Toshiba's VK and HVK series circuit breakers are rugged and reliable. It offers a complete line of 5 to 15 KV breakers, 1200 to 3000 A, from 250 to 1000 mVA. 1200 A and 2000 A breakers are available in drawout or fixed-type construction. 3000 A is only available in a drawout design.

For drawout versions, an OEM cell provides flexibility for design and application of vacuum circuit breakers by assemblers. Since the cell employs a heavy steel structure and is completely factory-assembled, no adjustment or alignment is required. This compact, versatile design allows for better space utilization in most applications. The OEM cell provides metal-clad quality and metal-clad safety features including barriers and interlocks.

FEATURES

- Rugged Steel Frame Houses/Protects Operating Mechanism & Rigidly Supports Insulation Barrier
- Heavy-Duty & Glass Polyester High-Performance Insulation Barrier Firmly Positions Interrupters & Primary Conductors; Provides Reliable Ground & Between-Phase Insulation
- Rugged & Simple Primary Disconnects Designed for Optimum Contact Pressure Extensively Tested to Verify Performance
- Heavy-Duty Auxiliary Contacts Provide Solid, Reliable Electrical Connections
- Cell Shutter-Barrier Made of Steel & Glass Polyester, Assures Safety Isolation of Primary Disconnects; Shutter Actuate-Links on Both Sides, Provide Positive Operation of Shutter by Breaker Movement
- Cell Ground-Bus Provides Positive Ground for Breaker Structure in Connected & Test Positions for Operator Safety
- Cell Interlock-Plate Provides Complete Interlock with Breaker for Safety
- Current Transformers, Installed by Others in Switchgear, Safely Isolated Behind Shutter Barrier & Front-Accessible
- Guide Rail Holds Breaker Wheels in Place
- Racking Nut, Housed in Steel Cover, Floated & Self-Aligned for Positive Rack-In & Withdrawal
- All VK, HVK, & HV6 Cells are Made in Houston, Texas; All Parts Made in U.S.A. & Canada
- Conformity Industrial Standards: Conforms to Latest International Standards Such as UL, CSA, AS, BS, NEMA, & IEC60470 (2000); Meets or Exceeds ANSI Standard
- Simple & Compact Operating Mechanism Offers Long, Trouble-Free Life & Minimizes Maintenance; Complete Interlocks Provided
- Simple, High-Tech Control Circuit Board Provides Reliability & Flexibility for Various Control Voltages
- Front-Panel Protects Operating Mechanism & Provides Well-Marked, Easy-to-Read Control Identification

VK/HVK SERIES BREAKER SPECIFICATIONS

RATING & SPECIFICATIONS WITH VOLTAGE RANGE FACTOR K=1.0 (SYMMETRICAL CURRENT RATING BASIS, ANSI C37.06-1997)								
Identification				Insulation Level		Current		
Model Number	Nominal RMS Voltage Class (KV)	Max. RMS Volts*	Nominal Three-Phase Class mVA	Rated Low Freq. Withstand (KV, RMS)	Rated Impulse With-stand Voltage (KV, CREST)	Cont. Cur-rent Rating (A, RMS)	RMS Short Circuit Current (KA, RMS)	Close & Latch Capability (KA, PEAK)
HVK-6M32A	4.16	4.76	250	19	60	1200	29	58
HVK-6P32A	4.16	4.76	250	19	60	2000	29	58
HVK-6M40A	4.16	4.76	350	19	60	1200	41	66
HVK-6P40A	4.16	4.76	350	19	60	2000	41	66
VK-6M50	4.16	4.76	350	19	60	1200	41	78
VK-6P50	4.16	4.76	350	19	60	2000	41	78
VK-6Q50	4.16	4.76	350	19	60	3000	41	78
HVK-8M40A	7.2	8.25	500	36	95	1200	33	66
HVK-8P40A	7.2	8.25	500	36	95	2000	33	66
VK-8Q40	7.2	8.25	500	36	95	3000	33	66
HVK-10M25A2	13.8	15	500	36	95	1200	18	37
HVK-10P25A2	13.8	15	500	36	95	2000	18	37
HVK-10M40A	13.8	15	750	36	95	1200	28	58
HVK-10P40A	13.8	15	750	36	95	2000	28	58
VK-10Q40	13.8	15	750	36	95	3000	28	58
HVK-10M40A	13.8	15	1000	36	95	1200	37	59
HVK-10P40A	13.8	15	1000	36	95	2000	37	59
VK-10Q40	13.8	15	1000	36	95	3000	37	59
VK-10M50	13.8	15	1000	36	95	1200	37	77
VK-10P50	13.8	15	1000	36	95	2000	37	77
VK-10Q50	13.8	15	1000	36	95	3000	37	77

Notes:

- Rated Interrupting time: three cycles (all above breakers).
- * Maximum voltage for which the breaker is designed and the upper limit of operation are based on ANSI C84.1.
- Rated permissible tripping delay time: two seconds (all above breakers).

VK/HVK SERIES PART NUMBERING CONVENTION

Ordering Information: Use the following part numbering convention to configure the breaker when placing your order. For additional factory installed options, add the appropriate option code on the end as in the example below.

Example is a HVK series breaker rated 4.16 KV, 1200 A, 29 KA, Fixed-Type, with 125 VDC Close/Charge/Trip and 120 VAC undervoltage release.

Example Part Number:	HVK-	6	M	32	F	V	V	-UV

Series

Voltage Class:
- 6 — 4.2 KV
- 8 — 7.2 KV
- 10 — 15 KV

Continuous Amps:
- M — 1200 A
- P — 2000 A
- Q — 3000 A

Interrupting Capability:
- 25 — 18 KA
- 32 — 29 KA
- 40 — 28 to 41 KA
- 50 — 37 to 41 KA

Breaker Configuration:
- - — Drawout
- F — Fixed

Closing/Charging Voltage:
- W — 250 VDC
- V — 125 VDC
- X — 48 VDC
- S — 24/32 VDC

Tripping Voltage:
- W — 250 VDC
- V — 125 VDC
- X — 48 VDC
- S — 24/32 VDC

Factory Modification:
- N/A — None
- UV — Undervoltage

VK/HVK SERIES BREAKER PRICING

Model Number	Nominal RMS Voltage Class (KV)	Cont. Current Rating (A, RMS)	Three-Phase Class MVA	RMS Short Circuit Current (KA, RMS)	Drawout-Type Breaker List Price	Fixed-Type Breaker List Price
HVK-6M32A	4.16	1200	250	29	$20,000	$21,000
HVK-6P32A	4.16	2000	250	29	$28,700	$29,700
HVK-6M40A	4.16	1200	350	41	$20,700	$21,700
HVK-6P40A	4.16	2000	350	41	$28,700	$29,700
VK-6M50	4.16	1200	350	41	$74,000	CF
VK-6P50	4.16	2000	350	41	$84,000	CF
VK-6Q50	4.16	3000	350	41	$94,000	CF
HVK-8M40A	7.2	1200	500	33	$20,700	$21,700
HVK-8P40A	7.2	2000	500	33	$28,700	$29,700
VK-8Q40	7.2	3000	500	33	$94,000	CF
HVK-10M25A2	13.8	1200	500	18	$20,700	$21,700
HVK-10P25A2	13.8	2000	500	18	$28,700	$29,700
HVK-10M40A	13.8	1200	750/1000	28	$20,700	$21,700
HVK-10P40A	13.8	2000	750/1000	28	$28,700	$29,700
VK-10Q40	13.8	3000	750/1000	28	$94,000	CF
VK-10M50	13.8	1200	1000	37	$74,000	CF
VK-10P50	13.8	2000	1000	37	$84,000	CF
VK-10Q50	13.8	3000	1000	37	$94,000	CF

Notes:

- CF = Consult factory.
- Breakers sold without cells are not for use in applications involving breaker retrofits.
- Racking and charging handles are not included with breaker or cell and must be ordered separately. See breaker accessories.

VK/HVK SERIES BREAKER FACTORY MODIFICATIONS

Modification	Breaker Series	Code	List Price
Under voltage release (120 VAC)	VK & HVK	UV	$1,000

VZ SERIES VACUUM CIRCUIT BREAKERS

Dedicated to the most advanced vacuum technology, Toshiba introduces the new VZ series vacuum circuit breakers. New vacuum arc-control technology (SADE) and a compact design to ensure reliability, handling ease, and safety, make these breakers suitable for various applications. The VZ series is a complete line of 24 KV, 630 to 2000 A, 16 KA, and 25 KA breakers.

VZ vacuum circuit breakers consist of two models for different configurations of switchgear design.

1. Standard drawout-type model with fully interlocked and racking system, which can be constructed per IEC60298 with Toshiba standard drawout cell. The switchgear is to be operated with full interlocking system and allows the racking of the breaker with the door closed for safety

2. Fixed-type model, which does not have the interlocking/racking system

FEATURES

- High Reliability; Breakers Manufactured Under Integrated Quality Control System; Vacuum Interrupters Assembled in Modern Clean Room by Using Vacuum Furnace
- Compact & Lightweight; Smaller Vacuum Interrupters & Lower Energy Springs on Improved Operating Mechanism, Offers Smooth/Reliable Operation & Installation
- Wide Variety Selection; Vacuum Breakers Available in Fixed or Drawout-Style & Manual or Motor Operated
- Conformity Industrial Standards; Conforms to the Latest International Standards Such as BS 5311 & IEC60056
- Electrical & Mechanical Interlocks Provided on Drawout Version
- Minimized Maintenance/Inspection; No Need for Inspection or Replacement of Contacts Since Sealed in Envelope; Dead Front Design & Front Access to For Easy Maintenance & Inspection

VZ SERIES PART NUMBERING CONVENTION

Ordering Information: Use the following part numbering convention to configure the breaker when placing your order. For additional factory installed options, add the appropriate option code on the end as in the example below.

Example is a VZ 24 KV, 1250 A, 25 KA, drawout-type with 125 VDC close/charge/trip.

Example Part Number:	VZ-	20	M	25	-	V	V

Series

Voltage Class:
20 — 24 KV

Continuous Amps:
J — 630 A
M — 1250 A
P — 2000 A

Interrupting Capability:
16 — 16 KA
25 — 25 KA

Breaker Configuration:
N/A — Drawout
F — Fixed

Closing/Charging Voltage:
W — 200 to 220 VDC
V — 125 VDC
X — 48 VDC
Z — 100/110 VDC

Tripping Voltage:
W — 200 to 220 VDC
V — 125 VDC
X — 48 VDC
Z — 100/110 VDC

VZ SERIES BREAKER SPECIFICATIONS & PRICING

SPECIFICATIONS		VZ-20J16	VZ-20M16	VZ-20J25	VZ-20M25	VZ-20P25
Maximum continuous current rating		630 A	1250 A	630 A	1250 A	2000 A
Rated voltage		24 KV				
Interrupting current		16 KA		25 KA		
Making current		40 KA		63 KA		
Short-time current		16 KA for Three Seconds		25 KA for three seconds		
Interrupting time		Less than three cycles				
Out-of-phase breaking current		25% of rated interrupting current				
Insulation level	Impulse	125 KV				
	Power frequency	50 KV				
Operation duty	Standard duty	Open for 3 minutes, closed/open for 3 minutes, closed/open				
	Rapid duty	Open for 0.3 seconds, closed/open for 3 minutes, closed/open				
Mechanical life		10-thousand operations				
Load switching life		10-thousand operations				
Auxiliary contacts	Form	4NO - 4NC				
	Cont. current	20 A				
	Voltage	220 V maximum; 48 V minimum				
	Interrupting	AC: make 20/break 10 A (110 V) at PF 0.35				
		DC: 10 A (48 V), 5 A (110 V), 2.5 A (220 V) at L/R 40 ms				
Altitude (Above derate by ANSI C37.04)		3300 ft (1000 m)				
Ambient temperature		-5° to 40°C				
Opening time		30 ms (Typical)				
No-load closing time		40 ms (Typical)				
Operating	Voltage/current	Standard 125 VDC, 5 A (Starting)/0.5 A, Optional: 48/50 VDC, 12 A (starting)/and1.3 A, 100 VDC/110 VDC and 200/220 VDC, 5 A (starting)/ 0.6 A (Charging Time 0.01 Seconds (Starting)/7 Seconds)				
Closing	Voltage/current	Standard 125 VDC, 3.2 A; optional: 48/50 VDC, 6.0/6.3 A, 100 VDC/ 110 VDC, 3.6/4 A, 200/220 VDC), 1.6/1.7 A				
Tripping	Voltage/current	Standard 125 VDC, 3.2 A; optional: 48/50 VDC, 6.0/6.3 A, 100 VDC/ 110 VDC, 3.6/4 A, 200/220 VDC), 1.6/1.7 A				
Weight in lbs. (kg)		298 (135)				320 (145)
List price	Fixed-type	$23,500	$26,700	$24,500	$28,500	$33,200
	Drawout-type	$22,500	$25,700	$23,500	$27,500	$32,200

HV6 SERIES VACUUM CIRCUIT BREAKERS

The Toshiba HV6 series circuit breakers deliver big performance in a small package. Designed specifically for medium-voltage, low-capacity power receiving and transforming facilities, the HV6 series capitalizes on Toshiba's more than 20 years of experience in vacuum interrupter technology. The HV6 series low surge characteristics coupled with its compact size make it ideal for a wide variety of applications including mobile power centers, portable substations, and generator protection/ paralleling.

FEATURES

- High Quality Vacuum Interrupters; Vacuum Interrupters Assembled in Modern Clean Room Using Vacuum Furnace
- Compact & Lightweight; Size Reduction from Axial-Magnetic Field Interruption Allows Use In Applications where Traditional Breakers Would Not Fit
- Wide Variety Selection; Vacuum Breakers Available in Fixed/ Drawout Style, & Manual/Motor Operated
- Front-Mounted Operation Counter Provides Positive Tracking for Maintenance Purposes
- Conformity Industrial Standards; Conforms to JIS C 4603 & JEC-2300
- Low Surge Interrupters; Low Chopping-Current Feature Means No Special Protective Devices Required for Motor Starting & Transformer Loads
- Multiple Main Terminal Configurations Allow User to Select Configuration Best-Suited to Application; Power Terminals Available in Two Directions, U-Vertical & L-Horizontal

HV6 SERIES PART NUMBERING CONVENTION

Ordering Information: Use the following part numbering convention to configure the breaker when placing your order. For additional factory installed options, add the appropriate option code on the end as in the example below.

Example is a HV6, fixed-type, motor-operated, with power stabs horizontal, with 125 VDC close/charge/trip.

HV6FS-	ML		-V		V					
Model	Type		Closing-Coil Volts		Trip-Coil Volts				Factory Modification	
VERSION	CODE	CONFIGURATION/ OPERATION	CODE	VOLTS	CODE	VOLT.	CODE	TYPE	CODE	MOD.
HV6AS	U	Fixed/manual operation	*	None (manually operated)	S	24/32 VDC	A	Manually operated breaker only	/R	Replaces V16 series fixed-mount version (same faceplate dimensions)
	L	Fixed/manual operation			V	125 VDC				
HV6FS	MU	Fixed/motor operation	V	125 VDC	S	24/32 VDC	No code for fixed type/motor operated		/R	Replaces V16 Series fixed-mount version (same faceplate dimensions)
	ML	Fixed/motor operation								
	MLD	Drawout/motor operation			V	125 VDC	U	Drawout breaker only	Not applicable on drawout version	

Notes:

- Factory modification "/R" includes a special mounting faceplate on the HV6 so it can replace a V16 without enclosure modification.
- The front-facing of the HV6 is smaller than the V16.
- This modification is applicable for the fixed-type models only if the face plate was used for mounting or if the face was protruding though the enclosure.
- This is a no cost adder.

HV6 SERIES BREAKER SPECIFICATIONS

Model Number		HV6AS-U	HV6AS-L	HV6FS-MU	HV6FS-ML	HV6FS-MLD
Maximum continuous current rating		630 A				
Rated voltage		7.2/4.8 KV				
Interrupting current (0.15 P.F.)		14 KA/16 KA (Sym.)				
Rated frequency		50/60 Hz				
Transient recovery voltage		0.32 KV/microsecond at 4.2 KV & above, below 0.16 KV/microsecond				
Making current		31.5 KA (peak)				
Short-time current		12.5 KA for two seconds				
Interrupting time		Less than three cycles				
Insulation level (basic impulse level)		60 KV				
AC withstand voltage		22 KV for 1 minute				
Operation duty		Open for 1 minute, closed/open; for 3 minutes, closed/open				
Mechanical life		10-thousand operations				
Load-switching life		10-thousand operations				
Auxiliary contacts	Form	2NO - 2NC				
	Cont. current	10 A				
	Voltage	300 V maximum; 48 V minimum				
	Interrupting	AC: 700 VA at PF 0.35/DC: 60 W at L/R 150 ms				
Altitude (above derate by ANSI C37.04)		3300 ft (1000 m)				
Ambient temperature		-5° to 40°C				
Installation		Fixed				Drawout
Operation		Manual closing		Motor spring closing		
Opening time		20 ms (typical)				
No-load closing time		-		30 ms (typical)		
Charging	Voltage/current	-		125 VDC/2.5 A peak (0.9 A average)		
Closing	Voltage/current	-		125 VDC/1.1 A		
Tripping	Voltage/current	125 VDC/3.0 A		125 VDC/4.6 A		
Under voltage release		0.4 A at 120 VAC (trip voltage 24 to 72 VAC)				
Weight in lbs. (kg.)		49 (22)	55 (25)	53 (24)	60 (27)	84 (38)
List price		$5,900		$8,700		$9,800

VHA & VJB SERIES VACUUM CIRCUIT BREAKERS

The Toshiba VHA series circuit breakers deliver big performance with a small package. Designed specifically for medium-voltage, low-capacity power receiving and transforming facilities, its low-surge characteristics coupled with compact size make it ideal for a wide variety of applications, including mobile power centers, portable substations, and generator protection/paralleling.

The VHA is available in 600 A and 1200 A models, 7200 V maximum in a fixed-mount configuration. Contact your Toshiba sales representative for further details.

FEATURES

- High Quality Vacuum Interrupters Assembled in Modern Clean Room Using Vacuum Furnace
- Compact & Lightweight; Less than 18" Wide; 600 A Unit Less than 19" Tall & Weighs Only 121 lbs.
- 120 VAC Undervoltage Release
- Front-Mounted Operation Counter Provides Positive Traking for Maintenance Purposes
- Conformity Industrial Standards: Conforms JEC-2300
- Low Surge Interrupters; Low Chopping-Current Feature Means No Special Protective Devices Required for Motor Starting & Transformer Loads
- Auxiliary Contacts: Four Normally-Open & Four Normally-Closed

The Toshiba VJB series circuit breaker is for frequent switching applications as in arc furnaces. The expected life of the breaker is 150,000 operations, 15 times longer than standard vacuum breakers.

The VJB breakers are available for 24 and 36 KV applications, and 1250 and 2000 A models. The breaker is fixed-mount only. Contact your Toshiba sales representative for further details.

For installation in the vicinity of an arc furnace with dust and particles, a dust-proof cubicle can be provided. The breaker is mounted on a rail in the cubilce and the front doors allow easy access for inspection. The back panels can be removed to allow inspection of the charging unit or replacement of vacuum interrupters.

FEATURES

- Extended Service Life; Life Expectancy is 150,000 Operations; Incomparable with Other Vacuum Circuit Breakers
- Easy Inspection; Simplified Structure Eliminates Disassembling Work in Maintenance & Inspection
- Easy Replacing of Conventional-Type Breakers, Series More Compact than Conventional Breakers
- Conformity Industrial Standards: Conforms to IEC 56 & JEC-2300
- Auxiliary Contacts: Seven Normally-Open & Six Normally-Closed
- Optional Control Panel Contains Control Power Supply & Vacuum Leak Detection Device

VACUUM CIRCUIT BREAKER OEM CELL PRICING

OEM Cell Model Number	Used for Breaker	Cell Weight	List Price
HKA-10MS-K-X (provision for kirk-key interlock* & shutter padlock)	HVK-6M32A HVK-6M40A HVK-8M40A HVK-10M25A2 HVK-10M40A	130 kg. 190 lb.	$10,400
HKA-10PS-K-X (provision for kirk-key interlock* & shutter padlock)	HVK-6P32A HVK-6P40A HVK-8P40A HVK-10P25A2 HVK-10P40A	150 kg. 330 lb.	$14,200
HKA-10MS1	VK-6M50 VK-10M50	150 kg. 330 lb.	$10,400
HKA-10PS1	VK-6P50 VK-10P50	170 kg. 380 lb.	$14,200
HKA-6QS	VK-6Q50 VK-8Q40 VK-10Q40 VK-10Q50	290 kg. 640 lb.	$19,000
UZP-20JS	VZ-20J16 VZ-20J25	145 kg. 320 lb.	$10,300
UZP-20MS	VZ-20M16 VZ-20M25	150 kg. 330 lb.	$11,000
UZP-20PS	VZ-20P25	150 kg. 330 lb.	$11,200
H6A-HLS	HV6FS-MLD	20 kg. 44 lb.	$3,600

Notes:

- * For adding a kirk-key interlock, the key interlock kit (in breaker accessories) is required. The actual kirk-key is not included with the cell or the interlock kit and must be purchased separately.

VACUUM CIRCUIT BREAKER ACCESSORIES

Model Number	Description	List Price
CIT-10QA	• Capacitor-trip device • Used for latched-type vacuum contactor or vacuum circuit breaker when DC power not available • Device charges from ac power & supplies dc power to trip-coil 	$1,500
4Z9G0334G001	• AC:DC Control Power Rectifier • Converts 120/240 VAC input to 125/250 VDC to power trip-coil on latched-type vacuum contactor or control power for vacuum circuit breaker 	$300
NV60K304T1	• Surge suppressor • Three-phase CR surge suppressor for 3.3 to 7.2 KV system 	$2,500
NV95K304T1	• Surge suppressor • Three-phase CR surge suppressor for 10 to 15 KV system	$5,900
4D9A2365G001	• Charging Handle • For VK & HVK series	$680
4D9A2177G002	• Racking handle • For VK & HVK series	$620
4D9A2283G002	• Key interlock kit • Without key • For HKA-10MS/PS cells	$750
4D9A2283G003	• Key Interlock Kit • Without key • For HKA-10MS1/PS1 cells	$750
4D9A2177G008	• Mechanism operating contacts (MOC 6a-6b) kit • For VK & HVK breakers	$1,350
4D9A2177G012	• Truck operating contacts (TOC 6a-6b) kit • For HKA cells (VK & HVK breakers)	$1,100
L-21CBS	• Portable lifter • For standard VK & HVK series breakers	$5,000
5P1B0404P013	• Portable Lifter • For VK 50 Series & 3000 A Breakers	$9,700
5P9A2593P001	• B9 lubricating grease (30 g tube)	Consult factory

SOLID STATE RELAYS

RC820 MOTOR PROTECTION RELAY

When motor protection needs are not elaborate, this relay combines reliable protection against overloads and single phasing with a simple, easily adjustable design. As a motor overload protection relay, the RC820, also known as the “2E Relay”, is adjustable from Class 3 through Class 40 to provide optimum protection and to accommodate reduced voltage starting and high inertia loads. Ground fault and phase reversal modules are available.

FEATURES

- Solid state provides high reliability and precise operation
- Phase Loss Protection prevents motor operation during damaging single-phase condition
- LED trip indication
- Manual test feature
- Two models: Manual/Remote Reset and Automatic Reset
- Flexibility: Allows wide range of current and trip time settings
- UL listed and CSA certified

OPTIONS

- Phase Reversal: Provides instantaneous trip on phase sequence reversal
- Ground Fault: With zero sequence current transformer, detects ground fault in less than 1 second (adjustable from 0.1 to 1.0 seconds)
- Flush (door) mounting kit

The 2E Relay is offered in six models:

Model	Trip Reset	Ampere-Turn Rating
RC820-HP1Y72	Manual/Remote	7AT
RC820-HP2Y72		55AT
RC820-HP3Y72		110AT
RC820-AP1Y	Automatic	7AT
RC820-AP2Y		55AT
RC820-AP3Y		110AT

Each model has an adjustable (Ampere-Turn) range of 75 to 150%. The relay has direct wiring capability through the three current transformer windows. This is limited to 165 amperes (i.e. RC820-HP3Y72). For higher currents, or voltages above 600 V, the use of external current transformers is required.

Selection of the suitable model may require some preliminary calculations. Model selection can also be influenced by wire size limiting the number of turns that can be passed through the CT windows (0.75 in. by 0.75 in.).

RC820 RELAY SPECIFICATIONS

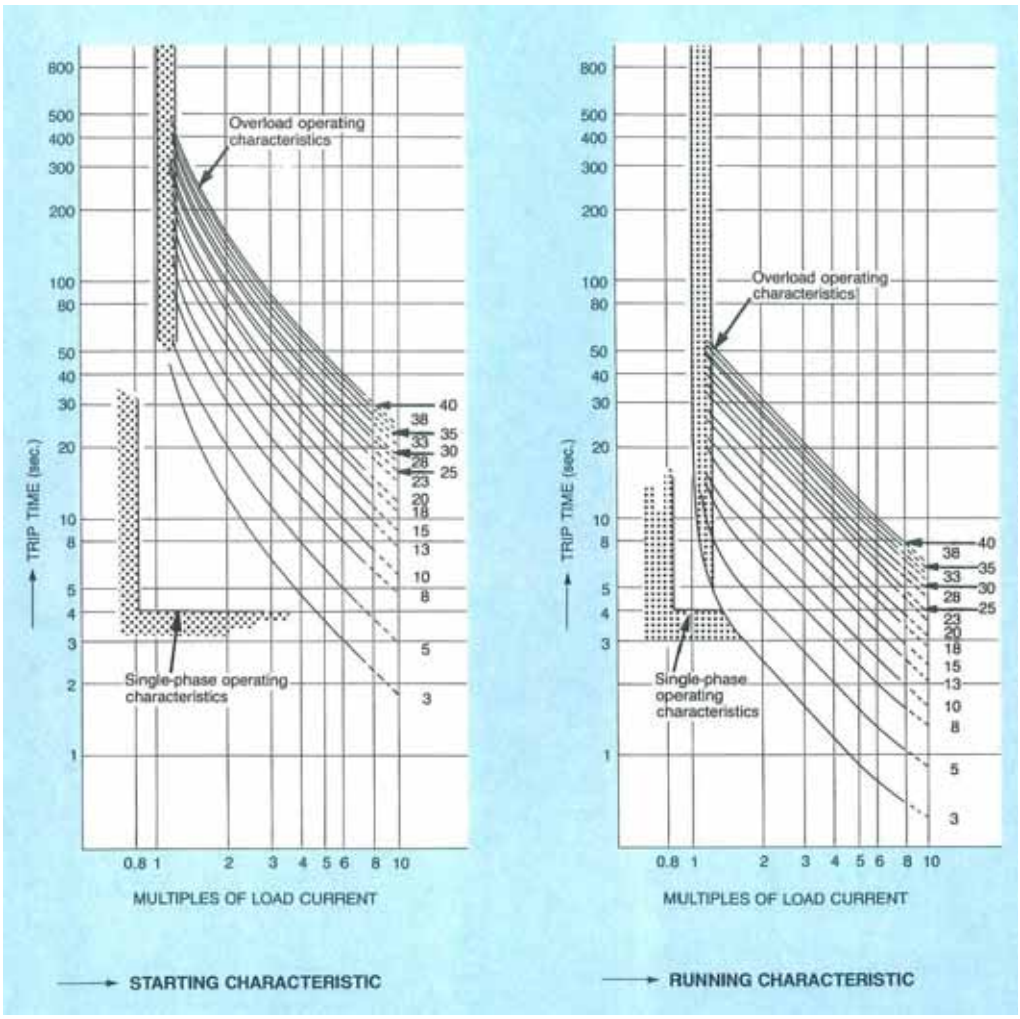
2E RELAY TECHNICAL DATA				
Model RC820-		**H/AP1Y**	**H/AP2Y**	**H/AP3Y**
Applicable Circuit		Three-phase, 50/60 Hz, 600 VAC max. Higher voltage with external CTs		
Operational Current	Rated Ampere-Turn	7AT	55AT	110AT
	Setting Range	75 to 150% of rated AT		
Overload Operating Characteristics	Ultimate Trip Current	105 to 125% of setting current		
	Operating Time Setting Range	3 to 40 sec. at 600% of setting current		
Single-Phase Operating Characteristics	Minimum Operating Current	85% of setting current flowing in conducting phase		
	Operating Time	Less than 4 seconds		
Control Voltage	Rating	100 to 120/200 to 240 VAC, single-phase, 50/60 Hz		
	Tolerance	85% to 110%		
Output Contact	Contact Arrangement	1NO/NC (Form C)		
	Contact Capacity NEMA B300	120 VAC — 5.0 A (resistive load) 120 VAC — Make 30 A/Break 3 A 240 VAC — Make 15 A/Break 1.5 A 125 VDC — 0.2 A (L/R = 7 ms) 250 VDC — 0.1 A (L/R = 7 ms)		
Power Consumption	Control Power Circuit	2 VA		
	Detecting Circuit	0.3 VA/phase at rated current		
Application	Ambient Temperature	-10° to 60°C		
	Relative Humidity	45 to 85% at 20°C		
Dimensions	Height x Width x Depth	7.00 x 3.66 x 6.2 in. (180 x 76 x 157 mm)		

ADDITIONAL MODULE SPECIFICATIONS

PHASE REVERSAL & GROUND FAULT TECHNICAL DATA				
Model		**RC-81A***	**RC-81B**	**RC-81C***
Phase Reversal Characteristics	Operating Current	Not Applicable	90% of 2E relay setting current	
	Operating Time		Less than 0.5 seconds	
Ground Fault Characteristics	Ground Fault Current Setting	4 to 12 A ZCT primary	Not Applicable	4 to 12 A ZCT primary
	Max. Ground Fault Current	60 A		60 A
	Ground Fault Time Setting	0.1 to 1.0 sec.		0.1 to 1.0 sec.
Output Signal		Output contacts of basic 2E relay		
Trip Indication		LED (manual reset only)		

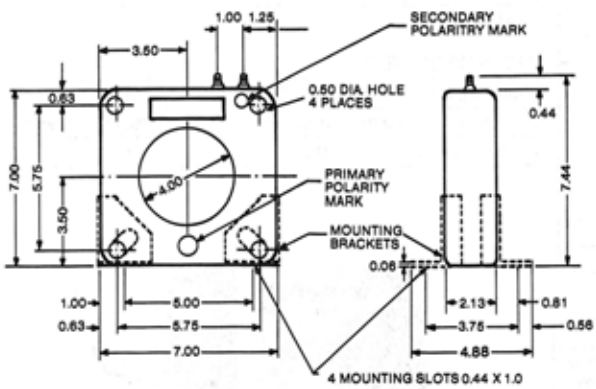
* RC-81A & RC-81C (Ground Fault) modules require model no. 810-ZCT-100 zero sequence current transformer.

Overload Trip Curves



Zero Sequence Current Transformer

No. 810-ZCT-100



2E with RC-81C Ground Fault/Phase Reversal Module

RELAY & MODULE PRICING

Model Number	Description	Setting Range	List Price
RC820-HP1Y72	7AT	5.25 to 10.5 A	$660
RC820-HP2Y72	55AT	41.25 to 85.5 A	
RC820-HP3Y72	110AT	82.5 to 165 A	
RC820-AP1Y	7AT	5.25 to 10.5 A	
RC820-AP2Y	55AT	41.25 to 85.5 A	
RC820-AP3Y	110AT	82.5 to 165 A	
RC-81A	Ground fault module	4 to 12 A	$560
RC-81B	Phase reversal module	-	$460
RC-81C	Ground fault/phase reversal module	4 to 12 A	$660

SELECTION & ORDERING

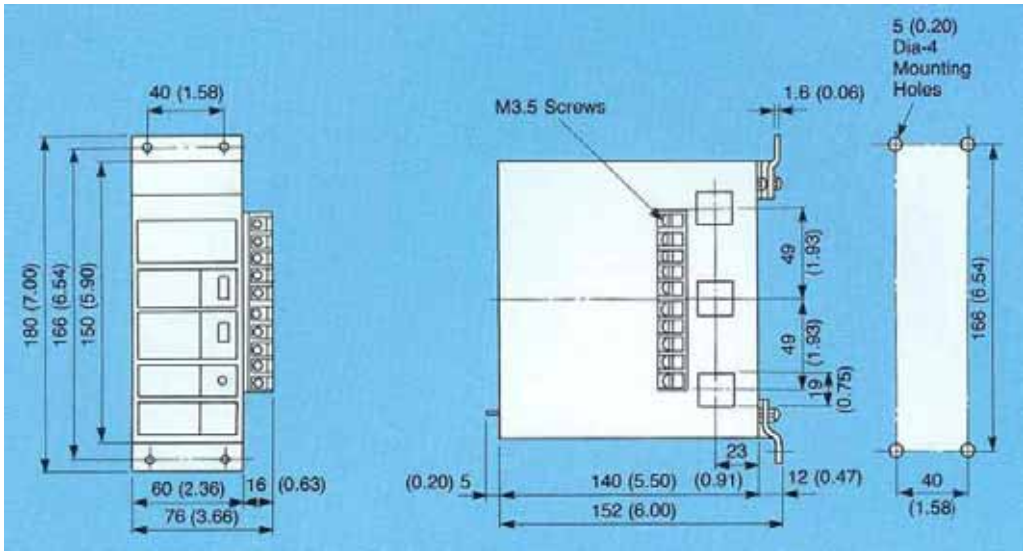
2E — For medium voltage applications and continuous load rating above 165 A, use external current transformers and select the RC820-HP1Y72 or -AP1Y.

Setting range is for rated load (continuous ampere load) and is not the trip value. See the relay trip curves for trip value.

Modules — Setting range shown is the CT primary current, ground fault trip value.

Model (ordering) number and price for the RC-81A and RC-81C includes the ZCT (Zero Sequence Current Transformer). If the ZCT alone is required (i.e. replacement or spare part), consult factory for pricing on part number 810-ZCT-100.

Installation (Units: mm (in.))



T1 SERIES PLC PRICING

T1 CONTROLLERS		
Part Number	**Description**	**Price**
TDR140-3S	• T1-40 • 24 inputs at 24 VDC • 14 output relays • 2 output transistors • 24 VDC PS	$200
TAR116-6S	• T1-16 • Eight inputs at 120 VAC • Six output relays • Two output triacs • 120/240 VAC PS	$150
TDR128-3S	• T1-28 • 14 inputs at 24 VDC • 12 output relays, • Two output transistors • 24 VDC PS	$150
TDR116S6S	• Super T1-16 RTC • RS485 • Eight inputs at 24 VDC • Six output relays • Two output transistors • 120/240 VAC PS	$300
TDR116S3S	• Super T1-16 • RTC • RS485 • Eight inputs at 24 VDC • Six output relays • Two output transistors • 24 VDC PS	$300

T1 CONTROLLERS		
Part Number	**Description**	**Price**
TDR140S6S	• Super T1-40 • 24 inputs at 24 VDC • 14 output relays • 2 output transistors • 120/240 VAC PS • 8/4K RAM • RTC • Built-in active RS485 port	$840
TDR140S3S	• Super T1-40 • 24 inputs at 24 VDC • 14 output relays • 2 output transistors • 24 VDC PS • 8/4K RAM • RTC • Built-in active RS485 port	$890
TAR140S6S	• Super T1-40 • 24 inputs at 120 VAC • 14 output relays • 2 output triacs • 120/240 VAC PS • 8/4K RAM • RTC • Built-in active RS485 port	$990

T1-16S I/O EXPANSION		
Part Number	**Description**	**Price**
TBU101-S	• One-slot expansion card holder for T1-16 • Holds T1-40 I/O expansion card	$25
TBU104-S	• Four-slot expansion card holder for T1-16S • Holds T1-40 I/O expansion card	$45
TDD116M-S	• Eight inputs at 24 VDC • Eight output transistors • Mounts on side of T1-16S • Order connector separately (EX10-KIO20)	$100
TDI116M-S	• 16 inputs at 24 VDC • Mounts on side of T1-16S • Order connector separately (EX10-KIO20)	$100
TDO116M-S	• 16 output transistors • Mounts on side of T1-16S • Order connector separately (EX10-KIO20)	$100
TRO108M-S	• Eight output relays • Mounts on side of T1-16S	$120
TAD131M-S	• One analog input: ±10 VDC, 12-bit • Mounts on side of T1-16S	$160
TAD121M-S	• One analog input • 0 to 20 mA/1 to 5 VDC, 12-bit • Mounts on side of T1-16S	$160
TDA121M-S	• One analog output • 0 to 20 mA/1 to 5 VDC, 12-bit • Mounts on side of T1-16S	$160
TDA131M-S	• One analog output: ±10 VDC, 12-bit • Mounts on side of T1-16S	$160
TTC111M-S	• One thermocouple input • Type E, J, K, or millivolt • Mounts on side of T1-16S	$225
TFR112M-S	• TOSLINE-F10 remote station • Mounts on side of T1-16S	$160
TDN111M-S	• DeviceNet slave module • Mounts on side of T1-16S	$260

T1-40 I/O EXPANSION CARDS		
Part Number	**Description**	**Price**
TDD116-BS	• Eight inputs at 24 VDC, Eight Output Transistors • Fits inside T1-40 • Order connector separately (EX10-KIO20 or TPT15S-AS)	$140
TDI116-BS	• 16 Inputs at 24 VDC • Fits inside T1-40; order connector separately (EX10-KIO20 or TPT15S-AS)	$140
TDO116-BS	• 16 Output Transistors • Fits inside T1-40 • Order connector separately (E10-KIO20 or TPT15S-AS)	$140

T1-40 I/O EXPANSION CARDS		
Part Number	**Description**	**Price**
TTC111-BS	• One thermocouple input • Type E, J, K, or millivolt • Fits inside T1-40	$300
TFR112-BS	• TOSLINE-F10 remote station • Fits inside T1-40	$200
TAD121-BS	• One analog input • 0 to 20 mA/1 to 5 VDC • 12-bit • Fits inside T1-40	$240
TAD131-BS	• One analog input • ±10 VDC, 12-bit • Fits inside T1-40	$240
TDA121-BS	• One analog output • 0 to 20 mA/1 to 5 VDC, 12-bit • Fits inside T1-40	$240
TDA131-BS	• One analog output • ±10 VDC, 12-bit • Fits inside T1-40	$240
TPT15S-AS	• Connector • Same as EX10-ANC32	$25
TDR132E-S	• 16 inputs at 24 VDC • 16 output relays with cable • 1 per T1-40	$420
TAR132E-S	• 16 inputs at 120 VAC • 16 output relays with cable • 1 per T1-40	$400

PARTS & PERIPHERALS		
Part Number	**Description**	**Price**
TPT1T4-AS	• T1-40/super T1-40 removable terminal strip • 31-point	$25
TPT15F-AS	• Connector • Flat ribbon cable	$25

CABLES		
Part Number	**Description**	**Price**
TCS1R2-CS	• Replacement expansion cable for connecting TBU152/154 to T1-40	$90
EX10-KIO20	• Cable for T1 discrete I/O modules or T2 Hi-Density (32-point) I/) Modules • 2 m • One end I/O connector, other end pigtail	$100
TCJ105-CS	• Programming cable • Connects T1 Programming Port to HP911/Computer RS232 Port • 5 m	$200

CABLES		
Part Number	**Description**	**Price**
TKRS232T1	• Programming cable • Connects T1 programming port to computer RS232 Port • 2 m	$75

PROGRAMMING		
Part Number	**Description**	**Price**
TRM102-S	• Programming storage module (EEPROM) • Load/save/compare programs without a computer or THP911 handy programmer	$255
THP911A-S	• Handy Programmer THP911 • Hand-held • For programming all T-Series controllers • Includes built-in EEPROM for program storage & cable for T1 controller • Requires adapter TCS7688-T2 for connection to T2 CPUs	$700
T-PDS	• T-Series computer programming software • CD with all user manuals • Includes info on older PLCs, sales brochures, etc. • Minimum computer = MS Windows® XP or later	$495

T-SERIES MANUALS		
Part Number	**Description**	**Price**
UM-TS01-E001	• T1 basic hardware & functions	$25
UM-TS01-E031	• T1-16S basic hardware & functions	$25
UM-TS01-E034	• T-16S I/O modules	$25
UM-TS01-E002	• T1 option I/O cards & I/O modules	$25
UM-TS01-E003	• T1 computer link function • Memory map & protocol	$25
UM-TS01-E033	• T1-16S computer link function • Memory map & protocol	$25
UM-TS03-E025	• THP911 handy programmer operation manual	$25
UM-TS03-E045	• T-PDS Windows® software basic operation manual, version 2	$25
PRIMER-T Series	• T-Series PLC primer for T1, T2, & V2000 PLC • Includes basics on T-PDS programming software • Application examples & advanced information	$45

V2000 SERIES PLC PRICING

T-SERIES CONTROLLER MODULES		
Part Number	**Description**	**Price**
GPU612E*S	• Sequence control module (S2E) • User program capacity 32 kSteps, T-series instruction set • Uses T-PDS programming software	$990
GPU662T*S	• Sequence control module (S2T) • User program capacity 32 kSteps, T-Series instruction set • Uses T-PDS programming software	$2,000
GPU672T*S	• Sequence Control Module (S2T) • User program capacity 64 kSteps, T-Series instruction set • Uses T-PDS programming software	$3,350

MAIN/EXPANSION RACKS		
Part Number	**Description**	**Price**
GBU643D*S	• Base rack for S2T/S2 • Four station bus slots, no I/O slots • Not for S2E	$395
GBU648E*S	• Base Rack for S2T/S2 • Four slots (up to 5 station bus slots) • Not for S2E	$425
GBU664**S	• Base Rack for S2E • Three I/O slots • Expansion rack for S2T/S2, four I/O Slots	$195
GBU666**S	• Base Rack for S2E • Five I/O slots • Expansion rack for S2T/S2, six I/O slots	$200
GBU668**S	• Base Rack for S2E • Seven I/O slots • Expansion Rack for S2T/S2, eight I/O slots	$210
GIF661**S	• Interface module for connecting expansion racks	$130

POWER SUPPLIES		
Part Number	**Description**	**Price**
GPS632**S	• 24 VDC power supply • For main/expansion racks	$130
GPS652**S	• 100 to 110 VDC power supply • For main/expansion racks	$600
GPS693**S	• 120/240 VAC power supply • For main/expansion racks • 24 VDC service PS	$240
GPS691**S	• 120/240 VAC Power Supply • For main rack with ups interface connection	$480
TKS20-OPTIC	• TOSLINE-S20 Fiber Optic cable • 2 m • For test & demo	$200

DIRECT I/O MODULES — DISCRETE		
Part Number	**Description**	**Price**
GIN663**S	• AC input module • 16 points • 200 to 240 VAC	$225
GIN653**S	• AC input module • 16 points • 100 to 120 VAC	$225
GDI632D*S	• DC input module • Eight points • 12 to 24 VDC • Isolated between channels	$255
GDI633**S	• DC input module • 16 points • 12 to 24 VDC	$140
GDI634**S	• DC input module • 32 points • 24 VDC	$330
GDI635**S	• DC input module • 64 points • 24 VDC	$475
GDI635H*S	• DC input module • High speed • 64 points • 24 VDC	$520
GDI653**S	• DC Input module • 16 points • 100 to 110 VDC • 0.1 A/point, sink	$330
GCD633**S	• DC input module • Change detect • 16 points • 12 to 24 VDC	$580

DIRECT I/O MODULES — DISCRETE		
Part Number	**Description**	**Price**
GDO633*S	• DC output module • 16 points • 5 to 24 VDC • 1 A/point • Sink (source load)	$160
GDO633P*S	• DC Output Module • 16 points, 5 to 24 VDC, 1 A/point, source	$185
GDO634**S	• DC output module • 32 points • 5 to 24 VDC • 0.1 A/point • sink	$390
GDO635**S	• DC output module • 64 points • 5 to 24 VDC • 0.1 A/point • Sink	$540
GAC663A*S	• AC output module • 12 points • 100 to 240 VAC • 1 A/point	$285
GRO662S*S	• Relay output module • Eight points (isolated) • 240 VAC/24 VDC (max) • 2 A/point	$190
GRO663**S	• Relay output module • 16 points, 240 VAC/24 VDC (max), 2 A/point	$215

DIRECT I/O MODULES — ANALOG		
Part Number	**Description**	**Price**
GAD634L*S	• Analog input module • Four channels • 0 to 10 V input • 8-bit	$320
GAD668**S	• Analog input module • Eight channels • 0 to 5 V • 0 to 20 mA • ±10 V • 16-bit	$880
GAD674**S	• Analog input module • Four channels • ±10 V input • 12-bit	$530

DIRECT I/O MODULES — ANALOG		
Part Number	**Description**	**Price**
GAD624**S	• Analog input module • Four channels • 1 to 5 VDC/4 to 20 mA • 12-bit	$530
GAD638S*S	• Analog input module • Eight channels (isolated) • ±10 VDC input • 12-bit	$1,590
GAD624L*S	• Analog input module • Four channels • 1 to 5 VDC/4 to 20 mA • 8-bit	$320
GAD628S*S	• Analog input module • Eight channels (isolated) • 0 to 5 V, 0 to 20 mA • 12-bit	$1,590
GRT614**S	• RTD input module • Four channels • Pt100 input • 12-bit	$1,145
GTC618**S	• Thermocouple input module • Eight channels • E, J, K • 16-bit	$900
GDA672**S	• Analog output module • Two channels • ±10 V output • 12-bit	$650
GDA624S*S	• Analog output module • Four channels (isolated) • 0 to 20 mA • 16-bit • Output hold option	$1,820
GDA622L*S	• Analog output module • Two channels • 1 to 5 VDC/4 to 20 mA • 8-bit	$350
GDA622**S	• Analog output module • Two channels • 1 to 5 V/4 to 20 mA • 8-bit	$650
GDA664**S	• Analog output module • Four channels • 0 to 5 V/0 to 20 mA • ±10 V • 16-bit	$840

CABLES		
Part Number	**Description**	**Price**
GCS6R3*CS	• Expansion cable • 0.3 m long	$90
GCS6R5*CS	• Expansion cable • 0.5 m long	$100
GC6R7*CS	• Expansion cable • 0.7 m long	$105
GCS6*1*CS	• Expansion cable • 1.2 m long	$120
TKS20-OPTIC	• TOSLINE-S20 fiber optic cable • 2 mlong • For test & demo	$200
TKIO20	• Cable for hi-density PLC I/O modules • 24 VDC • One end I/O connector & other end pigtail • 1/32 pt module • 2/64 module • 2 m long	$160

INTELLIGENT I/O MODULES		
Part Number	**Description**	**Price**
GCF612**S	• Communications module • Two channels • RS232/RS485 • ASCII/binary • S2T only	$1,830
GCF611**S	• Communications module • One channel • RS232C • ASCII	$930
GPI632**S	• Pulse input module • Two channels • Up to 50 kpps • 5/12/24 V input • 24-bit counter	$785
GPI672**S	• Pulse input module • Two channels • Up to 50 kpps • RS422 input • 24-bit counter	$850

NETWORK MODULES		
Part Number	**Description**	**Price**
GDN611A*S	• DeviceNet scanner module	$1,160
GPF611**S	• Profibus DP master module	$5,450

NETWORK MODULES		
Part Number	**Description**	**Price**
GUN611**S	• TOSLINE-F10 • Single bus • Twisted paired-cable • Master station	$1,170
GUN612**S	• TOSLINE-F10 • Single bus • Twisted paired-cable • Slave station	$1,170
GPF612**S	• Profibus DP Slave Module	$4,700
GFL612**S	• FL-Net master version 2.0	$1,730
GFL654**S	• FL-Net remote I/O station version 2.0 • CPU module not required	$2,290
GEN651A*S	• Ethernet module • Single bus • 100 base-TX	$1,690
GSN621**S	• TOSLINE-S20 • Single bus • Coaxial cable • S2E/S2 systems only	$1,570
GSN622**S	• TOSLINE-S20 • Single bus • Optical cable • S2E/S2 systems only	$1,980
GSN625**S	• TOSLINE-S20 • Single bus • Coaxial cable • S2T only	$2,350
GSN626**S	• TOSLINE-S20 • Single bus • Optical cable • S2T only	$2,970
GSN627**S	• TOSLINE-S20LP • Double-loop optical cable • S2T/S2 only	$3,070

NETWORK PERIPHERALS		
Part Number	**Description**	**Price**
FRO663-K	• TOSLINE-F10 block output relay • 16 points, four points/common	$650
FDO633-K	• TOSLINE-F10 block output transistor • 16 points	$650
FDI633-K	• TOSLINE-F10 block input • Dry contact (for NPN outputs) • 16 points	$650
FRP611AK	• TOSLINE-F10 repeater • Extends the length of a TOSLINE-F10 system • Two per system max • 24 VDC PS	$2,520
FRP613AK	• TOSLINE-F10 repeater • Extends the length of a TOSLINE-F10 system • Fiber optic link between repeaters • Two per F10 network • 24 VDC PS	$2,600
SSIF21-US	• TOSLINE-S20 SIF station • R232 & Coax • Provides a TOSLINE-S20 station for a host computer	$4,770
SSIF22-US	• SIF station • RS232 & fiber optic connector	$7,760
SSASC22-US	• TOSLINE-S20 fiber optic active star coupler • Connects 10 S20 stations (PLCs, ASDS, etc.) in a star configuration	$7,760
SASC25-US	• TOSLINE-S20 fiber optic active star coupler • Connects two F01 & eight F07 S20 Stations in a star configuration	$5,300

PROGRAMMING		
Part Number	**Description**	**Price**
T-PDS	• T-Series computer programming software • CD with all user manuals • Includes information on older PLCs, sales brochures, etc. • Minimum computer = MS Windows® XP or later	$495
S-LS	• TOSLINE-S20 S-LS Windows® Programming Software • Includes 3.5” disks, user’s manual • Used to set up TOSLINE-S20 modules & SIF stations	$300
T-DNW	• T-Series DeviceNet wizard software • MS Windows® 95/98/NT • Requires DeviceNet interface (AB 1770-KFC RS232 module or SST DeviceNet PCMCIA card)	$2,300
TKRS232	• Programming cable • Connects T2/T3 programming port to computer RS232 Port • 2 m • All T-Series, S2E & S2T processors	$70

PROGRAMMING		
Part Number	**Description**	**Price**
TCJ905-CS	• Programming cable • Connects T2/T3 programming port to HP911 handy programmer/computer RS232 Port • 2 m	$220

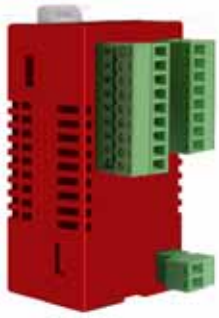
PARTS & PERIPHERALS		
Part Number	**Description**	**Price**
GPT9R2*AS	• Spare thermister for TTC218/GTC618 thermocouple input card	$15
GSP691**S	• Module • Blank with cover for Custom I/O Card	$60
GSP600*AS	• Module • Blank	$40
GBT611*AS	• Battery • Spare for S2/L2 CPU modules	$80

T-SERIES MANUALS		
Part Number	**Description**	**Price**
UM-TS03-E004	• T-Series • Instruction set • Includes: - Ladder - Function Blocks - SFC	$30
UM-TS08-E045	• T-PDS Windows® software basic operation manual version 2.0	$25
UM-TS03-E008	• T-Series computer link • Protocol & memory map	$30
6F8C0928	• S2T user's manual • Basic programming • Internal operation & program debugging	$40
6F8C0926	• S2T user's manual • Basic hardware • Specifications • I/O modules • Troubleshooting • For CPU662T*S/CPU672T*S	$40
6F8C1132	• S2E user's manual • Basic programming • Specifications • I/O modules • Troubleshooting • For CPU612E*S	$40
6F8C1094	• S2E user's manual • Basic Hardware • Specifications • I/O modules • Troubleshooting • For CPU612E*S	$40
6F8C1147	• Profibus module user's manual for S2E/S2T	$40
PRIMER-T Series	• T-Series PLC Primer for T1, T2, & V2000 PLC • Includes: - Basics on T-PDS programming software - Application examples - Advanced information	$45

V-SERIES MANUALS		
Part Number	**Description**	**Price**
6F8C0860	• I/O manual • Intelligent analog modules • Same as UM-TS02-E026 for S2E/S2T	$40
6F8C0841	• I/O manual • Pulse input module • Same as UM-TS02-E021 for S2E/S2T	$40
6F8C0843	• I/O manual • ASCII communications module • Same as UM-TS02-E013 for S2E/S2T	$40

V-SERIES MANUALS		
Part Number	**Description**	**Price**
6F8C0979	• Network manual • Ethernet module for S2/S2T	$40
6F3B0356	• Network manual • TOSLINE-S20LP for S2T	$40
6F3B0357	• Network manual • TOSLINE-S20S-LS software user's manual for S2E/S2T	$40
6F8C0840	• Network manual • TOSLINE-S20 for S2/S2E/S2T	$40
6F3B0364	• Network manual • DeviceNet Instruction manual for S2E/S2T • Same as UM-TS02-E016	$40
6F8C0890	• Network manual TOSLINE-S20 user's manual for S2E/S2T	$40
DeviceNetWizard1	• Network manual • DeviceNet Wizard configuration manual for S2/S2E/S2T	$40
DeviceNetWizard2	• Network manual DeviceNet Wizard user's manual for S2/S2E/S2T	$40
6F8C0845	• Network manual |DeviceNet instruction manual for S2	$40
6F8C1068	• Network manual • FL-net user's manual for S2E/S2T	$40

OIS SERIES PLC PRICING



OPERATOR INTERFACE STATIONS		
Part Number	**Description**	**Price**
OIS10	• 16 x 2 character backlit LCD • Six operator keys • Two LEDs • No programming • Messages & functions are stored in PLC • Power from PLC • Comes with cable for T1	$165
OIS15	• 16 x 4 character backlit LCD • Eight operator keys • Two LEDs • No programming • Messages & functions are stored in PLC • Power from PLC • Comes with cable for T1	$210
OIS40	• 20 x 4 character backlit LCD • Eight function keys • Eight LEDS • 0 to 9 number keys • Connects to PLC programming port • Power from PLC • Order all connection cables separately • Requires OISetup32 software	$375
OIS40R	• 20 x 4 character backlit LCD • Eight function keys • Eight LEDs • 0 to 9 number keys • Connects to RS485 Port • Requires separate 24 VDC PS • Order all connection cables separately • Requires OISetup32 software	$400

OPERATOR INTERFACE STATIONS		
Part Number	**Description**	**Price**
OIS120	• 12.1” TFT color touchscreen • For display of: - System Status - Alarms - Recipes - Trending • Order cable for T2 or T2/T3/S2E/S2T separately • Requires OISetup32 software	$2,300

OPERATOR INTERFACE STATIONS — NEW		
Part Number	**Description**	**Price**
OIS10 Plus	• 16 x 2 Text with multicolor backlit LCD • Numeric keypad • Six function keys with built-in LEDs • Built-in 8 to 24 VDC inputs • Six relay outputs • 2 to 24 VDC NPN transistor outputs • Requires OIL-DS setup software	$270
OIS12	• 16 x 2 Text with multicolor backlit LCD • Same as OIS10 Plus but no I/O • Used for: - T/C access - Message display - Data value change for all Toshiba PLCs - Integrated controllers & ASDs • Requires OIL-DS setup software	$130
OIS20 Plus	• 3.1” multicolor backlit LCD • Numeric keypad • Six function keys • Built-in 12 to 24 VDC inputs • Six relay outputs • 2 to 24 VDC NPN transistor outputs • Requires OIL-DS setup software	$370
OIS45 Plus	• 4.3” TFT color touchscreen • Accepts three clip-on I/O modules • Ethernet port • No function keys • 24 VDC PS • Requires OIL-DS setup software	$480
OIS55 Plus	• 3.5” TFT color touchscreen • Accepts three clip-on I/O modules • 24 VDC PS • Requires OIL-DS setup software	$370
OIS60 Plus	• 6” TFT color touchscreen • Accepts five clip-on I/O modules • 24 VDC PS • Requires OIL-DS setup software	$610
OIS70 Plus	• 7” TFT color touchscreen • Accepts five clip-on I/O modules • Ethernet port • No function keys • 24 VDC PS • Requires OIL-DS setup software	$720

CLIP-ON I/O — DIGITAL		
Part Number	**Description**	**Price**
TRPDIX1600	• 16 inputs • 24 VDC (sink/source)	$80

CLIP-ON I/O — DIGITAL		
Part Number	**Description**	**Price**
TRPDIO0808P	• Eight inputs • 24 VDC (sink/source) • Eight outputs • Transistor • 24 VDC • PNP	$105
TRPDIO0808N	• Eight inputs • 24 VDC (sink/source) • Eight outputs • Transistor • 24 VDC • NPN	$100
TRPRO0012R	• 12 output relays • 24 VDC/240 VAC • 2 A each • 5 A/common	$110
TRPDOX0016P	• 16 output transistors • 24 VDC • 0.4 A/each • PNP	$130
TRPDOX0016N	• 16 output transistors • 24 VDC • 0.5 A/each • NPN	$130

CLIP-ON I/O — ANALOG		
Part Number	**Description**	**Price**
TRPAIO0400L	• Four inputs • 4 to 20 mA/0 to 10 VDC • 12-bit	$170
TRPAIO0202L	• Two Inputs • 0 to 10 V, 4 to 20 mA • Two outputs • 0 to 10 V, 4 to 20 mA • 12-bits each	$205

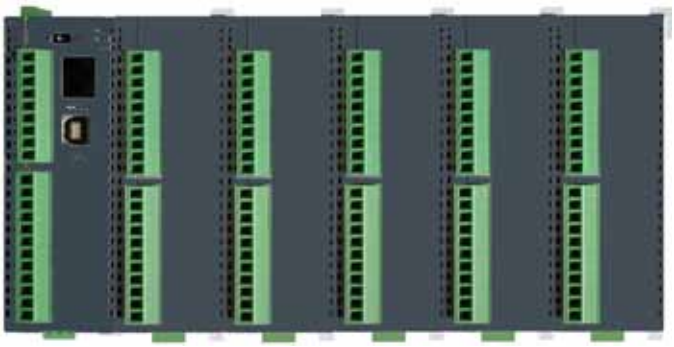
CLIP-ON MODULES — COMMUNICATIONS		
Part Number	**Description**	**Price**
TRPCOMPRO	• Profibus slave module • Under development	---
TRPCOMCAN	• CAN module • Under development	---
TRPCOMETH	• Ethernet IP Module • Under development	---
TRPCOMSMS	• SMS modern module • Under development	---

CABLES		
Part Number	**Description**	**Price**
EC-I-019B-00	• Connects OIS40 to T2E/T2N/T3/S2E/S2T programming port • 2 m	$25
EC-I-019A-00	• Connects OIS40 to T1 programming port • 2 m	$25
EC-P-009J-00	• Connects GWY to OIS Plus • RS232 • 2 m (Profibus, CAN Open, DeviceNet)	$25
EC-P-046B-00	• Connects OIS40R/OIS60 Plus/OIS80/OIS120/GWY to T2N/T3 RS485 port (DB15 Connector) • 2 m	$25
EC-P-108-00	• Connects OIS20/OIS Plus to S9/S11/VF-nC1/VF-nC3 TTL port • Smart cable • 2 m	$30
EC-P-046A-00	• Connects OIS40R/OIS55 Plus/OIS60 Plus/OIS80/OIS120/GWY to T1/T2E/T3/S2E/S2T RS485 port • Pigtail on PLC end • 2 m	$20
EC-P-019B-00	• Connects OIS40R/OIS55 Plus/60 Plus/OIS80/OIS120/GWY to T2/T3/S2E/S2T programming port • 2 m	$25
EC-P-019A-00	• Connects OIS40R/OIS55 Plus/60 Plus/OIS80/OIS120/GWY to T1 programming port • 2 m	$25
EC-P-009K-00	• Connects GWY to OIS Plus • RS485 • 2 m (Profibus, CAN Open, DeviceNet)	$25
EC-P-050-00	• Connects OIS40R/OIS60/OIS80/OIS120/GWY to S9/S11/VF-nC1/VF-nC3 TTL port • 2 m	$35
RC-P-009H-00	• Connects GWY/OIS Plus to V200 Series PLC • RS232 • 2 m	$25
RC-P-009I-00	• Connects GWY/OIS Plus to V200 Series PLC • RS485 • 2 m	$25
RC-P-046A-00	• Connects OIS55/55E to T1/T2E/S2E/S2T RS485 computer link port • 2 m	$25
RC-P-019B-00	• Connects OIS55/55E to T2E/T3/S2E/S2T programming port • 2 m	$25
RC-P-019A-00	• Connects OIS55/55E to T1 programming port • 2 m	25
EC-P-046C-00	• Connects OIS Plus to Toshiba G9/AS1 ASDs • RS485 • 2 m	$25

CABLES		
Part Number	**Description**	**Price**
RC-P-046B-00	• Connects OIS55/55E/V200 PLUS to Toshiba G9/AS1 ASDs • RS485 • 2 m	$25
IBM-0909-1-00	• Programming cable • For download from computer to all OIS • Required for OISetup32 software version 3.0 or higher	$25
IBM-H-005-00	• Programming cable • For download from computer serial port to all OIS55/55E & V200 CPUs • Alternate use USB printer cable	$30

OPERATOR INTERFACE STATION CABLE — OIS10/15/20		
Part Number	**Description**	**Price**
CAB-OIS-T2-X	• Connects OIS10/15/20/old40 to T2/T3 PLC • Order separately	$35
CAB-OIS-T1-X	• Connects OIS10/15/20/old40 to T1 PLC • Comes with OIS10/15	$35

V200 SERIES PLC PRICING



CPU MODULES		
Part Number	**Description**	**Price**
GPU288*3S	• V200 CP • Eight Inputs at 24 VDC • Two outputs • 24 VDC transistor • Six output relays • Requires 24 VDC PS	$220
GPU200*3S	• V200 CP • Ethernet & USB Port • Requires 24 VDC PS	$190
GPU232*3S	• V200 CPU • 16 inputs at 24 VDC • 16 output • 24 VDC transistor (PNP) • Requires 24 VDC PS	$260

DIGITAL I/O MODULES		
Part Number	**Description**	**Price**
GDI216**S	• 16 inputs • 24 VDC at 8 p/com • Sink/source	$95
GDR288**S	• Eight inputs • 24 VDC at 4 p/com Eight Output Relays — 4 p/com	$125
GDD288P*S	• Eight Inputs — 24 VDC at 4 p/com Eight Outputs PNP — 4 p/com	$125
GDD288N*S	• Eight Inputs — 24 VDC at 4 p/com Eight Outputs NPN — 4 p/com	$125
GRO216**S	• 16 output relays — 8 p/com	$150

DIGITAL I/O MODULES		
Part Number	**Description**	**Price**
GDO216P*S	• 16 outputs • 24 VDC transistor • 8 p/com • PNP	$150
GDO216N*S	• 16 Outputs • 24 VDC transistor • 8 p/com • NPN	$150

ANALOG I/O MODULES		
Part Number	**Description**	**Price**
GAD208L*S	• Eight analog inputs • 4 to 20 mA, 0 to 10 VDC (12-bit)	$260
GRT208**S	• Eight analog RTD inputs • PT100/PT100	$285
GAA242**S	• Four analog selectable inputs • 4 to 20 mA, 0 to 10 VDC, 0 to 50/100 mV, RTD, TC • Two analog outputs: 4 to 20 mA, 0 to 10 VDC	$240
GDA204**S	• Four analog outputs • 4 to 20 mA, 0 to 10 VDC	$270

COMMUNICATION MODULES		
Part Number	**Description**	**Price**
GSM213**S	• SMS message module • Under development	---
GPF212**S	• Profibus DP slave module • Under development	---
GDN212**S	• DeviceNet slave module • Under development	---
GEN250**S	• Ethernet IP module • Under development	---

CABLES		
Part Number	**Description**	**Price**
RC-P-009I-00	• Connects GWY/OIS Plus to V200 Series PLC • RS485 • 2 m	$25
RC-P-046B-00	• Connects OIS55/55E/V200 PLC to Toshiba G9/AS1 ASDs • RS485 • 2 m	$25
RC-P-009H-00	• Connects GWY/OIS Plus to V200 Series to PLC • RS232 • 2 m	$25

CABLES		
Part Number	**Description**	**Price**
IBM-H-005-00	• Programming cable • For download from computer serial port to all OIS55/55E & V200 CPUs • Alternate use USB printer cable	$30

SPECIAL ITEMS PLC PRICING

CONVERTERS		
Part Number	**Description**	**Price**
TCNV485-232C	• RS422/485 (2-wire/4-wire) to RS232/TTL • Requires 24 VDC external PS	$79
TCNV485-CMOS	• RS422/485 (2-wire/4-wire) to CMOS converter • RJ45 connector for Toshiba ASDs	$90

COMMUNICATIONS		
Part Number	**Description**	**Price**
GWY-00	• Gateway protocol converter • Modbus/Toshiba • Requires 24 VDC external PS • Order cables separately	$200
GWY-300	• Gateway protocol converter • CAN (J1939)/Toshiba • Requires 24 VDC external PS • Order cables separately	$230
GWY-610-B	• Gateway Protocol Converter • Modbus Ethernet TCP/IP to Toshiba PLC/ASD • Requires 24 VDC external PS • Order cables separately	$260
GWY-751	• Gateway GSM modem module • Send text messages from PLC • Requires 24 VDC external PS & phone company SIM card	$310

CABLES		
Part Number	**Description**	**Price**
EC-P-009K-00	• Connects GWY to OIS Plus • RS485 • 2 m (Profibus, CAN Open, DeviceNet)	$25
EC-P-009J-00	• Connects GWY to OIS Plus • RS232 • 2 m (Profibus, CAN Open, DeviceNet)	$25
EC-P-050-00	• Connects OIS40R/OIS60/OIS80/OIS120/GWY to s S9/S11/VF-nC1/VF-nC3 TTL port • 2 m	$35
EC-P-046A-00	• Connects OIS40R/OIS55 Plus/OIS60 Plus/OIS80/OIS120/GWY to T1/T2E/T3/ S2E/S2T RS485 port • Pigtail on PLC end • 2 m	$20
EC-P-019B-00	• Connects OIS40R/OIS55 Plus/60 Plus/OIS80/OIS120/GWY to T2/T2/S2E/S2T programming port • 2 m	$25
EC-P-109A-00	• Connects OIS40R/OIS55 Plus/60 Plus/OIS80/OIS120/GWY to T1 programming port • 2 m	$25
RC-P-009I-00	• Connects GWY/OIS Plus to V200 Series PLC • RS485 • 2 m	$25
RC-P-009H-00	• Connects GWY/OIS Plus to V200 Series PLC • RS232 • 2 m	$25
IBM-0909-1-00	• Programming cable • For download from computer to all OIS • Required for OISetup32 software version 3.0 or higher	$25

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TOSHIBA INTERNATIONAL CORPORATION

13131 W. Little York Road • Houston, TX 77041
Tel: 713-466-0277 Fax: 713-466-8773
US: 800-231-1412 Canada: 800-872-2792 Mexico: 800-527-1204

www.toshiba.com/ind