

SECTION VIII

RATINGS AND SPECIFICATIONS**RATINGS**

1. Current/Torque Reference Potentiometer. 10K Ohms, 1/2W
2. Duty. Continuous
3. Horsepower Range. 1/6 - 5 HP (See Table 1-1, Page 1-1)
4. Line Fuse Interrupting Capacity. 100,000 Amperes
5. Line Power. 115V Or 230V, Single-Phase, 50 Or 60 Hz
6. Motor Speed Potentiometer. 10K Ohms, 1/2W
7. Reference Power Supply (Non-isolated). ± 10 VDC
8. Service Factor. 1.0

TABLE 8-1. TYPICAL APPLICATION DATA

COMPONENT			RATINGS									
RATED HORSEPOWER (HP)			1/6	1/4	1/3	1/2	3/4	1	1-1/2	2	3	5
RATED KILOWATTS (kW)			0.124	0.187	0.249	0.373	0.560	0.746	1.120	1.492	2.238	3.730
1-PHASE AC INPUT (FULL-LOAD)	Line Amps	115V Unit	3.9	5.0	6.0	8.7	12.4	15.8	NA	NA	NA	NA
		230V Unit	NA	NA	NA	4.2	5.9	8.8	12.6	15.8	22.0	32.0
	KVA		0.48	0.58	0.71	1.00	1.40	2.00	3.00	4.00	5.00	8.00
DC OUTPUT (FULL-LOAD)	Motor Armature Amps	90V	2.0	2.8	3.5	5.4	8.1	10.5	NA	NA	NA	NA
		180V	NA	NA	NA	2.6	3.8	5.5	8.2	11.6	15.1	25.0
	Motor Field Amps (Maximum)	Series 2230	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	NA
		Model 2242	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
FULL-LOAD TORQUE (lb-ft.) with 1750 RPM Base Speed Motors			0.5	0.75	1.0	1.5	2.2	3.0	4.5	6.0	9.0	15.0
MINIMUM TRANSFORMER KVA FOR VOLTAGE MATCHING OR ISOLATION			0.5	0.75	0.75	1.0	1.5	2.0	3.0	5.0	7.5	10.0

TABLE 8-2. OPERATING VOLTAGES AND SIGNALS

POWER SOURCE (Single-Phase)	OUTPUT VDC		SPEED REFERENCE SIGNAL ^a	MAGNETIC CONTROL VOLTAGE	TACHOMETER GENERATOR VOLTAGE
	Armature	Field			
115V, 50 or 60 Hz	0 - 90	50/100	0 - ±10 VDC	24 VDC	5.5 - 200 VDC
230V, 50 or 60 Hz	0 - 180	100/200			

a. Speed reference signal must be ungrounded.

TABLE 8-3. CONTROLLER WEIGHTS

CONTROLLER MODEL	WEIGHT - LBS (KG)		
	1/6 - 2	3	5
2231	7.70 (3.49)	NA	NA
2231A	8.50 (3.86)	NA	NA
2231P0, P1	11.60 (5.26)	NA	NA
2231AP0, AP1	12.40 (5.62)	NA	NA
2232	7.70 (3.49)		NA
2232A	8.50 (3.86)		NA
2232P0, P1	11.60 (5.26)		NA
2235	2.00 (0.91)	NA	NA
2235B	2.25 (1.02)	NA	NA
2236	2.00 (0.91)		NA
2236B	2.25 (1.02)		NA
2242	8.20 (3.72)		8.60 (3.90)
2242A	8.90 (4.04)		9.30 (4.22)
2242P0, P1	12.10 (5.49)		12.50 (5.67)
2242AP0, AP1	12.80 (5.81)		13.20 (5.99)

OPERATING CONDITIONS

1. Altitude, Standard. 1000 Meters (3300 Feet) Maximum¹
2. Ambient Temperature². 0 - 40°C (32°F - 104°F)
3. Line Frequency Variation. ± 2 Hz Of Rated
4. Line Voltage Variation. ±10% Of Rated
5. Relative Humidity. 95% Noncondensing

1. Controller can be derated by 1% per 100 meters to operate at higher altitudes.
 2. 55°C (131°F) maximum in enclosed areas where open-chassis controllers are mounted.

PERFORMANCE CHARACTERISTICS

- 1. Controlled Bandwidth (Speed Of Response) 5 Hz
- 2. Controlled Speed Range 0 To Motor Base Speed
- 3. Current Ripple Frequency 120 Hz (60 Hz); 100 Hz (50 Hz)
- 4. Efficiency (Rated Speed/Rated Load)
 - a. Controller Only 98%
 - b. Controller With Motor, Typical 85%
- 5. Speed Regulation Regulation percentages are of motor base speed under steady-state conditions

TABLE 8-4. SPEED REGULATION CHARACTERISTICS

REGULATION METHOD	VARIABLE				
	Load Change (95%)	Line Voltage ($\pm 10\%$)	Field Heating (Cold/Normal)	Temperature ($\pm 10^{\circ}\text{C}$)	Speed Range
Standard Voltage Feedback with IR Compensation	2%	$\pm 1\%$	5 - 12%	$\pm 2\%$	50:1
Tachometer Feedback with 5PY DC Tachometer	0.5%	$\pm 1\%$	0.2%	$\pm 2\%$	200:1

ADJUSTMENTS

- 1. Acceleration, Linear 0.2 - 30 Seconds
- 2. Dead Band ± 2 Hz (Enable) Or 0 (Disable)
- 3. Deceleration, Linear 0.2 - 30 Seconds
- 4. Forward Torque (Current) Limit 10 - 150% Of Full-Load Torque
- 5. IR (Load) Compensation 0 - 10% Boost
- 6. Jog Speed 0 - 100% Of Motor Base Speed
- 7. Maximum Speed 50% - 100% Of Motor Base Speed
- 8. Reverse Torque (Current) Limit 10 - 150% Of Full-Load Torque

SPECIFICATIONS

- **AC LINE PROTECTION** - A 100,000 ampere interrupting capacity AC line fuse provides instantaneous protection from peak loads and fault currents. This line fuse is located inside the controller. A molded-case, magnetic-trip circuit breaker (Option 1010) is available for Model 2242 Controllers, which provides a manual disconnection to the controller, and also provides automatic instantaneous trip protection from a peak load.
- **AUXILIARY CONTACT** - A normally-open Form A relay contact, rated 5 amperes @115 VAC and 30 VDC, is available for external use at Terminals TB2-10 and TB2-11. The relay energizes when a Run command is initiated, and de-energizes when a Normal Stop command is initiated or the anti-restart circuit is activated.
- **CONTROL VOLTAGE** - A transformer coupled 24 VDC power supply provides non-isolated control power for all magnetic control logic and operator controls.
- **CURRENT LIMIT CONTROL** - A DIP Switch (S3) allows the forward and reverse current limit circuits to be controlled by internal or external forward and reverse current limit potentiometers. See S3 Segment 2 (Forward) and 7 (Reverse) in Table 4-1, page 4-4.
- **DEAD BAND** - A DIP Switch (S3) enables a 2% dead band around zero reference to prevent motor creeping. See S3 Segment 3 in Table 4-1, page 4-4.
- **DIP SWITCH SETTINGS** - An 8-position DIP Switch (S3) is used to program the controller for various applications and operations as shown in Table 4-1, page 4-4.
- **FEEDBACK** - Two modes of analog feedback are provided, as follows. See Table 8-4 (page 8-3) for speed regulation characteristics.
 - a. **Armature Feedback** - Counter EMF voltage feedback with IR compensation, adjustable for individual motor characteristics.
 - b. **DC Tachometer Feedback** - The controller provides voltage scaling, and terminals for accepting the output of a DC tachometer generator, mechanically coupled to the drive motor armature. The controller will automatically transfer to armature feedback if the tachometer signal is lost. Tachometer generators with an output of 5.5 VDC to 200 VDC at 1750 RPM may be used.
- **FIELD SUPPLY** - A half-wave or full-wave shunt field supply is available as shown in Table 8-5.

TABLE 8-5. SHUNT FIELD DATA

CONTROLLER RATING (VAC)	SHUNT FIELD VOLTAGE (VDC)		MOTOR SHUNT FIELD LEAD CONNECTIONS	
	Half-Wave	Full-Wave ^a	F1	F2
115	50		L1	F-
		100	F+	F-
230	100		L1	F-
		200	F+	F-

a. Low inductance motors require a full-wave field to prevent current instability.

- **LINE STARTING** - Allows the drive to start automatically when AC power is applied to the controller, and stop when power is removed. A DIP Switch (S3) disables the no-restart-on-power-failure feature and enables line starting. See S3 Segment 1 in Table 4-1, page 4-4.
- **MOTOR CONTACTOR** - Controller model numbers with an 'B' suffix, e.g., 2231B, 2242BP0, have a DC magnetic armature contactor, which disconnects both motor armature leads from the controller. An antiplug circuit ensures that the contactor does not make or break DC.
- **POWER CONVERSION** - The DC power bridge is a dual full-wave converter of two back-to-back bridges of four SCR's each. Each SCR is rated at least 600 PIV. The controller base forms an integral heat sink, with the power devices electrically isolated from the base.
- **STATUS INDICATOR** - A bicolor LED glows red when motor armature current is being limited by the controller current limit, and glows green when armature current is not being limited.
- **TACHOMETER VOLTAGE SELECTION** - A DIP Switch (S3) allows the use of a standard or nonstandard voltage DC tachometer generator for feedback. See S3 Segment 5 in Table 4-1, page 4-4.
- **TORQUE REGULATOR** - A DIP Switch (S3) enables the controller to function as a torque regulator instead of a speed regulator. This allows the use of external Forward and Reverse potentiometers to set motor torque (0 - 150% of rated). When the Torque mode is selected, motor speed will seek a level from 0 to 100% of rated depending on the application load torque. See S3 Segment 4 in Table 4-1, page 4-4.
- **VOLTAGE TRANSIENT PROTECTION** - A metal oxide suppressor (varistor) across the AC line is combined with RC snubbers across the power bridge to limit potentially damaging high voltage spikes from the AC power source.
- **50/60 HERTZ OPERATION** - A DIP Switch (S3) enables the controller to operate from either a 50 Hertz or 60 Hertz power source. See S3 Segment 6 in Table 4-1, page 4-4.

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