

D-C MILL MOTORS



AISE Technical Report No. 1

August 1991

Published by

ASSOCIATION OF IRON AND STEEL ENGINEERS

Three Gateway Center, Suite 2350, Pittsburgh, Pennsylvania 15222-1097 U.S.A.

1 GENERAL

1.1 Purpose.

The purpose of this Technical Report is to define the capability of the d-c mill motors and the mounting dimensions. These motors are for heavy-duty service applications similar to those found in steel mill auxiliary and overhead crane applications. This Technical Report supersedes the previous Standard No. 1 — *AISE D-C Mill Motors*, Revised September 1968.

1.2 Scope.

This Technical Report covers series, shunt and compound wound motors of two standard enclosure types:

TENV — Totally Enclosed Nonventilated

TEFV — Totally Enclosed Forced Ventilated from a separate source.

These motors shall be suitable for use outdoors.

2 MECHANICAL

2.1 Mounting.

The standard position of mounting shall be horizontal.

2.2 Dimensions and Tolerances.

The mounting dimensions and tolerances shall be as shown in Fig. 1.

2.3 Convertibility.

2.3.1 The TENV and TEFV enclosures shall be convertible by addition or removal of suitable covers.

2.3.2 The motors shall also have provision for self ventilation. This could require addition of armature fans and could require making openings in the frame per manufacturer's instructions.

2.4 Air Flow.

The motors shall be designed to meet the TEFV ratings when supplied with air volume and air pressures shown in Table 1. Air flow can be in either direction through the motor with applicable pressure.

2.5 Leads.

Leads shall be brought out on the left side facing the commutator end. Conduit boxes shall be furnished when specified by the purchaser.

2.6 Frames.

Frames shall be horizontally split in such a manner to allow removal of the armature by a straight vertical lift after the top frame half is opened or removed.

2.7 Shafts.

2.7.1 Shafts shall be replaceable.

2.7.2 A shaft extension key, a lockwasher and a nut shall be provided on the drive end only. A shaft guard (thimble) shall be provided on the commutator end. Bent locking plates shall be provided in place of lockwashers whenever specified.

2.8 Bearings.

The bearing identification is shown in Fig. 1. The 620, 622 and 624 shall be applicable for coupled service only.

2.9 End Play.

The axial end play of the armature shall not exceed 0.2 in.

3 ELECTRICAL

3.1 Ratings.

The voltage, horsepower, speed and time rating shall be as listed in Table 1.

3.2 Voltage Source.^Δ

3.2.2 Standard Voltage — The performance standards of motors in this publication are based on operation from a direct-current source of supply such as a generator or battery and ratings are based on 230 volts, but the motor shall be suitable for operation on voltages up to 500 volts. Ratings do not necessarily apply when appreciable ripple is present. Maximum running torques at voltages above 230 volts are reduced.

3.2.3 Rectified a-c* — All standard mill motors shall be suitable for operation on adjustable voltage (up to 500 volts d-c) rectified power supplies (such as SCRs) the equivalent of 3-phase, 50 or 60 hertz, 6 controlled legs (300 or 360 hertz ripple frequency) with a maximum of 500 volts a-c (RMS line to line) applied to the rectifier bridge.

3.3 Field Voltage.

Shunt field voltage rating shall be 230 volts.

^Δ For applications above 500 volts d-c, consult the motor manufacturer.

* Rectified a-c — When motors are operated from a rectified a-c supply, other than described in Section 3.2.3, the performance could differ materially from that of the same motors when operated from a d-c source of supply having the same effective value of voltage. At the same load, the temperature rise, speed regulation and noise level might be increased, and successful commutation might not be achieved. The degree of difference will depend upon the effect of the rectified voltage on the motor current and is more likely to be significant when the rectified pulse number is low (less than six) and/or the amount of phase control is substantial (more than 15%).

When motors are operated from some unfiltered rectified power supplies, bearing currents can result. Ripple currents, transmitted by capacitive coupling between the armature winding and core, can flow through the ground path to the transformer secondary. While these currents are small in magnitude, they can cause damage to the bearings under certain circumstances.

Table 1 — AISE Standardized D-C Mill Motor Ratings — 230 Volts

AISE Frame Size	Totally Enclosed 1 hr or Forced Ventilated Continuous					TENV Series Motors 30-Minute		TENV 30% Time-on Duty Cycle ^③						Air Requirements for Continuous Forced Ventilated Ratings		Maximum Starting Torque (lb-ft)			Maximum Running Torque on 230 Volts (lb-ft)			Maximum Armature WK ² (lb-ft ²) ^④	Maximum Safe Speed rpm	
	hp	rpm				hp	rpm	Series		Compound		Shunt		CFM	Static Press. at Inlet (in. H ₂ O)		Series	Compound	Shunt	Series	Compound			Shunt
		Series	Compound	Straight Shunt	Adjustable Speed ^②			hp	rpm	hp	rpm	hp	rpm		hp	rpm								
802A ^①	5	900	1025	1025	1025/2050	6.5	750	5.5	840	5	1080	5	1130	110	¾	½	145	115	92	116	90	75	6	3600
802B ^①	7.5	800	900	900	900/1800	10.0	675	8	780	7.5	950	7.5	1000	110	¾	½	245	198	158	196	154	130	6	3600
802C ^①	10	800	900	900	900/1800	13.5	675	10	800	9.5	940	9.0	1000	160	1	½	330	263	175	262	205	160	6	3600
803	15	725	800	800	800/2000	19	620	15	725	14.5	840	14	880	200	1¼	½	545	445	295	440	345	265	12	3300
804	20	650	725	725	725/1800	26	580	20	650	18.5	775	17	800	250	1¼	½	810	650	435	650	505	390	30	3000
806	30	575	650	650	650/1950	39	500	30	575	28.5	690	25	715	335	1½	¾	1370	1100	725	1100	855	650	50	2600
808	50	525	575	575	575/1725	65	450	40	570	37.5	625	35	630	425	1½	¾	2500	2050	1370	2000	1600	1220	90	2300
810	70	500	550	550	550/1650	90	440	60	550	52.5	615	45	600	525	1¾	1	3700	3000	2000	2950	2330	1800	145	2200
812	100	475	515	515	515/1300	135	420	85	525	75	580	60	565	750	2	1½	5500	4600	3060	4430	3600	2750	220	1900
814	150	460	500	500	500/1250	200	400	115	515	110	565	85	560	900	2¼	1	8550	7100	4725	6850	5550	4250	400	1700
816	200	450	480	480	480/1200	265	400	150	500	140	540	110	535	1200	2½	1¼	11,700	9800	6550	9300	7650	5900	600	1600
818	250	410	435	435	435/1100	325	360	185	485	165	490	130	470	1600	3	1½	16,000	13,600	9050	12,800	10,600	8150	1100	1500

① Frame size 802 is assigned three ratings. Mounting dimensions are the same for each rating, but the electrical designs will be different.

③ Continuously repeated duty cycles of 5 minutes duration with load on for 1½ minutes, power off for 3½ minutes, with shunt fields continuously excited.

② A light stabilizing series field may be used as required to obtain these speed ranges.

④ Limiting maximum values, not to be used for application calculations.

Table 1, Continued — AISE Standardized D-C Mill Motor Ratings — 230 Volts

AISE Frame Size	Totally Enclosed				Protected Self-Ventilated									Adjustable Speed		Enclosed Force-Ventilated Series, Compound, Shunt And Stabilized Shunt Wound		Maximum Starting Torque (lb-ft)			Maximum Running Torque on 230 Volts (lb-ft)		
	1 hr, 75°C Rise				Continuous, 75°C Rise			1 hr, 75°C Rise			Shunt or Stabilized Shunt Wound		The continuous, 75°C rise ratings of enclosed force-ventilated motors are equal to the 1 hr, 75°C rise totally enclosed ratings when the required volume of ventilating air for such ratings is supplied to the motors.										
	hp	rpm			hp	rpm			hp	rpm					1 hr, 75°C, Enclosed Cont., 75°C, Self-Vent.		Required Air CFM	Static Pressure at Motor Air Inlet (in. H ₂ O)	Series	Compound	Shunt	Series	Compound
		Series	Compound	Shunt		Series	Compound	Shunt		Series	Compound	Shunt	hp	rpm									
620	275	370	390	390	275	370	390	390	350	350	370	390	275	390/975	2000	1¾	19,500	16,650	13,320	15,600	12,950	11,100	
622	375	340	360	360	375	340	360	360	475	320	340	360	375	360/1080	2700	1¾	29,000	24,600	19,660	23,200	19,110	16,380	
624	500	320	340	340	500	320	340	340	625	300	320	340	500	340/1020	3500	1¾	41,100	34,740	27,790	32,800	27,020	23,160	