

SUBMITTAL

Serial Number:

Contractor:

Job Name:

Model:



See the difference...

GRINDERS • SHREDDERS • SCREENS • COMMINUTORS

Submittal Data

by **Franklin Miller, Inc.**

Prepared For:
Jacob Galanty
Franklin Miller, Inc.
60 Okner Parkway
Livingston, NJ 07039
Phone: 973-535-9200
Fax: 973-533-6456

Franklin Miller is pleased to provide the enclosed submittal data for your review and Approval.

Date		Pages	
Revision		Prepared By	
Copies		Action	
Purchase Order			
Installation			

Qty	Model	Your ID (Tag) #	Serial Number	Weight (Lbs.)
1				

Review & Approval Required:		
Signed by :	✓	Check One:
Title:		Approved without change
Organization: Franklin Miller, Inc.		Approved as noted
Date:		Revise and resubmit

Once approved with signature and released for production, this submittal document will be considered a legal document and will override any other documents; unless otherwise specified in writing in this document. Franklin Miller will only be responsible for items mentioned herein. If any modifications are required, Franklin Miller will resubmit this document for final approval (without charge).

Please send back your approval and confirm/provide the following:

- Dimensions marked with "Note #1" on the outline drawing.
- Confirm your ability to notch the channel floor, as indicated in "Note # 2."
- Please select the wet well shape (either round or rectangular) as shown on the outline drawing
- Confirm the motor voltage requirements (230/3/60) or (460/3/60).
- Acknowledgement of the minimum upstream water level for the flow indicated on the outline drawing.

The returned data package may be transmitted via fax, mail, or email. **This machine can not be released for production without the above mentioned information and APPROVAL signature.**

Franklin Miller Inc.

60 Okner Parkway • Livingston, N.J. 07039 • Phone: (973)535-9200 • Fax: (973)535-6269

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CUSTOMER: Franklin Miller, Inc.
INSTALLATION:
EQUIPMENT:
MANUFACTURER: FRANKLIN MILLER INC.

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1

Unit Specifications

FRANKLIN MILLER, INC.

UNIT SPECIFICATIONS

ORDER #:

SERIAL #:

- **CUSTOMER:** Franklin Miller, Inc.
- **PURCHASE ORDER NUMBER:**
- **MACHINE INSTALLATION:**
- **MACHINE MODEL:**
- **QUANTITY: 1**

Motor:

MANUFACTURER: TECO	HP: 3	ENCLOSURE: TEFC
VOLTS: 230/460	PHASE: 3	HERTZ: 60
Not es:		

Reducer:

MANUFACTURER: SUMITOMO	MODEL: 6125	RATIO: 29
Notes:		

Enclosure:

MODEL: S250	ENCLOSURE: NEMA 4X FRP	
VOLTS: 230/460	PHASE: 3	HERTZ: 60

2

TM8512 Grinder

Taskmaster® TM8512 Grinder Specification

PART 1 - GENERAL

1.01 DESCRIPTION:

The unit shall be a TM8512 TASKMASTER® manufactured by Franklin Miller, Inc. of Livingston, New Jersey and shall meet the following requirements:

1.02 QUALITY ASSURANCE:

A. REFERENCES:

This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
AISI 304	Grade 304 Stainless Steel
AISI 316	Grade 316 Stainless Steel
AISI 4140	Heat Treated Hexagon Steel
ASTM A 536-84	Standard Specification for Ductile Iron Castings

PART 2 - PRODUCTS

2.01 SEWAGE GRINDER:

A. General:

1. The TASKMASTER® twin shaft grinder shall be designed to reduce solids normally found in a sewage system.
2. The grinder shall be capable of handling the specified flow rate without the use of moving diverter screen(s).
3. Each grinder shall consist of the following main components:
 - a. Grinder housing assembly (Lower Works)
 - b. Drive assembly
 - c. Connecting Member
 - 1) (Open Channel) Channel Frame:
 - a) The channel frame shall facilitate the slide-in installation of grinder for easy servicing.

4. Two-shaft design shall consist of two parallel shafts stacked with intermeshing cutter cartridges. The shafts shall counter-rotate with the driven cutter peripheral linear speed operating at approximately two-thirds (2/3) that of the drive cutter peripheral linear speed.

B. Main Housing:

1. The main end housing components shall be a cast structure made of ASTM A536-84 ductile iron.
2. The main end housing components shall be independent of and shall not be subject to wear from seal or labyrinth seal system and shall not constitute a seal wear element.

C. Cutters:

1. The cutters shall be a monolithic cutter cartridge type comprising a plurality of 7-tooth cam shaped cutter elements. The cartridges shall be designed to eliminate individual cutter and spacer disks for improved strength and transmission of power from the shaft. Units using multitudes of individual cutters and spacers shall not be accepted.
2. No cutter stack re-tightening shall be required with this system.
3. The cutter profile shall be a 7 tooth cam type to minimize frictional drag. To maintain particle size, the height of the tooth shall not exceed 1/2-inch (13-mm) above the root diameter. Cutter to cutter root diameter shall not be less than 1/16-inch (1.6-mm) or greater than 1/4-inch (6.0-mm) to maintain the best possible cutting efficiency while incurring the least amount of frictional losses.
4. The inside configuration of cutters shall be hexagonal so as to fit the shafts with a total clearance not to exceed 0.015-inch across the flats to assure positive drive and minimize wear.
5. Cutter Cartridges shall be AISI 4140 Heat Treated Alloy Steel, The spaces defined by the adjacent side surfaces of the cutting edges and outer surface of the connecting spacer areas shall be cylindrically ground for uniformity. Each cutter cartridge shall further have a total accumulated tolerance of plus or minus .0005" to eliminate shimming, cutter stack tolerance accumulation and misalignment. The cutters shall be through-hardened to a minimum 45-49 Rockwell C.
6. The cutters shall exert a minimum force of 450-lbs./HP (2680-N/kW) continuously and 1430-lbs./HP (8530-N/kW) at momentary load peaks at the tooth tip.

D. Shafts:

1. Grinder drive and driven shafts shall be made of AISI 4140 heat treated hexagon steel with a nominal tensile strength rating of 180,000-psi (1241.1-MPa). Each shaft size shall be a minimum of 2-inch hexagon (across the flats) (51-mm).

E. Bearings and Seals:

1. The cutter shaft's radial and axial loads shall be borne by a sealed oversize deep-groove (Conrad type) ball bearing at each end. The bearings shall have a minimum rating of 9230 lbf (basic dynamic rating).
2. The bearings shall be protected by a combination of a replaceable and independent tortuous path device and end face mechanical seals.
3. Face materials shall be tungsten carbide vs. tungsten carbide and not require an external flush. The seals shall employ elastomeric members operating as opposing disk springs when compressed and at the same time maintain a positive seal face pressure to insure positive sealing. No metal springs shall be employed.
4. The bearings and seals shall be housed in a replaceable cartridge that supports and aligns the bearings and seals. The cartridge housings shall be constructed of hardened 17-4 PH stainless steel for superior resistance to corrosive and abrasive contaminants.
5. Components subject to wear shall be designed into replaceable elements and not be a part of the ductile iron unit main housing.
6. O-rings shall be made of Buna-N. elastomers.

F. Reducer:

1. The speed reducer shall be a grease-filled planetary or cycloidal type reducer with "Heavy-Shock" load classification. The reduction ratio shall be 29:1. The high-speed shaft of the grinder shall be directly coupled with the reducer via a coupling.
2. The two-piece, three-lobed coupling shall have jaws that intermesh by at least 3/4" for dependable torque transmission.

G. Motor:

1. Motor B Non-Submersible
 - a. The motor shall be TEFC, 3 HP 230/460 Volt, 3-phase, 60 Hz. Motor service factor shall be 1.15, the efficiency factor not less than 87.5% at full load and the power factor not less than 82% at full load.
 - b. Required Running Torque per Horsepower (kW): Continuously: 1589 in-lbs. (180-Nm) minimum.
 - c. At Momentary Load Peaks: 5483 in-lbs. (619-Nm).

PART 3 - EXECUTION

3.01 FACTORY TEST:

Each grinder and controller shall be factory tested to ensure satisfactory operation.

3.02 INSTALLATION:

Grinder and controller shall be installed in accordance with the supplier's installation instructions, and in compliance with all OSHA, local, state, and federal codes and regulations.

3.03 OPERATION AND MAINTENANCE MANUALS:

Supplier shall provide (2) Operation and Maintenance Manuals. The manuals shall include equipment descriptions, operating instructions, drawings, troubleshooting techniques, a recommended maintenance schedule, and the recommended lubricants.

3

Paint Specifications

PAINTING SPECIFICATIONS

(Franklin Miller Fabricated Parts)

All stainless steel parts, if used, will not be painted.

All steel surfaces shall be primed the same day as cleaned.

All steel parts which are exposed will be painted to the following procedures.

SURFACE PREPARATION

Surface preparation for steel will be defined by the Steel Structures Painting Council (SSPC) and is as follows:

SSPC-10-NEAR WHITE BLAST CLEANING

Near-white blast cleaning is a method of preparing metal surfaces for painting or coating by removing nearly all mill scale, rust scale, paint or foreign matter by the use of abrasives propelled through nozzles or by centrifugal wheels. A near-white blast cleaned surface finish is defined as one in which all oil, grease, dirt, mill scale, rust corrosion products, oxides, paint or other foreign matter have been completely removed from the surface except for very light shadows, very slight streaks or slight discolorations caused by rust stain, mill scale oxides, or slight, tight residues of paint or coating that may remain. At least 95% of each square inch of surface area shall be free of all visible residues, and the remainder shall be limited to the light discolored mentioned above.

COATING

DESCRIPTION:	Polyamide Epoxy
TYPICAL USE:	Coating structural steel, machinery and equipment.
COLOR:	Franklin Miller Blue
FINISH:	Satin
PRIMER:	One Coat
TOP:	One Coat
DRY FILM THICKNESS:	(As recommended by manufacturer): 3 to 5 mil per coat.

4

Warranty

FRANKLIN MILLER INC.
LIMITED WARRANTY
DOMESTIC

SELLER warrants the goods sold hereunder to be free from defects in material and workmanship under normal use and service not arising from misuse, negligence or accident, or unauthorized modification of the equipment, in connection with the use, installation, and transportation of the goods by BUYER, its agents, servants, employees or by carriers. SELLER's obligations under this warranty are limited to remedying any deficiencies in the goods at such place or places in the United States of America as may be designated by SELLER. This warranty shall pertain to any part or parts of any goods to which BUYER has, within (12) months after date of shipment, given written notice of a claimed defect to the SELLER. The BUYER shall be required to furnish SELLER with details of such defects and this warranty shall be effective as to such goods which upon SELLER's examination shall disclose to its satisfaction to have been defective and which at SELLER's option shall be repaired in place if required for a warranty repair. The BUYER at his expense shall make available in a suitable location for repair by SELLER or promptly thereafter be returned to SELLER, at BUYER's, or its nominees expense. If upon examination it is determined by the SELLER that the repair or replacement does not fall within the Warranty as set forth in this clause, an estimate for cost of repair will be provided to the BUYER. This warranty is expressly in lieu of all other warranties expressed or implied. In no event shall the SELLER be liable to the BUYER or to any other person for any loss or damage, direct or indirect, arising out of or caused by the use or operation of the goods, or for the loss of profits, business, or good will. Under no circumstance will SELLER be liable for any of the following: (1) third party claims against BUYER for losses or damages including liquidated damages; (2) loss of or damage to BUYER's records or data; or (3) economic consequential damages (including loss of profits or savings) or incidental damages even if SELLER is informed of their possibility. Excluded from the warranty herein are (a) defects in parts or components not manufactured directly by SELLER; Franklin Miller will, however, pass on the remaining balance of the purchased equipment manufacturer's warranty; (b) or not part of SELLER's standard design or are supplied pursuant to special BUYER's requirements; (c) certain parts which are subject to wear and tear from abrasive action or use thereof; and (d) any part that has been subjected to misuse. SELLER's liability is limited to furnishing or repairing at SELLER's option parts determined by SELLER to be defective. No express warranties and no implied warranties, whether of merchantability or fitness for any particular use, or otherwise (except as to title), other than those expressly set forth above which are made expressly in lieu of all other warranties, shall apply to products sold by us, and no waiver, alteration, or modification of the foregoing conditions shall be valid unless made in writing and signed by an executive officer of our corporation. If the buyer is in default of Clause 6 (Payment of Purchase Price) this warranty is null and void unless reinstated by SELLER.

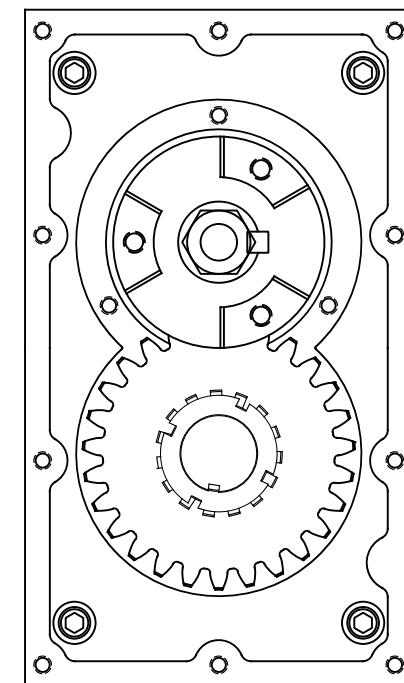
5

Drawings

BILL OF MATERIAL

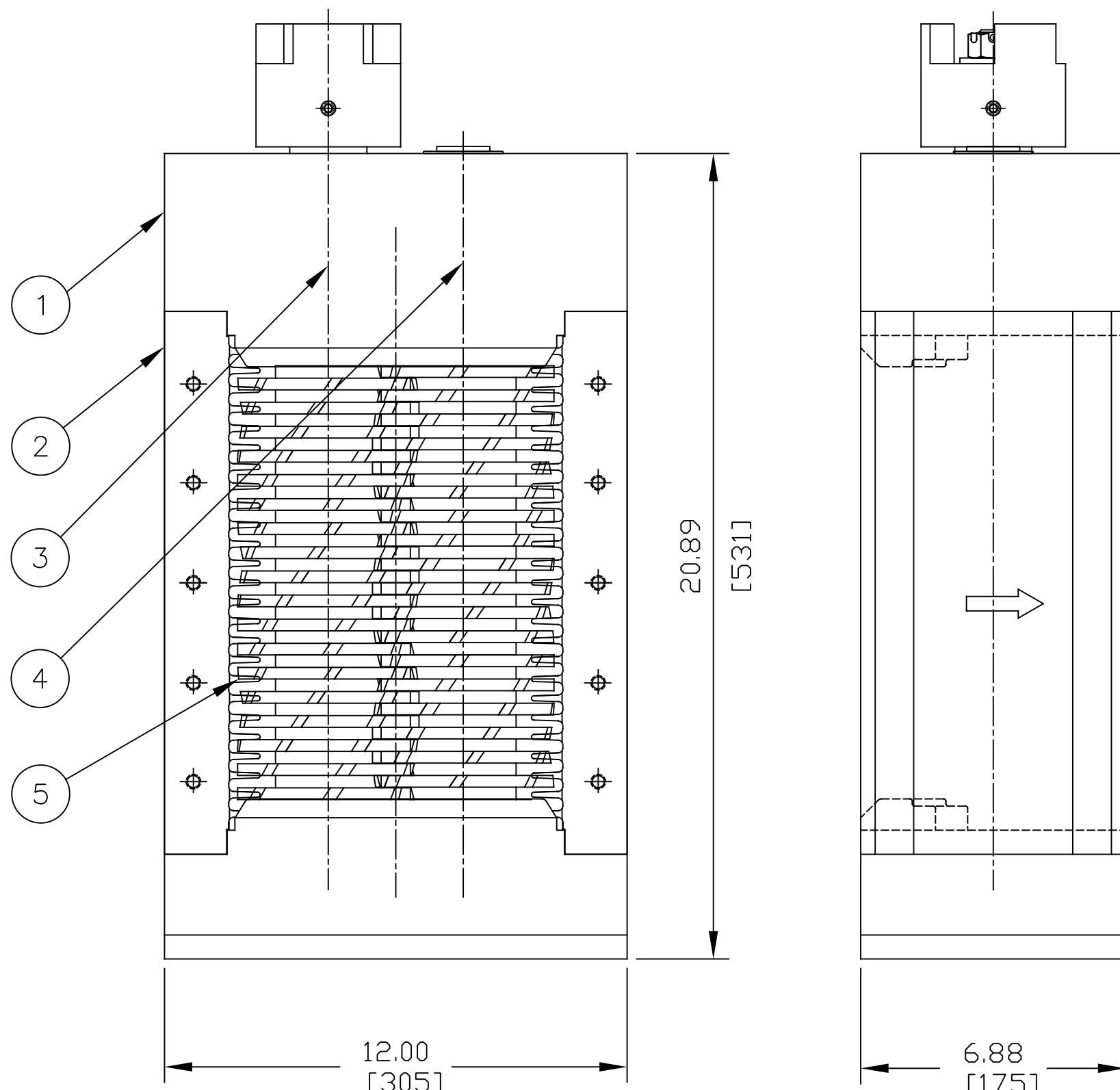
ITEM	QTY	DESCRIPTION	FMI P/#	MATERIAL STANDARD	WEIGHT
1	1	TM850000 COMMON PARTS	TM850000	SEE DETAIL	110.7 LBS
2	2	SIDE FRAME	TM85660	DUCT	28.5 LBS
3	1	DRIVE SHAFT	TM85373B	4140 Rc28-32	16.5 LBS
4	1	DRIVEN SHAFT	TM8572B	4140	15.5 LBS
5	6	CUTTER CARTRIDGE	TM8551A	4140	6.5 LBS

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Approved by:

- Approved Without Comment
- Approved As Noted
- Revise and Resubmit

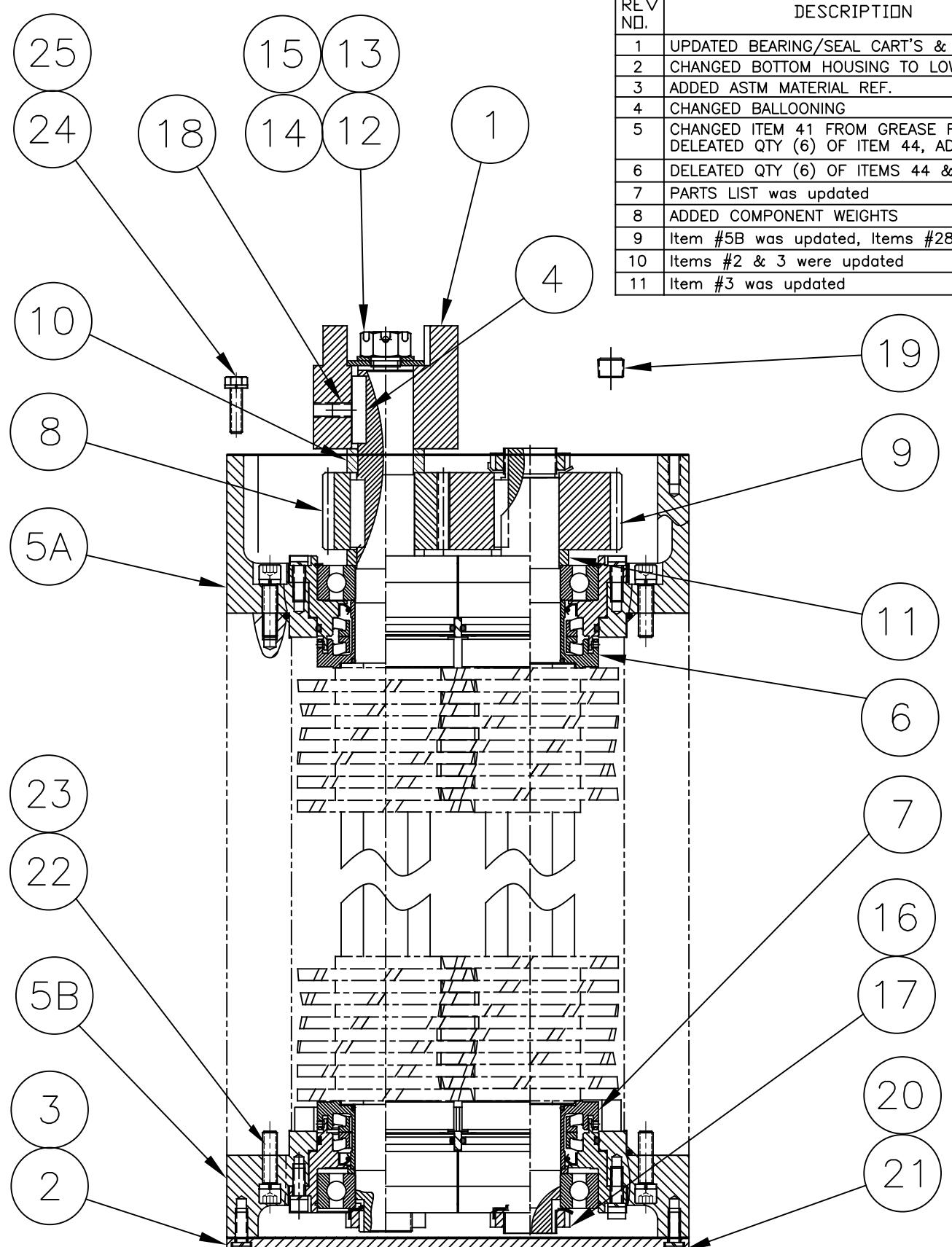


Franklin Miller INC.
60 OKNER PARKWAY, LIVINGSTON, N.J. 07039

TM8512 LESS DRIVE

ITEM	DESCRIPTION	SCALE	DWT	DATE	CKD	DATE	DWG NO.	REV
- SEE BOM		1: 4	AEG	10/13/00	.	.	TM851200	
LTR P/N	MATERIAL	WEIGHT#						

PARTS LIST						
ITEM	QTY	DESCRIPTION	MATERIAL	FMI PART/#	WEIGHT	
1	1	COUPLING HALF, DRIVE SHAFT	1018 C.S.	FM00015AU	5.5 LBS	
2	1	COVER, BOTTOM	D.I. 65-45-12	TM8510B	13.5 LBS	
3	2	GASKET	BUNA	TM8512A	-	
4	3	KEY, 3/8 SQ x 1 3/4	1090 C.S.	KS0628	.125 LBS	
5A	1	HOUSING, TOP	D.I. 65-45-12	TM8546M	37 LBS	
5B	1	HOUSING, BOTTOM w/DEFLECTOR, FLOW	D.I. 65-45-12	TM85646M	26.5 LBS	
6	2	BEARING/SEAL CARTRIDGE, FIXED	SEE DETAIL	TM85760	6 LBS	
7	2	BEARING/SEAL CARTRIDGE, EXPANSION	SEE DETAIL	TM85990	5.9 LBS	
8	1	PINION GEAR, 18T	4140 ALLOY STEEL	TM85125	2.5 LBS	
9	1	SPUR GEAR, 27T	4140 ALLOY STEEL	TM85124	7.5 LBS	
10	1	SPACER, GEAR/COUPLING	1018 C.S.	TM85410	.25 LBS	
11	2	SPACER, BRG/GEAR	1018 C.S.	TM8596	.25 LBS	
12	1	WASHER, PLAIN, WIDE 3/4	CS	WPW12HT	.125 LBS	
13	1	WASHER, BELLVILLE, 3/4 X .107 THK	CS	WB12107	.125 LBS	
14	1	COTTER PIN, 1/8 x 1 1/2	18-8 S.S.	MM00120	.125 LBS	
15	1	NUT, HEX, SLOTTED, 3/4-10	CS	NHS1210	.25 LBS	
16	3	NUT, BEARING, N-07	1018 C.S.	BN07	.25 LBS	
17	3	LOCKWASHER, BEARING, W-07	1018 C.S.	BW07	.125 LBS	
18	2	SETSCREW, 3/8-16 x 1/2	18-8 S.S.	SS061608S	.125 LBS	
19	1	PIPE PLUG 3/8 NPT	GALV.	PP00027	.25 LBS	
20	10	SOHCS, 5/16-18 x 1"	18-8 S.S.	SC051816S	.125 LBS	
21	10	LOCKWASHER, HI-COLLAR 5/16	18-8 S.S.	LWH05S	.125 LBS	
22	8	SOHCS, 3/8-16 x 1 1/2	18-8 S.S.	SC061624S	.125 LBS	
23	8	WASHER, BOLT SEALING 3/8	18-8 S.S.	MM00153	.125 LBS	
24	10	HHCS, 5/16-18 x 1 1/4	18-8 S.S.	HC051820S	.125 LBS	
25	10	LOCKWASHER, 5/16	18-8 S.S.	LW05S	.125 LBS	
26	1	NAMEPLATE-S/N FMI	18-8 S.S.	NP1000	.25 LBS	
27	7oz	LUBRICANT, GREASE, GEAR	LUBRICANT	LU00003	1 LBS	



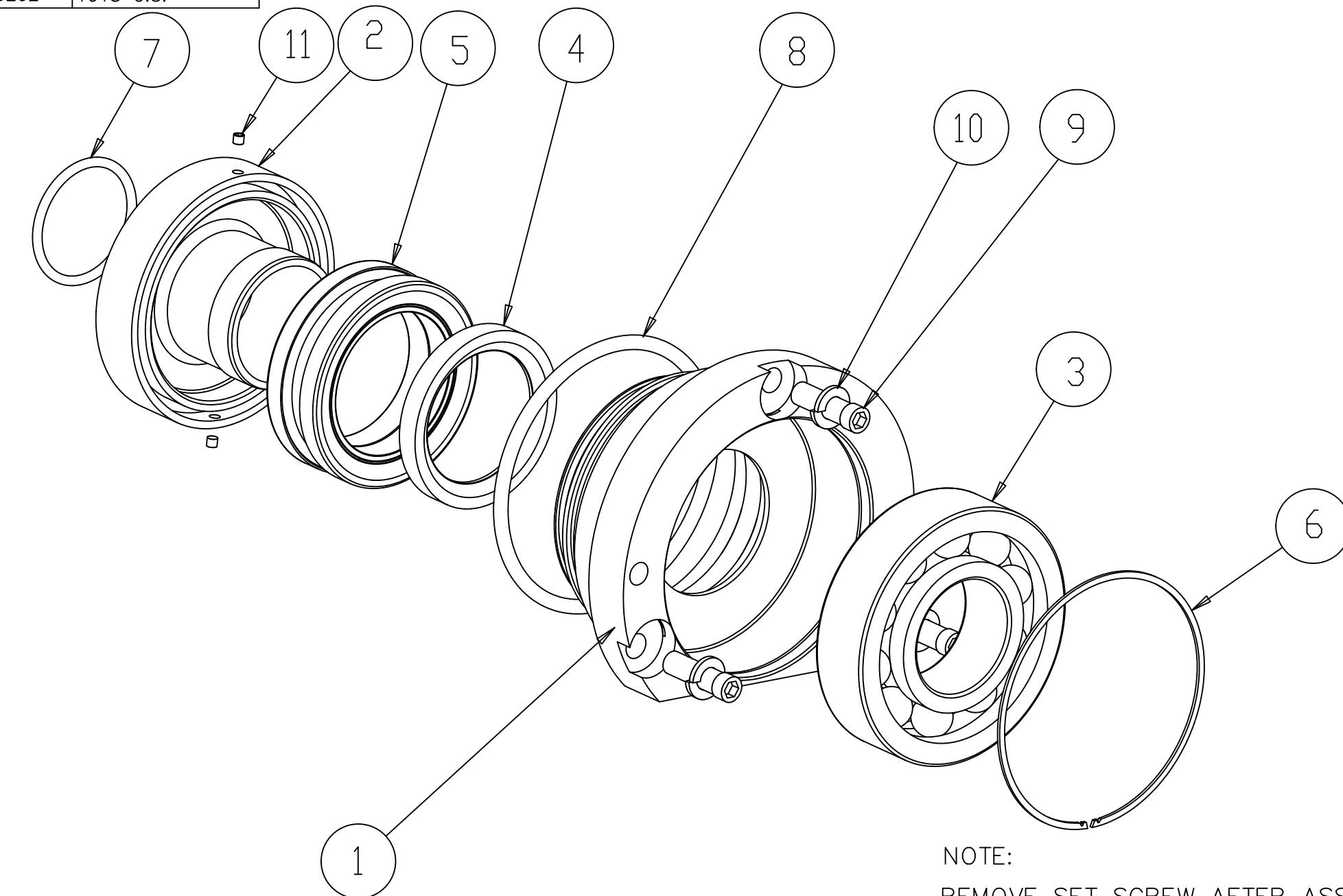
REV NO.	DESCRIPTION	DWN	DATE
1	UPDATED BEARING/SEAL CART'S & HARDWARE	AEW	08/24/01
2	CHANGED BOTTOM HOUSING TO LOW-PROFILE	AEW	12/21/01
3	ADDED ASTM MATERIAL REF.	JHT	03/25/02
4	CHANGED BALLOONING	JHT	06/20/02
5	CHANGED ITEM 41 FROM GREASE FITTING TO PLUG, DELETED QTY (6) OF ITEM 44, ADDED ITEM 17A	GWC	10/30/03
6	DELETED QTY (6) OF ITEMS 44 & 48	AG	01/30/04
7	PARTS LIST was updated	AG	05/23/05
8	ADDED COMPONENT WEIGHTS	JT	10/05/05
9	Item #5B was updated, Items #28, 29 were removed	AG	02/10/06
10	Items #2 & 3 were updated	AG	03/13/06
11	Item #3 was updated	AG	07/25/16

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— SEE BOM				
LTR P/N	MATERIAL	WEIGHT#		
THIRD ANGLE PROJECTION		DIMENSIONS INCH [mm]	SCALE	DWN
			1:3	AEW
			10/13/00	.
			.	.
				DWG NO. TM850000 REV 11

BILL OF MATERIAL

ITEM	QTY	DESCRIPTION	FMI P/#	MATERIAL
1	1	STATIONARY SEAL GLAND	TM8549C	17-4 PH S.S.
2	1	ROTARY SEAL GLAND	TM8594C	17-4 PH S.S.
3	1	BALL BEARING	BB245616	ALLOY STEEL
4	1	LIP SEAL	S0293906	BUNA
5	1	MECHANICAL SEAL	MS284415T	TUNGSTEN CARBIDE
6	1	RETAINING RING	RR-UR356	1060 C.S.
7	1	O-RING	OR2129B	BUNA
8	1	O-RING	OR2236B	BUNA
9	3	LO-SOCK. HD CAP SCREW 5/16-18 x 1"	SCL051816S	18-8 SS
10	3	LOCKWASHER HI-COLLAR 5/16	LWH05S	18-8 SS
11	2	SET SCREW 8-32 x 1/8	SS083202	1018 C.S.



NOTE:

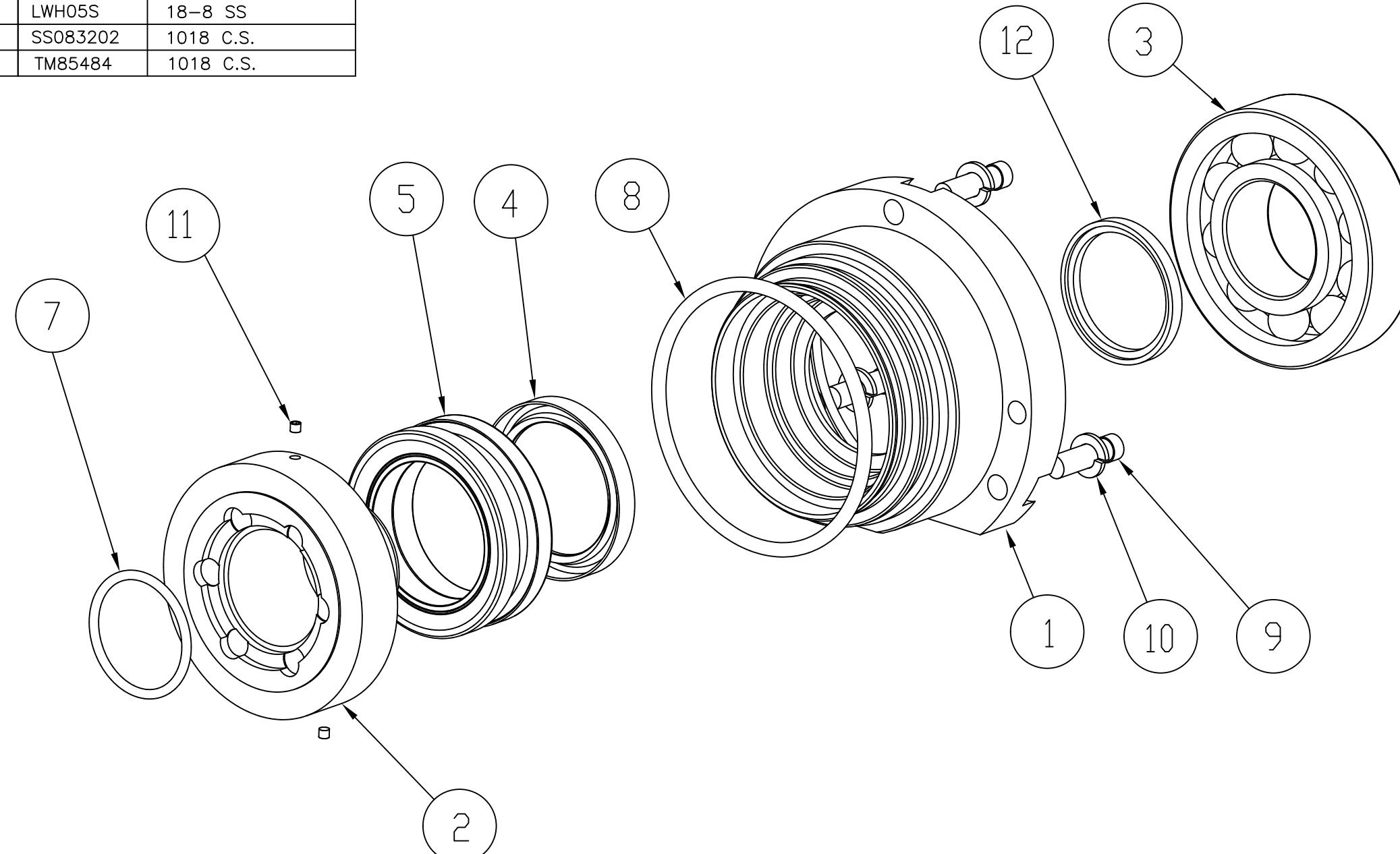
REMOVE SET SCREW AFTER ASSEMBLY INTO MACHINE!

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V	VITON	TM8500 FIXED CARTRIDGE ASSEMBLY, T/C, SS				
—	BUNA					
LTR P/N	MATERIAL	WEIGHT#	SCALE	DWN	DATE	CKD
			.75	MSS	08/28/06	.
						DWG. NO.
						TM85760
						REV.
						—

BILL OF MATERIAL

ITEM	QTY	DESCRIPTION	FMI P/#	MATERIAL
1	1	STATIONARY SEAL GLAND	TM8549C	17-4 PH S.S.
2	1	ROTARY SEAL GLAND	TM8594C	17-4 PH S.S.
3	1	BALL BEARING	BB245616	ALLOY STEEL
4	1	LIP SEAL	SO293906	BUNA
5	1	MECHANICAL SEAL	MS284415T	TUNGSTEN CARBIDE
6	-	-	-	-
7	1	O-RING	OR2129B	BUNA
8	1	O-RING	OR2236B	BUNA
9	3	SCREW, SOHCS, 5/16-18 x 1"	SC051816S	18-8 SS
10	3	LOCKWASHER HI-COLLAR 5/16	LWH05S	18-8 SS
11	2	SET SCREW 8-32 x 1/8	SS083202	1018 C.S.
12	1	SPACER, ROTARY GLAND	TM85484	1018 C.S.



NOTE:

REMOVE SET SCREW AFTER ASSEMBLY INTO MACHINE!

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LIVINGSTON, NEW JERSEY.

V	VITON		
-	BUNA		
LTR P/N	MATERIAL	WEIGHT#	SCALE DWN DATE CKD DATE DWG. NO. REV.
		.75	MSS 08/28/06 . . TM85990 4

FRANKLIN MILLER INC.
60 OKNER PARKWAY, LIVINGSTON, N.J. 07039

TM8500 EXPANSION CARTRIDGE ASSEMBLY, T/C, SS

Motor Data

DATE
JULY 15, 2004
CATALOG NO.
NVO034C

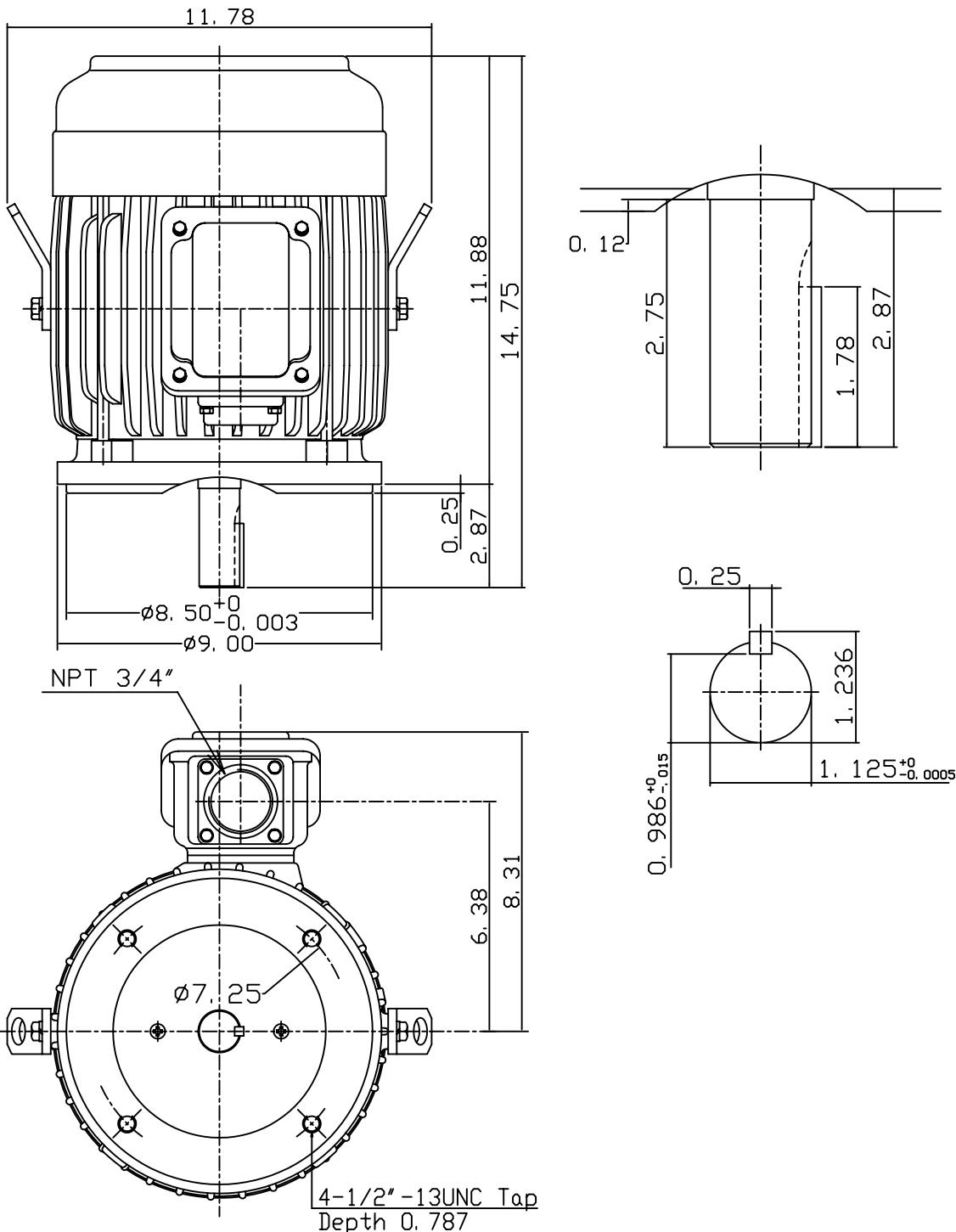
OUTLINE DIMENSIONS
3-PHASE INDUCTION MOTOR

MOTOR TYPE:
AEVANE
FRAME NO. 182TC

Pole	HP	KW	Hz	VOLT	Syn. Speed RPM
4	3	2.2	60	230/460	1800

Ins	Rating	Dimension in	Approx Weight	Bearings
F	CONT.	INCHES	60	DE: 6306ZZ NDE: 6306ZZ

Totally Enclosed Fan-Cooled Vertical Type. Squirrel-Cage Rotor.



DWN.	Y. C. LAI	02-10-99
CHKD.	C. S. LO	02-11-99
APPD.	Y. B. HUANG	02-11-99

TECO **Westinghouse**

DWG NO.
31049U569011



ISSUED
September 26, 2005
TYPE
AEVANE

PERFORMANCE DATA 3-PHASE INDUCTION MOTOR

ENCLOSURE
TEFC
CATALOG#
NV0034C

NAMEPLATE INFORMATION

OUTPUT		POLE	FRAME SIZE	VOLTAGE	HZ	RATED AMBIENT	INS. CLASS	NEMA DESIGN	TIME RATING	SERVICE FACTOR
HP	KW									
3	2.2	4	182TC	230/460	60	40°C	F	B	CONT.	1.15

TYPICAL PERFORMANCE

FULL LOAD RPM	EFFICIENCY			POWER FACTOR			MAXIMUM POWER FACTOR CORRECTION	
	FULL LOAD		3/4 LOAD	1/2 LOAD	F. L.	3/4 LOAD	1/2 LOAD	
	MIN. %	NOM. %	%	%	%	%	%	
1760	85.5	87.5	88.5	87.5	82.5	76.5	65	1 KVAR

CURRENTS

NO LOAD			FULL LOAD			LOCKED ROTOR			NEMA KVA CODE LETTER
AT 208 VOLT	AT 230 VOLT	AT 460 VOLT	AT 208 VOLT	AT 230 VOLT	AT 460 VOLT	AT 208 VOLT	AT 230 VOLT	AT 460 VOLT	
4.03	3.64	1.82	8.60	7.78	3.89	70.77	64.00	32.00	K

TORQUE

FULL LOAD lb-ft	LOCKED ROTOR %FLT	PULL UP %FLT	BREAK DOWN %FLT	ROTOR WR ² lb-ft ²	NEMA LOAD WK ² lb-ft ²	INERTIA		ACCEL TIME	
						MAX ALLOWABLE WK ² lb-ft ²	NEMA LOAD WK ² Sec	MAX ALLOWABLE WK ² Sec	
8.949	220	160	350	0.349	17	63	4.18	15.26	

SOUND
PRESSURE
LEVEL @ 3 FT
dB(A)

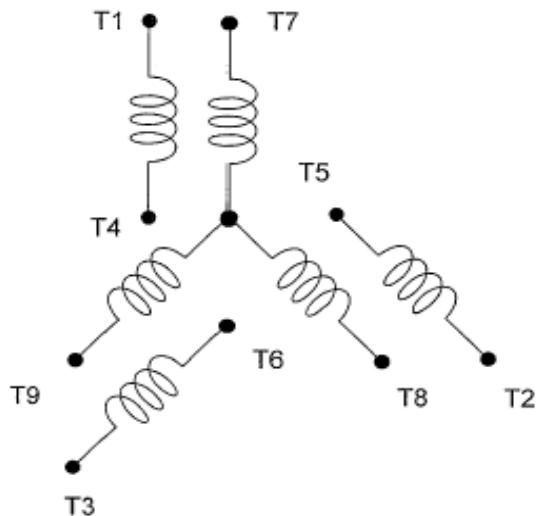
59

APPROVED:	M. PRATER	DRAWING NO.	31057NV0034C	REVISION 0
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DATE:
June 27, 2005

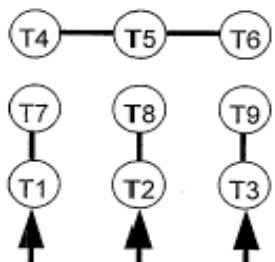
CONNECTION DIAGRAM

CATALOG NO.:
NV0034C

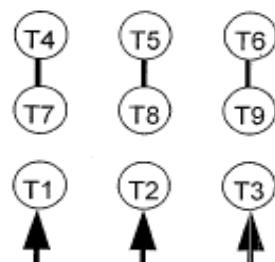


SCHEMATIC - 2Y/Y CONNECTION

ACROSS THE LINE CONNECTION



LINE
230 VOLT CONNECTION



LINE
460 VOLT CONNECTION

TECO  **Westinghouse**

DWG NO.
DAC-1566-2

Reducer Data

Cyclo® 6000 Speed Reducers



Superior design, powerful performance

- Cyclo® 6000 boasts an expanded range of standard sizes and ratings. Use this chart to select a new Cyclo® 6000 when replacing Cyclo® series 3000 and 4000 models.

CYCLO® Frame Size Cross Reference

OLD 3000	4000	NEW 6000
3075	4075	6060
3085	4085	6065
		6070
		6075
		6080
		6085
3090	4090	6090
3095	4095	6095
3097	4097	6095
3100	4100	6100
3105	4105	6105
310H	410H	610H
		6110
		6115
3110	4110	6120
3115	4115	6125
311H	4125	612H
3140	4130	6130
3145	4135	6135
		6140
3155	4145	6145
315H	415H	614H
3160	4165	6165
3165	416H	616H
316H	4170	6170
3170	4175	6175
3175	4180	6180
3180	4170	6170
3185	4185	6185
3190	4190	6190
3195	4195	6195
3205	4205	6205
3215	4215	6215
3225	4225	6225
3235	4235	6235
3245	4245	6245
3255	4255	6255
3265	4265	6265
3275	4275	6275



- The Cyclo® 6000 is also available as an inline Gearmotor

To request a catalog, or for more information on any of our high quality products, please visit our Website:



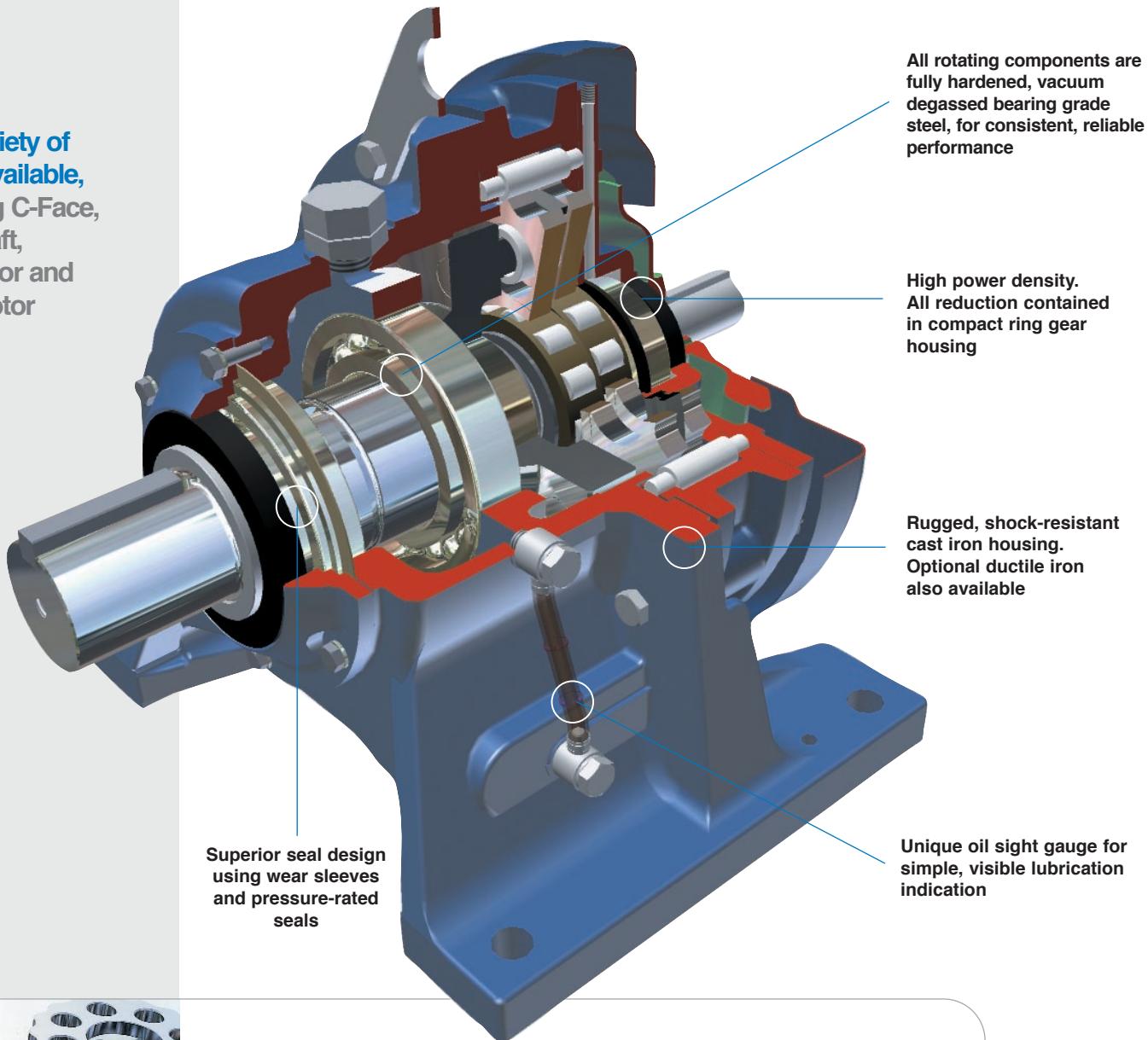
www.smcylo.com



Cyclo® 6000

High Torque Density, High Reliability Cycloidal Speed Reducers

- Wide variety of inputs available, including C-Face, Free-Shaft, Gearmotor and Brakemotor



Unmatched Reliability, Exceptional Performance

- Cyclo® speed reducers and gearmotors are designed to withstand shock loads exceeding 500% of their ratings



► Sumitomo's Cyclo® 6000 is extremely torque dense and is available as an inline speed reducer or gearmotor

Product Description

The Sumitomo Cyclo® drive is **unsurpassed by any other inline drive** available in the market today. Cyclo®'s unique **epicyclic-dial design** has advantages superior to speed reducers using common involute tooth gears. Cyclo® components operate in compression, not in shear. Unlike gear teeth with limited contact points, a Cyclo® has two thirds of its reduction components in contact at all times. Cyclo® speed reducers and gearmotors are **designed to withstand shock loads exceeding 500%** of their ratings, and provide exceptional performance, reliability and long life in the most severe applications.

Features & Benefits

- **Highest overload capacity**, exceeding 500%
- **Exceptional life** with a 24 month warranty
- **High efficiency**, even at high reduction ratios
- **Remarkably versatile**, and available as inline speed reducer or gearmotor
- Ideal for **severe, high shock** applications
- Optional grease lubrication for **no maintenance**

Specifications

Sizes:	23 models (5 lbs to 5000 lbs)
Torque Rating:	210 to 603,000 lb in
HP Rating:	.10 to 232 HP
Ratio Range:	3 to 119 (single), 121 to 7569 (double), 8041 to 658,503 (triple)
Mounting:	Foot, Flange, Face Mount
Motor Standards:	NEMA, IEC, JIS, UL, CSA, CE



- **Simple, Compact Design**
- **Rugged Forged Output Shaft**
- **Many Mounting Styles**
- **C-Face, Shovel Base & Top Mount Options**



► Applications

- Conveyors
- Food Machinery
- Mixers
- Automotive Plants
- Recycling Machines
- Poultry Plants
- Sawmills and Wood Mills
- Wastewater Treatment
- Steel Mills
- Construction Equipment
- Paper Mills
- Processing Plants

FAQs

How do I select a Cyclo speed reducer or gearmotor?

Selection is based on the actual horsepower and/or torque requirements at the output shaft. The Cyclo speed reducer has particularly high efficiencies over a wide range of reduction ratios, which frequently permits the use of reduced input power requirements (smaller HP motor) without sacrificing output shaft torque. The selection procedures in this catalog will guide you in choosing the most efficient reducer for your application.

What information do I need to get started in the selection process?

To select the proper reducer for your application, you will need to know:

- Application: type of driven machine
- Hours of operation per day
- Motor horsepower (HP) and speed (RPM)
- Mounting position

If there are any special environmental factors or operation requirements, they must also be noted. This information will be important in determining the Service Factor of your application.

What are Service Factors and how are they used?

In general, reducers and gearmotors are rated for the specific conditions and operating requirements of the application by the use of AGMA-defined Service Factors. There are three AGMA load classifications for reducers: uniform (U), moderate shock (M) and heavy shock (H) (page 2.3) The Service Factors are used in the product selection process to adjust for the specific conditions and operating requirements of your application.

What do I do if my application has particularly severe operating conditions?

The standard ratings for Cyclo are based on 10-hour daily service under conditions of uniform loads (equivalent to AGMA service factor 1.0). By following the product selection process, you will determine and apply the Service Factors to compensate for the severe operating conditions.

How can I be sure that the reducer can withstand periodic excessive overloads?

Cyclo Speed Reducers provide 500% momentary intermittent shock load capacity. For applications with shock loads greater than 500%, consult an SMA Application Engineer.

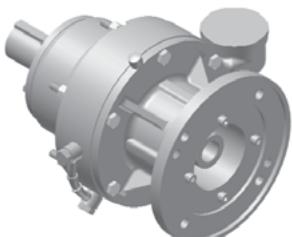
What are the standard input speeds?

In general terms, the speeds are 1750 and 1165 RPM. The selection tables in this catalog are based on 1750, 1165, 870, 580, and 50 RPM. When non-standard input speeds are used, the horsepower and torque ratings also vary.

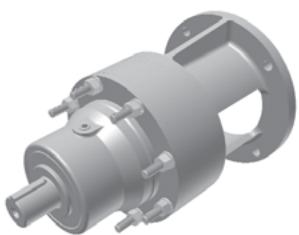
What thermal capacity limitations does the Cyclo have?

The Cyclo speed reducer, by virtue of its smooth, almost frictionless operation (unlike traditional helical gears), has a thermal rating that far exceeds its mechanical capacity and all but eliminates the conventional limitations due to heat.

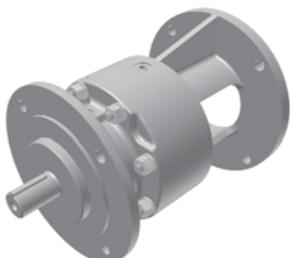
Common Configurations



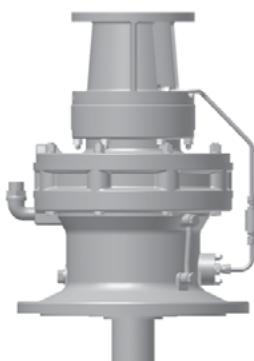
Single Reduction,
Horizontal Flange Mount
with Hollow Shaft Input



Single Reduction, Flange Mount
with C-Face Adapter



Single Reduction, V-Flange Mount
with C-Face Adapter



Double Reduction with
C-Face Adapter

Standard Specifications

Reducer	Reduction:	Internal planetary gear mechanism with trochoidal curved tooth profile.
	Lubrication:	Grease or oil lubricated models available.
	Seals:	Nitrile material, dual lipped, double output seals available.
	Material:	Rugged cast iron or ductile housings.
	Paint Color:	Blue, Muenter's color number 6.5PB 3.6/8.2

Ambient Conditions	Installation Location:	Indoors or Outdoors
	Ambient Temperature:	14°~104° F (-10° ~ 40° C)
	Ambient Humidity:	Under 85%
	Elevation:	Under 3,281 ft. (1000 meters)
	Atmosphere:	Well ventilated location, free of corrosive gases, explosive gases, vapors and dust.

Shaft Rotation

On single reduction Cyclo® speed reducers, ratios 3 through 119, the slow speed shaft rotates in a reverse direction to that of the high speed shaft.

On double reduction units, ratios 104 through 7569, both the high speed and the slow speed shaft rotate in the same direction.

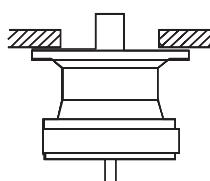
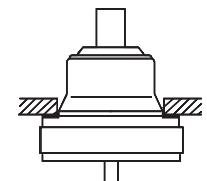
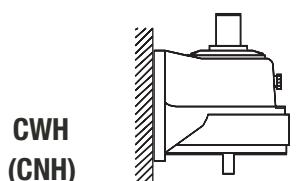
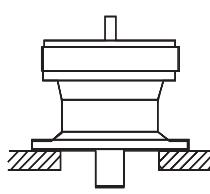
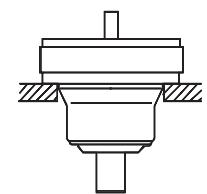
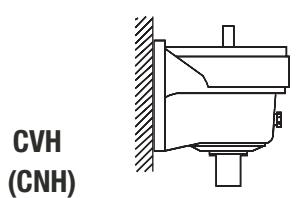
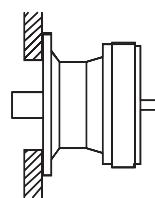
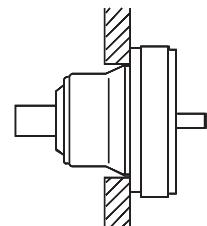
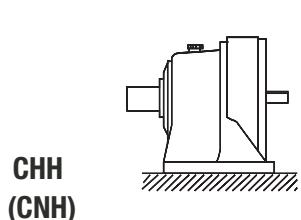
Input Speeds

In general terms, the standard input speeds of single reduction units are 1750, 1165, 875, 580, and 50 RPM. When non-standard input speeds are used, the horsepower and torque ratings will also vary.

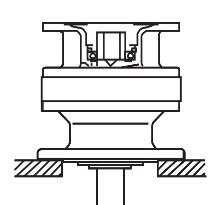
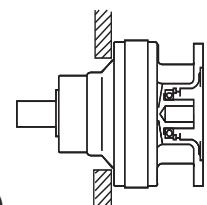
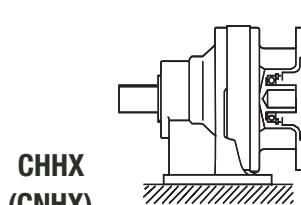
Thermal Capacity

The Cyclo® speed reducer's smooth, almost frictionless operation all but eliminates the conventional limitations due to heat. In all sizes, Cyclo® speed reducers have thermal ratings that exceed their mechanical capacity.

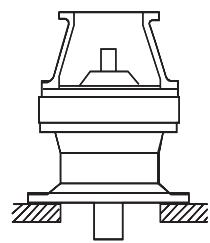
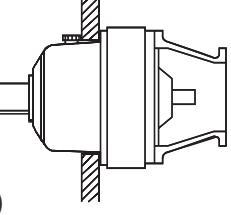
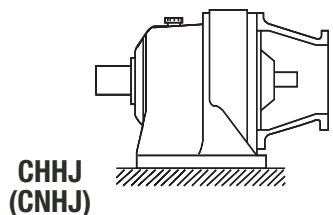
Housing Styles & Mounting Positions



Input Side Hollow Shaft



With Adaptor

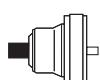


Mounting
Positions

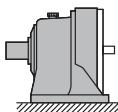
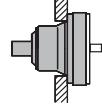
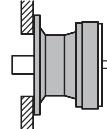
Configure a Model Number

Output Shaft Orientation

Type	Prefix
Horizontal	H
Vertical	V
Vertical Up (Solid Shaft)	W
Universal Direction	N

**H****V****W****Housing Style**

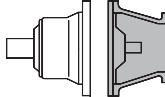
Type	Prefix
Foot	H
Flange	F
V-Flange	V

**H**
Foot**F**
Flange**V**
V Flange**Input Connection**

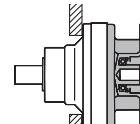
Input Connection	Prefix
None	-
C-Face Adaptor	J
Hollow Input Shaft	X

No Symbol

Reducers



With Adapter



Hollow Shaft

Modification (Special)

	Prefix
Special	S
Standard	-

Frame Size (from Selection Tables)**Shaft Specifications**

Input Shaft	Suffix
Inch	Y
DIN	G
Metric DIN	-

C H H - 6 1 1 5

Frame size

Y**29**

Shaft specification

Mounting style
Input connection
Output shaft orientation

Modification (Special feature)

Input connection

Output shaft orientation

Ratio

Cyclo Speed Reducer product code (always "C")

Nomenclature

Example

CNV – 6125Y – 29

C – Cyclo 6000
N – Universal
V – V-Flange

6125 – Frame Sizen
Y – Inch Shaft
29 – Ratio

Nomenclature

Ratio

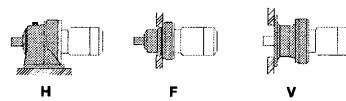
Ratio is found here in Selection Tables

Nominal
Total Ratio

Output RPM	540	360	210	219	108	135	117	100	83.3	71	FRAME SIZE
Ratio	3	5	6	8	11	13	15	17	21	21	
Input HP	20.2	20.2	20.3	20.3	20.3	20.3	20.3	20.3	18.1	18.1	
Output Torque in-lbs	2081	1469	4179	5868	7656	9338	10000	10371	10500	10500	614S
Overhung Load (lb)	1164	1843	1965	2170	2430	2470	2500	2710	2880	2880	614M
Input HP	27.2	27.2	27.2	26.4	26.4	26.4	25.1	22.6	17.3	17.3	
Output Torque in-lbs	2798	4814	5880	7230	9909	11808	12900	16290	12400	12400	616S
Overhung Load (lb)	1702	2018	2158	2400	2980	2850	3000	3150	3250	3250	
Input HP	32.3	32.3	32.3	32.3	32.3	32.3	32.3	32.3	25.2	21.6	
Output Torque in-lbs	3322	5530	6810	8868	12290	13608	15000	14700	15500	15500	616S
Overhung Load (lb)	1486	1986	2130	2365	2470	2790	2956	3065	3210	3210	616M
Input HP	37.8	37.8	37.8	37.8	37.8	36.8	34.2	28.4	26.2	21.6	
Output Torque in-lbs	3798	6335	7650	10100	13960	16308	17500	15300	18700	18700	617S
Overhung Load (lb)	1906	2281	2400	2950	3046	3150	3290	3460	3750	3750	
Input HP	40.4	40.4	40.4	40.4	40.4	40.4	40.4	32.3	22.3	22.3	
Output Torque in-lbs	4141	6914	8290	11000	15200	18000	20700	18700	23200	23200	617S
Overhung Load (lb)	1906	2381	2400	2620	3020	3130	3290	3440	3880	3880	
Input HP	-	-	-	-	47.2	47.2	43.5	41.1	40.2	40.2	
Output Torque in-lbs	-	-	-	-	17800	21000	23200	23800	28900	28900	618S
Overhung Load (lb)	-	-	-	-	4000	4210	4420	4670	5030	5030	
Input HP	-	-	-	-	52.3	52.3	52.3	52.3	52.3	52.3	

1750 RPM Frame Size Selection Tables

Dimensions:		Pages
Foot Mount (H)		4.2–4.15
F-Flange (F)		4.30–4.38
V-Flange (V)		4.48–4.64

Single Reduction, Ratios 25-119
H, F, V Housing Styles

Output RPM Ratio	70.0	60.3	50.0	40.7	34.3	29.7	24.6	20.1	14.7	FRAME SIZE
25		29		35	43	51	59	71	87	119
Input HP	0.15	0.15	0.15	0.12	-	-	-	-	-	
Output Torque (in•lbs)	127	146	177	178	-	-	-	-	-	
Overhung Load (lbs)	265	265	265	265	-	-	-	-	-	6060
Input HP	0.22	0.22	0.19	0.15	-	-	-	-	-	
Output Torque in•lbs	190	220	230	223	-	-	-	-	-	
Overhung Load (lbs)	265	265	265	265	-	-	-	-	-	6065
Input HP	0.31	0.30	0.28	0.23	0.13	0.13	-	-	-	
Output Torque in•lbs	264	301	339	334	233	271	-	-	-	
Overhung Load (lbs)	397	397	397	397	397	397	-	-	-	6070
Input HP	0.40	0.38	0.37	0.30	0.19	0.18	-	-	-	
Output Torque in•lbs	337	380	448	446	335	367	-	-	-	
Overhung Load (lbs)	397	397	397	397	397	397	-	-	-	6075
Input HP	0.46	0.46	0.44	0.34	0.26	0.25	0.16	0.12	-	
Output Torque in•lbs	391	452	527	493	450	500	391	359	-	
Overhung Load (lbs)	569	575	575	575	575	575	575	575	-	6080
Input HP	0.64	0.63	0.49	0.40	0.32	0.31	0.25	0.16	-	
Output Torque in•lbs	544	621	595	580	563	632	609	484	-	
Overhung Load (lbs)	562	573	575	575	575	575	571	575	-	6085
Input HP	0.90	0.84	0.82	0.58	0.45	0.42	0.34	0.28	0.17	
Output Torque in•lbs	769	832	981	858	776	836	819	843	682	
Overhung Load (lbs)	750	750	750	750	750	750	750	750	750	6090
Input HP	1.16	1.05	1.02	0.81	0.57	0.50	0.40	0.40	0.20	
Output Torque in•lbs	990	1040	1220	1190	990	1010	981	1210	823	
Overhung Load (lbs)	750	750	745	750	750	750	750	750	750	6095
Input HP	1.70	1.62	1.31	1.05	0.75	0.69	0.59	0.58	0.28	
Output Torque in•lbs	1460	1610	1560	1540	1310	1400	1410	1730	1150	
Overhung Load (lbs)	1210	1210	1210	1210	1210	1210	1210	1210	1210	6100
Input HP	2.24	2.13	1.61	1.45	1.04	0.95	0.75	0.76	0.38	
Output Torque in•lbs	1920	2120	1920	2140	1810	1920	1830	2260	1560	
Overhung Load (lbs)	1210	1210	1210	1210	1210	1210	1210	1210	1210	6105
Input HP	2.56	2.55	2.01	1.74	1.27	1.15	0.90	0.89	-	
Output Torque in•lbs	2200	2530	2410	2570	2200	2330	2180	2640	-	
Overhung Load (lbs)	1500	1540	1650	1710	1710	1710	1710	1710	-	6110
Input HP	2.98	2.98	2.43	2.04	1.49	1.36	1.02	1.02	-	
Output Torque in•lbs	2550	2950	2900	2990	2600	2730	2470	3030	-	
Overhung Load (lbs)	1490	1530	1640	1710	1710	1710	1710	1710	-	6115
Input HP	4.15	4.01	3.34	2.56	2.31	1.74	1.28	1.27	-	
Output Torque in•lbs	3540	3980	4010	3780	4020	3530	3120	3770	-	
Overhung Load (lbs)	1790	1860	1980	2120	2200	2200	2200	2200	-	6120
Input HP	5.32	5.06	4.27	3.19	3.06	2.17	1.61	1.52	-	
Output Torque in•lbs	4540	5010	5100	4700	5330	4380	3910	4510	-	
Overhung Load (lbs)	1770	1840	1950	2100	2190	2200	2200	2200	-	6125
Input HP	6.93	6.01	4.98	4.01	3.41	2.94	2.46	1.91	-	
Output Torque in•lbs	5920	5960	5950	5910	5950	5920	5960	5660	-	
Overhung Load (lbs)	2050	2160	2290	2470	2580	2710	2890	3130	-	6130
Input HP	7.99	7.57	5.70	5.06	3.93	3.38	2.91	2.56	-	
Output Torque in•lbs	6820	7500	6820	7430	6860	6830	7070	7620	-	
Overhung Load (lbs)	2030	2130	2270	2430	2560	2690	2870	3110	-	6135
Input HP	9.25	7.99	6.99	5.29	4.60	3.97	3.26	2.66	-	
Output Torque in•lbs	7900	7920	8360	7780	8020	8010	7920	7900	-	
Overhung Load (lbs)	3090	3150	3400	3550	3590	3590	3590	3590	-	6140

Speed Reducers
Selection Tables

Electrical Controls

Franklin Miller, Inc. S25060 Standard Controller

Specification number: S25060-STRD-SPEC.04

Controller: The controller shall completely sequence the operation of the equipment covered by the job specification.

Enclosure type: The enclosure rating and material shall be as indicated on the drawings. A provision shall be made within the enclosure for connection of a grounding cable.

The controller shall contain the following features:

1. Disconnect: A disconnect means must be provided adjacent to the controller (by others). Terminal blocks only shall be provided for the primary feeder cables entering the controller enclosure.

For an alternative, see Option H3 on page 6.

2. Motor starter: A reversing starter shall be provided for the motor indicated in the job specifications. The size of the starter shall be based on IEC requirements for the motor horsepower.

A motor overload relay shall be furnished as part of the starting equipment. Tripping of the relay shall stop the motor and flash the trip light. Resetting the relay shall allow the motor to restart.

Output terminals shall be provided for connection of the motor leads exiting the enclosure.

3. Control circuit: The following provisions apply.

Voltage: Nominally 120V with other levels determined by the requirements of the PLC and other control items supplied as part of the controller.

If DC voltage is required, an adequately sized source of DC power must be provided within the controller.

Transformer: Ungrounded primary and secondary side leads shall be fuse protected. The control transformer shall be sized to carry the control-circuit load plus a minimum of 20% spare capacity for future load growth.

PLC: A vendor standard programmable logic controller shall be provided within the controller.

4. Operation: A three-position "HAND-OFF/RESET-AUTO" selector switch shall be provided in the front cover. Its function is as follows:

Hand: When in this position, the motor starter is energized and the motor runs under the control of the PLC as described in "Operation."

Off-Reset: When in this position, the motor shall be prevented from starting in both the forward and reverse direction; the signal from the remote-start dry contact shall be disabled; and if established, the Alarm Condition circuitry is reset.

Auto: In this position, when a remote Run signal is received, the motor shall cycle under the control of the PLC. The cycle shall be terminated if the run signal is interrupted, or the selector switch is placed in the Off/Reset position, or if the equipment experiences an Alarm Condition shutdown.

5. Indicators: The following LED indicators shall be provided. (Also see Option H1 on page 6.)

A white "POWER ON" indicating light shall be illuminated when power is available in the control circuit.

A green "RUN" indicating light shall be illuminated when the selector switch is in the Hand or Auto position with the equipment motor running in the forward or reverse direction; and during motor reversal pauses.

A red "TRIP" indicating light shall be illuminated steadily when the selector switch is in the Hand or Auto position and the equipment has experienced an Alarm Condition stoppage.

The red "TRIP" indicating light shall flash when the motor overload relay trips.

The red "TRIP" indicating light shall "double flash" when the motor winding temperature causes the embedded thermostats to open (standard feature for explosion-proof motor).

6. Remote I/Os: The following inputs and outputs shall be supplied.

Wiring shall be complete from the PLC to terminal blocks.

Run Status: A normally open dry-contact output shall close when the equipment motor is running (and during motor reversal pauses). It shall open when the equipment is stopped, trips on an Alarm Condition, or power to the controller is disconnected.

Trip Status: A normally open dry-contact output shall close when the equipment experiences an Alarm Condition stoppage. It shall open when the Alarm Condition lockout circuit has been reset.

The contact shall also close and remain closed (no pulsing) when the motor overload relay trips. It shall open when the relay is reset.

Remote E-stop: Provision shall be made for a maintained-contact pushbutton (by others) that shall disconnect control voltage within the enclosure. These terminals shall be jumped (to be removed if an E-stop is installed).

Remote Start: Provision shall be made to accept a remote contact closure input (by others) that starts the cycle when the selector switch is in the Auto position.

7. Components: The following items shall be included as part of the controls of the subject equipment.

(Also see Option H2 on page 6).

Current Sensor: One phase shall be monitored for a high current condition with a current sensor and current relay. If the phase current reaches an adjustable set point (factory set at approximately 80% of locked-rotor current), the motor starter shall be de-energized and after a two-second delay (adjustable), an "Auto-Clear" sequence as described below shall be initiated.

Only during initial starting, the current sensor C/S signal to the PLC shall be blocked by a time-delay relay (adjustable) during the motor inrush current period.

8. Operation: The mode of operation may be either S250 (reversing grinder that will normally operate in either direction), or S260 (momentary reversing grinder that will normally operate in only one direction). The mode, as well as timer settings and reversals, shall be accessible to allow change to meet field conditions.

S250 When the selector switch is turned to the Hand or Auto position (only after receiving a remote Run signal if in Auto), the equipment shall start and run in the direction opposite from the direction it was running when it was last stopped.

If the equipment runs for more than two hours without experiencing an Alarm Condition, the motor starter shall be de-energized. After a two second delay (adjustable) to allow the equipment to coast to a stop, the grinder shall run in the opposite direction.

The automatic reversals shall continue until the cycle is stopped by interrupting the remote-run signal, or by moving the selector switch to the Off/Reset position, or if a Jam occurs. This periodic rotation direction change aids in cleaning the equipment.

Auto Clear Cycle: If the phase current reaches an adjustable set point (factory set) at any time within the 2-hr cycle, the motor starter shall be de-energized. After a two second delay (adjustable), the equipment shall automatically restart in the opposite direction of rotation in an attempt to clear the Jam.

This auto-clear cycle shall be repeated a total of four times (adjustable).

If at any time the equipment runs for more than 30 seconds in the forward direction during the four attempts, the reversal counter shall be reset.

Alarm Condition: If after four tries, however, the Jam condition still exists, the forward starter shall be de-energized, and after a 2-sec delay, the reverse starter coil shall be energized for 1-sec then be de-energized. An Alarm Condition lockout circuit shall be established and remain in the alarm state (even if power is lost) until it is reset.

The lockout circuit shall disable the automatic cycle, cause the Trip pilot light to be illuminated, the Trip Status contact to close, the Running pilot light to be extinguished, and the Run Status contact to open. Once the obstruction has been cleared, the Alarm Condition lockout circuit can be reset by moving the selector switch to the Off/Reset position.

S260

Placing the selector switch in the Hand or (when a remote run signal is received, if in the Auto position), shall energize the "reverse" motor starter and the equipment rotates in that direction for two seconds (adjustable) before the reverse starter coil is de-energized. After a delay of two seconds (adjustable) to allow the equipment to coast to a stop, the equipment shall run continuously in the "forward" direction of rotation. It shall continue to run in this direction until the motor starter is de-energized by interrupting the remote-run signal, or by turning the selector switch to the 'Off' position, or if the equipment experiences an Jam condition.

Auto Clear Cycle: If the phase current reaches an adjustable set point (factory set) while running, the motor starter shall be de-energized. After a delay of two seconds to allow the equipment to coast to a stop, the sequence described above for a normal S260 starting cycle shall be initiated in an attempt to clear the Jam condition.

This automatic auto-clear cycle shall repeat a total of four times.

If at any time the equipment runs for more than 30 seconds continuously in the forward direction during the four attempts, the reversal counter shall be reset.

Alarm Condition: If after four tries, however, the Jam condition still exists, the forward starter coil shall be de-energized, and after a 2-sec delay, the reverse starter coil shall be energized for 1-sec then be de-energized. An Alarm Condition lockout circuit shall then be established and remain in the alarm state (even if power is lost) until it is reset.

The lockout circuit shall disable the automatic cycle, cause the Trip pilot light to be illuminated, the Trip Status contact to close, the Running pilot light to be extinguished, and the Run Status contact to open.

Once the obstruction has been cleared, the Alarm Condition lockout circuit can be reset by moving the selector switch to the Off/Reset position.

NOTE: Before manually clearing an obstruction, the disconnect switch ahead of the controller must be opened and locked out.

9. Options: The following items are extras and shall only be included as part of this specification if called for in an addendum or unit specification sheet.

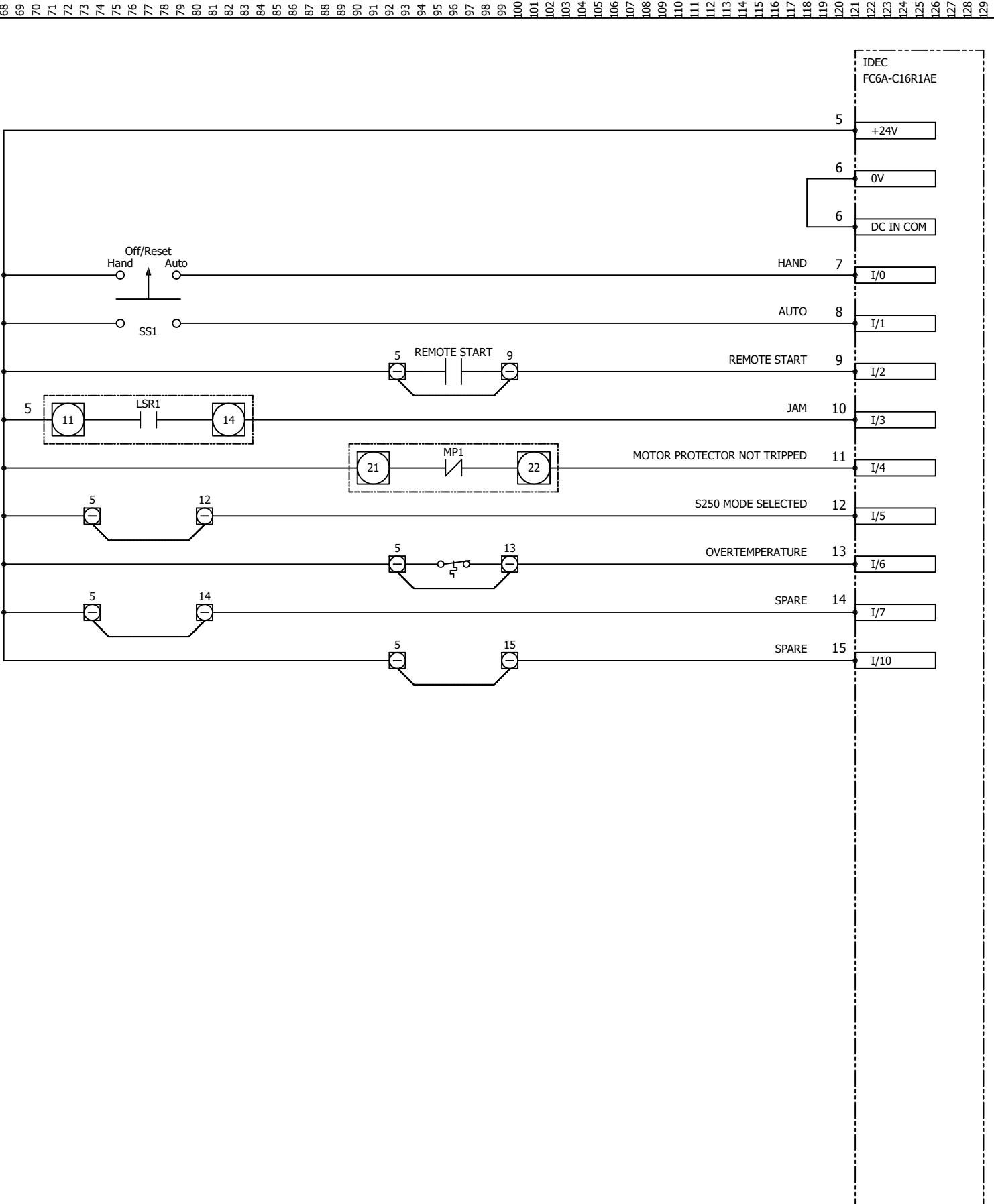
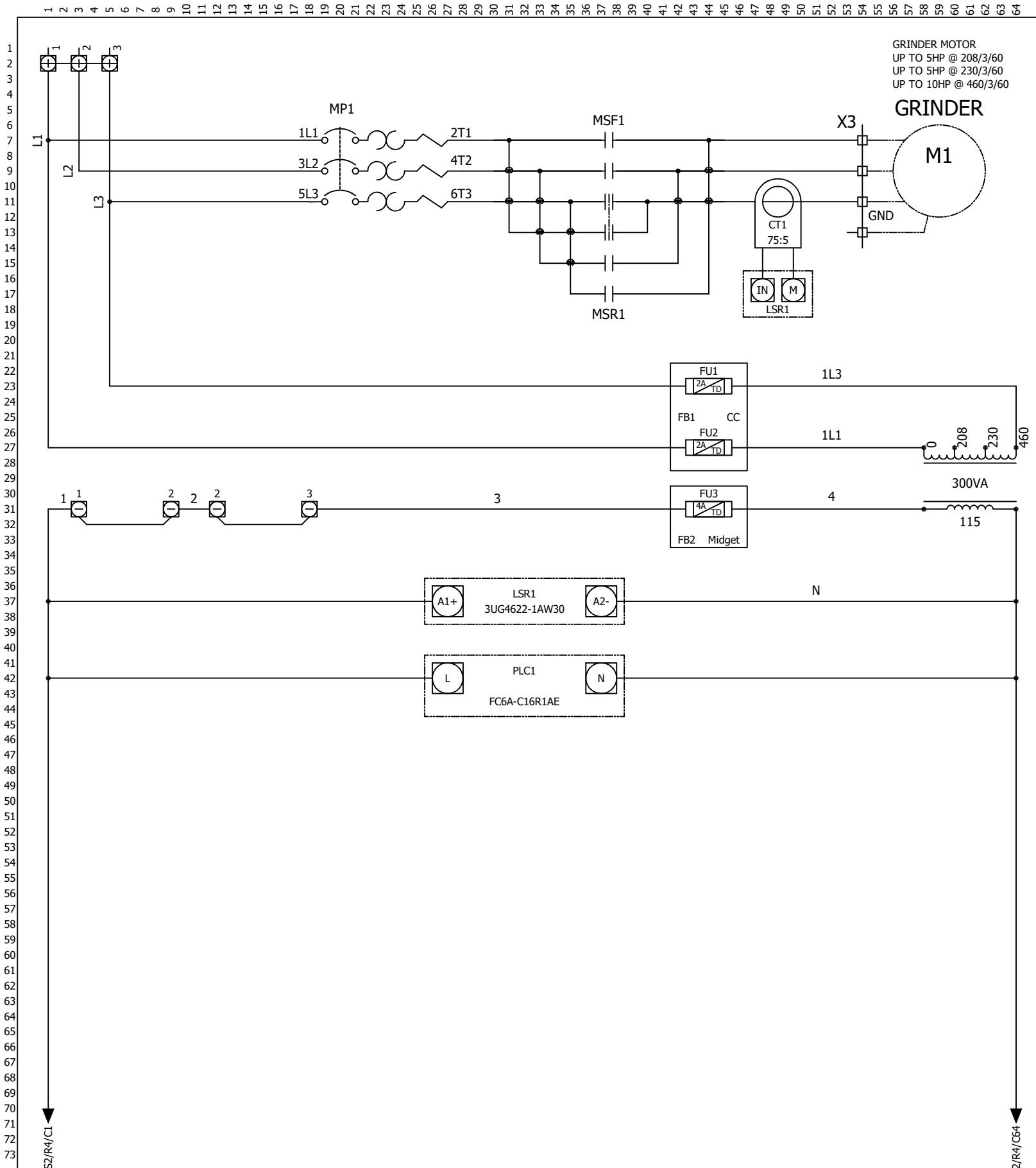
Power Monitor (H2): A power monitor shall be connected to the power supply. It continuously monitors the three-phases for low voltage, phase loss, phase reversal, and voltage unbalance. If any of these conditions occur, the grinder shall stop and the "power on" light shall flash. When the condition returns to normal, the grinder shall run.

Disconnect (H3): Controller supplied with a disconnect switch installed within the enclosure, supplied with an external operating handle and lockout means.

Zero Speed Switch (ZSS): The speed is monitored with a proximity sensor, counter control relay with two set points, and a target. If the shaft speed reaches the set point (normally 80% of normal running speed) the grinder motor will be de-energized.

An adjustable timer will start after a second set point (normally set to 2 RPM) is reached. The grinder will automatically restart after this delay has timed out.

This automatic starting sequence will repeat a total of four times. If a low shaft speed is detected after four starts, the grinder will stop and go into an alarm condition. If at any time the grinder runs for more than an adjustable number of seconds without experiencing a low speed condition, the restart counter is reset. The controller will remain in an alarm condition until reset.



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120V NEUTRAL	16 AWG	WHITE	EXT. POWER	16 AWG	YELLOW	
24 VAC	16 AWG	ORANGE	SHIELDED	18 AWG	MULTI	

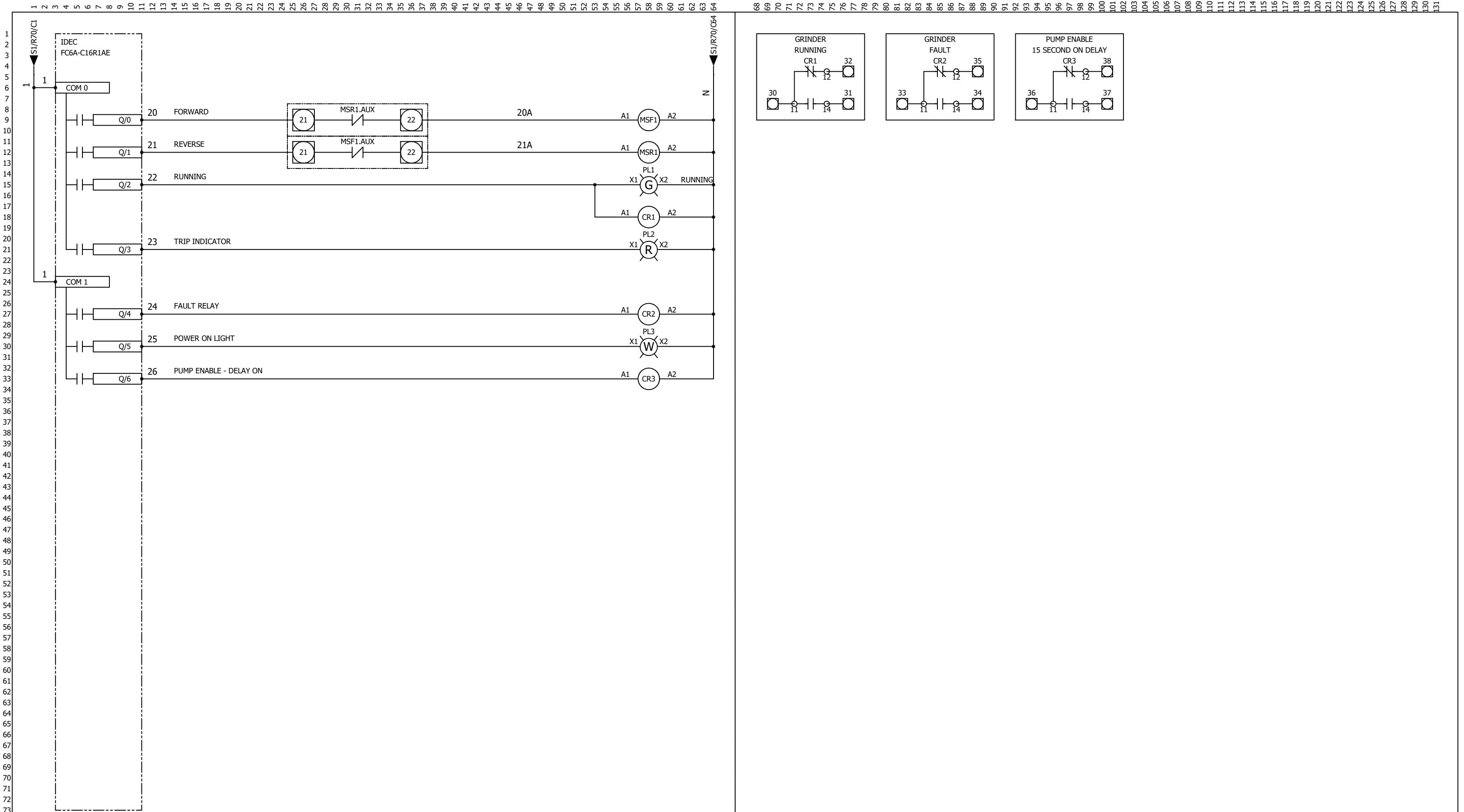
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120V NEUTRAL	16 AWG	WHITE	EXT. POWER	16 AWG	YELLOW
24 VAC	16 AWG	ORANGE	SHIELDED	18 AWG	MULTI
LOW VAC	16 AWG	BROWN	GROUND	16 AWG	GREEN

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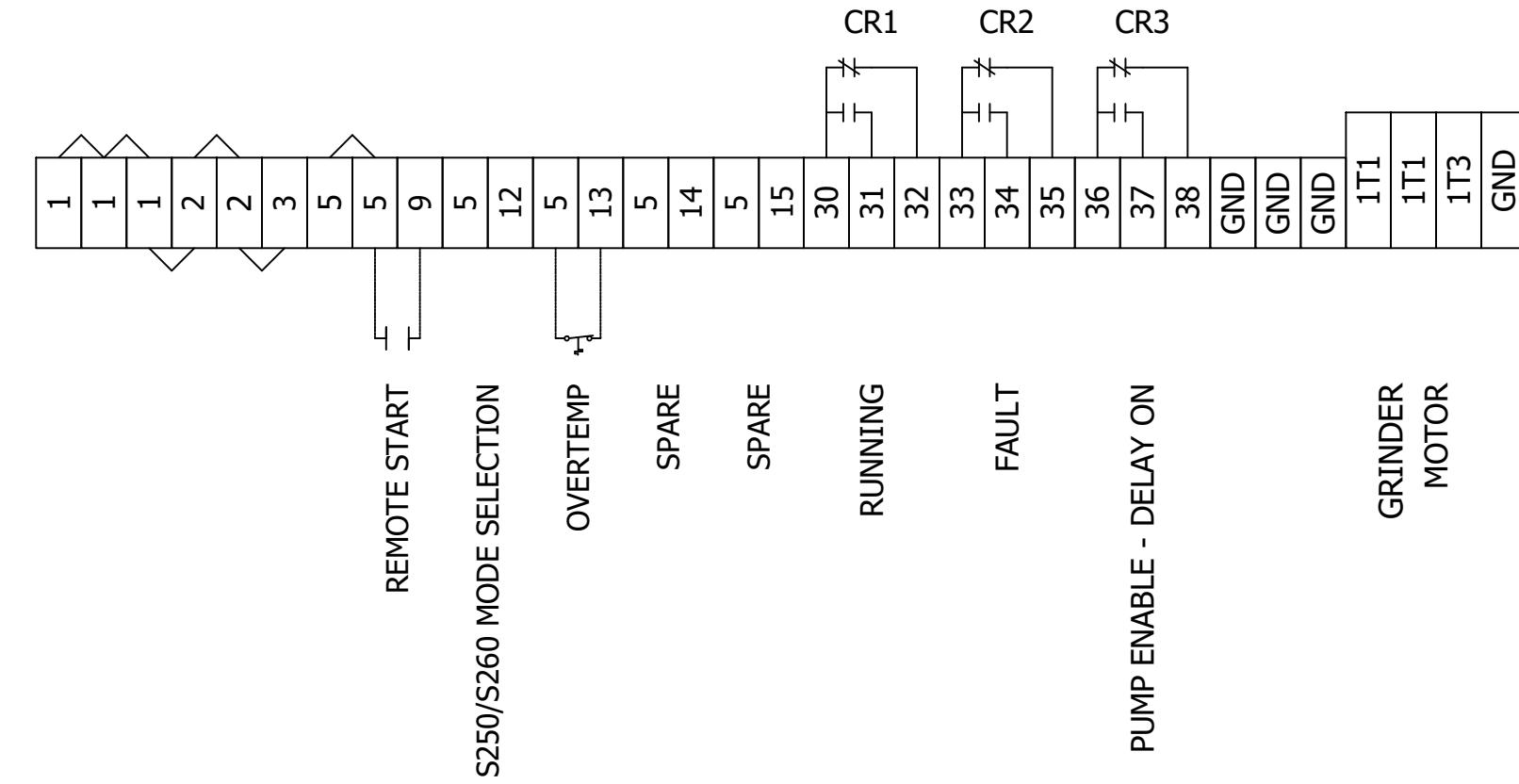
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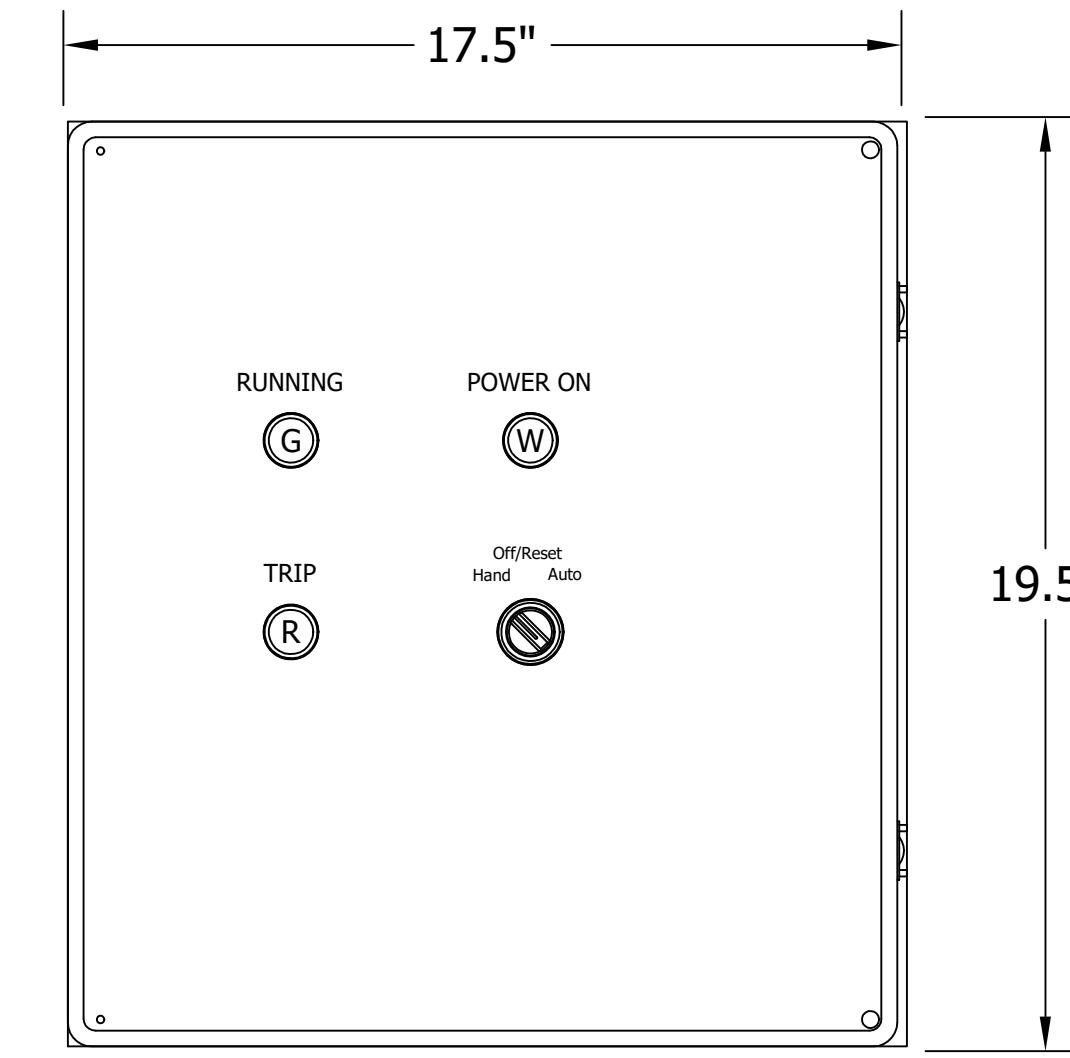
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LOW VAC	16 AWG	BROWN	GROUND	16 AWG	GREEN	
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