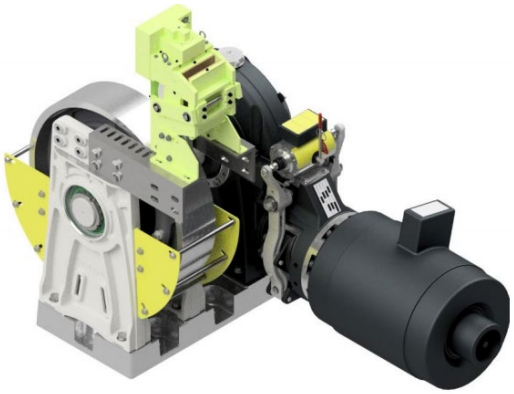
Hollister-Whitney

A VANTAGE Company

Bulletin #1187S
GT-Series Geared Traction Machine Manual Supplement

REV A; 12/11/2024

Bulletin #1187S
GT-Series Geared Traction Machine
Manual Supplement



#1Hollister-Whitney Parkway

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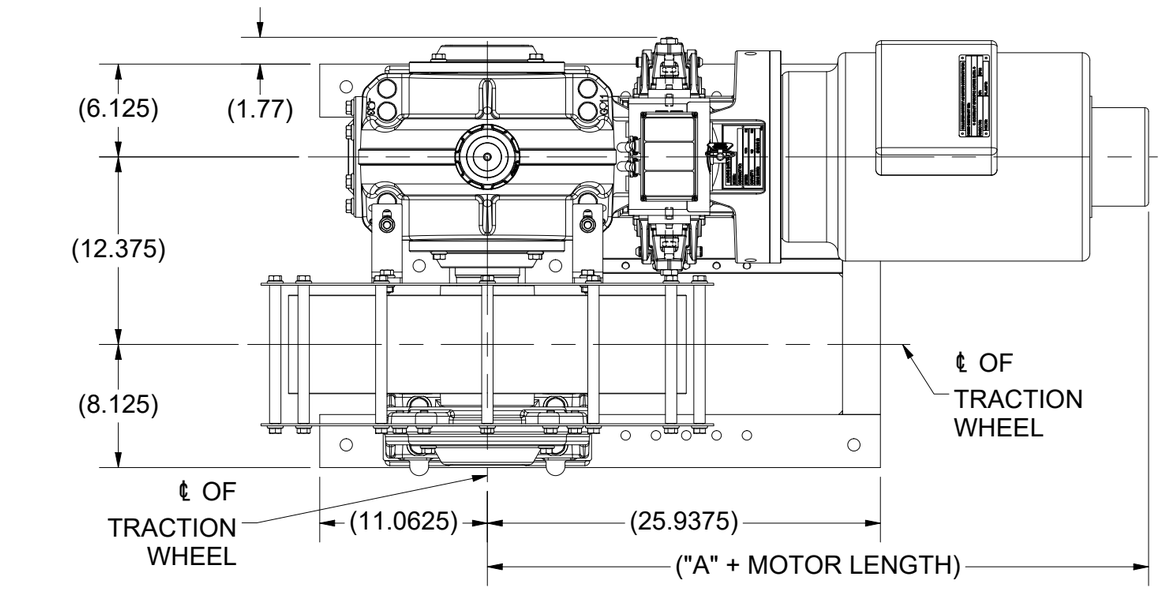
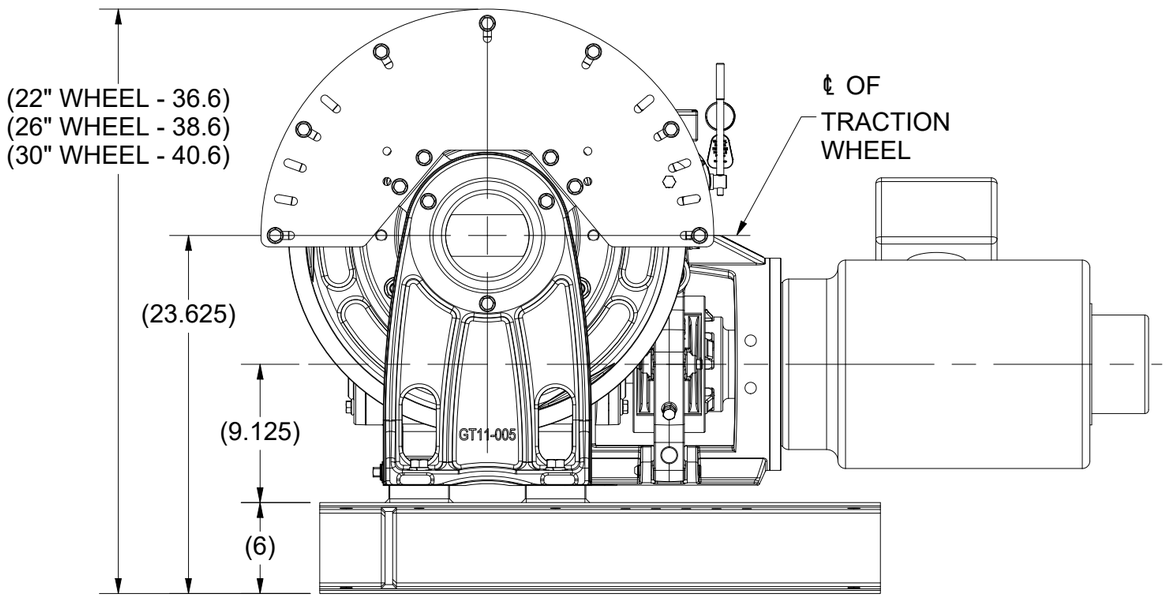
DATA TAGS

Below is some general information on the motor tags and what they represent.

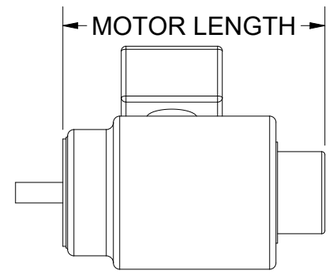
- Hollister-Whitney Contract Data Tag:
    - These are the estimated values the machine will run at. These values are typically less than the motor manufacturer's data plate values. This information is mainly used for drive sizing.

- Motor Manufacturer Data Tag:
    - The data on the motor manufacturer's nameplate represents the actual motor characteristics. These are typically higher than what is needed for the installation. This information is typically used for drive setup so the drive can model the correct motor.





CONTRACT SPECIFIC PARTS LIST ITEMS				
PART NUMBER				DESCRIPTION
				MOTOR, C-FLANGE - REFERENCE
GT11-080	-01	-02	-03	ASSY, CENTER -01 = 49:1, -02 = 49:2, -03 = 49:3
GT11-294	-01	-02	-03	ASSY, WORM AND BEARING -01 = 49:1, -02 = 49:2, -03 = 49:3
GT31-297	-1.625 -2.125	-1.875 -2.375		COUPLER, MOTOR -1.625 = 1.625", 254TC / 256TC FRAME -1.875 = 1.875", 284TC / 286TC FRAME -2.125 = 2.125", 324TC / 326TC FRAME -2.375 = 2.375", 364TC / 365TC FRAME
GT31	-312	-313		PLATE, ADAPTER, MOTOR -312 = 254TC / 256TC / 284TC / 286TC FRAME -313 = 324TC / 326TC / 364TC / 365TC FRAME
GT11-250	-22	-26	-30	ASSY, RETAINER, ROPE -22 = 22", -26 = 26", -30 = 30"
GT11-286	-22	-26	-30	ASSY,TRACTION WHEEL AND HUB -22 = 22", -26 = 26", -30 = 30"



SEE MOTOR PRINT

"A" DIMENSION	
FRAME SIZE	INCHES
254TC / 256TC	18.895
284TC / 286TC	19.135
324TC / 326TC 364TC / 365TC	20.625

NOTES UNLESS OTHERWISE SPECIFIED:

1. MACHINE AVAILABLE IN 22", 26", AND 30" TRACTION SHEAVES. (26" TRACTION SHEAVE SHOWN).
2. MACHINE COMPATIBLE WITH 254TC, 256TC, 284TC, 286TC, 324TC, 326TC, 364TC, AND 365TC MOTORS.
3. APPROXIMATE MACHINE AND BASE WEIGHT: 1700#
4. MAX SHEAVE SHAFT LOAD: 17,000#
5. BRAKE INFORMATION:
   PICK: 190Vdc, 1.94A, (2.5A Max.)
   HOLD: 80Vdc, 0.81A (1A Max.)

B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

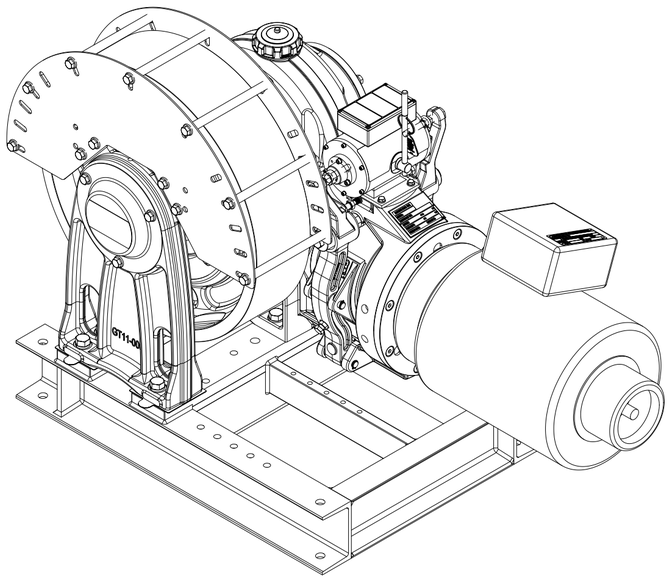
TITLE: ASSY, GT11, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:10	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

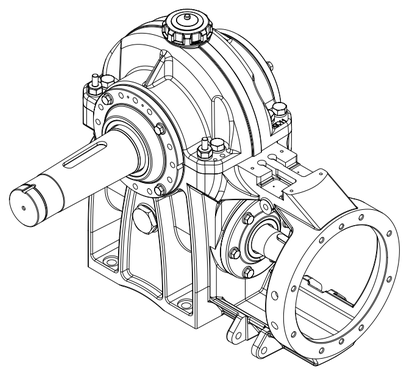
SHEET SIZE	DATE	
B	4/25/2023	GT11-LH SHEET 1 OF 9

ENGINEERING MASTER PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	GT11-273-01	ASSY, GEAR BOX, SINGLE LEAD, 49:1
		GT11-273-02	ASSY, GEAR BOX, DOUBLE LEAD, 49:2
		GT11-273-03	ASSY, GEAR BOX, TRIPLE LEAD, 49:3
2	1	GT11-001	ASSY, BASE, FINISHED
3	1	GT11-005	STAND, OUTBOARD
4	1	GT11-093	BEARING, ROLLER, SPHERICAL
5	1	GT11-250-22	ASSY, RETAINER, ROPE, 22"
		GT11-250-26	ASSY, RETAINER, ROPE, 26"
		GT11-250-30	ASSY, RETAINER, ROPE, 30"
6	1	GT11-281	COVER, STAND, OUTBOARD
7	1	GT11-282	NUT, LOCK, SHAFT
8	1	GT11-283	WASHER, LOCK, SHAFT
9	1	GT11-286-22	ASSY,TRACTION WHEEL AND HUB, 22"
		GT11-286-26	ASSY,TRACTION WHEEL AND HUB, 26"
		GT11-286-30	ASSY,TRACTION WHEEL AND HUB, 30"
10	2	GT11-315	ASSY, ARM, BRAKE
11	1	GT11-326	PLATE, RETENTION, BEARING, STAND
12	AS REQ'D	GT31-062-05	SHIM, STAND, OUTBOARD, 0.0050" THK
		GT31-062-10	SHIM, STAND, OUTBOARD, 0.0100" THK
		GT31-062-31	SHIM, STAND, OUTBOARD, 0.0310" THK
13	2	GT31-290	CONDUIT, METAL, FLEXIBLE, 3/8"
14	2	GT31-291	ADAPTER, FMC, 90 DEG ELBOW, 3/8"
15	2	GT31-293	ADAPTER, STRAIGHT, FMC, 3/8"
16	1	GT31-297-1.625	COUPLER, MOTOR, 1.625", 254TC / 256TC FRAME
		GT31-297-1.875	COUPLER, MOTOR, 1.875", 284TC / 286TC FRAME
		GT31-297-2.125	COUPLER, MOTOR, 2.125", 324TC / 326TC FRAME
		GT31-297-2.375	COUPLER, MOTOR, 2.125", 364TC / 365TC FRAME
17	1	GT31-298	ELEMENT, COUPLING
18	2	GT31-299	BUSHING, ANTI-SHORT, FEMALE, FMC, 3/8"
19	1	GT11-300	KEY, SHAFT, WHEEL
20	1	GT31-310	NUT, LOCK, SHAFT
21	1	GT31-311	WASHER, LOCK, SHAFT
22	1	GT31-312	PLATE, ADAPTER, MOTOR, 254TC / 256TC / 284TC / 286TC FRAME
		GT31-313	PLATE, ADAPTER, MOTOR, 324TC / 326TC / 364TC / 365TC FRAME
23	1	GT31-314	ASSY, SOLENOID, BRAKE
24	2	GT31-321	PIN, PIVOT
25	1	GT31-322	DRUM, BRAKE
26	2	GT31-327	ASSY, SWITCH, BRAKE
27	1	GT31-358	ASSY, BLOCK, TERMINAL
28	1	P-208	MANUAL BRAKE RELEASE TAG
29	1	P-226	LABEL, DATA, ELECTRICAL, BRAKE
30	1	P-227	LABEL, INSTRUCTION, BRAKE
31	1	P-228	LABEL, WIRING, BRAKE
32	2	P-230	NAMEPLATE, SMALL, HOLLISTER-WHITNEY
33	1	P-231	TAG, DATA, MOTOR, CONTRACT
34	1	P-236	MACHINE DATA TAG
35	4	#6 - 32 UNC x 7/8"	SCREW, HEX HEAD
36	4	5/16" - 18 UNC x 3/4"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
37	1	7/16" - 14 UNC x 2-1/4"	SCREW, HEX, CAP, SOCKET HEAD, BLACK OXIDE FINISH
38	AS REQ'D	1/2" - 13 UNC x 1-1/2"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
39	AS REQ'D	1/2" - 13 UNC x 1-1/2"	SCREW, HEX, CAP, FLAT SOCKET HEAD, BLACK OXIDE FINISH
40	4	5/8" - MS 16624	RING, RETAINING, EXTERNAL, SERIES 3100
41	4	5/8" x 1-1/2"	PIN, DOWEL, GROUND, HARDENED
42	AS REQ'D	5/8" - 11 UNC x 1-1/2"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
43	8	3/4"	LOCK WASHER, HELICAL SPRING, REGULAR
44	8	3/4" - 10 UNC x 2-1/2"	HEX CAP SCREW, GRADE 5, BLACK OXIDE FINISH
45	1.75 gal	MOBIL SHC 636	OIL, GEAR, HIGH PRESSURE

GT11-273 PARTS LIST					
ITEM	QTY GT11-273-01	QTY GT11-273-02	QTY GT11-273-03	PART NUMBER	DESCRIPTION
2.1	1	0	0	GT11-080-01	ASSY, CENTER, SINGLE LEAD
2.1	0	1	0	GT11-080-02	ASSY, CENTER, DOUBLE LEAD
2.1	0	0	1	GT11-080-03	ASSY, CENTER, TRIPLE LEAD
2.2	1	1	1	GT11-284	ASSY, UPPER AND LOWER HOUSING, MACHINED
2.3	1	0	0	GT11-294-01	ASSY, WORM SHAFT AND BEARING, 7/8" SINGLE
2.3	0	1	0	GT11-294-02	ASSY, WORM SHAFT AND BEARING, 7/8" DOUBLE
2.3	0	0	1	GT11-294-03	ASSY, WORM SHAFT AND BEARING, 7/8" TRIPLE
2.4	2	2	2	GT11-367	BOLT, HOUSING, GUARD MOUNTING
2.5	1	1	1	GT31-063	CAP, FILL, OIL
2.6	1	1	1	GT31-085	CAP, BEARING, REAR END
2.7	1	1	1	GT31-085-FE	CAP, BEARING, FORWARD END
2.8	AS REQ'D	AS REQ'D	AS REQ'D	GT31-087	SHIM, CAP, BEARING
2.9	1	1	1	GT31-276	GLASS, SIGHT, OIL
2.10	1	1	1	GT31-277	PLUG, DRAIN, OIL
2.11	1	1	1	GT31-278	PLUG, OIL
2.12	1	1	1	GT31-279	O-RING, PLUG, OIL
2.13	1	1	1	GT31-287	SEAL, SHAFT, RADIAL
2.14	1	1	1	GT31-287-1	SEAL, SHAFT, RADIAL
2.15	4	4	4	GT31-295	SHIM, ECCENTRIC, EDGE BONDED
2.16	1	1	1	GT31-301	KEY, SHAFT, WORM
2.17	20	20	20	1/2"-13 UNC X 1.5"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED



GT11-LH
SCALE 1:10



GT11-273
SCALE 1:10

B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

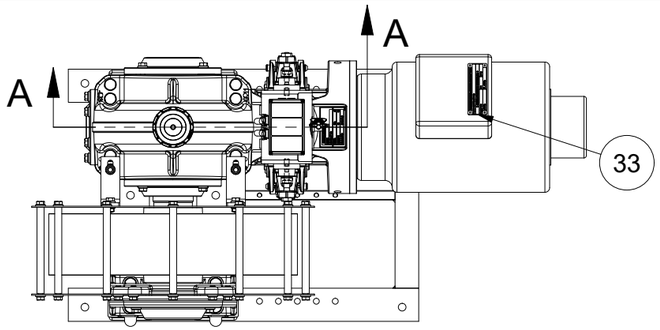
THIRD ANGLE PROJECTION

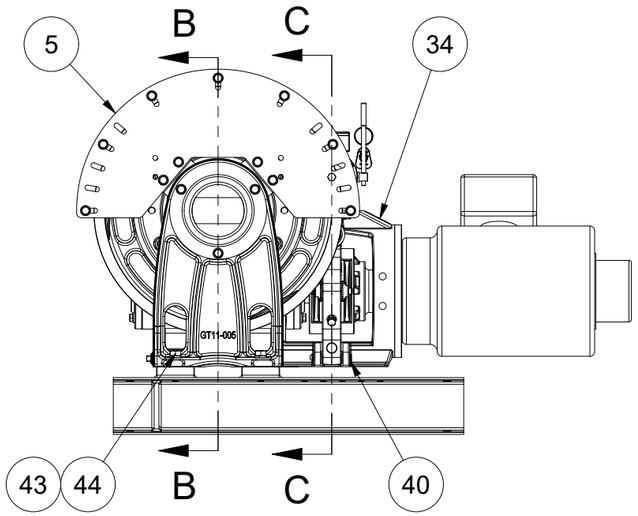
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

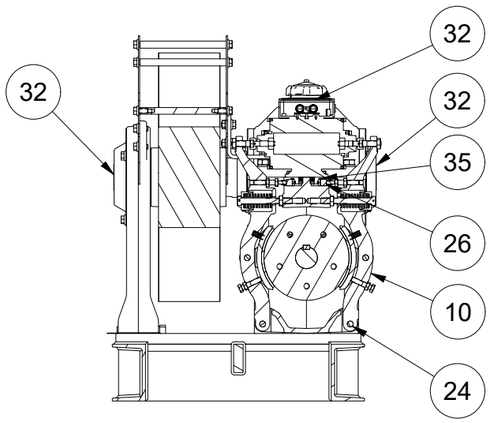
TITLE: ASSY, GT11, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:10	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

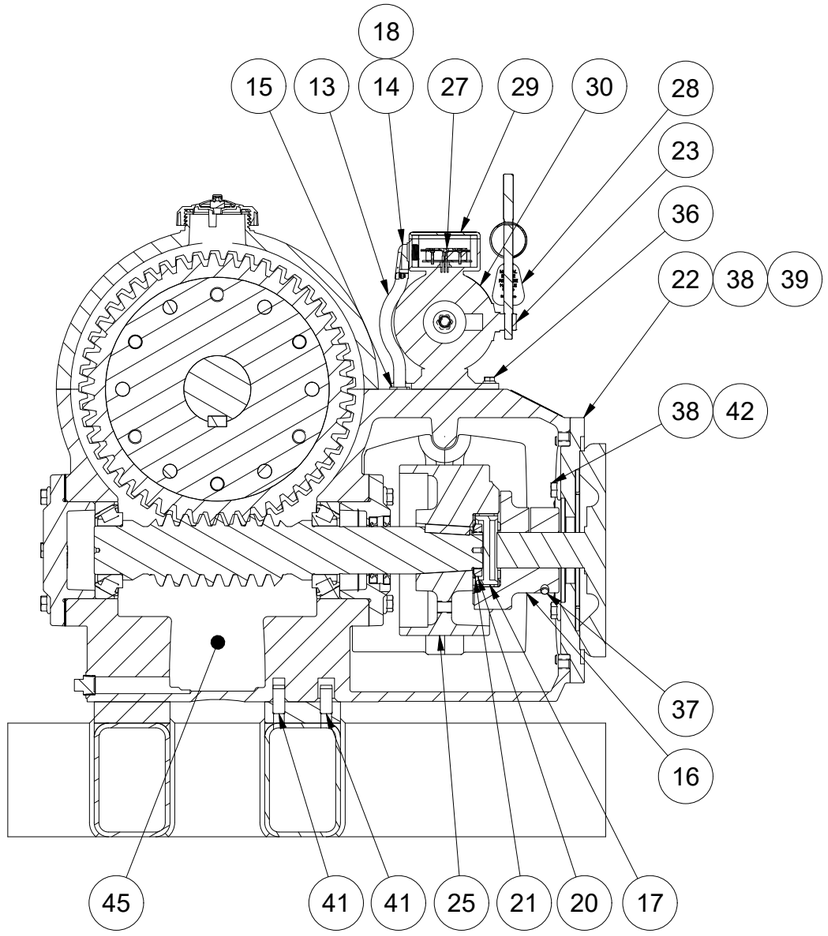
SHEET SIZE	DATE	
C	4/25/2023	GT11-LH SHEET 2 OF 9



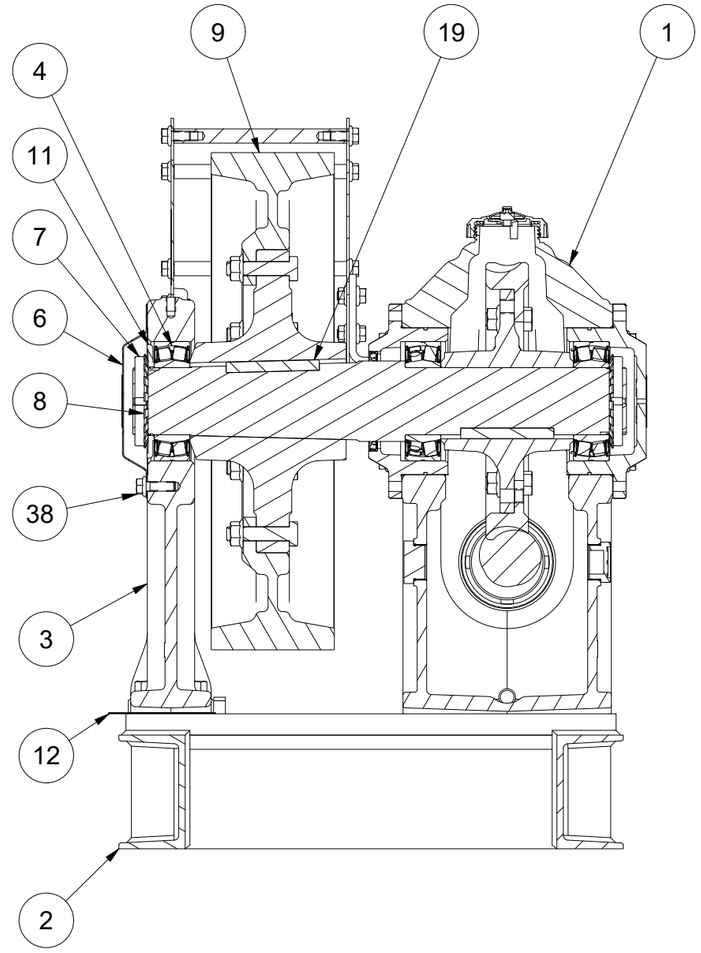




SECTION C-C
SCALE 1:16



SECTION A-A
SCALE 1:8



SECTION B-B
SCALE 1:8

B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

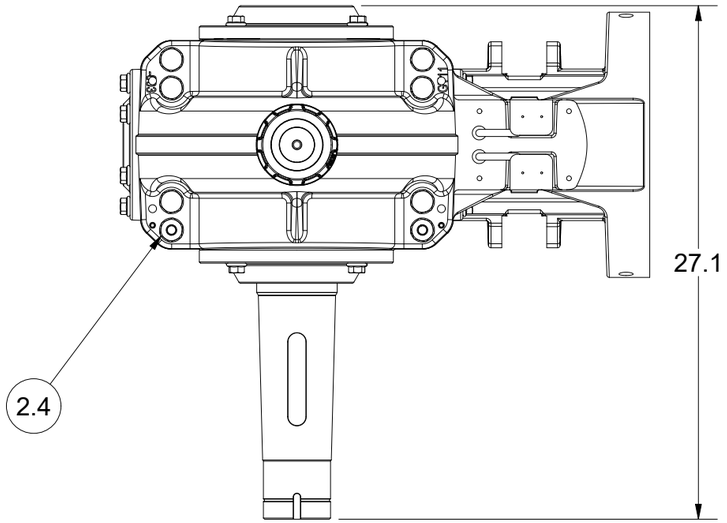
THIRD ANGLE PROJECTION

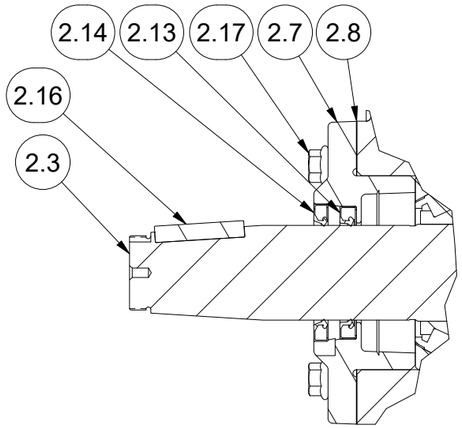
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:16	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11-LH SHEET 3 OF 9





DETAIL F
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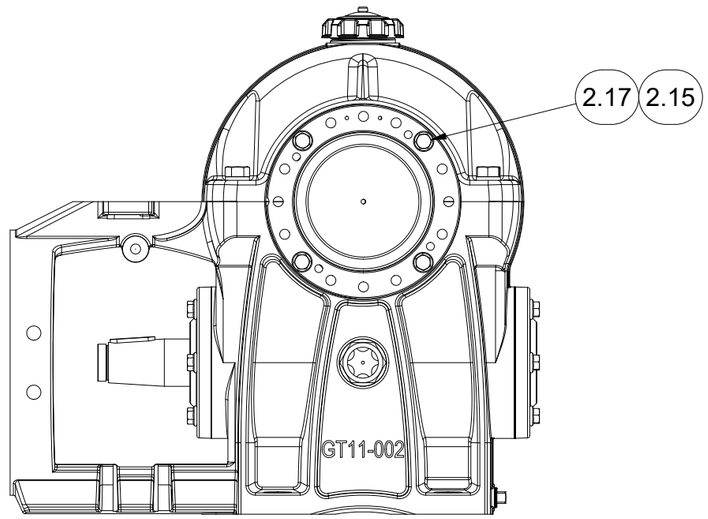
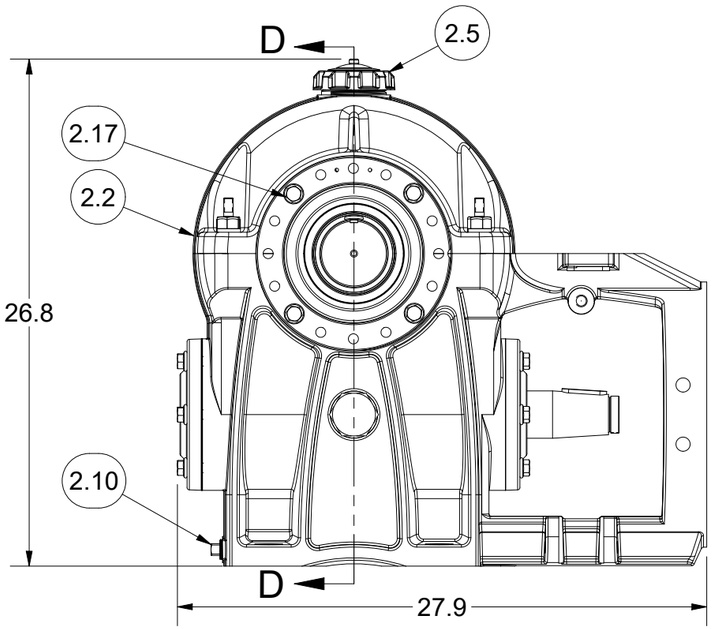
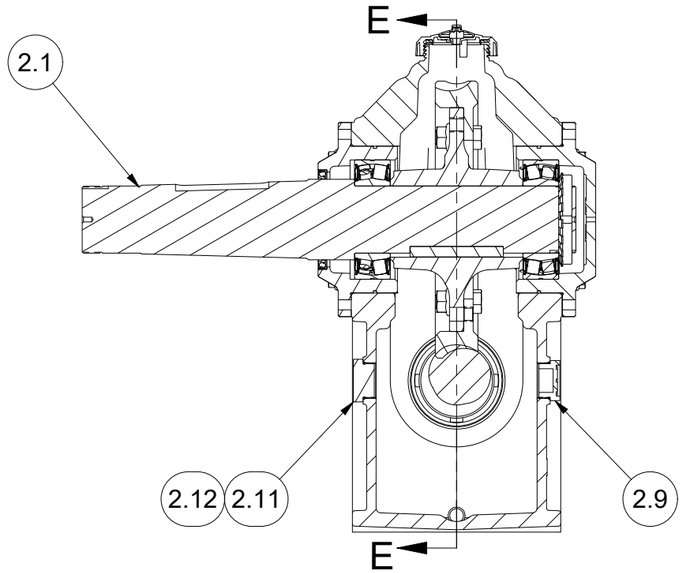


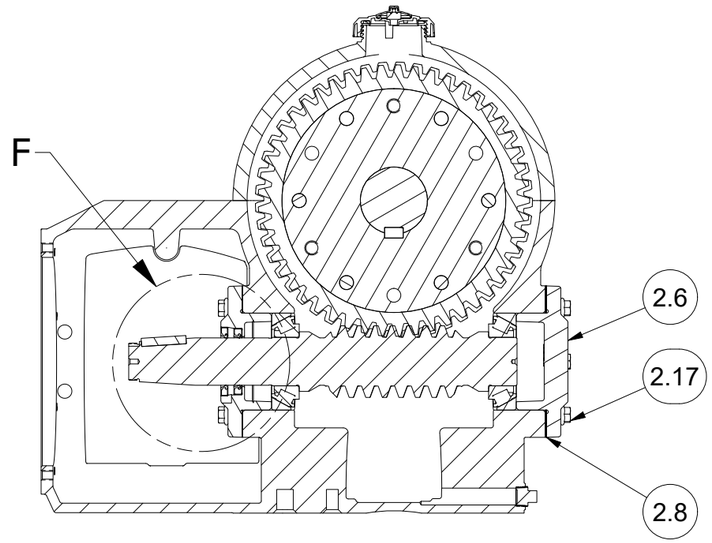
OPPOSING SIDE VIEW



SECTION D-D



SECTION E-E



B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:8	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11-LH SHEET 4 OF 9

MOTOR CHART 1:1 ROPING														
SPEED	(ft/min)	50	75	100	125	150	175	200	250	300	350	400	450	500
CAP (lbs)	SHEAVE SIZE (in)													
1000	22	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1505 IG1MTR1514	49:1 CMTR1505 N/A	49:2 CMTR1001 IG1MTR1030	49:2 CMTR2001 IG1MTR1031	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 IG1MTR3515	49:3 CMTR2001 IG3MTR2013	49:3 CMTR3005 IG3MTR3014	49:3 CMTR3005 IG1MTR3515
1000	26	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1505 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG1MTR1514	49:3 CMTR2501 IG1MTR2504	49:3 CMTR2501 IG3MTR2013	49:3 CMTR2501 IG3MTR3013
1000	30	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG1MTR2504	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	49:2 CMTR3005 IG1MTR3515	49:2 CMTR3005 IG1MTR3515
1500	22	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1505 IG1MTR1514	49:1 CMTR1505 N/A	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 IG1MTR3515	49:3 CMTR2501 IG3MTR3013	49:3 CMTR4005 IG3MTR3014	49:3 CMTR4005 IG1MTR3515
1500	26	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1505 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	49:3 CMTR3001 IG1MTR2504	49:3 CMTR3001 IG3MTR3013	49:3 CMTR3001 IG3MTR3013
1500	30	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG1MTR2504	49:2 CMTR2001 IG3MTR2013	49:2 CMTR4005 IG3MTR3014	49:2 CMTR4005 IG1MTR3515	49:2 CMTR4005 IG1MTR3515
2000	22	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1505 IG1MTR1514	49:1 CMTR1505 N/A	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	49:2 CMTR3005 IG1MTR3515	49:3 CMTR3001 IG3MTR3013	49:3 CMTR4005 IG3MTR3014	49:3 CMTR4005 IG1MTR3515
2000	26	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 IG1MTR1030	49:1 CMTR2001 IG1MTR1031	49:1 CMTR3005 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2501 IG3MTR2030	49:2 CMTR2501 IG3MTR2013	49:2 CMTR4005 IG3MTR3014	49:3 CMTR5001 IG1MTR2504	49:3 CMTR5001 IG3MTR3013	49:3 CMTR5001 IG3MTR3013
2000	30	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 IG1MTR1030	49:1 CMTR2001 IG1MTR1031	49:1 CMTR2001 N/A	49:1 CMTR3005 IG1MTR1514	49:2 CMTR2501 IG3MTR2030	49:2 CMTR2501 IG1MTR2504	49:2 CMTR2501 IG3MTR3013	49:2 CMTR4005 IG3MTR3014	49:2 CMTR4005 IG1MTR3515	49:2 CMTR4005 IG1MTR3515
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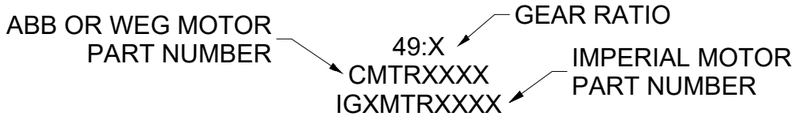
2500	26	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 IG1MTR1030	49:1 CMTR2001 IG3MTR2013	49:1 CMTR3005 N/A	49:2 CMTR2501 IG1MTR1729	49:2 CMTR2501 IG3MTR2030	49:2 CMTR2501 IG3MTR3013	49:2 CMTR4005 IG3MTR3014	GT31	GT31	GT31
2500	30	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 IG1MTR1030	49:1 CMTR2001 IG1MTR2504	49:1 CMTR2001 N/A	49:1 CMTR3005 IG3MTR3014	49:2 CMTR3001 IG3MTR2030	49:2 CMTR3001 IG1MTR2504	49:2 CMTR3001 IG3MTR3013	GT31	GT31	GT31

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11-LH SHEET 5 OF 9

MOTOR CHART 1:1 ROPING

SPEED	(ft/min)	50	75	100	125	150	175	200	250	300	350	400	450	500
CAP (lbs)	SHEAVE SIZE (in)													
3000	22	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1030	49:1 CMTR2001 IG3MTR2013	49:1 CMTR3005 IG1MTR1514	49:1 CMTR3005 N/A	49:2 CMTR2501 IG3MTR2030	GT31	GT31	GT31	GT31	GT31	GT31
3000	26	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 IG3MTR2030	49:1 CMTR2001 IG3MTR2013	49:1 CMTR3005 N/A	49:2 CMTR3001 IG1MTR1729	GT31	GT31	GT31	GT31	GT31	GT31
3000	30	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 IG3MTR2030	49:1 CMTR2001 IG1MTR2504	49:1 CMTR2001 N/A	49:1 CMTR3005 IG3MTR3014	GT31	GT31	GT31	GT31	GT31	GT31

NOTES UNLESS OTHERWISE SPECIFIED:

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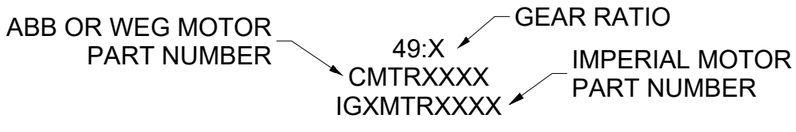
2. CELL FORMAT IS AS FOLLOWS:



B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

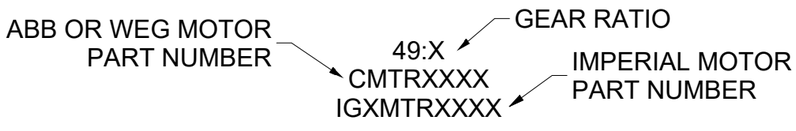
SHEET SIZE	DATE	
B	4/25/2023	GT11-LH SHEET 6 OF 9

MOTOR CHART 2:1 ROPING

SPEED	(ft/min)	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400
CAP (lbs)	SHEAVE SIZE (in)															
1000	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 IG1MTR1514	49:2 CMTR1505 N/A	49:3 CMTR1001 IG1MTR1514	49:3 CMTR1505 N/A	49:3 CMTR1505 IG1MTR3515	N/A	N/A	N/A	N/A	N/A	N/A
1000	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR1001 IG1MTR1729	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 N/A	49:3 CMTR1001 IG1MTR1031	49:3 CMTR1001 N/A	49:3 CMTR1001 IG1MTR1514	N/A	N/A	N/A	N/A	N/A	N/A
1000	30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1001 N/A	49:2 CMTR1505 IG1MTR1514	49:2 CMTR1505 N/A	49:2 CMTR1505 IG1MTR3515	49:3 CMTR2001 N/A	49:3 CMTR3005 IG1MTR1514	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515
1500	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 IG1MTR1514	49:2 CMTR1505 N/A	49:3 CMTR1001 IG1MTR1514	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515	N/A	N/A	N/A	N/A	N/A	N/A
1500	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR1001 IG1MTR1729	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 N/A	49:3 CMTR2001 IG1MTR1031	49:3 CMTR2001 N/A	49:3 CMTR2001 IG3MTR2013	N/A	N/A	N/A	N/A	N/A	N/A
1500	30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1001 N/A	49:2 CMTR1505 IG1MTR1514	49:2 CMTR1505 N/A	49:2 CMTR1505 IG1MTR3515	49:3 CMTR2001 N/A	49:3 CMTR3005 IG1MTR1514	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515
2000	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 IG1MTR1514	49:2 CMTR1505 N/A	49:3 CMTR2001 IG1MTR1514	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515	N/A	N/A	N/A	N/A	N/A	N/A
2000	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR1001 IG1MTR1729	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 N/A	49:3 CMTR2001 IG1MTR2504	49:3 CMTR2001 N/A	49:3 CMTR2001 IG3MTR2013	N/A	N/A	N/A	N/A	N/A	N/A
2000	30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG1MTR1031	49:2 CMTR2001 N/A	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 N/A	49:2 CMTR3005 IG1MTR3515	49:3 CMTR2001 N/A	49:3 CMTR3005 IG3MTR3014	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515
2500	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 N/A	49:3 CMTR2001 IG3MTR2013	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515	N/A	N/A	N/A	N/A	N/A	N/A
2500	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 N/A	49:3 CMTR2001 IG1MTR2504	49:3 CMTR2001 N/A	49:3 CMTR2001 IG3MTR2013	N/A	N/A	N/A	N/A	N/A	N/A
2500	30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG1MTR2504	49:2 CMTR2001 N/A	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 N/A	49:2 CMTR3005 IG1MTR3515	49:3 CMTR2501 N/A	49:3 CMTR4005 IG3MTR3014	49:3 CMTR4005 N/A	49:3 CMTR4005 IG1MTR3515	49:3 CMTR4005 N/A	49:3 CMTR4005 IG1MTR3515

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAIL AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



		A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23
B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23		

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11-LH SHEET 7 OF 9

MOTOR CHART 2:1 ROPING

SPEED (ft/min)	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400
CAP (lbs) / SHEAVE SIZE (in)															
3000 / 22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG1MTR1031	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 N/A	49:3 CMTR2001 IG3MTR2013	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515	N/A	N/A	N/A	N/A	N/A	N/A
3000 / 26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 N/A	49:3 CMTR2501 IG1MTR2504	49:3 CMTR2501 N/A	49:3 CMTR2501 IG3MTR3013	N/A	N/A	N/A	N/A	N/A	N/A
3000 / 30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG1MTR2504	49:2 CMTR2001 N/A	49:2 CMTR3005 IG3MTR3014	49:2 CMTR3005 N/A	49:2 CMTR3005 IG1MTR3515	49:3 CMTR2501 N/A	49:3 CMTR4005 IG3MTR3014	49:3 CMTR4005 N/A	49:3 CMTR4005 IG1MTR3515	49:3 CMTR4005 N/A	49:3 CMTR4005 IG1MTR3515
3500 / 22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 N/A	49:3 CMTR2001 IG3MTR2013	49:3 CMTR4005 N/A	49:3 CMTR4005 IG1MTR3515	N/A	N/A	N/A	N/A	N/A	N/A
3500 / 26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 N/A	49:3 CMTR2501 IG1MTR2504	49:3 CMTR2501 N/A	49:3 CMTR2501 IG3MTR3013	N/A	N/A	N/A	N/A	N/A	N/A
3500 / 30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG1MTR2504	49:2 CMTR2001 N/A	49:2 CMTR3005 IG3MTR3014	49:2 CMTR3005 N/A	49:2 CMTR3005 IG1MTR3515	49:3 CMTR3001 N/A	49:3 CMTR5005 IG3MTR3014	49:3 CMTR5005 N/A	49:3 CMTR5005 IG1MTR3515	N/A	N/A
4000 / 22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	49:2 CMTR3005 N/A	49:3 CMTR2501 IG3MTR3013	49:3 CMTR4005 N/A	49:3 CMTR4005 IG1MTR3515	N/A	N/A	N/A	N/A	N/A	N/A
4000 / 26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 N/A	49:3 CMTR3001 IG1MTR2504	49:3 CMTR3001 N/A	49:3 CMTR3001 IG3MTR3013	N/A	N/A	N/A	N/A	N/A	N/A
4000 / 30	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:1 CMTR3005 IG1MTR1514	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2501 IG1MTR2504	49:2 CMTR2501 N/A	49:2 CMTR4005 IG3MTR3014	49:2 CMTR4005 N/A	49:2 CMTR4005 IG1MTR3515	49:3 CMTR5001 N/A	49:3 CMTR5005 IG3MTR5014	N/A	N/A	N/A	N/A
4500 / 22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
4500 / 26	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
4500 / 30	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:1 CMTR3005 IG1MTR1514	49:2 CMTR2501 IG3MTR2030	49:2 CMTR2501 IG1MTR2504	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A

NOTES UNLESS OTHERWISE SPECIFIED:

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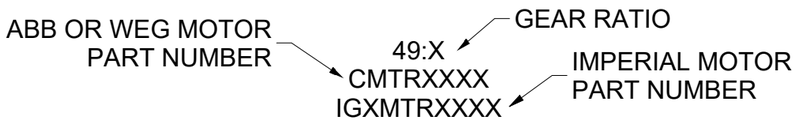


B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	
A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23	

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11, LEFT HAND

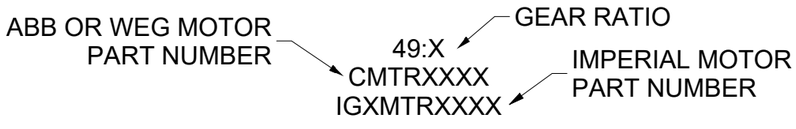
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11-LH SHEET 8 OF 9

MOTOR CHART 2:1 ROPING																
SPEED	(ft/min)	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400
CAP (lbs)	SHEAVE SIZE (in)															
5000	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
5000	26	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:2 CMTR2501 IG1MTR1729	49:2 CMTR2501 IG3MTR2030	49:2 CMTR2501 IG3MTR2013	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
5000	30	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:1 CMTR3005 IG1MTR1514	49:2 CMTR2501 IG3MTR2030	49:2 CMTR3001 IG1MTR2504	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
5500	22	49:1 CMTR2001 IG1MTR1030	49:1 CMTR3005 N/A	49:2 CMTR2001 IG3MTR2030	GT31	GT31	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
5500	26	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:2 CMTR2501 IG1MTR1729	GT31	GT31	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
5500	30	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:1 CMTR3005 IG3MTR3014	GT31	GT31	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
6000	22	49:1 CMTR2001 IG1MTR1030	49:1 CMTR3005 N/A	49:2 CMTR2501 IG3MTR2030	GT31	GT31	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
6000	26	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:2 CMTR3001 IG1MTR1729	GT31	GT31	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
6000	30	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:1 CMTR3005 IG3MTR3014	GT31	GT31	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

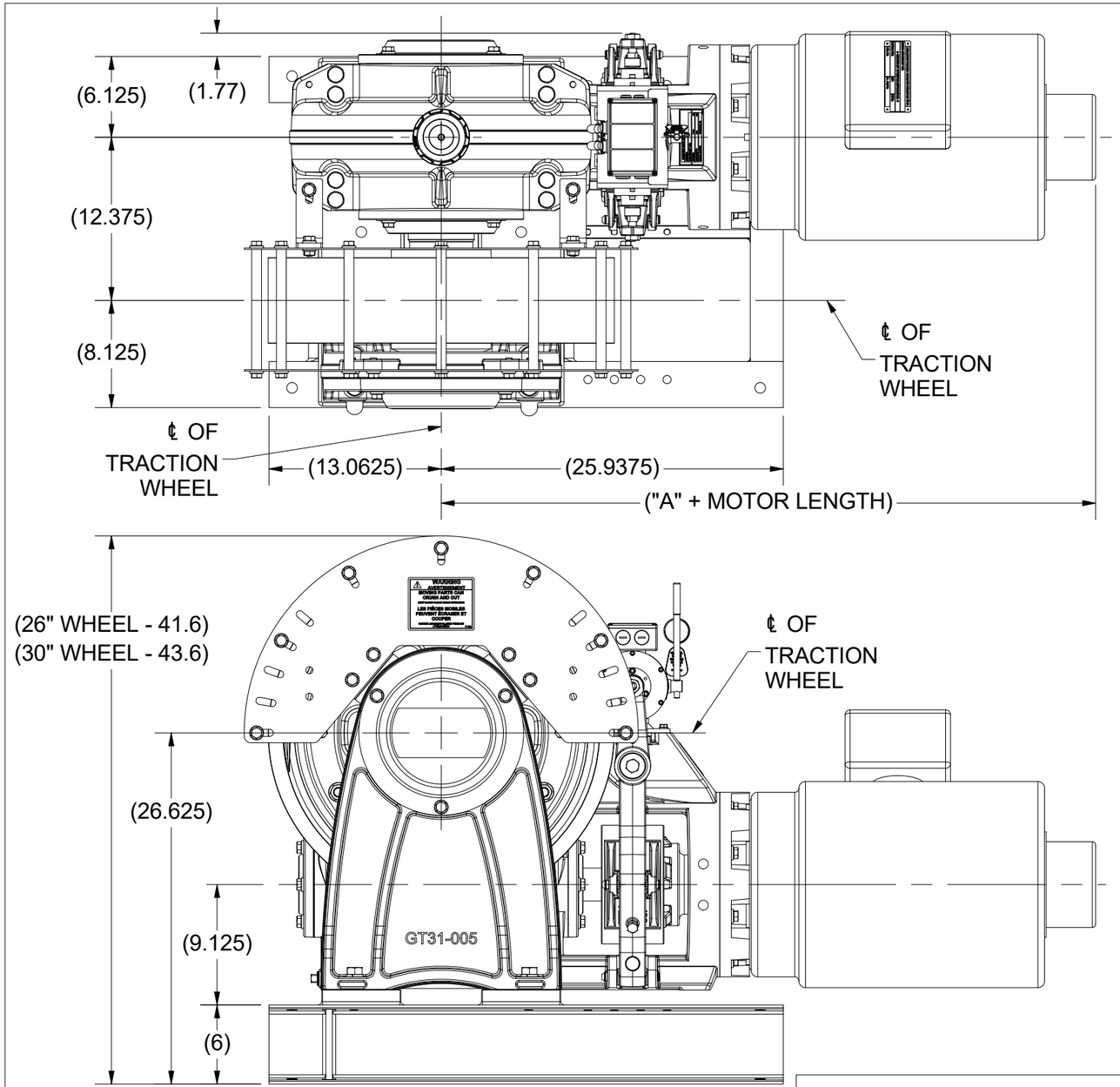
THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

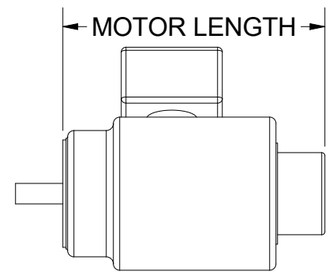
TITLE: ASSY, GT11, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11-LH SHEET 9 OF 9



CONTRACT SPECIFIC PARTS LIST ITEMS				
PART NUMBER				DESCRIPTION
				MOTOR, C-FLANGE - REFERENCE
GT31-080	-01	-02	-03	ASSY, CENTER -01 = 71:1, -02 = 71:2, -03 = 71:3
GT31-294	-01	-02	-03	ASSY, WORM AND BEARING -01 = 71:1, -02 = 71:2, -03 = 71:3
GT31-297	-1.625 -2.125	-1.875 -2.375		COUPLER, MOTOR -1.625 = 1.625", 254TC / 256TC FRAME -1.875 = 1.875", 284TC / 286TC FRAME -2.125 = 2.125", 324TC / 326TC FRAME -2.375 = 2.375", 364TC / 365TC FRAME
GT31	-312	-313		PLATE, ADAPTER, MOTOR -312 = 254TC / 256TC / 284TC / 286TC FRAME -313 = 324TC / 326TC / 364TC / 365TC FRAME
GT31-250	-26	-30		ASSY, RETAINER, ROPE -26 = 26", -30 = 30"
GT31-286	-26	-30		ASSY,TRACTION WHEEL AND HUB -26 = 26", -30 = 30"



SEE MOTOR PRINT

"A" DIMENSION	
FRAME SIZE	INCHES
254TC / 256TC	21.395
284TC / 286TC	21.635
324TC /326TC 364TC / 365TC	23.125

NOTES UNLESS OTHERWISE SPECIFIED:

1. MACHINE AVAILABLE IN 26" AND 30" TRACTION SHEAVES. (26" TRACTION SHEAVE SHOWN).
2. MACHINE COMPATIBLE WITH 254TC, 256TC, 284TC, 286TC, 324TC, 326TC, 364TC, AND 365TC MOTORS.
3. APPROXIMATE MACHINE AND BASE WEIGHT: 2100#
4. MAX SHEAVE SHAFT LOAD: 25,000#
5. BRAKE INFORMATION: PICK: 190Vdc, 1.94A, (2.5A Max.)
   HOLD: 80Vdc, 0.81A (1A Max.)

			C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23
D	CORRECT GT31-273 PART 2.7 QTY TO AS REQ'D, PUR #1846	EMM 01/08/24	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

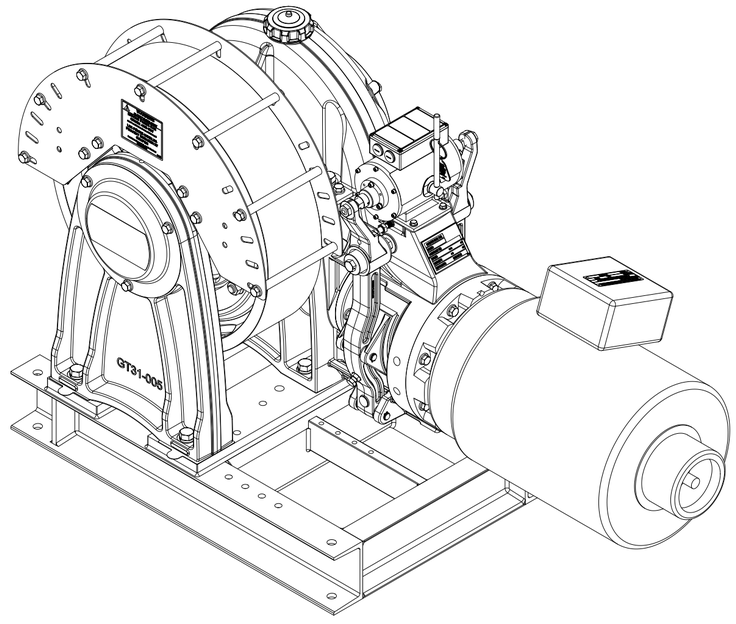
TITLE: ASSY, GT31, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:10	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

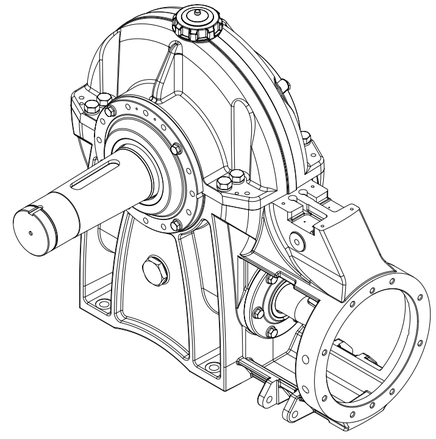
SHEET SIZE	DATE	
B	4/26/2023	GT31-LH SHEET 1

ENGINEERING MASTER PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	GT31-273-01	ASSY, GEAR BOX, SINGLE LEAD, 71:1
		GT31-273-02	ASSY, GEAR BOX, DOUBLE LEAD, 71:2
		GT31-273-03	ASSY, GEAR BOX, TRIPLE LEAD, 71:3
2	1	GT31-OH-1	ASSY, BASE, FINISHED
3	1	GT31-005	STAND, OUTBOARD
4	AS REQ'D	GT31-062-05	SHIM, STAND, OUTBOARD, 0.0050" THICK
		GT31-062-10	SHIM, STAND, OUTBOARD, 0.0100" THICK
		GT31-062-31	SHIM, STAND, OUTBOARD, 0.0310" THICK
5	1	GT31-093	BEARING, ROLLER, SPHERICAL
6	1	GT31-250-26	ASSY, RETAINER, ROPE, 26"
		GT31-250-30	ASSY, RETAINER, ROPE, 30"
7	1	GT31-281	COVER, STAND, OUTBOARD
8	1	GT31-282	NUT, LOCK, SHAFT
9	1	GT31-283	WASHER, LOCK, SHAFT
10	1	GT31-286-26	ASSY, TRACTION WHEEL AND HUB, 26"
		GT31-286-30	ASSY, TRACTION WHEEL AND HUB, 30"
11	2	GT31-290	CONDUIT, METAL, FLEXIBLE, 3/8"
12	2	GT31-291	ADAPTER, FMC, 90 DEG ELBOW, 3/8"
13	2	GT31-293	ADAPTER, STRAIGHT, FMC, 3/8"
14	1	GT31-297-1.625	COUPLER, MOTOR, 1.625", 254TC / 256TC FRAME
		GT31-297-1.875	COUPLER, MOTOR, 1.875", 284TC / 286TC FRAME
		GT31-297-2.125	COUPLER, MOTOR, 2.125", 324TC / 326TC FRAME
		GT31-297-2.375	COUPLER, MOTOR, 2.375", 364TC / 365TC FRAME
15	1	GT31-298	ELEMENT, COUPLING
16	2	GT31-299	BUSHING, ANTI-SHORT, FEMALE, FMC, 3/8"
17	1	GT31-300	KEY, SHAFT, WHEEL
18	1	GT31-310	NUT, LOCK, SHAFT
19	1	GT31-311	WASHER, LOCK, SHAFT
20	1	GT31-312	PLATE, ADAPTER, MOTOR, 254TC / 256TC / 284TC / 286TC FRAME
		GT31-313	PLATE, ADAPTER, MOTOR, 324TC / 326TC / 364TC / 365TC FRAME
21	1	GT31-314	ASSY, SOLENOID, BRAKE
22	2	GT31-315	ASSY, ARM, BRAKE
23	2	GT31-321	PIN, PIVOT
24	1	GT31-322	DRUM, BRAKE
25	1	GT31-326	PLATE, RETENTION, BEARING, STAND
26	2	GT31-327	ASSY, SWITCH, BRAKE
27	1	GT31-358	ASSY, BLOCK, TERMINAL
28	1	P-208	MANUAL BRAKE RELEASE TAG
29	2	P-223-R	CUSTOMER NAMEPLATE
30	1	P-226	LABEL, DATA, ELECTRICAL, BRAKE
31	1	P-227	LABEL, INSTRUCTION, BRAKE
32	1	P-228	LABEL, WIRING, BRAKE
33	1	P-231	TAG, DATA, MOTOR, CONTRACT
34	1	P-236	MACHINE DATA TAG
35	4	#6-32 UNC X 7/8"	SCREW, HEX HEAD
36	4	5/16"-18 UNC X 3/4"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
37	1	7/16"-14 UNC X 2-1/4"	SCREW, HEX, CAP, SOCKET HEAD, BLACK OXIDE FINISH
38	AS REQ'D	1/2"-13 UNC X 1-1/2"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
39	AS REQ'D	1/2"-13 UNC X 1-1/2"	SCREW, HEX, CAP, FLAT SOCKET HEAD, BLACK OXIDE FINISH
40	4	5/8" - MS 16624	RING, RETAINING, EXTERNAL, SERIES 3100
41	4	5/8" X 1-1/2"	PIN, DOWEL, GROUND, HARDENED
42	AS REQ'D	5/8" - 11 UNC x 1-1/2"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
43	8	3/4"-10 UNC X 2-1/2"	BOLT, HEX, GRADE 5, BLACK OXIDE FINISH
44	8	3/4"	WASHER, LOCK, HELICAL
45	2.5 gal	MOBIL SHC 636	OIL, GEAR, HIGH PRESSURE

GT31-273 PARTS LIST					
ITEM	QTY GT31-273-01	QTY GT31-273-02	QTY GT31-273-03	PART NUMBER	DESCRIPTION
2.1	1	0	0	GT31-080-01	ASSY, CENTER, SINGLE LEAD
2.1	0	1	0	GT31-080-02	ASSY, CENTER, DOUBLE LEAD
2.1	0	0	1	GT31-080-03	ASSY, CENTER, TRIPLE LEAD
2.2	1	1	1	GT31-284	ASSY, UPPER AND LOWER HOUSING, MACHINED
2.3	1	0	0	GT31-294-01	ASSY, WORM SHAFT AND BEARING, 7/8" SINGLE
2.3	0	1	0	GT31-294-02	ASSY, WORM SHAFT AND BEARING, 7/8" DOUBLE
2.3	0	0	1	GT31-294-03	ASSY, WORM SHAFT AND BEARING, 7/8" TRIPLE
2.4	1	1	1	GT31-063	CAP, FILL, OIL
2.5	1	1	1	GT31-085	CAP, BEARING, REAR END
2.6	1	1	1	GT31-085-FE	CAP, BEARING, FORWARD END
D 2.7	AS REQ'D	AS REQ'D	AS REQ'D	GT31-087	SHIM, CAP, BEARING
2.8	1	1	1	GT31-276	GLASS, SIGHT, OIL
2.9	1	1	1	GT31-277	PLUG, DRAIN, OIL
2.10	1	1	1	GT31-278	PLUG, OIL
2.11	1	1	1	GT31-279	O-RING, PLUG, OIL
2.12	1	1	1	GT31-287	SEAL, SHAFT, RADIAL
2.13	1	1	1	GT31-287-1	SEAL, SHAFT, RADIAL
2.14	4	4	4	GT31-295	SHIM, ECCENTRIC, EDGE BONDED
2.15	1	1	1	GT31-301	KEY, SHAFT, WORM
2.16	20	20	20	1/2"-13 UNC X 1.5	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED



GT31-LH



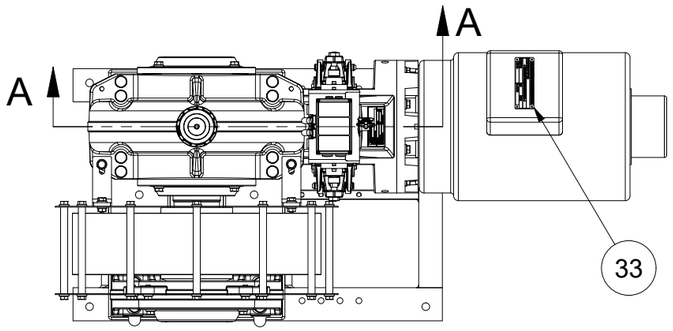
GT31-273

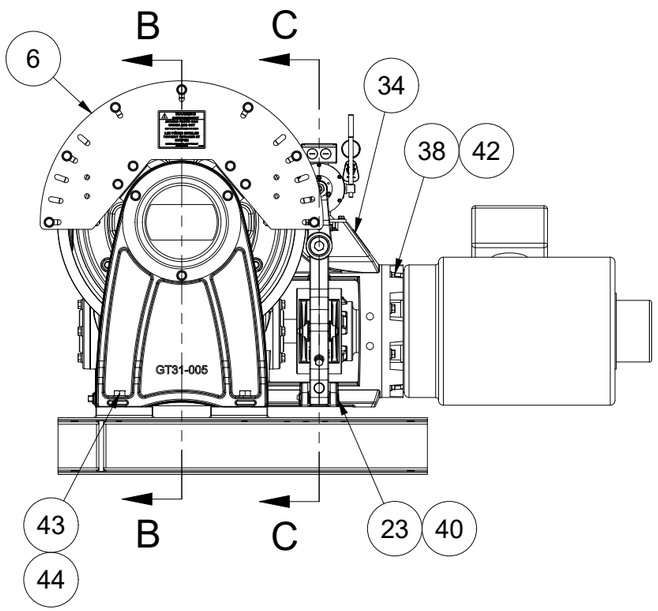
		C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23	HOLLISTER-WHITNEY ELEVATOR CO. LLC
D	CORRECT GT31-273 PART 2.7 QTY TO AS REQ'D, PUR #1846	EMM 01/08/24	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23	TITLE: ASSY, GT31, LEFT HAND

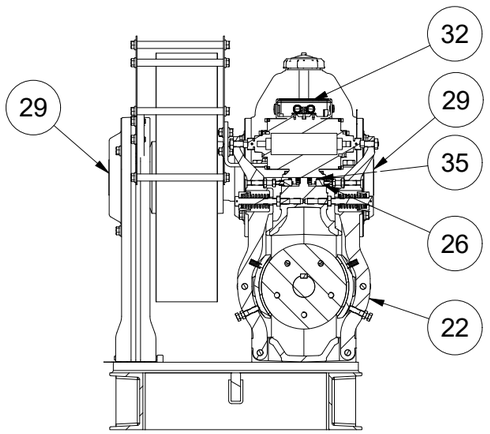
THIRD ANGLE PROJECTION

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:10	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

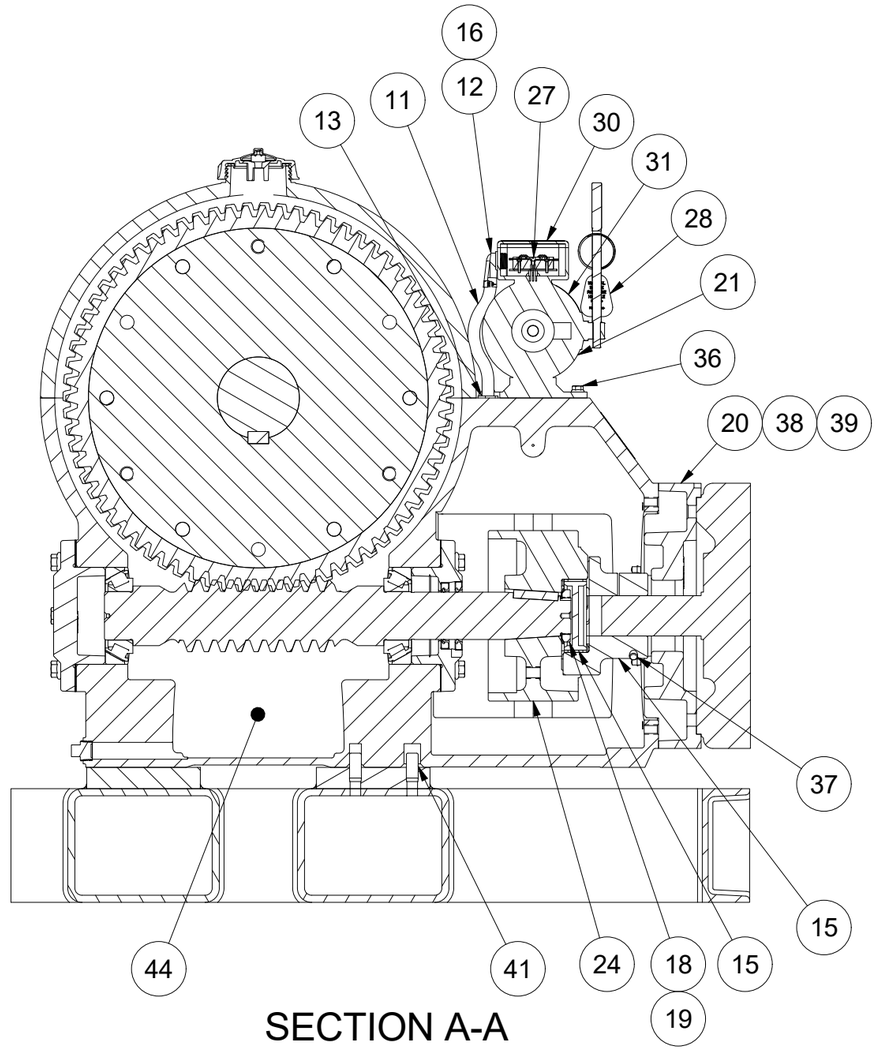
SHEET SIZE	DATE	
C	4/26/2023	GT31-LH SHEET 2



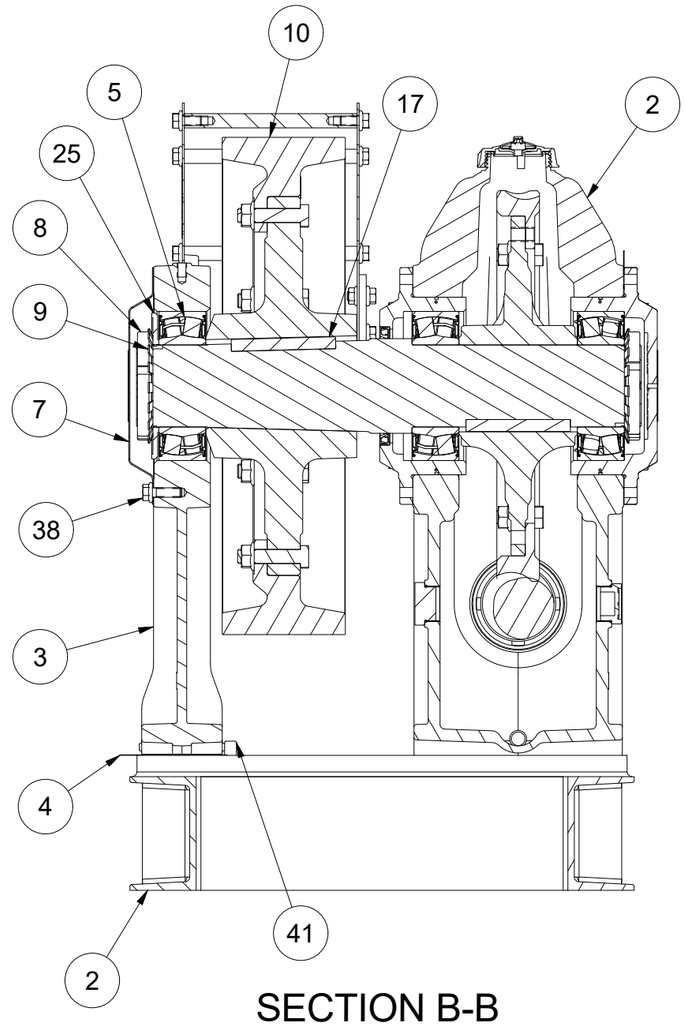




SECTION C-C



SECTION A-A
SCALE 1:8



SECTION B-B
SCALE 1:8

D	CORRECT GT31-273 PART 2.7 QTY TO AS REQ'D, PUR #1846	EMM 01/08/24	C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23
			B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

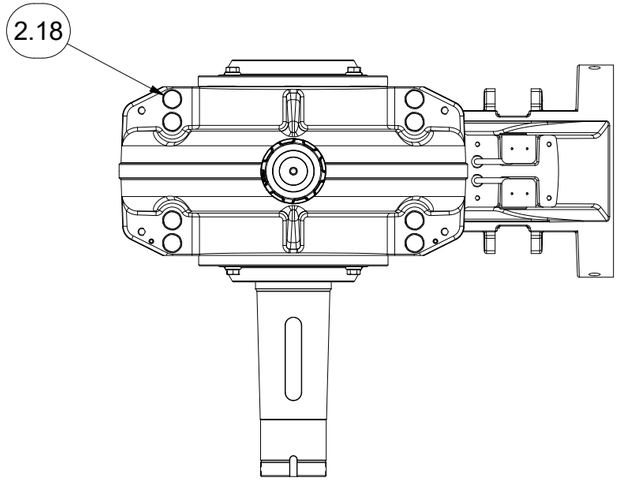
THIRD ANGLE PROJECTION

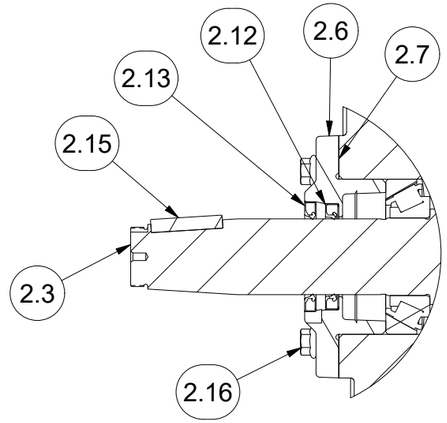
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT31, LEFT HAND

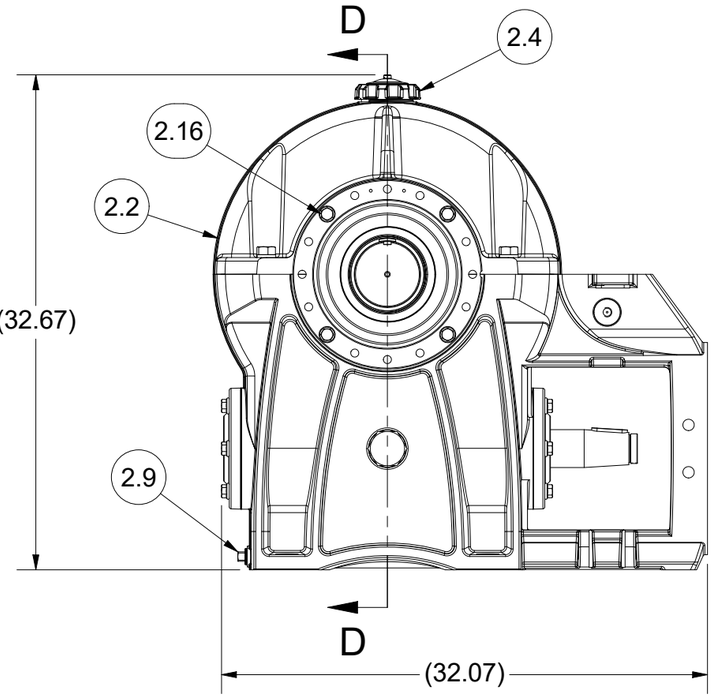
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:16	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/26/2023	GT31-LH SHEET 3

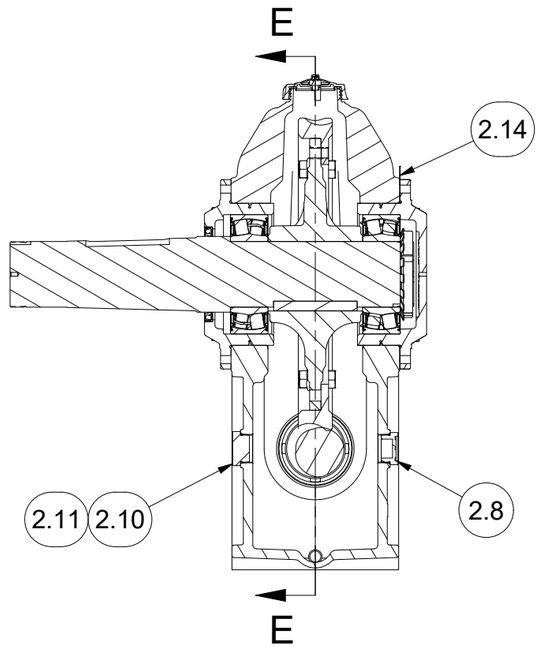


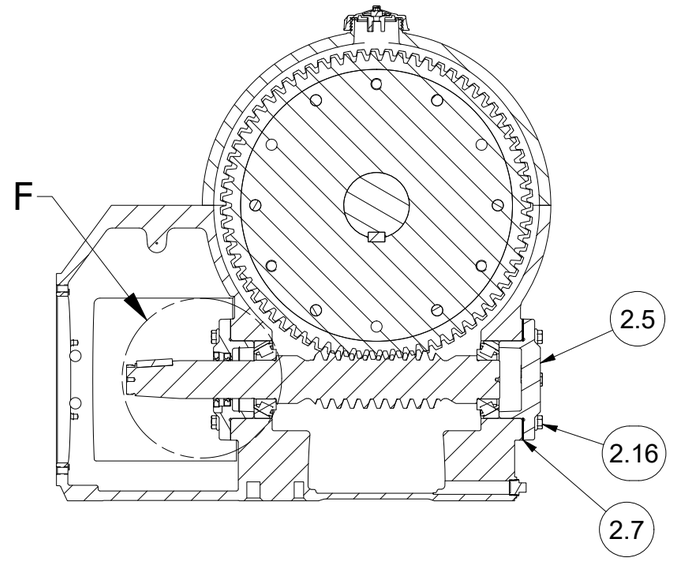


DETAIL F



SECTION D-D





SECTION E-E

D	CORRECT GT31-273 PART 2.7 QTY TO AS REQ'D, PUR #1846	EMM 01/08/24	C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23
			B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT31, LEFT HAND

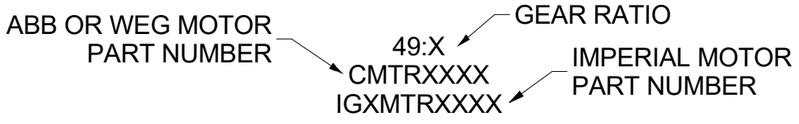
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:10	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/26/2023	GT31-LH SHEET 4

MOTOR CHART 1:1 ROPING														
SPEED	(ft/min)	50	75	100	125	150	175	200	250	300	350	400	450	500
CAP (lbs)	SHEAVE SIZE (in)													
2000	26	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:2 CMTR3005 IG1MTR3515	71:3 CMTR2501 IG3MTR3013	71:3 CMTR4005 IG3MTR3014	71:3 CMTR4005 IG1MTR3515	71:3 CMTR4005 IG3MTR5023
2000	30	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 N/A	71:2 CMTR3005 IG3MTR3014	71:3 CMTR2501 IG3MTR3013	71:3 CMTR2501 IG3MTR3013	71:3 CMTR4005 IG3MTR3014	71:3 CMTR4005 IG1MTR3515
2500	26	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:2 CMTR3005 IG1MTR3515	71:3 CMTR2501 IG3MTR3013	71:3 CMTR4005 IG3MTR3014	71:3 CMTR4005 IG3MTR5023	71:3 CMTR4005 IG3MTR5023
2500	30	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR3005 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:3 CMTR3001 IG3MTR3013	71:3 CMTR3001 IIG3MTR301	71:3 CMTR5005 IG3MTR5014	71:3 CMTR5005 IG3MTR5014
3000	26	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2013	71:1 CMTR1505 IG1MTR1514	71:1 CMTR3005 IG1MTR3515	71:2 CMTR2001 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:2 CMTR3005 IG1MTR3515	71:3 CMTR3001 IG3MTR3013	71:3 CMTR5005 IG3MTR5014	71:3 CMTR5005 IG3MTR5023	71:3 CMTR5005 IG3MTR5023
3000	30	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG1MTR1030	71:1 CMTR2001 IG1MTR1514	71:1 CMTR3005 IG1MTR1514	71:2 CMTR2501 N/A	71:2 CMTR2501 IG1MTR2504	71:2 CMTR2501 IG3MTR3013	71:2 CMTR4005 IG3MTR3014	71:3 CMTR5001 IG3MTR3013	71:3 CMTR5001 IG3MTR5013	71:3 CMTR5005 IG3MTR5014	71:3 CMTR5005 IG3MTR5014
3500	26	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG1MTR1514	71:1 CMTR3005 IG1MTR3515	71:2 CMTR2501 N/A	71:2 CMTR2501 IG3MTR2013	71:2 CMTR4005 IG3MTR3014	71:2 CMTR4005 IG1MTR3515	71:3 CMTR5001 IG3MTR5013	71:3 CMTR5005 IG3MTR5014	71:3 CMTR5005 IG3MTR5023	71:3 CMTR5005 IG3MTR5023
3500	30	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2030	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:2 CMTR2501 N/A	71:2 CMTR2501 IG1MTR2504	71:2 CMTR3001 IG3MTR3013	71:2 CMTR4005 IG3MTR3014	71:3 CMTR5001 IG3MTR5013	71:3 CMTR5001 IG3MTR5013	71:3 CMTR6005 IG3MTR5014	71:3 CMTR6005 IG3MTR5014
4000	26	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG1MTR1514	71:1 CMTR3005 IG1MTR3515	71:2 CMTR2501 N/A	71:2 CMTR2501 IG3MTR3013	71:2 CMTR4005 IG3MTR3014	71:2 CMTR4005 IG3MTR5023	71:3 CMTR5001 IG3MTR5013	71:3 CMTR6005 IG3MTR5014	71:3 CMTR6005 IG3MTR5023	N/A
4000	30	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2030	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:2 CMTR3001 N/A	71:2 CMTR3001 IG1MTR2504	71:2 CMTR3001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:3 CMTR5001 IG3MTR5013	71:3 CMTR5001 IG3MTR5013	71:3 N/A IG3MTR5014	N/A
4500	26	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:1 CMTR3005 IG1MTR3515	71:2 CMTR3001 N/A	71:2 CMTR3001 IG3MTR3013	71:2 CMTR4005 IG3MTR5014	71:2 CMTR4005 IG3MTR5023	71:3 CMTR5001 IG3MTR5013	71:3 CMTR6005 IG3MTR5014	N/A	N/A
4500	30	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2030	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:2 CMTR3001 N/A	71:2 CMTR3001 IG1MTR2504	71:2 CMTR5001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:3 CMTR5001 IG3MTR5013	71:3 CMTR5001 IG3MTR5013	N/A	N/A

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



D	CORRECT GT31-273 PART 2.7 QTY TO AS REQ'D, PUR #1846	EMM 01/08/24	C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23
			B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT31, LEFT HAND

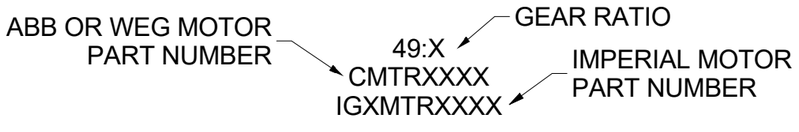
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/26/2023	GT31-LH SHEET 5

MOTOR CHART 1:1 ROPING														
SPEED	(ft/min)	50	75	100	125	150	175	200	250	300	350	400	450	500
CAP (lbs)	SHEAVE SIZE (in)													
5000	26	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:1 CMTR3005 IG1MTR3515	71:2 CMTR3001 N/A	71:2 CMTR3001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:2 CMTR5005 IG3MTR5023	71:3 CMTR5001 IG3MTR5013	N/A	N/A	N/A
5500	26	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:1 CMTR3005 IG1MTR3515	71:2 CMTR5001 N/A	71:2 CMTR5001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:2 CMTR5005 IG3MTR5023	N/A	N/A	N/A	N/A
6000	26	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:1 CMTR3005 IG1MTR3515	71:2 CMTR5001 N/A	71:2 CMTR5001 IG3MTR3013	71:2 CMTR6005 IG3MTR5014	N/A	N/A	N/A	N/A	N/A

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



D	CORRECT GT31-273 PART 2.7 QTY TO AS REQ'D, PUR #1846	EMM 01/08/24	C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23
			B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT31, LEFT HAND

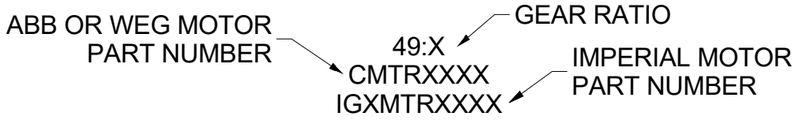
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/26/2023	GT31-LH SHEET 6

MOTOR CHART 2:1 ROPING										
SPEED	(ft/min)	50	75	100	125	150	175	200	225	250
CAP (lbs)	SHEAVE SIZE (in)									
2500	26	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR1001 N/A	71:2 CMTR1505 N/A	71:2 CMTR1505 N/A	71:3 CMTR2001 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A
2500	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR1001 N/A	71:2 CMTR1001 N/A	71:2 CMTR1505 N/A	71:3 CMTR2001 N/A	71:3 CMTR2001 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A
3000	26	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR1001 N/A	71:2 CMTR1505 N/A	71:2 CMTR1505 N/A	71:3 CMTR2001 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A
3000	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 N/A	71:2 CMTR3005 N/A	71:3 CMTR2001 N/A	71:3 CMTR2001 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A
3500	26	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR3005 N/A	71:2 CMTR3005 N/A	71:3 CMTR2001 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A
3500	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 N/A	71:2 CMTR3005 N/A	71:3 CMTR2001 N/A	71:3 CMTR2001 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A
4000	26	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 N/A	71:2 CMTR3005 IG1MTR3515	71:3 CMTR2001 N/A	71:3 CMTR3005 IG3MTR3014	71:3 CMTR3005 N/A	71:3 CMTR3005 IG3MTR3005
4000	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 IG1MTR1514	71:2 CMTR3005 IG3MTR3014	71:3 CMTR2501 N/A	71:3 CMTR2501 IG3MTR3013	71:3 CMTR4005 N/A	71:3 CMTR4005 N/A
4500	26	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 N/A	71:2 CMTR3005 IG1MTR3515	71:3 CMTR2001 N/A	71:3 CMTR3005 IG3MTR3014	71:3 CMTR4005 N/A	71:3 CMTR4005 IG3MTR3005
4500	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:3 CMTR2501 N/A	71:3 CMTR2501 IG3MTR3013	71:3 CMTR4005 N/A	71:3 CMTR4005 N/A
5000	26	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:2 CMTR3005 IG1MTR3515	71:3 CMTR2501 N/A	71:3 CMTR4005 IG3MTR3014	71:3 CMTR4005 N/A	71:3 CMTR4005 IG3MTR5023
5000	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 IG1MTR2504	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:3 CMTR3001 N/A	71:3 CMTR3001 IG3MTR3013	71:3 CMTR4005 N/A	71:3 CMTR4005 IG1MTR3515

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



D	CORRECT GT31-273 PART 2.7 QTY TO AS REQ'D, PUR #1846	EMM 01/08/24	C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23
			B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT31, LEFT HAND

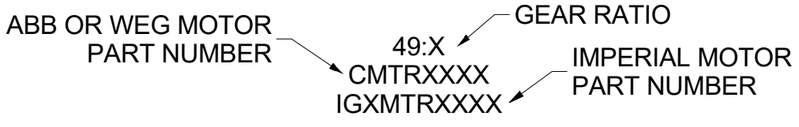
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/26/2023	GT31-LH SHEET 7

MOTOR CHART 2:1 ROPING										
SPEED	(ft/min)	50	75	100	125	150	175	200	225	250
CAP (lbs)	SHEAVE SIZE (in)									
5500	26	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:2 CMTR3005 IG1MTR3515	71:3 CMTR2501 N/A	71:3 CMTR4005 IG3MTR3014	71:3 CMTR4005 N/A	71:3 CMTR4005 IG3MTR5023
5500	30	71:1 CMTR2001 N/A	71:1 CMTR3005 N/A	71:2 CMTR2001 IG1MTR2504	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:3 CMTR3001 N/A	71:3 CMTR3001 IG3MTR3013	71:3 CMTR5005 N/A	71:3 CMTR5005 IG3MTR5014
6000	26	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:2 CMTR3005 IG1MTR3515	71:3 CMTR3001 N/A	71:3 CMTR4005 IG3MTR5014	71:3 CMTR4005 N/A	71:3 CMTR4005 IG3MTR5023
6000	30	71:1 CMTR2001 N/A	71:1 CMTR3005 N/A	71:2 CMTR2001 IG1MTR2504	71:2 CMTR2001 IG3MTR2013	71:2 CMTR4005 IG3MTR3014	71:3 CMTR3001 N/A	71:3 CMTR3001 IG3MTR5013	71:3 CMTR5005 N/A	71:3 CMTR5005 IG3MTR5014
7000	26	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:2 CMTR4005 IG1MTR3515	71:3 CMTR3001 N/A	71:3 CMTR5005 IG3MTR5014	71:3 CMTR5005 N/A	71:3 CMTR5005 IG3MTR5023
7000	30	71:1 CMTR2001 IG3MTR2030	71:1 CMTR3005 N/A	71:2 CMTR2501 IG1MTR2504	71:2 CMTR2501 IG3MTR3013	71:2 CMTR4005 IG3MTR3014	71:3 CMTR5001 N/A	71:3 CMTR5001 IG3MTR5013	71:3 CMTR6005 N/A	71:3 CMTR6005 IG3MTR5014
8000	26	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 N/A	71:2 CMTR2501 IG3MTR2013	71:2 CMTR4005 IG3MTR3014	71:2 CMTR4005 IG3MTR5023	71:3 CMTR5001 N/A	71:3 CMTR5005 IG3MTR5014	N/A	N/A
8000	30	71:1 CMTR2001 IG3MTR2030	71:1 CMTR3005 N/A	71:2 CMTR3001 IG1MTR2504	71:2 CMTR3001 IG3MTR3013	71:2 CMTR4005 IG3MTR5014	71:3 CMTR5001 N/A	71:3 CMTR5001 IG3MTR5013	N/A	N/A
9000	26	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 N/A	71:2 CMTR3001 IG3MTR3013	71:2 CMTR4005 IG3MTR3014	71:2 CMTR4005 IG3MTR5023	71:3 CMTR5001 N/A	71:3 CMTR6005 IG3MTR5014	N/A	N/A
9000	30	71:1 CMTR2001 IG3MTR2030	71:1 CMTR3005 N/A	71:2 CMTR3001 IG1MTR2504	71:2 CMTR3001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:3 CMTR5001 N/A	71:3 CMTR5001 IG3MTR5013	N/A	N/A
10000	26	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 N/A	71:2 CMTR3001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:2 CMTR5005 IG3MTR5023	N/A	N/A	N/A	N/A
12000	26	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 N/A	71:2 CMTR5001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:2 CMTR6005 IG3MTR5023	N/A	N/A	N/A	N/A

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



D	CORRECT GT31-273 PART 2.7 QTY TO AS REQ'D, PUR #1846	EMM 01/08/24	C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23
			B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

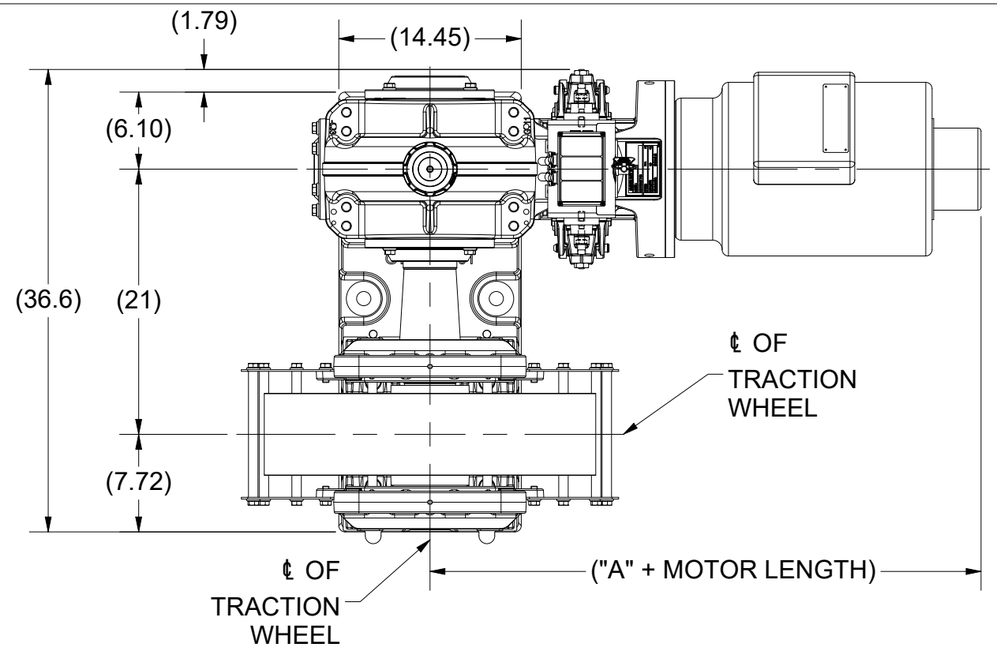
THIRD ANGLE PROJECTION

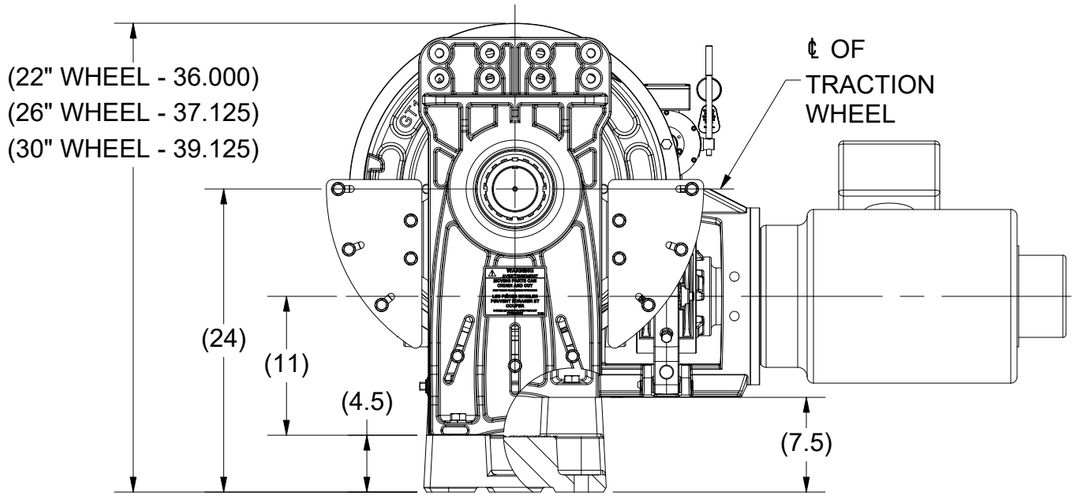
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT31, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/26/2023	GT31-LH SHEET 8



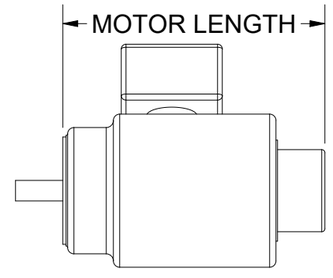


NOTES UNLESS OTHERWISE SPECIFIED:

1. MACHINE AVAILABLE IN 22", 26", AND 30" TRACTION SHEAVES. (26" TRACTION SHEAVE SHOWN).
2. MACHINE COMPATIBLE WITH 254TC, 256TC, 284TC, 286TC, 324TC, 326TC, 364TC, AND 365TC MOTORS.
3. APPROXIMATE MACHINE AND BASE WEIGHT: 2025#
4. MAX SHEAVE SHAFT LOAD: 17,000#
5. BRAKE INFORMATION:
   PICK: 190Vdc, 1.94A, (2.5A Max.)
   HOLD: 80Vdc, 0.81A (1A Max.)

CONTRACT SPECIFIC PARTS LIST ITEMS

PART NUMBER				DESCRIPTION
				MOTOR, C-FLANGE - REFERENCE
GT11BS-080	-01	-02	-03	ASSY, CENTER -01 = 49:1, -02 = 49:2, -03 = 49:3
GT11-294	-01	-02	-03	ASSY, WORM AND BEARING -01 = 49:1, -02 = 49:2, -03 = 49:3
GT31-297	-1.625 -2.125	-1.875 -2.375		COUPLER, MOTOR -1.625 = 1.625", 254TC / 256TC FRAME -1.875 = 1.875", 284TC / 286TC FRAME -2.125 = 2.125", 324TC / 326TC FRAME -2.375 = 2.375", 364TC / 365TC FRAME
GT31	-312	-313		PLATE, ADAPTER, MOTOR -312 = 254TC / 256TC / 284TC / 286TC FRAME -313 = 324TC / 326TC / 364TC / 365TC FRAME
GT11BS-250	-22	-26	-30	ASSY, RETAINER, ROPE -22 = 22", -26 = 26", -30 = 30"
GT11-286	-22	-26	-30	ASSY,TRACTION WHEEL AND HUB -22 = 22", -26 = 26", -30 = 30"



SEE MOTOR PRINT

"A" DIMENSION	
FRAME SIZE	INCHES
254TC / 256TC	18.895
284TC / 286TC	19.135
324TC / 326TC 364TC / 365TC	20.625

			A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23
B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23			

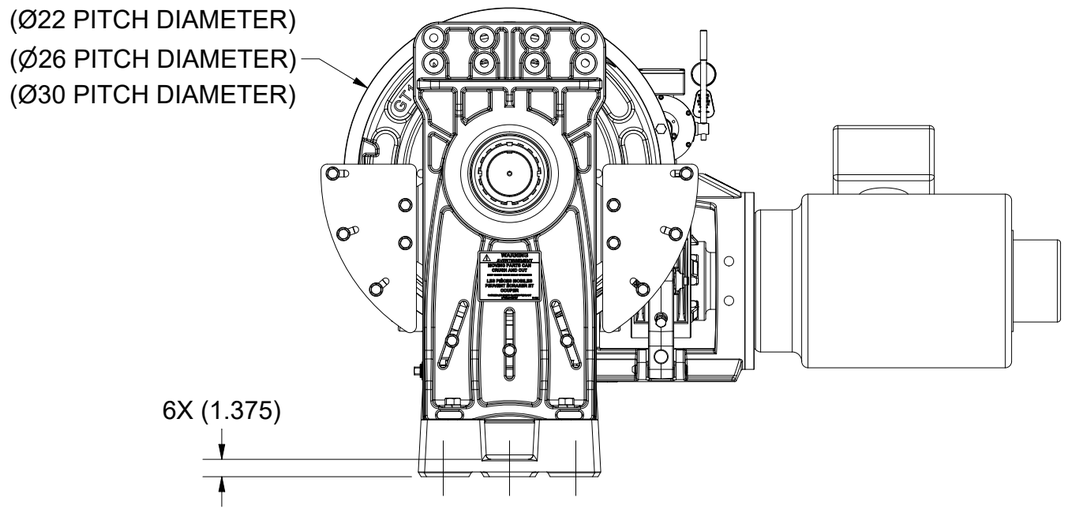
THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

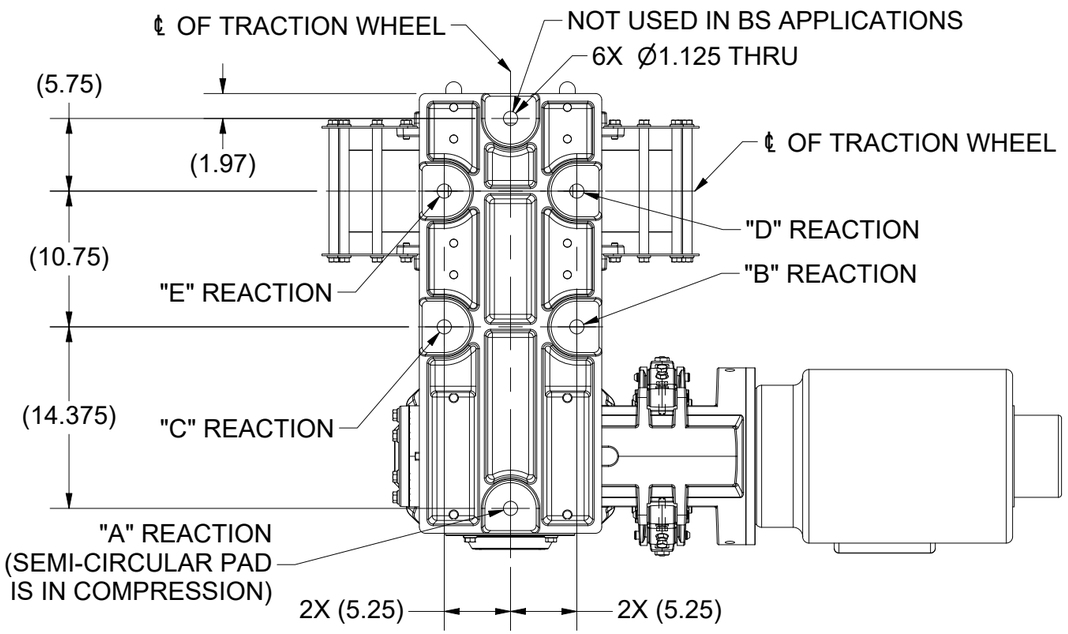
TITLE: ASSY, GT11BS, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:12	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

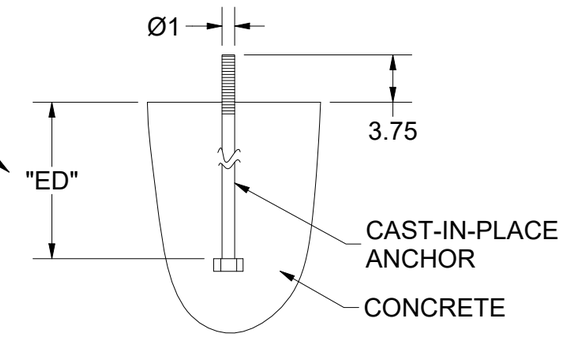
SHEET SIZE	DATE	
B	4/25/2023	GT11BS-LH SHEET 1 OF 10



FOUNDATION BOLT REACTION FORCES			
LOCATION	REACTION TYPE	TO DETERMINE THE LOCATION REACTION FORCE MULTIPLY THE SHEAVE SHAFT LOAD BY THE FOLLOWING % (- SIGN INDICATES FORCE DIRECTION)	TO DETERMINE PSI OF COMPRESSIVE LOAD DIVIDE THE COMPRESSIVE FORCE BY THE FOLLOWING
"A"	COMPRESSION	-10.6%	12.6 in²
"B"	TENSION	12.7%	N/A
"C"	TENSION	12.7%	N/A
"D"	TENSION	42.6%	N/A
"E"	TENSION	42.6%	N/A



CONCRETE GRADE, CAST-IN-PLACE ANCHOR TYPE, AND EMBEDMENT DEPTH ("ED" DIMENSION) TO BE DETERMINED BY THE STRUCTURAL ENGINEER OF RECORD



ANCHOR REACTIONS ASSUMPTIONS:

1. ALL ANCHOR LOADS ARE APPROXIMATE AND SHOULD BE REVIEWED BY THE BUILDING STRUCTURAL ENGINEER OF RECORD.
2. APPROXIMATE ANCHOR LOADS DO NOT INCLUDE ANY LOADING DUE TO A ROPE GRIPPER.
3. APPROXIMATE ANCHOR LOADS ASSUME PLUM VERTICAL DROPS WITH 180 DEGREES OF ROPE CONTACT ON TRACTION SHEAVE.
4. ONLY THE VERTICAL REACTION COMPONENT IS GIVEN AS AN APPROXIMATE ANCHOR LOAD.
5. APPROXIMATE ANCHOR LOADS NEGLECT THE WEIGHT OF THE MACHINE.
6. APPROXIMATE ANCHOR LOADS ARE BASED ONLY ON THE TRACTION SHEAVE SHAFT LOAD AND ARE NOT DOUBLED FOR IMPACT OR OTHER SYSTEM CONDITIONS.
7. APPROXIMATE ANCHOR LOADS DO NOT ASSUME ANY SEISMIC LOADING CONDITIONS.

NOTES UNLESS OTHERWISE SPECIFIED:

1. FOUNDATION/ANCHORING SHALL BE DESIGNED BY OTHERS ON THE ABOVE SPECIFICATIONS. HOLLISTER-WHITNEY ASSUMES NO RESPONSIBILITY FOR THE DESIGN OF THE FOUNDATION.

			A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23
B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23			

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

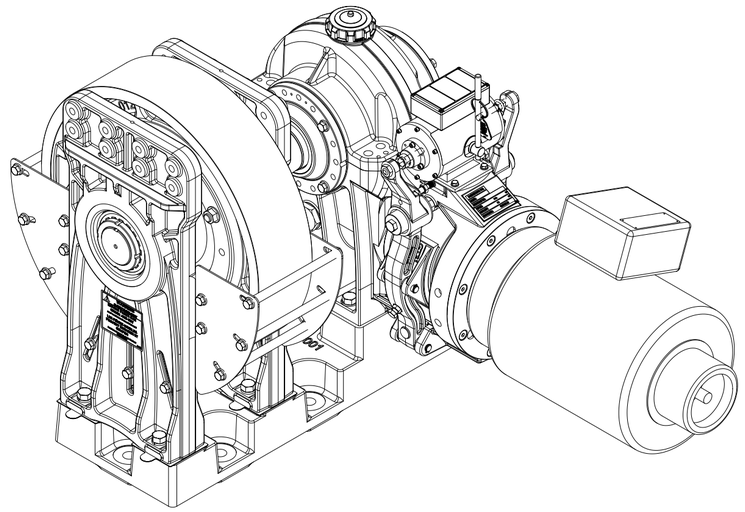
TITLE: ASSY, GT11BS, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:12	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

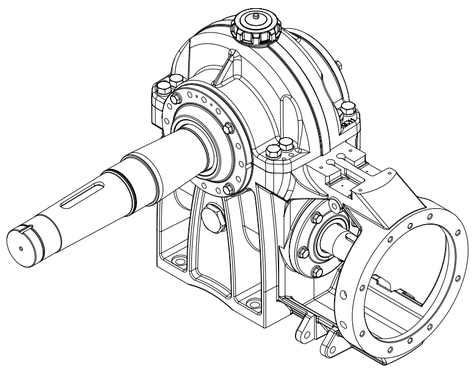
SHEET SIZE	DATE	
B	4/25/2023	GT11BS-LH SHEET 2 OF 10

ENGINEERING MASTER PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	GT11BS-273-01	ASSY, GEAR BOX, SINGLE LEAD, 49:1
		GT11BS-273-02	ASSY, GEAR BOX, DOUBLE LEAD, 49:2
		GT11BS-273-03	ASSY, GEAR BOX, TRIPLE LEAD, 49:3
2	1	GT11BS-001	BASE, BS/OD
3	1	GT11BS-005	STAND, OUTBOARD, BS
4	1	GT11BS-006	STAND, INBOARD, BS
5	1	GT11-093	BEARING, ROLLER, SPHERICAL
6	0	GT11BS-250-22	ASSY, RETAINER, ROPE, BS, 22"
		GT11BS-250-26	ASSY, RETAINER, ROPE, BS, 26"
		GT11BS-250-30	ASSY, RETAINER, ROPE, BS, 30"
7	1	GT11-282	NUT, LOCK, SHAFT
8	1	GT11-283	WASHER, LOCK, SHAFT
9	0	GT11-286-22	ASSY,TRACTION WHEEL AND HUB, 22"
		GT11-286-26	ASSY,TRACTION WHEEL AND HUB, 26"
		GT11-286-30	ASSY,TRACTION WHEEL AND HUB, 30"
10	2	GT11-315	ASSY, ARM, BRAKE
11	1	GT11-326	PLATE, RETENTION, BEARING, STAND
12	1	GT11BS-368	RETAINING RING, SPIRAL, MEDIUM DUTY
13	AS REQ'D	GT31-062-05	SHIM, STAND, OUTBOARD, 0.0050" THK
		GT31-062-10	SHIM, STAND, OUTBOARD, 0.0100" THK
		GT31-062-31	SHIM, STAND, OUTBOARD, 0.0310" THK
14	1	GT31-093	BEARING, ROLLER, SPHERICAL
15	2	GT31-290	CONDUIT, METAL, FLEXIBLE, 3/8"
16	2	GT31-291	ADAPTER, FMC, 90 DEG ELBOW, 3/8"
17	2	GT31-293	ADAPTER, STRAIGHT, FMC, 3/8"
18	1	GT31-297-1.625	COUPLER, MOTOR, 1.625", 254TC / 256TC FRAME
		GT31-297-1.875	COUPLER, MOTOR, 1.875", 284TC / 286TC FRAME
		GT31-297-2.125	COUPLER, MOTOR, 2.125", 324TC / 326TC FRAME
		GT31-297-2.375	COUPLER, MOTOR, 2.125", 364TC / 365TC FRAME
19	1	GT31-298	ELEMENT, COUPLING
20	2	GT31-299	BUSHING, ANTI-SHORT, FEMALE, FMC, 3/8"
21	1	GT11-300	KEY, SHAFT, WHEEL
22	1	GT31-310	NUT, LOCK, SHAFT
23	1	GT31-311	WASHER, LOCK, SHAFT
24	1	GT31-312	PLATE, ADAPTER, MOTOR, 254TC / 256TC / 284TC / 286TC FRAME
		GT31-313	PLATE, ADAPTER, MOTOR, 324TC / 326TC / 364TC / 365TC FRAME
25	1	GT31-314	ASSY, SOLENOID, BRAKE
26	2	GT31-321	PIN, PIVOT
27	1	GT31-322	DRUM, BRAKE
28	2	GT31-327	ASSY, SWITCH, BRAKE
29	1	GT31-358	ASSY, BLOCK, TERMINAL
30	1	P-208	MANUAL BRAKE RELEASE TAG
31	1	P-226	LABEL, DATA, ELECTRICAL, BRAKE
32	1	P-227	LABEL, INSTRUCTION, BRAKE
33	1	P-228	LABEL, WIRING, BRAKE
34	1	P-230	NAMEPLATE, SMALL, HOLLISTER-WHITNEY
35	1	P-231	TAG, DATA, MOTOR, CONTRACT
36	1	P-236	MACHINE DATA TAG
37	4	#6 - 32 UNC x 7/8"	SCREW, HEX HEAD
38	4	5/16" - 18 UNC x 3/4"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
39	1	7/16" - 14 UNC x 2-1/4"	SCREW, HEX, CAP, SOCKET HEAD, BLACK OXIDE FINISH
40	AS REQ'D	1/2" - 13 UNC x 1-1/2"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
41	AS REQ'D	1/2" - 13 UNC x 1-1/2"	SCREW, HEX, CAP, FLAT SOCKET HEAD, BLACK OXIDE FINISH
42	4	5/8" - MS 16624	RING, RETAINING, EXTERNAL, SERIES 3100
43	6	5/8" x 1-1/2"	PIN, DOWEL, GROUND, HARDENED
44	AS REQ'D	5/8" - 11 UNC x 1-1/2"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
45	12	3/4"	LOCK WASHER, HELICAL SPRING, REGULAR
46	12	3/4" - 10 UNC x 2-1/2"	HEX CAP SCREW, GRADE 5, BLACK OXIDE FINISH
47	1.75 gal	MOBIL SHC 636	OIL, GEAR, HIGH PRESSURE

GT11-273 PARTS LIST					
ITEM	QTY GT11BS-273-01	QTY GT11BS-273-02	QTY GT11BS-273-03	PART NUMBER	DESCRIPTION
2.1	1	0	0	GT11BS-080-01	ASSY, CENTER, BS/OD, SINGLE LEAD
2.1	0	1	0	GT11BS-080-02	ASSY, CENTER, BS/OD, DOUBLE LEAD
2.1	0	0	1	GT11BS-080-03	ASSY, CENTER, BS/OD, TRIPLE LEAD
2.2	1	1	1	GT11-284	ASSY, UPPER AND LOWER HOUSING, MACHINED
2.3	1	0	0	GT11-294-01	ASSY, WORM SHAFT AND BEARING, 7/8" SINGLE
2.3	0	1	0	GT11-294-02	ASSY, WORM SHAFT AND BEARING, 7/8" DOUBLE
2.3	0	0	1	GT11-294-03	ASSY, WORM SHAFT AND BEARING, 7/8" TRIPLE
2.4	1	1	1	GT31-063	CAP, FILL, OIL
2.5	1	1	1	GT31-085	CAP, BEARING, REAR END
2.6	1	1	1	GT31-085-FE	CAP, BEARING, FORWARD END
2.7	AS REQ'D	AS REQ'D	AS REQ'D	GT31-087	SHIM, CAP, BEARING
2.8	1	1	1	GT31-276	GLASS, SIGHT, OIL
2.9	1	1	1	GT31-277	PLUG, DRAIN, OIL
2.10	1	1	1	GT31-278	PLUG, OIL
2.11	1	1	1	GT31-279	O-RING, PLUG, OIL
2.12	1	1	1	GT31-287	SEAL, SHAFT, RADIAL
2.13	1	1	1	GT31-287-1	SEAL, SHAFT, RADIAL
2.14	4	4	4	GT31-295	SHIM, ECCENTRIC, EDGE BONDED
2.15	1	1	1	GT31-301	KEY, SHAFT, WORM
2.16	20	20	20	1/2"-13 UNC X 1.5"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED



GT11BS-LH
SCALE 1:10



GT11BS-273
SCALE 1:10

B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

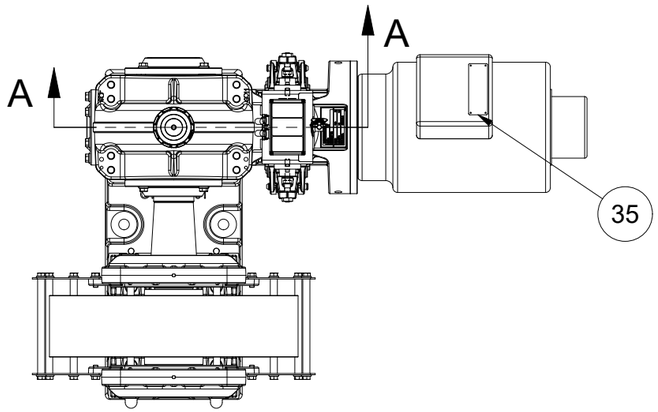
THIRD ANGLE PROJECTION

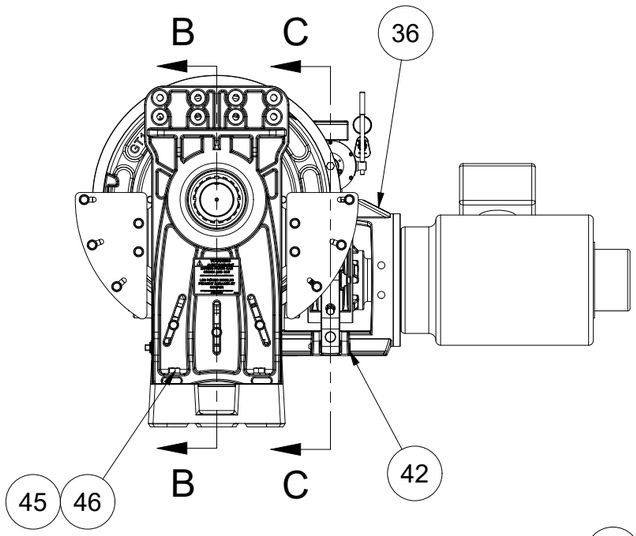
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

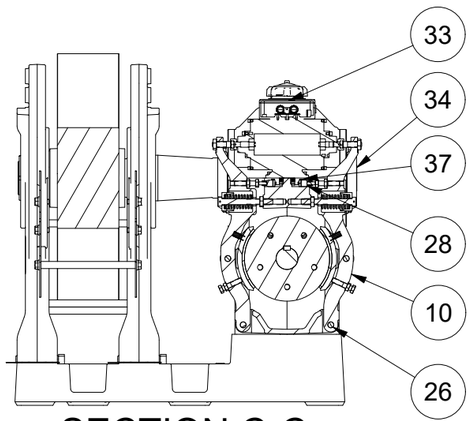
TITLE: ASSY, GT11BS, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:10	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

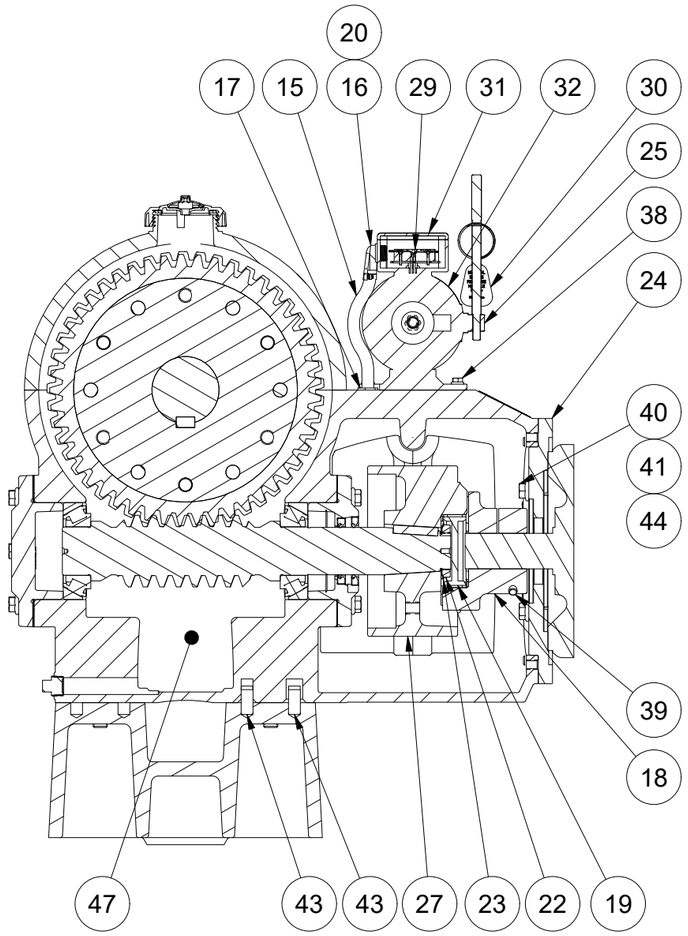
SHEET SIZE	DATE	
C	4/25/2023	GT11BS-LH SHEET 3 OF 10



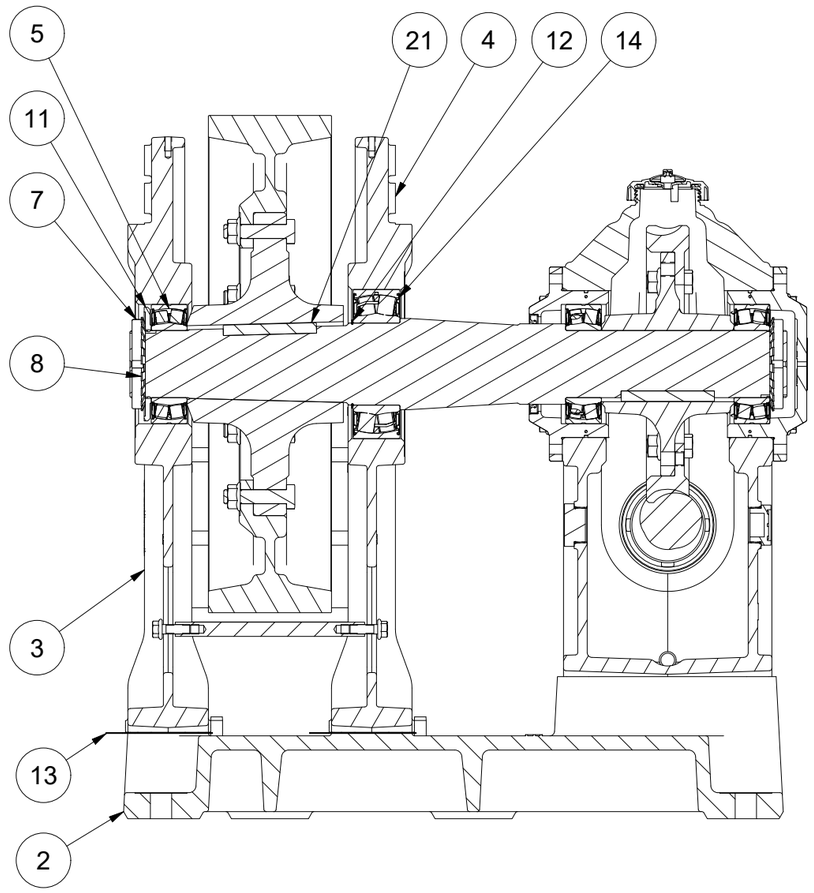




SECTION C-C
SCALE 1:16



SECTION A-A
SCALE 1:8



SECTION B-B
SCALE 1:8

B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

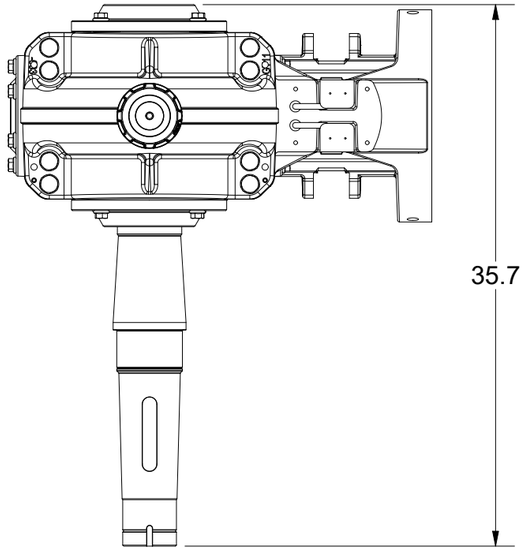
THIRD ANGLE PROJECTION

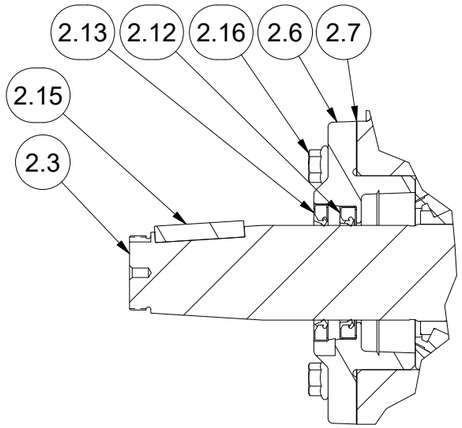
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11BS, LEFT HAND

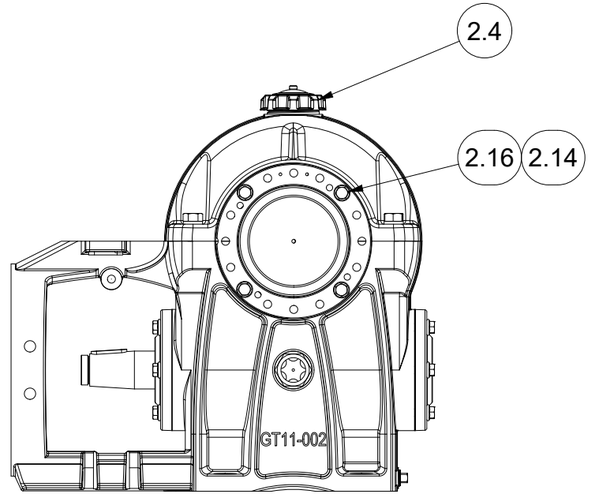
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:16	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11BS-LH SHEET 4 OF 10

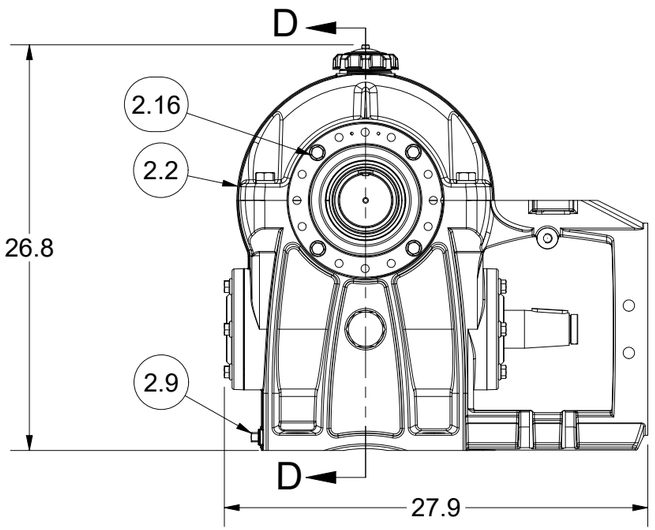


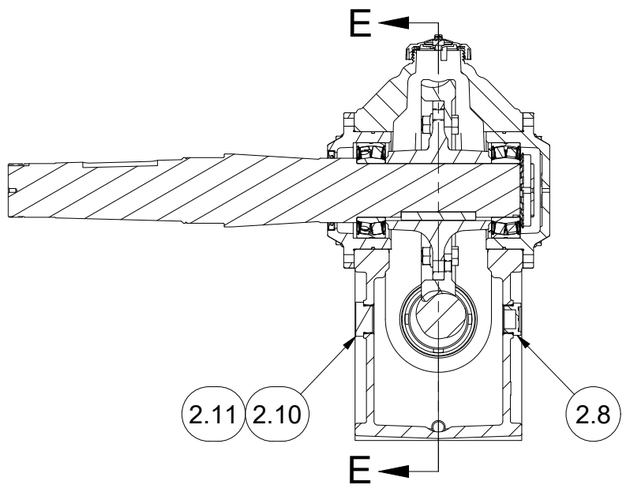


DETAIL F
SCALE 1:4

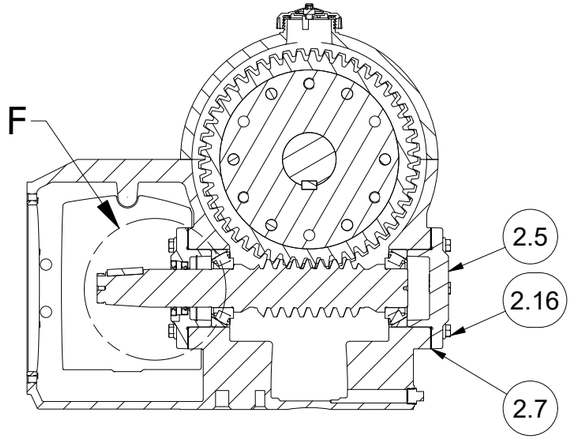


OPPOSING SIDE VIEW





SECTION D-D



SECTION E-E

			A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23
B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23			

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11BS, LEFT HAND

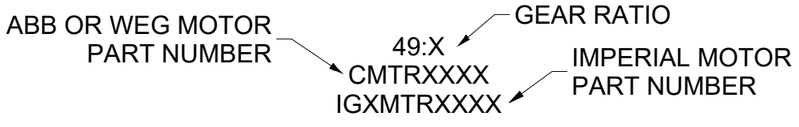
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:10	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11BS-LH SHEET 5 OF 10

MOTOR CHART 1:1 ROPING														
SPEED	(ft/min)	50	75	100	125	150	175	200	250	300	350	400	450	500
CAP (lbs)	SHEAVE SIZE (in)													
1000	22	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1505 IG1MTR1514	49:1 CMTR1505 N/A	49:2 CMTR1001 IG1MTR1030	49:2 CMTR2001 IG1MTR1031	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 IG1MTR3515	49:3 CMTR2001 IG3MTR2013	49:3 CMTR3005 IG3MTR3014	49:3 CMTR3005 IG1MTR3515
1000	26	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1505 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG1MTR1514	49:3 CMTR2501 IG1MTR2504	49:3 CMTR2501 IG3MTR2013	49:3 CMTR2501 IG3MTR3013
1000	30	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG1MTR2504	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	49:2 CMTR3005 IG1MTR3515	49:2 CMTR3005 IG1MTR3515
1500	22	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1505 IG1MTR1514	49:1 CMTR1505 N/A	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 IG1MTR3515	49:3 CMTR2501 IG3MTR3013	49:3 CMTR4005 IG3MTR3014	49:3 CMTR4005 IG1MTR3515
1500	26	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1505 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	49:3 CMTR3001 IG1MTR2504	49:3 CMTR3001 IG3MTR3013	49:3 CMTR3001 IG3MTR3013
1500	30	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG1MTR2504	49:2 CMTR2001 IG3MTR2013	49:2 CMTR4005 IG3MTR3014	49:2 CMTR4005 IG1MTR3515	49:2 CMTR4005 IG1MTR3515
2000	22	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1505 IG1MTR1514	49:1 CMTR1505 N/A	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	49:2 CMTR3005 IG1MTR3515	49:3 CMTR3001 IG3MTR3013	49:3 CMTR4005 IG3MTR3014	49:3 CMTR4005 IG1MTR3515
2000	26	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 IG1MTR1030	49:1 CMTR2001 IG1MTR1031	49:1 CMTR3005 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR4005 IG3MTR3014	49:3 CMTR5001 IG1MTR2504	49:3 CMTR5001 IG3MTR3013	49:3 CMTR5001 IG3MTR3013
2000	30	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 IG1MTR1030	49:1 CMTR2001 IG1MTR1031	49:1 CMTR2001 N/A	49:1 CMTR3005 IG1MTR1514	49:2 CMTR2501 IG3MTR2030	49:2 CMTR2501 IG1MTR2504	49:2 CMTR2501 IG3MTR3013	49:2 CMTR4005 IG3MTR3014	49:2 CMTR4005 IG1MTR3515	49:2 CMTR4005 IG1MTR3515
2500	22	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1030	49:1 CMTR2001 IG1MTR1031	49:1 CMTR3005 IG1MTR1514	49:1 CMTR3005 N/A	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2501 IG3MTR2013	49:2 CMTR4005 IG3MTR3014	49:2 CMTR4005 IG1MTR3515	GT31	GT31	GT31
2500	26	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 IG1MTR1030	49:1 CMTR2001 IG3MTR2013	49:1 CMTR3005 N/A	49:2 CMTR2501 IG1MTR1729	49:2 CMTR2501 IG3MTR2030	49:2 CMTR2501 IG3MTR3013	49:2 CMTR4005 IG3MTR3014	GT31	GT31	GT31
2500	30	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 IG1MTR1030	49:1 CMTR2001 IG1MTR2504	49:1 CMTR2001 N/A	49:1 CMTR3005 IG3MTR3014	49:2 CMTR3001 IG3MTR2030	49:2 CMTR3001 IG1MTR2504	49:2 CMTR3001 IG3MTR3013	GT31	GT31	GT31

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11BS, LEFT HAND

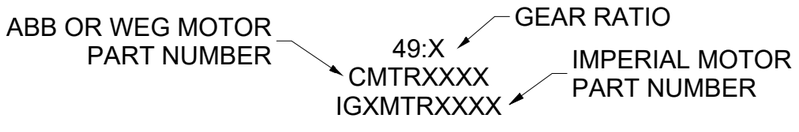
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11BS-LH SHEET 6 OF 10

MOTOR CHART 1:1 ROPING														
SPEED	(ft/min)	50	75	100	125	150	175	200	250	300	350	400	450	500
CAP (lbs)	SHEAVE SIZE (in)													
3000	22	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1030	49:1 CMTR2001 IG3MTR2013	49:1 CMTR3005 IG1MTR1514	49:1 CMTR3005 N/A	49:2 CMTR2501 IG3MTR2030	GT31	GT31	GT31	GT31	GT31	GT31
3000	26	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 IG3MTR2030	49:1 CMTR2001 IG3MTR2013	49:1 CMTR3005 N/A	49:2 CMTR3001 IG1MTR1729	GT31	GT31	GT31	GT31	GT31	GT31
3000	30	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 IG3MTR2030	49:1 CMTR2001 IG1MTR2504	49:1 CMTR2001 N/A	49:1 CMTR3005 IG3MTR3014	GT31	GT31	GT31	GT31	GT31	GT31

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11BS, LEFT HAND

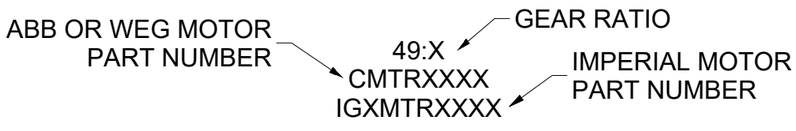
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11BS-LH SHEET 7 OF 10

MOTOR CHART 2:1 ROPING										
SPEED	(ft/min)	50	75	100	125	150	175	200	225	250
CAP (lbs)	SHEAVE SIZE (in)									
1000	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 IG1MTR1514	49:2 CMTR1505 N/A	49:3 CMTR1001 IG1MTR1514	49:3 CMTR1505 N/A	49:3 CMTR1505 IG1MTR3515
1000	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR1001 IG1MTR1729	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 N/A	49:3 CMTR1001 IG1MTR1031	49:3 CMTR1001 N/A	49:3 CMTR1001 IG1MTR1514
1000	30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1001 N/A	49:2 CMTR1505 IG1MTR1514	49:2 CMTR1505 N/A	49:2 CMTR1505 IG1MTR3515
1500	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 IG1MTR1514	49:2 CMTR1505 N/A	49:3 CMTR1001 IG1MTR1514	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515
1500	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR1001 IG1MTR1729	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 N/A	49:3 CMTR2001 IG1MTR1031	49:3 CMTR2001 N/A	49:3 CMTR2001 IG3MTR2013
1500	30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1001 N/A	49:2 CMTR1505 IG1MTR1514	49:2 CMTR1505 N/A	49:2 CMTR1505 IG1MTR3515
2000	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 IG1MTR1514	49:2 CMTR1505 N/A	49:3 CMTR2001 IG1MTR1514	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515
2000	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR1001 IG1MTR1729	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 N/A	49:3 CMTR2001 IG1MTR2504	49:3 CMTR2001 N/A	49:3 CMTR2001 IG3MTR2013
2000	30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG1MTR1031	49:2 CMTR2001 N/A	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 N/A	49:2 CMTR3005 IG1MTR3515
2500	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 N/A	49:3 CMTR2001 IG3MTR2013	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515
2500	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 N/A	49:3 CMTR2001 IG1MTR2504	49:3 CMTR2001 N/A	49:3 CMTR2001 IG3MTR2013
2500	30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG1MTR2504	49:2 CMTR2001 N/A	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 N/A	49:2 CMTR3005 IG1MTR3515

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAIL AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11BS, LEFT HAND

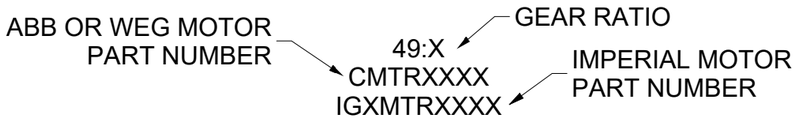
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11BS-LH SHEET 8 OF 10

MOTOR CHART 2:1 ROPING										
SPEED	(ft/min)	50	75	100	125	150	175	200	225	250
CAP (lbs)	SHEAVE SIZE (in)									
3000	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG1MTR1031	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 N/A	49:3 CMTR2001 IG3MTR2013	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515
3000	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 N/A	49:3 CMTR2501 IG1MTR2504	49:3 CMTR2501 N/A	49:3 CMTR2501 IG3MTR3013
3000	30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG1MTR2504	49:2 CMTR2001 N/A	49:2 CMTR3005 IG3MTR3014	49:2 CMTR3005 N/A	49:2 CMTR3005 IG1MTR3515
3500	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 N/A	49:3 CMTR2001 IG3MTR2013	49:3 CMTR4005 N/A	49:3 CMTR4005 IG1MTR3515
3500	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 N/A	49:3 CMTR2501 IG1MTR2504	49:3 CMTR2501 N/A	49:3 CMTR2501 IG3MTR3013
3500	30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG1MTR2504	49:2 CMTR2001 N/A	49:2 CMTR3005 IG3MTR3014	49:2 CMTR3005 N/A	49:2 CMTR3005 IG1MTR3515
4000	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	49:2 CMTR3005 N/A	49:3 CMTR2501 IG3MTR3013	49:3 CMTR4005 N/A	49:3 CMTR4005 IG1MTR3515
4000	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 N/A	49:3 CMTR3001 IG1MTR2504	49:3 CMTR3001 N/A	49:3 CMTR3001 IG3MTR3013
4000	30	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:1 CMTR3005 IG1MTR1514	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2501 IG1MTR2504	49:2 CMTR2501 N/A	49:2 CMTR4005 IG3MTR3014	49:2 CMTR4005 N/A	49:2 CMTR4005 IG1MTR3515
4500	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	GT31	GT31	GT31	GT31
4500	26	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	GT31	GT31	GT31	GT31
4500	30	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:1 CMTR3005 IG1MTR1514	49:2 CMTR2501 IG3MTR2030	49:2 CMTR2501 IG1MTR2504	GT31	GT31	GT31	GT31

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11BS, LEFT HAND

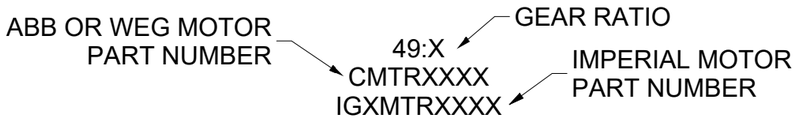
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11BS-LH SHEET 9 OF 10

MOTOR CHART 2:1 ROPING										
SPEED	(ft/min)	50	75	100	125	150	175	200	225	250
CAP (lbs)	SHEAVE SIZE (in)									
5000	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	GT31	GT31	GT31	GT31
5000	26	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:2 CMTR2501 IG1MTR1729	49:2 CMTR2501 IG3MTR2030	49:2 CMTR2501 IG3MTR2013	GT31	GT31	GT31	GT31
5000	30	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:1 CMTR3005 IG1MTR1514	49:2 CMTR2501 IG3MTR2030	49:2 CMTR3001 IG1MTR2504	GT31	GT31	GT31	GT31
5500	22	49:1 CMTR2001 IG1MTR1030	49:1 CMTR3005 N/A	49:2 CMTR2001 IG3MTR2030	GT31	GT31	GT31	GT31	GT31	GT31
5500	26	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:2 CMTR2501 IG1MTR1729	GT31	GT31	GT31	GT31	GT31	GT31
5500	30	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:1 CMTR3005 IG3MTR3014	GT31	GT31	GT31	GT31	GT31	GT31
6000	22	49:1 CMTR2001 IG1MTR1030	49:1 CMTR3005 N/A	49:2 CMTR2501 IG3MTR2030	GT31	GT31	GT31	GT31	GT31	GT31
6000	26	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:2 CMTR3001 IG1MTR1729	GT31	GT31	GT31	GT31	GT31	GT31
6000	30	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:1 CMTR3005 IG3MTR3014	GT31	GT31	GT31	GT31	GT31	GT31

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

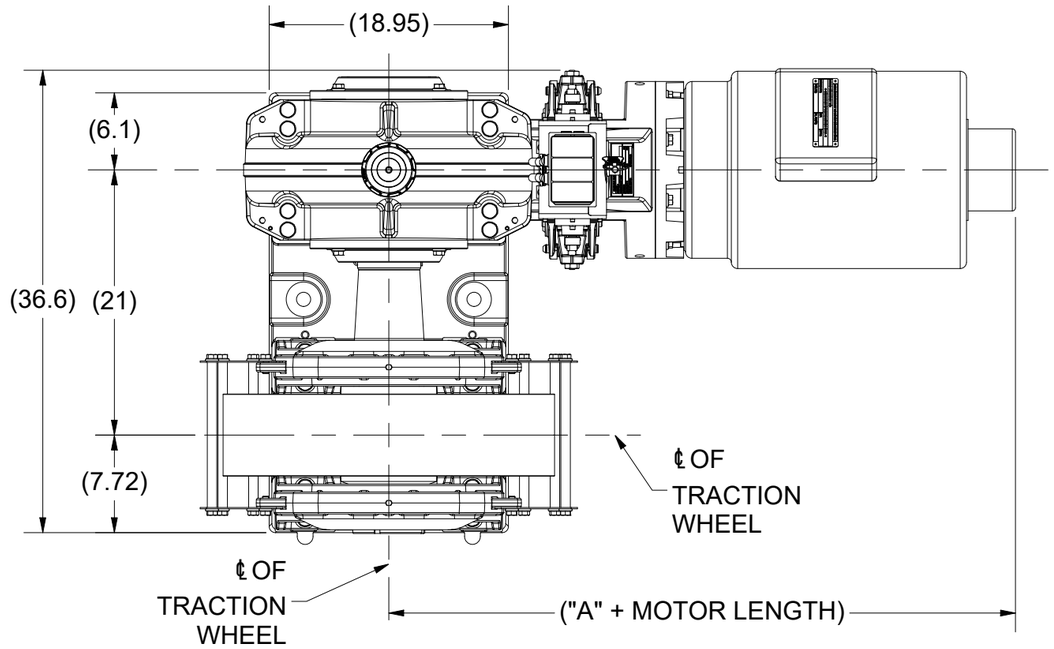
THIRD ANGLE PROJECTION

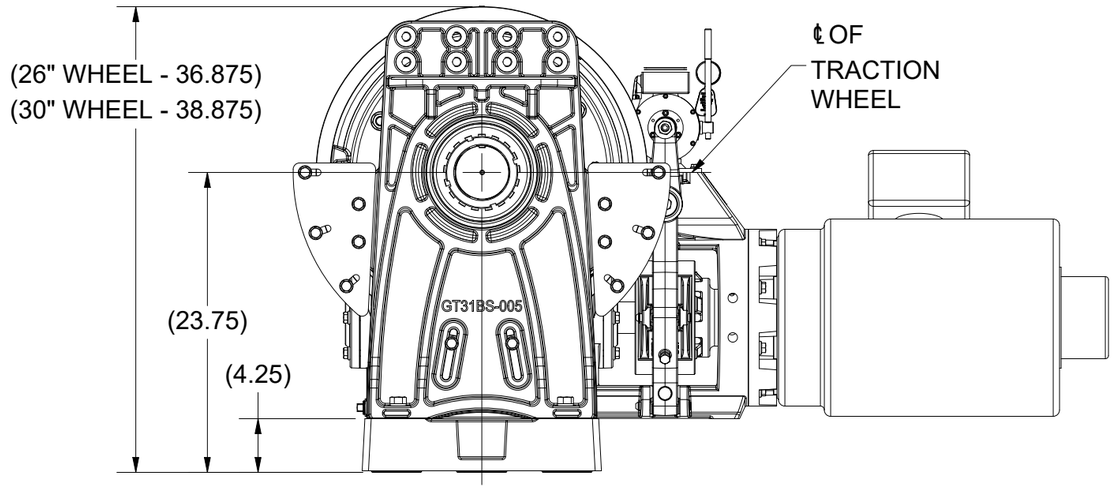
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11BS, LEFT HAND

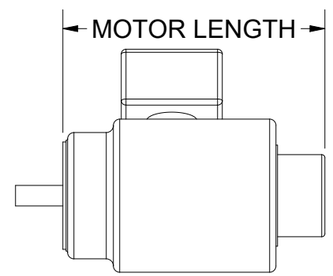
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11BS-LH SHEET 10 OF 10





CONTRACT SPECIFIC PARTS LIST ITEMS				
PART NUMBER				DESCRIPTION
				MOTOR, C-FLANGE - REFERENCE
GT31BS-080	-01	-02	-03	ASSY, CENTER -01 = 71:1, -02 = 71:2, -03 = 71:3
GT31-294	-01	-02	-03	ASSY, WORM AND BEARING -01 = 71:1, -02 = 71:2, -03 = 71:3
GT31-297	-1.625 -2.125	-1.875 -2.375		COUPLER, MOTOR -1.625 = 1.625", 254TC / 256TC FRAME -1.875 = 1.875", 284TC / 286TC FRAME -2.125 = 2.125", 324TC / 326TC FRAME -2.375 = 2.375", 364TC / 365TC FRAME
GT31	-312	-313		PLATE, ADAPTER, MOTOR -312 = 254TC / 256TC / 284TC / 286TC FRAME -313 = 324TC / 326TC / 364TC / 365TC FRAME
GT31-250	-26	-30		ASSY, RETAINER, ROPE -26 = 26", -30 = 30"
GT31-286	-26	-30		ASSY,TRACTION WHEEL AND HUB -26 = 26", -30 = 30"



SEE MOTOR PRINT

"A" DIMENSION	
FRAME SIZE	INCHES
254TC / 256TC	21.395
284TC / 286TC	21.635
324TC /326TC 364TC / 365TC	23.125

NOTES UNLESS OTHERWISE SPECIFIED:

1. MACHINE AVAILABLE IN 26" AND 30" TRACTION SHEAVES. (26" TRACTION SHEAVE SHOWN).
2. MACHINE COMPATIBLE WITH 254TC, 256TC, 284TC, 286TC, 324TC, 326TC, 364TC, AND 365TC MOTORS.
3. APPROXIMATE MACHINE AND BASE WEIGHT: 2435#
4. MAX SHEAVE SHAFT LOAD: 25,000#
5. BRAKE INFORMATION:
   PICK: 190Vdc, 1.94A, (2.5A Max.)
   HOLD: 80Vdc, 0.81A (1A Max.)

			C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23
D	CORRECTED PART NUMBER, PUR #1808	DRO 08/18/23	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

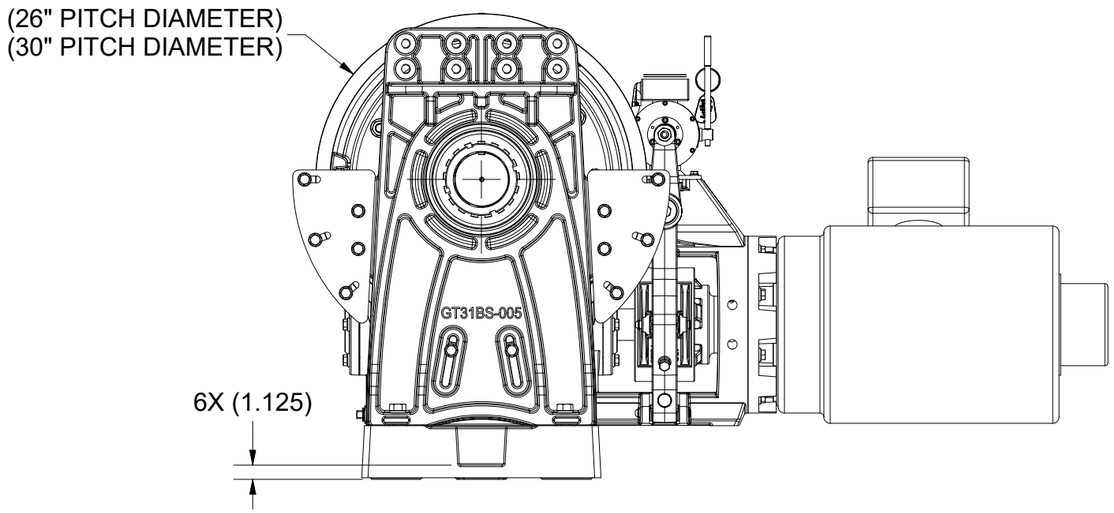
THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

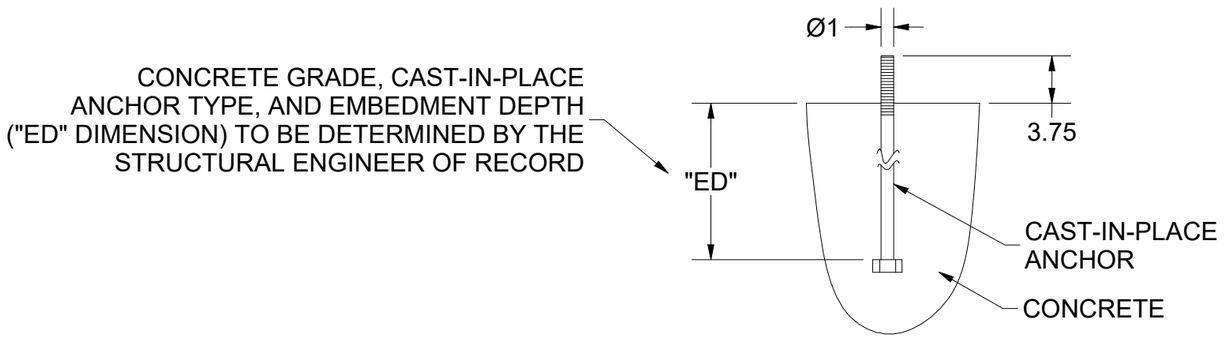
TITLE: ASSY, GT31, LEFT HAND, BS

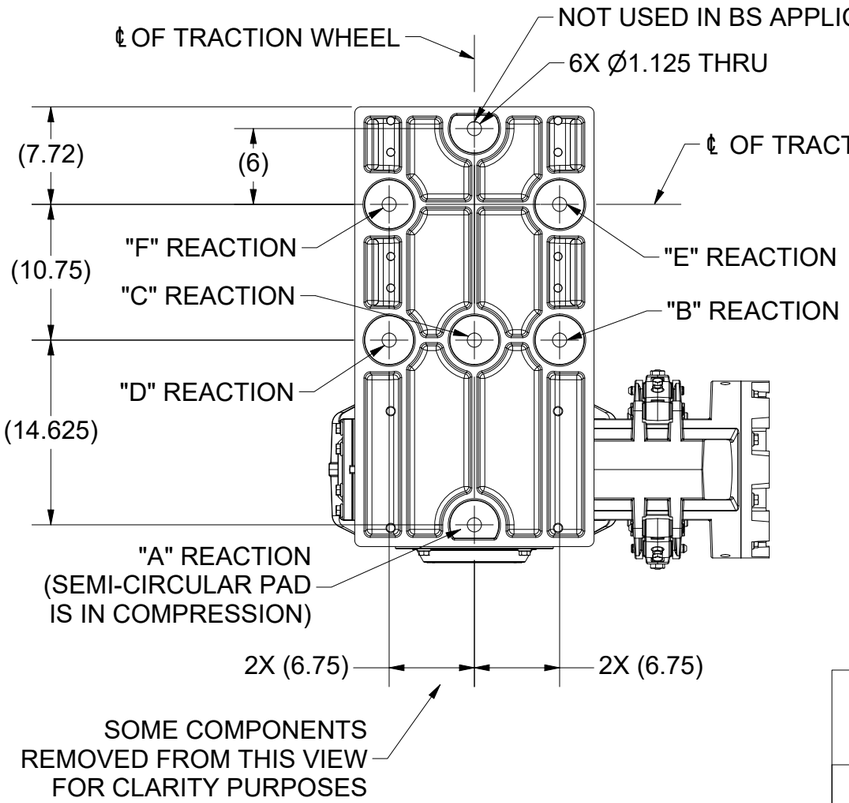
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:12	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/8/2023	GT31BS-LH SHEET 1



FOUNDATION BOLT REACTION FORCES			
LOCATION	REACTION TYPE	TO DETERMINE THE LOCATION REACTION FORCE MULTIPLY THE SHEAVE SHAFT LOAD BY THE FOLLOWING % (- SIGN INDICATES FORCE DIRECTION)	TO DETERMINE PSI OF COMPRESSIVE LOAD DIVIDE THE COMPRESSIVE FORCE BY THE FOLLOWING
"A"	COMPRESSION	-11%	8.6 in^2
"B"	TENSION	11%	N/A
"C"	TENSION	5%	N/A
"D"	TENSION	11%	N/A
"E"	TENSION	42%	N/A
"F"	TENSION	42%	N/A





ANCHOR REACTIONS ASSUMPTIONS:

1. ALL ANCHOR LOADS ARE APPROXIMATE AND SHOULD BE REVIEWED BY THE BUILDING STRUCTURAL ENGINEER OF RECORD.
2. APPROXIMATE ANCHOR LOADS DO NOT INCLUDE ANY LOADING DUE TO A ROPE GRIPPER.
3. APPROXIMATE ANCHOR LOADS ASSUME PLUM VERTICAL DROPS WITH 180 DEGREES OF ROPE CONTACT ON TRACTION SHEAVE.
4. ONLY THE VERTICAL REACTION COMPONENT IS GIVEN AS AN APPROXIMATE ANCHOR LOAD.
5. APPROXIMATE ANCHOR LOADS NEGLECT THE WEIGHT OF THE MACHINE.
6. APPROXIMATE ANCHOR LOADS ARE BASED ONLY ON THE TRACTION SHEAVE SHAFT LOAD AND ARE NOT DOUBLED FOR IMPACT OR OTHER SYSTEM CONDITIONS.
7. APPROXIMATE ANCHOR LOADS DO NOT ASSUME ANY SEISMIC LOADING CONDITIONS.

NOTES UNLESS OTHERWISE SPECIFIED:

1. FOUNDATION/ANCHORING SHALL BE DESIGNED BY OTHERS ON THE ABOVE SPECIFICATIONS. HOLLISTER-WHITNEY ASSUMES NO RESPONSIBILITY FOR THE DESIGN OF THE FOUNDATION.

			C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23
D	CORRECTED PART NUMBER, PUR #1808	DRO 08/18/23	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

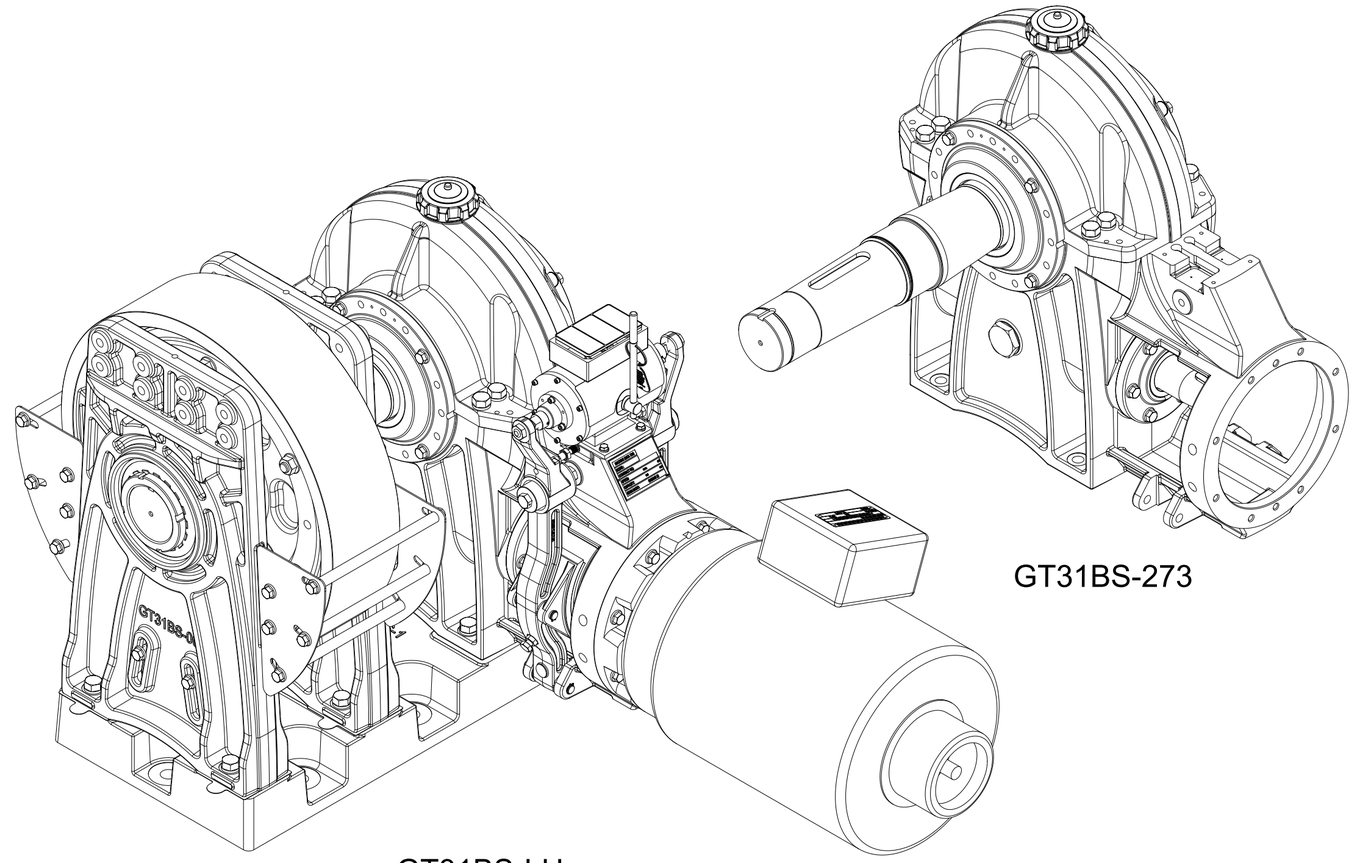
TITLE: ASSY, GT31, LEFT HAND, BS

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:12	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/8/2023	GT31BS-LH SHEET 2

ENGINEERING MASTER PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	GT31BS-273-01	ASSY, GEAR BOX, SINGLE LEAD, 71:1
		GT31BS-273-02	ASSY, GEAR BOX, DOUBLE LEAD, 71:2
		GT31BS-273-03	ASSY, GEAR BOX, TRIPLE LEAD, 71:3
2	1	GT31BS-001	BASE, BS/OD
3	2	GT31BS-005	STAND, OUTBOARD, BS
4	AS REQ'D	GT31-062-05	SHIM, STAND, OUTBOARD, 0.005" THICK
		GT31-062-01	SHIM, STAND, OUTBOARD, 0.010' THICK
		GT31-062-31	SHIM, STAND, OUTBOARD, 0.031" THICK
5	1	GT31-093	BEARING, ROLLER, SPHERICAL
6	1	GT31-094	BEARING, ROLLER, SPHERICAL
7	1	GT31BS-250-26	ASSY, RETAINER, ROPE, BS, 26"
		GT31BS-250-30	ASSY, RETAINER, ROPE, BS, 30"
8	1	GT31-282	NUT, LOCK, SHAFT
9	1	GT31-283	WASHER, LOCK, SHAFT
10	1	GT31-286-26	ASSY, TRACTION WHEEL AND HUB, 26"
		GT31-286-30	ASSY, TRACTION WHEEL AND HUB, 30"
11	2	GT31-290	CONDUIT, METAL, FLEXIBLE, 3/8"
12	2	GT31-291	ADAPTER, FMC, 90 DEG ELBOW, 3/8"
13	2	GT31-293	ADAPTER, STRAIGHT, FMC, 3/8"
14	1	GT31-297-1.625	COUPLER, MOTOR, 1.625", 254TC / 256TC FRAME
		GT31-297-1.875	COUPLER, MOTOR, 1.875", 284TC / 286TC FRAME
		GT31-297-2.125	COUPLER, MOTOR, 2.125", 324TC / 326TC FRAME
		GT31-297-2.375	COUPLER, MOTOR, 2.375", 364TC / 365TC FRAME
15	1	GT31-298	ELEMENT, COUPLING
16	2	GT31-299	BUSHING, ANTI-SHORT, FEMALE, FMC, 3/8"
17	1	GT31-300	KEY, SHAFT, WHEEL
18	1	GT31-310	NUT, LOCK, SHAFT
19	1	GT31-311	WASHER, LOCK, SHAFT
20	1	GT31-312	PLATE, ADAPTER, MOTOR, 254TC / 256TC / 284TC / 286TC FRAME
		GT31-313	PLATE, ADAPTER, MOTOR, 324TC / 326TC / 364TC / 365TC FRAME
21	1	GT31-314	ASSY, SOLENOID, BRAKE
22	2	GT31-315	ASSY, ARM, BRAKE
23	2	GT31-321	PIN, PIVOT
24	1	GT31-322	DRUM, BRAKE
25	1	GT31-326	PLATE, RETENTION, BEARING, STAND
26	2	GT31-327	ASSY, SWITCH, BRAKE
27	1	GT31-358	ASSY, BLOCK, TERMINAL
28	1	GT31BS-368	RETAINING RING, SPIRAL, MEDIUM DUTY
29	1	P-208	MANUAL BRAKE RELEASE TAG
30	1	P-223-R	CUSTOMER NAMEPLATE
31	1	P-226	LABEL, DATA, ELECTRICAL, BRAKE
32	1	P-227	LABEL, INSTRUCTION, BRAKE
33	1	P-228	LABEL, WIRING, BRAKE
34	1	P-231	TAG, DATA, MOTOR, CONTRACT
35	1	P-236	MACHINE DATA TAG
36	4	#6-32 UNC X 7/8"	SCREW, HEX HEAD
37	4	5/16"-18 UNC X 3/4"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
38	1	7/16" - 14 UNC X 2-1/4"	SCREW, HEX, CAP, SOCKET HEAD, BLACK OXIDE FINISH
39	AS REQ'D	1/2"-13 UNC X 1-1/2"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
40	AS REQ'D	1/2"-13 UNC X 1-1/2"	SCREW, HEX, CAP, FLAT SOCKET HEAD, BLACK OXIDE FINISH
41	4	5/8" - MS 16624	RING, RETAINING, EXTERNAL, SERIES 3100
42	6	5/8" X 1-1/2"	PIN, DOWEL, GROUND, HARDENED
43	AS REQ'D	5/8" - 11 UNC x 1-1/2"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
44	12	3/4"-10 UNC X 2-1/2"	BOLT, HEX, GRADE 5, BLACK OXIDE FINISH
45	12	3/4"	WASHER, LOCK
46	2.5 gal	MOBIL SHC 636	OIL, GEAR, HIGH PRESSURE

GT31BS-273 PARTS LIST					
ITEM	QTY GT31BS-273-01	QTY GT31BS-273-02	QTY GT31BS-273-03	PART NUMBER	DESCRIPTION
2.1	1	0	0	GT31BS-080-01	ASSY, CENTER, SINGLE LEAD
2.1	0	1	0	GT31BS-080-02	ASSY, CENTER, DOUBLE LEAD
2.1	0	0	1	GT31BS-080-03	ASSY, CENTER, TRIPLE LEAD
2.2	1	1	1	GT31-284	ASSY, UPPER AND LOWER HOUSING, MACHINED
2.3	1	0	0	GT31-294-01	ASSY, WORM SHAFT AND BEARING, 7/8" SINGLE
2.3	0	1	0	GT31-294-02	ASSY, WORM SHAFT AND BEARING, 7/8" DOUBLE
2.3	0	0	1	GT31-294-03	ASSY, WORM SHAFT AND BEARING, 7/8" TRIPLE
2.4	1	1	1	GT31-063	CAP, FILL, OIL
2.5	1	1	1	GT31-085	CAP, BEARING, REAR END
2.6	1	1	1	GT31-085-FE	CAP, BEARING, FORWARD END
2.7	AS REQ'D	AS REQ'D	AS REQ'D	GT31-087	SHIM, CAP, BEARING
2.8	1	1	1	GT31-276	GLASS, SIGHT, OIL
2.9	1	1	1	GT31-277	PLUG, DRAIN, OIL
2.10	1	1	1	GT31-278	PLUG, OIL
2.11	1	1	1	GT31-279	O-RING, PLUG, OIL
2.12	1	1	1	GT31-287	SEAL, SHAFT, RADIAL
2.13	1	1	1	GT31-287-1	SEAL, SHAFT, RADIAL
2.14	4	4	4	GT31-295	SHIM, ECCENTRIC, EDGE BONDED
2.15	1	1	1	GT31-301	KEY, SHAFT, WORM
2.16	20	20	20	1/2"-13 UNC X 1-1/2"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED



GT31BS-273

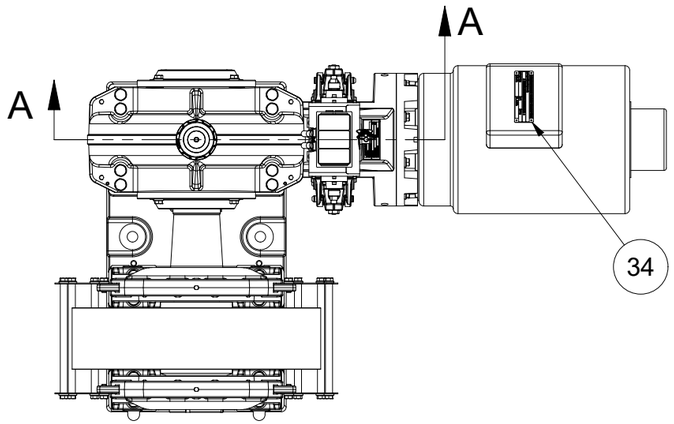
GT31BS-LH

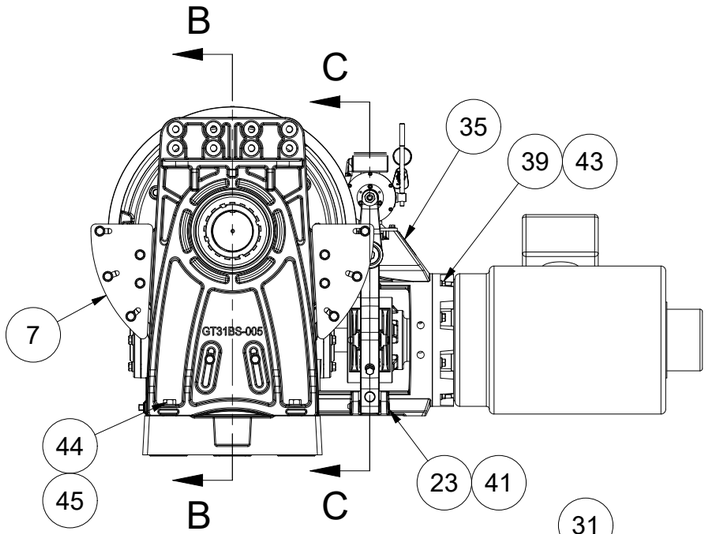
			C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23	HOLLISTER-WHITNEY ELEVATOR CO. LLC
D	CORRECTED PART NUMBER, PUR #1808	DRO 08/18/23	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23	TITLE: ASSY, GT31, LEFT HAND, BS

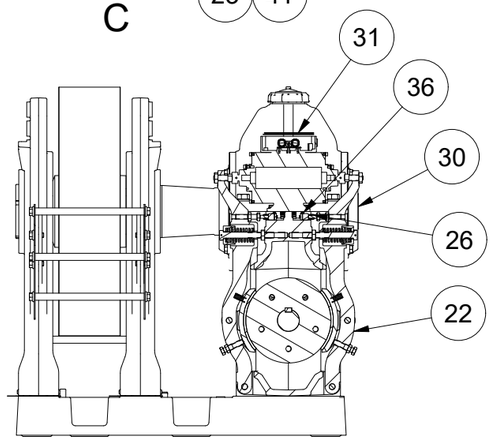
THIRD ANGLE PROJECTION

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:8	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

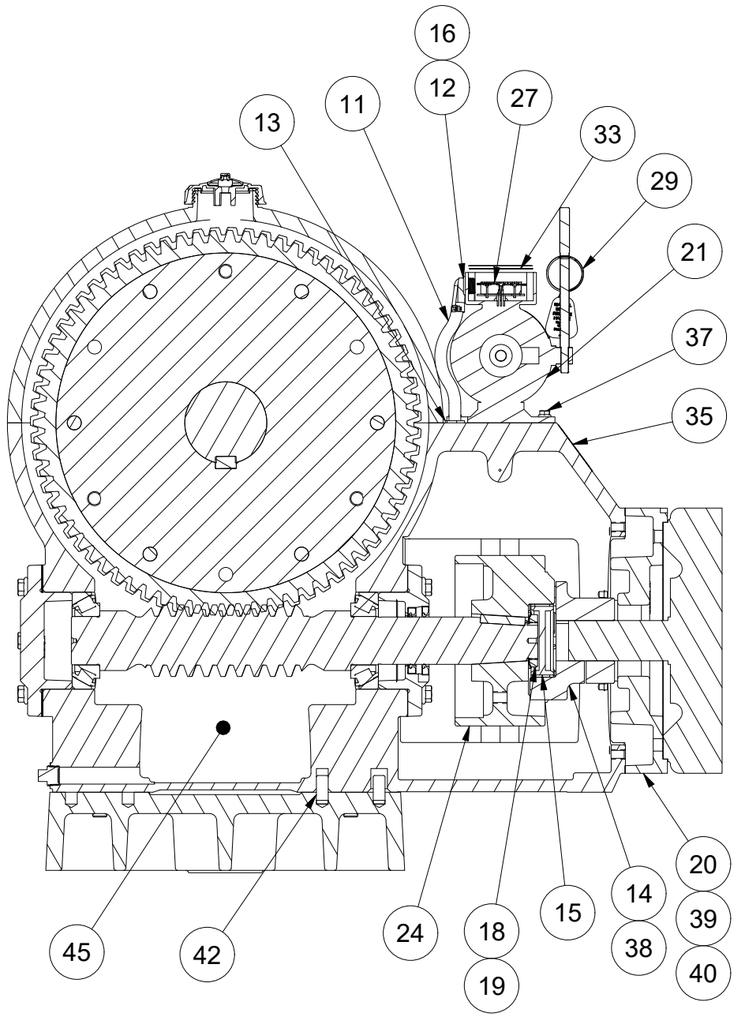
SHEET SIZE	DATE	
C	5/8/2023	GT31BS-LH SHEET 3



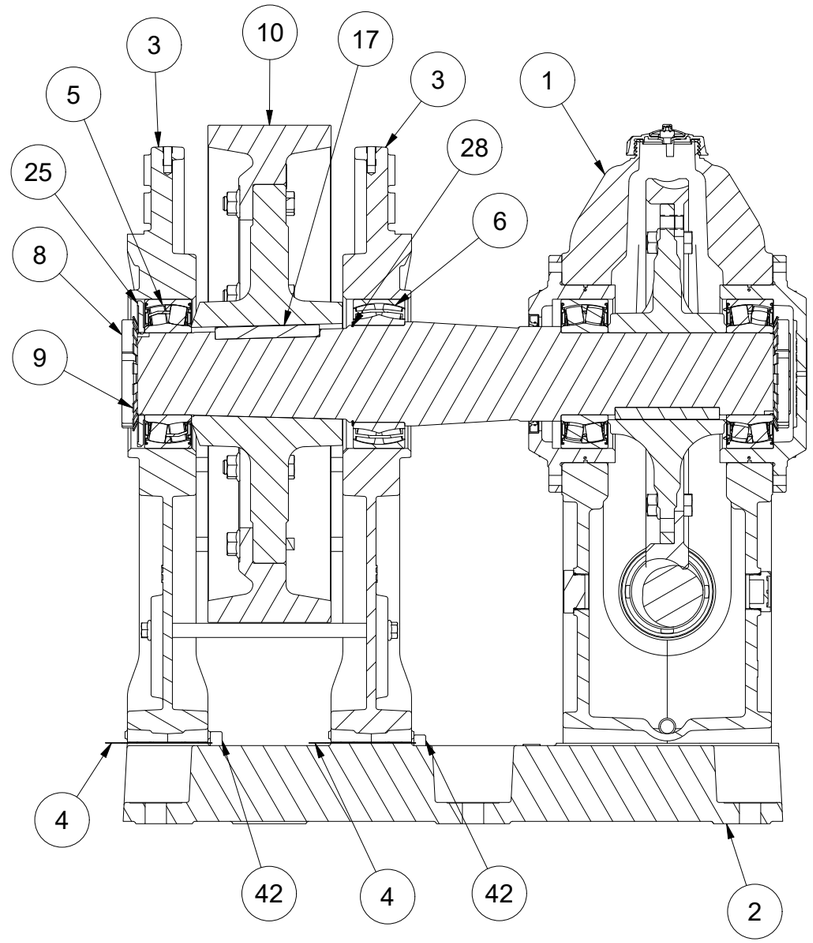




SECTION C-C

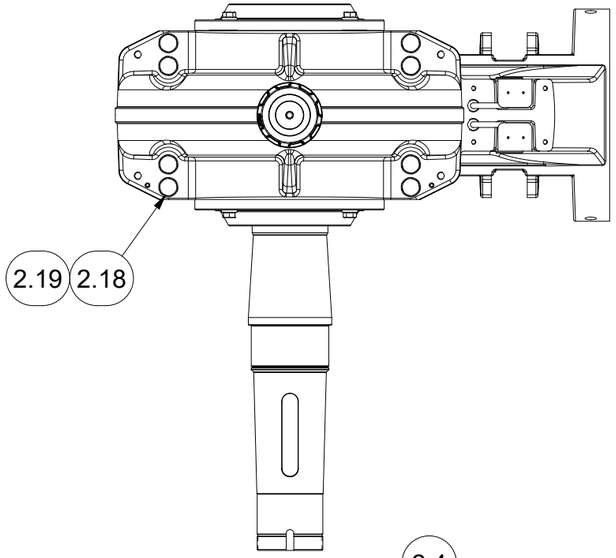


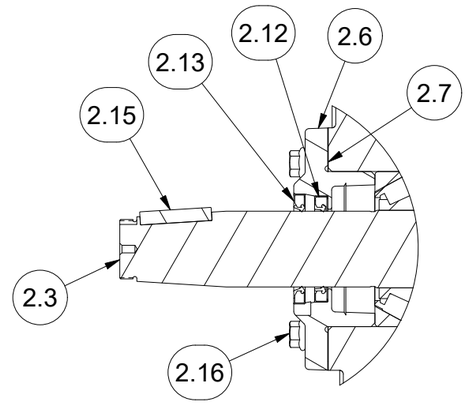
SECTION A-A
SCALE 1 / 8



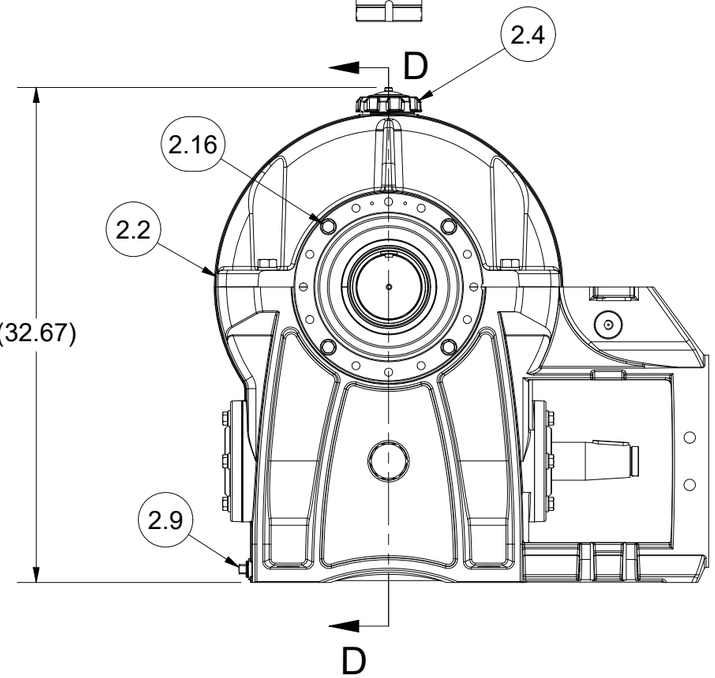
SECTION B-B
SCALE 1 / 8

			C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23	HOLLISTER-WHITNEY ELEVATOR CO. LLC	
D	CORRECTED PART NUMBER, PUR #1808	DRO 08/18/23	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23	TITLE: ASSY, GT31, LEFT HAND, BS	
THIS DRAWING IS SUPPLIED AS A REPRESENTATION OF THE EQUIPMENT HOLLISTER-WHITNEY ELEVATOR CO. LLC ("MANUFACTURER") HAS AGREED TO SUPPLY. SLIGHT ADJUSTMENTS MAY OCCUR DURING MANUFACTURING AND INSTALLATION. ANY MODIFICATIONS NOT APPROVED IN WRITING BY MANUFACTURER MAY AFFECT OPERATION, VOIDS ANY WARRANTY AND RELEASES MANUFACTURER OF ALL LIABILITY. THIS DOCUMENT CONTAINS CONFIDENTIAL AND PROPRIETARY INFORMATION THAT CANNOT BE REPRODUCED OR DIVULGED, IN WHOLE OR IN PART, WITHOUT WRITTEN AUTHORIZATION FROM THE MANUFACTURER.			THIRD ANGLE PROJECTION			DRAWN BY: DRO	SCALE: 1 / 16	MATERIAL: N/A	REFERENCE TOL. ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED
						SHEET SIZE: B	DATE: 5/8/2023	GT31BS-LH SHEET 4

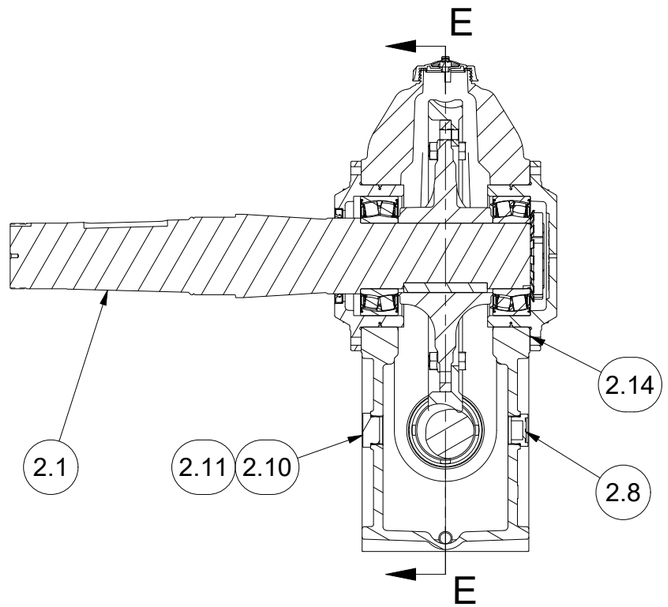


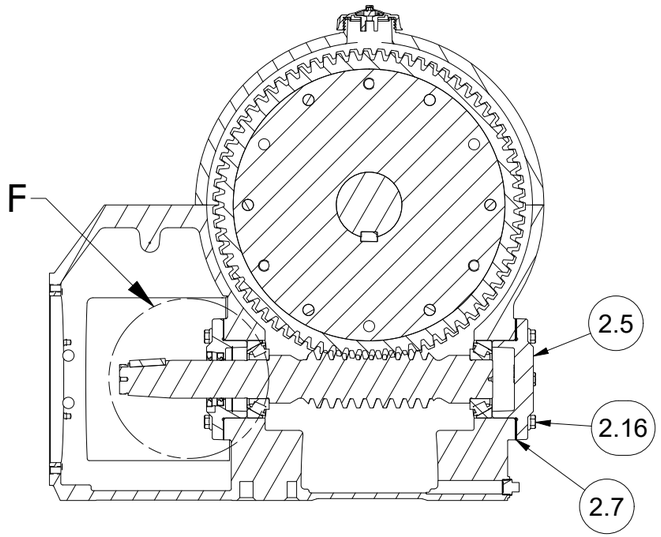


DETAIL F



SECTION D-D





SECTION E-E

			C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23
D	CORRECTED PART NUMBER, PUR #1808	DRO 08/18/23	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT31, LEFT HAND, BS

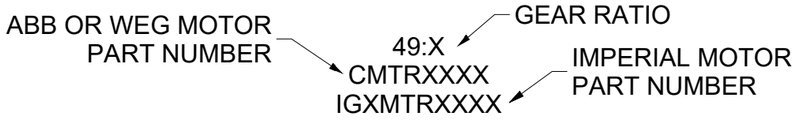
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:10	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/8/2023	GT31BS-LH SHEET 5

MOTOR CHART 1:1 ROPING														
SPEED	(ft/min)	50	75	100	125	150	175	200	250	300	350	400	450	500
CAP (lbs)	SHEAVE SIZE (in)													
2000	26	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:2 CMTR3005 IG1MTR3515	71:3 CMTR2501 IG3MTR3013	71:3 CMTR4005 IG3MTR3014	71:3 CMTR4005 IG1MTR3515	71:3 CMTR4005 IG3MTR5023
2000	30	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 N/A	71:2 CMTR3005 IG3MTR3014	71:3 CMTR2501 IG3MTR3013	71:3 CMTR2501 IG3MTR3013	71:3 CMTR4005 IG3MTR3014	71:3 CMTR4005 IG1MTR3515
2500	26	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:2 CMTR3005 IG1MTR3515	71:3 CMTR2501 IG3MTR3013	71:3 CMTR4005 IG3MTR3014	71:3 CMTR4005 IG3MTR5023	71:3 CMTR4005 IG3MTR5023
2500	30	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR3005 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:3 CMTR3001 IG3MTR3013	71:3 CMTR3001 IIG3MTR301	71:3 CMTR5005 IG3MTR5014	71:3 CMTR5005 IG3MTR5014
3000	26	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2013	71:1 CMTR1505 IG1MTR1514	71:1 CMTR3005 IG1MTR3515	71:2 CMTR2001 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:2 CMTR3005 IG1MTR3515	71:3 CMTR3001 IG3MTR3013	71:3 CMTR5005 IG3MTR5014	71:3 CMTR5005 IG3MTR5023	71:3 CMTR5005 IG3MTR5023
3000	30	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG1MTR1030	71:1 CMTR2001 IG1MTR1514	71:1 CMTR3005 IG1MTR1514	71:2 CMTR2501 N/A	71:2 CMTR2501 IG1MTR2504	71:2 CMTR2501 IG3MTR3013	71:2 CMTR4005 IG3MTR3014	71:3 CMTR5001 IG3MTR3013	71:3 CMTR5001 IG3MTR5013	71:3 CMTR5005 IG3MTR5014	71:3 CMTR5005 IG3MTR5014
3500	26	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG1MTR1514	71:1 CMTR3005 IG1MTR3515	71:2 CMTR2501 N/A	71:2 CMTR2501 IG3MTR2013	71:2 CMTR4005 IG3MTR3014	71:2 CMTR4005 IG1MTR3515	71:3 CMTR5001 IG3MTR5013	71:3 CMTR5005 IG3MTR5014	71:3 CMTR5005 IG3MTR5023	71:3 CMTR5005 IG3MTR5023
3500	30	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2030	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:2 CMTR2501 N/A	71:2 CMTR2501 IG1MTR2504	71:2 CMTR3001 IG3MTR3013	71:2 CMTR4005 IG3MTR3014	71:3 CMTR5001 IG3MTR5013	71:3 CMTR5001 IG3MTR5013	71:3 CMTR6005 IG3MTR5014	71:3 CMTR6005 IG3MTR5014
4000	26	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG1MTR1514	71:1 CMTR3005 IG1MTR3515	71:2 CMTR2501 N/A	71:2 CMTR2501 IG3MTR3013	71:2 CMTR4005 IG3MTR3014	71:2 CMTR4005 IG3MTR5023	71:3 CMTR5001 IG3MTR5013	71:3 CMTR6005 IG3MTR5014	71:3 CMTR6005 IG3MTR5023	N/A
4000	30	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2030	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:2 CMTR3001 N/A	71:2 CMTR3001 IG1MTR2504	71:2 CMTR3001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:3 CMTR5001 IG3MTR5013	71:3 CMTR5001 IG3MTR5013	71:3 N/A IG3MTR5014	N/A
4500	26	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:1 CMTR3005 IG1MTR3515	71:2 CMTR3001 N/A	71:2 CMTR3001 IG3MTR3013	71:2 CMTR4005 IG3MTR5014	71:2 CMTR4005 IG3MTR5023	71:3 CMTR5001 IG3MTR5013	71:3 CMTR6005 IG3MTR5014	N/A	N/A
4500	30	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2030	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:2 CMTR3001 N/A	71:2 CMTR3001 IG1MTR2504	71:2 CMTR5001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:3 CMTR5001 IG3MTR5013	71:3 CMTR5001 IG3MTR5013	N/A	N/A

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



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D	CORRECTED PART NUMBER, PUR #1808	DRO 08/18/23	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23	

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT31, LEFT HAND, BS

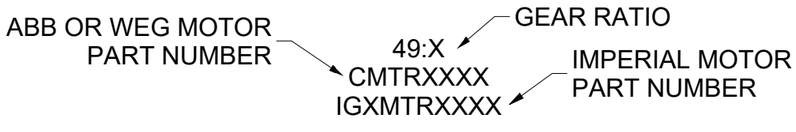
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED
SHEET SIZE: B	DATE: 5/8/2023	GT31BS-LH	SHEET 6

MOTOR CHART 1:1 ROPING

SPEED	(ft/min)	50	75	100	125	150	175	200	250	300	350	400	450	500
CAP (lbs)	SHEAVE SIZE (in)													
5000	26	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:1 CMTR3005 IG1MTR3515	71:2 CMTR3001 N/A	71:2 CMTR3001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:2 CMTR5005 IG3MTR5023	71:3 CMTR5001 IG3MTR5013	N/A	N/A	N/A
5500	26	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:1 CMTR3005 IG1MTR3515	71:2 CMTR5001 N/A	71:2 CMTR5001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:2 CMTR5005 IG3MTR5023	N/A	N/A	N/A	N/A
6000	26	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:1 CMTR3005 IG1MTR3515	71:2 CMTR5001 N/A	71:2 CMTR5001 IG3MTR3013	71:2 CMTR6005 IG3MTR5014	N/A	N/A	N/A	N/A	N/A

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



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THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT31, LEFT HAND, BS

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/8/2023	GT31BS-LH SHEET 7

MOTOR CHART 2:1 ROPING										
SPEED	(ft/min)	50	75	100	125	150	175	200	225	250
CAP (lbs)	SHEAVE SIZE (in)									
2500	26	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR1001 N/A	71:2 CMTR1505 N/A	71:2 CMTR1505 N/A	71:3 CMTR2001 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A
2500	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR1001 N/A	71:2 CMTR1001 N/A	71:2 CMTR1505 N/A	71:3 CMTR2001 N/A	71:3 CMTR2001 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A
3000	26	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR1001 N/A	71:2 CMTR1505 N/A	71:2 CMTR1505 N/A	71:3 CMTR2001 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A
3000	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 N/A	71:2 CMTR3005 N/A	71:3 CMTR2001 N/A	71:3 CMTR2001 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A
3500	26	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR3005 N/A	71:2 CMTR3005 N/A	71:3 CMTR2001 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A
3500	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 N/A	71:2 CMTR3005 N/A	71:3 CMTR2001 N/A	71:3 CMTR2001 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A
4000	26	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 N/A	71:2 CMTR3005 IG1MTR3515	71:3 CMTR2001 N/A	71:3 CMTR3005 IG3MTR3014	71:3 CMTR3005 N/A	71:3 CMTR3005 IG3MTR3005
4000	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 IG1MTR1514	71:2 CMTR3005 IG3MTR3014	71:3 CMTR2501 N/A	71:3 CMTR2501 IG3MTR3013	71:3 CMTR4005 N/A	71:3 CMTR4005 N/A
4500	26	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 N/A	71:2 CMTR3005 IG1MTR3515	71:3 CMTR2001 N/A	71:3 CMTR3005 IG3MTR3014	71:3 CMTR4005 N/A	71:3 CMTR4005 IG3MTR3005
4500	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:3 CMTR2501 N/A	71:3 CMTR2501 IG3MTR3013	71:3 CMTR4005 N/A	71:3 CMTR4005 N/A
5000	26	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:2 CMTR3005 IG1MTR3515	71:3 CMTR2501 N/A	71:3 CMTR4005 IG3MTR3014	71:3 CMTR4005 N/A	71:3 CMTR4005 IG3MTR5023
5000	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 IG1MTR2504	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:3 CMTR3001 N/A	71:3 CMTR3001 IG3MTR3013	71:3 CMTR4005 N/A	71:3 CMTR4005 IG1MTR3515

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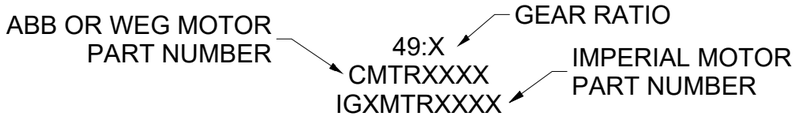

		C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23	
D	CORRECTED PART NUMBER, PUR #1808	DRO 08/18/23	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT31, LEFT HAND, BS

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/8/2023	GT31BS-LH SHEET 8

MOTOR CHART 2:1 ROPING										
SPEED	(ft/min)	50	75	100	125	150	175	200	225	250
CAP (lbs)	SHEAVE SIZE (in)									
5500	26	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:2 CMTR3005 IG1MTR3515	71:3 CMTR2501 N/A	71:3 CMTR4005 IG3MTR3014	71:3 CMTR4005 N/A	71:3 CMTR4005 IG3MTR5023
5500	30	71:1 CMTR2001 N/A	71:1 CMTR3005 N/A	71:2 CMTR2001 IG1MTR2504	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:3 CMTR3001 N/A	71:3 CMTR3001 IG3MTR3013	71:3 CMTR5005 N/A	71:3 CMTR5005 IG3MTR5014
6000	26	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:2 CMTR3005 IG1MTR3515	71:3 CMTR3001 N/A	71:3 CMTR4005 IG3MTR5014	71:3 CMTR4005 N/A	71:3 CMTR4005 IG3MTR5023
6000	30	71:1 CMTR2001 N/A	71:1 CMTR3005 N/A	71:2 CMTR2001 IG1MTR2504	71:2 CMTR2001 IG3MTR2013	71:2 CMTR4005 IG3MTR3014	71:3 CMTR3001 N/A	71:3 CMTR3001 IG3MTR5013	71:3 CMTR5005 N/A	71:3 CMTR5005 IG3MTR5014
7000	26	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:2 CMTR4005 IG1MTR3515	71:3 CMTR3001 N/A	71:3 CMTR5005 IG3MTR5014	71:3 CMTR5005 N/A	71:3 CMTR5005 IG3MTR5023
7000	30	71:1 CMTR2001 IG3MTR2030	71:1 CMTR3005 N/A	71:2 CMTR2501 IG1MTR2504	71:2 CMTR2501 IG3MTR3013	71:2 CMTR4005 IG3MTR3014	71:3 CMTR5001 N/A	71:3 CMTR5001 IG3MTR5013	71:3 CMTR6005 N/A	71:3 CMTR6005 IG3MTR5014
8000	26	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 N/A	71:2 CMTR2501 IG3MTR2013	71:2 CMTR4005 IG3MTR3014	71:2 CMTR4005 IG3MTR5023	71:3 CMTR5001 N/A	71:3 CMTR5005 IG3MTR5014	N/A	N/A
8000	30	71:1 CMTR2001 IG3MTR2030	71:1 CMTR3005 N/A	71:2 CMTR3001 IG1MTR2504	71:2 CMTR3001 IG3MTR3013	71:2 CMTR4005 IG3MTR5014	71:3 CMTR5001 N/A	71:3 CMTR5001 IG3MTR5013	N/A	N/A
9000	26	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 N/A	71:2 CMTR3001 IG3MTR3013	71:2 CMTR4005 IG3MTR3014	71:2 CMTR4005 IG3MTR5023	71:3 CMTR5001 N/A	71:3 CMTR6005 IG3MTR5014	N/A	N/A
9000	30	71:1 CMTR2001 IG3MTR2030	71:1 CMTR3005 N/A	71:2 CMTR3001 IG1MTR2504	71:2 CMTR3001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:3 CMTR5001 N/A	71:3 CMTR5001 IG3MTR5013	N/A	N/A
10000	26	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 N/A	71:2 CMTR3001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:2 CMTR5005 IG3MTR5023	N/A	N/A	N/A	N/A
12000	26	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 N/A	71:2 CMTR5001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:2 CMTR6005 IG3MTR5023	N/A	N/A	N/A	N/A

NOTES UNLESS OTHERWISE SPECIFIED:

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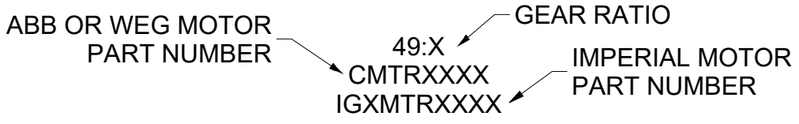
2. CELL FORMAT IS AS FOLLOWS:



		C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23	
D	CORRECTED PART NUMBER, PUR #1808	DRO 08/18/23	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT31, LEFT HAND, BS

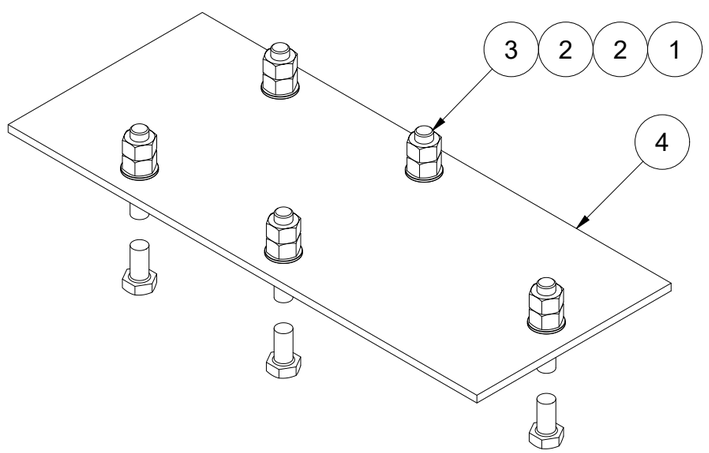
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/8/2023	GT31BS-LH SHEET 9

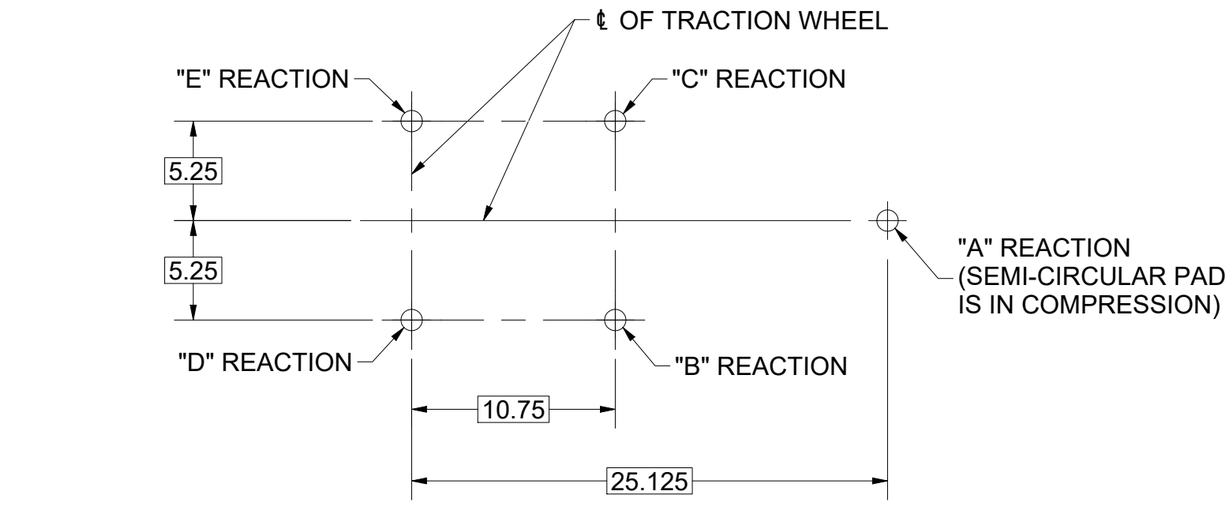
FOUNDATION BOLT REACTION FORCES			
LOCATION	REACTION TYPE	SERVICE LOAD	COMPRESSIVE LOAD AREA
"A"	COMPRESSION	-1802 POUNDS	12.6 in²
"B"	TENSION	2159 POUNDS	N/A
"C"	TENSION	2159 POUNDS	N/A
"D"	TENSION	7242 POUNDS	N/A
"E"	TENSION	7242 POUNDS	N/A

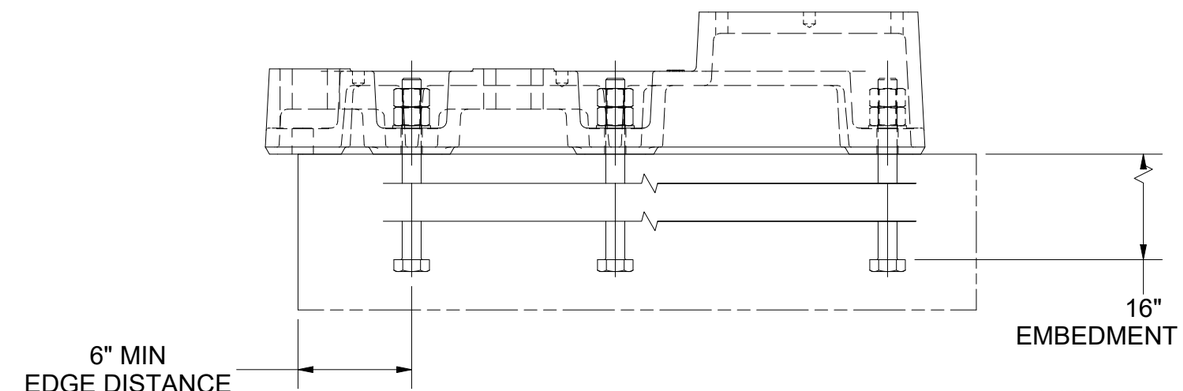
ANCHOR AND FOUNDATION NOTES:

1. THE FINAL FOUNDATION AND ANCHORING EMBEDMENT METHOD FOR THIS EQUIPMENT SHALL BE DESIGNED BY THE STRUCTURAL ENGINEER OF RECORD BASED ON THE LOADS AND LOCATIONS PROVIDED ON THIS SHEET. HOLLISTER-WHITNEY ASSUMES NO RESPONSIBILITY FOR THE DESIGN OF THE FOUNDATION OR THE METHOD OF THE ANCHORING EMBEDMENT.
2. ALL ANCHOR LOADS SHOWN IN THE TABLE ABOVE ARE SERVICE LOADS BASED ON THE OVERALL UPWARD PLUMB VERTICAL LOAD RESULTING FROM A 17,000 POUND SHEAVE SHAFT LOAD. FOR ANCHOR DESIGN, THESE LOADS SHALL BE DOUBLED PER SECTION 2.9.2.2 OF ASME A17.1, SAFETY CODE FOR ELEVATORS. THEY SHALL ALSO BE FACTORED ACCORDINGLY FOR ANCHOR DESIGN PER ACI 318.
3. THE WEIGHT OF THE MACHINE HAS NOT BEEN INCLUDED IN THE ANCHOR LOADS.
4. THE ANCHOR ROD SIZE, GRADE, AND EMBEDMENT DEPTH SHOWN ARE BASED ON THE FOLLOWING DESIGN ASSUMPTIONS:
   - -CONCRETE STRENGTH = 4000PSI
   - -UN-CRACKED CONCRETE
   - -UN-REINFORCED CONCRETE
   - -6" EDGE DISTANCE IN THE ONE DIRECTION INDICATED.
   - -EDGE DISTANCE IN THE OTHER DIRECTIONS HAS NOT BEEN ACCOUNTED FOR.
5. LEFT HAND MACHINE CONFIGURATION SHOWN.



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	5	GT11BS-156-1	1", FLAT WASHER, ASTM F436, TYPE 1 HARDEDNED, GALVANIZED
2	10	GT11BS-156-2	1" - 8 UNC, HEX NUT, HEAVY, ASTM A194, GRADE 2H, GALVANIZED
3	5	GT11BS-156-3	1" - 8 UNC x 20", HEX BOLT, HEAVY, ASTM F1554, GRADE 36, GALVANIZED
4	1	GT11BS-180	MACHINE TEMPLATE





WEIGHT: 34.3 lbmass

	A	PRODUCTION RELEASE, PUR #1616	DRO 05/17/22

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: FOUNDATION ANCHOR ASSEMBLY

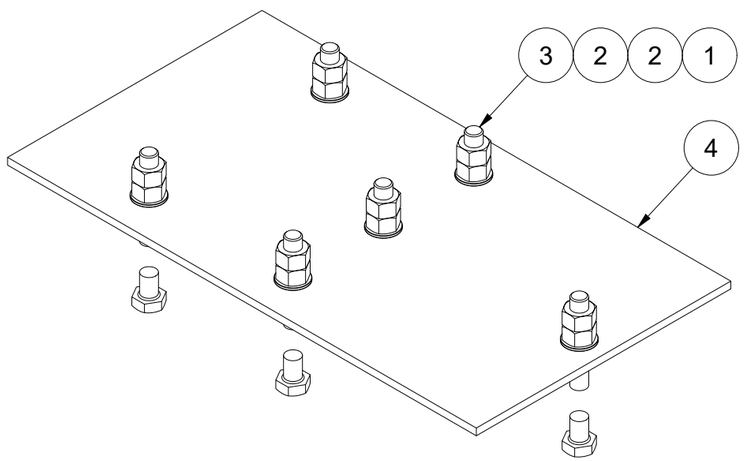
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:8	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	2/7/2022	GT11BS-156 SHEET 1 OF 1

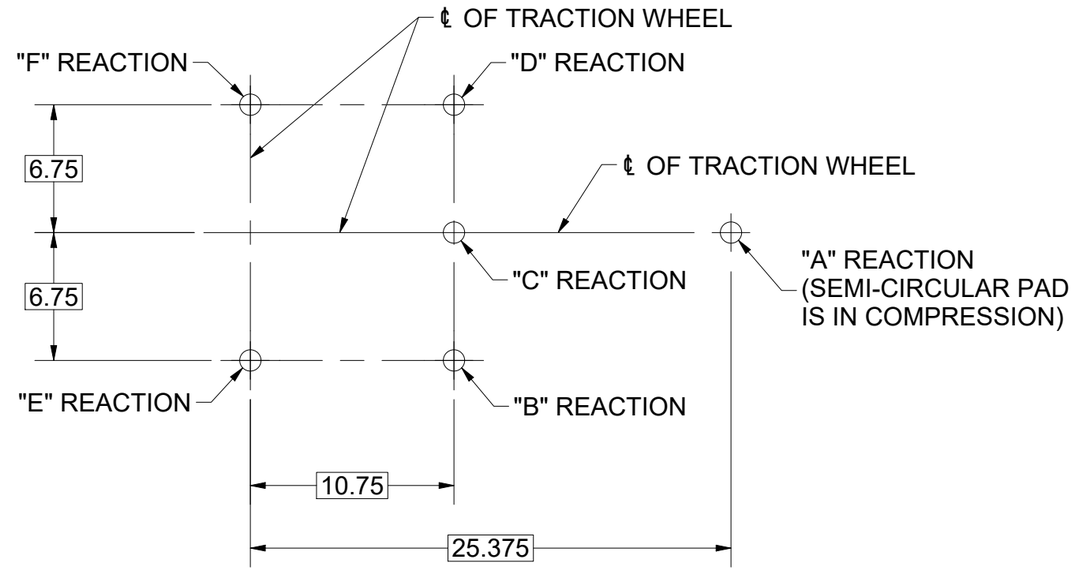
FOUNDATION BOLT REACTION FORCES			
LOCATION	REACTION TYPE	SERVICE LOAD	COMPRESSIVE LOAD AREA
"A"	COMPRESSION	-2750 POUNDS	8.6 in²
"B"	TENSION	2750 POUNDS	N/A
"C"	TENSION	1250 POUNDS	N/A
"D"	TENSION	2750 POUNDS	N/A
"E"	TENSION	10500 POUNDS	N/A
"F"	TENSION	10500 POUNDS	N/A

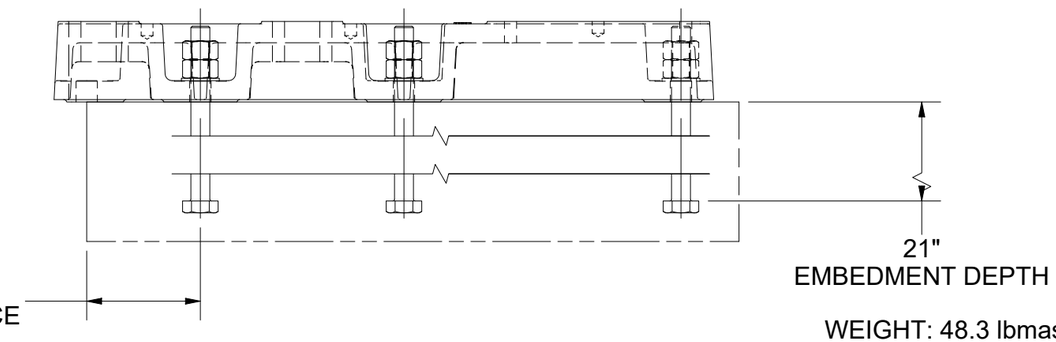
ANCHOR AND FOUNDATION NOTES:

1. THE FINAL FOUNDATION AND ANCHORING EMBEDMENT METHOD FOR THIS EQUIPMENT SHALL BE DESIGNED BY THE STRUCTURAL ENGINEER OF RECORD BASED ON THE LOADS AND LOCATIONS PROVIDED ON THIS SHEET. HOLLISTER-WHITNEY ASSUMES NO RESPONSIBILITY FOR THE DESIGN OF THE FOUNDATION OR THE METHOD OF THE ANCHORING EMBEDMENT.
2. ALL ANCHOR LOADS SHOWN IN THE TABLE ABOVE ARE SERVICE LOADS BASED ON THE OVERALL UPWARD PLUMB VERTICAL LOAD RESULTING FROM A 25,000 POUND SHEAVE SHAFT LOAD. FOR ANCHOR DESIGN, THESE LOADS SHALL BE DOUBLED PER SECTION 2.9.2.2 OF ASME A17.1, SAFETY CODE FOR ELEVATORS. THEY SHALL ALSO BE FACTORED ACCORDINGLY FOR ANCHOR DESIGN PER ACI 318.
3. THE WEIGHT OF THE MACHINE HAS NOT BEEN INCLUDED IN THE ANCHOR LOADS.
4. THE ANCHOR ROD SIZE, GRADE, AND EMBEDMENT DEPTH SHOWN ARE BASED ON THE FOLLOWING DESIGN ASSUMPTIONS:
   - -CONCRETE STRENGTH = 4000PSI
   - -UN-CRACKED CONCRETE
   - -UN-REINFORCED CONCRETE
   - -6" EDGE DISTANCE IN THE ONE DIRECTION INDICATED.
   - -EDGE DISTANCE IN THE OTHER DIRECTIONS HAS NOT BEEN ACCOUNTED FOR.
5. LEFT HAND MACHINE CONFIGURATION SHOWN.



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	6	GT11BS-156-1	1", FLAT WASHER, ASTM F436, TYPE 1 HARDEDNED, GALVANIZED
2	12	GT11BS-156-2	1" - 8 UNC, HEX NUT, HEAVY, ASTM A194, GRADE 2H, GALVANIZED
3	6	GT31BS-156-3	1" - 8 UNC x 25", HEX BOLT, HEAVY, ASTM F1554, GRADE 55, GALVANIZED
4	1	GT31BS-180	MACHINE TEMPLATE





WEIGHT: 48.3 lbmass

A	PRODUCTION RELEASE, PUR #1616	DRO 05/17/22	

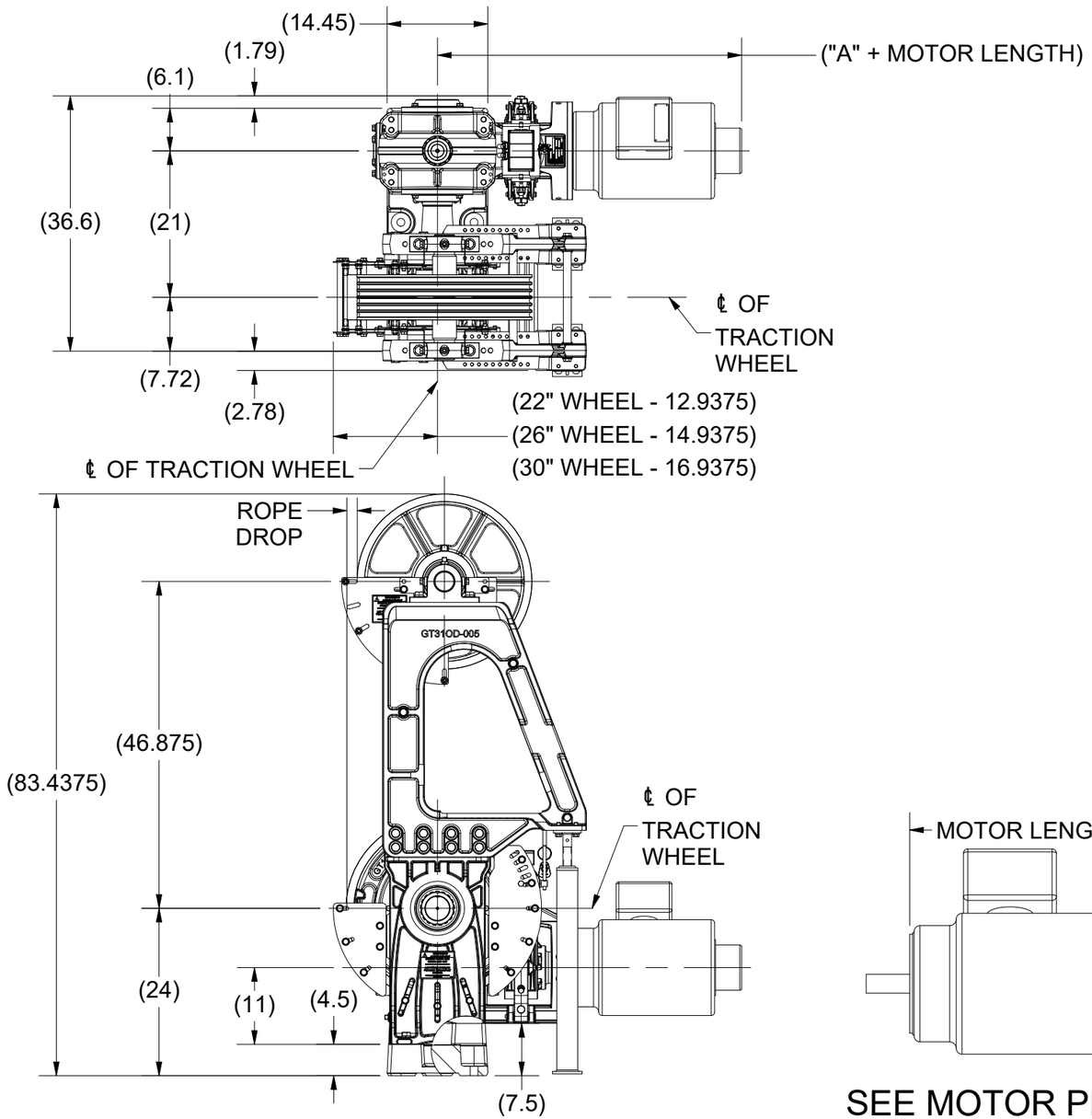
THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: FOUNDATION ANCHOR ASSEMBLY

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:8	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	2/9/2022	GT31BS-156 SHEET 1 OF 1



SEE MOTOR PRINT

CONTRACT SPECIFIC PARTS LIST ITEMS				
PART NUMBER				DESCRIPTION
				MOTOR, C-FLANGE - REFERENCE
GT11BS-080	-01	-02	-03	ASSY, CENTER -01 = 49:1, -02 = 49:2, -03 = 49:3
GT11-294	-01	-02	-03	ASSY, WORM AND BEARING -01 = 49:1, -02 = 49:2, -03 = 49:3
GT31-297	-1.625 -2.125	-1.875 -2.375		COUPLER, MOTOR -1.625 = 1.625", 254TC / 256TC FRAME -1.875 = 1.875", 284TC / 286TC FRAME -2.125 = 2.125", 324TC / 326TC FRAME -2.375 = 2.375", 364TC / 365TC FRAME
GT31	-312	-313		PLATE, ADAPTER, MOTOR -312 = 254TC / 256TC / 284TC / 286TC FRAME -313 = 324TC / 326TC / 364TC / 365TC FRAME
GT11OD-250	-22	-26	-30	ASSY, RETAINER, ROPE -22 = 22", -26 = 26", -30 = 30"
GT11-286	-22	-26	-30	ASSY,TRACTION WHEEL AND HUB -22 = 22", -26 = 26", -30 = 30"

"A" DIMENSION	
FRAME SIZE	INCHES
254TC / 256TC	18.895
284TC / 286TC	19.135
324TC / 326TC 364TC / 365TC	20.625

ROPE DROP DIMENSION		
22" WHEEL	26" WHEEL	30" WHEEL
		1.5
	1.5	2.5
1.5	2.5	3.5
2.5	3.5	4.5
	4.5	5.5
		6.5

NOTES UNLESS OTHERWISE SPECIFIED:

1. MACHINE AVAILABLE IN 22", 26", AND 30" TRACTION SHEAVES. (26" TRACTION SHEAVE SHOWN).
2. MACHINE COMPATIBLE WITH 254TC, 256TC, 284TC, 286TC, 324TC, 326TC, 364TC, AND 365TC MOTORS.
3. APPROXIMATE MACHINE AND BASE WEIGHT: 2800#
4. MAX SHEAVE SHAFT LOAD: 17,000#
5. BRAKE INFORMATION:
   PICK: 190Vdc, 1.94A, (2.5A Max.)
   HOLD: 80Vdc, 0.81A (1A Max.)

B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	
A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23	

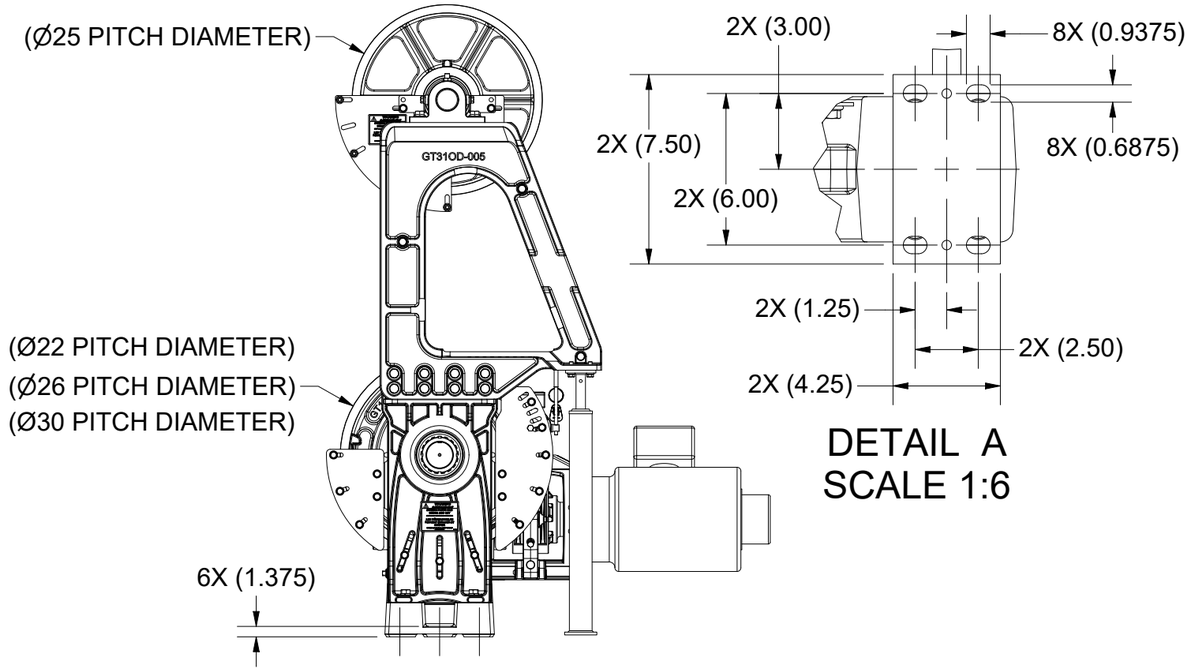
THIRD ANGLE PROJECTION

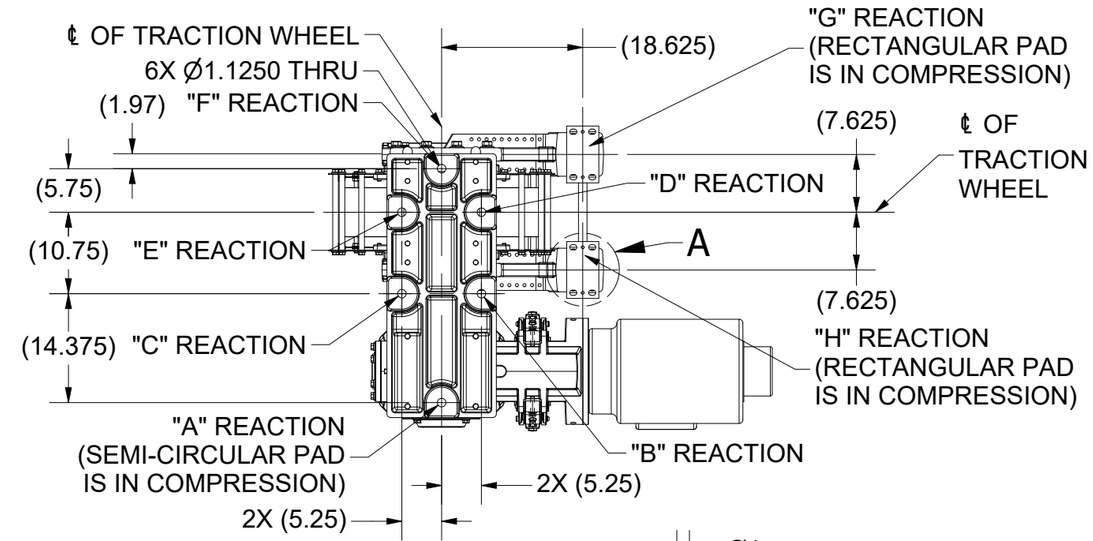
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

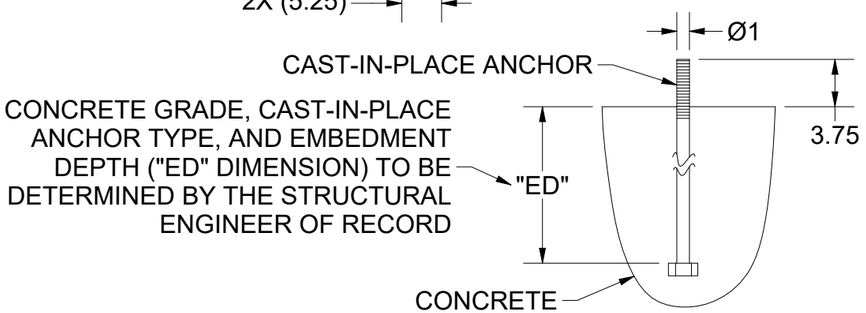
TITLE: ASSY, GT11OD, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:20	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11OD-LH SHEET 1 OF 10







FOUNDATION BOLT REACTION FORCES			
LOCATION	REACTION TYPE	TO DETERMINE THE LOCATION REACTION FORCE MULTIPLY THE SHEAVE SHAFT LOAD BY THE FOLLOWING % (- SIGN INDICATES FORCE DIRECTION)	TO DETERMINE PSI OF COMPRESSIVE LOAD DIVIDE THE COMPRESSIVE FORCE BY THE FOLLOWING
"A"	COMPRESSION	-4%	12.6 in²
"B"	TENSION	7%	N/A
"C"	TENSION	22" WHEEL = 29% 26" WHEEL = 31% 30" WHEEL = 34%	N/A
"D"	TENSION	15%	N/A
"E"	TENSION	22" WHEEL = 42% 26" WHEEL = 45% 30" WHEEL = 49%	N/A
"F"	TENSION	22" WHEEL = 52% 26" WHEEL = 55% 30" WHEEL = 59%	N/A
"G"	COMPRESSION	22" WHEEL = -17% 26" WHEEL = -22% 30" WHEEL = -27%	30 in²
"H"	COMPRESSION	22" WHEEL = -17% 26" WHEEL = -22% 30" WHEEL = -27%	30 in²

NOTES UNLESS OTHERWISE SPECIFIED:

1. FOUNDATION/ANCHORING SHALL BE DESIGNED BY OTHERS ON THE ABOVE SPECIFICATIONS. HOLLISTER-WHITNEY ASSUMES NO RESPONSIBILITY FOR THE DESIGN OF THE FOUNDATION.

ANCHOR REACTIONS ASSUMPTIONS:

1. ALL ANCHOR LOADS ARE APPROXIMATE AND SHOULD BE REVIEWED BY THE BUILDING STRUCTURAL ENGINEER OF RECORD.
2. APPROXIMATE ANCHOR LOADS DO NOT INCLUDE ANY LOADING DUE TO A ROPE GRIPPER.
3. ONLY THE VERTICAL REACTION COMPONENT IS GIVEN AS AN APPROXIMATE ANCHOR LOAD.
4. APPROXIMATE ANCHOR LOADS NEGLECT THE WEIGHT OF THE MACHINE.
5. APPROXIMATE ANCHOR LOADS ARE BASED ONLY ON THE TRACTION SHEAVE SHAFT LOAD AND ARE NOT DOUBLED FOR IMPACT OR OTHER SYSTEM CONDITIONS.
6. APPROXIMATE ANCHOR LOADS DO NOT ASSUME ANY SEISMIC LOADING CONDITIONS.
7. APPROXIMATE ANCHOR LOADS ASSUME 1.5" ROPE OFFSET BETWEEN DEFLECTOR SHEAVE AND TRACTION SHEAVE.

			A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23
B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23			

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

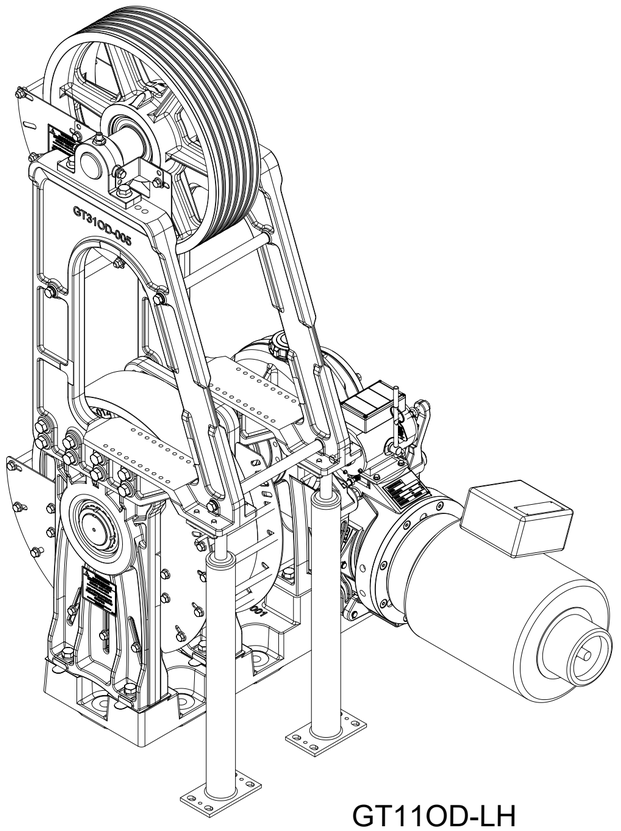
TITLE: ASSY, GT11OD, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:20	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

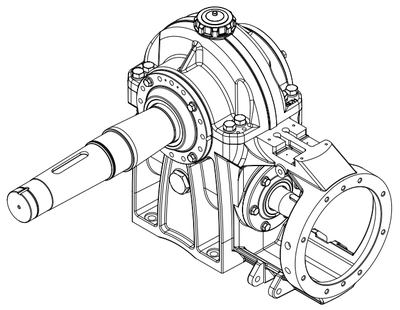
SHEET SIZE	DATE	
B	4/25/2023	GT11OD-LH SHEET 2 OF 10

ENGINEERING MASTER PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	GT11BS-273-01	ASSY, GEAR BOX, SINGLE LEAD, 49:1
		GT11BS-273-02	ASSY, GEAR BOX, DOUBLE LEAD, 49:2
		GT11BS-273-03	ASSY, GEAR BOX, TRIPLE LEAD, 49:3
2	1	GT11BS-001	BASE, BS/OD
3	1	GT11BS-005	STAND, OUTBOARD, BS
4	1	GT11BS-006	STAND, INBOARD, BS
5	1	GT11-093	BEARING, ROLLER, SPHERICAL
6	1	GT11OD-250-22	ASSY, RETAINER, ROPE, OD, 22"
		GT11OD-250-26	ASSY, RETAINER, ROPE, OD, 26"
		GT11OD-250-30	ASSY, RETAINER, ROPE, OD, 30"
7	1	GT11OD-331-027B	ASSY, SHEAVE, BALL BEARING, SEALED
		GT11OD-331-027SR	ASSY, SHEAVE, SPHERICAL ROLLER BEARING, SEALED
8	1	GT11-282	NUT, LOCK, SHAFT
9	1	GT11-283	WASHER, LOCK, SHAFT
10	1	GT11-286-22	ASSY,TRACTION WHEEL AND HUB, 22"
		GT11-286-26	ASSY,TRACTION WHEEL AND HUB, 26"
		GT11-286-30	ASSY,TRACTION WHEEL AND HUB, 30"
11	2	GT11-315	ASSY, ARM, BRAKE
12	1	GT11-326	PLATE, RETENTION, BEARING, STAND
13	1	GT11BS-368	RETAINING RING, SPIRAL, MEDIUM DUTY
14	2	GT31OD-005	STAND, OUTBOARD, OD
15	AS REQ'D	GT31-062-05	SHIM, STAND, OUTBOARD, 0.0050" THK
		GT31-062-10	SHIM, STAND, OUTBOARD, 0.0100" THK
		GT31-062-31	SHIM, STAND, OUTBOARD, 0.0310" THK
16	1	GT31-093	BEARING, ROLLER, SPHERICAL
17	2	GT31-290	CONDUIT, METAL, FLEXIBLE, 3/8"
18	3	GT31OD-144	SPACER, STAND, OD
19	2	GT31-291	ADAPTER, FMC, 90 DEG ELBOW, 3/8"
20	2	GT31-293	ADAPTER, STRAIGHT, FMC, 3/8"
21	1	GT31-297-1.625	COUPLER, MOTOR, 1.625", 254TC / 256TC FRAME
		GT31-297-1.875	COUPLER, MOTOR, 1.875", 284TC / 286TC FRAME
		GT31-297-2.125	COUPLER, MOTOR, 2.125", 324TC / 326TC FRAME
		GT31-297-2.375	COUPLER, MOTOR, 2.125", 364TC / 365TC FRAME
22	1	GT31-298	ELEMENT, COUPLING
23	2	GT31-299	BUSHING, ANTI-SHORT, FEMALE, FMC, 3/8"
24	1	GT11-300	KEY, SHAFT, WHEEL
25	1	GT31-310	NUT, LOCK, SHAFT
26	1	GT31-311	WASHER, LOCK, SHAFT
27	1	GT31-312	PLATE, ADAPTER, MOTOR, 254TC / 256TC / 284TC / 286TC FRAME
		GT31-313	PLATE, ADAPTER, MOTOR, 324TC / 326TC / 364TC / 365TC FRAME
28	1	GT31-314	ASSY, SOLENOID, BRAKE
29	2	GT31-321	PIN, PIVOT
30	1	GT31-322	DRUM, BRAKE
31	2	GT31-327	ASSY, SWITCH, BRAKE
32	2	GT31OD-335	COLUMN, SUPPORT, ADJUSTABLE
33	1	GT31-358	ASSY, BLOCK, TERMINAL
34	1	P-208	MANUAL BRAKE RELEASE TAG
35	1	P-226	LABEL, DATA, ELECTRICAL, BRAKE
36	1	P-227	LABEL, INSTRUCTION, BRAKE
37	1	P-228	LABEL, WIRING, BRAKE
38	1	P-230	NAMEPLATE, SMALL, HOLLISTER-WHITNEY
39	1	P-231	TAG, DATA, MOTOR, CONTRACT
40	1	P-236	MACHINE DATA TAG
41	4	#6 - 32 UNC x 7/8"	SCREW, HEX HEAD
42	4	5/16" - 18 UNC x 3/4"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
43	1	7/16" - 14 UNC x 2-1/4"	SCREW, HEX, CAP, SOCKET HEAD, BLACK OXIDE FINISH
44	AS REQ'D	1/2" - 13 UNC x 1-1/2"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
45	AS REQ'D	1/2" - 13 UNC x 1-1/2"	SCREW, HEX, CAP, FLAT SOCKET HEAD, BLACK OXIDE FINISH
46	4	5/8" - MS 16624	RING, RETAINING, EXTERNAL, SERIES 3100
47	6	5/8" x 1-1/2"	PIN, DOWEL, GROUND, HARDENED
48	6	5/8"	LOCK WASHER, HELICAL SPRING, REGULAR
49	AS REQ'D	5/8" - 11 UNC x 1-1/2"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
50	6	5/8" - 11 UNC x 3"	HEX CAP SCREW
51	28	3/4"	LOCK WASHER, HELICAL SPRING, REGULAR
52	12	3/4" - 10 UNC x 2-1/2"	HEX CAP SCREW, GRADE 5, BLACK OXIDE FINISH
53	16	3/4" - 10 UNC x 3"	HEX CAP SCREW, GRADE 5, BLACK OXIDE FINISH
54	1.75 gal	MOBIL SHC 636	OIL, GEAR, HIGH PRESSURE

GT11-273 PARTS LIST					
ITEM	QTY GT11BS-273-01	QTY GT11BS-273-02	QTY GT11BS-273-03	PART NUMBER	DESCRIPTION
2.1	1	0	0	GT11BS-080-01	ASSY, CENTER, BS/OD, SINGLE LEAD
2.1	0	1	0	GT11BS-080-02	ASSY, CENTER, BS/OD, DOUBLE LEAD
2.1	0	0	1	GT11BS-080-03	ASSY, CENTER, BS/OD, TRIPLE LEAD
2.2	1	1	1	GT11-284	ASSY, UPPER AND LOWER HOUSING, MACHINED
2.3	1	0	0	GT11-294-01	ASSY, WORM SHAFT AND BEARING, 7/8" SINGLE
2.3	0	1	0	GT11-294-02	ASSY, WORM SHAFT AND BEARING, 7/8" DOUBLE
2.3	0	0	1	GT11-294-03	ASSY, WORM SHAFT AND BEARING, 7/8" TRIPLE
2.4	1	1	1	GT31-063	CAP, FILL, OIL
2.5	1	1	1	GT31-085	CAP, BEARING, REAR END
2.6	1	1	1	GT31-085-FE	CAP, BEARING, FORWARD END
2.7	AS REQ'D	AS REQ'D	AS REQ'D	GT31-087	SHIM, CAP, BEARING
2.8	1	1	1	GT31-276	GLASS, SIGHT, OIL
2.9	1	1	1	GT31-277	PLUG, DRAIN, OIL
2.10	1	1	1	GT31-278	PLUG, OIL
2.11	1	1	1	GT31-279	O-RING, PLUG, OIL
2.12	1	1	1	GT31-287	SEAL, SHAFT, RADIAL
2.13	1	1	1	GT31-287-1	SEAL, SHAFT, RADIAL
2.14	4	4	4	GT31-295	SHIM, ECCENTRIC, EDGE BONDED
2.15	1	1	1	GT31-301	KEY, SHAFT, WORM
2.16	20	20	20	1/2"-13 UNC X 1.5"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED



GT11OD-LH
SCALE 1:12



GT11BS-273
SCALE 1:12

		A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23	
B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23			

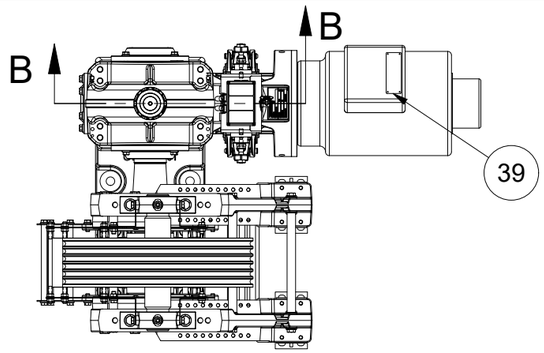
THIRD ANGLE PROJECTION

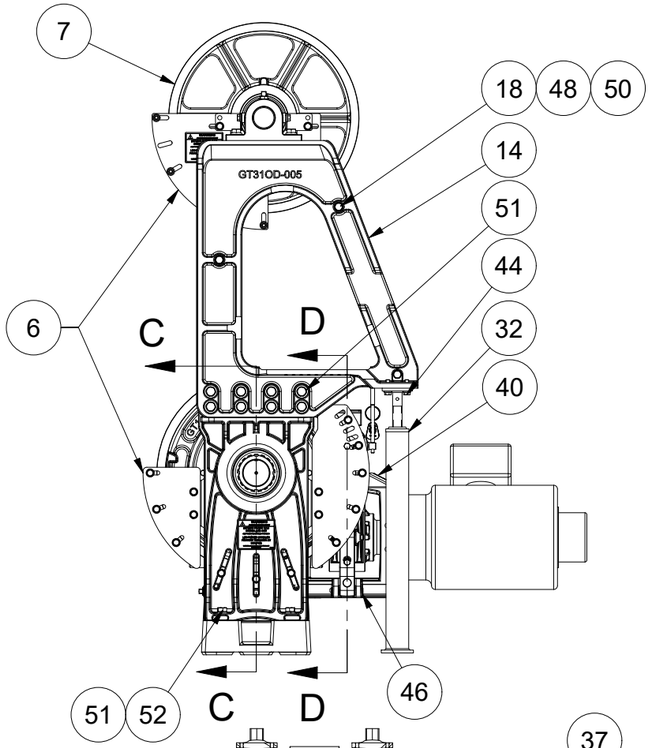
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11OD, LEFT HAND

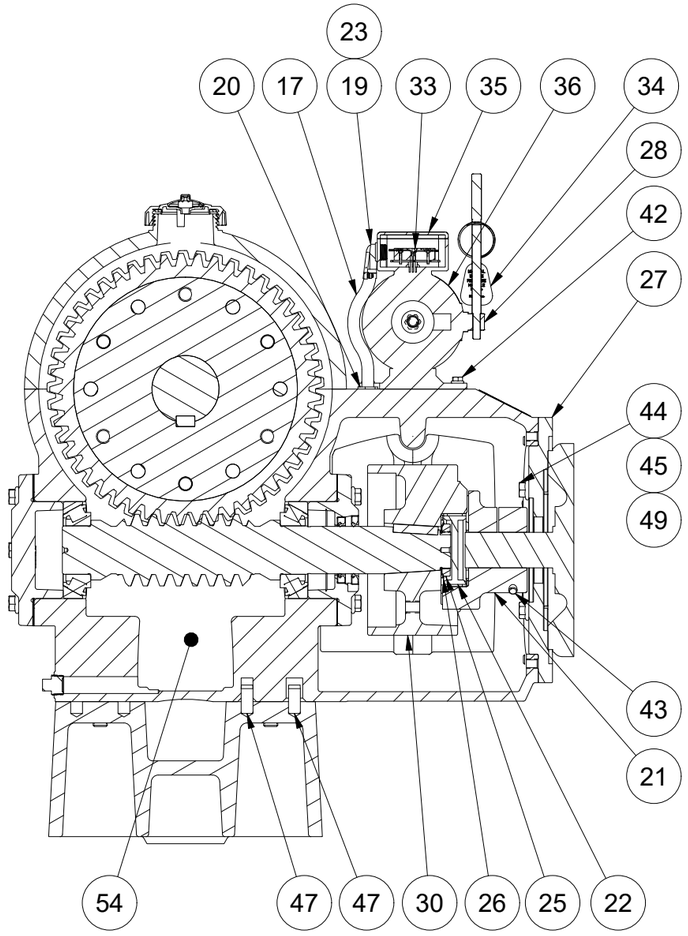
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:12	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
C	4/25/2023	GT11OD-LH SHEET 3 OF 10

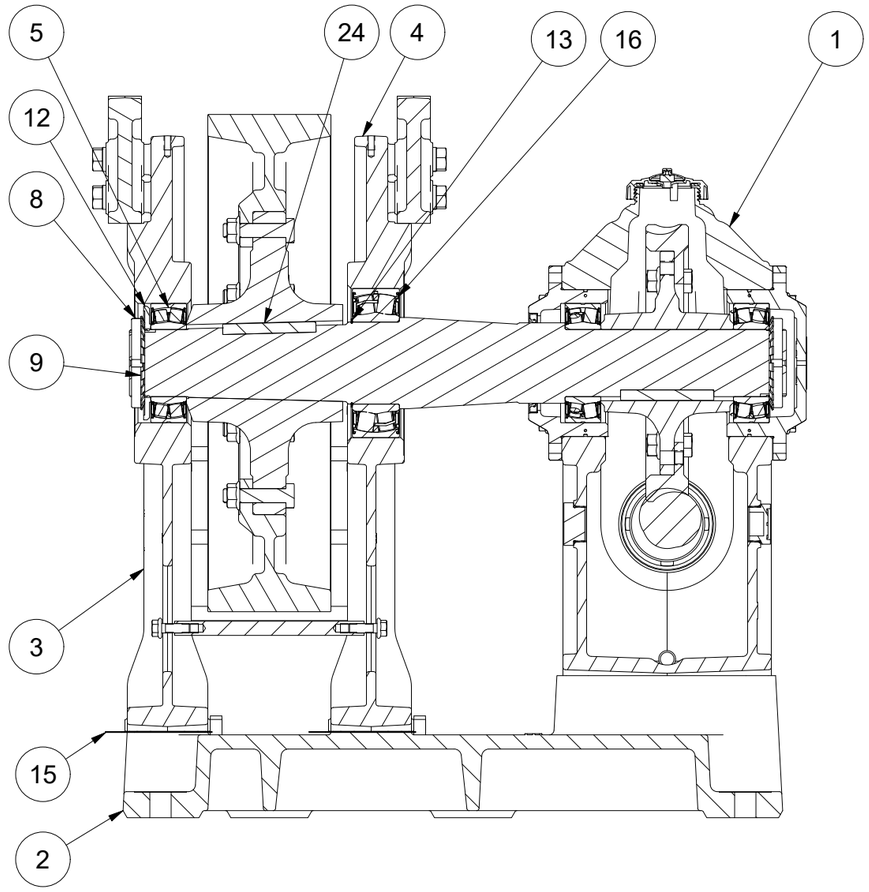




SECTION D-D
SCALE 1:20



SECTION B-B
SCALE 1:8



SECTION C-C
SCALE 1:8

B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

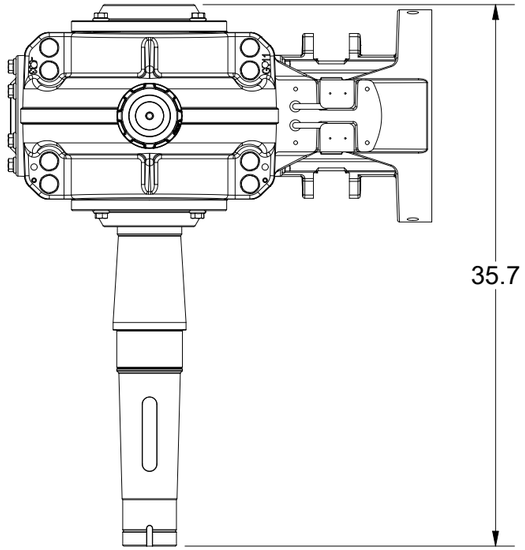
THIRD ANGLE PROJECTION

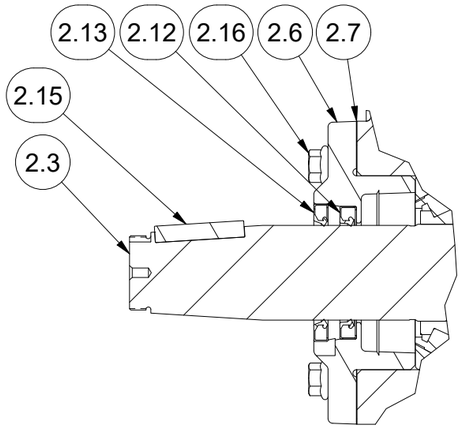
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11OD, LEFT HAND

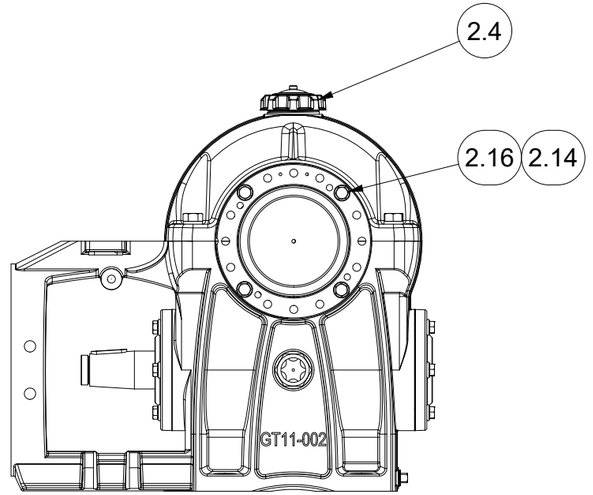
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:20	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11OD-LH SHEET 4 OF 10

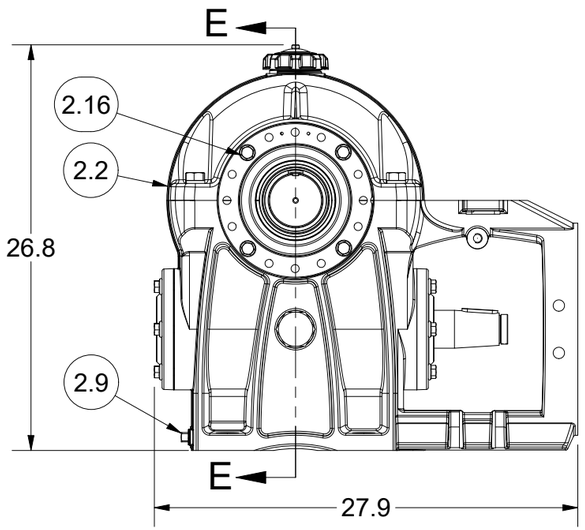




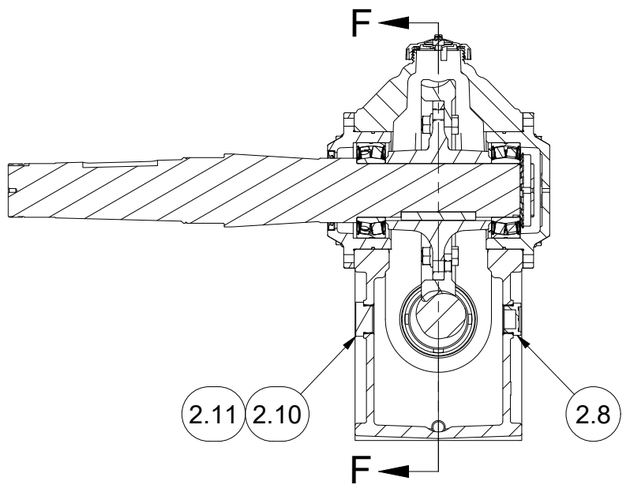
DETAIL G
SCALE 1:4



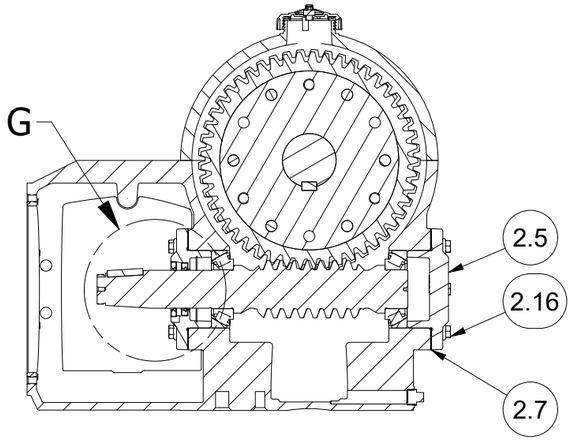
OPPOSING SIDE VIEW



SECTION E-E



SECTION F-F



			A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23
B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23			

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11OD, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:10	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

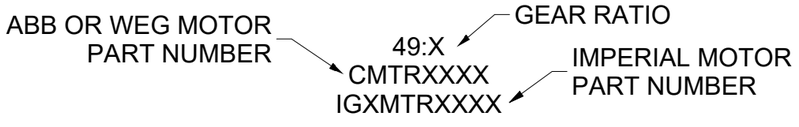
SHEET SIZE	DATE	
B	4/25/2023	GT11OD-LH SHEET 5 OF 10

MOTOR CHART 1:1 ROPING

SPEED	(ft/min)	50	75	100	125	150	175	200	250	300	350	400	450	500
CAP (lbs)	SHEAVE SIZE (in)													
1000	22	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1505 IG1MTR1514	49:1 CMTR1505 N/A	49:2 CMTR1001 IG1MTR1030	49:2 CMTR2001 IG1MTR1031	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 IG1MTR3515	49:3 CMTR2001 IG3MTR2013	49:3 CMTR3005 IG3MTR3014	49:3 CMTR3005 IG1MTR3515
1000	26	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1505 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG1MTR1514	49:3 CMTR2501 IG1MTR2504	49:3 CMTR2501 IG3MTR2013	49:3 CMTR2501 IG3MTR3013
1000	30	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG1MTR2504	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	49:2 CMTR3005 IG1MTR3515	49:2 CMTR3005 IG1MTR3515
1500	22	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1505 IG1MTR1514	49:1 CMTR1505 N/A	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 IG1MTR3515	49:3 CMTR2501 IG3MTR3013	49:3 CMTR4005 IG3MTR3014	49:3 CMTR4005 IG1MTR3515
1500	26	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1505 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	49:3 CMTR3001 IG1MTR2504	49:3 CMTR3001 IG3MTR3013	49:3 CMTR3001 IG3MTR3013
1500	30	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG1MTR2504	49:2 CMTR2001 IG3MTR2013	49:2 CMTR4005 IG3MTR3014	49:2 CMTR4005 IG1MTR3515	49:2 CMTR4005 IG1MTR3515
2000	22	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1001 IG1MTR1031	49:1 CMTR1505 IG1MTR1514	49:1 CMTR1505 N/A	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	49:2 CMTR3005 IG1MTR3515	49:3 CMTR3001 IG3MTR3013	49:3 CMTR4005 IG3MTR3014	49:3 CMTR4005 IG1MTR3515
2000	26	49:1 CMTR1001 N/A	49:1 CMTR1001 N/A	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 IG1MTR1030	49:1 CMTR2001 IG1MTR1031	49:1 CMTR3005 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2501 IG3MTR2030	49:2 CMTR2501 IG3MTR2013	49:2 CMTR4005 IG3MTR3014	49:3 CMTR5001 IG1MTR2504	49:3 CMTR5001 IG3MTR3013	49:3 CMTR5001 IG3MTR3013
2000	30	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 IG1MTR1030	49:1 CMTR2001 IG1MTR1031	49:1 CMTR2001 N/A	49:1 CMTR3005 IG1MTR1514	49:2 CMTR2501 IG3MTR2030	49:2 CMTR2501 IG1MTR2504	49:2 CMTR2501 IG3MTR3013	49:2 CMTR4005 IG3MTR3014	49:2 CMTR4005 IG1MTR3515	49:2 CMTR4005 IG1MTR3515
2500	22	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1030	49:1 CMTR2001 IG1MTR1031	49:1 CMTR3005 IG1MTR1514	49:1 CMTR3005 N/A	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2501 IG3MTR2013	49:2 CMTR4005 IG3MTR3014	49:2 CMTR4005 IG1MTR3515	GT31	GT31	GT31
2500	26	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 IG1MTR1030	49:1 CMTR2001 IG3MTR2013	49:1 CMTR3005 N/A	49:2 CMTR2501 IG1MTR1729	49:2 CMTR2501 IG3MTR2030	49:2 CMTR2501 IG3MTR3013	49:2 CMTR4005 IG3MTR3014	GT31	GT31	GT31
2500	30	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 IG1MTR1030	49:1 CMTR2001 IG1MTR2504	49:1 CMTR2001 N/A	49:1 CMTR3005 IG3MTR3014	49:2 CMTR3001 IG3MTR2030	49:2 CMTR3001 IG1MTR2504	49:2 CMTR3001 IG3MTR3013	GT31	GT31	GT31

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11OD, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

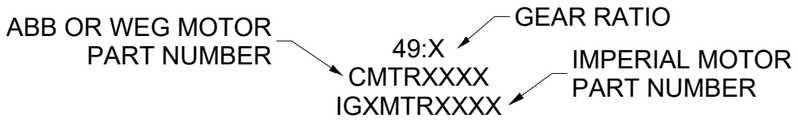
SHEET SIZE	DATE	
B	4/25/2023	GT11OD-LH SHEET 6 OF 10

MOTOR CHART 1:1 ROPING

SPEED	(ft/min)	50	75	100	125	150	175	200	250	300	350	400	450	500
CAP (lbs)	SHEAVE SIZE (in)													
3000	22	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1030	49:1 CMTR2001 IG3MTR2013	49:1 CMTR3005 IG1MTR1514	49:1 CMTR3005 N/A	49:2 CMTR2501 IG3MTR2030	GT31	GT31	GT31	GT31	GT31	GT31
3000	26	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 IG3MTR2030	49:1 CMTR2001 IG3MTR2013	49:1 CMTR3005 N/A	49:2 CMTR3001 IG1MTR1729	GT31	GT31	GT31	GT31	GT31	GT31
3000	30	49:1 CMTR2001 N/A	49:1 CMTR2001 N/A	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 IG3MTR2030	49:1 CMTR2001 IG1MTR2504	49:1 CMTR2001 N/A	49:1 CMTR3005 IG3MTR3014	GT31	GT31	GT31	GT31	GT31	GT31

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11OD, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

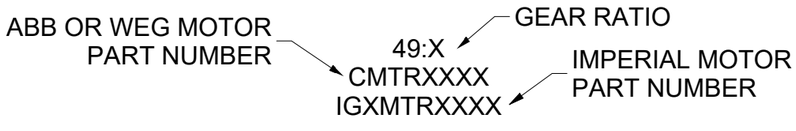
SHEET SIZE	DATE	
B	4/25/2023	GT11OD-LH SHEET 7 OF 10

MOTOR CHART 2:1 ROPING

SPEED	(ft/min)	50	75	100	125	150	175	200	225	250
CAP (lbs)	SHEAVE SIZE (in)									
1000	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 IG1MTR1514	49:2 CMTR1505 N/A	49:3 CMTR1001 IG1MTR1514	49:3 CMTR1505 N/A	49:3 CMTR1505 IG1MTR3515
1000	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR1001 IG1MTR1729	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 N/A	49:3 CMTR1001 IG1MTR1031	49:3 CMTR1001 N/A	49:3 CMTR1001 IG1MTR1514
1000	30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1001 N/A	49:2 CMTR1505 IG1MTR1514	49:2 CMTR1505 N/A	49:2 CMTR1505 IG1MTR3515
1500	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 IG1MTR1514	49:2 CMTR1505 N/A	49:3 CMTR1001 IG1MTR1514	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515
1500	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR1001 IG1MTR1729	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 N/A	49:3 CMTR2001 IG1MTR1031	49:3 CMTR2001 N/A	49:3 CMTR2001 IG3MTR2013
1500	30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1001 N/A	49:2 CMTR1505 IG1MTR1514	49:2 CMTR1505 N/A	49:2 CMTR1505 IG1MTR3515
2000	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 IG1MTR1514	49:2 CMTR1505 N/A	49:3 CMTR2001 IG1MTR1514	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515
2000	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR1001 IG1MTR1729	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR1505 N/A	49:3 CMTR2001 IG1MTR2504	49:3 CMTR2001 N/A	49:3 CMTR2001 IG3MTR2013
2000	30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG1MTR1031	49:2 CMTR2001 N/A	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 N/A	49:2 CMTR3005 IG1MTR3515
2500	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR1001 IG1MTR1030	49:2 CMTR1001 IG1MTR1031	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 N/A	49:3 CMTR2001 IG3MTR2013	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515
2500	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 N/A	49:3 CMTR2001 IG1MTR2504	49:3 CMTR2001 N/A	49:3 CMTR2001 IG3MTR2013
2500	30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG1MTR2504	49:2 CMTR2001 N/A	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 N/A	49:2 CMTR3005 IG1MTR3515

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAIL AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11OD, LEFT HAND

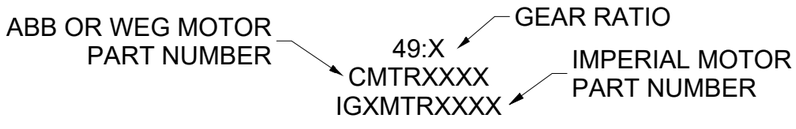
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11OD-LH SHEET 8 OF 10

MOTOR CHART 2:1 ROPING										
SPEED	(ft/min)	50	75	100	125	150	175	200	225	250
CAP (lbs)	SHEAVE SIZE (in)									
3000	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG1MTR1031	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 N/A	49:3 CMTR2001 IG3MTR2013	49:3 CMTR3005 N/A	49:3 CMTR3005 IG1MTR3515
3000	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 N/A	49:3 CMTR2501 IG1MTR2504	49:3 CMTR2501 N/A	49:3 CMTR2501 IG3MTR3013
3000	30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG1MTR2504	49:2 CMTR2001 N/A	49:2 CMTR3005 IG3MTR3014	49:2 CMTR3005 N/A	49:2 CMTR3005 IG1MTR3515
3500	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR2001 IG1MTR1030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG1MTR1514	49:2 CMTR3005 N/A	49:3 CMTR2001 IG3MTR2013	49:3 CMTR4005 N/A	49:3 CMTR4005 IG1MTR3515
3500	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 N/A	49:3 CMTR2501 IG1MTR2504	49:3 CMTR2501 N/A	49:3 CMTR2501 IG3MTR3013
3500	30	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:1 CMTR1505 IG1MTR1514	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG1MTR2504	49:2 CMTR2001 N/A	49:2 CMTR3005 IG3MTR3014	49:2 CMTR3005 N/A	49:2 CMTR3005 IG1MTR3515
4000	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	49:2 CMTR3005 N/A	49:3 CMTR2501 IG3MTR3013	49:3 CMTR4005 N/A	49:3 CMTR4005 IG1MTR3515
4000	26	49:1 CMTR1001 IG1MTR1729	49:1 CMTR1001 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 N/A	49:3 CMTR3001 IG1MTR2504	49:3 CMTR3001 N/A	49:3 CMTR3001 IG3MTR3013
4000	30	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:1 CMTR3005 IG1MTR1514	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2501 IG1MTR2504	49:2 CMTR2501 N/A	49:2 CMTR4005 IG3MTR3014	49:2 CMTR4005 N/A	49:2 CMTR4005 IG1MTR3515
4500	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	GT31	GT31	GT31	GT31
4500	26	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:2 CMTR2001 IG1MTR1729	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	GT31	GT31	GT31	GT31
4500	30	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:1 CMTR3005 IG1MTR1514	49:2 CMTR2501 IG3MTR2030	49:2 CMTR2501 IG1MTR2504	GT31	GT31	GT31	GT31

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT11OD, LEFT HAND

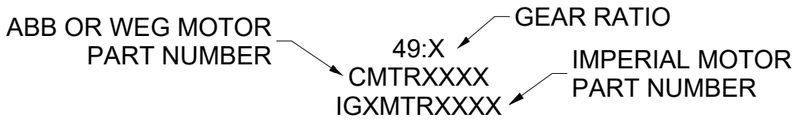
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11OD-LH SHEET 9 OF 10

MOTOR CHART 2:1 ROPING										
SPEED	(ft/min)	50	75	100	125	150	175	200	225	250
CAP (lbs)	SHEAVE SIZE (in)									
5000	22	49:1 CMTR1001 IG1MTR1030	49:1 CMTR1505 N/A	49:2 CMTR2001 IG3MTR2030	49:2 CMTR2001 IG3MTR2013	49:2 CMTR3005 IG3MTR3014	GT31	GT31	GT31	GT31
5000	26	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:2 CMTR2501 IG1MTR1729	49:2 CMTR2501 IG3MTR2030	49:2 CMTR2501 IG3MTR2013	GT31	GT31	GT31	GT31
5000	30	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:1 CMTR3005 IG1MTR1514	49:2 CMTR2501 IG3MTR2030	49:2 CMTR3001 IG1MTR2504	GT31	GT31	GT31	GT31
5500	22	49:1 CMTR2001 IG1MTR1030	49:1 CMTR3005 N/A	49:2 CMTR2001 IG3MTR2030	GT31	GT31	GT31	GT31	GT31	GT31
5500	26	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:2 CMTR2501 IG1MTR1729	GT31	GT31	GT31	GT31	GT31	GT31
5500	30	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:1 CMTR3005 IG3MTR3014	GT31	GT31	GT31	GT31	GT31	GT31
6000	22	49:1 CMTR2001 IG1MTR1030	49:1 CMTR3005 N/A	49:2 CMTR2501 IG3MTR2030	GT31	GT31	GT31	GT31	GT31	GT31
6000	26	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:2 CMTR3001 IG1MTR1729	GT31	GT31	GT31	GT31	GT31	GT31
6000	30	49:1 CMTR2001 IG1MTR1729	49:1 CMTR2001 N/A	49:1 CMTR3005 IG3MTR3014	GT31	GT31	GT31	GT31	GT31	GT31

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



B	100-FPM 5500-CAP 22-WHEEL 2:1 WAS CMTR2501, PUR #1808	DRO 08/11/23	A	COMBINED ALL WHEEL SIZES TO ONE PRINT, UPDATED PARTS LIST, MOVED MOTOR DATA TO MOTOR PRINTS, PUR #1764	DRO 05/08/23

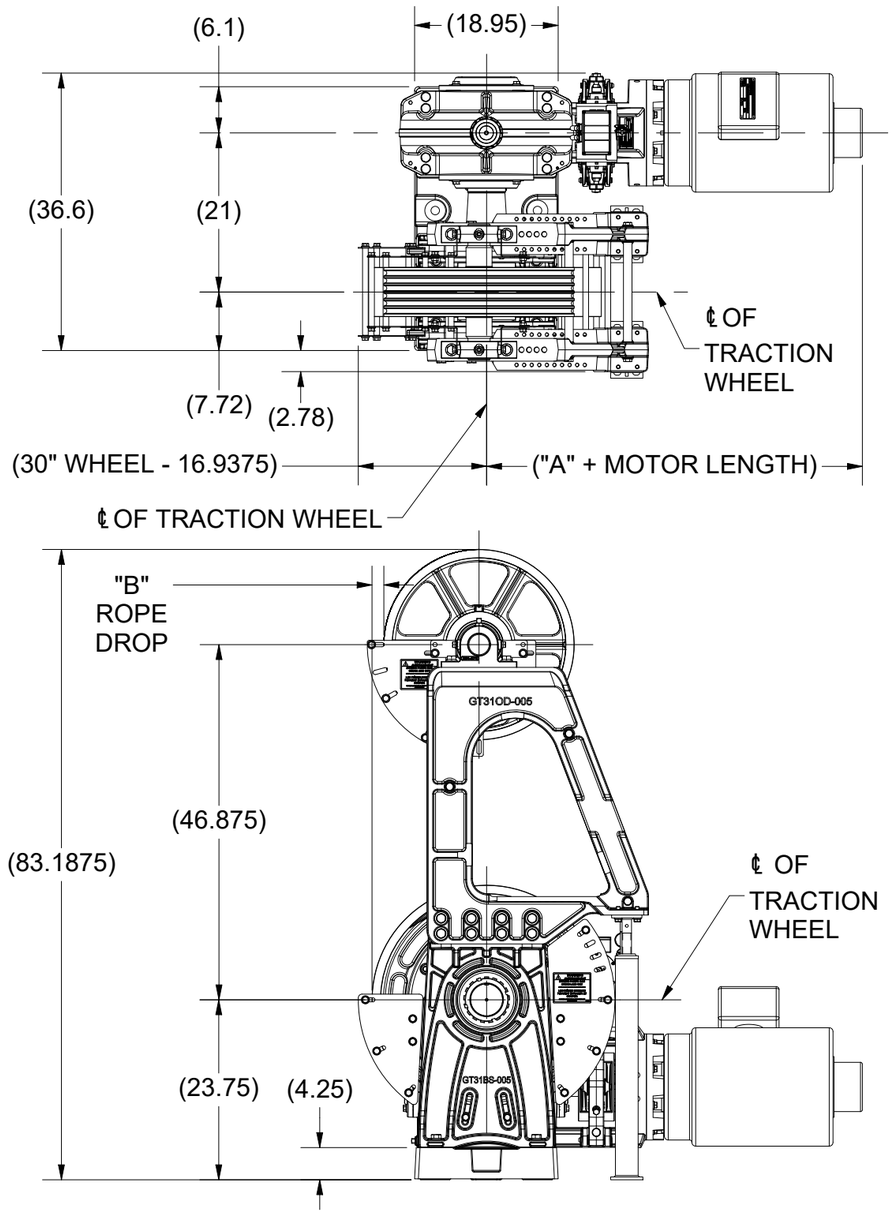
THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

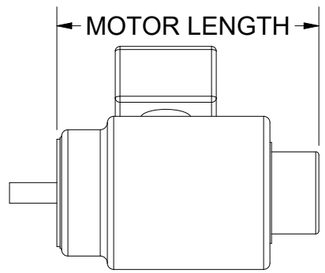
TITLE: ASSY, GT11OD, LEFT HAND

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	4/25/2023	GT11OD-LH SHEET 10 OF 10



CONTRACT SPECIFIC PARTS LIST ITEMS				
PART NUMBER				DESCRIPTION
				MOTOR, C-FLANGE - REFERENCE
GT31BS-080	-01	-02	-03	ASSY, CENTER -01 = 71:1, -02 = 71:2, -03 = 71:3
GT31-294	-01	-02	-03	ASSY, WORM AND BEARING -01 = 71:1, -02 = 71:2, -03 = 71:3
GT31-297	-1.625	-1.875		COUPLER, MOTOR -1.625 = 1.625", 254TC / 256TC FRAME -1.875 = 1.875", 284TC / 286TC FRAME -2.125 = 2.125", 324TC / 326TC FRAME -2.375 = 2.375", 364TC / 365TC FRAME
	-2.125	-2.375		
GT31	-312	-313		PLATE, ADAPTER, MOTOR -312 = 254TC / 256TC / 284TC / 286TC FRAME -313 = 324TC / 326TC / 364TC / 365TC FRAME



SEE MOTOR PRINT

"A" DIMENSION	
FRAME SIZE	INCHES
254TC / 256TC	21.395
284TC / 286TC	21.635
324TC /326TC 364TC / 365TC	23.125

"B" ROPE DROP DIMENSION
30" WHEEL
1.5
2.5
3.5
4.5
5.5
6.5

NOTES UNLESS OTHERWISE SPECIFIED:

1. MACHINE AVAILABLE WITH A 30" TRACTION SHEAVES.
2. MACHINE COMPATIBLE WITH 254TC, 256TC, 284TC, 286TC, 324TC, 326TC, 364TC, AND 365TC MOTORS.
3. APPROXIMATE MACHINE, BASE, DEFLECTOR, RETAINERS AND STANDS WEIGHT: 3251#
4. MAX SHEAVE SHAFT LOAD: 25,000#
5. BRAKE INFORMATION:
   PICK: 190Vdc, 1.94A, (2.5A Max.)
   HOLD: 80Vdc, 0.81A (1A Max.)

			C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23
D	CORRECTED PART NUMBER, PUR #1808	DRO 08/18/23	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

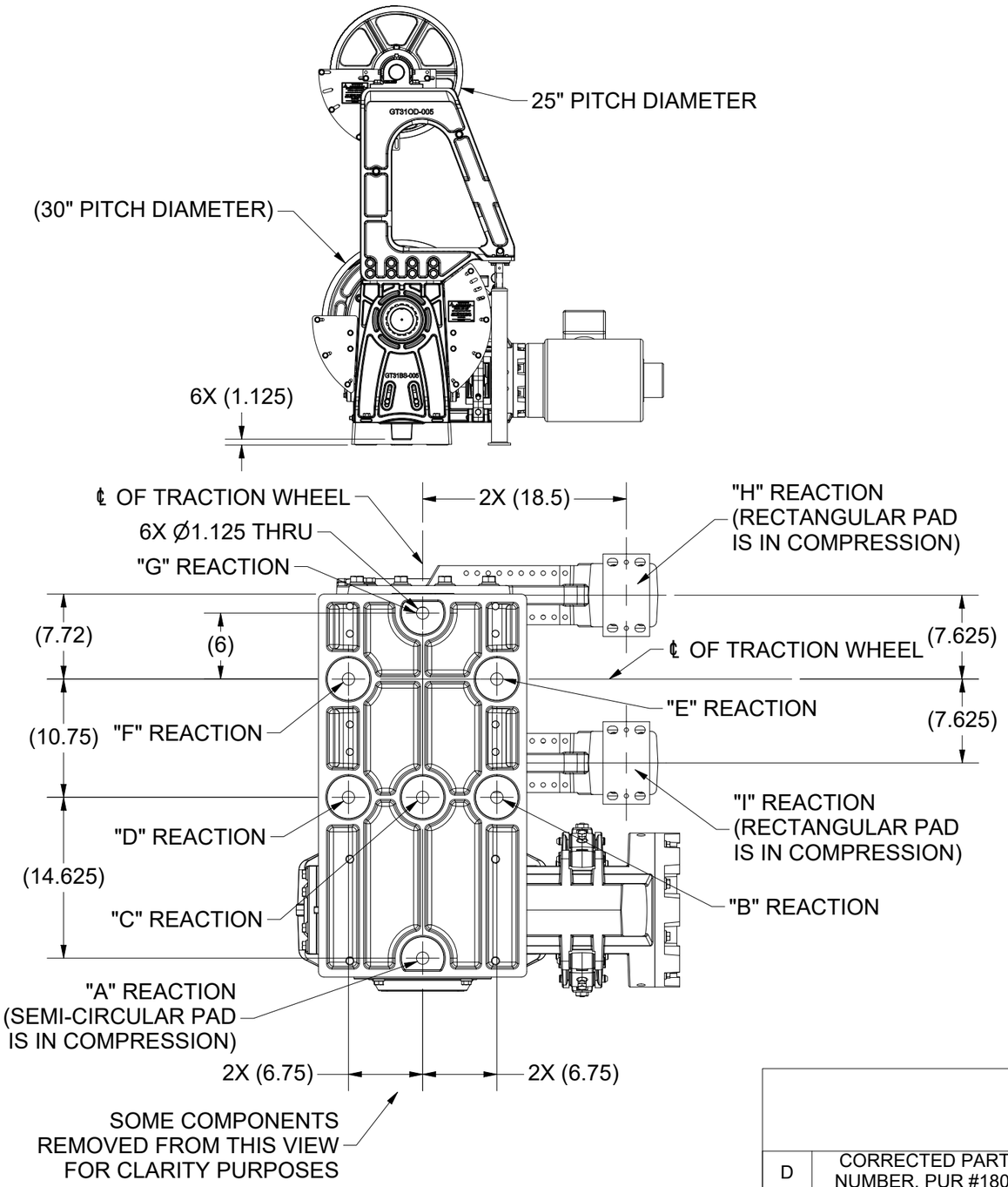
THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT31, LEFT HAND, OD

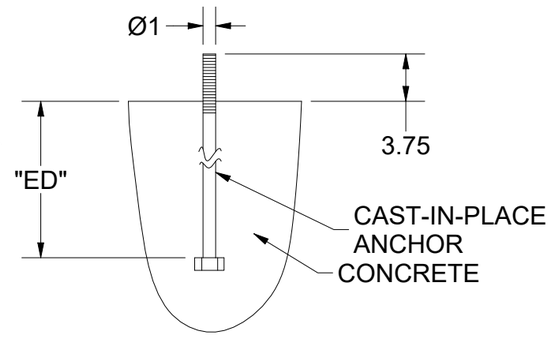
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:20	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/8/2023	GT31OD-LH SHEET 1



FOUNDATION BOLT REACTION FORCES			
LOCATION	REACTION TYPE	TO DETERMINE THE LOCATION REACTION FORCE MULTIPLY THE SHEAVE SHAFT LOAD BY THE FOLLOWING % (- SIGN INDICATES FORCE DIRECTION)	TO DETERMINE PSI OF COMPRESSIVE LOAD DIVIDE THE COMPRESSIVE FORCE BY THE FOLLOWING
"A"	COMPRESSION	-6%	8.6 in^2
"B"	TENSION	2%	N/A
"C"	TENSION	10%	N/A
"D"	TENSION	29%	N/A
"E"	TENSION	13%	N/A
"F"	TENSION	57%	N/A
"G"	TENSION	47%	N/A
"H"	COMPRESSION	-24%	30 in^2
"I"	COMPRESSION	-24%	30 in^2

CONCRETE GRADE, CAST-IN-PLACE ANCHOR TYPE, AND EMBEDMENT DEPTH ("ED" DIMENSION) TO BE DETERMINED BY THE STRUCTURAL ENGINEER OF RECORD



ANCHOR REACTIONS ASSUMPTIONS:

1. ALL ANCHOR LOADS ARE APPROXIMATE AND SHOULD BE REVIEWED BY THE BUILDING STRUCTURAL ENGINEER OF RECORD.
2. APPROXIMATE ANCHOR LOADS DO NOT INCLUDE ANY LOADING DUE TO A ROPE GRIPPER.
3. ONLY THE VERTICAL REACTION COMPONENT IS GIVEN AS AN APPROXIMATE ANCHOR LOAD.
4. APPROXIMATE ANCHOR LOADS NEGLECT THE WEIGHT OF THE MACHINE.
5. APPROXIMATE ANCHOR LOADS ARE BASED ONLY ON THE TRACTION SHEAVE SHAFT LOAD AND ARE NOT DOUBLED FOR IMPACT OR OTHER SYSTEM CONDITIONS.
6. APPROXIMATE ANCHOR LOADS DO NOT ASSUME ANY SEISMIC LOADING CONDITIONS.

NOTES UNLESS OTHERWISE SPECIFIED:

1. FOUNDATION/ANCHORING SHALL BE DESIGNED BY OTHERS ON THE ABOVE SPECIFICATIONS. HOLLISTER-WHITNEY ASSUMES NO RESPONSIBILITY FOR THE DESIGN OF THE FOUNDATION.

			C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23
D	CORRECTED PART NUMBER, PUR #1808	DRO 08/18/23	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

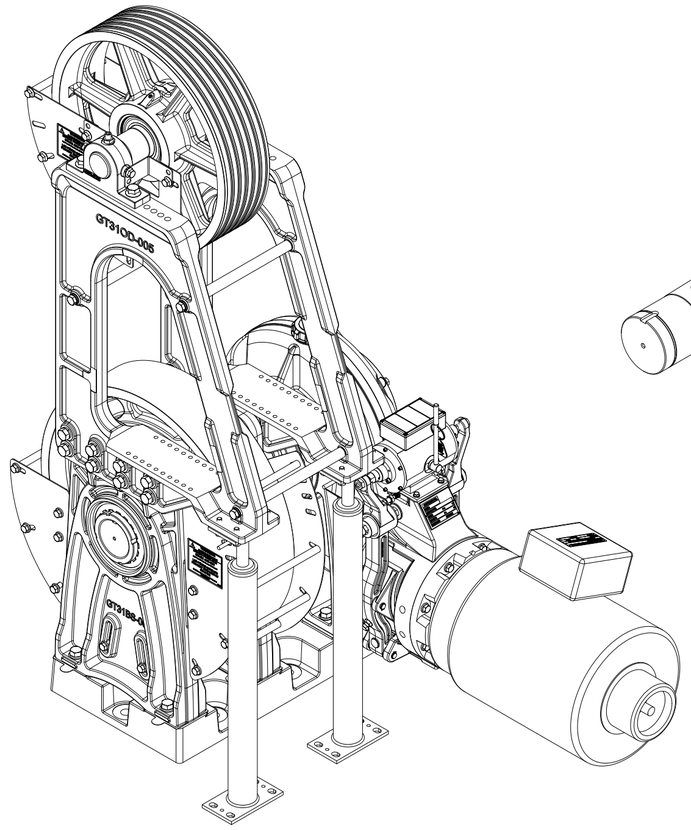
TITLE: ASSY, GT31, LEFT HAND, OD

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:25	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

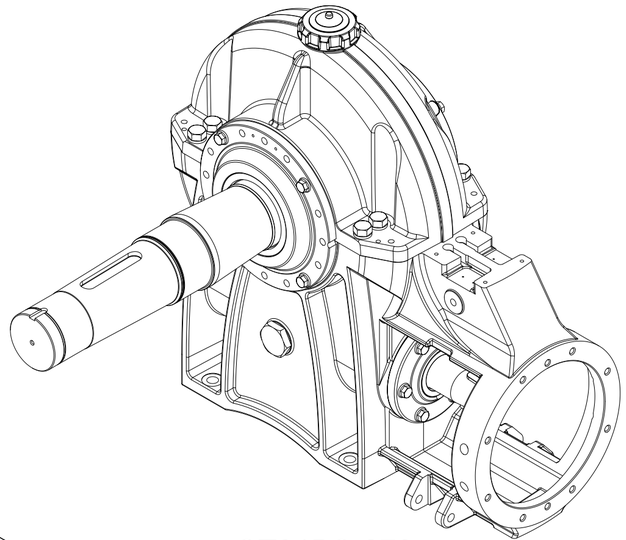
SHEET SIZE	DATE	
B	5/8/2023	GT31OD-LH SHEET 2

ENGINEERING MASTER PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	GT31BS-273-01	ASSY, GEAR BOX, SINGLE LEAD, 71:1
		GT31BS-273-02	ASSY, GEAR BOX, DOUBLE LEAD, 71:2
		GT31BS-273-03	ASSY, GEAR BOX, TRIPLE LEAD, 71:3
2	1	GT31BS-001	BASE, BS/OD
3	2	GT31BS-005	STAND, OUTBOARD, BS
4	2	GT31OD-005	STAND, OUTBOARD, OD
5	AS REQ'D	GT31-062-05	SHIM, STAND, OUTBOARD, 0.005" THICK
		GT31-062-01	SHIM, STAND, OUTBOARD, 0.010' THICK
		GT31-062-31	SHIM, STAND, OUTBOARD, 0.031" THICK
6	1	GT31-093	BEARING, ROLLER, SPHERICAL
7	1	GT31-094	BEARING, ROLLER, SPHERICAL
8	3	GT31OD-144	SPACER, STAND, OD
9	1	GT31OD-250-30	ASSY, RETAINER, ROPE, OD, 30"
10	1	GT31-282	NUT, LOCK, SHAFT
11	1	GT31-283	WASHER, LOCK, SHAFT
12	1	GT31-286-30	ASSY, TRACTION WHEEL AND HUB, 30"
13	2	GT31-290	CONDUIT, METAL, FLEXIBLE, 3/8"
14	2	GT31-291	ADAPTER, FMC, 90 DEG ELBOW, 3/8"
15	2	GT31-293	ADAPTER, STRAIGHT, FMC, 3/8"
16	1	GT31-297-1.625	COUPLER, MOTOR, 1.625", 254TC / 256TC FRAME
		GT31-297-1.875	COUPLER, MOTOR, 1.875", 284TC / 286TC FRAME
		GT31-297-2.125	COUPLER, MOTOR, 2.125", 324TC / 326TC FRAME
		GT31-297-2.375	COUPLER, MOTOR, 2.375", 364TC / 365TC FRAME
17	1	GT31-298	ELEMENT, COUPLING
18	2	GT31-299	BUSHING, ANTI-SHORT, FEMALE, FMC, 3/8"
19	1	GT31-300	KEY, SHAFT, WHEEL
20	1	GT31-310	NUT, LOCK, SHAFT
21	1	GT31-311	WASHER, LOCK, SHAFT
22	1	GT31-312	PLATE, ADAPTER, MOTOR, 254TC / 256TC / 284TC / 286TC FRAME
		GT31-313	PLATE, ADAPTER, MOTOR, 324TC / 326TC / 364TC / 365TC FRAME
23	1	GT31-314	ASSY, SOLENOID, BRAKE
24	2	GT31-315	ASSY, ARM, BRAKE
25	2	GT31-321	PIN, PIVOT
26	1	GT31-322	DRUM, BRAKE
27	1	GT31-326	PLATE, RETENTION, BEARING, STAND
28	2	GT31-327	ASSY, SWITCH, BRAKE
29	1	GT11OD-331-027B	ASSY, SHEAVE, DEFLECOR, GT OD MACINE, BALL BEARING, SEALED
30	2	GT31OD-335	COLUMN, SUPPORT, ADJUSTABLE
31	1	GT31-358	ASSY, BLOCK, TERMINAL
32	1	GT31BS-368	RETAINING RING, SPIRAL, MEDIUM DUTY
33	1	P-208	MANUAL BRAKE RELEASE TAG
34	1	P-223-R	CUSTOMER NAMEPLATE
35	1	P-226	LABEL, DATA, ELECTRICAL, BRAKE
36	1	P-227	LABEL, INSTRUCTION, BRAKE
37	1	P-228	LABEL, WIRING, BRAKE
38	1	P-231	TAG, DATA, MOTOR, CONTRACT
39	1	P-236	MACHINE DATA TAG
40	4	#6-32 UNC X 7/8"	SCREW, HEX HEAD
41	4	5/16"-18 UNC X 3/4"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
42	1	7/16"-14 UNC X 2-1/4"	SCREW, HEX, CAP, SOCKET HEAD, BLACK OXIDE FINISH
43	AS REQ'D	1/2"-13 UNC X 1-1/2"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
44	AS REQ'D	1/2"-13 UNC X 1-1/2"	SCREW, HEX, CAP, FLAT SOCKET HEAD, BLACK OXIDE FINISH
45	4	5/8" - MS 16624	RING, RETAINING, EXTERNAL, SERIES 3100
46	6	5/8"	LOCK WASHER, HELICAL SPRING, REGULAR
47	6	5/8" X 1-1/2"	PIN, DOWEL, GROUND, HARDENED
48	AS REQ'D	5/8" - 11 UNC x 1-1/2"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
49	6	5/8" - 11 UNC x 3"	HEX CAP SCREW
50	28	3/4"	WASHER, LOCK
51	12	3/4"-10 UNC X 2-1/2"	BOLT, HEX, GRADE 5, BLACK OXIDE FINISH
52	16	3/4"-10 UNC X 3"	BOLT, HEX, GRADE 5, BLACK OXIDE FINISH
53	2.5 gal	MOBIL SHC 636	OIL, GEAR, HIGH PRESSURE

GT31BS-273 PARTS LIST					
ITEM	QTY GT31BS-273-01	QTY GT31BS-273-02	QTY GT31BS-273-03	PART NUMBER	DESCRIPTION
2.1	1	0	0	GT31BS-080-01	ASSY, CENTER, SINGLE LEAD
2.1	0	1	0	GT31BS-080-02	ASSY, CENTER, DOUBLE LEAD
2.1	0	0	1	GT31BS-080-03	ASSY, CENTER, TRIPLE LEAD
2.2	1	1	1	GT31-284	ASSY, UPPER AND LOWER HOUSING, MACHINED
2.3	1	0	0	GT31-294-01	ASSY, WORM SHAFT AND BEARING, 7/8" SINGLE
2.3	0	1	0	GT31-294-02	ASSY, WORM SHAFT AND BEARING, 7/8" DOUBLE
2.3	0	0	1	GT31-294-03	ASSY, WORM SHAFT AND BEARING, 7/8" TRIPLE
2.4	1	1	1	GT31-063	CAP, FILL, OIL
2.5	1	1	1	GT31-085	CAP, BEARING, REAR END
2.6	1	1	1	GT31-085-FE	CAP, BEARING, FORWARD END
2.7	AS REQ'D	AS REQ'D	AS REQ'D	GT31-087	SHIM, CAP, BEARING
2.8	1	1	1	GT31-276	GLASS, SIGHT, OIL
2.9	1	1	1	GT31-277	PLUG, DRAIN, OIL
2.10	1	1	1	GT31-278	PLUG, OIL
2.11	1	1	1	GT31-279	O-RING, PLUG, OIL
2.12	1	1	1	GT31-287	SEAL, SHAFT, RADIAL
2.13	1	1	1	GT31-287-1	SEAL, SHAFT, RADIAL
2.14	4	4	4	GT31-295	SHIM, ECCENTRIC, EDGE BONDED
2.15	1	1	1	GT31-301	KEY, SHAFT, WORM
2.16	20	20	20	1/2"-13 UNC X 1-1/2"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED



GT31OD-LH



GT31BS-273

			C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23
D	CORRECTED PART NUMBER, PUR #1808	DRO 08/18/23	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

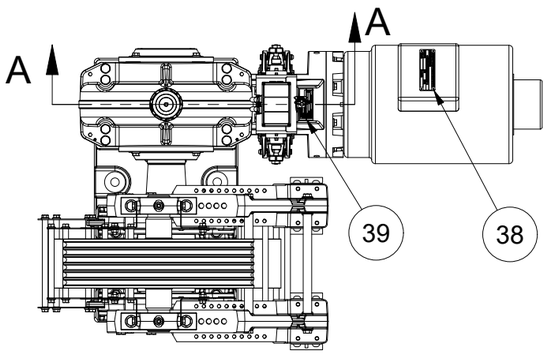
THIRD ANGLE PROJECTION

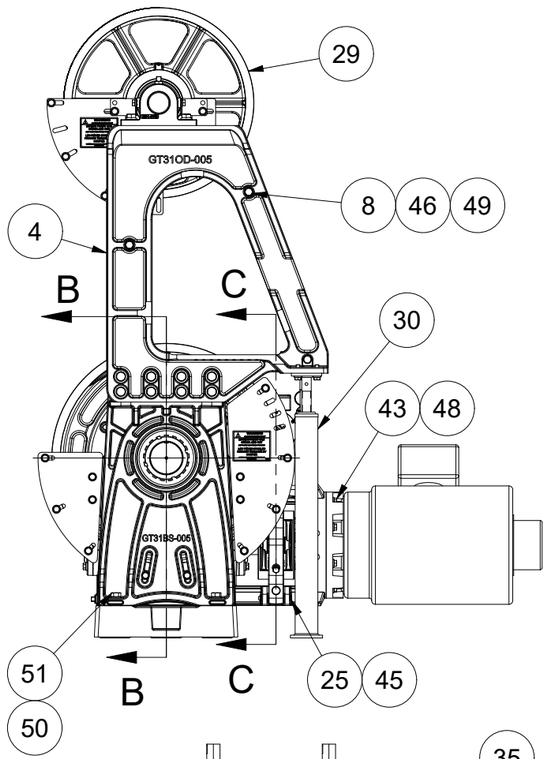
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

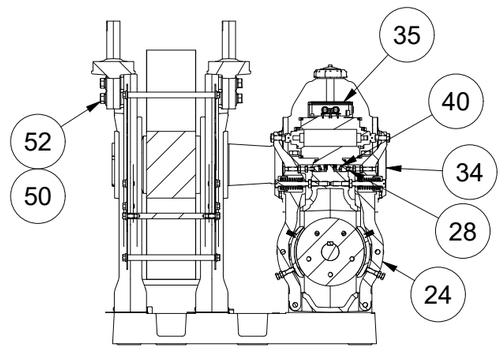
TITLE: ASSY, GT31, LEFT HAND, OD

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:12	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

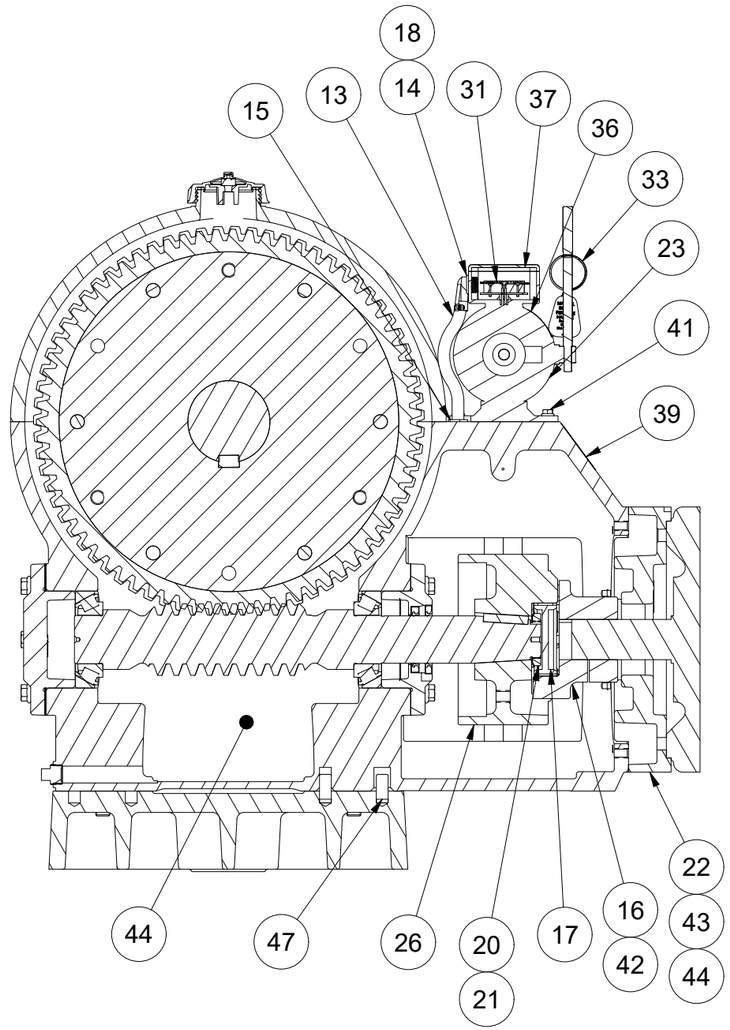
SHEET SIZE	DATE	
C	5/8/2023	GT31OD-LH SHEET 3



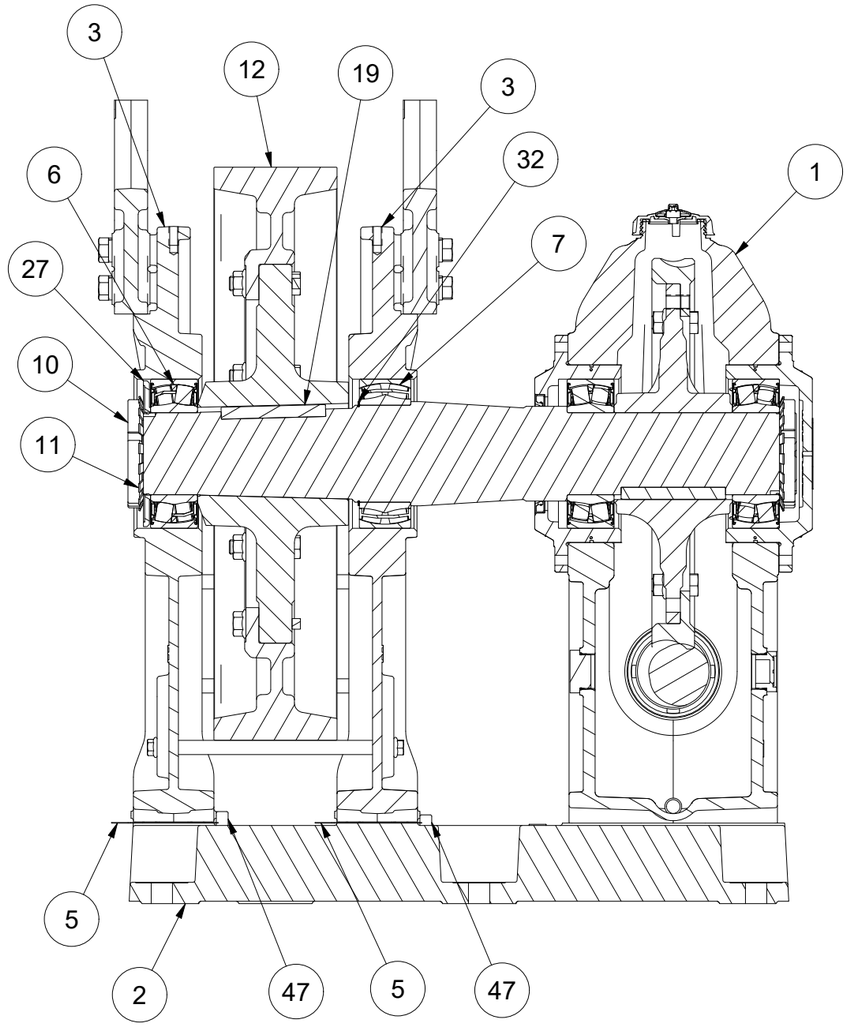




SECTION C-C



SECTION A-A
SCALE 1:8



SECTION B-B
SCALE 1:8

			C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23
D	CORRECTED PART NUMBER, PUR #1808	DRO 08/18/23	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

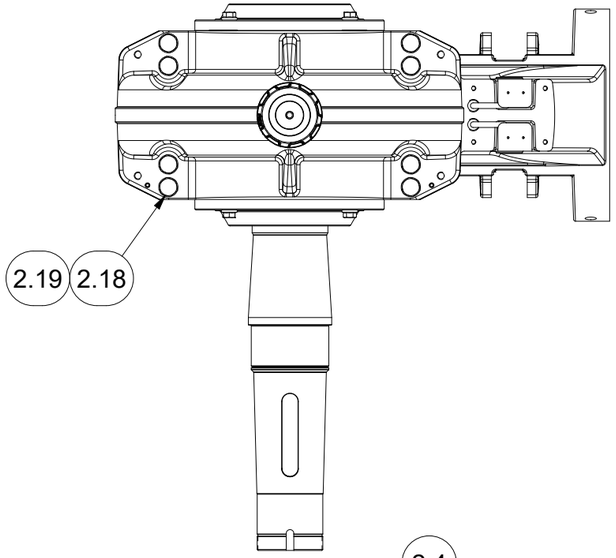
THIRD ANGLE PROJECTION

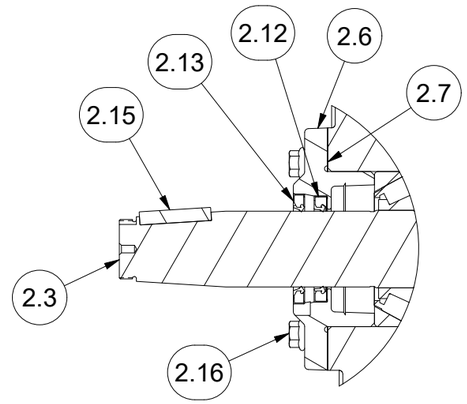
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT31, LEFT HAND, OD

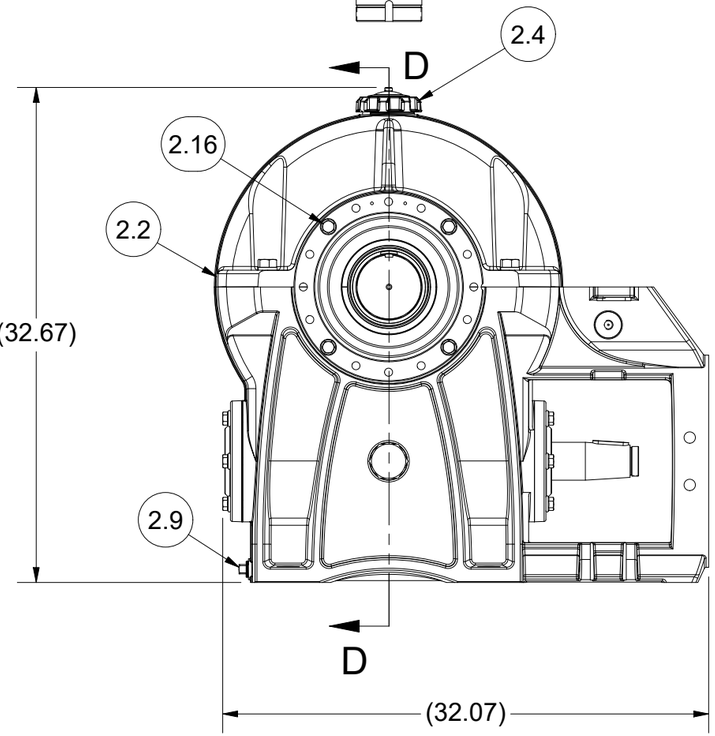
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:20	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

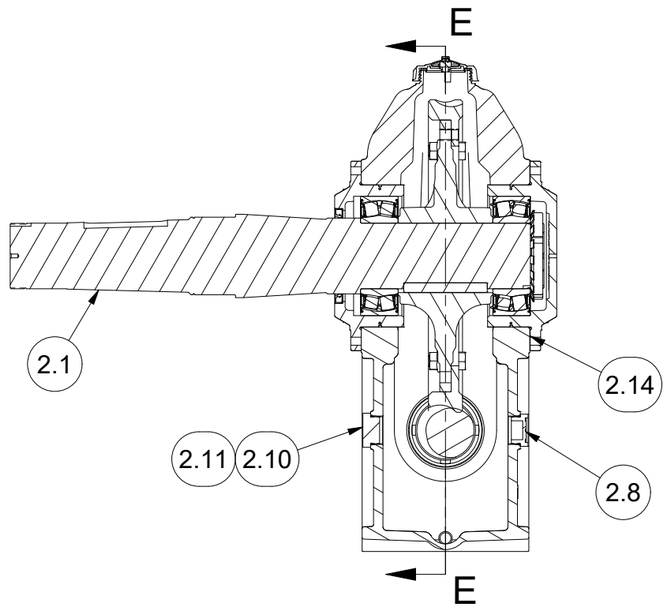
SHEET SIZE	DATE	
B	5/8/2023	GT31OD-LH SHEET 4



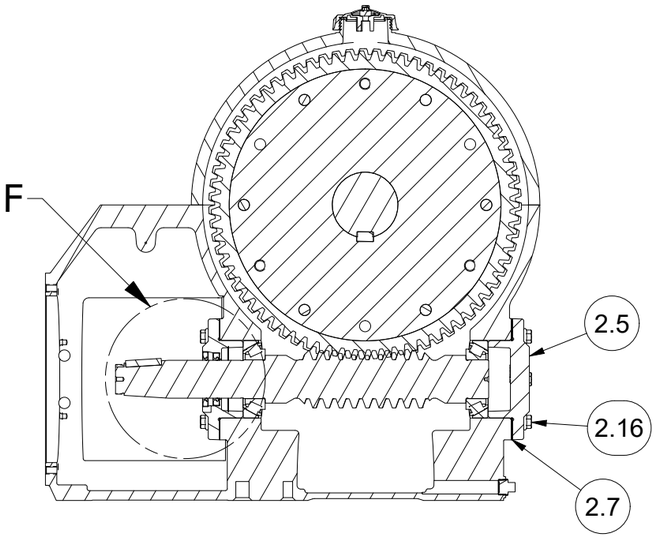


DETAIL F





SECTION D-D



SECTION E-E

			C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23
D	CORRECTED PART NUMBER, PUR #1808	DRO 08/18/23	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE
ASSY, GT31, LEFT HAND, OD

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:10	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

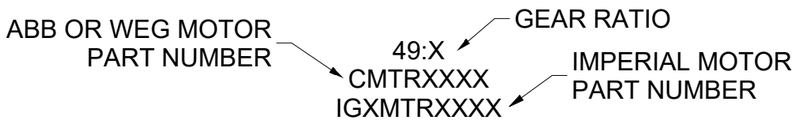
SHEET SIZE	DATE	
B	5/8/2023	GT31OD-LH SHEET 5

MOTOR CHART 1:1 ROPING

SPEED	(ft/min)	50	75	100	125	150	175	200	250	300	350	400	450	500
CAP (lbs)	SHEAVE SIZE (in)													
2000	30	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 N/A	71:2 CMTR3005 IG3MTR3014	71:3 CMTR2501 IG3MTR3013	71:3 CMTR2501 IG3MTR3013	71:3 CMTR4005 IG3MTR3014	71:3 CMTR4005 IG1MTR3515
2500	30	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR1001 N/A	71:1 CMTR3005 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:3 CMTR3001 IG3MTR3013	71:3 CMTR3001 IIG3MTR301	71:3 CMTR5005 IG3MTR5014	71:3 CMTR5005 IG3MTR5014
3000	30	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG1MTR1030	71:1 CMTR2001 IG1MTR1514	71:1 CMTR3005 IG1MTR1514	71:2 CMTR2501 N/A	71:2 CMTR2501 IG1MTR2504	71:2 CMTR2501 IG3MTR3013	71:2 CMTR4005 IG3MTR3014	71:3 CMTR5001 IG3MTR3013	71:3 CMTR5001 IG3MTR5013	71:3 CMTR5005 IG3MTR5014	71:3 CMTR5005 IG3MTR5014
3500	30	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2030	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:2 CMTR2501 N/A	71:2 CMTR2501 IG1MTR2504	71:2 CMTR3001 IG3MTR3013	71:2 CMTR4005 IG3MTR3014	71:3 CMTR5001 IG3MTR5013	71:3 CMTR5001 IG3MTR5013	71:3 CMTR6005 IG3MTR5014	71:3 CMTR6005 IG3MTR5014
4000	30	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2030	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:2 CMTR3001 N/A	71:2 CMTR3001 IG1MTR2504	71:2 CMTR3001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:3 CMTR5001 IG3MTR5013	71:3 CMTR5001 IG3MTR5013	71:3 N/A IG3MTR5014	N/A
4500	30	71:1 CMTR2001 N/A	71:1 CMTR2001 N/A	71:1 CMTR2001 IG3MTR2030	71:1 CMTR2001 IG3MTR2013	71:1 CMTR3005 IG3MTR3014	71:2 CMTR3001 N/A	71:2 CMTR3001 IG1MTR2504	71:2 CMTR5001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:3 CMTR5001 IG3MTR5013	71:3 CMTR5001 IG3MTR5013	N/A	N/A

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



		C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23	
D	CORRECTED PART NUMBER, PUR #1808	DRO 08/18/23	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT31, LEFT HAND, OD

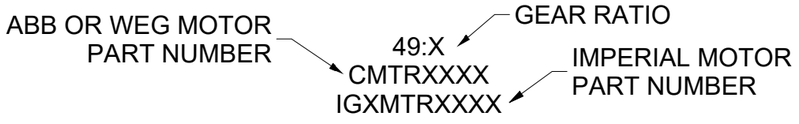
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/8/2023	GT31OD-LH SHEET 6

MOTOR CHART 2:1 ROPING										
SPEED	(ft/min)	50	75	100	125	150	175	200	225	250
CAP (lbs)	SHEAVE SIZE (in)									
2500	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR1001 N/A	71:2 CMTR1001 N/A	71:2 CMTR1505 N/A	71:3 CMTR2001 N/A	71:3 CMTR2001 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A
3000	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 N/A	71:2 CMTR3005 N/A	71:3 CMTR2001 N/A	71:3 CMTR2001 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A
3500	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 N/A	71:2 CMTR3005 N/A	71:3 CMTR2001 N/A	71:3 CMTR2001 N/A	71:3 CMTR3005 N/A	71:3 CMTR3005 N/A
4000	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 IG1MTR1514	71:2 CMTR3005 IG3MTR3014	71:3 CMTR2501 N/A	71:3 CMTR2501 IG3MTR3013	71:3 CMTR4005 N/A	71:3 CMTR4005 N/A
4500	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 N/A	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:3 CMTR2501 N/A	71:3 CMTR2501 IG3MTR3013	71:3 CMTR4005 N/A	71:3 CMTR4005 N/A
5000	30	71:1 CMTR1001 N/A	71:1 CMTR1505 N/A	71:2 CMTR2001 IG1MTR2504	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:3 CMTR3001 N/A	71:3 CMTR3001 IG3MTR3013	71:3 CMTR4005 N/A	71:3 CMTR4005 IG1MTR3515
5500	30	71:1 CMTR2001 N/A	71:1 CMTR3005 N/A	71:2 CMTR2001 IG1MTR2504	71:2 CMTR2001 IG3MTR2013	71:2 CMTR3005 IG3MTR3014	71:3 CMTR3001 N/A	71:3 CMTR3001 IG3MTR3013	71:3 CMTR5005 N/A	71:3 CMTR5005 IG3MTR5014
6000	30	71:1 CMTR2001 N/A	71:1 CMTR3005 N/A	71:2 CMTR2001 IG1MTR2504	71:2 CMTR2001 IG3MTR2013	71:2 CMTR4005 IG3MTR3014	71:3 CMTR3001 N/A	71:3 CMTR3001 IG3MTR5013	71:3 CMTR5005 N/A	71:3 CMTR5005 IG3MTR5014
7000	30	71:1 CMTR2001 IG3MTR2030	71:1 CMTR3005 N/A	71:2 CMTR2501 IG1MTR2504	71:2 CMTR2501 IG3MTR3013	71:2 CMTR4005 IG3MTR3014	71:3 CMTR5001 N/A	71:3 CMTR5001 IG3MTR5013	71:3 CMTR6005 N/A	71:3 CMTR6005 IG3MTR5014
8000	30	71:1 CMTR2001 IG3MTR2030	71:1 CMTR3005 N/A	71:2 CMTR3001 IG1MTR2504	71:2 CMTR3001 IG3MTR3013	71:2 CMTR4005 IG3MTR5014	71:3 CMTR5001 N/A	71:3 CMTR5001 IG3MTR5013	N/A	N/A
9000	30	71:1 CMTR2001 IG3MTR2030	71:1 CMTR3005 N/A	71:2 CMTR3001 IG1MTR2504	71:2 CMTR3001 IG3MTR3013	71:2 CMTR5005 IG3MTR5014	71:3 CMTR5001 N/A	71:3 CMTR5001 IG3MTR5013	N/A	N/A

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE MOTOR DRAWINGS FOR SPECIFIC MOTOR DETAILS AND CHARACTERISTICS.
2. CELL FORMAT IS AS FOLLOWS:



		C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR SELECTIONS, PUR #1801	DRO 07/27/23	
D	CORRECTED PART NUMBER, PUR #1808	DRO 08/18/23	B	CORRECTED DUTY TABLES, PUR #1772	DRO 05/18/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GT31, LEFT HAND, OD

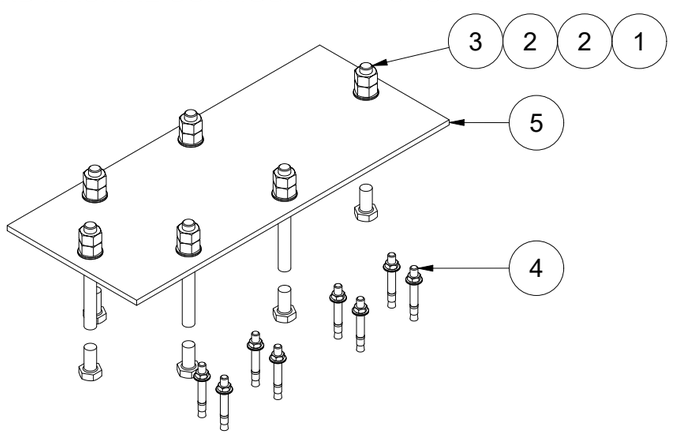
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/8/2023	GT31OD-LH SHEET 7

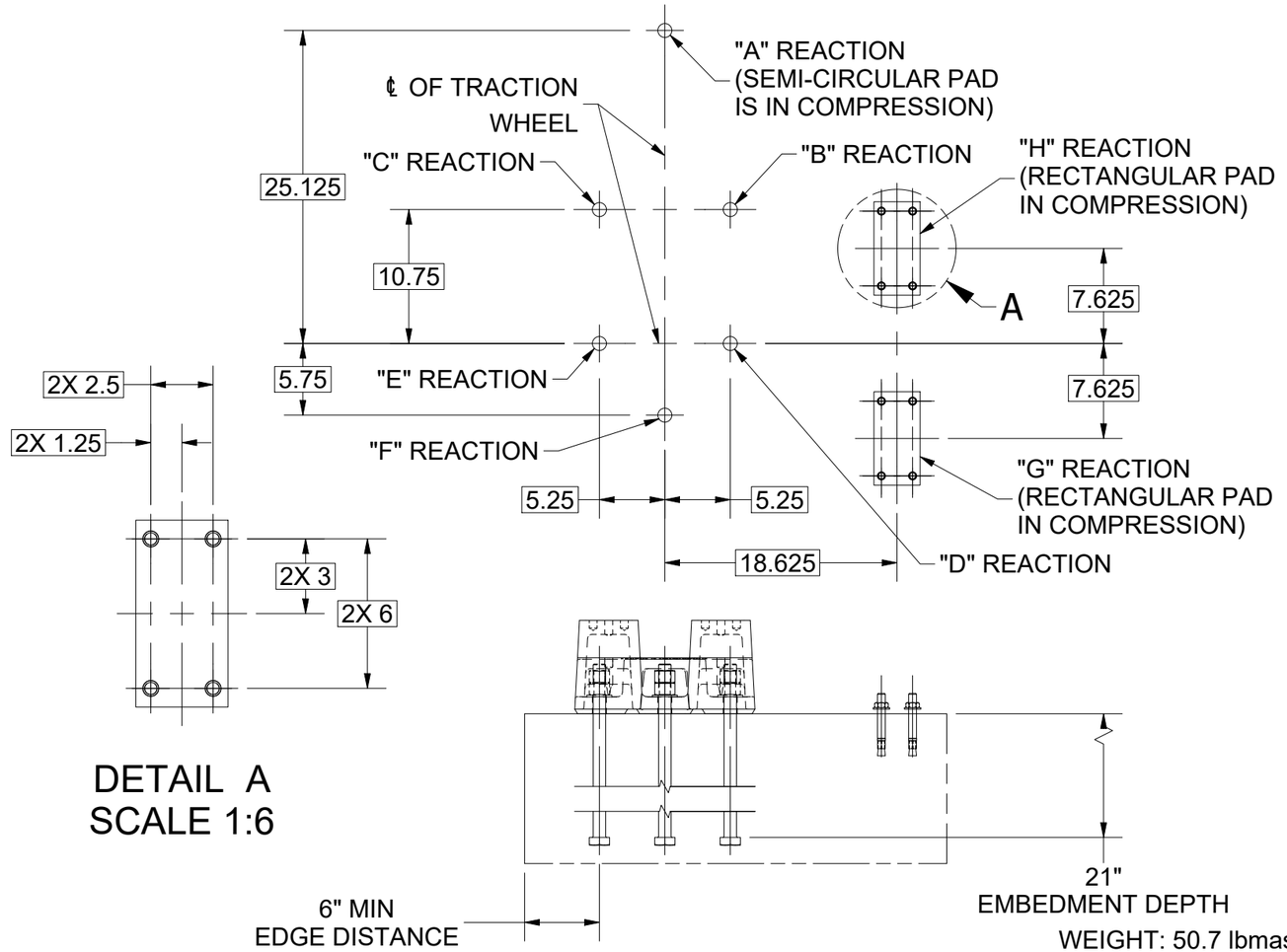
FOUNDATION BOLT REACTION FORCES			
LOCATION	REACTION TYPE	30" WHEEL SERVICE LOAD	COMPRESSIVE LOAD AREA
"A"	COMPRESSION	-680 POUNDS	12.6 in²
"B"	TENSION	1190 POUNDS	N/A
"C"	TENSION	5780 POUNDS	N/A
"D"	TENSION	2550 POUNDS	N/A
"E"	TENSION	8330 POUNDS	N/A
"F"	TENSION	10030 POUNDS	N/A
"G"	COMPRESSION	-4590 POUNDS	30 in²
"H"	COMPRESSION	-4590 POUNDS	30 in²

ANCHOR AND FOUNDATION NOTES:

1. THE FINAL FOUNDATION AND ANCHORING EMBEDMENT METHOD FOR THIS EQUIPMENT SHALL BE DESIGNED BY THE STRUCTURAL ENGINEER OF RECORD BASED ON THE LOADS AND LOCATIONS PROVIDED ON THIS SHEET. HOLLISTER-WHITNEY ASSUMES NO RESPONSIBILITY FOR THE DESIGN OF THE FOUNDATION OR THE METHOD OF THE ANCHORING EMBEDMENT.
2. ALL ANCHOR LOADS SHOWN IN THE TABLE ABOVE ARE SERVICE LOADS BASED ON THE OVERALL UPWARD PLUMB VERTICAL LOAD RESULTING FROM A 17,000 POUND SHEAVE SHAFT LOAD WITH A 30 INCH TRACTION WHEEL AND 1.5 INCHES OF ROPE OFFSET. FOR ANCHOR DESIGN, THESE LOADS SHALL BE DOUBLED PER SECTION 2.9.2.2 OF ASME A17.1, SAFETY CODE FOR ELEVATORS. THEY SHALL ALSO BE FACTORED ACCORDINGLY FOR ANCHOR DESIGN PER ACI 318.
3. THE WEIGHT OF THE MACHINE HAS NOT BEEN INCLUDED IN THE ANCHOR LOADS.
4. THE ANCHOR ROD SIZE, GRADE, AND EMBEDMENT DEPTH SHOWN ARE BASED ON THE FOLLOWING DESIGN ASSUMPTIONS:
   - -CONCRETE STRENGTH = 4000PSI
   - -UN-CRACKED CONCRETE
   - -UN-REINFORCED CONCRETE
   - -6" EDGE DISTANCE IN THE ONE DIRECTION INDICATED.
   - -EDGE DISTANCE IN THE OTHER DIRECTIONS HAS NOT BEEN ACCOUNTED FOR.
5. LEFT HAND MACHINE CONFIGURATION SHOWN.



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	6	GT11BS-156-1	1", FLAT WASHER, ASTM F436, TYPE 1 HARDEDNED, GALVANIZED
2	12	GT11BS-156-2	1" - 8 UNC, HEX NUT, HEAVY, ASTM A194, GRADE 2H, GALVANIZED
3	6	GT31BS-156-3	1" - 8 UNC x 25", HEX BOLT, HEAVY, ASTM F1554, GRADE 55, GALVANIZED
4	8	GT11OD-156-3	5/8" - 11 UNC x 5", WEDGE EXPANSION ANCHOR
5	1	GT11OD-180	MACHINE TEMPLATE



	A	PRODUCTION RELEASE, PUR #1616	DRO 05/17/22

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: FOUNDATION ANCHOR ASSEMBLY

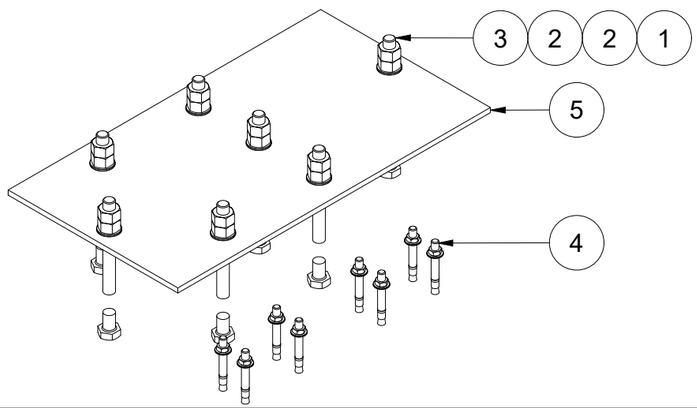
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:12	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	2/8/2022	GT11OD-156 SHEET 1 OF 1

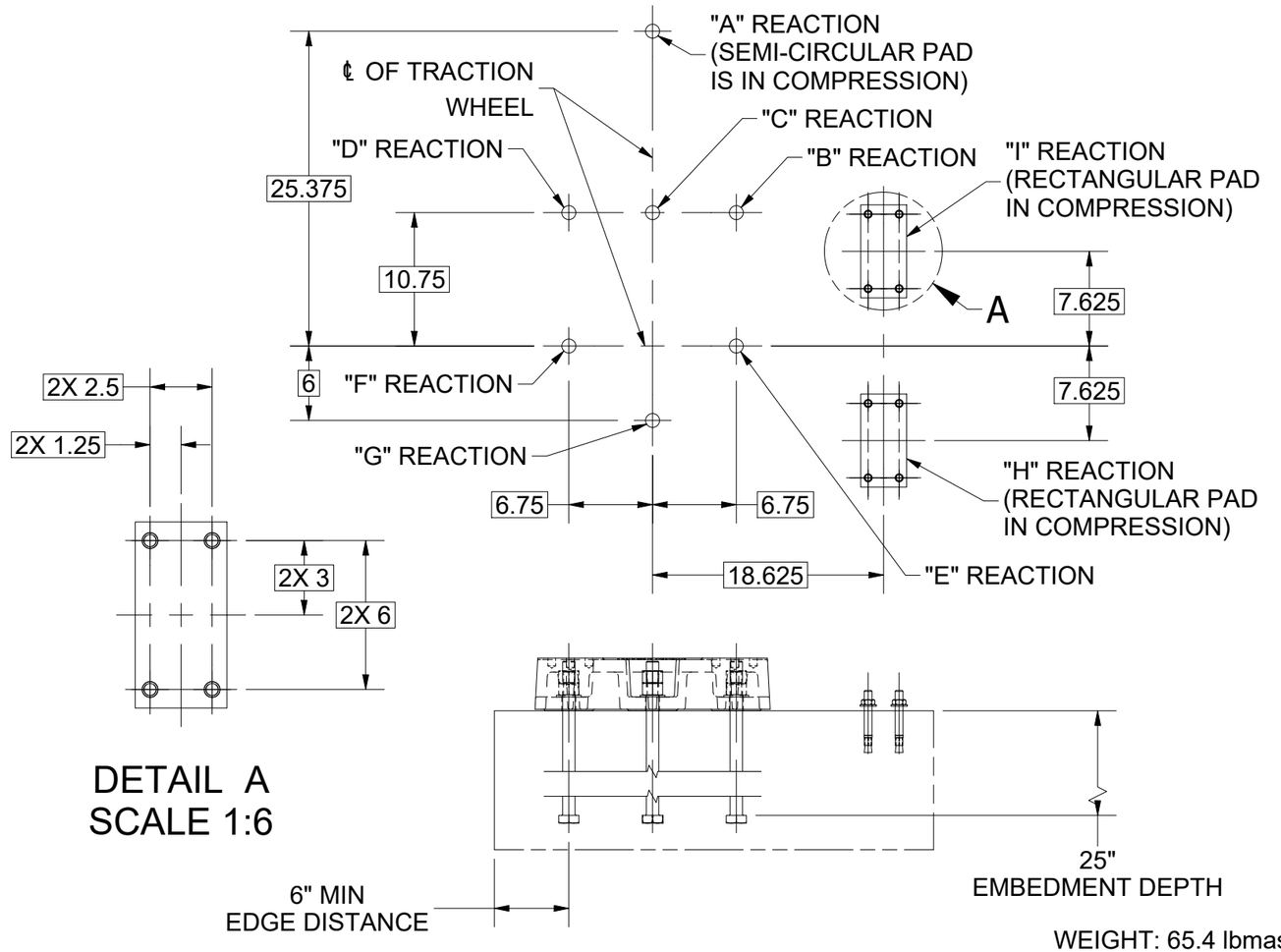
FOUNDATION BOLT REACTION FORCES			
LOCATION	REACTION TYPE	30" WHEEL SERVICE LOAD	COMPRESSIVE LOAD AREA
"A"	COMPRESSION	-1500 POUNDS	8.6 in²
"B"	TENSION	500 POUNDS	N/A
"C"	TENSION	2500 POUNDS	N/A
"D"	TENSION	7250 POUNDS	N/A
"E"	TENSION	3250 POUNDS	N/A
"F"	TENSION	14250 POUNDS	N/A
"G"	TENSION	11750 POUNDS	N/A
"H"	COMPRESSION	-6000 POUNDS	30 in²
"I"	COMPRESSION	-6000 POUNDS	30 in²

ANCHOR AND FOUNDATION NOTES:

1. THE FINAL FOUNDATION AND ANCHORING EMBEDMENT METHOD FOR THIS EQUIPMENT SHALL BE DESIGNED BY THE STRUCTURAL ENGINEER OF RECORD BASED ON THE LOADS AND LOCATIONS PROVIDED ON THIS SHEET. HOLLISTER-WHITNEY ASSUMES NO RESPONSIBILITY FOR THE DESIGN OF THE FOUNDATION OR THE METHOD OF THE ANCHORING EMBEDMENT.
2. ALL ANCHOR LOADS SHOWN IN THE TABLE ABOVE ARE SERVICE LOADS BASED ON THE OVERALL UPWARD PLUMB VERTICAL LOAD RESULTING FROM A 25,000 POUND SHEAVE SHAFT LOAD WITH A 30 INCH TRACTION WHEEL AND 1.5 INCHES OF ROPE OFFSET. FOR ANCHOR DESIGN, THESE LOADS SHALL BE DOUBLED PER SECTION 2.9.2.2 OF ASME A17.1, SAFETY CODE FOR ELEVATORS. THEY SHALL ALSO BE FACTORED ACCORDINGLY FOR ANCHOR DESIGN PER ACI 318.
3. THE WEIGHT OF THE MACHINE HAS NOT BEEN INCLUDED IN THE ANCHOR LOADS.
4. THE ANCHOR ROD SIZE, GRADE, AND EMBEDMENT DEPTH SHOWN ARE BASED ON THE FOLLOWING DESIGN ASSUMPTIONS:
   - -CONCRETE STRENGTH = 4000PSI
   - -UN-CRACKED CONCRETE
   - -UN-REINFORCED CONCRETE
   - -6" EDGE DISTANCE IN THE ONE DIRECTION INDICATED.
   - -EDGE DISTANCE IN THE OTHER DIRECTIONS HAS NOT BEEN ACCOUNTED FOR.
5. LEFT HAND MACHINE CONFIGURATION SHOWN.



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	7	GT11BS-156-1	1", FLAT WASHER, ASTM F436, TYPE 1 HARDEDNED, GALVANIZED
2	14	GT11BS-156-2	1" - 8 UNC, HEX NUT, HEAVY, ASTM A194, GRADE 2H, GALVANIZED
3	7	GT31OD-156-3	1" - 8 UNC x 29", HEX BOLT, HEAVY, ASTM F1554, GRADE 105, GALVANIZED
4	8	GT11OD-156-3	5/8" - 11 UNC x 5", WEDGE EXPANSION ANCHOR
5	1	GT31OD-180	MACHINE TEMPLATE



WEIGHT: 65.4 lbmass

A	PRODUCTION RELEASE, PUR #1616	DRO	05/17/22

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE
FOUNDATION ANCHOR ASSEMBLY

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:12	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	2/9/2022	GT31OD-156 SHEET 1 OF 1

Bulletin #1160 Content

1. Hollister-Whitney Geared Machine Brake Data – Footed Motor

Machine Model	Brake Model	Brake Style	Constant Line Voltage (VDC)	Pick Voltage (VDC)	Pick Current (Amps)	Hold Voltage (VDC)	Coil Resistance (Ohms)	Supplied
#34	#92	Disc	115	125	3.48	75	33	Optional
			230	**250**	**1.66**	**150**	**138**	**Standard**
#43	#90	Drum	115	125	1.63	75	71	Optional
			230	**250**	**0.82**	**150**	**280**	**Standard**
#44	#102	Disc	115	125	2.44	75	46.45	Optional
			230	**250**	**1.24**	**150**	**190**	**Standard**
#53	#100	Drum	115	125	1.63	75	71	Optional
			230	**250**	**0.82**	**150**	**280**	**Standard**
#54	#102	Disc	115	125	2.44	75	46.45	Optional
			230	**250**	**1.24**	**150**	**190**	**Standard**
#63	#110	Drum	115	125	1.63	75	71	Optional
			230	**250**	**0.82**	**150**	**280**	**Standard**
#64	#112	Disc	115	125	2.44	75	46.45	Optional
			230	**250**	**1.24**	**150**	**190**	**Standard**
#74	#120	Drum	115	125	1.38	75	84	Optional
			230	**250**	**0.73**	**150**	**313**	**Standard**

Notes:

- Brake Coils on Geared Machines with ***Foot Mounted Motors*** are supplied standard as 230 VDC. 115 VDC brake coils must be specified when ordering.
- Brake Monitor Switches on Geared Machines with ***Foot Mounted Motors*** are wired "***Normally Closed***."

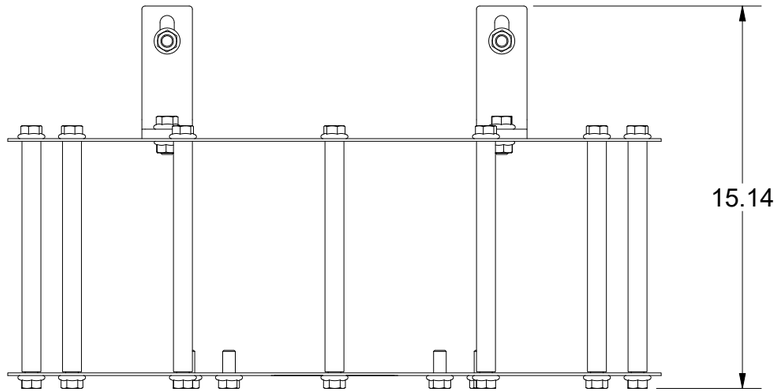
2. Hollister-Whitney Geared Machine Brake Data – C-Face Motor

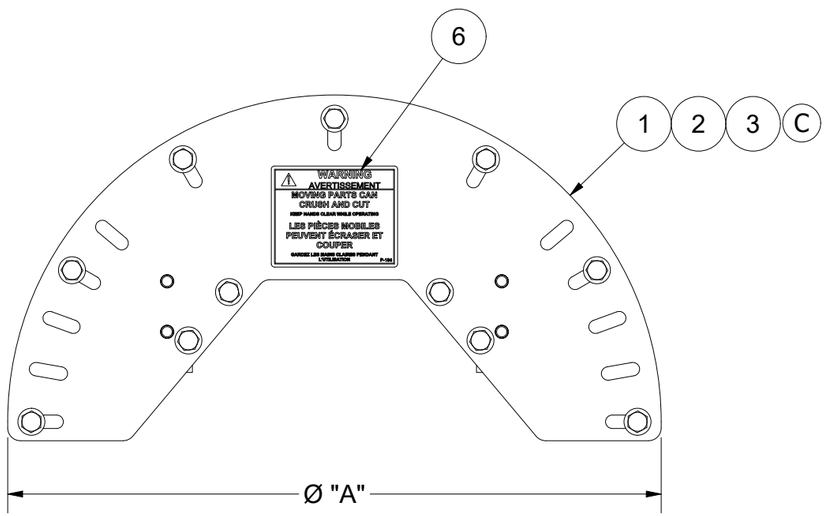
Machine Model	Brake Model	Brake Style	Constant Line Voltage (VDC)	Pick Voltage (VDC)	Pick Current (Amps)	Hold Voltage (VDC)	Coil Resistance (Ohms)	Supplied As
#44F	#93 (Mayr #100)	Shaft Mounted Disc	115	104	2.17	52	48 ± 5%	**Standard**
#GT11 #GT31	#GT31-314 (Wulon)	Drum	230	190	1.94	80	98 ± 5%	**Standard**

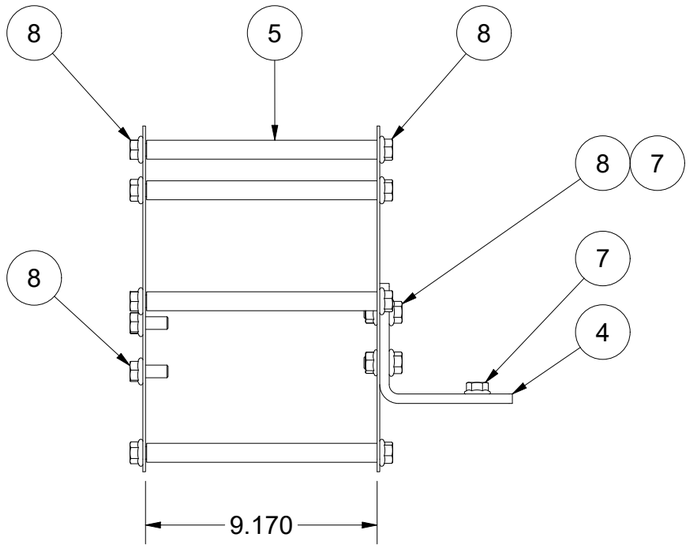
TABLE			
PART NUMBER	DESCRIPTION	DIA "A"	WEIGHT
GT11-250-22	ASSY, RETAINER, ROPE, 22"	25.875	26.1 lbmass
GT11-250-26	ASSY, RETAINER, ROPE, 26"	29.875	31.5 lbmass
GT11-250-30	ASSY, RETAINER, ROPE, 30"	33.875	37.6 lbmass

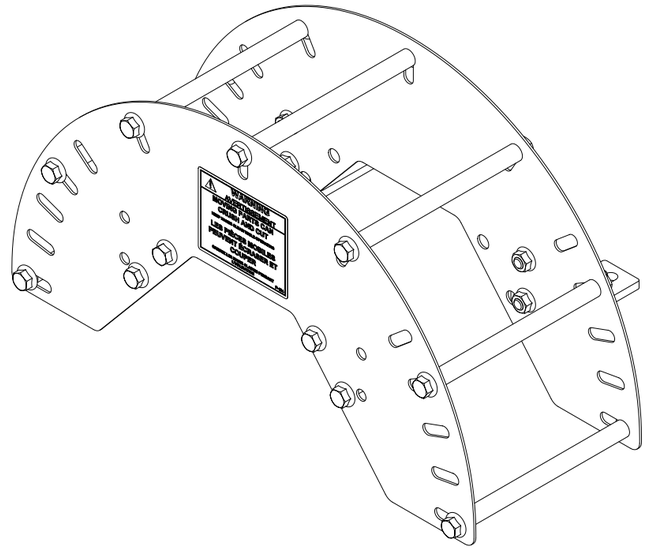
C

PARTS LIST					
ITEM	QTY GT11-250-22	QTY GT11-250-26	QTY GT11-250-30	PART NUMBER	DESCRIPTION
1	2	0	0	GT11-252-22	PLATE, RETAINER, ROPE, 22"
2	0	2	0	GT11-252-26	PLATE, RETAINER, ROPE, 26"
3	0	0	2	GT11-252-30	PLATE, RETAINER, ROPE, 30"
4	2	2	2	GT31-251	BRACKET, RETAINER, ROPE
5	7	7	7	GT31-257	ROD, RETAINER, ROPE
6	1	1	1	P-184	WARNING LABEL, MOVING PARTS CAN CRUSH AND CUT
7	6	6	6	1/2-13 UNC	NUT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
8	22	22	22	1/2-13 UNC X 1	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED









D	UPDATED PLATES & WEIGHTS, PUR #1766	DRO 04/24/23	B	COMBINED GT11-250-22 & GT11-252-26 PRINTS, PUR #1330	DRO 06/04/20
C	ADDED GT11-250-30, PUR #1363	DRO 07/30/20	A	PRODUCTION RELEASE PUR #1304	DRO 03/24/20

THIRD ANGLE PROJECTION

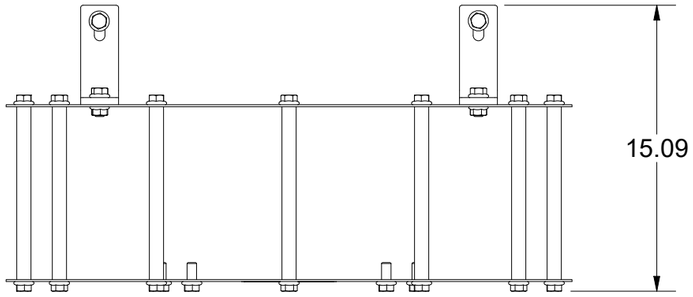
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

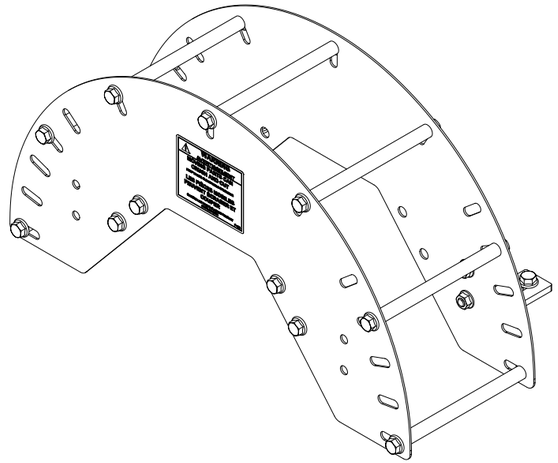
TITLE: ASSY, RETAINER, ROPE

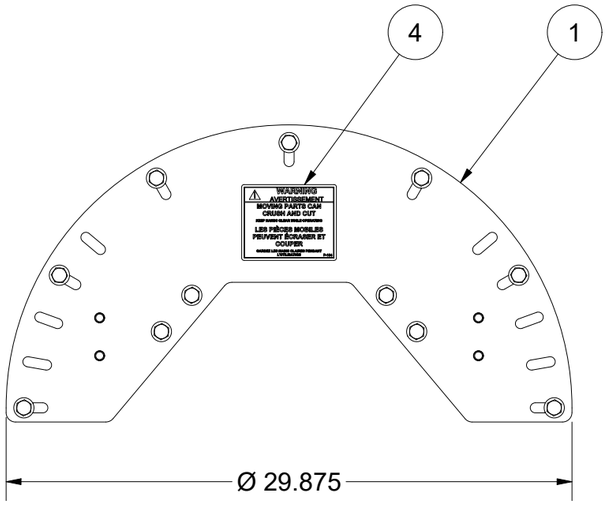
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:6	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

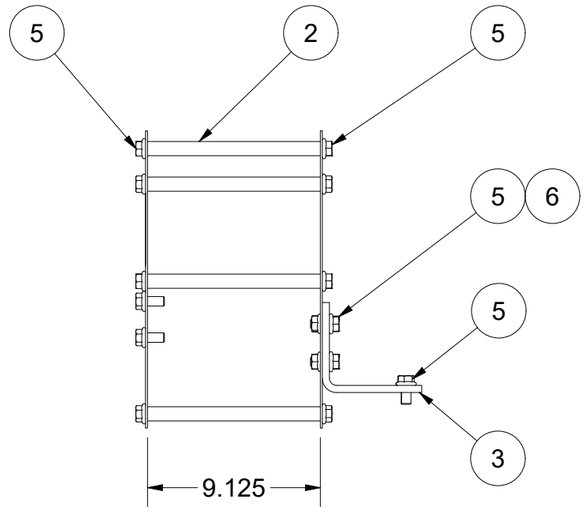
SHEET SIZE	DATE	
B	3/12/2020	GT11-250 SHEET 1 OF 1

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	GT31-252-26	PLATE, RETAINER, ROPE, 26"
2	7	GT31-257	ROD, RETAINER, ROPE
3	2	GT31-251	BRACKET, RETAINER, ROPE
4	1	P-184	WARNING LABEL, MOVING PARTS CAN CRUSH AND CUT
5	24	1/2-13 UNC X 1	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
6	4	1/2-13 UNC	NUT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED









WEIGHT: 30.2 lbmass

			C	UPDATED PLATES & WEIGHT, PUR #1766	DRO 04/24/23
			B	ADDED PROJECTED VIEWS, PUR #1422	DRO 05/04/21
			A	PRODUCTION RELEASE PUR #1164	BEH 04Aug19

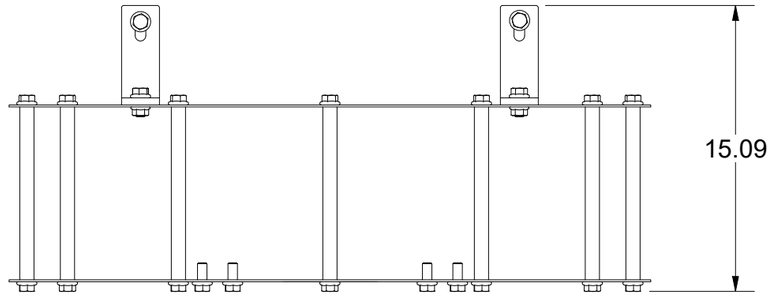
THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

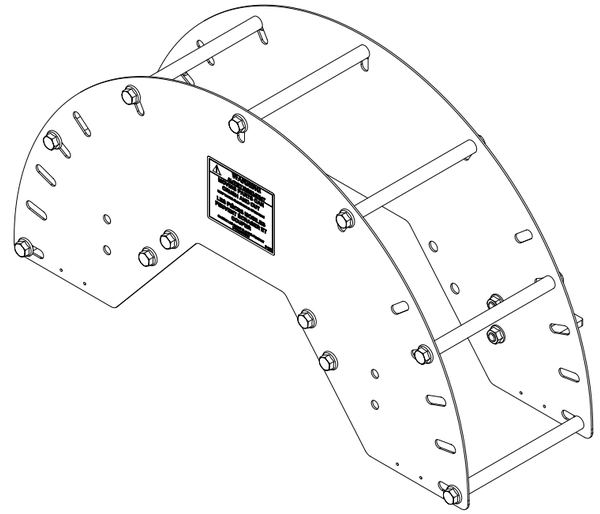
TITLE: ASSY, RETAINER, ROPE, 26"

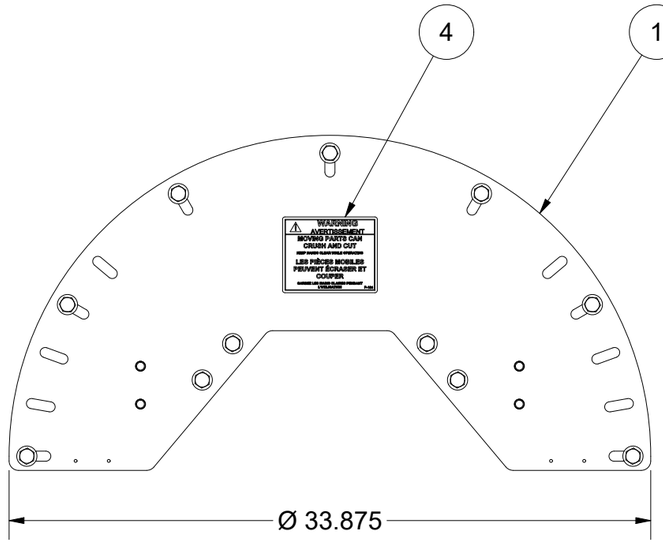
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:8	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

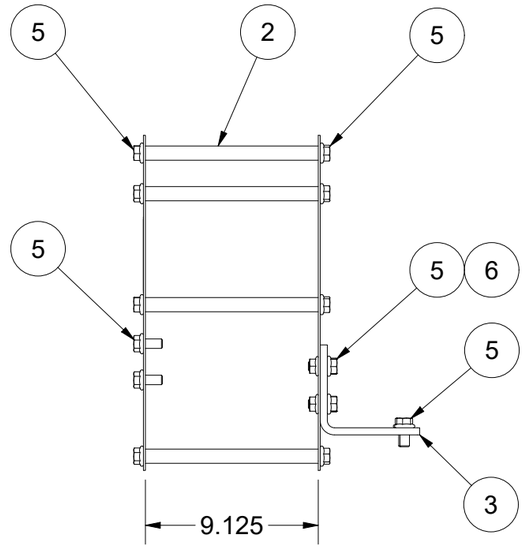
SHEET SIZE	DATE	
B	7/29/2019	GT31-250-26 SHEET 1 OF 1



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	GT31-252-30	PLATE, RETAINER, ROPE, 30"
2	7	GT31-257	ROD, RETAINER, ROPE
3	2	GT31-251	BRACKET, RETAINER, ROPE
4	1	P-184	WARNING LABEL, MOVING PARTS CAN CRUSH AND CUT
5	24	1/2-13 UNC X 1	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
6	4	1/2-13 UNC	NUT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED







WEIGHT: 36.3 lbmass

			C	UPDATED PLATES & WEIGHT, PUR #1766	DRO 04/24/23
			B	ADDED PROJECTED VIEWS, PUR #1422	DRO 05/04/21
			A	PRODUCTION RELEASE PUR #1164	BEH 04Aug19

THIRD ANGLE PROJECTION

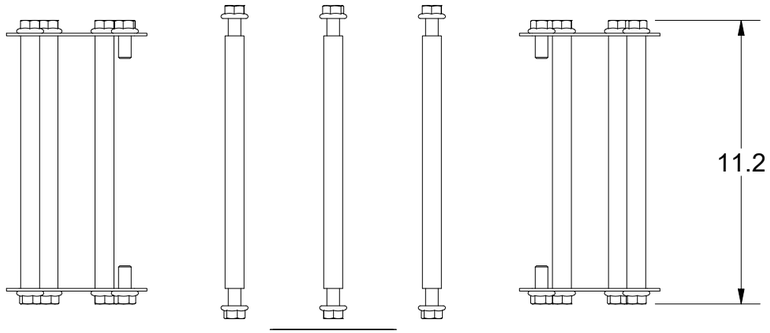
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

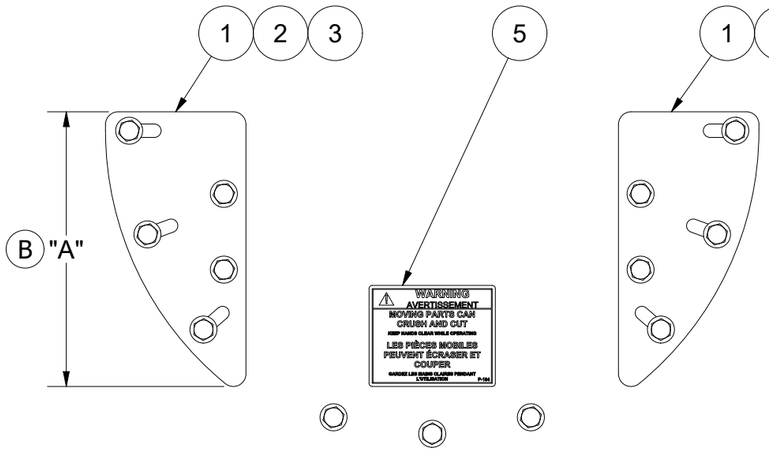
TITLE: ASSY, RETAINER, ROPE, 30"

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:8	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

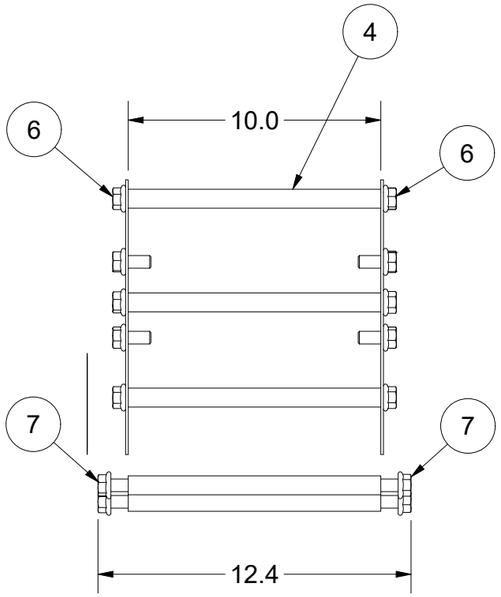
SHEET SIZE	DATE	
B	7/29/2019	GT31-250-30 SHEET 1 OF 1

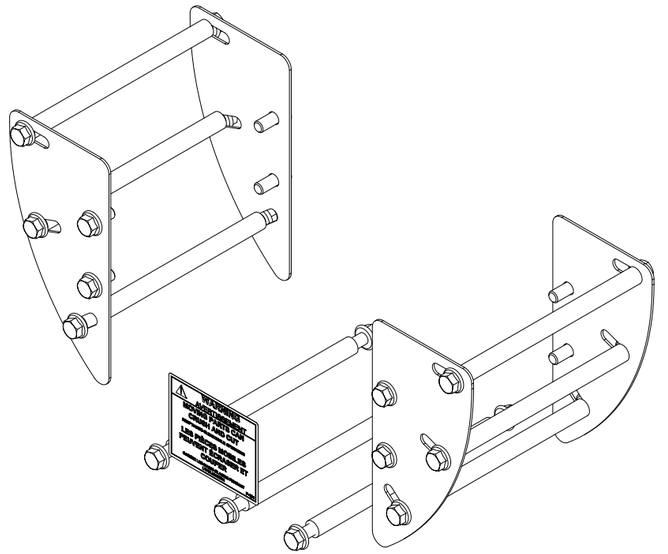
TABLE			
PART NUMBER	DESCRIPTION	"A"	WEIGHT
GT11BS-250-22	ASSY, RETAINER, ROPE, BS, 22"	10.9	19.2 lbmass
GT11BS-250-26	ASSY, RETAINER, ROPE, BS, 26"	13.4	22.7 lbmass
GT11BS-250-30	ASSY, RETAINER, ROPE, BS, 30"	15.7	27.0 lbmass





PARTS LIST					
ITEM	QTY GT11BS-250-22	QTY GT11BS-250-26	QTY GT11BS-250-30	PART NUMBER	DESCRIPTION
1	4	0	0	GT11BS-252-22	PLATE, RETAINER, ROPE, BS, 22"
2	0	4	0	GT11BS-252-26	PLATE, RETAINER, ROPE, BS, 26"
3	0	0	4	GT11BS-252-30	PLATE, RETAINER, ROPE, BS, 30"
4	9	9	9	GT11BS-257	ROD, RETAINER, ROPE
5	1	1	1	P-184	WARNING LABEL, MOVING PARTS CAN CRUSH AND CUT
6	20	20	20	1/2-13 UNC X 1	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
7	6	6	6	1/2-13 UNC X 1.5	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED





NOTES UNLESS OTHERWISE SPECIFIED:

1. PLACE P-184 AT A VISIBLE LOCATION NEAR ROPE RETIANER.

C	UPDATED PLATES & WEIGHTS, PUR #1766	DRO 04/24/23	
B	"A" DIMENSION WAS DIA, PUR #1695	DRO 08/19/22	
A	PRODUCTION RELEASE, PUR #1401	DRO 11/20/20	

THIRD ANGLE PROJECTION

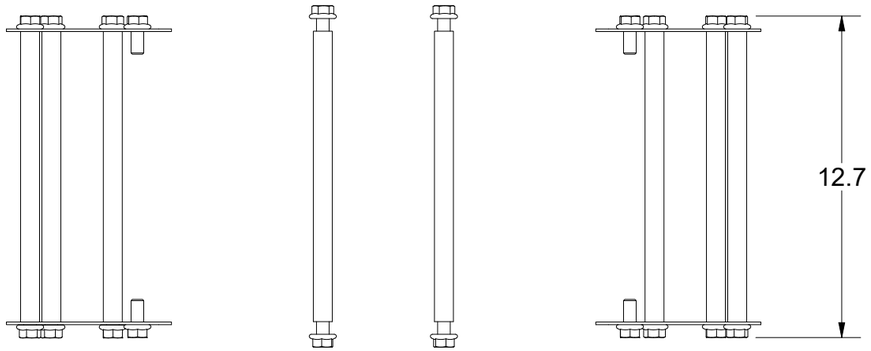
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

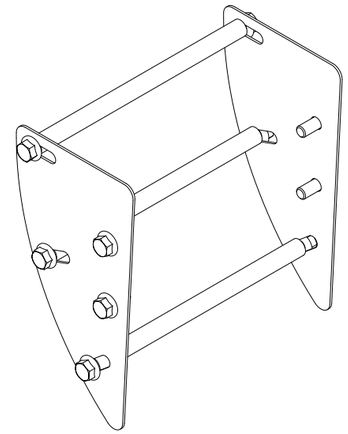
TITLE: ASSY, RETAINER, ROPE, BS

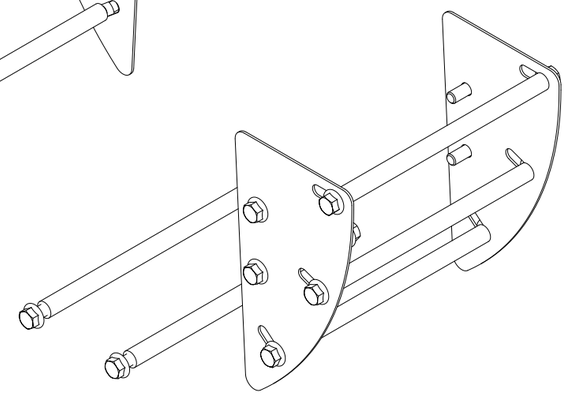
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:6	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

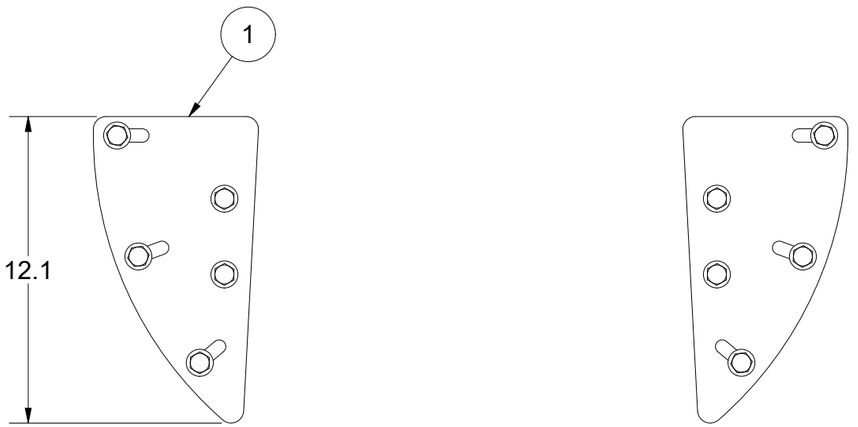
SHEET SIZE	DATE	
B	11/11/2020	GT11BS-250 SHEET 1 OF 1

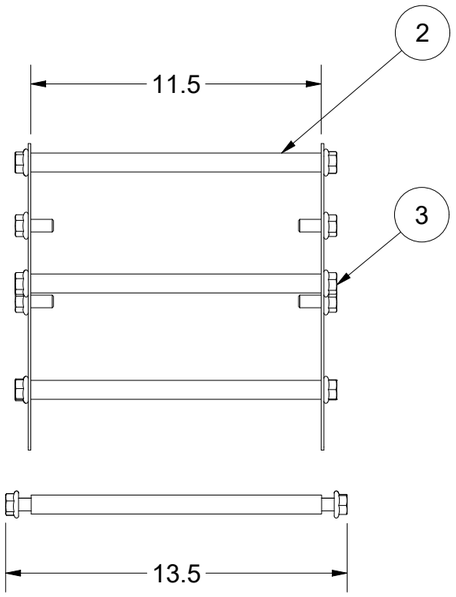
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	GT31BS-252-26	PLATE, RETAINER, ROPE, BS, 26"
2	8	GT31BS-257	ROD, RETAINER, ROPE
3	24	1/2-13 UNC X 1"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED











WEIGHT: 20.5 lbmass

			B	REDRAWN, ADDED VIEWS AND DIMENSIONS, PUR #1695	DRO 08/19/22	
C	UPDATED PLATES & WEIGHT, PUR #1766	DRO 04/24/23	A	PRODUCTION RELEASE PUR #1353	BEH 26Jun20	

THIRD ANGLE PROJECTION

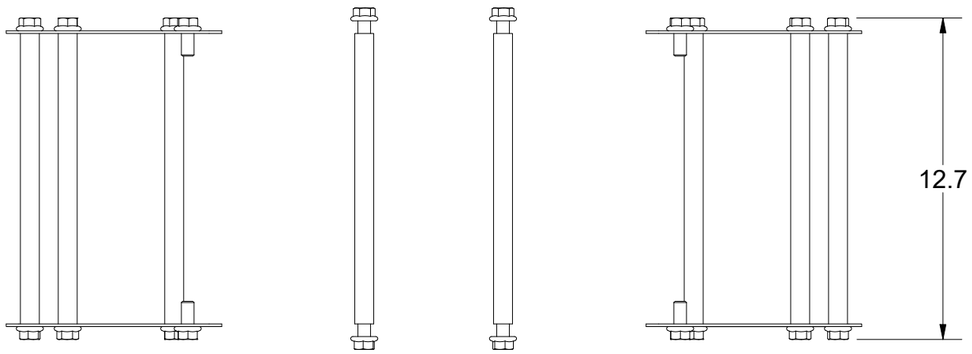
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

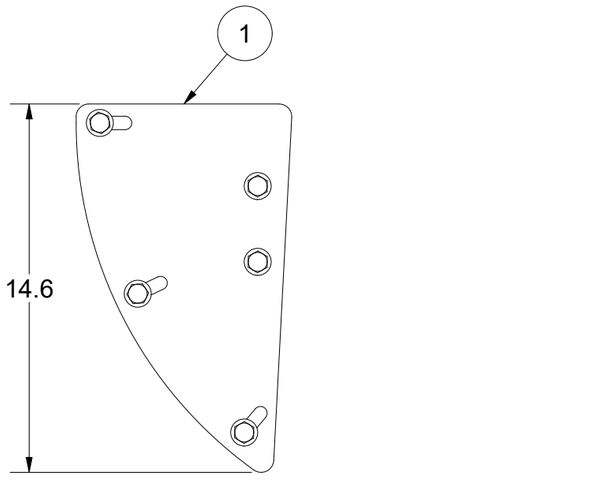
TITLE
ASSY, RETAINER, ROPE, BS, 26"

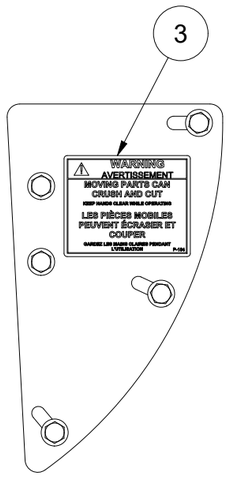
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:6	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

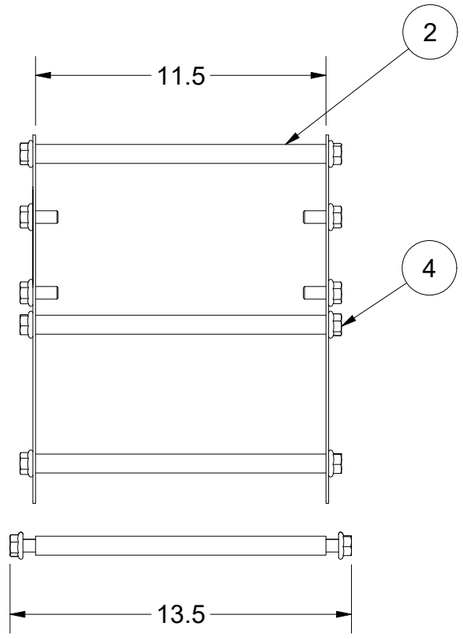
SHEET SIZE	DATE	
B	6/26/2020	GT31BS-250-26 SHEET 1 OF 1

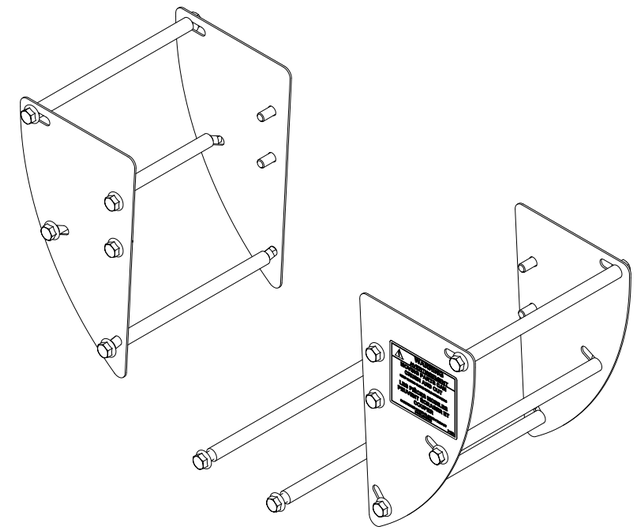
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	GT31BS-252-30	PLATE, RETAINER, ROPE, BS, 30"
2	8	GT31BS-257	ROD, RETAINER, ROPE
3	1	P-184	WARNING LABEL, MOVING PARTS CAN CRUSH AND CUT
4	24	1/2-13 UNC X 1"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED











ISO VIEW
SCALE 1:8

WEIGHT: 24.3 lbmass

			B	REDRAWN, ADDED VIEWS AND DIMENSIONS, PUR #1695	DRO 08/19/22
C	UPDATED PLATES & WEIGHT, PUR #1766	C	A	PRODUCTION RELEASE PUR #1353	BEH 26Jun20

THIRD ANGLE PROJECTION

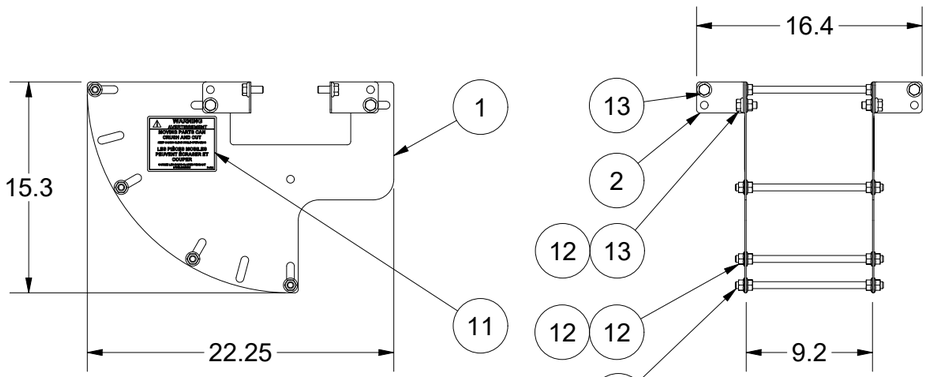
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

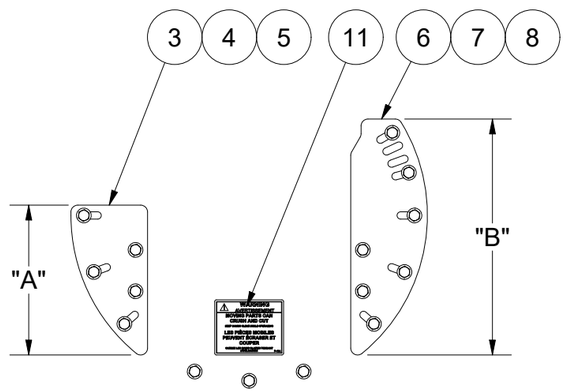
TITLE
ASSY, RETAINER, ROPE, BS, 30"

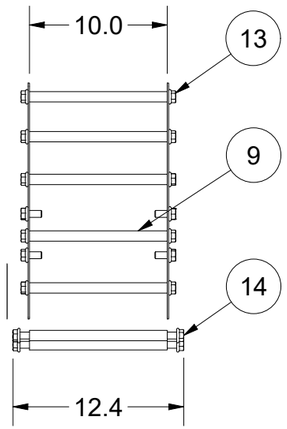
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:8	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	6/26/2020	GT31BS-250-30 SHEET 1 OF 1

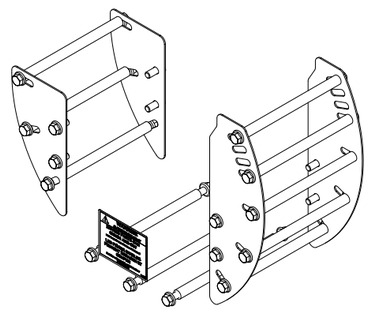
TABLE				
PART NUMBER	DESCRIPTION	"A"	"B"	WEIGHT
GT11OD-250-22	ASSY, RETAINER, ROPE, OD, 22"	10.9	17.2	41.6 lbmass
GT11OD-250-26	ASSY, RETAINER, ROPE, OD, 26"	13.4	21.7	46.4 lbmass
GT11OD-250-30	ASSY, RETAINER, ROPE, OD, 30"	15.7	26.5	52.5 lbmass

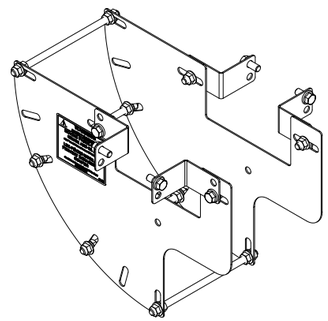






PARTS LIST					
ITEM	QTY GT11OD-250-22	QTY GT11OD-250-26	QTY GT11OD-250-30	PART NUMBER	DESCRIPTION
1	2	2	2	331-175-003	ROPE RETAINER SIDE PLATE, 25" & 26" DIAMETER SHEAVE
2	4	4	4	GT11OD-251	BRACKET, ROPE RETAINER, OD DEFLECTOR SHEAVE, GT MACHINE
3	2	0	0	GT11BS-252-22	PLATE, RETAINER, ROPE, BS, 22"
4	0	2	0	GT11BS-252-26	PLATE, RETAINER, ROPE, BS, 26"
5	0	0	2	GT11BS-252-30	PLATE, RETAINER, ROPE, BS, 30"
6	2	0	0	GT11OD-252-22	PLATE, RETAINER, ROPE, OD, 22"
7	0	2	0	GT11OD-252-26	PLATE, RETAINER, ROPE, OD, 26"
8	0	0	2	GT11OD-252-30	PLATE, RETAINER, ROPE, OD, 30"
9	11	11	11	GT11BS-257	ROD, RETAINER, ROPE
10	4	4	4	GT11OD-257	ROD, RETAINER, ROPE
11	3	3	3	P-184	WARNING LABEL, MOVING PARTS CAN CRUSH AND CUT
12	20	20	20	1/2" - 13 UNC	SERRATED FLANGE LOCKNUT
13	32	32	32	1/2" - 13 UNC x 1	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
14	6	6	6	1/2" - 13 UNC x 1.5	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED





NOTES UNLESS OTHERWISE SPECIFIED:

1. PLACE P-184 LABELS AT VISIBLE LOCATIONS NEAR ROPE RETAINERS.

C	UPDATED PLATES & WEIGHTS, PUR #1766	DRO 04/24/23
B	GT11OD-257 WAS GT31-257, PUR #1447	DRO 02/02/21
A	PRODUCTION RELEASE, PUR #1417	DRO 12/11/20

THIRD ANGLE PROJECTION

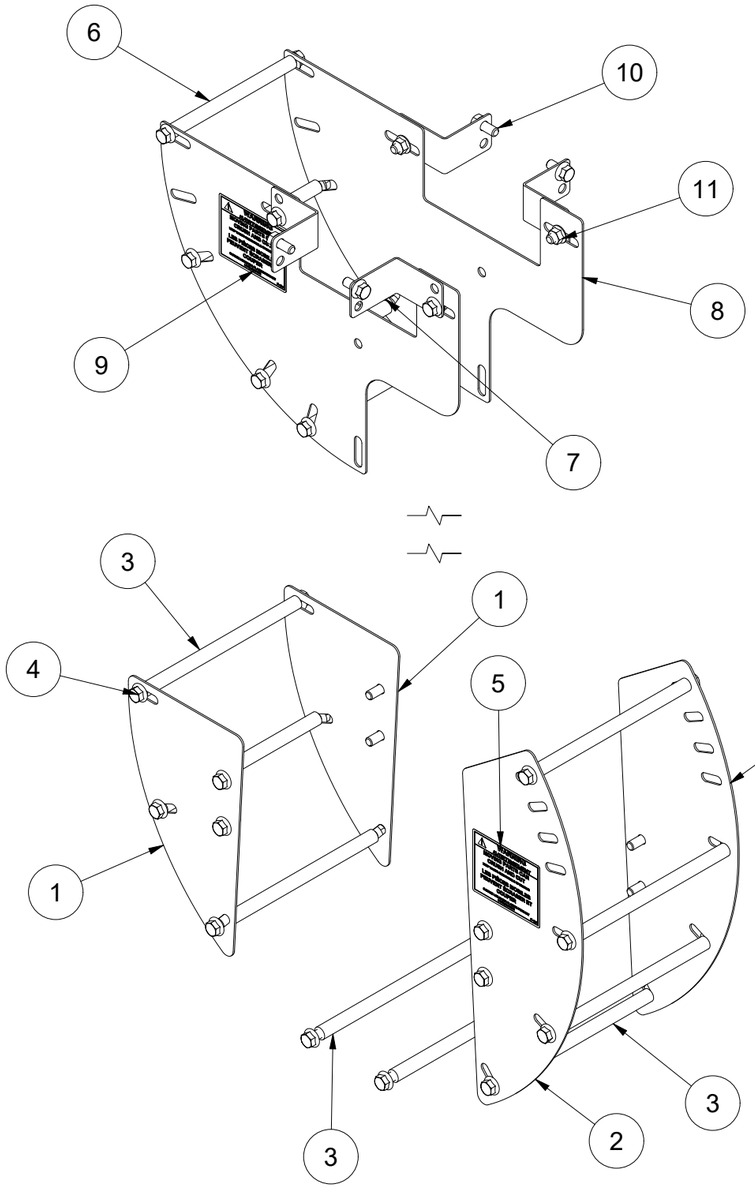
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, RETAINER, ROPE, OD

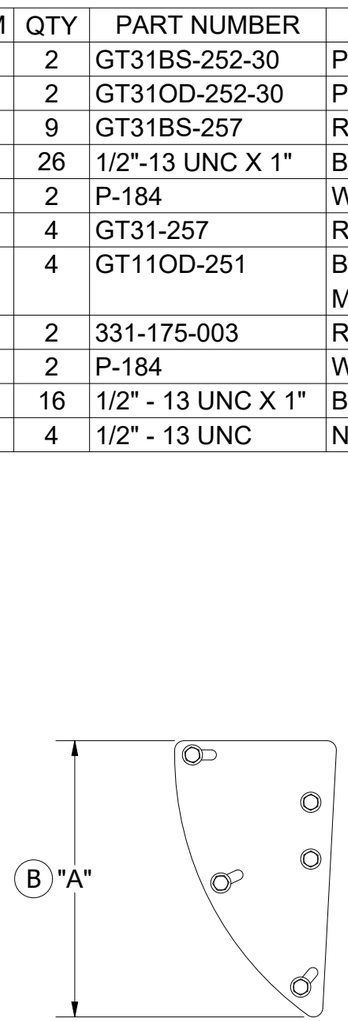
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:11	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

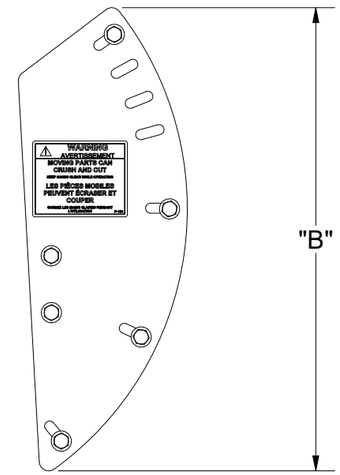
SHEET SIZE	DATE	
B	12/11/2020	GT11OD-250 SHEET 1 OF 1

TABLE				
ASSY PART NUMBER	DESCRIPTION	"A"	"B"	WEIGHT
GT31OD-250-30	ASSY, RETAINER, ROPE, OD, 30"	14.6"	24.4"	49.7 lbmass



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	GT31BS-252-30	PLATE, RETAINER, ROPE, BS, 30"
2	2	GT31OD-252-30	PLATE, RETAINER, ROPE, OD, 30"
3	9	GT31BS-257	ROD, RETAINER, ROPE
4	26	1/2"-13 UNC X 1"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
5	2	P-184	WARNING LABEL, MOVING PARTS CAN CRUSH AND CUT
6	4	GT31-257	ROD, RETAINER, ROPE
7	4	GT11OD-251	BRACKET, ROPE RETAINER, OD DEFLECTOR SHEAVE, GT MACHINE
8	2	331-175-003	ROPE RETAINER SIDE PLATE, 25" & 26" DIAMETER SHEAVE
9	2	P-184	WARNING LABEL, MOVING PARTS CAN CRUSH AND CUT
10	16	1/2" - 13 UNC X 1"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
11	4	1/2" - 13 UNC	NUT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED





WEIGHT: 49.7 lbmass

C	UPDATED PLATES & WEIGHT, PUR #1766	DRO 04/24/23	
B	CORRECTED LETTER, PUR #1695	DRO 08/19/22	
A	PRODUCTION RELEASE PUR #1490	BEH 22May21	

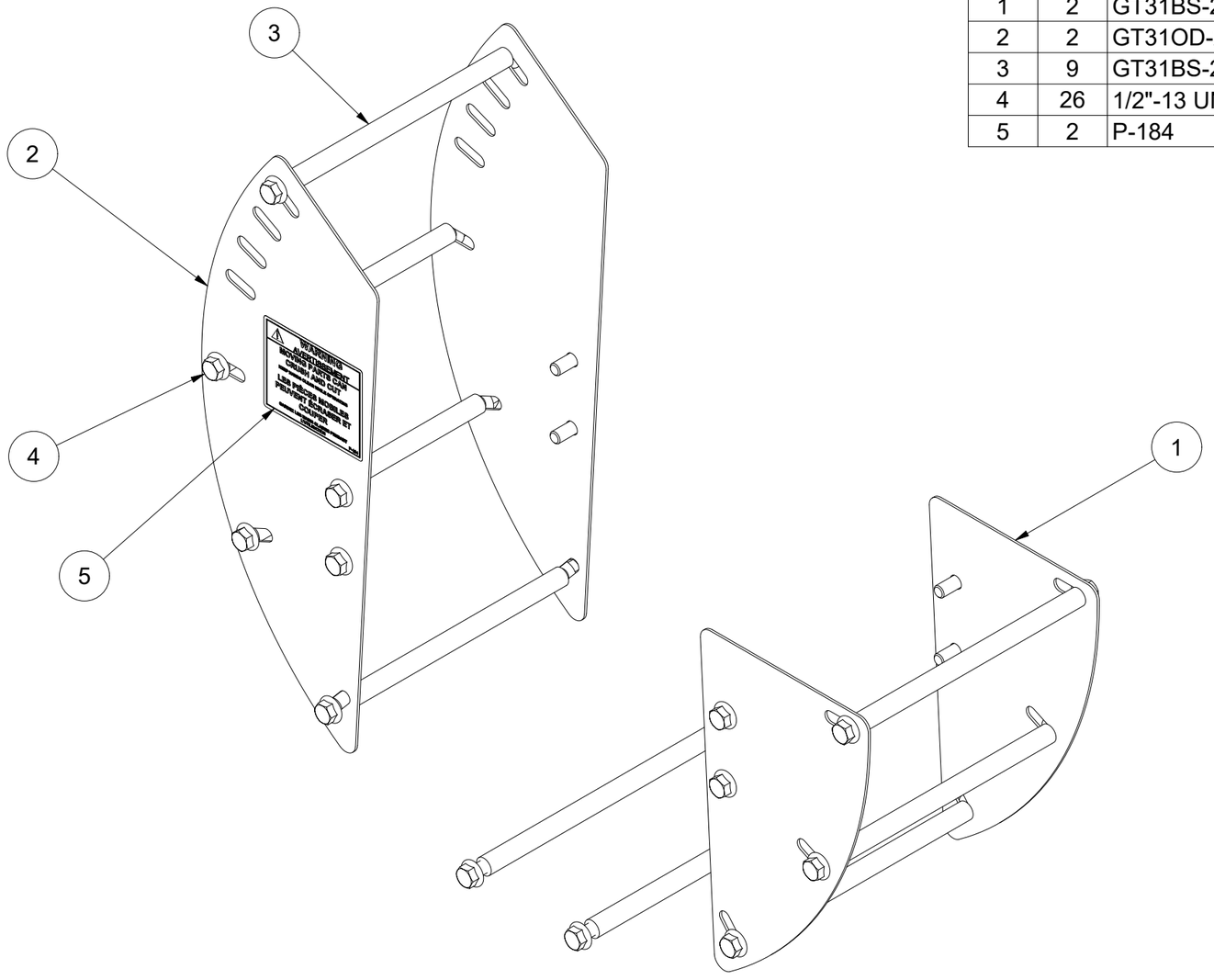
THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, RETAINER, ROPE, OD

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:8	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/26/2021	GT31OD-250 SHEET 1 OF 1



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	GT31BS-252-30	PLATE, RETAINER, ROPE, BS, 30"
2	2	GT31OD-252-30	PLATE, RETAINER, ROPE, OD, 30"
3	9	GT31BS-257	ROD, RETAINER, ROPE
4	26	1/2"-13 UNC X 1"	BOLT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
5	2	P-184	WARNING LABEL, MOVING PARTS CAN CRUSH AND CUT

WEIGHT: 29.7 lbmass

B	UPDATED PLATES & WEIGHT, PUR #1766	DRO 04/24/23
A	PRODUCTION RELEASE PUR #1490	BEH 22May21

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE
ASSY, RETAINER, ROPE, BS, 30"

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:5	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

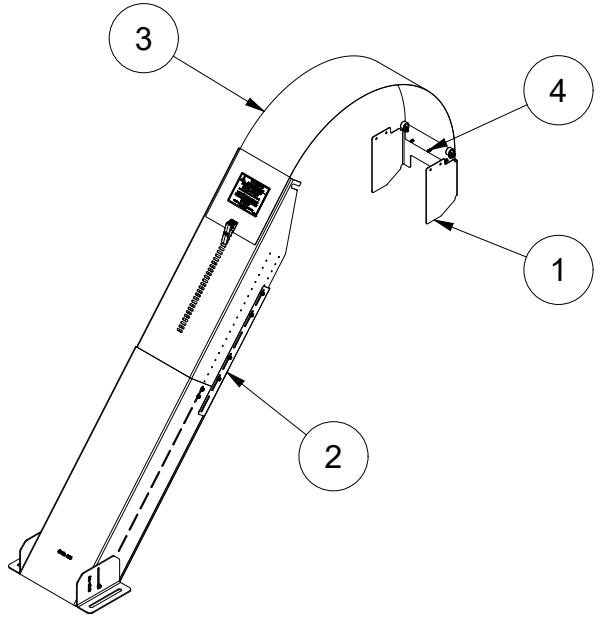
SHEET SIZE	DATE	
B	6/26/2020	GT31OD-250-30 SHEET 1 OF 1

NOTES UNLESS OTHERWISE SPECIFIED:

1. ITEM 3 SHOWN IN INSTALLED CURVED CONDITION. ACTUAL SHAPE WILL BE FLAT FOR SHIPPING PURPOSES.
2. ITEM 3 BEND RADIUS TO BE ADJUSTED DURING INSTALLATION FOR FINAL FIT WITH ROPE RETAINER.
3. FIELD MODIFICATION OF PANEL LENGTHS WILL BE REQUIRED FOR SOME APPLICATIONS.

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	GT11-270	SHROUD, GUARD, ROPE, FRONT
2	1	GT31-269	ASSY, GUARD, ROPE, REAR
3	1	GT31-271	ASSY, COVER, WHEEL, TRACTION
4	3	10-24 UNC X 0.5"	SCREW, THREAD FORMING - HEX WASHER, TYPE F



WEIGHT: 44.0 lbmass

A	PRODUCTION RELEASE PUR #1303	DRO 03/23/20

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE
ASSY, GUARD, ROPE AND WHEEL

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:24	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

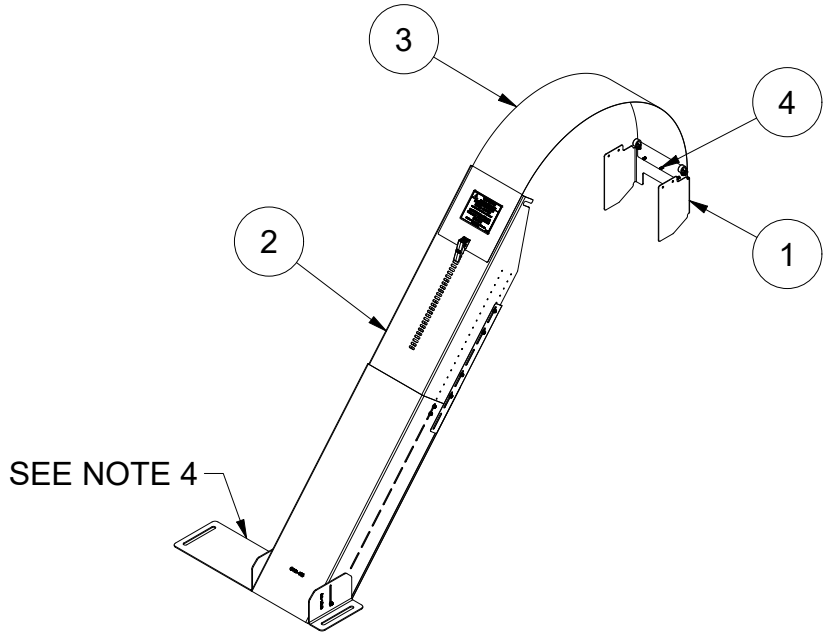
SHEET SIZE	DATE	
A	3/17/2020	GT11-261 SHEET 1 OF 1

NOTES UNLESS OTHERWISE SPECIFIED:

1. ITEM 4 SHOWN IN INSTALLED CURVED CONDITION. ACTUAL SHAPE WILL BE FLAT FOR SHIPPING PURPOSES.
2. ITEM 4 BEND RADIUS TO BE ADJUSTED DURING INSTALLATION FOR FINAL FIT WITH ROPE RETAINER.
3. FIELD MODIFICATION OF PANEL LENGTHS WILL BE REQUIRED FOR SOME APPLICATIONS.
4. VIEW SHOWN IS FOR A LEFT HAND ARRANGEMENT. FLOOR MOUNTING ANGLES NEED TO SWITCH SIDES FOR A RIGHT HAND ARRANGEMENT.

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	GT11-270	SHROUD, GUARD, ROPE, FRONT
2	1	GT31-269-1	ASSY, GUARD, ROPE, REAR
3	1	GT31-271	ASSY, COVER, WHEEL, TRACTION
4	3	10 -24 UNC X 0.5"	SCREW, THREAD FORMING - HEX WASHER, TYPE F



WEIGHT: 47.3 lbmass

A	PRODUCTION RELEASE PUR #1303	DRO 03/23/20

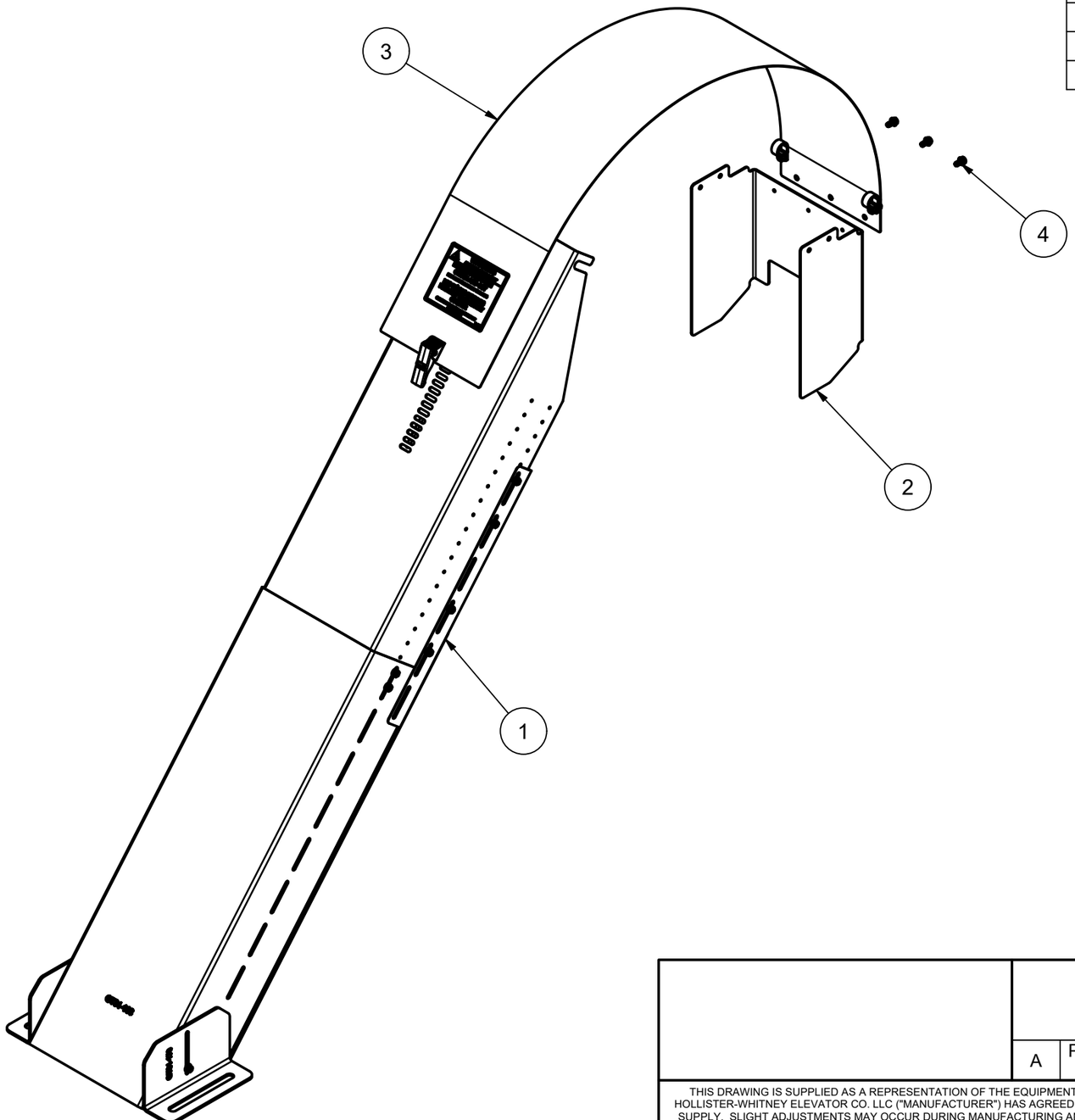
THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE
ASSY, GUARD, ROPE AND WHEEL, BLOCK UP

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:24	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
A	3/17/2020	GT11-261-B SHEET 1 OF 1



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	GT31-269	ASSY, GUARD, ROPE, REAR
2	1	GT31-270	SHROUD, GUARD, ROPE, FRONT
3	1	GT31-271	ASSY, COVER, WHEEL, TRACTION
4	3	10-24 UNC X 0.5"	SCREW, THREAD FORMING - HEX WASHER, TYPE F

NOTES UNLESS OTHERWISE SPECIFIED:

1. ITEM 3 SHOWN IN INSTALLED CURVED CONDITION. ACTUAL SHAPE WILL BE FLAT FOR SHIPPING PURPOSES.
2. ITEM 3 BEND RADIUS TO BE ADJUSTED DURING INSTALLATION FOR FINAL FIT WITH ROPE RETAINER.
3. FIELD MODIFICATION OF PANEL LENGTHS WILL BE REQUIRED FOR SOME APPLICATIONS.

WEIGHT: 45.4 lbmass

A	PRODUCTION RELEASE PUR #1293	BEH 26Feb20

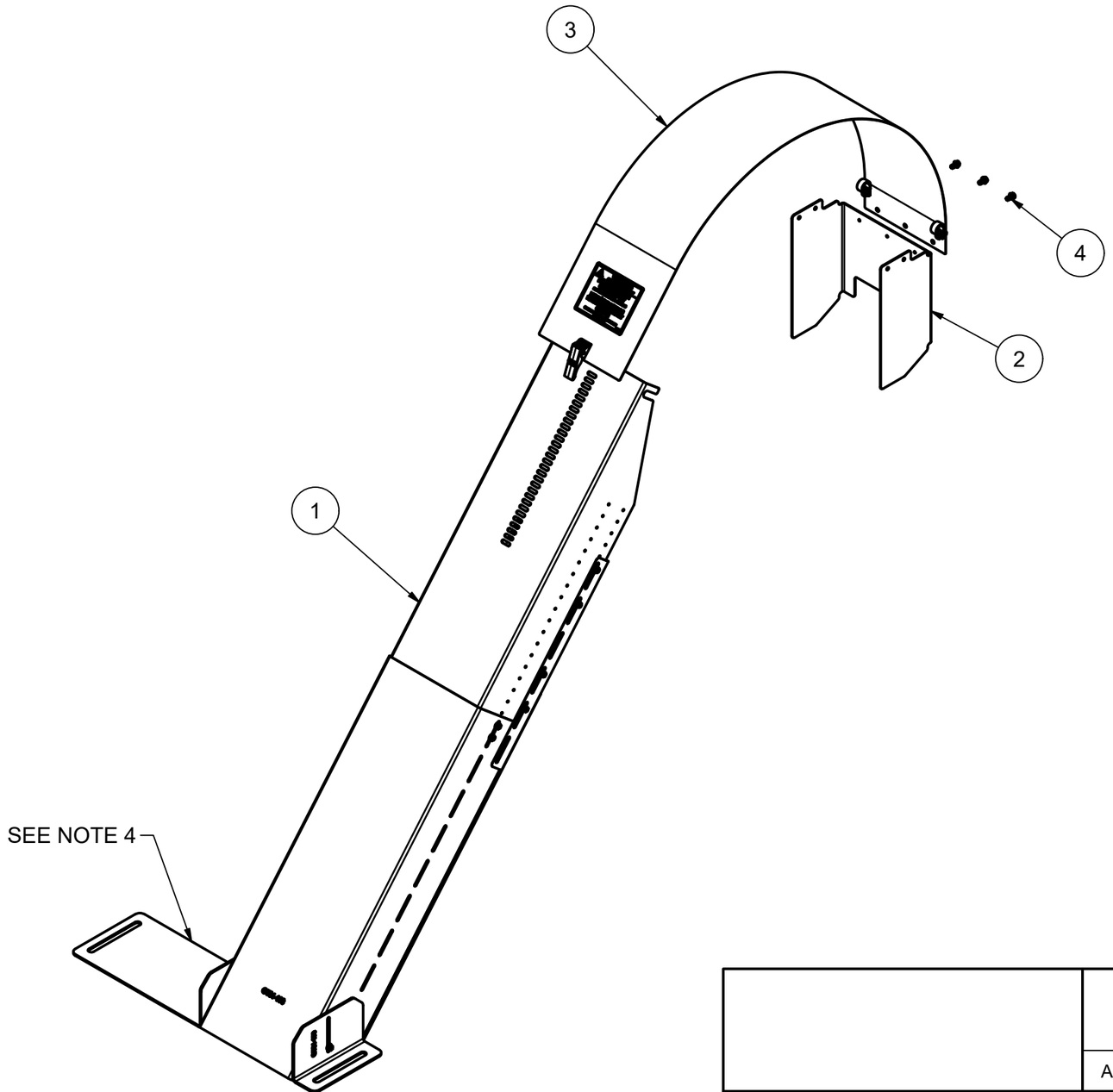
THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GUARD, ROPE AND WHEEL

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:8	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	2/27/2020	GT31-261 SHEET 1 OF 1



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	GT31-269-1	ASSY, GUARD, ROPE, REAR
2	1	GT31-270	SHROUD, GUARD, ROPE, FRONT
3	1	GT31-271	ASSY, COVER, WHEEL, TRACTION
4	3	10 -24 UNC X 0.5"	SCREW, THREAD FORMING - HEX WASHER, TYPE F

NOTES UNLESS OTHERWISE SPECIFIED:

1. ITEM 4 SHOWN IN INSTALLED CURVED CONDITION. ACTUAL SHAPE WILL BE FLAT FOR SHIPPING PURPOSES.
2. ITEM 4 BEND RADIUS TO BE ADJUSTED DURING INSTALLATION FOR FINAL FIT WITH ROPE RETAINER.
3. FIELD MODIFICATION OF PANEL LENGTHS WILL BE REQUIRED FOR SOME APPLICATIONS.
4. VIEW SHOWN IS FOR A LEFT HAND ARRANGEMENT. FLOOR MOUNTING ANGLES NEED TO SWITCH SIDES FOR A RIGHT HAND ARRANGEMENT.

WEIGHT: 48.7 lbmass

A	PRODUCTION RELEASE PUR #1293	BEH 03Mar20

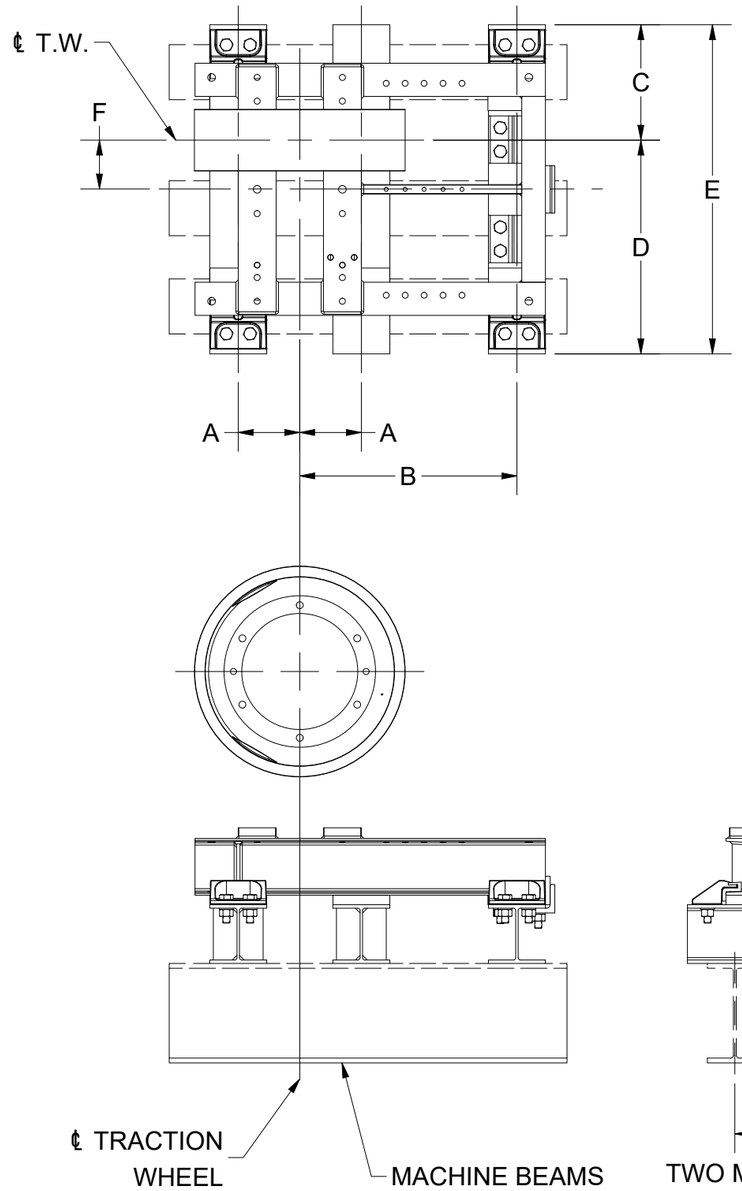
THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, GUARD, ROPE AND WHEEL, BLOCK UP

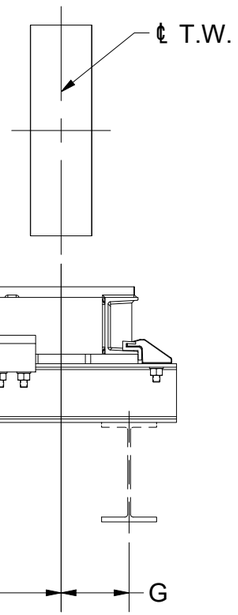
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:10	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	2/27/2020	GT31-261-B SHEET 1 OF 1

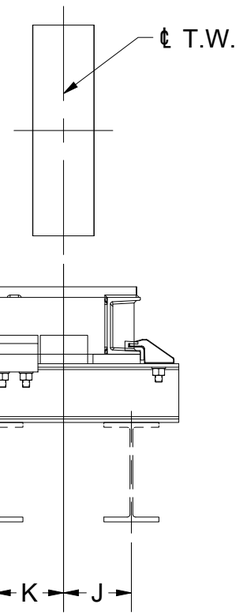


DIMENSIONS	
DESIGNATION	INCHES
A	6 1/2"
B	22 15/16"
C	12 3/16"
D	22 9/16"
E	34 3/4"
F	5 3/16"
G	
H	
J	
K	
L	

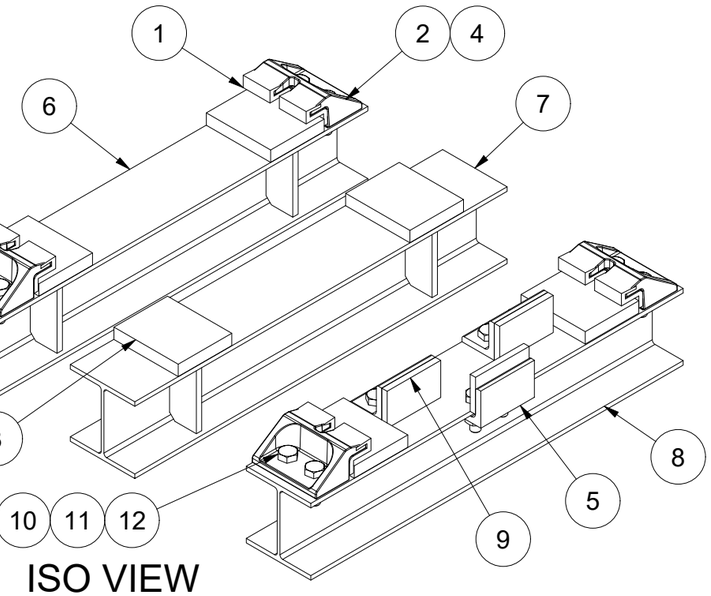
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	8	34-107S	RUBBER PAD (ZEE BRACKET)
2	4	34-112S	CAST Z-BRACKET
3	6	34-131S	ISOLATION RUBBER
4	4	34-303	ISOLATION BRACKET SHIM
5	3	GT31-105	BRACKET, ISOLATION
6	1	GT31-121-1	BEAM, ISOLATION, REAR END
7	1	GT31-121-2	BEAM, ISOLATION, CENTER
8	1	GT31-121-3	BEAM, ISOLATION, FORWARD END
9	3	GT31-131	PAD, ISOLATION
10	14	3/4"	WASHER, PLAIN
11	14	3/4"-10 UNC	NUT, HEAVY HEX, GRADE 5, BLACK OXIDE FINISH
12	14	3/4"-10 UNC X 2 1/2"	BOLT, HEAVY HEX, GRADE 5, BLACK OXIDE FINISH
13	1	E-175	INSTRUCTIONS, ISOLATION BRACKET SHIM



TWO MACHINE BEAM SETTING



THREE MACHINE BEAM SETTING



ISO VIEW
SCALE 1:10

NOTES UNLESS OTHERWISE SPECIFIED:

1. RIGHT HAND MACHINE SHOWN. LEFT HAND MACHINE SYMMETRICALLY OPPOSITE.

A	PRODUCTION RELEASE, PUR #1306	DRO 03/26/20

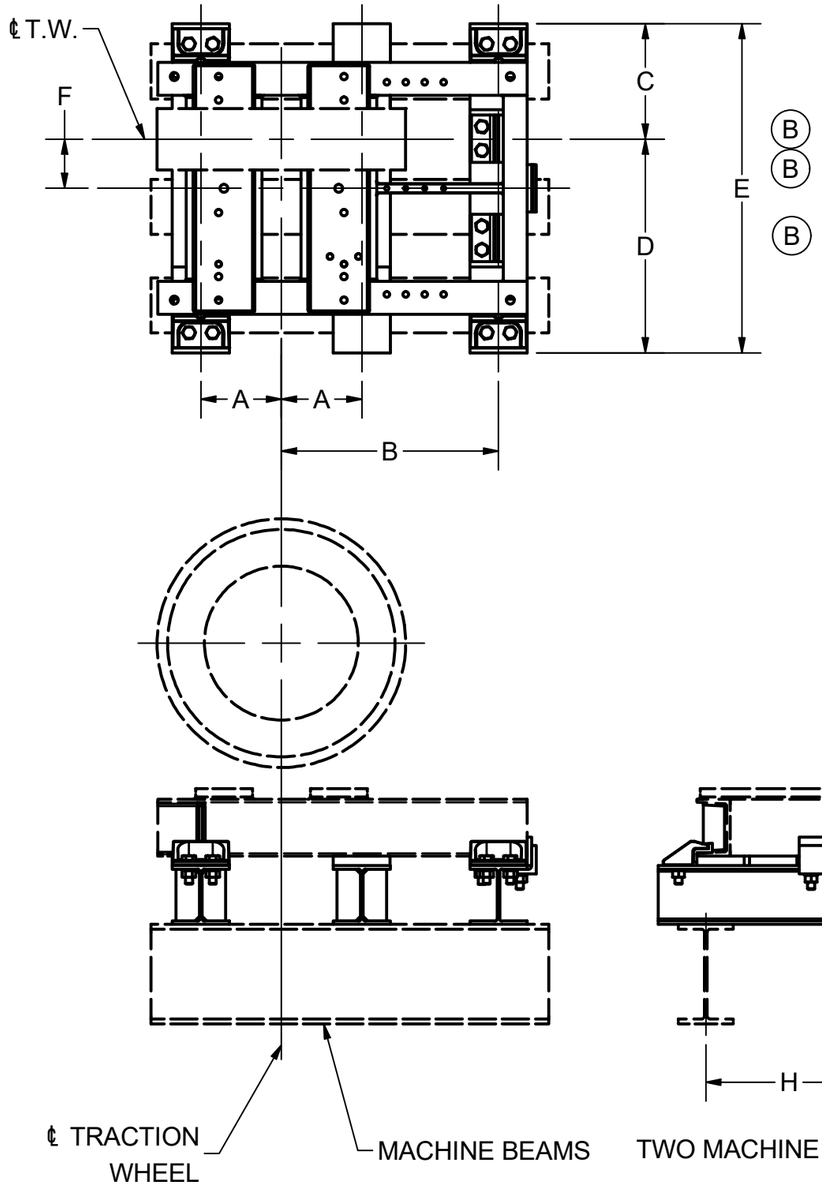
THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: ASSY, ISOLATION, MACHINE

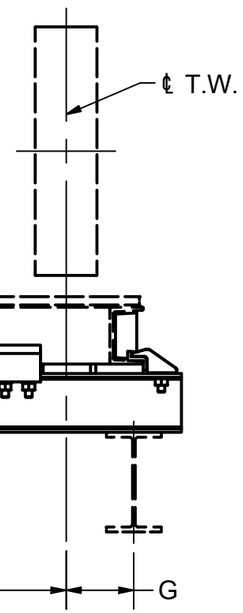
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:16	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	3/26/2020	GT11-110 SHEET 1 OF 1

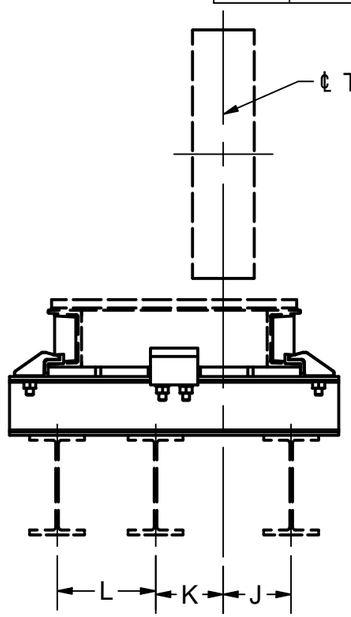


DIMENSIONS	
DESIGNATION	INCHES
A	8 1/2"
B	22 15/16"
C	12 3/16"
D	22 9/16"
E	34 3/4"
F	5 3/16"
G	
H	
J	
K	
L	

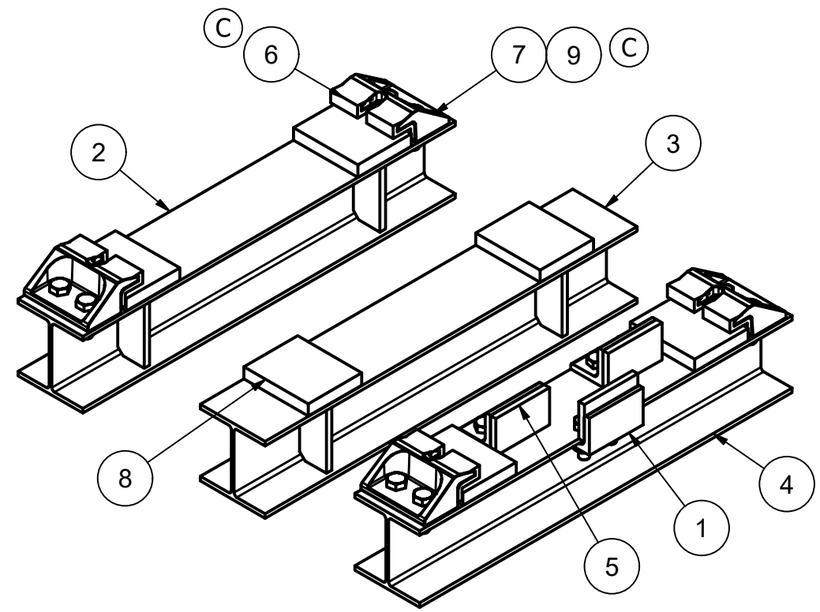
PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	3	GT31-105	BRACKET, ISOLATION
2	1	GT31-121-1	BEAM, ISOLATION, REAR END
3	1	GT31-121-2	BEAM, ISOLATION, CENTER
4	1	GT31-121-3	BEAM, ISOLATION, FORWARD END
5	3	GT31-131	PAD, ISOLATION
6	8	34-107S	RUBBER PAD (ZEE BRACKET)
7	4	34-112S	CAST Z-BRACKET
8	6	34-131S	ISOLATION RUBBER
9	4	34-303	ISOLATION BRACKET SHIM
10	14	3/4"	WASHER, PLAIN
11	14	3/4"-10 UNC	NUT, HEAVY HEX, GRADE 5, BLACK OXIDE FINISH
12	14	3/4"-10 UNC X 2 1/2"	BOLT, HEAVY HEX, GRADE 5, BLACK OXIDE FINISH
13	1	E-175	INSTRUCTIONS, ISOLATION BRACKET SHIM



TWO MACHINE BEAM SETTING



THREE MACHINE BEAM SETTING



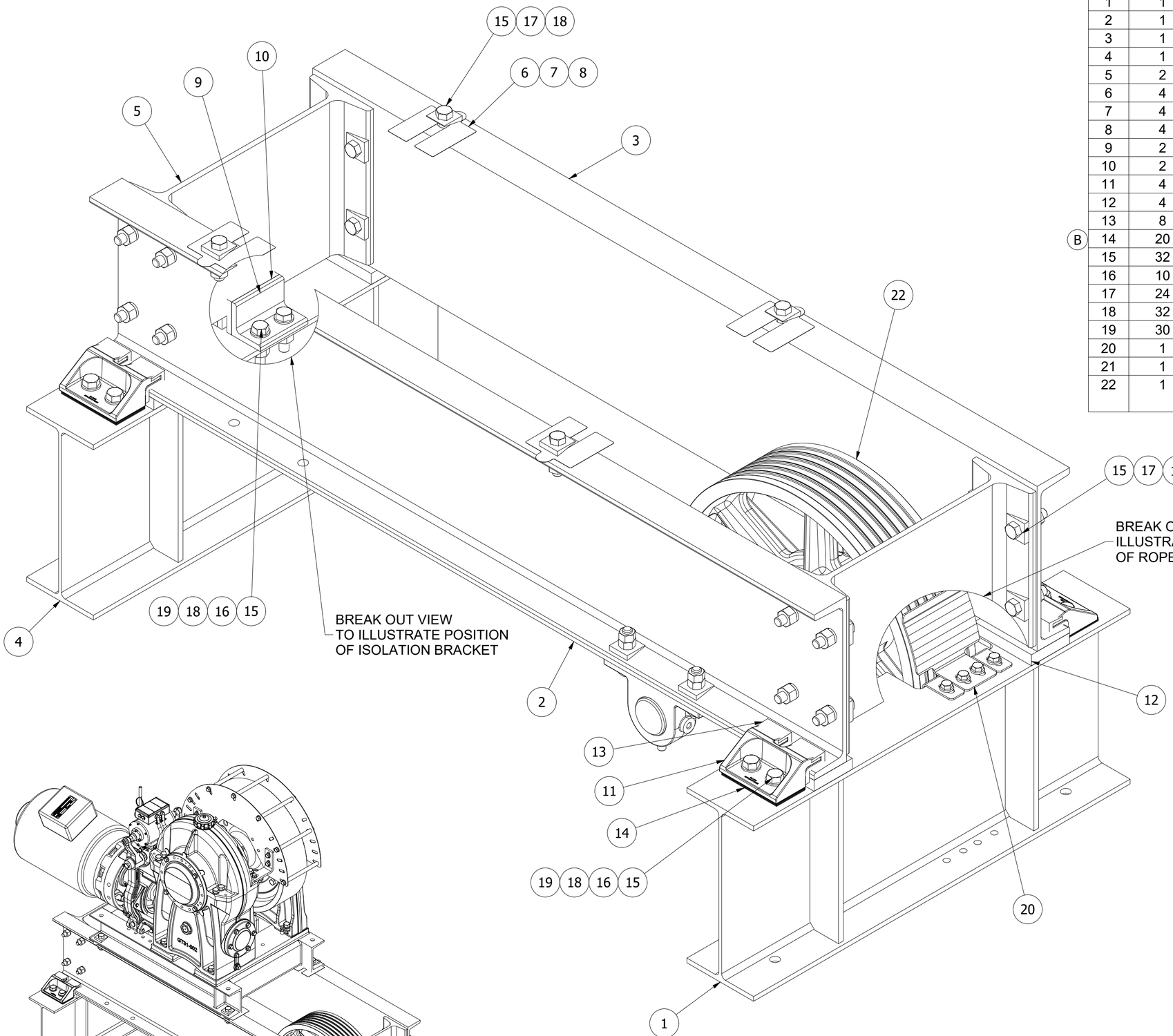
NOTES UNLESS OTHERWISE SPECIFIED:
1. RIGHT HAND MACHINE SHOWN. LEFT HAND MACHINE SYMMETRICALLY OPPOSITE.

			C	34-107S WAS 34-107, ADD 34-303, PUR #1291	SC 03/25/20	HOLLISTER-WHITNEY ELEVATOR CO. LLC
			B	REVISE DIMENSION TABLE, PUR #1290	BEH 05Mar20	TITLE: ASSY, ISOLATION, MACHINE
			A	PRODUCTION RELEASE PUR #1207	BEH 09Oct19	

THIRD ANGLE PROJECTION

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:16	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	9/11/2019	GT31-110 SHEET 1 OF 1



VIEW SHOWING MACHINE
MOUNTED TO BLOCK UP ASSY
FOR REFERENCE

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	GTX-204-1	BEAM, BLOCK UP, FWD END
2	1	GTX-204-2-RH	BEAM, BLOCKING, RH
3	1	GTX-204-2-LH	BEAM, BLOCKING, LH
4	1	GTX-204-4	BEAM, BLOCK UP, REAR END
5	2	GT31-204-5	BEAM, CROSS
6	4	GT31-062-05	SHIM, STAND, OUTBOARD
7	4	GT31-062-10	SHIM, STAND, OUTBOARD
8	4	GT31-062-31	SHIM, STAND, OUTBOARD
9	2	GT31-105	BRACKET, ISOLATION
10	2	GT31-131	PAD, ISOLATION
11	4	34-112S	CAST Z-BRACKET
12	4	GL185-108	GL MACHINE ISOLATOR
13	8	34-107S	RUBBER PAD (ZEE BRACKET)
B 14	20	34-303	ISOLATION BRACKET SHIM
15	32	3/4" - 10 UNC	NUT, HEX, HEAVY, GRADE 5, PLAIN FINISH
16	10	3/4"	WASHER, PLAIN FINISH
17	24	270-054	BEVEL WASHER
18	32	3/4" - 10 UNC X 3"	BOLT, HEX, GRADE 5, BLACK OXIDE FINISH
19	30	3/4"	WASHER, LOCK, BLACK OXIDE FINISH
20	1	322-179	ASSY, RETAINER, ROPE, DFLCTR, BLOCK UP
21	1	E-175	INSTRUCTIONS, ISOLATION BRACKET SHIM
22	1	GTX-322-	ASSY, SHEAVE, DEFLECTOR, GT MACHINE BLOCK UP, BALL BEARING, SEALED

NOTES UNLESS OTHERWISE SPECIFIED:

1. IF RADIAL LOAD ON DEFLECTOR SHEAVE EXCEEDS 5,750#, THEN SPHERICAL ROLLER BEARINGS MUST BE USED.
2. WEIGHTS:
   BLOCK UP ASSY: 1278#
   DEFLECTOR SHEAVE: 323#
   TOTAL: 1801#
3. MINIMUM OVERHEAD CLEARANCE FROM BOTTOM OF BLOCK UP BEAMS FOR REMOVAL OF UPPER HOUSING IS AS FOLLOWS:
   GT11-SERIES MACHINES: 75 1/4"
   GT31-SERIES MACHINES: 81 1/4"

B	34-303 QTY. 20 WAS 12, PUR #1892	DRO 06/19/24	
A	PRODUCTION RELEASE PUR #1819	BEH 20Sep23	

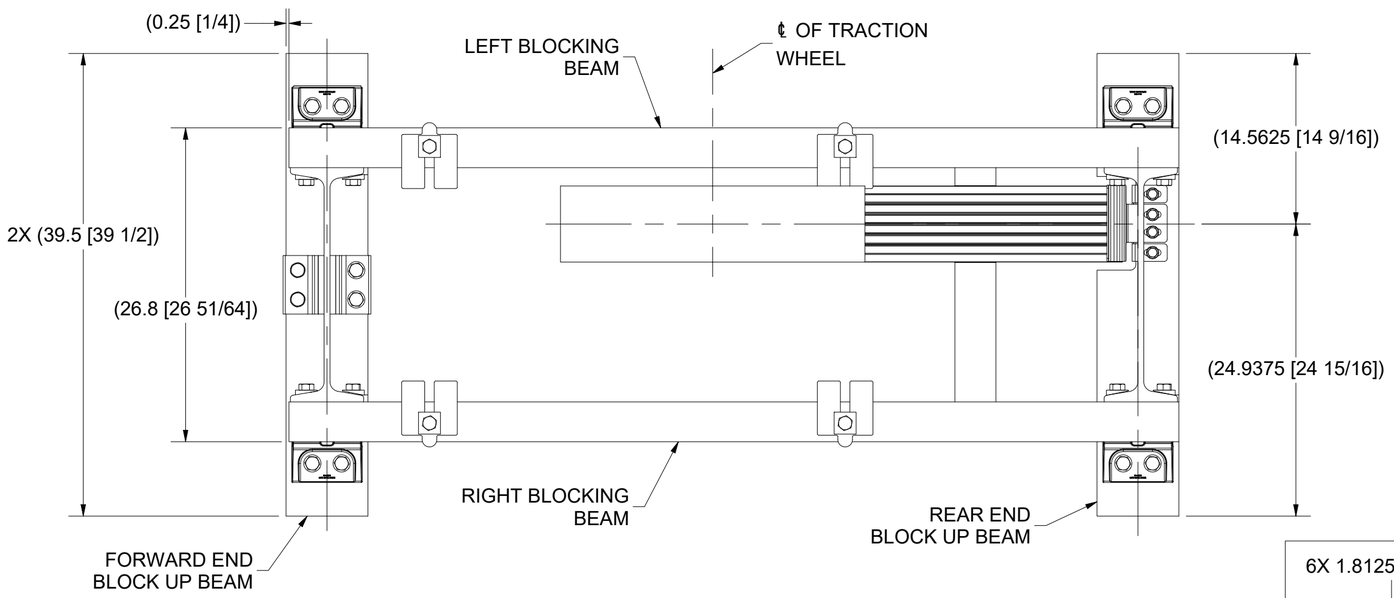
THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

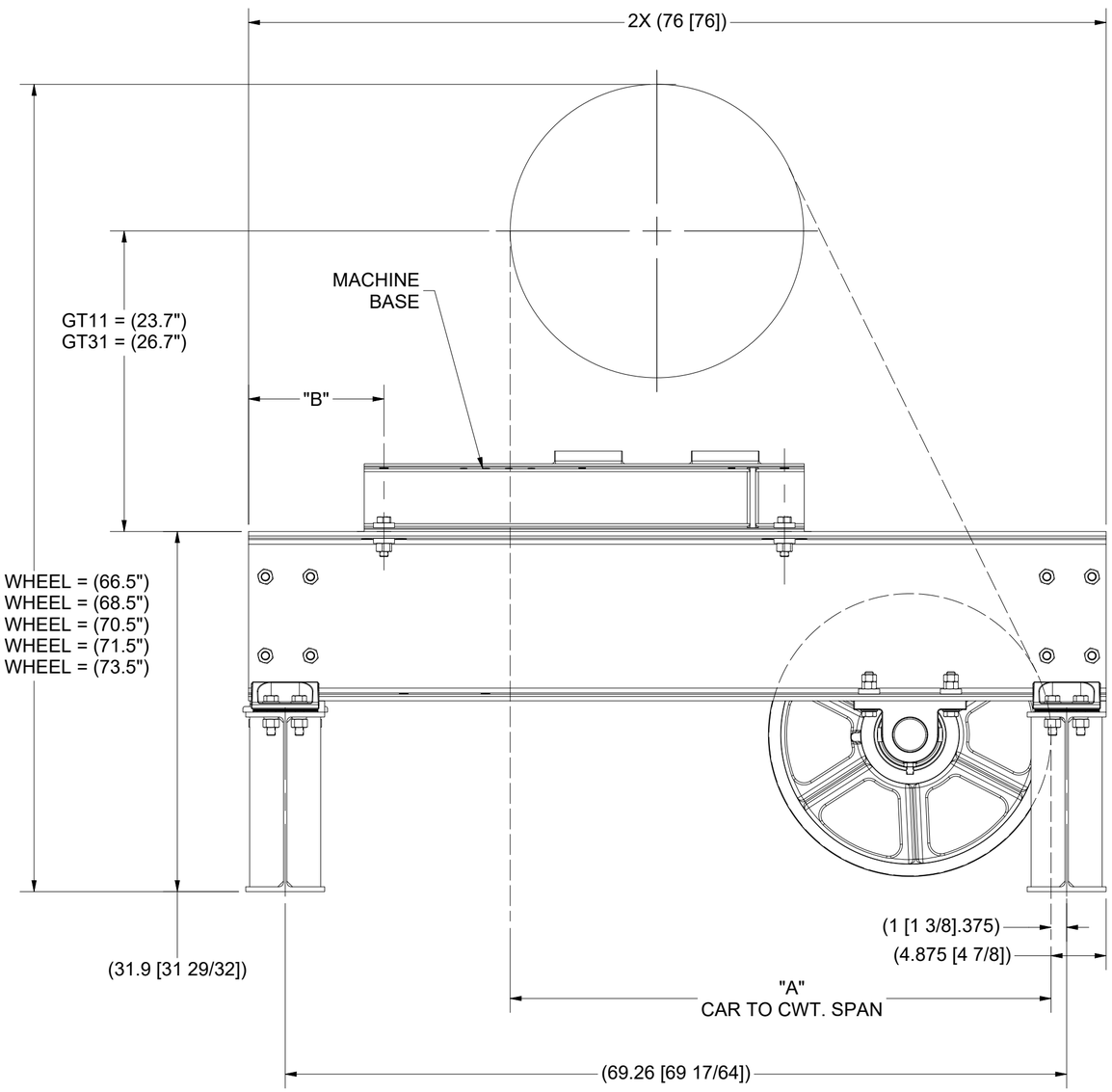
TITLE: ASSY, BLOCK UP, GT-SERIES, LH

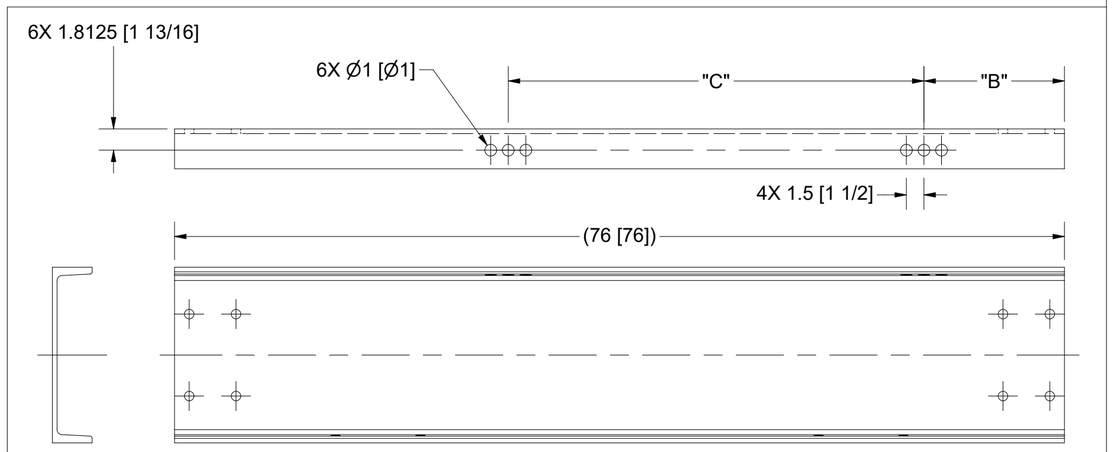
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1 / 6	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
C	8/17/2023	GTX-204-LH SHEET 1 OF 2

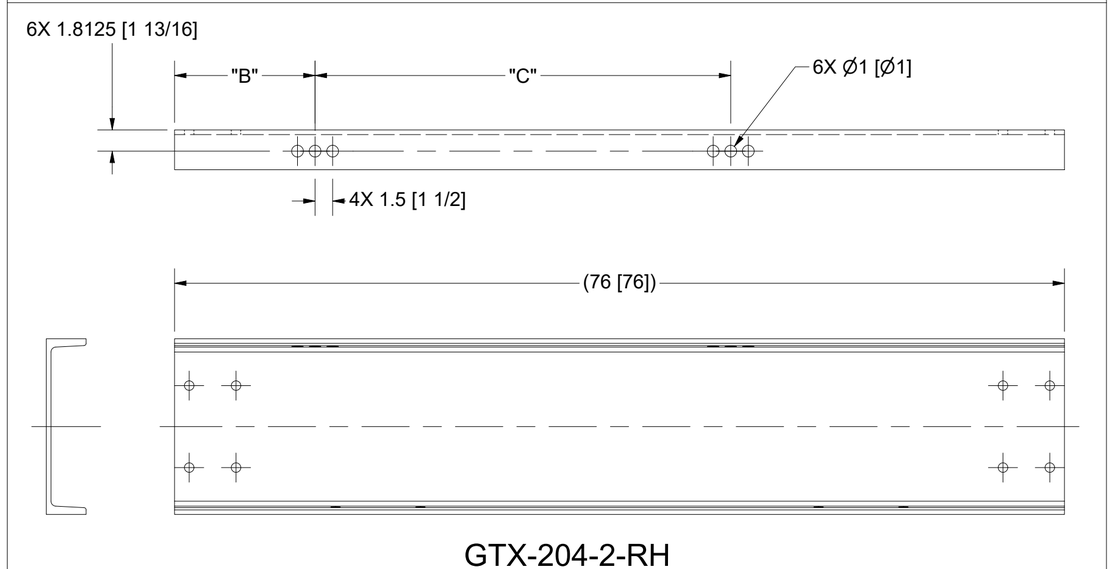


DIMENSION TABLE			
DIM	DESCRIPTION	EQUATION	VALUE
A	CAR TO CWT. SPAN (ROPE DROP)	GT11 22" WHEEL = 29.5" TO 53.5" GT11 26" WHEEL = 33.5" TO 55.5" GT11 30" WHEEL = 37.5" TO 59" GT31 26" WHEEL = 34" TO 57.5" GT31 30" WHEEL = 38" TO 59.5"	
B	END OF BLOCKING BEAM TO FIRST MACHINE BASE MOUNTING HOLE	GT11 22" WHEEL =76"-18.0625" - "A" GT11 26" WHEEL = 76"-16.0625" - "A" GT11 30" WHEEL = 76"-14.0625" - "A" GT31 26" WHEEL = 76"-16.0625" - "A" GT31 30" WHEEL = 76"-14.0625" - "A"	
C	MACHINE BASE MOUNTING HOLE SPACING	GT11 = 33.5" GT31 = 35.5"	





GTX-204-2-LH



GTX-204-2-RH

B	34-303 QTY. 20 WAS 12, PUR #1892	DRO	06/19/24
A	PRODUCTION RELEASE PUR #1819	BEH	20Sep23

HOLLISTER-WHITNEY ELEVATOR CO. LLC

TITLE: ASSY, BLOCK UP, GT-SERIES, LH

THIRD ANGLE PROJECTION

DRAWN BY	SCALE	MATERIAL	FABRICATED TOL.
BEH	1 / 10	N/A	X.X ±0.1, X.XX ±0.06 X.XXX ±0.031, X.XXXX ±0.0156 HOLES ±0.015, ANGLES ±2°

SHEET SIZE	DATE	
C	8/17/2023	GTX-204-LH SHEET 2 OF 2

Rope Gripper® - Machine duty table

Machine	Machine Type	Gripper Type	Required Gripper Mounting Angles	Required Gripper Bracket
GT11	OH	620L	620L-041	N/A
		622L	622L-041	N/A
		620H	620H-041	N/A
		622H	622H-041	N/A
	OD	620L	620L-OD-041	N/A
		622L	622L-OD-041	N/A
		620H	620L-OD-041	N/A
		622H	622L-OD-041	N/A
	BS	620L	N/A	GT11BS-205
		622L	N/A	GT11BS-205
		620H	N/A	GT11BS-205
		622H	N/A	GT11BS-205
GT31	OH	620L	620L-041	N/A
		622L	622L-041	N/A
		620H	620H-041	N/A
		622H	622H-041	N/A
		624H/626H	Standard	N/A
	OD	620L	620L-OD-041	N/A
		622L	622L-OD-041	N/A
		620H	620L-OD-041	N/A
		622H	622L-OD-041	N/A
		624H/626H	624-OD-041-1-L, 624-OD-041-1-R	N/A
	BS	620L	N/A	GT11BS-205
		622L	N/A	GT11BS-205
		620H	N/A	GT11BS-205
		622H	N/A	GT11BS-205
		624H/626H	N/A	GT31BS-205

Overhead Machine Rope Gripper Mounting

NOTE:

CONSULT THE PROPER ROPE GRIPPER INSTALLATION MANUAL FOR THE INSTALLATION OF THE ROPE GRIPPER.

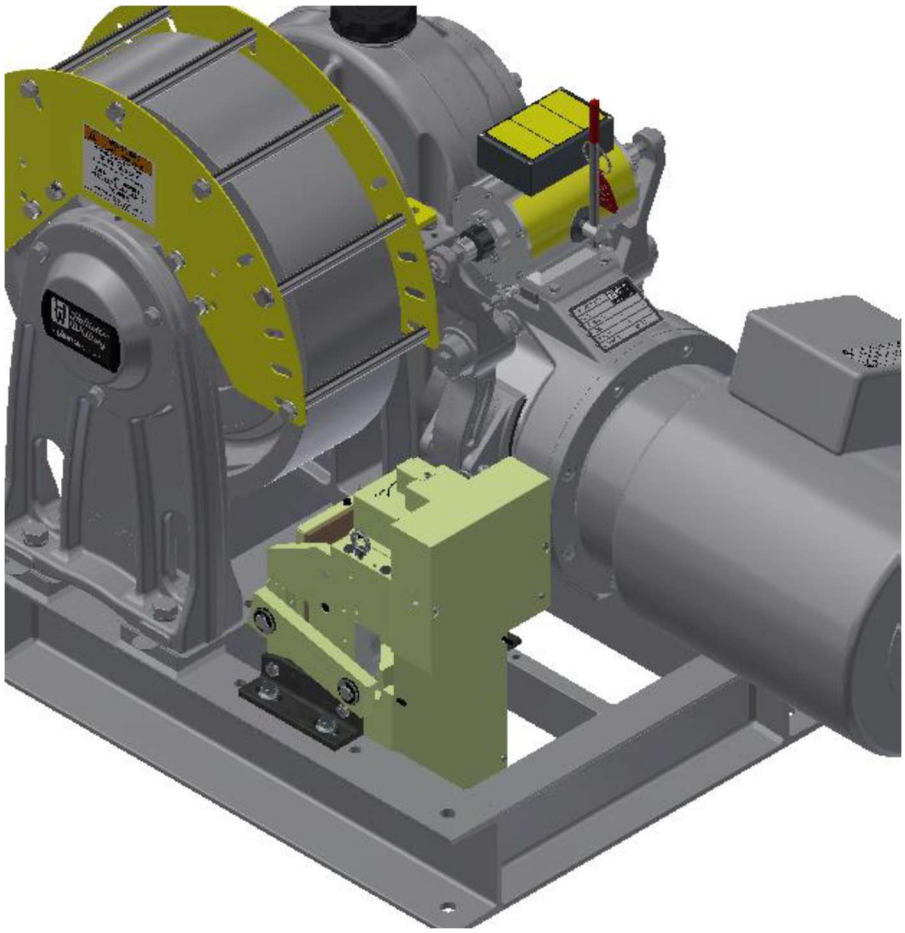
• Remove the standard mounting feet that come with the rope gripper.

• Attach the non-standard specified mounting angles listed in the Rope Gripper Machine Duty Table on the prior page to the rope gripper with the required hardware and properly torque.

• Verify the assembly will not interfere with elevator equipment (machine frame, traction or deflector sheave, machine beams, etc.) or any other obstructions.

• Follow the rope gripper manual installation procedure and when appropriate attach the mounting angles to the machine base.

• See the figure below for an illustration of a finished installation.



Basement Machine Rope Gripper Mounting

NOTE:

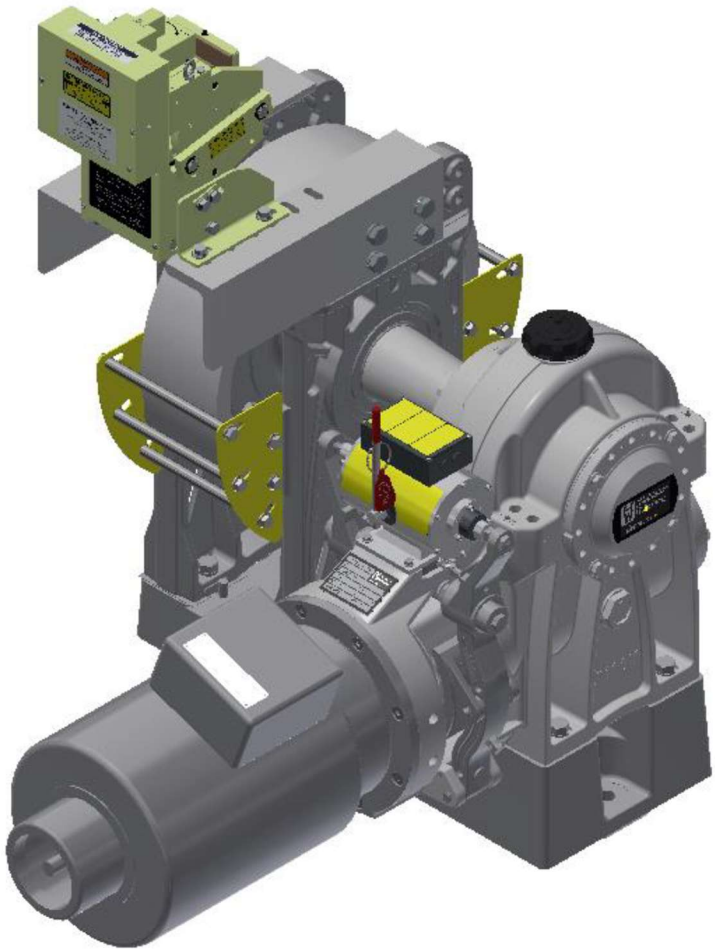
CONSULT THE PROPER ROPE GRIPPER INSTALLATION MANUAL FOR THE INSTALLATION OF THE ROPE GRIPPER.

• If not already completed, attach the rope gripper brackets specified in the Rope Gripper Machine Duty Table to the machine stands with the required hardware and properly torque.

• Verify the assembly will not interfere with elevator equipment (machine frame, traction or deflector sheave, machine beams, etc.) or any other obstructions.

• Follow the rope gripper manual installation procedure and when appropriate attach the mounting angles to the mounting brackets.

• See the image below for an illustration of a finished installation.



Basement Machine Rope Gripper Mounting

NOTE:

CONSULT THE PROPER ROPE GRIPPER INSTALLATION MANUAL FOR INSTALLATION OF THE ROPE GRIPPER.

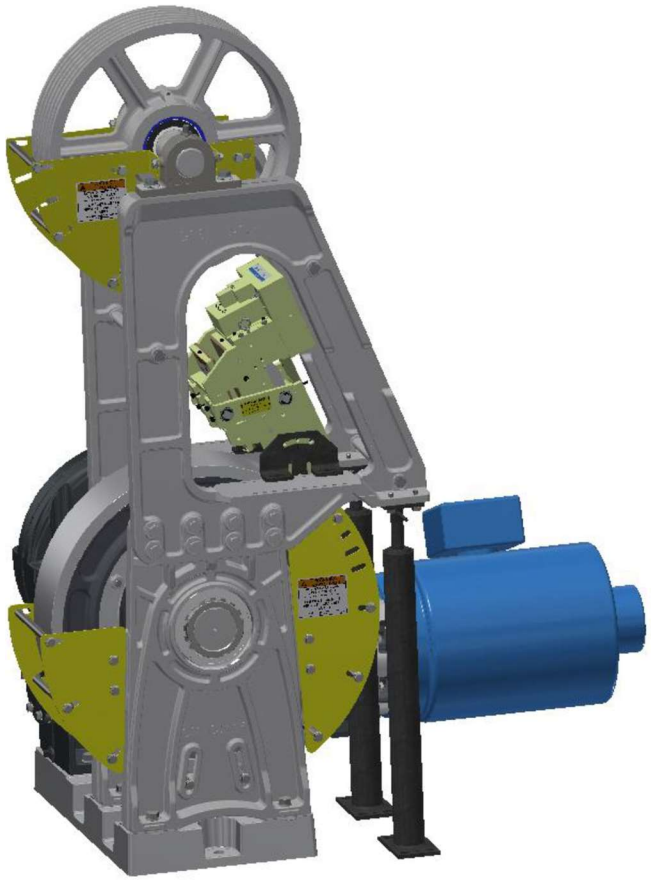
• Remove the standard mounting feet that come with the rope gripper.

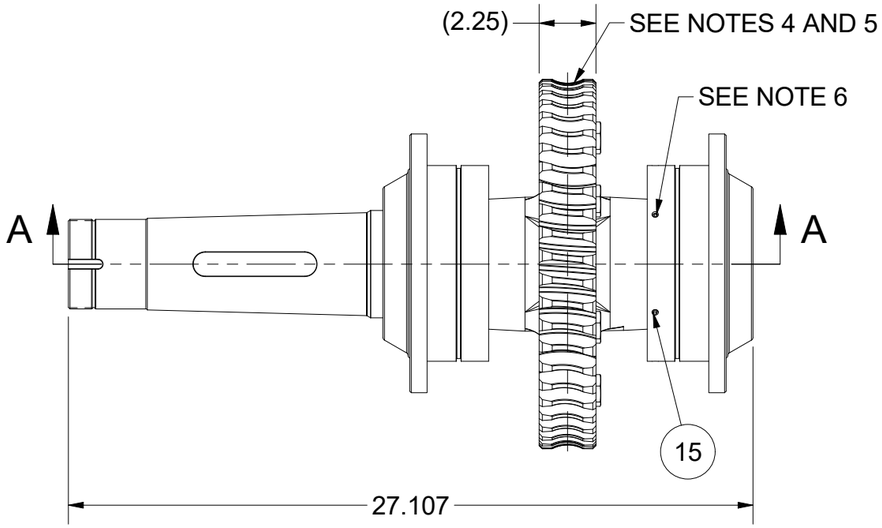
• Attach the non-standard specified mounting angles in the Rope Gripper Machine Duty Table to the rope gripper with the required hardware and properly torque.

• Verify the assembly will not interfere with elevator equipment (machine frame, traction or deflector sheave, machine beams, etc.) or any other obstructions.

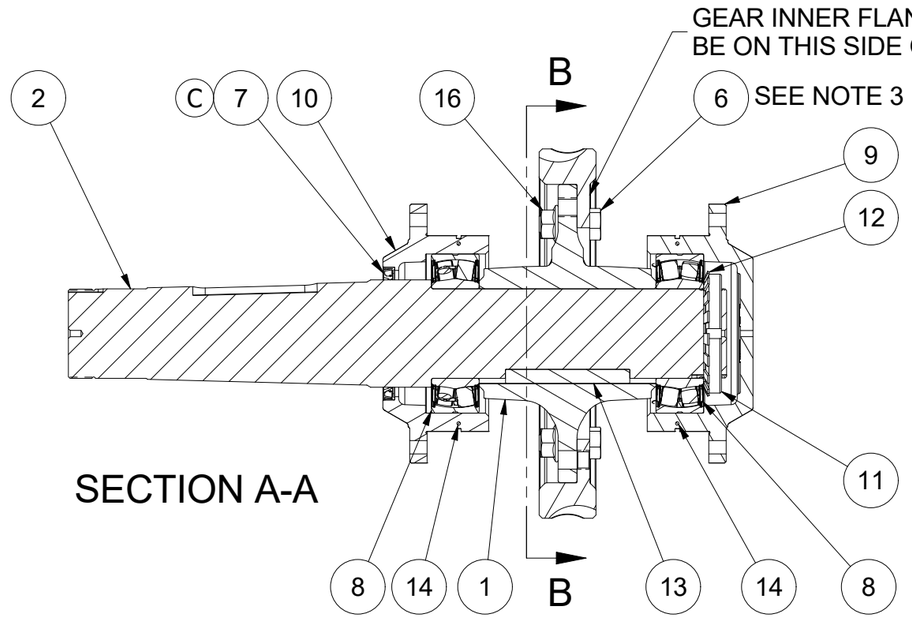
• Follow the rope gripper manual installation procedure and when appropriate attach the mounting angles to the machine up-stand.

• See image below for an illustration of a finished installation.

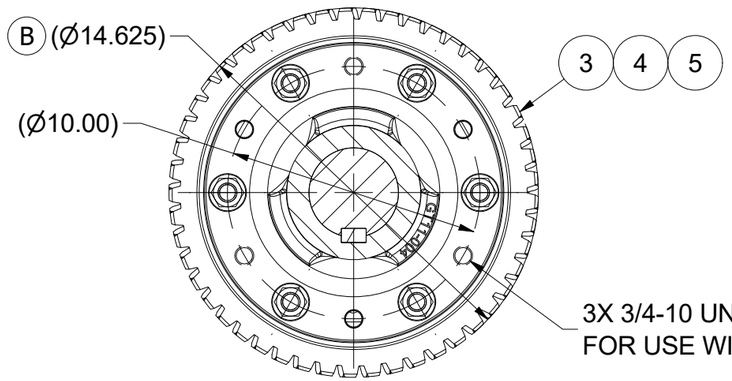




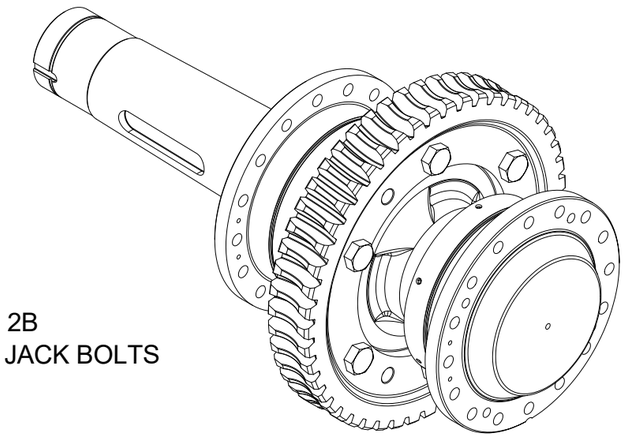
PARTS LIST					
ITEM	QTY GT11-080-01	QTY GT11-080-02	QTY GT11-080-03	PART NUMBER	DESCRIPTION
1	1	1	1	GT11-004	HUB, GEAR
2	1	1	1	GT11-018-01	SHAFT, WHEEL, TRACTION
3	1	0	0	GT11-027	GEAR, 7/8" PITCH, SINGLE LEAD
4	0	1	0	GT11-028	GEAR, 7/8" PITCH, DOUBLE LEAD
5	0	0	1	GT11-029	GEAR, 7/8" PITCH, TRIPLE LEAD
6	6	6	6	GT31-072	BOLT, BODY, GEAR
7	1	1	1	GT11-092	GREASE SEAL
8	2	2	2	GT11-093	BEARING, ROLLER, SPHERICAL
9	1	1	1	GT11-275	ECCENTRIC
10	1	1	1	GT11-275-WS	ECCENTRIC, TRACTION WHEEL SIDE
11	1	1	1	GT11-282	NUT, LOCK, SHAFT
12	1	1	1	GT11-283	WASHER, LOCK, SHAFT
13	1	1	1	GT11-300	KEY, SHAFT, WHEEL
14	2	2	2	GT11-305	O-RING, ECCENTRIC
15	6	6	6	5/16-18 UNC X 0.75"	SCREW, SET, HEX, CONE POINT
16	6	6	6	3/4"-10 UNC	NUT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED



SECTION A-A



SECTION B-B
SCALE 1:6



WEIGHT: 230 lbmass

NOTES UNLESS OTHERWISE SPECIFIED:

1. HOBBED GEAR TO BE HEATED AND ASSEMBLED TO THE HUB.
2. DRILL AND REAM BODY BOLT HOLES. BODY BOLT HOLE DIAMETER TO BE Ø0.7502/Ø0.7500.
3. INSERT BODY BOLTS AND NUTS AND TORQUE TO 95 ft*lbs TO 105 ft*lbs.
4. TOOTH GEOMETRY IS SHOWN FOR REFERENCE PURPOSES ONLY. ACTUAL GEOMETRY MAY BE VISUALLY DIFFERENT.
5. REFER TO PC-00001 FOR GEOMETRY.
6. APPLY LOCTITE THREADLOCKER BLUE 243 TO SET SCREWS PRIOR TO INSTALLATION.

			C	ADDED GT11-092 SEAL, PUR #1655	DRO 05/20/22
E	GT11-018-01 WAS GT11-018, PUR #1845	EMM 12/27/23	B	O.D. WAS 14.500, PUR #1364	DRO 08/03/20
D	DISSOLVED GT11-302 PARTS, PUR #1753	DRO 03/03/23	A	PRODUCTION RELEASE PUR #1330	DRO 06/04/20

THIRD ANGLE PROJECTION

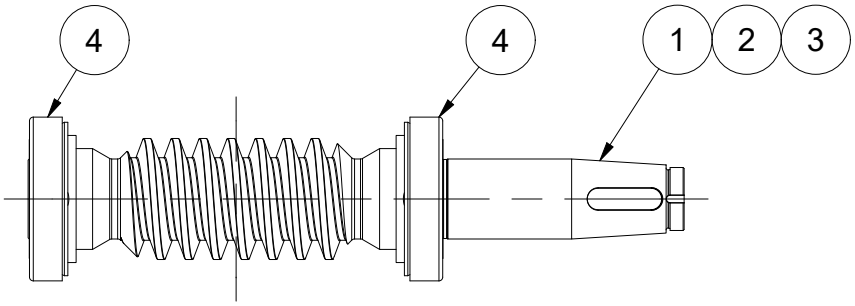
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

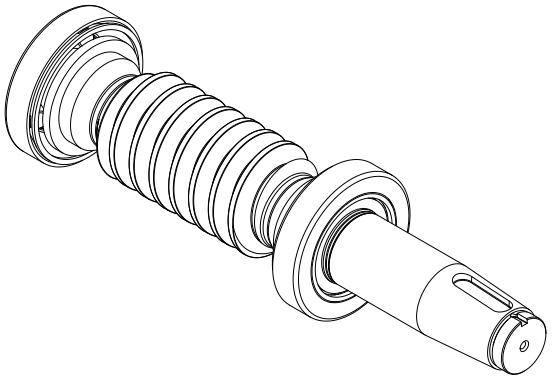
TITLE: ASSY, CENTER

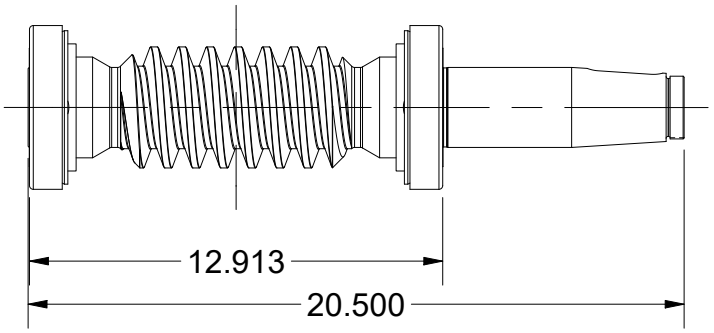
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:6	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

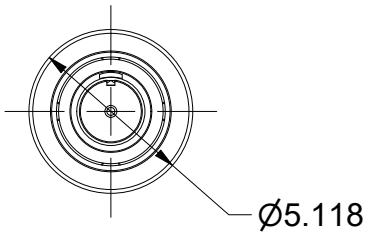
SHEET SIZE	DATE	
B	4/30/2020	GT11-080 SHEET 1 OF 1

PARTS LIST					
ITEM	QTY GT11-294-01	QTY GT11-294-02	QTY GT11-294-03	PART NUMBER	DESCRIPTION
1	1	0	0	GT11-047	WORM, FINISHED, 7/8" SINGLE
2	0	1	0	GT11-048	WORM, FINISHED, 7/8" DOUBLE
3	0	0	1	GT11-049	WORM, FINISHED, 7/8" TRIPLE
4	2	2	2	GT31-090	BEARING, ROLLER, TAPERED









WEIGHT: 43 lbmass

B	UPDATED VIEWS, PUR #1764	DRO 04/26/23
A	PRODUCTION RELEASE, PUR #1330	DRO 06/04/20

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

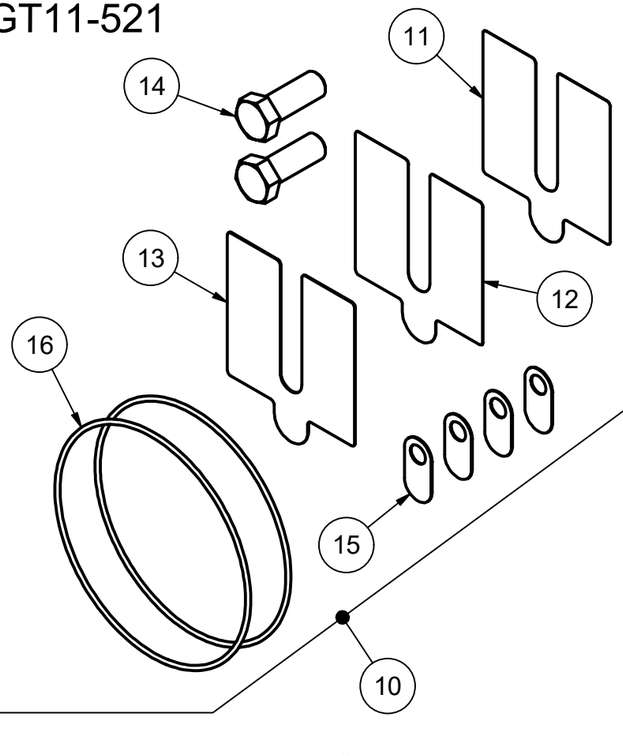
TITLE
ASSY, WORM SHAFT AND BEARING

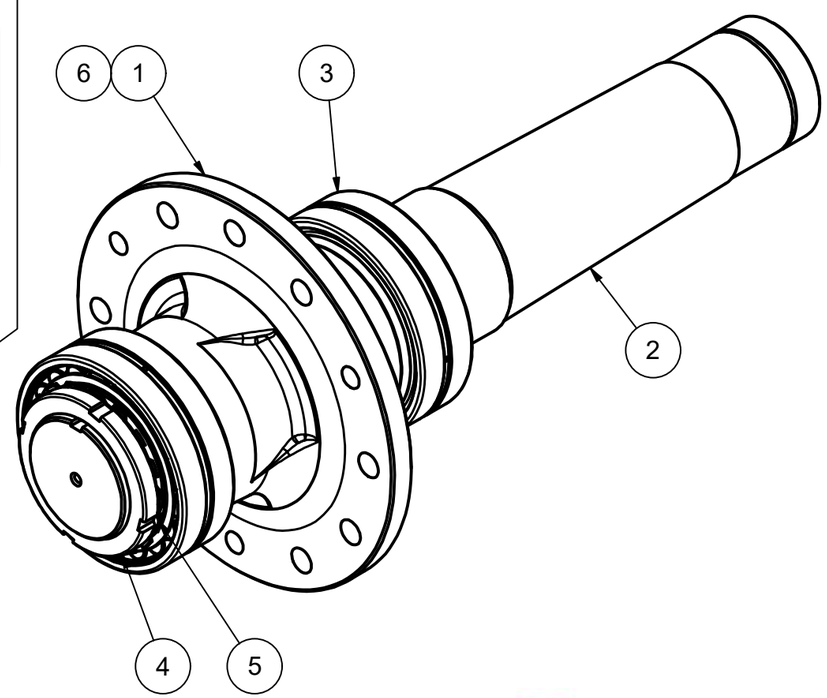
THIRD ANGLE PROJECTION

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:6	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
A	4/30/2020	GT11-294 SHEET 1 OF 1

GT11-521





GT31-520

PARTS LIST				
ITEM	QTY	CHK	PART NUMBER	DESCRIPTION
1	1		GT11-004	HUB, GEAR
2	1		GT11-018-01 (D)	SHAFT, WHEEL, TRACTION
3	2		GT11-093	BEARING, ROLLER, SPHERICAL
4	1		GT11-282	NUT, LOCK, SHAFT
5	1		GT11-283	WASHER, LOCK, SHAFT
6	1		GT11-300	KEY, SHAFT, WHEEL
7	1		GT31-512	OIL, GEAR (1 qt.)
8	1		BULL-1197	MANUAL, RETROFIT (NOT SHOWN)
9	1		GT11OH-CRATE	CRATE (NOT SHOWN)
10	1		GT11-521	KIT, SHIM AND SEAL
11	6		GT31-062-05	SHIM, STAND, OUTBOARD
12	2		GT31-062-10	SHIM, STAND, OUTBOARD
13	2		GT31-062-31	SHIM, STAND, OUTBOARD
14	2		GT31-072	BOLT, BODY, GEAR
15	4		GT31-295	SHIM, ECCENTRIC, EDGE BONDED
16	2		GT11-305	O-RING, ECCENTRIC
17	1		GT31-520	KIT, HARDWARE
18	1		GT31-501	TUBE, SILICONE
19	1		GT31-502	THREAD LOCKER, 243
20	6		5/16-18 UNC X 0.75"	SCREW, SET, HEX, CONE POINT
21	2		3/4"-10 UNC	NUT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
(D)	22	1	P-243	LABEL, WARNING

WEIGHT: 141.3 lbmass

D	GT11-018-01 WAS GT11-018, ADD ITEM #22, PUR #1834	BEH 02Nov23

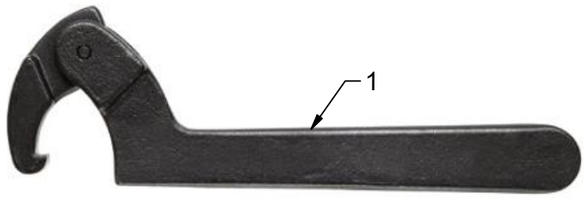
THIRD ANGLE PROJECTION

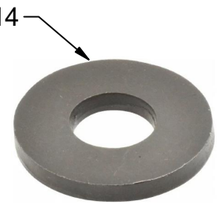
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

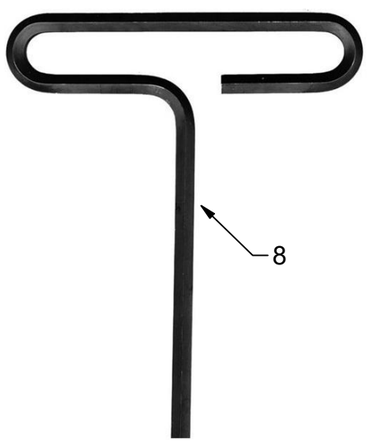
TITLE: KIT, RETROFIT, GT11OH

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:4	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	9/16/2023	GT11-500-KT SHEET 1 OF 1







PART LIST				
ITEM	QTY	PART NAME	MANUFACTURER	MANUFACTURER PART NUMBER
1	1	SPANNER, HOOK, ADJUSTABLE	MARTIN TOOL	474A
2	1	DYE, LAYOUT, SPRAY	SPRAYON	SP603
3	1	STRAP, RATCHET, 2" WIDE X 12' LONG	LOAD LUGGER	60513X12
4	1	KIT, INDICATOR, DIAL, IMPERIAL	SHARS	303-2710
5	1	REAMER, SQUARE END, 3/4"	MULTIPLE	-
6	1	EYEBOLT, HOISTING, SHOULDER, 3/8" X 1"	MULTIPLE	-
7	3	EYEBOLT, HOISTING, SHOULDER, 1/2" X 1-1/2"	MULTIPLE	-
8	1	WRENCH, ALLEN, T-HANDLE, 5/32"	EKLIND	31310
9	1	PASTE, INDICATOR, TAMPER	DYKEM	83316
10	3	NUT, FLANGE, SERRATED, 1/2"	MULTIPLE	-
11	2	BOLT, FLANGE, SERRATED, 1/2" X 1-1/2"	MULTIPLE	-
12	1	SOCKET, DEEP WELL, 12-pt, 9/16", DRIVE, 1/2"	PROTO	J7318S
13	2	NUT, HEX, HEAVY, 3/4"	MULTIPLE	-
14	2	WASHER, HEAVY, 3/4"	MULTIPLE	-

NOTES UNLESS OTHERWISE SPECIFIED:
1. EQUIVALENTS ARE ALLOWED WITH PRIOR H-W ENGINEERING APPROVAL.
2. ALL PARTS ARE TO BE PROVIDED IN A CARDBOARD BOX WITH A LABEL DISPLAYING THE H-W PART NUMBER (GT11-500-TLKT).
3. PARTS ARE NOT TO SCALE.

A	PRODUCTION RELEASE PUR #1824	BEH 12Oct23

THIRD ANGLE PROJECTION

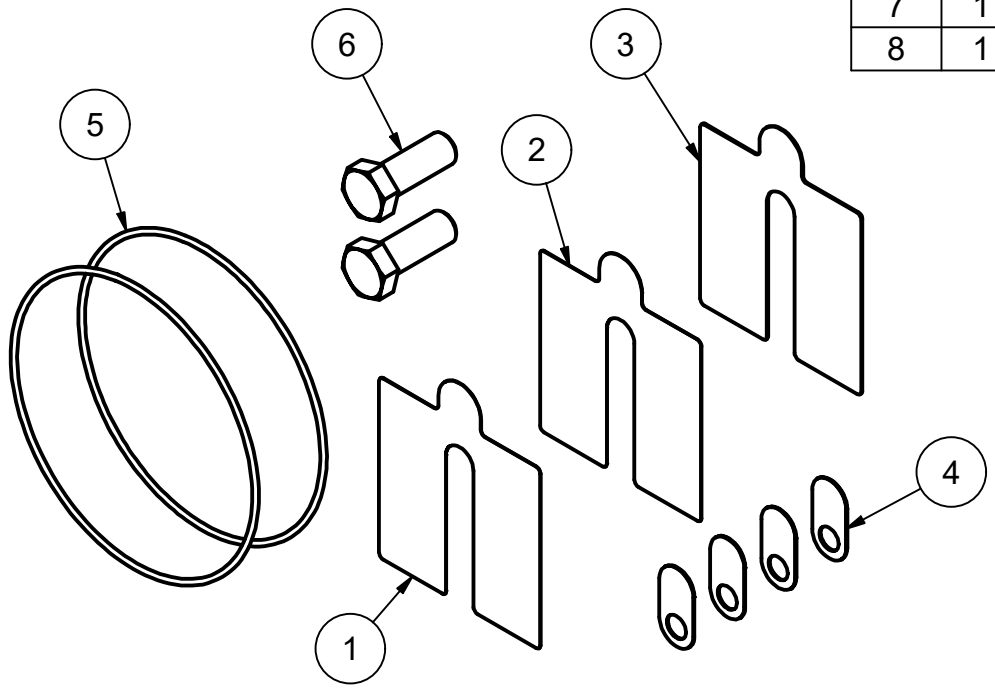
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: KIT, TOOL, RETROFIT, SHAFT

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	10/12/2023	GT11-500-TLKT SHEET 1 OF 1

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	6	GT31-062-05	SHIM, STAND, OUTBOARD
2	2	GT31-062-10	SHIM, STAND, OUTBOARD
3	2	GT31-062-31	SHIM, STAND, OUTBOARD
4	4	GT31-295	SHIM, ECCENTRIC, EDGE BONDED
5	2	GT11-305	O-RING, ECCENTRIC
6	2	GT31-072	BOLT, BODY, GEAR
7	1	N/A	BAG, PLASTIC (NOT SHOWN)
8	1	N/A	LABEL (NOT SHOWN)



NOTES UNLESS OTHERWISE SPECIFIED:
1. PARTS TO BE PLACED IN PLASTIC BAG.
2. LABEL WITH PART NUMBER TO PLACED ON BAG.

WEIGHT: 1.1 lbmass

A	PRODUCTION RELEASE PUR #1820	BEH 05Oct23

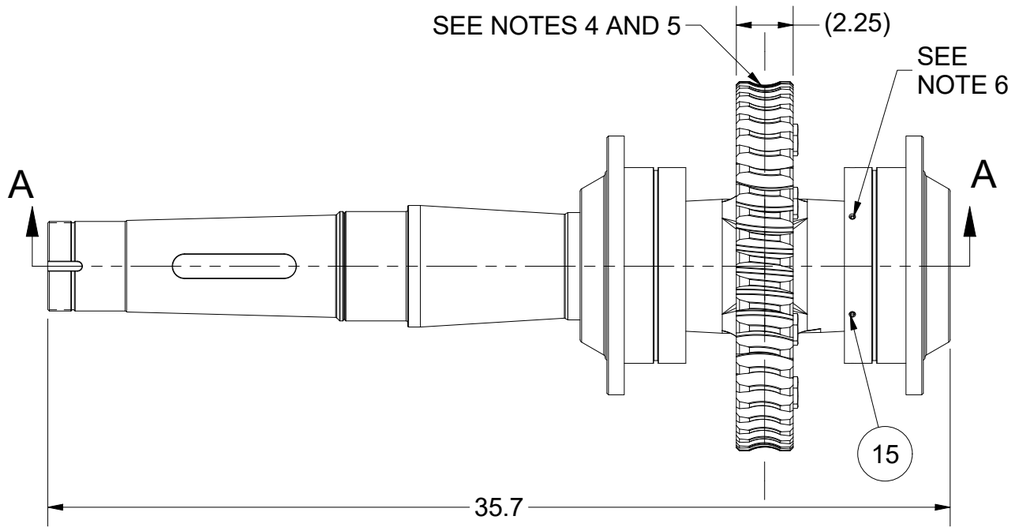
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE
KIT, SHIM AND SEAL

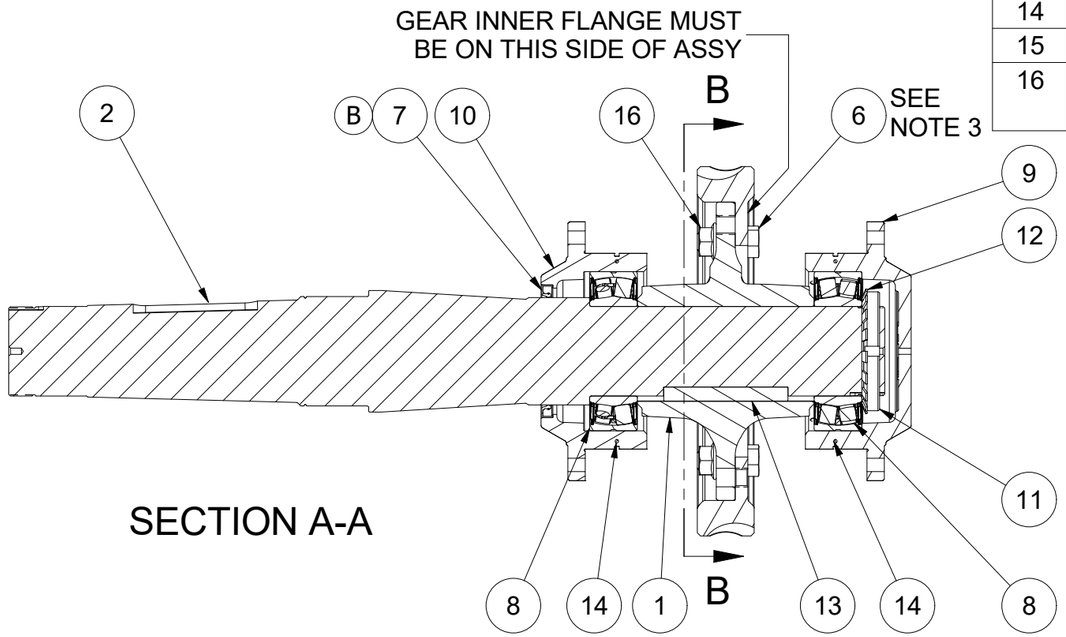
THIRD ANGLE PROJECTION

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:4	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

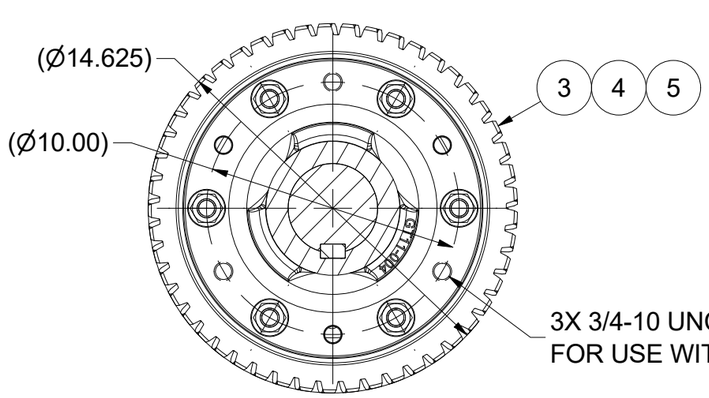
SHEET SIZE	DATE	
A	10/5/2023	GT11-521 SHEET 1 OF 1



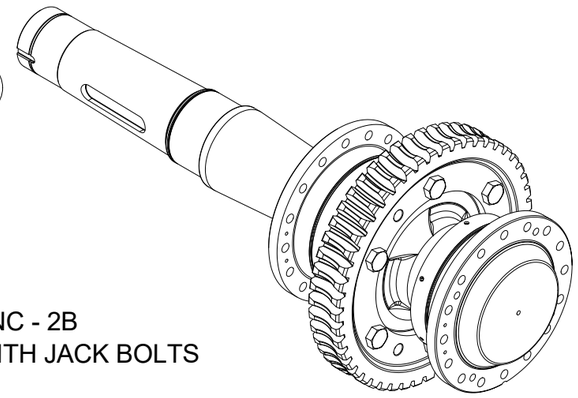
PARTS LIST					
ITEM	QTY GT11BS-080-01	QTY GT11BS-080-02	QTY GT11BS-080-03	PART NUMBER	DESCRIPTION
1	1	1	1	GT11-004	HUB, GEAR
2	1	1	1	GT11BS-018-01	SHAFT, WHEEL, TRACTION, BS/OD
3	1	0	0	GT11-027	GEAR, 7/8" PITCH, SINGLE LEAD
4	0	1	0	GT11-028	GEAR, 7/8" PITCH, DOUBLE LEAD
5	0	0	1	GT11-029	GEAR, 7/8" PITCH, TRIPLE LEAD
6	6	6	6	GT31-072	BOLT, BODY, GEAR
7	1	1	1	GT11-092-1	GREASE SEAL - SPLIT
8	2	2	2	GT11-093	BEARING, ROLLER, SPHERICAL
9	1	1	1	GT11-275	ECCENTRIC
10	1	1	1	GT11-275-WS	ECCENTRIC, TRACTION WHEEL SIDE
11	1	1	1	GT11-282	NUT, LOCK, SHAFT
12	1	1	1	GT11-283	WASHER, LOCK, SHAFT
13	1	1	1	GT11-300	KEY, SHAFT, WHEEL
14	2	2	2	GT11-305	O-RING, ECCENTRIC
15	6	6	6	5/16-18 UNC X 0.75"	SCREW, SET, HEX, CONE POINT
16	6	6	6	3/4"-10 UNC	NUT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED



SECTION A-A



SECTION B-B
SCALE 1:6



ISO VIEW
SCALE 1:8

WEIGHT: 268 lbmass

NOTES UNLESS OTHERWISE SPECIFIED:

1. HOBBED GEAR TO BE HEATED AND ASSEMBLED TO THE HUB.
2. DRILL AND REAM BODY BOLT HOLES. BODY BOLT HOLE DIAMETER TO BE Ø0.7502/Ø0.7500.
3. INSERT BODY BOLTS AND NUTS AND TORQUE TO 95 ft*lbs TO 105 ft*lbs.
4. TOOTH GEOMETRY IS SHOWN FOR REFERENCE PURPOSES ONLY. ACTUAL GEOMETRY MAY BE VISUALLY DIFFERENT.
5. REFER TO PC-00001 FOR GEOMETRY.
6. APPLY LOCTITE THREADLOCKER BLUE 243 TO SET SCREWS PRIOR TO INSTALLATION.

			C	DISSOLVED GT11-302 PARTS, PUR #1753	DRO 03/03/23
			B	ADDED GT11-092-1 SEAL, PUR #1655	DRO 05/23/22
D	GT11BS-018-01 WAS GT11BS-018, PUR #1845	EMM 12/27/23	A	PRODUCTION RELEASE, PUR #1421	DRO 04/30/21

THIRD ANGLE PROJECTION

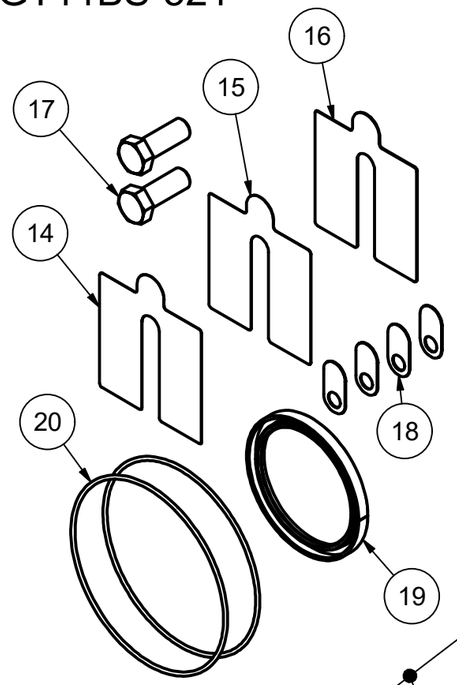
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

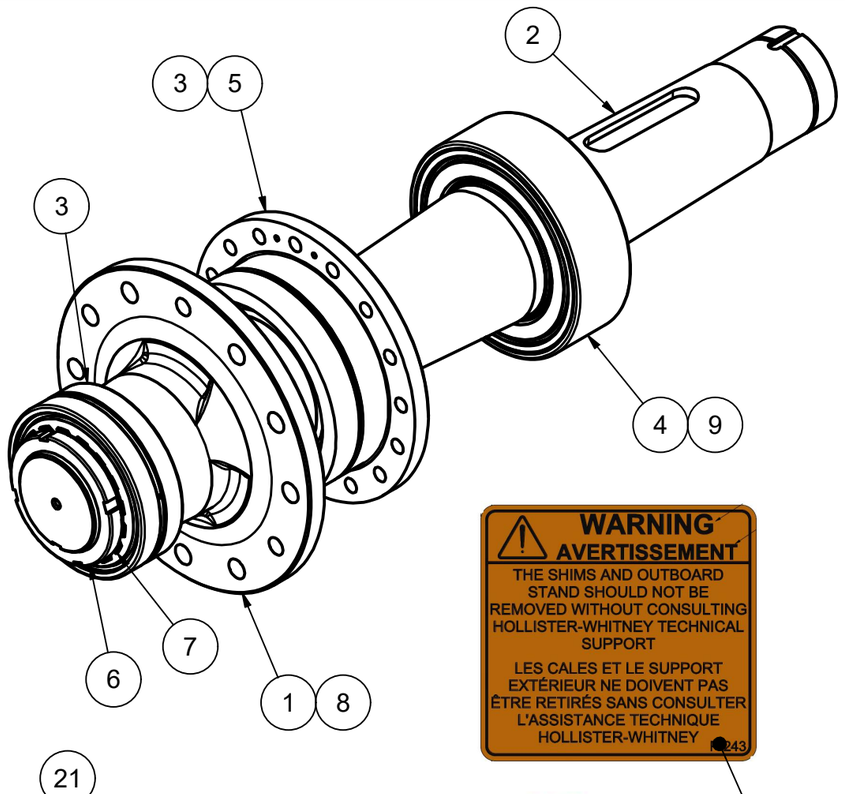
TITLE: ASSY, CENTER, BS/OD

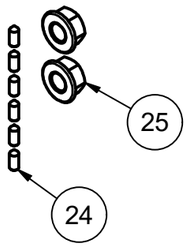
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:6	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	11/6/2020	GT11BS-080 SHEET 1 OF 1

GT11BS-521







22

23

GT31-520

PARTS LIST				
ITEM	QTY	CHK	PART NUMBER	DESCRIPTION
1	1		GT11-004	HUB, GEAR
2	1		GT11BS-018-01 (D)	SHAFT, WHEEL, TRACTION, BS/OD
3	2		GT11-093	BEARING, ROLLER, SPHERICAL
4	1		GT31-093	BEARING, ROLLER, SPHERICAL
5	1		GT11-275-WS	ECCENTRIC, TRACTION WHEEL SIDE
6	1		GT11-282	NUT, LOCK, SHAFT
7	1		GT11-283	WASHER, LOCK, SHAFT
8	1		GT11-300	KEY, SHAFT, WHEEL
9	1		GT11BS-368	RETAINING RING, SPIRAL, MEDIUM DUTY
10	1		GT31-512	OIL, GEAR (1 qt.)
11	1		BULL-1197	MANUAL, RETROFIT (NOT SHOWN)
12	1		GT11BS-CRATE	CRATE (NOT SHOWN)
13	1		GT11BS-521	KIT, SHIM AND SEAL
14	12		GT31-062-05	SHIM, STAND, OUTBOARD
15	4		GT31-062-10	SHIM, STAND, OUTBOARD
16	4		GT31-062-31	SHIM, STAND, OUTBOARD
17	2		GT31-072	BOLT, BODY, GEAR
18	4		GT31-295	SHIM, ECCENTRIC, EDGE BONDED
19	1		GT11-092-1	GREASE SEAL - SPLIT
20	2		GT11-305	O-RING, ECCENTRIC
21	1		GT31-520	KIT, HARDWARE
22	1		GT31-501	TUBE, SILICONE
23	1		GT31-502	THREAD LOCKER, 243
24	6		5/16-18 UNC X 0.75"	SCREW, SET, HEX, CONE POINT
25	2		3/4"-10 UNC	NUT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
(D) 26	1		P-243	LABEL, WARNING

WEIGHT: 221.4 lbmass

D	GT11BS-018-01 WAS GT11BS-018, ADD ITEM #26, PUR #1834	BEH 02Nov23	

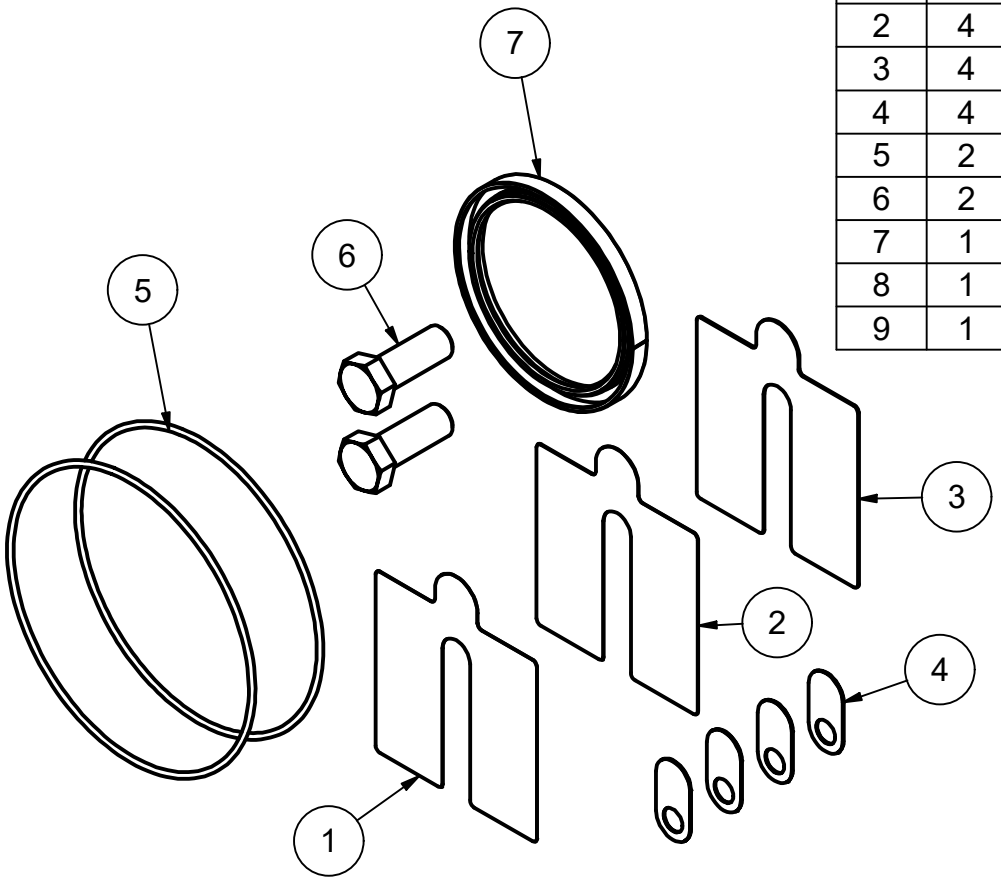
THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: KIT, RETROFIT, GT11 BS/OD

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:5	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	9/16/2023	GT11BS-500-KT SHEET 1 OF 1



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	12	GT31-062-05	SHIM, STAND, OUTBOARD
2	4	GT31-062-10	SHIM, STAND, OUTBOARD
3	4	GT31-062-31	SHIM, STAND, OUTBOARD
4	4	GT31-295	SHIM, ECCENTRIC, EDGE BONDED
5	2	GT11-305	O-RING, ECCENTRIC
6	2	GT31-072	BOLT, BODY, GEAR
7	1	GT11-092-1	GREASE SEAL - SPLIT
8	1	N/A	BAG, PLASTIC (NOT SHOWN)
9	1	N/A	LABEL (NOT SHOWN)

NOTES UNLESS OTHERWISE SPECIFIED:
1. PARTS TO BE PLACED IN PLASTIC BAG.
2. LABEL WITH PART NUMBER TO PLACED ON BAG.

WEIGHT: 1.4 lbmass

A	PRODUCTION RELEASE PUR #1820	BEH 05Oct23

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE
KIT, SHIM AND SEAL

THIRD ANGLE PROJECTION

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:4	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
A	10/5/2023	GT11BS-521 SHEET 1 OF 1

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	GT11-027	GEAR, 7/8" PITCH, SINGLE LEAD
		GT11-028	GEAR, 7/8" PITCH, DOUBLE LEAD
		GT11-029	GEAR, 7/8" PITCH, TRIPLE LEAD
2	2	GT31-062-05	SHIM, STAND, OUTBOARD, 0.0050" THK
3	4	GT31-062-10	SHIM, STAND, OUTBOARD, 0.0100" THK
4	2	GT31-062-31	SHIM, STAND, OUTBOARD, 0.0310" THK
5	6	GT31-072	BOLT, BODY, GEAR
6	7	GT31-087	SHIM, CAP, BEARING
7	1	GT31-287	SEAL, SHAFT, RADIAL
8	1	GT31-287-1	SEAL, SHAFT, RADIAL
9	1	GT11-294-01	ASSY, WORM SHAFT AND BEARING, 7/8" SINGLE
		GT11-294-02	ASSY, WORM SHAFT AND BEARING, 7/8" DOUBLE
		GT11-294-03	ASSY, WORM SHAFT AND BEARING, 7/8" TRIPLE
10	4	GT31-295	SHIM, ECCENTRIC, EDGE BONDED
11	1	GT31-301	KEY, SHAFT, WORM
12	2	GT11-305	O-RING, ECCENTRIC
13	1	GT31-310	NUT, LOCK, SHAFT
14	1	GT31-311	WASHER, LOCK, SHAFT
15	6	3/4"-10 UNC	NUT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
16	0.75 OZ.	80038	PRUSSIAN BLUE
17	2 gal	MOBIL SHC-636	OIL, GEAR, HIGH PRESSURE
18	10 OZ.	SILICONE	CLEAR RTV SILICONE SEALANT - WL099110C

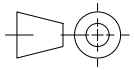
WEIGHT: 101 lbmass

A	PRODUCTION RELEASE, PUR #1432	DRO 01/13/21

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

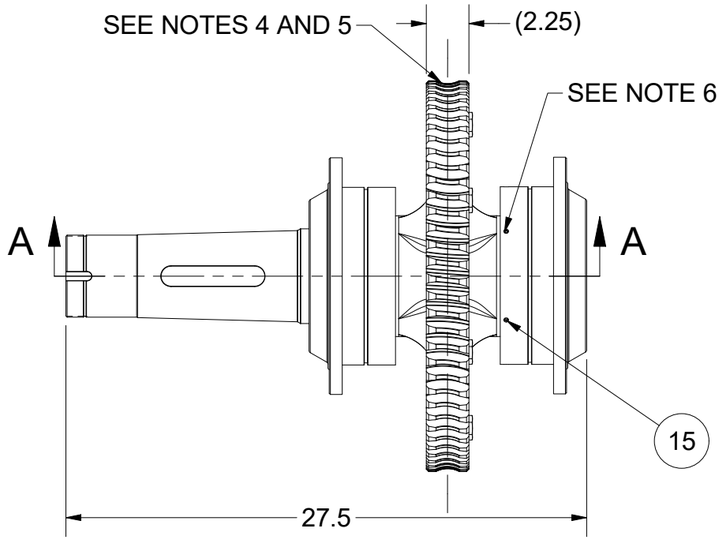
TITLE
WORM & GEAR REPLACEMENT SET

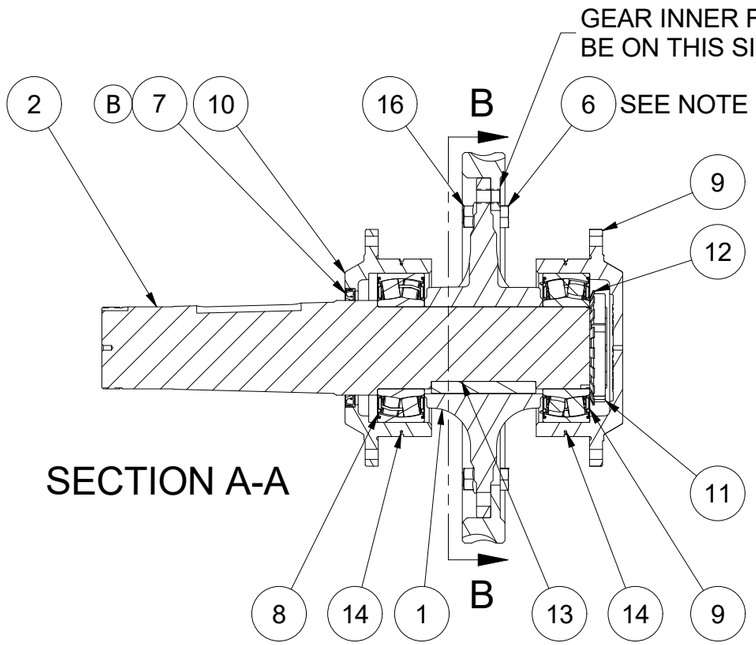
THIRD ANGLE PROJECTION



DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PART LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

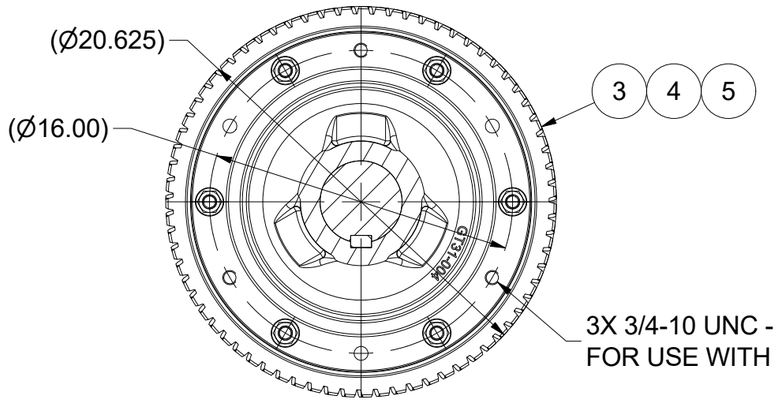
SHEET SIZE	DATE	
A	1/5/2021	GT11-WG
		SHEET 1 OF 1

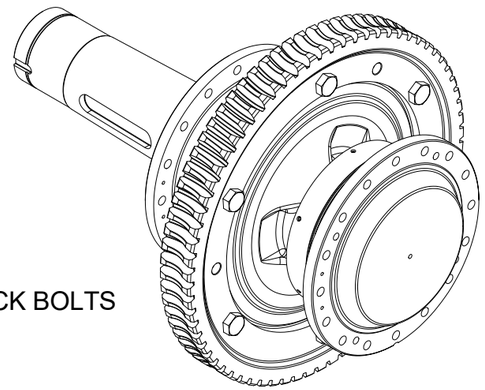




SECTION A-A

PARTS LIST					
ITEM	QTY GT31-080-01	QTY GT31-080-02	QTY GT31-080-03	PART NUMBER	DESCRIPTION
1	1	1	1	GT31-004	HUB, GEAR
2	1	1	1	GT31-018-01	SHAFT, WHEEL, TRACTION
3	1	0	0	GT31-027	GEAR, 7/8" PITCH, SINGLE LEAD
4	0	1	0	GT31-028	GEAR, 7/8" PITCH, DOUBLE LEAD
5	0	0	1	GT31-029	GEAR, 7/8" PITCH, TRIPLE LEAD
6	6	6	6	GT31-072	BOLT, BODY, GEAR
7	1	1	1	GT31-092	GREASE SEAL
8	2	2	2	GT31-093	BEARING, ROLLER, SPHERICAL
9	1	1	1	GT31-275	ECCENTRIC
10	1	1	1	GT31-275-WS	ECCENTRIC, TRACTION WHEEL SIDE
11	1	1	1	GT31-282	NUT, LOCK, SHAFT
12	1	1	1	GT31-283	WASHER, LOCK, SHAFT
13	1	1	1	GT31-300	KEY, SHAFT, WHEEL
14	2	2	2	GT31-305	O-RING, ECCENTRIC
15	6	6	6	5/16-18 UNC X 0.75"	SCREW, SET, HEX, CONE POINT
16	6	6	6	3/4"-10 UNC	NUT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED





SECTION B-B
SCALE 1:8

WEIGHT: 386 lbmass

NOTES UNLESS OTHERWISE SPECIFIED:

1. HOBBED GEAR TO BE HEATED AND ASSEMBLED TO THE HUB.
2. DRILL AND REAM BODY BOLT HOLES. BODY BOLT HOLE DIAMETER TO BE Ø0.7502/Ø0.7500.
3. INSERT BODY BOLTS AND NUTS AND TORQUE TO 95 ft*lbs TO 105 ft*lbs.
4. TOOTH GEOMETRY IS SHOWN FOR REFERENCE PURPOSES ONLY. ACTUAL GEOMETRY MAY BE VISUALLY DIFFERENT.
5. REFER TO PC-00001 FOR GEOMETRY.
6. APPLY LOCTITE THREADLOCKER BLUE 243 TO SET SCREWS PRIOR TO INSTALLATION.

			B	ADDED GT31-092 SEAL, PUR #1655	DRO 05/23/22
D	GT31-018-01 WAS GT31-018, PUR #1845	EMM 12/27/23	A	COMBINED GT31-080 -01, -02, & -03 TO ONE PRINT, PUR #1647	DRO 05/05/22
C	DISSOLVED GT31-302 PARTS, PUR #1753	DRO 03/03/23			

THIRD ANGLE PROJECTION

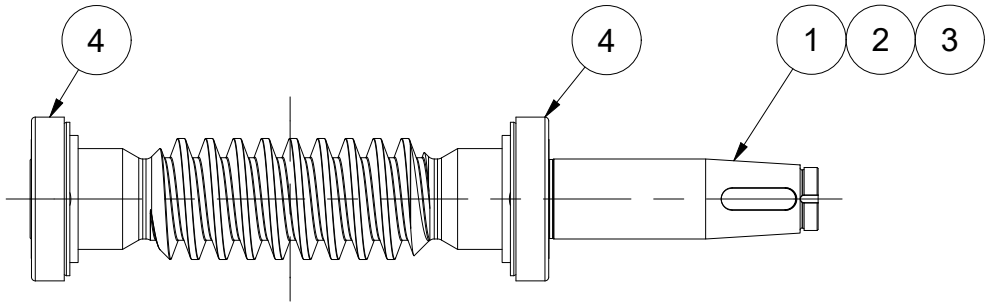
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

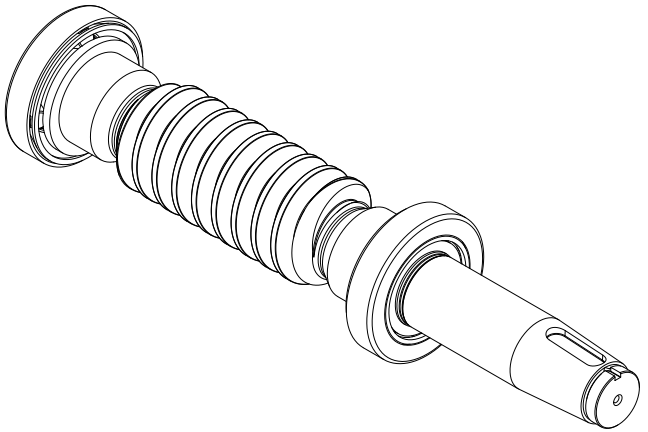
TITLE: ASSY, CENTER

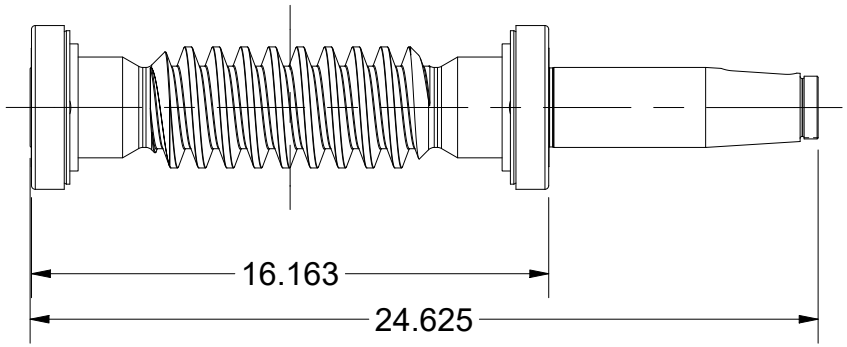
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:8	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

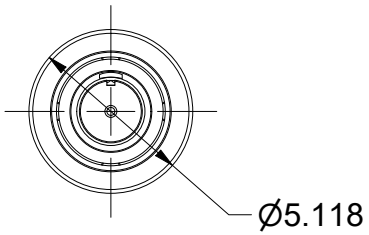
SHEET SIZE	DATE	
B	5/4/2022	GT31-080 SHEET 1 OF 1

PARTS LIST					
ITEM	QTY GT31-294-01	QTY GT31-294-02	QTY GT31-294-03	PART NUMBER	DESCRIPTION
1	1	0	0	GT31-047	WORM, FINISHED, 7/8" SINGLE
2	0	1	0	GT31-048	WORM, FINISHED, 7/8" DOUBLE
3	0	0	1	GT31-049	WORM, FINISHED, 7/8" TRIPLE
4	2	2	2	GT31-090	BEARING, ROLLER, TAPERED









WEIGHT: 52 lbmass

B	UPDATED VIEWS, PUR #1764	DRO 04/26/23
A	COMBINED GT31-294 -01, -02, & -03 TO ONE PRINT, PUR #1647	DRO 05/04/22

THIRD ANGLE PROJECTION

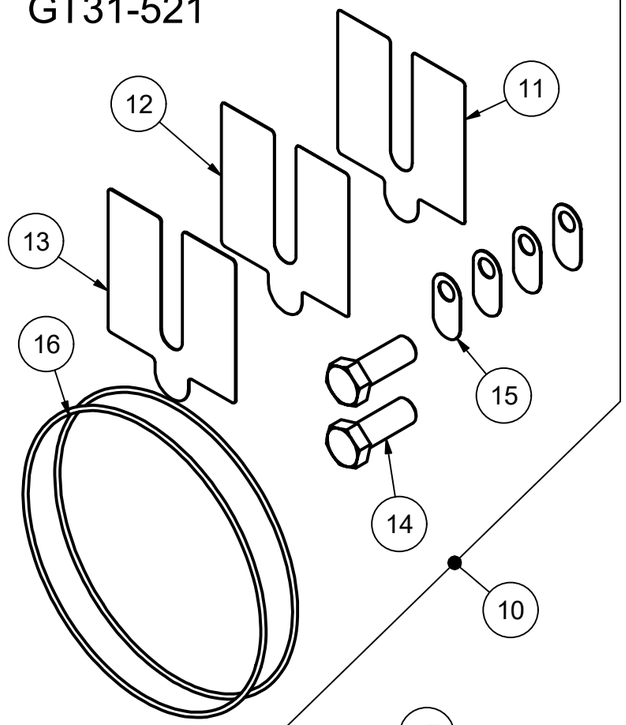
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

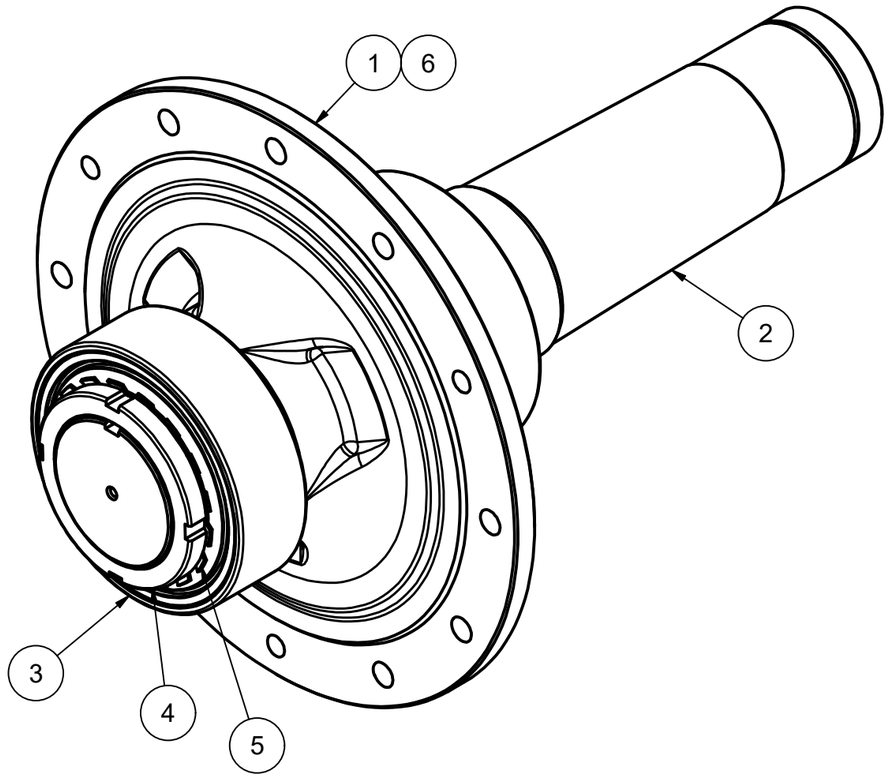
TITLE: ASSY, WORM SHAFT AND BEARING

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:6	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
A	5/4/2022	GT31-294 SHEET 1 OF 1

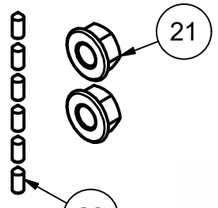
GT31-521





PARTS LIST				
ITEM	QTY	CHK	PART NUMBER	DESCRIPTION
1	1		GT31-004	HUB, GEAR
2	1		GT31-018-01 (D)	SHAFT, WHEEL, TRACTION
3	2		GT31-093	BEARING, ROLLER, SPHERICAL
4	1		GT31-282	NUT, LOCK, SHAFT
5	1		GT31-283	WASHER, LOCK, SHAFT
6	1		GT31-300	KEY, SHAFT, WHEEL
7	1		GT31-512	OIL, GEAR (1 qt.)
8	1		BULL-1197	MANUAL, RETROFIT (NOT SHN)
9	1		GT31OH-CRATE	CRATE (NOT SHOWN)
10	1		GT31-521	KIT, SHIM AND SEAL
11	6		GT31-062-05	SHIM, STAND, OUTBOARD
12	2		GT31-062-10	SHIM, STAND, OUTBOARD
13	2		GT31-062-31	SHIM, STAND, OUTBOARD
14	2		GT31-072	BOLT, BODY, GEAR
15	4		GT31-295	SHIM, ECCENTRIC, EDGE BOND
16	2		GT31-305	O-RING, ECCENTRIC
17	1		GT31-520	KIT, HARDWARE
18	1		GT31-501	TUBE, SILICONE
19	1		GT31-502	THREAD LOCKER, 243
20	6		5/16-18 UNC X 0.75"	SCREW, SET, HEX, CONE POINT
21	2		3/4"-10 UNC	NUT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
(D)	22	1	P-243	LABEL, WARNING

GT31-520



WEIGHT: 253.2 lbmass

D	GT31-018-01 WAS GT31-018, ADD ITEM #22, PUR #1834	BEH 02Nov23	

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: KIT, RETROFIT, GT31OH

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:4	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	9/16/2023	GT31-500-KT SHEET 1 OF 1

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	GT31-501	TUBE, SILICONE
2	1	GT31-502	THREAD LOCKER, 243
3	6	5/16-18 UNC X 0.75"	SCREW, SET, HEX, CONE POINT
4	2	3/4"-10 UNC	NUT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED

NOTES UNLESS OTHERWISE SPECIFIED:

1. PARTS TO BE PLACED IN A 6.25" X 10.25" HDPE/LDPE PLASTIC BAG. 1.5 MIL SIDE.
2. BAG TO HAVE LABEL INDICATING KIT PART NUMBER.
3. BAG AND LABEL NOT SHOWN.

WEIGHT: 0.4 lbmass

A	PRODUCTION RELEASE PUR #1820	BEH 03Oct23

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

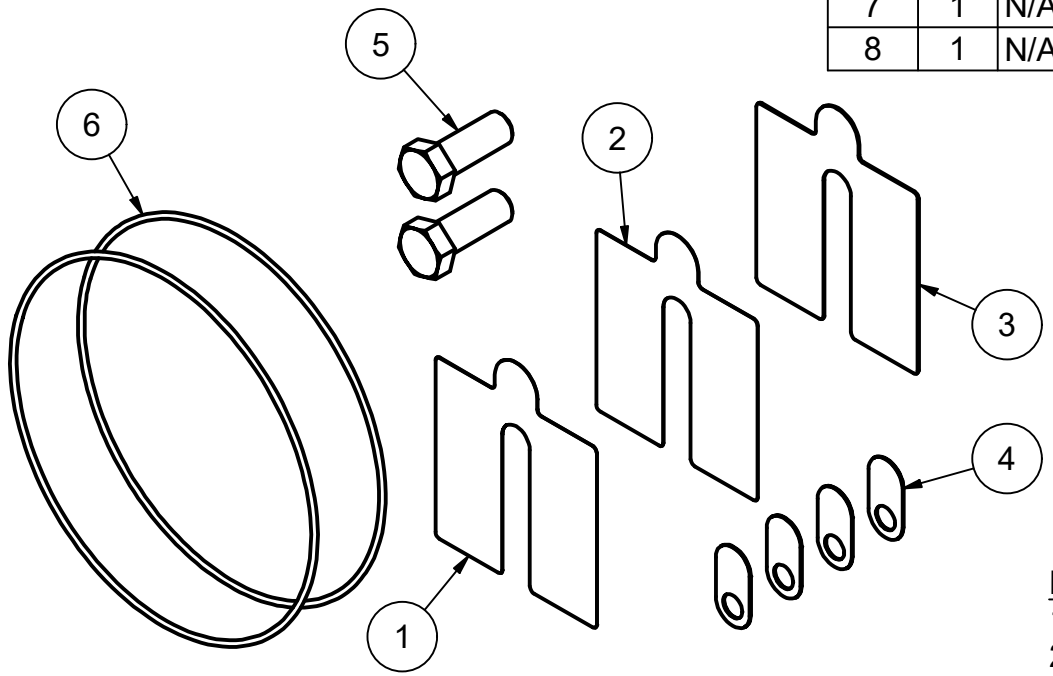
TITLE: KIT, HARDWARE

THIRD ANGLE PROJECTION

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:2	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
A	10/3/2023	GT31-520 SHEET 1 OF 1

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	6	GT31-062-05	SHIM, STAND, OUTBOARD
2	2	GT31-062-10	SHIM, STAND, OUTBOARD
3	2	GT31-062-31	SHIM, STAND, OUTBOARD
4	4	GT31-295	SHIM, ECCENTRIC, EDGE BONDED
5	2	GT31-072	BOLT, BODY, GEAR
6	2	GT31-305	O-RING, ECCENTRIC
7	1	N/A	BAG, PLASTIC (NOT SHOWN)
8	1	N/A	LABEL (NOT SHOWN)



NOTES UNLESS OTHERWISE SPECIFIED:
1. PARTS TO BE PLACED IN PLASTIC BAG.
2. LABEL WITH PART NUMBER TO PLACED ON BAG.

WEIGHT: 1.1 lbmass

A	PRODUCTION RELEASE PUR #1820	BEH 05Oct23

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

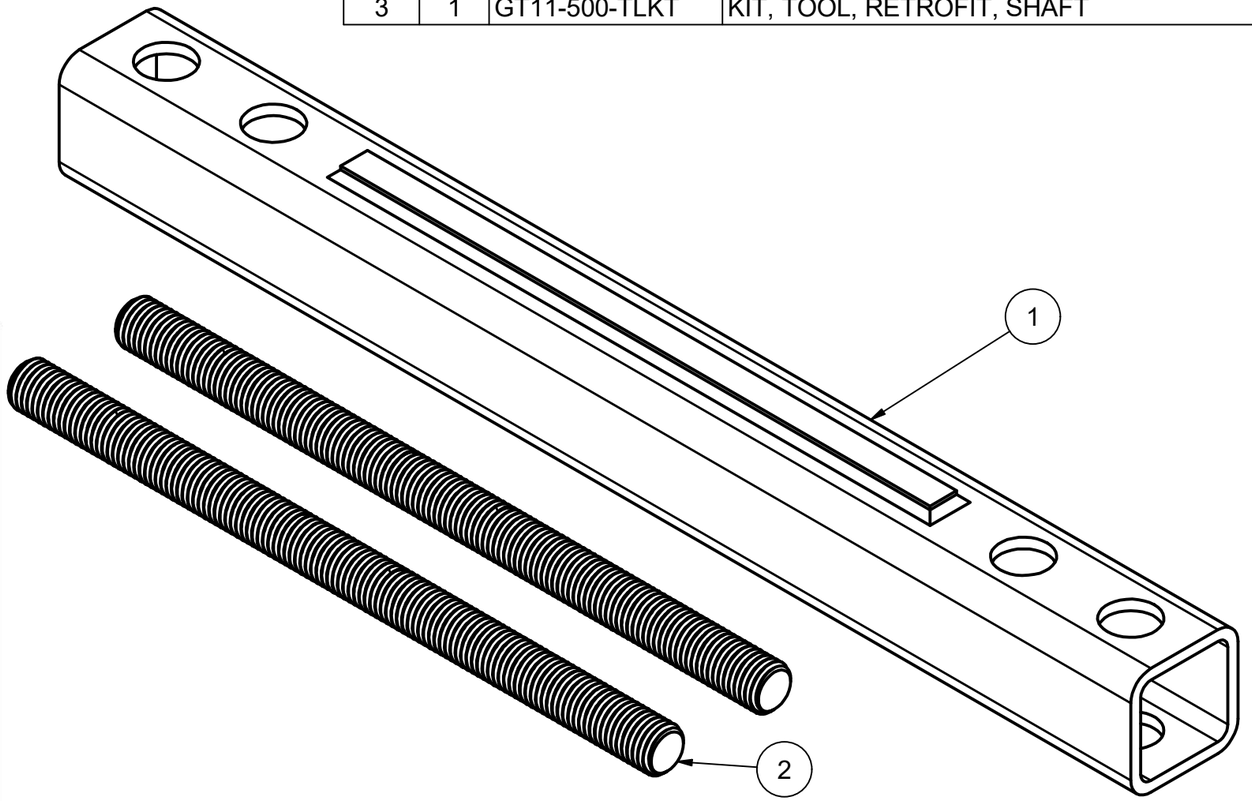
TITLE: KIT, SHIM AND SEAL

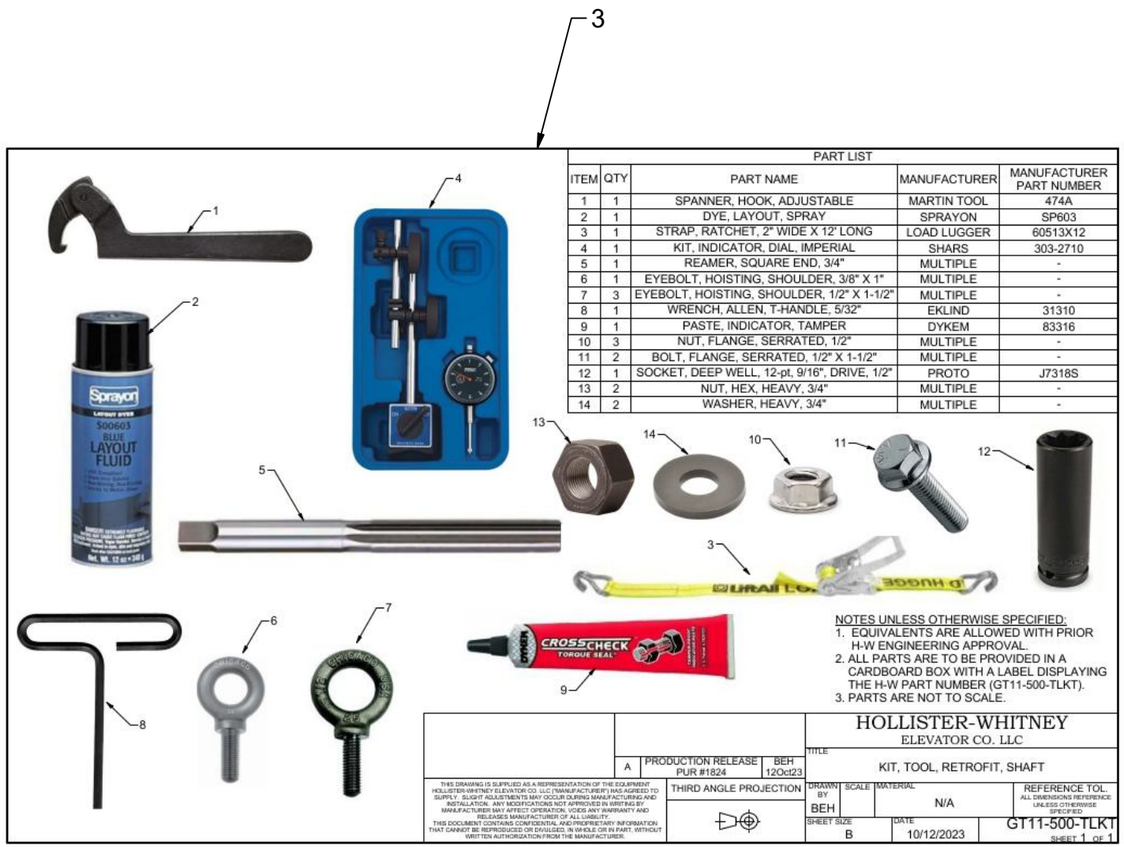
THIRD ANGLE PROJECTION

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:4	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
A	10/5/2023	GT31-521 SHEET 1 OF 1

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	GT31-600	GT Sheave and Hub Puller
2	2	GT31-603	ROD, THREADED, 3/4"-10 UNC
3	1	GT11-500-TLKT	KIT, TOOL, RETROFIT, SHAFT





PART LIST				
ITEM	QTY	PART NAME	MANUFACTURER	MANUFACTURER PART NUMBER
1	1	SPANNER, HOOK, ADJUSTABLE	MARTIN TOOL	474A
2	1	DYE, LAYOUT, SPRAY	SPRAYON	SP603
3	1	STRAP, RATCHET, 2" WIDE X 12' LONG	LOAD LUGGER	60513X12
4	1	KIT, INDICATOR, DIAL, IMPERIAL	SHARS	303-2710
5	1	REAMER, SQUARE END, 3/4"	MULTIPLE	-
6	1	EYEBOLT, HOISTING, SHOULDER, 3/8" X 1"	MULTIPLE	-
7	3	EYEBOLT, HOISTING, SHOULDER, 1/2" X 1-1/2"	MULTIPLE	-
8	1	WRENCH, ALLEN, T-HANDLE, 5/32"	EKLIND	31310
9	1	PASTE, INDICATOR, TAMPER	DYKEM	83316
10	3	NUT, FLANGE, SERRATED, 1/2"	MULTIPLE	-
11	2	BOLT, FLANGE, SERRATED, 1/2" X 1-1/2"	MULTIPLE	-
12	1	SOCKET, DEEP WELL, 12-pt, 9/16", DRIVE, 1/2"	PROTO	J7318S
13	2	NUT, HEX, HEAVY, 3/4"	MULTIPLE	-
14	2	WASHER, HEAVY, 3/4"	MULTIPLE	-

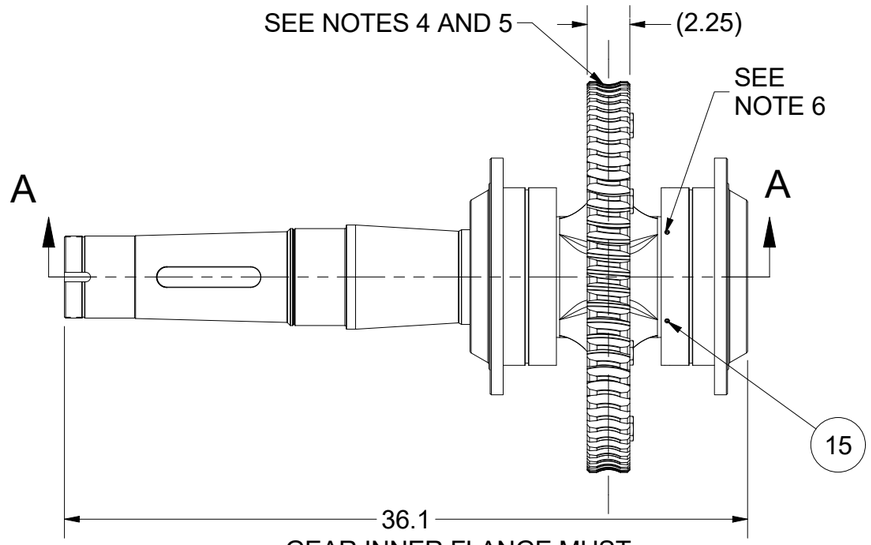
NOTES UNLESS OTHERWISE SPECIFIED:
1. EQUIVALENTS ARE ALLOWED WITH PRIOR H-W ENGINEERING APPROVAL.
2. ALL PARTS ARE TO BE PROVIDED IN A CARDBOARD BOX WITH A LABEL DISPLAYING THE H-W PART NUMBER (GT11-500-TLKT).
3. PARTS ARE NOT TO SCALE.

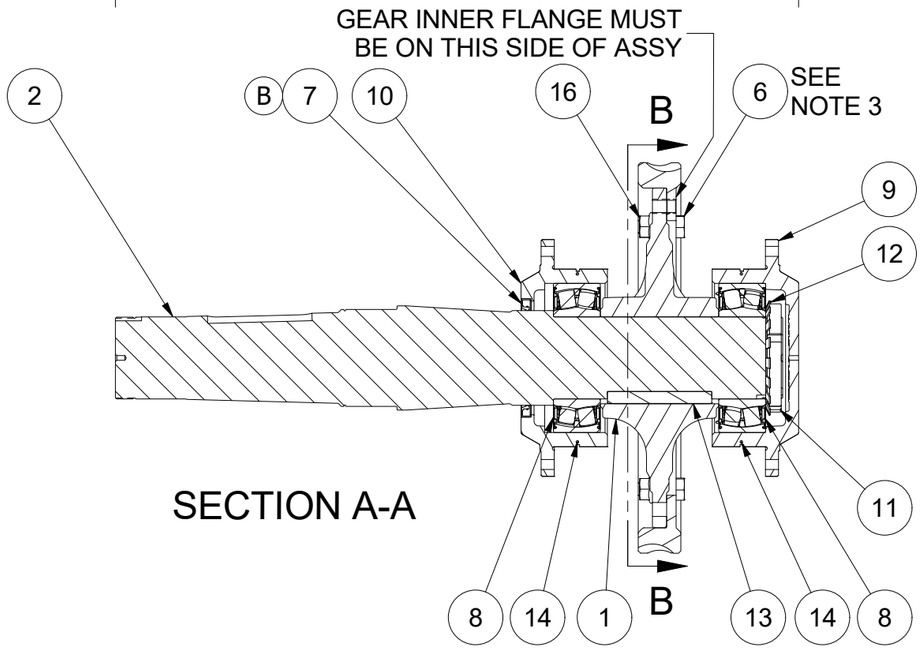
		HOLLISTER-WHITNEY ELEVATOR CO. LLC	
	A	PRODUCTION RELEASE PUR #1824	BEH 12Oct23
		TITLE: KIT, TOOL, RETROFIT, SHAFT	
THIS DRAWING IS SUPPLIED AS A REPRESENTATION OF THE EQUIPMENT HOLLISTER-WHITNEY ELEVATOR CO. LLC ("MANUFACTURER") HAS AGREED TO SUPPLY. SLIGHT ADJUSTMENTS MAY OCCUR DURING MANUFACTURING AND INSTALLATION. ANY MODIFICATIONS NOT APPROVED IN WRITING BY MANUFACTURER MAY AFFECT OPERATION, VOIDS ANY WARRANTY AND RELEASES MANUFACTURER OF ALL LIABILITY. THIS DOCUMENT CONTAINS CONFIDENTIAL AND PROPRIETARY INFORMATION THAT CANNOT BE REPRODUCED OR DIVULGED, IN WHOLE OR IN PART, WITHOUT WRITTEN AUTHORIZATION FROM THE MANUFACTURER.	THIRD ANGLE PROJECTION	DRAWN BY: BEH; SCALE: ; MATERIAL: N/A; REFERENCE TOL. ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED	
		SHEET SIZE: B; DATE: 10/12/2023	GT11-500-TLKT SHEET 1 OF 1

NOTES UNLESS OTHERWISE SPECIFIED:
1. GT11-500-TLKT TO BE SUPPLIED BY SUB-SUPPLIER.
2. GT11-500-TLKT, GT31-600, AND GT31-603 TO BE PLACED IN A CARDBOARD BOX WITH A LABEL ON THE BOX WHICH CLEARLY INDICATES THE KIT NAME AND PART NUMBER.

WEIGHT: 12.3 lbmass

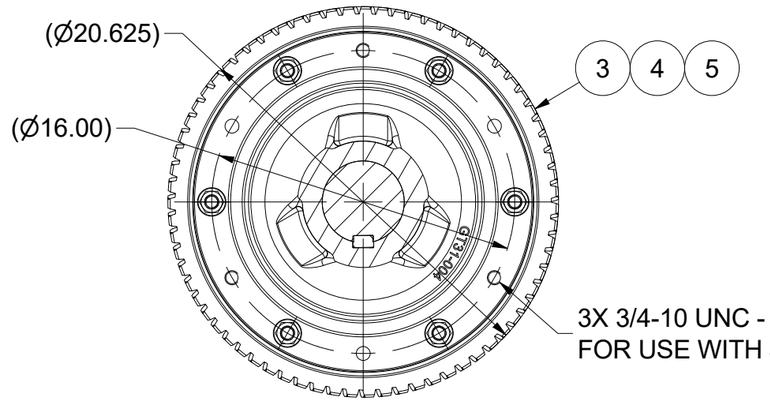
		HOLLISTER-WHITNEY ELEVATOR CO. LLC	
	A	PRODUCTION RELEASE PUR #1824	BEH 23Oct23
		TITLE: KIT, TOOL, RETROFIT, GT-SERIES	
THIS DRAWING IS SUPPLIED AS A REPRESENTATION OF THE EQUIPMENT HOLLISTER-WHITNEY ELEVATOR CO. LLC ("MANUFACTURER") HAS AGREED TO SUPPLY. SLIGHT ADJUSTMENTS MAY OCCUR DURING MANUFACTURING AND INSTALLATION. ANY MODIFICATIONS NOT APPROVED IN WRITING BY MANUFACTURER MAY AFFECT OPERATION, VOIDS ANY WARRANTY AND RELEASES MANUFACTURER OF ALL LIABILITY. THIS DOCUMENT CONTAINS CONFIDENTIAL AND PROPRIETARY INFORMATION THAT CANNOT BE REPRODUCED OR DIVULGED, IN WHOLE OR IN PART, WITHOUT WRITTEN AUTHORIZATION FROM THE MANUFACTURER.	THIRD ANGLE PROJECTION	DRAWN BY: BEH; SCALE: 1:2; MATERIAL: N/A; REFERENCE TOL. ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED	
		SHEET SIZE: B; DATE: 10/23/2023	GT31-599-TLKT SHEET 1 OF 1



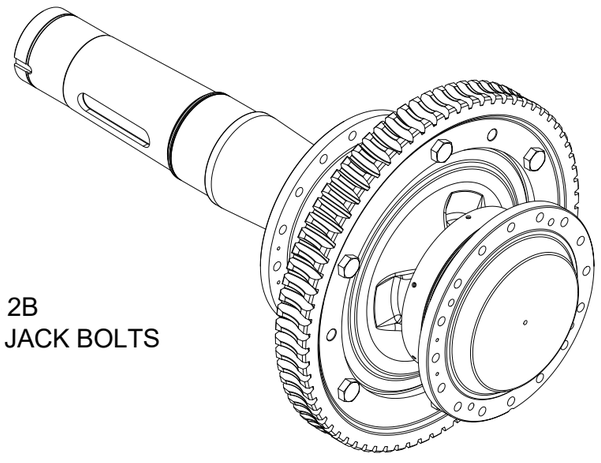


SECTION A-A

PARTS LIST					
ITEM	QTY GT31BS-080-01	QTY GT31BS-080-02	QTY GT31BS-080-03	PART NUMBER	DESCRIPTION
1	1	1	1	GT31-004	HUB, GEAR
2	1	1	1	GT31BS-018-01	SHAFT, WHEEL, TRACTION
3	1	0	0	GT31-027	GEAR, 7/8" PITCH, SINGLE LEAD
4	0	1	0	GT31-028	GEAR, 7/8" PITCH, DOUBLE LEAD
5	0	0	1	GT31-029	GEAR, 7/8" PITCH, TRIPLE LEAD
6	6	6	6	GT31-072	BOLT, BODY, GEAR
7	1	1	1	GT31-092-1	GREASE SEAL - SPLIT
8	2	2	2	GT31-093	BEARING, ROLLER, SPHERICAL
9	1	1	1	GT31-275	ECCENTRIC
10	1	1	1	GT31-275-WS	ECCENTRIC, TRACTION WHEEL SIDE
11	1	1	1	GT31-282	NUT, LOCK, SHAFT
12	1	1	1	GT31-283	WASHER, LOCK, SHAFT
13	1	1	1	GT31-300	KEY, SHAFT, WHEEL
14	2	2	2	GT31-305	O-RING, ECCENTRIC
15	6	6	6	5/16-18 UNC X 0.75"	SCREW, SET, HEX, CONE POINT
16	6	6	6	3/4"-10 UNC	NUT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED



SECTION B-B
SCALE 1:8



WEIGHT: 437.1 lbmass

NOTES UNLESS OTHERWISE SPECIFIED:

1. HOBBED GEAR TO BE HEATED AND ASSEMBLED TO THE HUB.
2. DRILL AND REAM BODY BOLT HOLES. BODY BOLT HOLE DIAMETER TO BE Ø0.7502/Ø0.7500.
3. INSERT BODY BOLTS AND NUTS AND TORQUE TO 95 ft*lbs TO 105 ft*lbs.
4. TOOTH GEOMETRY IS SHOWN FOR REFERENCE PURPOSES ONLY. ACTUAL GEOMETRY MAY BE VISUALLY DIFFERENT.
5. REFER TO PC-00001 FOR GEOMETRY.
6. APPLY LOCTITE THREADLOCKER BLUE 243 TO SET SCREWS PRIOR TO INSTALLATION.

			B	ADDED GT31-092-1 SEAL, PUR #1655	DRO 05/23/22
D	GT31BS-018-01 WAS GT31BS-018, PUR #1845	EMM 12/27/23	A	COMBINED GT31BS-080 -01, -02, & -03 TO ONE PRINT, PUR #1647	DRO 05/05/22
C	DISSOLVED GT31-302 PARTS, PUR #1753	DRO 03/03/23			

THIRD ANGLE PROJECTION

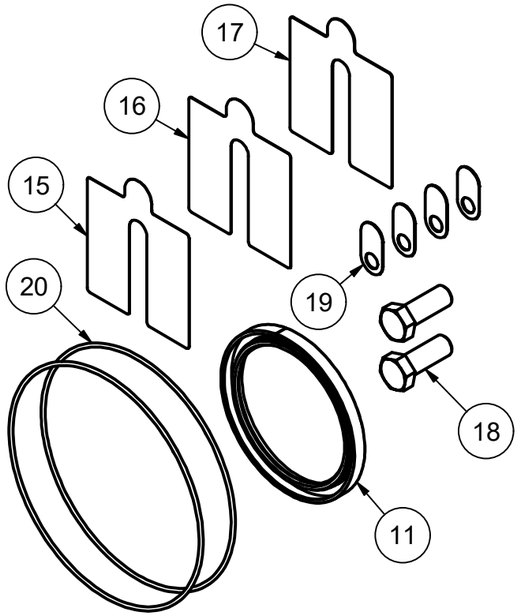
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

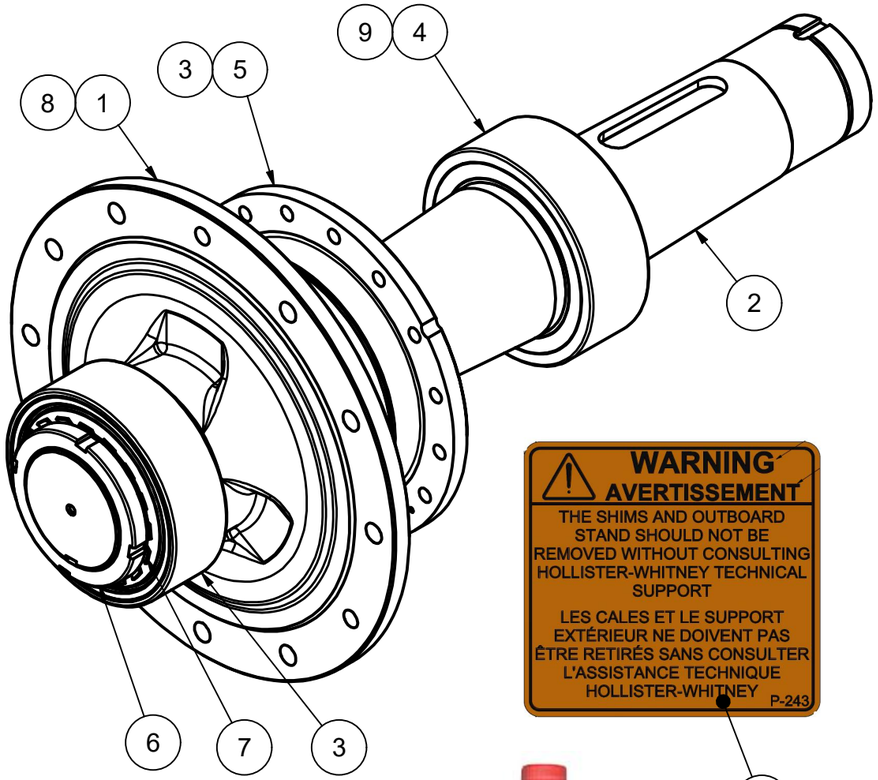
TITLE: ASSY, CENTER

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:8	SEE PARTS LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/4/2022	GT31BS-080 SHEET 1 OF 1

GT31BS-521



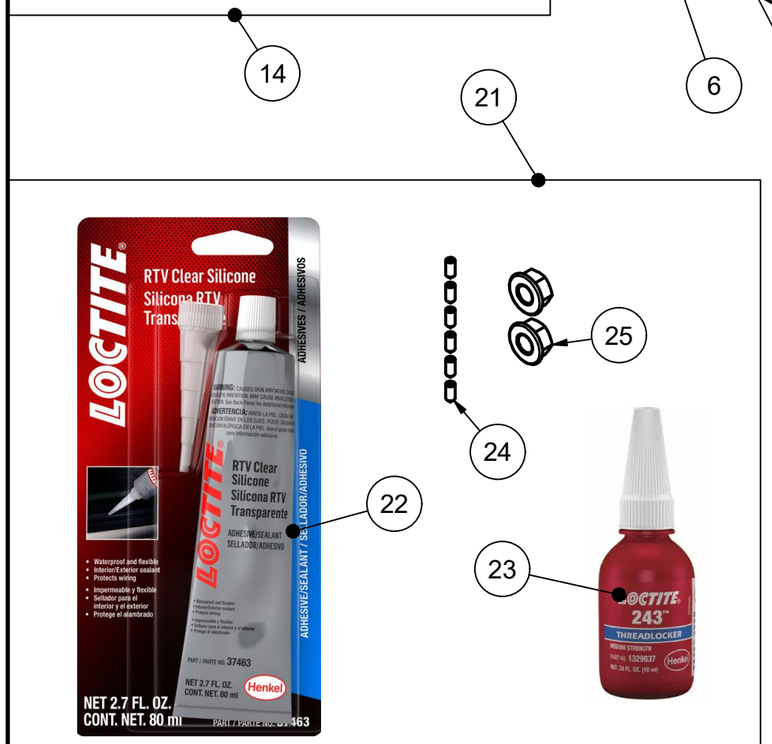


WARNING
AVERTISSEMENT

THE SHIMS AND OUTBOARD STAND SHOULD NOT BE REMOVED WITHOUT CONSULTING HOLLISTER-WHITNEY TECHNICAL SUPPORT

LES CALES ET LE SUPPORT EXTÉRIEUR NE DOIVENT PAS ÊTRE RETIRÉS SANS CONSULTER L'ASSISTANCE TECHNIQUE HOLLISTER-WHITNEY

P-243



GT31-520

PARTS LIST				
ITEM	QTY	CHK	PART NUMBER	DESCRIPTION
1	1		GT31-004	HUB, GEAR
2	1		GT31BS-018-01 (D)	SHAFT, WHEEL, TRACTION
3	2		GT31-093	BEARING, ROLLER, SPHERICAL
4	1		GT31-094	BEARING, ROLLER, SPHERICAL
5	1		GT31-275-WS	ECCENTRIC, TRACTION WHEEL SIDE
6	1		GT31-282	NUT, LOCK, SHAFT
7	1		GT31-283	WASHER, LOCK, SHAFT
8	1		GT31-300	KEY, SHAFT, WHEEL
9	1		GT31BS-368	RETAINING RING, SPIRAL, MED DUTY
10	1		GT31-512	OIL, GEAR (1 qt.)
11	1		GT31-092-1	GREASE SEAL - SPLIT
12	1		BULL-1197	MANUAL, RETROFIT (NOT SHOWN)
13	1		GT31BS-CRATE	CRATE (NOT SHOWN)
14	1		GT31BS-521	KIT, SHIM AND SEAL
15	12		GT31-062-05	SHIM, STAND, OUTBOARD
16	4		GT31-062-10	SHIM, STAND, OUTBOARD
17	4		GT31-062-31	SHIM, STAND, OUTBOARD
18	2		GT31-072	BOLT, BODY, GEAR
19	4		GT31-295	SHIM, ECCENTRIC, EDGE BONDED
20	2		GT31-305	O-RING, ECCENTRIC
21	1		GT31-520	KIT, HARDWARE
22	1		GT31-501	TUBE, SILICONE
23	1		GT31-502	THREAD LOCKER, 243
24	6		5/16-18 UNC X 0.75"	SCREW, SET, HEX, CONE POINT
25	2		3/4"-10 UNC	NUT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
(D) 26	1		P-243	LABEL, WARNING

WEIGHT: 359.1 lbmass

D	GT31BS-018-01 WAS GT31BS-018, ADD ITEM #26, PUR #1834	BEH 02Nov23	

THIRD ANGLE PROJECTION

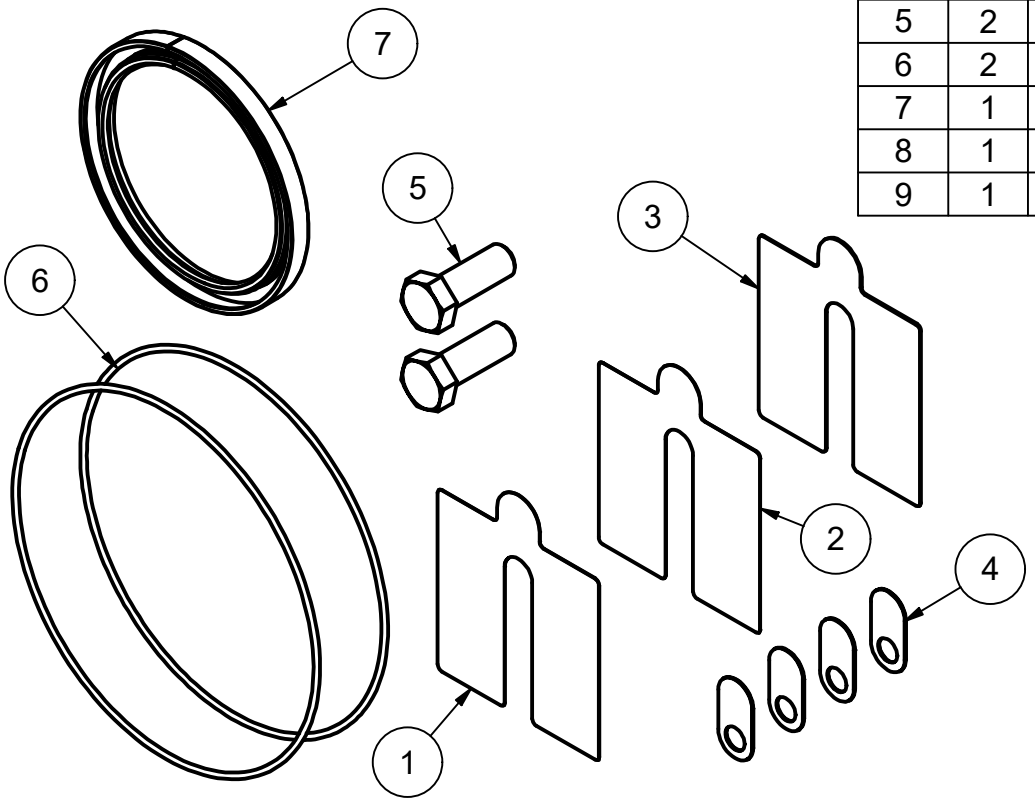
HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: KIT, RETROFIT, GT31 BS/OD

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:5	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	9/16/2023	GT31BS-500-KT SHEET 1 OF 1

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	12	GT31-062-05	SHIM, STAND, OUTBOARD
2	4	GT31-062-10	SHIM, STAND, OUTBOARD
3	4	GT31-062-31	SHIM, STAND, OUTBOARD
4	4	GT31-295	SHIM, ECCENTRIC, EDGE BONDED
5	2	GT31-072	BOLT, BODY, GEAR
6	2	GT31-305	O-RING, ECCENTRIC
7	1	GT31-092-1	GREASE SEAL - SPLIT
8	1	N/A	BAG, PLASTIC
9	1	N/A	LABEL



NOTES UNLESS OTHERWISE SPECIFIED:
1. PARTS TO BE PLACED IN PLASTIC BAG.
2. LABEL WITH PART NUMBER TO PLACED ON BAG.

WEIGHT: 1.7 lbmass

A	PRODUCTION RELEASE PUR #1820	BEH 05Oct23

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: KIT, SHIM AND SEAL

THIRD ANGLE PROJECTION

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
BEH	1:4	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

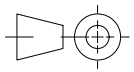
SHEET SIZE	DATE	
A	10/5/2023	GT31BS-521 SHEET 1 OF 1

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	GT31-027	GEAR, 7/8" PITCH, SINGLE LEAD
		GT31-028	GEAR, 7/8" PITCH, DOUBLE LEAD
		GT31-029	GEAR, 7/8" PITCH, TRIPLE LEAD
2	2	GT31-062-05	SHIM, STAND, OUTBOARD, 0.0050" THK
3	4	GT31-062-10	SHIM, STAND, OUTBOARD, 0.0100" THK
4	2	GT31-062-31	SHIM, STAND, OUTBOARD, 0.0310" THK
5	6	GT31-072	BOLT, BODY, GEAR
6	7	GT31-087	SHIM, CAP, BEARING
7	1	GT31-287	SEAL, SHAFT, RADIAL
8	1	GT31-287-1	SEAL, SHAFT, RADIAL
9	1	GT31-294-01	ASSY, WORM SHAFT AND BEARING, 7/8" SINGLE
		GT31-294-02	ASSY, WORM SHAFT AND BEARING, 7/8" DOUBLE
		GT31-294-03	ASSY, WORM SHAFT AND BEARING, 7/8" TRIPLE
10	4	GT31-295	SHIM, ECCENTRIC, EDGE BONDED
11	1	GT31-301	KEY, SHAFT, WORM
12	2	GT31-305	O-RING, ECCENTRIC
13	1	GT31-310	NUT, LOCK, SHAFT
14	1	GT31-311	WASHER, LOCK, SHAFT
15	6	3/4"-10 UNC	NUT, HEX, SERRATED FLANGE, GRADE 5, ZINC-PLATED
16	0.75 OZ.	80038	PRUSSIAN BLUE
17	3 gal	MOBIL SHC-636	OIL, GEAR, HIGH PRESSURE
18	10 OZ.	SILICONE	CLEAR RTV SILICONE SEALANT - WL099110C

WEIGHT: 134 lbmass

A	PRODUCTION RELEASE, PUR #1432	DRO 01/13/21

THIRD ANGLE PROJECTION



HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE
WORM & GEAR REPLACEMENT SET

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		SEE PART LIST	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
A	1/5/2021	GT31-WG SHEET 1 OF 1

English:

(Original version)

User´s Manual

For UL compliance:

⚠ CAUTION

Sensitive products.
The device could be damaged or be destroyed.
► Do not use a hammer for adjusting the device.

⚠ CAUTION

Electrostatic sensitive devices.
The device could be damaged or be destroyed.
► Observe precautions for handling.

Français:

(La version anglaise constitue la version originale.)

Instructions d'utilisation

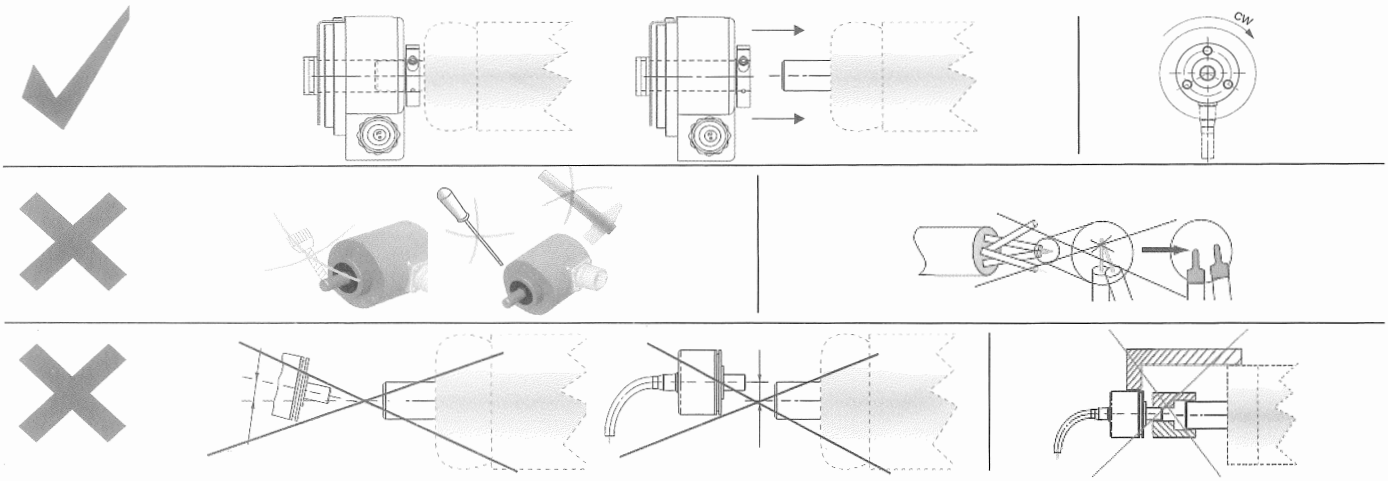
Pour le respect de la conformité UL:

⚠ ATTENTION

Produits fragiles.
Risque de dommages ou de destruction de l'appareil.
► Ne pas utiliser de marteau pour le régler.

⚠ ATTENTION

Appareil sensible aux décharges électrostatiques.
Risque de dommages ou de destruction de l'appareil.
► Prendre les précautions nécessaires pour la manipulation.



Technical data:

- This device is intended for determine absolute or differential rotation positions. It is also possible to measure rotation speeds.
- Altitude up to 2000 m [2187.2 yds].
- Overvoltage category I.
- Electrical power input: minimum 5 V DC - maximum 30 V DC ⎓ as marked, depends on type, fluctuations not exceed ±10% of nominal voltage, class 2.
  Please see datasheet on **www.kuebler.com** or labels on the product for details.
- Signal inputs and outputs: class 2.
- Max relative humidity 93% at 40°C [104°F].
- Pollution degree 2.
- No ventillation required.
- Indoor use, outdoor use possible, not intended for direct exposure to UV-radiation.
- Temperature range minimum -20°C [-4°F] up to +70°C [158°F] (depends on type). Range could be extended.
  Please see datasheet on **www.kuebler.com** for details.
- Cleaning only with water.
- Electrical connections and ratings: see labels on product or in the datasheets on **www.kuebler.com**.
- Valid accessories you can find in catalogue on **www.kuebler.com**.
- This device is maintenance-free and need no consumable material.

Données techniques:

- Cet appareil est destiné à la détermination de positions en rotation absolues ou différentielles. Il permet également la mesure de vitesses de rotation.
- Altitude jusqu'à 2000 m [2187.2 yds].
- Catégorie de surtension I.
- Alimentation électrique : minimum 5 V DC - maximum 30 V DC ⎓ selon indication, en fonction du type, fluctuations maximales ±10% de la tension nominale, classe 2.
  Se reporter à la fiche technique à l'adresse Internet **www.kuebler.com** ou aux étiquettes du produit pour des détails.
- Entrées et sorties de signal : classe 2.
- Humidité relative max. 93% à 40°C [104°F].
- Degré de pollution 2.
- Ne nécessite aucune ventilation.
- Pour utilisation à l'intérieur, utilisation à l'extérieur possible, n'est pas prévu pour une exposition directe au rayonnement UV.
- Plage de températures minimale -20°C [-4°F] à +70°C [158°F] (selon le type). Cette plage pourrait s'élargir.
  Se reporter à la fiche technique à l'adresse Internet **www.kuebler.com** pour des détails.
- Nettoyage à l'eau uniquement.
- Raccordements et valeurs électriques: voir les étiquettes apposées sur le produit ou les fiches techniques à l'adresse Internet **www.kuebler.com**.
- Vous trouverez les accessoires pour cet appareil dans notre catalogue l'adresse Internet **www.kuebler.com**.
- Cet appareil est sans maintenance et ne nécessite aucun consommable.

Kübler Group • Fritz Kübler GmbH • Schubertstr. 47 • D-78054 Villingen-Schwenningen • Phone: +49 7720 3903-0 • info@kuebler.com • www.kuebler.com
Service & Support: www.kuebler.com/usa/service-support.html • mail to: servicecenter@kuebler.com

R600066.0009 - Index 3

Deutsch

Installationsanleitung Drehgeber

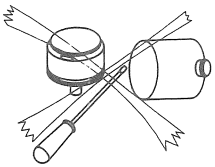
Wichtig!

Vor Inbetriebnahme des Gebers unbedingt lesen.

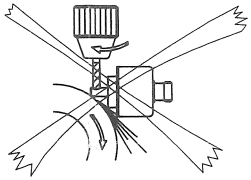
Mit diesem Geber haben Sie ein Präzisionsmessgerät erworben. Beachten Sie stets die Angaben und Hinweise des Datenblattes, um eine problemlose Funktion des Gebers zu gewährleisten und um die Garantieleistung aufrecht zu erhalten. Falls im Datenblatt nichts anderes angegeben ist, bitte folgendes unbedingt beachten:

Mechanisch:

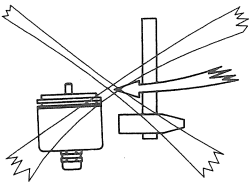
- Der Drehgeber darf weder teilweise noch ganz zerlegt oder modifiziert werden.



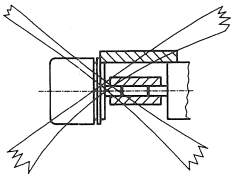
- Die Welle nicht nachträglich bearbeiten (schleifen, sägen, bohren, usw.). Die Genauigkeit des Gebers und die Zuverlässigkeit von Lager und Dichtung nehmen sonst Schaden. Wir sind gerne bereit, auf Ihre Kundenwünsche einzugehen.



- Das Gerät niemals mit dem Hammer ausrichten.
- Schlagbelastungen unbedingt vermeiden.
- Drehgeberwelle nicht über die im Datenblatt angegebenen Werte belasten (weder axial noch radial).



- Drehgeber und Antriebsgerät nicht an Wellen und Flanschen starr miteinander verbinden. Benutzen Sie grundsätzlich eine Kupplung (zwischen Antriebswelle und Geberwelle, bzw. zwischen Hohlwellen-Geber-Flansch und Antriebsflansch).



Für die Gebermontage empfehlen wir Ihnen den Einsatz unserer Montagehilfen und Kupplungen (siehe Zubehör-Datenblätter).

Bitte beachten Sie die umseitig stehenden Montagehinweise!

English

Installing instructions for rotary encoders

Important!

It is imperarive to read these instructions before setting the encoder in operation.

This encoder is a precision measuring instrument.
Always observe the information and instructions of the data sheet to ensure trouble-free function and to maintain warranty claims. Unless otherwise stated in the data sheet, the following has to be absolutely observed:

Mechanical:

- It is not permissible to dismantle the encoder entirely or in part or to modify it.

- Do not alter the shaft (by grinding, sawing, drilling, etc.), otherwise the accuracy of the encoder and the dependability of bearing and gasket will suffer. We are prepared to discuss special designs.

- Never align the instrument with a hammer.
- It is imperative to avoid impact loads.
- Radial and axial load capacity as stated in the data sheet have to be observed under any circumstances.

- Do not connect encoder and drive rigidly to one another at shafts and flanges. Always use a coupling (between drive shaft and encoder shaft, or between hollow-shaft encoder flange and drive flange).

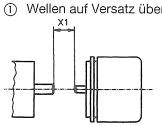
We recommend that you use our assembly aids and couplings to install the encoder (see accessory data sheets).

Please observe the installation instructions on the back page, too.

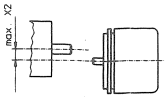
Deutsch

Montagehinweis für Geber mit Welle:

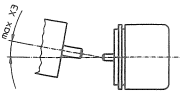
① Wellen auf Versatz überprüfen.



Axialversatz/*Axial offset*



Radialversatz/*Radial offset*

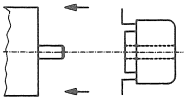


Winkelfehler/*Angle error*

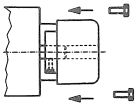
Entnehmen Sie die Werte X1, X2 und X3 dem Datenblatt der Kupplung.

② Kupplung während der Montage vor zu starker Biegung sowie Beschädigung schützen.
③ Kupplung auf den Wellen ausrichten.
④ Spann- oder Klemmschrauben vorsichtig anziehen.

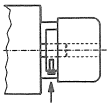
Montagehinweise für Hohlwellengeber mit Kupplung:



Geber mit Kupplung auf Welle montieren. *Mount encoder with coupling on shaft.*



Kupplung mit Antriebflansch verschrauben *Bolt coupling to drive flange.*



Klemmnabe vorsichtig anziehen *Carefully tighten clamping hub*

Elektrisch:

1. Geltende Sicherheitsnormen
- Vor Inbetriebnahme sind alle benötigten Kabeladern laut Datenblatt anzuschließen! Isolieren Sie alle nicht benötigten Enden sauber, um Kurzschlüsse zu vermeiden.
- Bei der Konfektionierung des Gegensteckers ist eine, evtl. dem Stecker beigelegte, Anleitung zu beachten.
- An Leistungslängen empfehlen wir:
• bei asymmetrischer Übertragung, d.h. invertierte Signale werden nicht verwendet, max. 10 m Leitungslänge.
• bei symmetrischer Übertragung (z.B. nach RS 422) max. 50 m Leitungslänge (Leitungslänge mit verdrillten Aderpaaren)
- Gegenstecken am Geber nur im spannungslosen Zustand ziehen oder stecken.
- Die richtige Betriebsspannung und den maximal zulässigen Ausgangsstrom berücksichtigen (siebe Datenblatt)!
- Ein- bzw. Ausschalten der Betriebsspannung für den Geber und das Folgegerät muss gemeinsam erfolgen.

2. Um CE-Konformität zu erreichen, ist eine EMV-gerechte Installation Voraussetzung:
- Als Steuerleitungen sind durchgehend geschirmte Kabel zu verwenden. Bei symmetrischer Übertragung (z.B. RS 422) muss ein Kabel mit verdrillten Aderpaaren verwendet werden.
Der Kabelschirm wird idealerweise rundum (360°) über schirmbare Stecker oder kabeldurchführungen an den Geber und die Auswertung angelegt.
- Die Schutzerde (PE) ist bevorzugt beidseitig, am Geber und an der Auswertung, impedanzarm aufzulegen.
- Bei Problemen durch Erdschleifen ist die Schutzerde (PE) auf der Geberseite aufzutrennen. Der Geber sollte hierhei gegenüber dem Antrieb elektrisch isoliert angebaut werden.
- Die Geberleitungen sind getrennt von Leitungen mit hohem Störpegel zu verlegen.
- An der Spannungsversorgung des Gebers sollten keine Verbraucher mit hohem Störpegel, wie z.B. Frequenzumrichter, Magnetventile, Schütze etc. angeschlossen werden. Andernfalls ist für eine geeignete Spannungsfilterung zu sorgen.

Sicherheitshinweise:

1. Wenn anzunehmen ist, dass ein gefahrloser Betrieb nicht mehr gewährleistet ist, muss das Gerät außer Betrieb gesetzt und gegen unbeabsichtigtes Einschalten gesichert werden.
2. Wenn durch den Ausfall oder eine Fehlfunktion des Gebers eine Gefährdung von Menschen oder eine Beschädigung von Betriebseinrichtungen nicht auszuschließen ist, so muss dies durch geeignete Sicherheitsmaßnahmen wie Schutzvorrichtungen oder Endschalter usw. verhindert werden.

Bei Missachtung der obigen Richtlinien können wir keine Garantie gewähren.
Wir bitten um Verständnis.

English

Installation instructions for encoders with shaft:

① Check shafts for offset.

Refer to the coupling data sheet for the values X1, X2, and X3.

② During assembly, protect coupling against excessive bending or damage.
③ Align coupling on the shafts.
④ Carefully tighten pulling or clamping bolts.

Installation instructions for hollow-shaft encoders with coupling:

Electrical:

1. The existing safety devices for electrical installations have to be observed.
- Before setting in operation, connect all required strands as per data sheet. To prevent short-circuits, neatly insulate the ends of all strands which are not required
- When preassembling the mating connector, comply with any instructions accompanying the connector.
- Our recommendations regarding cable lengths:
• in case of asymmetrical transmission, i.e. inverted signals are not used, cable length max. 10 m.
• in case of symmetrical transmission (e.g. to RS 422), cable length max. 50 m (cable with twisted pairs of wires).
- Plug in or pull out mating connector at the encoder only when encoder is de-energized.
- Make certain that the operating voltage is correct and the max. permissible output current is not exceeded (see data sheet).
- The operating voltage for encoder and succeeding device must be turned on and off together.

2. In order to obtain CE-Conformity, EMC installation conformity should be observed.
Shielded cables should be used or control lines.
In case of symmetrical transmission (e.g. Rh 422) a cable with twisted pairs of wire has to be used.
The cable shield should it possible be connected fully enclosed (360°) by shielded connectors or cable bushings. This has to be done at the encoder and transmision end.
- The protection earth should be put with low impedance on both face and back of the encoder and the transmission end.
- In case of earth loop problems, the protection earth of the encoder side has to be removed. On this occasion, the encoder should be placed electrically isolated opposite the actuation.
- The encoder lines should run separately to cables with high noise levels.
- Consumer with high disturbance level, e.g. frequency converters, solenoid valves, contactors etc. should not be connected to the same voltage supply. Otherwise, a suitable voltage filtering has to be installed.

Safety precautions:

1. If operation without danger can no longer be assured of some point, the unit must be shut down and secured against accidental activation.
2. If personal injury or damage to equipment is possible should the encoder fail or malfunction, this must be prevented by suitable safety precautions such as protective devices or limit switches, etc.

We can assume no warranty it the above directives are disregarded.
We ask for your understanding.


Kübler
by TURCK
K180986
T8.A02H.64AE.2048.P13B0
C UL US
LISTED
30YV
Process Control
Equipment
Connection to
Class 2 Power
supply required
Made in Germany

Baldor-Reliance® AC & DC Motor Installation & Maintenance

Note! The manufacturer of these products, Baldor Electric Company, became ABB Motors and Mechanical Inc. on March 1, 2018. Nameplates, Declaration of Conformity and other collateral material may contain the company name of Baldor Electric Company and the brand names of Baldor-Dodge and Baldor-Reliance until such time as all materials have been updated to reflect our new corporate identity.

Safety Notice: Be sure to read and understand all of the Safety Notice statements in MN408, MN605 or Product Specific manual for your motor. A copy is available at: http://www.baldor.com/support/product_manuals.asp

WEEE EU Directive 2012/19/EU
Products that are marked with the crossed-out wheeled bin symbol as shown here; shall be handled by applying following information:

The crossed-out wheeled bin symbol on the product(s) and / or accompanying documents means that used electrical and electronic equipment (WEEE) should not be mixed with general household waste. For users in the European Union, please contact your dealer or supplier for more information on how to discard electrical and electronic equipment (EEE).

ACCEPTANCE
Thoroughly inspect this equipment before accepting shipment from the transportation company. If any damage or shortage is discovered do not accept until noted on the freight bill. Report all damage to the freight carrier.

SAFETY
Eye bolts, lifting lugs or lifting openings, if provided, are intended only for lifting the motor and motor mounted standard accessories not exceeding, in total 30% of the motor weight. These lifting provisions should never be used when lifting or handling the motor and driven equipment. Eye bolt lifting capacity rating is based on a lifting alignment coincident with eye bolt center line. Eye bolt capacity reduces as deviation from this alignment is increased. Be sure eye bolts are tight and prevented from turning before lifting.

INSTALLATION OUTSIDE THE USA:
Refer to MN408, MN605 and MN1383 for Compliance with European Directives. Copies are available at:
http://www.baldor.com/support/product_manuals.asp

MOTOR ENCLOSURE
ODP, Open drip proof motors are intended for use in clean, dry locations with adequate supply of cooling air. These motors should not be used in the presence of flammable or combustible materials. Open motors can emit flame and/or molten metal in the event of insulation failure.

Standard Totally Enclosed motors provide additional protection from moisture and dust compared to Open motors. Severe Duty and Washdown Duty motors provide additional protection compared to Standard Totally Enclosed motors.
Explosion protected motors, as indicated by a Nationally Recognized Testing Laboratory Certification mark and marking with Class, Division and Temperature Code are intended for installation in hazardous locations as described in Article 500 of the NEC. Refer to MN408 for more details.

MOUNTING
Foot mounted machines should be mounted to a rigid foundation to prevent excessive vibration. Shims may be used if location is uneven.

Flange mounted machines should be properly seated and aligned. Note: If improper rotation direction is detrimental to the load, check rotation direction prior to coupling the load to the motor shaft.
For V-belt drive, mount the sheave pulley close to the motor housing. Allow clearance for end to end movement of the motor shaft. Do not overtighten belts as this may cause premature bearing failure or shaft breakage.
Direct coupled machines should be carefully aligned and the shaft should rotate freely without binding.

GENERAL
The user must select a motor starter and overcurrent protection suitable for this motor and its application. Consult motor starter application data as well as the National Electric Code and/or applicable local codes. Special motors for use by United States Government including special specifications, master plans, etc. refer to the applicable master plans and specifications involved.
On motors received from the factory with the shaft blocked, remove blocking before operating the motor. If motor is to be reshipped alone or installed to another piece of equipment, the shaft block must be installed to prevent axial movement and prevent brinelling of the bearings during shipment.

TESTING
If the motor has been in storage for an extensive period or has been subjected to adverse moisture conditions, check the motor insulation resistance with a meg ohm meter. Depending on storage conditions it may be necessary to regrease or change rusted bearings. Contact your local sales office if resistance is less than 5 meg ohms.

WARNING: Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury.

WARNING: Be sure the system is properly grounded before applying power. Electrical shock can cause serious or fatal injury.

INSTALLATION
This motor must be installed in accordance with National Electric Code, NEMA MG-2, IEC standards or local codes.

WIRING
Connect the motor as shown in the connection diagrams. If this motor is installed as part of a motor control drive system, connect and protect the motor according to the control manufacturers diagrams. Refer to MN408 or MN605 for additional details on lead marking. The wiring, fusing and grounding must comply with the National Electrical Code or IEC and local codes. When the motor is connected to the load for proper direction of rotation and started, it should start quickly and run smoothly. If not, stop the motor immediately and determine the cause. Possible causes are: low voltage at the motor, motor connections are not correct or the load is too heavy. Check the motor current after a few minutes of operation and compare the measured current with the nameplate rating.

GROUNDING
Ground the motor according to NEC and local codes. In the USA consult the National Electrical Code, Article 430 for information on grounding of motors and generators, and Article 250 for general information on grounding. In making the ground connection, the installer should make certain that there is a solid and permanent metallic connection between the ground point, the motor or generator terminal housing, and the motor or generator frame. In non-USA locations consult the appropriate national or local code applicable.

ADJUSTMENT
The neutral is adjustable on some DC motors. AC motors have no adjustable parts.

Noise
For specific sound power or pressure level information, contact your local sales office.

VIBRATION
This motor is balanced to NEMA MG1, Part 7 standard.

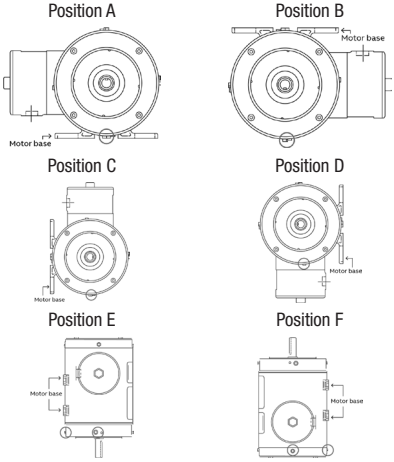
BRUSHES (DC Motors)
Periodically, the brushes should be inspected and all brush dust blown out of the motor. If a brush is worn 1/2, (length specified in renewal parts data), replace the brushes.

WARNING: Guards must be insalled for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions, should be permanently guareded to prevent accidental contact by personnel. Accidental contact with body parts or clothing can cause serious or fatal injury.

Reassemble and seat the new brushes using a brush seating stone. Be sure the rocker arm is set on the neutral mark.

INSPECTION
Before connecting the motor to an electrical supply, inspect for any damage resulting from shipment. Turn the shaft by hand to ensure free rotation. Motor leads must be isolated before the shaft will turn freely on permanent magnet motors.

DRAIN PLUGS
One or more condensation drain plugs are provided on each end plate for various motor types and mounting positions. If your motor is equipped with multiple condensation drain holes in each end plate. Please use this chart for proper orientation of plugs and/or T'drains. Failure to follow these instructions will void the warranty.



Positions A, B, C, D: leave drain open or install T'drain on both ends of the motor at circuled locations. Plug all other drain holes. **Positions E, F**: leave drain open or install T'drain at circled locations. Plug all other drain holes.

MOUNTING
Mount the motor on a foundation sufficiently rigid to prevent excessive vibration. Grease lubricated ball bearing motors may be mounted with the feet at any angle. After careful alignment, bolt motor securely in place. Use shim to fill any unevenness in the foundation. Motor feet should sit solidly on the foundation before mounting bolts are tightened.

IP (Ingress Protection)
IP designations include two numerals, the first characteristic numeral is for ingress solid bodies and from dust. The second for ingress protection from liquid - water. The IP rating assigned to a motor is based on horizontal mounting unless the motor is specifically designed for vertical positioning. Mounting the horizontal rated motor in a non-horizontal position may require additional protection, contact the local ABB District Office to review the mounting requirements and ingress protection. Open motors (IPX2 and IPX3) must be located, oriented, or additionally protected in the application to prevent falling water from entering the motor.

GUARDING
After motor installation is complete, a guard of suitable dimensions must be constructed and installed around the motor/gearmotor. This guard must prevent personnel from coming in contact with any moving parts of the motor or drive assembly but must allow sufficient cooling air to pass over the motor. If a motor mounted brake is installed, provide proper safeguards for personnel in case of brake failure. Brush inspection plates and electrical connection cover plates or lids, must be installed before operating the motor.

STARTING
Before starting motor remove all unused shaft keys and loose rotating parts to prevent them from flying off. Check direction of rotation before coupling motor to load. The motor should start quickly and run smoothly and with little noise. If the motor should fail to start the load may be too great for the motor, the voltage is low or the motor has been miswired. In any case immediately shut motor off and investigate the cause.

ROTATION
To reverse the direction of rotation, disconnect and lockout power and interchange any two of the three AC power leads for three phase motors. For two-phase four wire, disconnect and lockout power and interchange the AC line leads on any one phase. For two phase three wire, disconnect and lockout power and interchange phase one and phase two AC line leads.

MAINTENANCE PROCEDURES

WARNING: Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury.

WARNING: Surface temperatures of motor enclosures may reach temperatures which can cause discomfort or injury to personnel accidentally coming in contact with hot surfaces. Protection should be provided by the user to protect against accidental contact with hot surfaces. Failure to observe this precaution could result in bodily injury.

Lubrication Information
Refer to motor nameplate for recommended lubricant. If none is shown, the recommended lubricant for anti-friction bearings (15°F to 120°F (-9°C to 49°C) is POLYREX EM.
For Min Start Temp -100°F (38°C) use AEROSHELL #7.
For roller bearings is ExxonMobil SHC-220.

Relubrication Intervals
(For motors with regrease capability)
New motors that have been stored for a year or more should be relubricated. Lubrication is also recommended at Table 1 intervals.

LUBRICATION INSTRUCTIONS

Cleanliness is important in lubrication. Any grease used to lubricate anti friction bearings should be fresh and free from contamination. Properly clean the grease inlet area of the motor to prevent grease contamination.

1. Select service conditions (Table 2).
2. Select lubrication interval (Table 1).
3. Adjust lubrication interval with multiplier (Table 3).
4. Select volume of grease (Table 4).

LUBRICATION PROCEDURE

Bearings should be lubricated while stationary and the motor is warm.

1. Locate the grease inlet, clean the area, and replace the pipe plug with a grease fitting.
2. Locate and remove the grease drain plug, if provided.
3. Add the recommended volume of the recommended grease.
4. Replace the grease inlet plug and run the motor for 15 minutes.
5. Replace the grease drain plug.

SPECIAL APPLICATIONS

For special temperature applications, contact your local sales office.

Relubrication Intervals

Recommended relubrication intervals are shown in Table 1. It is important to realize that the recommended intervals of Table 2 are based on average use. Refer to additional information contained in Tables 2, 3 and 4.

Table 1 Relubrication Interval

NEMA (IEC) Frame Size	Rated Speed (RPM)			
	3600	1800	1200	900
Up to 210 incl. (132)	5500Hrs.	12000Hrs.	18000Hrs.	22000Hrs.
Over 210 to 280 incl. (180)	3600Hrs.	9500Hrs.	15000Hrs.	18000Hrs.
Over 280 to 360 incl. (225)	2200Hrs.	7400Hrs.	12000Hrs.	15000Hrs.
Over 360 to 5800 incl. (400)	2200Hrs.	3500Hrs.	7400Hrs.	10500Hrs.

* Relubrication intervals are for ball bearings.
For vertically mounted motors and roller bearings, divide the relubrication interval by 2.

** For motors operating at speeds greater than 3600 RPM, contact your local sales office for relubrication recommendations.

Table 2 Service Conditions

Severity of Service	Hours per day of Operation	Ambient Temperature Maximum °F (°C)	Atmospheric Contamination
Standard	8	104°F (40°C)	Clean, Little Corrosion
Severe	16 Plus	122°F (50°C)	Moderate dirt, Corrosion
Extreme	16 Plus	>122°F (50°C)* or Class H Insulation	Severe dirt, Abrasive dust, Corrosion, Heavy Shock or Vibration
Low Temperature		<-20°F (-29°C)**	

* Special high temperature grease is recommended (Dow Corning DC44).

** Special low temperature grease is recommended (AEROSHELL 7).

Note: Different grease types are generally incompatible and should not be mixed. Mixing different types can cause lubricant and bearing failure. Thoroughly clean bearing and cavity before changing grease type.

Table 3 Lubrication Interval Multiplier

Severity of Service	Multiplier
Standard	1.0
Severe	0.5
Extreme	0.1
Low Temperature	1.0

Some motor designs use different bearings on each motor end. This is normally indicated on the motor nameplate. In this case, the larger bearing is installed on the motor drive endplate. For best relubrication results, only use the appropriate amount of grease for

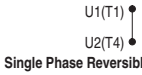
each bearing size (not the same for both).

Table 4 Amount of Grease to Add

Frame Size NEMA (IEC)	Bearing Description (These are the "Large" bearings (Shaft End) in each frame size)			
	Bearing	Weight of Grease to add in Ounces (Grams)	Volume of grease to be added	
			in^3	teaspoon
56 to 140 (90)	6203	0.08 (2.4)	0.15	0.5
140 (90)	6205	0.15 (3.9)	0.2	0.8
180 (100–112)	6206	0.19 (5.0)	0.3	1.0
210 (132)	6307	0.30 (8.4)	0.6	2.0
250 (160)	6309	0.47 (12.5)	0.7	2.5
280 (180)	6311	0.61 (17)	1.2	3.9
320 (200)	6312	0.76 (20.1)	1.2	4.0
360 (225)	6313	0.81 (23)	1.5	5.2
400 (250)	6316	1.25 (33)	2.0	6.6
440 (280)	6318	1.52(40)	2.5	8.2
440 (280)	6319	2.12 (60)	4.1	13.4
5000 to 5800 (315–400)	6328	4.70 (130)	9.2	30.0
5000 to 5800 (315–400)	NU328	4.70 (130)	9.2	30.0
360 to 449 (225–280)	NU319	2.12 (60)	4.1	13.4
AC Induction Servo				
76 Frame 180 (112)	6207	0.22 (6.1)	0.44	1.4
77 Frame 210 (132)	6210	0.32 (9.0)	0.64	2.1
80 Frame 250(160)	6213	0.49 (14.0)	0.99	3.3

Typical IEC vs NEMA Lead Marking

Single Phase Non-Reversible
Refer to the connection diagram provided on the motor.



Single Phase Reversible

Dual Voltage Reversible

DC Motors
Lead markings can be translated between IEC and NEMA designations as follows:

	NEMA	IEC
Armature	A1, A2	A1, A2
Series Field	S1, S2	D1, D2
Shunt Field	F1, F2	E1, E2

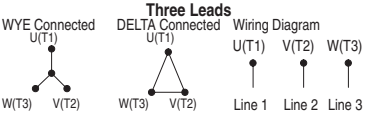
Refer to the connection diagram provided on the motor.

Three Phase
For single winding 3 phase motors, lead markings can be directly translated between IEC and NEMA designations. For these motors, the lead markings are:

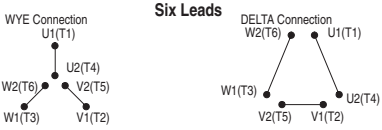
U1=T1 U2=T4 U3=T7 U4=T10
V1=T2 V2=T5 V3=T8 V4=T11
W1=T3 W2=T6 W3=T9 W4=T12

Refer to the connection diagram provided on the motor. Some examples are as follows:

Three Leads



Six Leads



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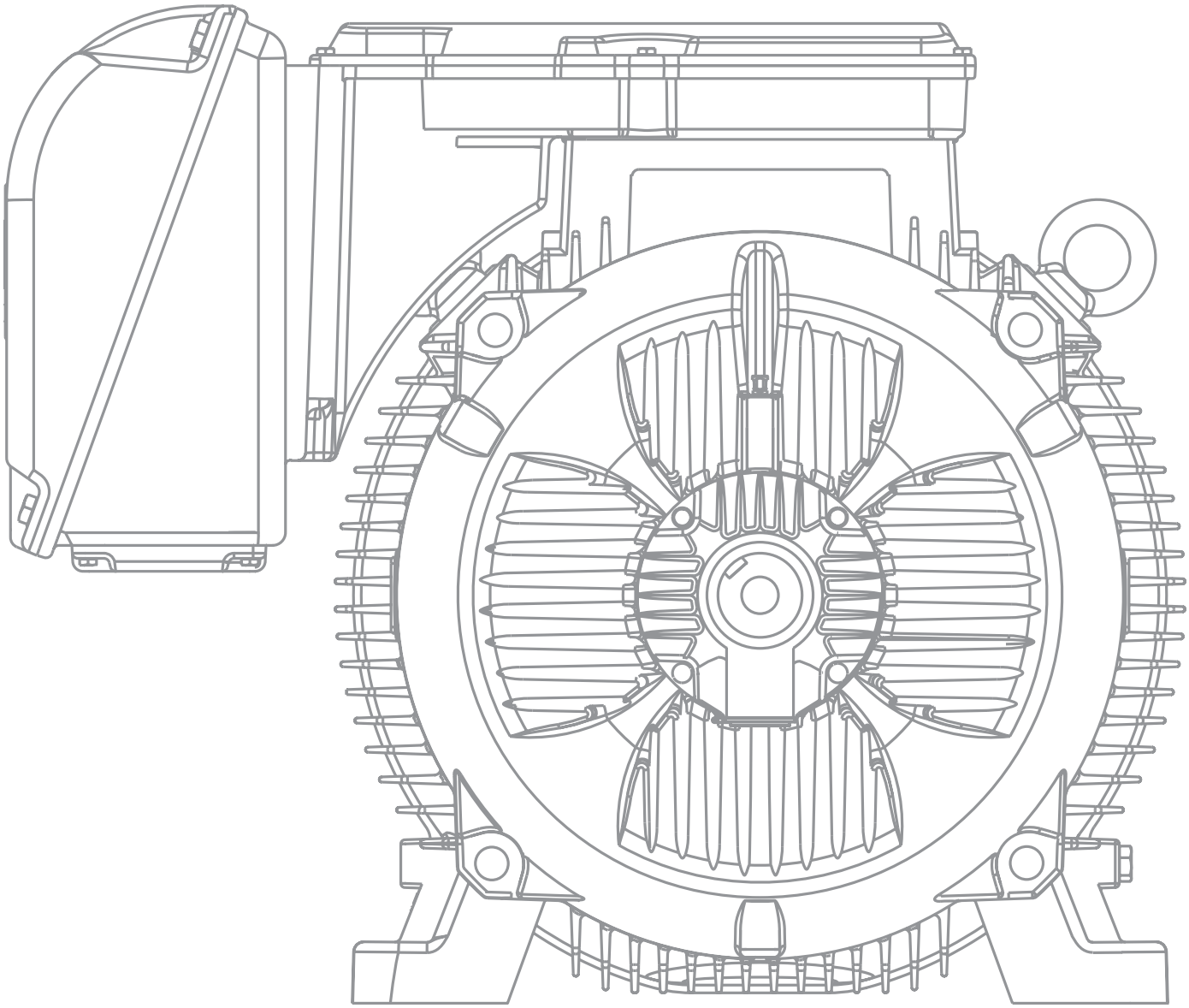
* M N 4 1 6 – 1 1 2 *

Driving efficiency and sustainability

SPECIFICATION GUIDE
ELECTRIC MOTORS



Specification of Electric Motors

WEG, which began in 1961 as a small factory of electric motors, has become a leading global supplier of electronic products for different segments. The search for excellence has resulted in the diversification of the business, adding to the electric motors products which provide from power generation to more efficient means of use.

This diversification has been a solid foundation for the growth of the company which, for offering more complete solutions, currently serves its customers in a dedicated manner. Even after more than 50 years of history and continued growth, electric motors remain one of WEG's main products. Aligned with the market, WEG develops its portfolio of products always thinking about the special features of each application.

In order to provide the basis for the success of WEG Motors, this simple and objective guide was created to help those who buy, sell and work with such equipment. It brings important information for the operation of various types of motors. Enjoy your reading.

Table of Contents

1. Fundamental Concepts

1.1 Electric Motors

The electric motor is a machine capable of converting electrical energy into mechanical energy. The induction motor is the most widely used type of motor because it combines all the advantages offered by the electrical energy such as low cost, easy of supply and distribution, clean handling and simple controls - together with those of simple construction and its great versatility to be adapted to wide ranges of loads and improved efficiencies. The most common types of electric motors are:

a) Direct current motors

These motors are quite expensive requiring a direct current source or a converting device to convert normal alternating current into direct current. They are capable of operating with adjustable speeds over a wide range and are perfectly suited for accurate and flexible speed control. Therefore, their use is restricted to special applications where these requirements compensate the much higher installation and maintenance costs.

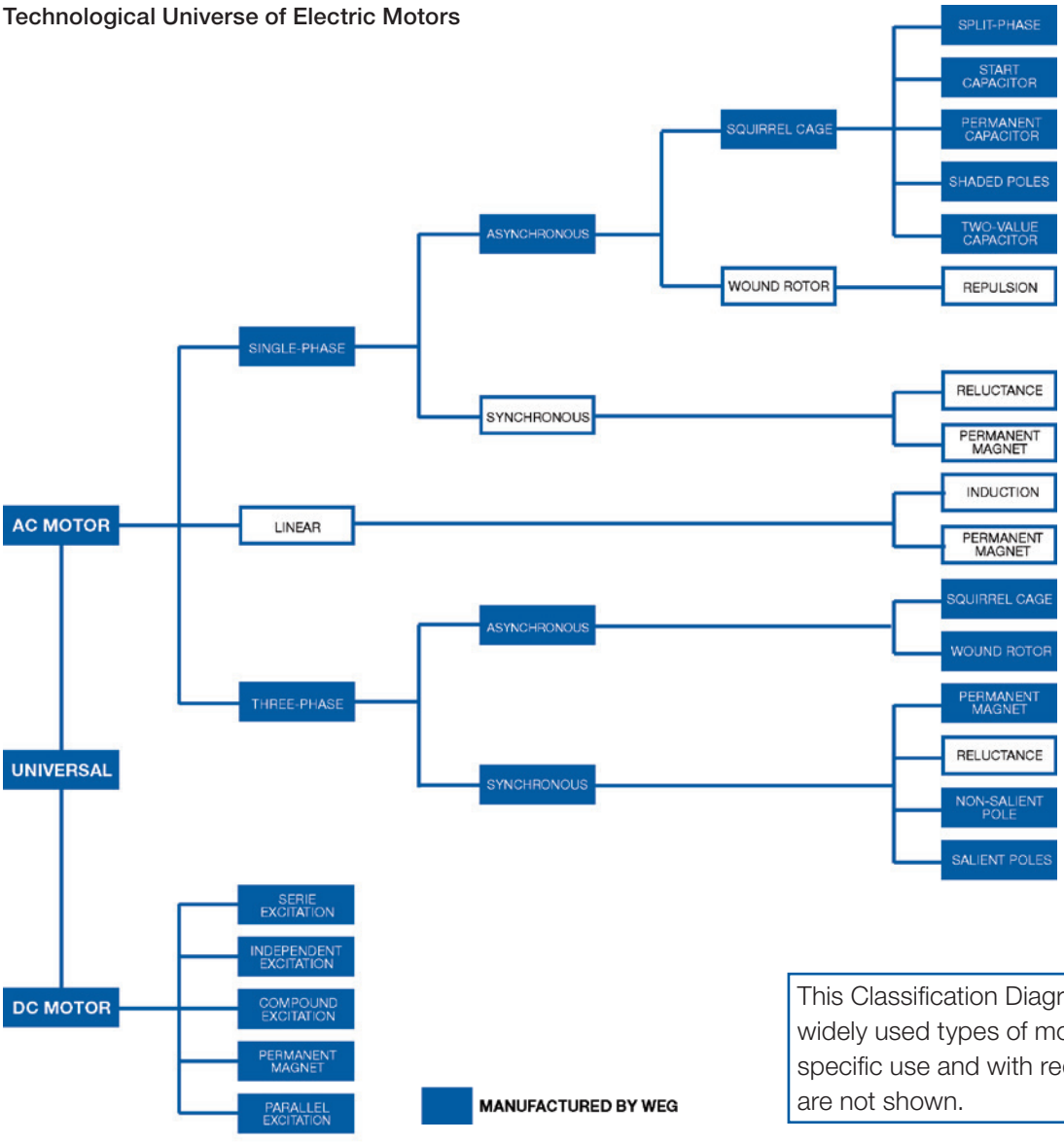
b) Alternating current motors

These are the most frequently used motors because electrical power is normally supplied as alternating current. The most common types are:

Synchronous motors: synchronous motors are three-phase AC motors which run at fixed speed, without slip, and are generally applied for large outputs (due to their relatively high costs in smaller frame sizes).

Induction motor: these motors generally run at a constant speed which changes slightly when mechanical loads are applied to the motor shaft. Due to its simplicity, robustness and low cost, this type of motor is the most widely used and, in practical terms, is quite suitable for almost all types of machines. Currently it is possible to control the speed of induction motors by frequency inverters.

Technological Universe of Electric Motors



This Classification Diagram shows the most widely used types of motors. Motors for specific use and with reduced application are not shown.

Figure 1.1 - Technological Universe of Electric Motors

1.2 Basic Concepts

For a better understanding of the next sections, the following are described the concepts of some principles of Physics concerning energy and forces.

1.2.1 Torque

Torque, also known as moment of force, is the measure of the energy required to rotate a shaft. Through practical experience, we can note that for lifting a weight similar to the one used in water wells (see figure 1.2). The required force "F" to be applied on the winch depends on the length "E" of the crank handle. The larger the crank handle, the less force is required. By doubling the length "E" of the crank handle, the required force "F" is reduced by half.

Figure 1.2 shows that the bucket weights 20 N while the diameter of the drum is 0.20 m, thus permitting the rope to transmit a force of 20 N on the drum's surface, i.e. at 0.10 m from the axis center. In order to counterbalance this force, 10 N is must be applied on the crank handle if "E" has a length of 0.20 m. If "E" is twice as much, i.e. 0.40 m, force "F" becomes half, or 5 N. As you can see, to measure the "energy" required to make the shaft rotate, it is not sufficient to define the force applied but it is also necessary to indicate at what distance from the shaft center the force is applied. You must also inform at what distance from the shaft center the force is applied. The "energy" is measured by the torque. that is the result of "F" (force) x "E" (distance). F x E. In the given example, the torque is:

C = 20 N x 0.10 m = 10 N x 0.20 m = 5 N x 0.40 m = 2.0 Nm

$$C = F \cdot E \qquad (N.m)$$

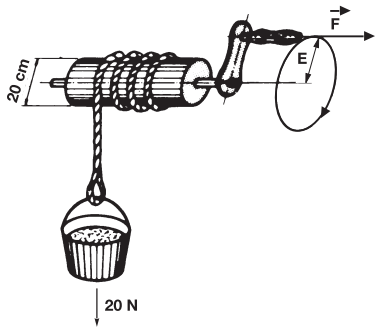


Figure 1.2 - Torque

1.2.2 Mechanical Energy & Power

Power measures the "speed" with which energy is applied or consumed. In the previous example, if the well is 24.5 m deep the work or energy (W) spent to lift the bucket from the bottom of the well up to the wellhead will always be the same: 20 N x 24.6 m = 490 Nm

Note: the measuring unit for the mechanical energy, Nm, is the same that is used for torque - however the values are of different nature and therefore should not be confused.

W = F . d (N.m)

OBS.: 1 Nm = 1 J = Power x time = Watts x second

Power expresses how quick the energy is applied, it is calculated by dividing the total energy or work by the time in which it is done.

Therefore, by using an electric motor to lift a water bucket in 2.0 seconds, the required Power will be:

$$P_{mec} = \frac{F \cdot d}{t} \quad (W)$$

$$P_1 = \frac{490}{2.0} = 245 \text{ W}$$

If we use a higher power rating motor, able to do this work in 1.3 seconds, the required power will be:

$$P_2 = \frac{490}{1.3} = 377 \text{ W}$$

The most commonly used unit for measuring the mechanical power is HP (horsepower), equivalent to 0.7457 kW (measuring unit used internationally for the same purpose).

Relationship between power units
P (kW) = 0.7457 . P (HP)
P (HP) = 1.341 P (kW)

In this case the outputs of the above mentioned motors will be:

$$P_1 = \frac{245}{745} = \frac{1}{3} \text{ HP} \qquad P_2 = \frac{377}{745} = \frac{1}{2} \text{ HP}$$

For circular movements

$$C = F \cdot r \quad (N.m)$$

$$v = \frac{\pi \cdot d \cdot n}{60} \quad (m/s)$$

$$P_{mec} = \frac{F \cdot d}{745 \cdot t} \quad (HP)$$

Where: C = torque (Nm)
F = force (N)
r = pulley radius (m)
v = angular speed (m/s)
d = part diameter (m)
n = speed (rpm)

1.2.3 Electrical Energy & Power

Although energy is always one and the same thing, it can be presented in several forms. By connecting a resistance to a voltage supply, an electric current will flow through the resistance that will be heated. The resistance absorbs energy, transforming it into heat which is also a form of energy. An electric motor absorbs electric energy from the power supply, transforming it into mechanical energy available at the end of the shaft.

DC Circuits

The "electric power" on DC circuits can be obtained by the ratio among voltage (U), current (I) and resistance (R) involved in such circuit, that is:

$$P = U \cdot I \quad (W)$$

or

$$P = \frac{U^2}{R} \quad (W)$$

or

$$P = R \cdot I^2 \quad (W)$$

Where: U = voltage (V)
I = current (Amps)
R = resistance (Ω)
P = average Power (W)

AC Circuits

a) Resistance

In the case of "resistances", the higher the supply voltage, the higher the current that results in faster heating of the resistance. This means that the electric power will be higher. The electric energy absorbed from the line, in case of resistance, is calculated by multiplying the line voltage by the current if the resistance (load) is single-phase.

$$P = U_f \cdot I_f \quad (W)$$

In a three-phase system, the power in each phase of the load is $P_f = U_f \times I_f$ as it were an independent single-phase system. The total power is the sum of the power of the three-phases, i.e.:

$$P = 3P_f = 3 \cdot U_f \cdot I_f$$

Considering that the three-phase system can be delta or star connected, we will have the following relations:

Star-connection: $U = \sqrt{3} \cdot U_f$ e $I = I_f$

Delta-connection: $U = U_f$ e $I = \sqrt{3} \cdot I_f$

Thus, the total power for both connections will:

$$P = \sqrt{3} \cdot U \cdot I \quad (W)$$

Note: this formula applies to resistive loads only, i.e. where there is no phase shift of the current.

b) Reactive loads

For "reactive" loads, i.e. where there is phase shifting in the case of induction motors, the phase shift must be taken into account and the formula then becomes.

$$P = \sqrt{3} \cdot U \cdot I \cdot \cos \varphi \quad (W)$$

Where: U = Line voltage
I = Line current
cos φ = Phase shift angle between voltage and current.

Electric power is normally measured in watts (W) corresponding to 1 volt x 1 ampere or its multiple kilowatts (kW) = 1000 watts. This unit may also be used to measure the output of mechanical power. Electric energy is normally measured by the kilowatt-hour (kWh) corresponding to the energy supplied by a power of 1 kW over a period of 1 hour (this is the unit appearing on electricity bills).

1.2.4 Apparent, Active and Reactive Power

Apparent power (S)

It is the multiplication result of the voltage by the current ($S = U \cdot I$ for single-phase systems and $S = \sqrt{3} \cdot U \cdot I$, for three-phase systems. This corresponds to the effective power which exists when there is no phase displacement of the current, i. e. for the resistive loads. Then,

$$S = \frac{P}{\cos \varphi} \ (VA)$$

Evidently, for resistive loads, $\cos \varphi = 1$, and the effective power can then be interpreted as apparent power. The measuring unit for apparent power is volt-ampere (VA) or its multiple, kilovolt-ampere (kVA).

Active power (P)

It is the portion of apparent power that performs work, that is, the portion that is converted into energy.

$$P = \sqrt{3} \cdot U \cdot I \cdot \cos \varphi \ (W) \quad \text{or} \quad P = S \cdot \cos \varphi \ (W)$$

Reactive power (Q)

It is the portion of apparent power that does "not" perform work. It is only transferred and stored on passive elements (capacitors and inductors) of the circuit.

$$Q = \sqrt{3} \cdot U \cdot I \operatorname{sen} \varphi \ (VAr) \quad \text{or} \quad Q = S \cdot \operatorname{sen} \varphi \ (VAr)$$

Power triangle

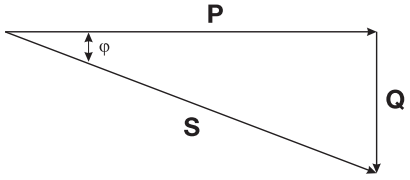


Figure 1.3 - Power Triangle (inductive load)

1.2.5 Power Factor

The power factor is indicated by cos φ, where φ is the angle of voltage displacement relating to the current. It is the relationship between active (P) and the apparent power (S) (Figure 1.3).

$$\cos \varphi = \frac{P}{S} = \frac{P\,(kW) \cdot 1000}{3 \cdot U \cdot I}$$

Then we can state that,

- Resistive load: cos φ = 1
- Inductive load: cos φ (delayed)
- Capacitive load: cos φ (advanced)

Note: the terms "delayed" and "advanced" refers to the current angle relating to the voltage angle.

A motor does not draw only active power, transformed after in mechanical power and heat (losses), but also absorbs reactive power needed for magnetization, but that does not produce work. On the diagram of figure 1.4, the vector P represents the active power and Q the reactive power, which added results in the apparent power S. The power factor is determined by measuring the input power, voltage and, rated load current.

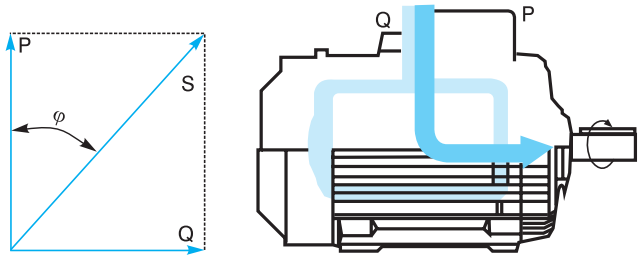


Figure 1.4 - The Power factor is determined measuring the input power, the voltage and the rated load

Power factor importance

Reactive energy limits useful (active) energy carrying capacity in the transmission, sub-transmission, and distribution, in other words, the higher the power factor, the greater the availability of active power in the system and greater is the use of the electrical system.

The electric motor plays a very important role in the industry since it represents more than 68% of the energy consumption. Therefore, it is essential to apply motors with outputs and features well adapted to its function since the power factor changes with motor load.

Power factor correction

The increase of power factor is made by the connection of a capacitive load, in general, a capacitor or a synchronous motor with overexcitation, in parallel with the load.

For example:

A three-phase electric motor, 100 HP (75 kW), IV poles, running at 100% of the rated power, with an original power factor of 0.87 and efficiency of 93.5%. Now a reactive power should be determined to raise the power factor to 0.95.

Solution:

Using the table 1.2, on the intersection of 0.87 line with the column of 0.95, we get the value 0.238 that multiplied by the motor absorbed power from the line in kW, gives the amount of reactive power necessary to increase the power factor from 0.87 to 0.95.

$$kVAr = \frac{P\,(HP) \times 0.7457 \times F \times 100\%}{Eff.\ \%}$$

$$= \frac{100 \times 0.7457 \times 0.238 \times 100\%}{93.5\%}$$

$$kVAr = 18.981\ kVAr$$

Where: kVAr = Three-phase power of the capacitor bank to be installed
P (HP) = Motor rated output
F = Factor obtained in the Table 1.2
Eff. % = Motor efficiency

Original Power Factor	Required Power Factor																				
	0,8	0,81	0,82	0,83	0,84	0,85	0,86	0,87	0,88	0,89	0,9	0,91	0,92	0,93	0,94	0,95	0,96	0,97	0,98	0,99	1
0,5	0,982	1,008	1,034	1,06	1,086	1,112	1,139	1,165	1,192	1,220	1,248	1,276	1,306	1,337	1,369	1,403	1,442	1,481	1,529	1,590	1,732
0,51	0,937	0,962	0,989	1,015	1,041	1,067	1,094	1,120	1,147	1,175	1,203	1,231	1,261	1,292	1,324	1,358	1,395	1,436	1,484	1,544	1,687
0,52	0,893	0,919	0,945	0,971	0,997	1,023	1,060	1,076	1,103	1,131	1,159	1,187	1,217	1,248	1,280	1,314	1,351	1,392	1,440	1,500	1,643
0,53	0,850	0,876	0,902	0,928	0,954	0,980	1,007	1,033	1,060	1,088	1,116	1,144	1,174	1,205	1,237	1,271	1,308	1,349	1,397	1,457	1,600
0,54	0,809	0,835	0,861	0,887	0,913	0,939	0,966	0,992	1,019	1,047	1,075	1,103	1,133	1,164	1,196	1,230	1,267	1,308	1,356	1,416	1,359
0,55	0,769	0,795	0,821	0,847	0,873	0,899	0,926	0,952	0,979	1,007	1,035	1,063	1,090	1,124	1,456	1,190	1,228	1,268	1,316	1,377	1,519
0,56	0,730	0,756	0,782	0,808	0,834	0,860	0,887	0,913	0,940	0,968	0,996	1,024	1,051	1,085	1,117	1,151	1,189	1,229	1,277	1,338	1,480
0,57	0,692	0,718	0,744	0,770	0,796	0,882	0,849	0,875	0,902	0,930	0,958	0,986	1,013	1,047	1,079	1,113	1,151	1,191	1,239	1,300	1,442
0,58	0,655	0,681	0,707	0,733	0,759	0,785	0,812	0,838	0,865	0,893	0,921	0,949	0,976	1,010	1,042	1,076	1,114	1,154	1,202	1,263	1,405
0,59	0,618	0,644	0,670	0,696	0,722	0,748	0,775	0,801	0,828	0,856	0,884	0,912	0,943	0,973	1,005	1,039	1,077	1,117	1,165	1,226	1,368
0,6	0,584	0,610	0,636	0,662	0,688	0,714	0,741	0,767	0,794	0,822	0,850	0,878	0,905	0,939	0,971	1,005	1,043	1,083	1,131	1,192	1,334
0,61	0,549	0,575	0,601	0,627	0,653	0,679	0,706	0,732	0,759	0,787	0,815	0,843	0,870	0,904	0,936	0,970	1,008	1,048	1,096	1,157	1,299
0,62	0,515	0,541	0,567	0,593	0,619	0,645	0,672	0,698	0,725	0,753	0,781	0,809	0,836	0,870	0,902	0,936	0,974	1,014	1,062	1,123	1,265
0,63	0,483	0,509	0,535	0,561	0,587	0,613	0,640	0,666	0,693	0,721	0,749	0,777	0,804	0,838	0,870	0,904	0,942	0,982	1,000	1,091	1,233
0,64	0,450	0,476	0,502	0,528	0,554	0,580	0,607	0,633	0,660	0,688	0,716	0,744	0,771	0,805	0,837	0,871	0,909	0,949	0,997	1,066	1,200
0,65	0,419	0,445	0,471	0,497	0,523	0,549	0,576	0,602	0,629	0,657	0,685	0,713	0,740	0,774	0,806	0,840	0,878	0,918	0,966	1,027	1,169
0,66	0,388	0,414	0,440	0,466	0,492	0,518	0,545	0,571	0,598	0,260	0,654	0,692	0,709	0,742	0,755	0,809	0,847	0,887	0,935	0,996	1,138
0,67	0,358	0,384	0,410	0,436	0,462	0,488	0,515	0,541	0,568	0,596	0,624	0,652	0,679	0,713	0,745	0,779	0,817	0,857	0,906	0,966	1,108
0,68	0,329	0,355	0,381	0,407	0,433	0,459	0,486	0,512	0,539	0,567	0,595	0,623	0,650	0,684	0,716	0,750	0,788	0,828	0,876	0,937	1,079
0,69	0,299	0,325	0,351	0,377	0,403	0,429	0,456	0,482	0,509	0,537	0,565	0,593	0,620	0,654	0,686	0,720	0,758	0,798	0,840	0,907	1,049
0,7	0,270	0,296	0,322	0,348	0,374	0,400	0,427	0,453	0,480	0,508	0,536	0,564	0,591	0,625	0,657	0,691	0,729	0,769	0,811	0,878	1,020
0,71	0,242	0,268	0,294	0,320	0,346	0,372	0,399	0,425	0,452	0,480	0,508	0,536	0,563	0,597	0,629	0,663	0,701	0,741	0,783	0,850	0,992
0,72	0,213	0,239	0,265	0,291	0,317	0,343	0,370	0,396	0,423	0,451	0,479	0,507	0,534	0,568	0,600	0,624	0,672	0,712	0,754	0,821	0,963
0,73	0,186	0,212	0,238	0,264	0,290	0,316	0,343	0,369	0,396	0,424	0,452	0,480	0,507	0,541	0,573	0,607	0,645	0,685	0,727	0,794	0,936
0,74	0,159	0,185	0,211	0,237	0,263	0,289	0,316	0,342	0,369	0,397	0,425	0,453	0,480	0,514	0,546	0,580	0,618	0,658	0,700	0,767	0,909
0,75	0,132	0,158	0,184	0,210	0,236	0,262	0,289	0,315	0,342	0,370	0,398	0,426	0,453	0,487	0,519	0,553	0,591	0,631	0,673	0,740	0,882
0,76	0,106	0,131	0,157	0,183	0,209	0,235	0,262	0,288	0,315	0,343	0,371	0,399	0,426	0,460	0,492	0,526	0,564	0,604	0,652	0,713	0,855
0,77	0,079	0,106	0,131	0,157	0,183	0,209	0,236	0,262	0,289	0,317	0,345	0,373	0,400	0,434	0,466	0,500	0,538	0,578	0,620	0,686	0,829
0,78	0,053	0,079	0,105	0,131	0,157	0,183	0,210	0,236	0,263	0,291	0,319	0,347	0,374	0,408	0,440	0,474	0,512	0,562	0,594	0,661	0,803
0,79	0,026	0,062	0,078	0,104	0,130	0,153	0,183	0,209	0,236	0,264	0,292	0,320	0,347	0,381	0,403	0,447	0,485	0,525	0,567	0,634	0,776
0,8	0,000	0,026	0,062	0,078	0,104	0,130	0,157	0,183	0,210	0,238	0,266	0,264	0,321	0,355	0,387	0,421	0,459	0,499	0,541	0,608	0,750
0,81		0,000	0,026	0,062	0,078	0,104	0,131	0,157	0,184	0,212	0,240	0,268	0,295	0,329	0,361	0,395	0,433	0,473	0,515	0,582	0,724
0,82			0,000	0,026	0,062	0,078	0,105	0,131	0,158	0,186	0,214	0,242	0,269	0,303	0,335	0,369	0,407	0,447	0,496	0,556	0,696
0,83				0,000	0,026	0,062	0,079	0,105	0,132	0,160	0,188	0,216	0,243	0,277	0,309	0,343	0,381	0,421	0,463	0,536	0,672
0,84					0,000	0,026	0,053	0,079	0,106	0,140	0,162	0,190	0,217	0,251	0,283	0,317	0,355	0,395	0,437	0,504	0,645
0,85						0,000	0,027	0,053	0,080	0,108	0,136	0,164	0,194	0,225	0,257	0,191	0,229	0,369	0,417	0,476	0,620
0,86							0,000	0,026	0,053	0,081	0,109	0,137	0,167	0,198	0,230	0,265	0,301	0,343	0,390	0,451	0,593
0,87									0,027	0,055	0,082	0,111	0,141	0,172	0,204	0,238	0,275	0,317	0,364	0,425	0,567
0,88										0,028	0,056	0,084	0,114	0,145	0,177	0,211	0,248	0,290	0,337	0,398	0,540
0,89											0,028	0,056	0,086	0,117	0,149	0,183	0,220	0,262	0,309	0,370	0,512
0,9												0,028	0,058	0,089	0,121	0,155	0,192	0,234	0,281	0,342	0,484
0,91													0,030	0,061	0,093	0,127	0,164	0,206	0,253	0,314	0,456
0,92														0,031	0,063	0,097	0,134	0,176	0,223	0,284	0,426
0,93															0,032	0,068	0,103	0,145	0,192	0,253	0,395
0,94																0,034	0,071	0,113	0,160	0,221	0,363
0,95																	0,037	0,079	0,126	0,187	0,328
0,96																		0,042	0,089	0,149	0,292
0,97																			0,047	0,108	0,251
0,98																				0,061	0,203
0,99																					0,142

Table 1.2 - Power factor correction

1.2.6 Efficiency

The electric motor efficiency is defined as how efficient it is to make the conversion of the line absorbed electric energy into mechanical energy available at the shaft end. The efficiency defines how this transformation is made. By calling mechanical power available at the shaft end "output" (P_u) and electric energy absorbed by the motor from the supply "input" (P_a), the efficiency is the ratio between these two, i.e.,

$$\eta = \frac{P_u\,(W)}{P_a\,(W)} = \frac{745 \cdot P\,(HP)}{\sqrt{3} \cdot U \cdot I \cdot \cos\varphi} = \frac{1000 \cdot P\,(kW)}{\sqrt{3} \cdot U \cdot I \cdot \cos\varphi}$$

or

$$\eta\% = \frac{745 \cdot P\,(HP)}{\sqrt{3} \cdot U \cdot I \cdot \cos\varphi} \cdot 100$$

1.2.7 Torque Versus Power Ratio

When mechanical energy is applied in the form of a rotating movement, the developed output depends on the torque C and on the rotational speed n. The ratio is as follows:

$$P\,(HP) = \frac{C\,(kgfm) \cdot n\,(rpm)}{716} = \frac{C\,(Nm) \cdot n\,(rpm)}{7024}$$

$$P\,(kW) = \frac{C\,(kgfm) \cdot n\,(rpm)}{974} = \frac{C\,(Nm) \cdot n\,(rpm)}{9555}$$

Inversely

$$C\,(kgfm) = \frac{716 \cdot P\,(HP)}{n\,(rpm)} = \frac{974 \cdot P\,(kW)}{n\,(rpm)}$$

$$C\,(Nm) = \frac{7024 \cdot P\,(HP)}{n\,(rpm)} = \frac{9555 \cdot P\,(kW)}{n\,(rpm)}$$

1.3 Single-Phase AC Systems

Alternating current is distinguished by that voltage, which (instead of being a steady one, as for instance between the poles of a battery) varies with time, alternately reversing its direction.

In the single-phase systems, the alternating voltage U (Volts) is generated and applied between two wires to which the load absorbing current I (Amperes) is connected - see figure 1.5a.

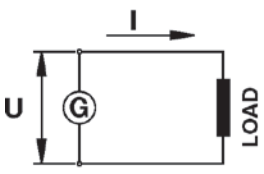


Figure 1.5a

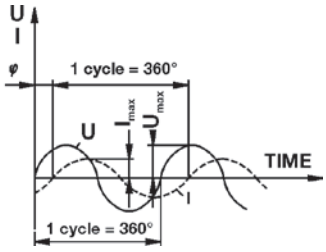


Figure 1.5b

By representing the values U and I in a graph at successive instants, we obtain figure 1.5b. Figure 1.5b also shows some values which will be defined further on. It can be noted that the voltage and current waves are not "in phase", i.e. they do not pass the zero point simultaneously, notwithstanding the fact that they are of the same frequency. This occurs with many types of electrical loads e.g. electric motors (reactive loads).

Frequency

Is the number of times per second the voltage changes its direction and returns to the initial condition. It is expressed in "cycle per second " or "Hertz" and is represented by Hz.

Maximum voltage (Umax)

This is the "peak value" of the voltage, i.e. the instantaneous crest value achieved by the voltage during one cycle (one half of the cycle is positive and the other half negative, this is reached twice per cycle).

Maximum current (Imax)

This is the "peak" of the current.

Effective value of voltage and current (U and I)

It is the value of the continuous voltage and current which generate an output corresponding to that generated by the alternated current. We can identify the effective value as:

$$U = \frac{U_{max}}{\sqrt{2}} \quad \text{and} \quad I = \frac{I_{max}}{\sqrt{2}}$$

For example:
If we connect a "resistance" to an AC circuit ($\cos\varphi = 1$) with $U_{max} = 311$ V and $I_{max} = 14.14$ A.

the developed output power will be:

$$P = U \cdot I \cdot COS\,\varphi = \frac{U_{max}}{\sqrt{2}} \cdot \frac{I_{max}}{\sqrt{2}} \cdot 311 \cdot 14.14 \cdot 1$$

P = 2.200 Watts = 2.2 kW

Note: usually, when referring to voltage and current, for example, 220 V or 10 A, without mentioning any other factor, we are referring to voltage or current effective values, which are normally applied.

Phase displacement (φ)

Phase displacement means "delay" of the current wave with respect to the voltage wave (see figure 1.5b). Instead of being measured in time (seconds), this delay is usually measured in degrees, corresponding to the fraction of a complete cycle, taking 1 cycle = 360º. However, phase displacement is usually expressed by the angle cosine (see Item 1.2.5 - Power Factor).

1.3.1 Connection: Parallel and Series

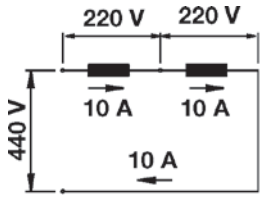


Figure 1.6a

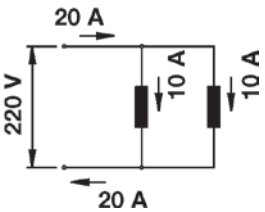


Figure 1.6b

Two equal loads can be connected, for example, to a single-phase system, in two different ways:

- By making a series connection (figure 1.6a), where the total current flows through the two loads. In this case, the voltage across each load is half of the circuit voltage.
- By making a parallel connection (figure 1.6b), where the voltage is applied across each load. In this case, the current in each load is half of the total circuit current.

1.4 Three-Phase AC System

A three-phase system is formed by associating three single-phase voltage system, U_1, U_2 and U_3 which so the phase displacement between any two of them ch is 120º, which means, the "delays" of U_2 relating to U_1, U_3 relating to U_2, relating to U_3, are equal to 120º (considering a complete cycle = 360º). The system is balanced if the three voltages have the same effective value, $U_1 = U_2 = U_3$, as shown in figure 1.7.

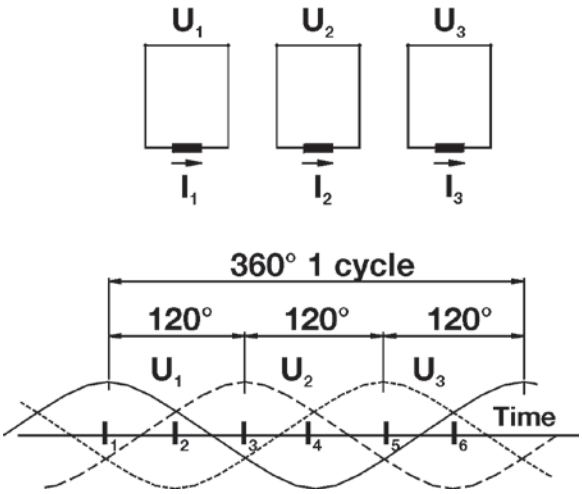


Figure 1.7

By interconnecting the three single-phase systems and by eliminating the unnecessary wires, we have a three-phase system: three balanced voltages U_1, U_2 and U_3 the phases of which are reciprocally displaced by 120º and applied between the three wires of the system. There are two different ways of making a connection, as shown in the following diagrams. In these diagrams the voltage is usually shown by inclined arrows or rotating vectors and maintaining between them the angle corresponding to the phase displacement (120º), according to figures 1.8a, b, and c, and figures 1.9a, b, and c.

1.4.1 Delta Connection

By connecting the three single-phase systems, as shown in figures 1.8a, b and c, we can eliminate the three wires, leaving only one at each connecting point. Thus, the three-phase system can be reduced to three-wires, L_1, L_2, and L_3.

Line voltage (U)

Is the rated voltage of the three-phase system applied between any two of these three wires L_1, L_2, and L_3.

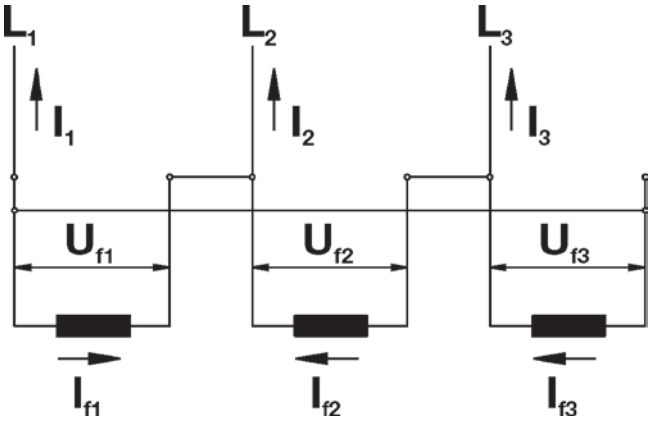


Figure. 1.8a - Connections

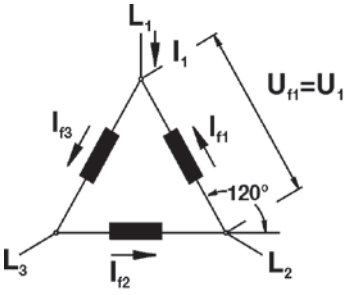


Figure 1.8b - Electrical diagram

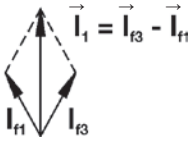


Figure 1.8c - Phasorial diagram

Line current (I)

The current in any one of the three wires L_1, L_2, and L_3.

Phase voltage and current (U_f and I_f)

Is the voltage and current of each one of the considered single-phase systems.

Looking at the diagram in fig. 1.7b, one can see that:

$U = U_f$

$I = \sqrt{3} \cdot I_f = 1.732\ I_f$

$\vec{I} = \vec{I}_{f3} - \vec{I}_{f1}$ *(Figure 1.7c)*

Example:

Consider a balanced three-phase system with a rated voltage of 220 V. The measured line current is 10 amperes. By connecting a three-phase load to this system, composed of three equal loads connected in delta, what is the voltage across, and the current in each load?

We have $U_f = U_1 = 220$ V in each load.

if $I = 1.732 \cdot I_f$, we have $I_f = 0.577 \cdot I = 0.577 \cdot 10 = 5.77$ A in each one of the load.

1.4.2 Star Connection

By connecting one of the wires of each single-phase system to a common point, the three remaining wires will form a three-phase star system (see figure 1.9a). Sometimes the three-phase star system is made as a "four wire" or with the "neutral wire" system. The fourth wire is connected to the common point for the three phases.

The line voltage, or rated voltage of the three-phase system - and the line current - are defined in the same way as for delta-connections.

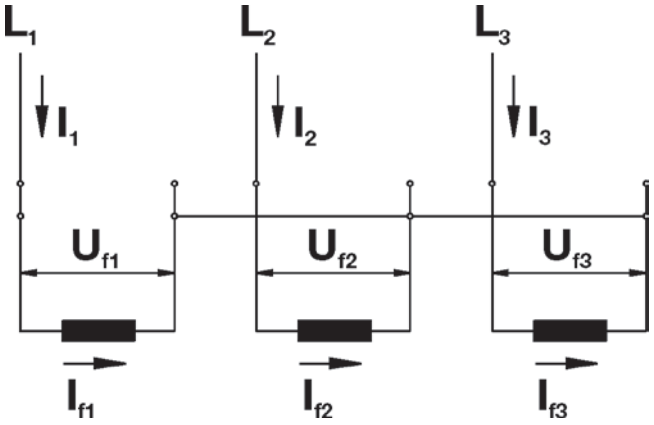


Figure 1.9a - Connections

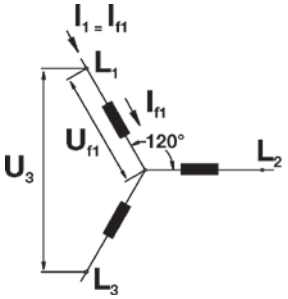


Figure 1.9b - Electrical wiring diagram

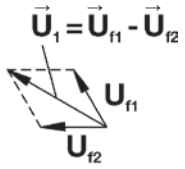


Figure 1.9c - Phasor diagram

By analyzing the wiring diagram in Figure 1.9b, one can note that:

$I = I_f$

$U = \sqrt{3} . U_f = 1.732 . U_f$

$\vec{U} = \vec{U}_{f1} - \vec{U}_{f2}$ *(figure 1.9c)*

Example:
Consider a three-phase load composed of three equal loads. Each load is connected to a voltage of 220 V, absorbing 5.77 A. What is the rated voltage of the three-phase system feeding this load under normal conditions (220 and 5.77 A)? What is the line current?

We have U_f = 220 V (rated voltage for each load)
U = 1.732 . 220 = 380 V
I = I_f = 5.77 A

1.5 Three-Phase Induction Motor

Fundamentally a three-phase induction motor consists of two parts: stator and rotor.

Stator consists of

- The frame (1) - is the supporting structure of the assembly; manufactured of iron, steel, die-cast aluminum, resistant to corrosion and with cooling fins.
- The lamination core (2) - constructed with magnetic steel plates.
- The three-phase winding (8) - comprises three equal sets of coils, one set for each phase, forming a balanced three-phase system when connected to a three-phase power supply.

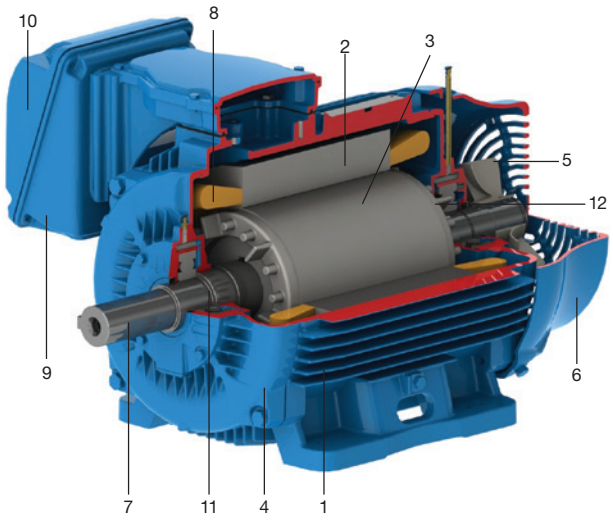


Figure 1.10

The rotor consists of:

- The shaft (7) - which transmits the mechanical output developed by the motor.
- The laminated magnetic core (3) - the rotor steel sheets have the same characteristics as the stator steel sheets.
- Bars and short-circuit rings (12) - are aluminum die castings formed as one piece.

Other components of the three-phase induction motor:

- End shields (4)
- Fan (5)
- Fan cover (6)
- Terminal box (9)
- Terminals (10)
- Bearings (11)

This manual covers “squirrel cage rotor motor” where the rotor consists of a set of non-insulated bars that are interconnected by short-circuiting rings. What characterizes an induction motor is a fact that only the stator is connected to the power supply. The rotor is not power supplied externally and the currents that flow through it are induced electromagnetically by the stator from which comes the induction motor name.

1.5.1 Working Principle - Rotating Field

When an electric current flows through a coil, a magnetic field is generated, the direction of which is along the coil axis and proportional in value to the current.

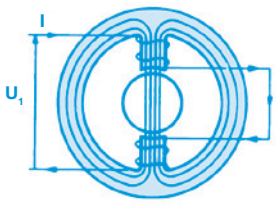


Figure 1.11a

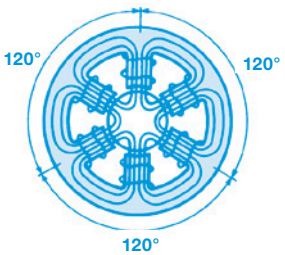


Figure 1.11b

a) Figure 1.11a shows a single-phase winding through which flow the current I, and the field H, generated by the current. The winding is composed of one pair of poles, the North Pole and the South Pole, the effects of which are added to produce field H. The magnetic flux passes through the rotor, across both poles and links up with itself by means of the stator core. When "I" is an alternating current, field H is established in the same way, so that its value is represented at every instant, by the same chart shown in figure 1.5b, also reversing its direction at every half cycle. The field H is pulsating, its intensity “varies” proportionally to the current, always in the same direction - North-South.

b) Figure 1.11b shows a three-phase winding consisting of three single-phase winding displaced 120º each other. If this winding is fed from a three-phase system, currents I_1, I_2 and I_3 will generate their own magnetic fields H_1, H_2 and H_3 in a similar way. The displacement between these fields is 120º; moreover, since they are proportional to the respective currents, the phase displacement in time between them will equally be 120º, which can be represented in a chart similar to figure 1.7. At any instant, the total resulting field H will be equal to the graphical sum of field H_1, H_2 and H_3.

Figure 1.12 shows this graphic sum for six successive steps

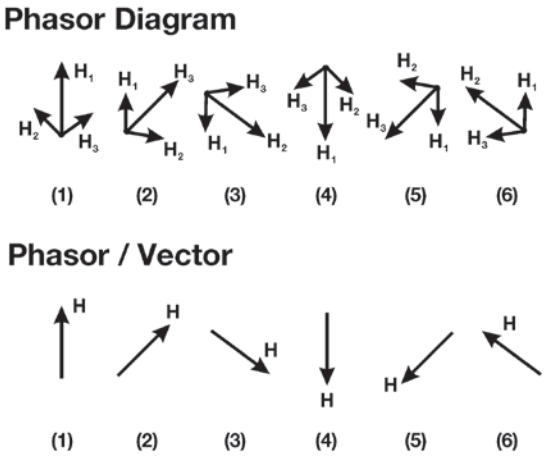


Figure 1.12

At instant (1), figure 1.12 shows that the field H_1 is at its maximum whereas fields H_2 and H_3 are negative and have the same value: 0.5. The resulting field (graphic sum) is shown in the upper part of figure 1.12 (1) and has the same direction as the winding of phase 1.

Repeating this procedure for the instants 2, 3, 4, 5 and 6 of figure 1.7 we can see that the resulting field H presents a constant intensity, but its direction keeps rotating to complete a whole turn at the end of a cycle.

We can, therefore, conclude that a three-phase winding fed from three-phase currents generates a "rotating field" as if one single pair of poles was present, rotating and fed with a constant current. This rotating field, generated by the three-phase stator winding, induces certain voltages into the rotor bars (magnetic flux lines go through the rotor bars) which, being short-circuited, generate currents and, as a consequence, create a field on the rotor with reverse polarity if compared with the rotating field polarity. Since opposite fields attract each other and considering the stator field (rotating field) is rotative, the rotor tends to follow the speed of this field. The result of this is that motor torque is created in the rotor that makes it rotate and then drive the load.

1.5.2 Synchronous Speed (ns)

The synchronous speed of the motor is defined by the rotation speed of the rotating field which depends on the number of poles (2p) of the motor and on the line frequency (f) in Hertz. The field makes a complete revolution at each cycle and “f” is the system frequency in cycles per second (Hertz). Winding may have more than one pair of poles which can be alternately distributed (one “North” and one “South”) along the circumference of the magnetic core. Since the rotating field runs through one pair of poles at each cycle and the winding has poles or “p” pair of poles, the speed of the field is:

$$n_s = \frac{60 \cdot f}{p} = \frac{120 \cdot f}{2\,p} \quad (\text{rpm})$$

Examples:

a) What is the synchronous speed of a six-pole motor, 50 Hz?

$$n_s = \frac{120 \cdot 50}{6} = 1000 \text{ rpm}$$

b) A twelve-pole motor, 60 Hz?

$$n_s = \frac{120 \cdot 60}{12} = 600 \text{ rpm}$$

It must be remembered that the number of poles of a motor must always be an even number in order to form pairs of poles. The table 1.3 shows the synchronous speed of the more common number of poles at 60 Hz and 50 Hz.

Number of poles	Synchronous speed per minute	
	60 Hertz	50 Hertz
II	3.600	3.000
IV	1.800	1.500
VI	1.200	1.000
VIII	900	750
X	720	600

Table 1.3 - Synchronous speed

For 2-pole motors, as in item 1.5.1, the field turns by one complete revolution at each cycle. Thus, electrical degrees are equivalent to mechanical degrees. For motors with more than 2 poles, a smaller “geometrical” revolution is realized by the field.

For example:
For a 6-pole motor, we will have, in a complete cycle, a field revolution of 360º x 2/6 = 120 geometrical degrees. This is equivalent to 1/3 of the speed in 2 poles. We conclude, then, that:

Geometrical degrees = Mechanical degrees x p

1.5.3 Slip (s)

If the motor runs at a speed different from the synchronous speed, i.e. differing from the speed of the rotating field, the rotor winding “cut” the magnetic force lines of the field and so, according to the electromagnetism laws, induced currents will flow through the rotor winding. The heavier the load the higher must be the required torque to move it.

To obtain a higher torque, the speed difference must be greater so that induced current and the generated field becomes higher. Therefore, as the load increases, the motor speed decreases. When the load is at zero (motor at no-load) the rotor practically rotates at its synchronous speed.

The difference between motor speed (n) and synchronous speed (ns) is called slip (s), expressed as rpm or fraction of the synchronous speed or as a percentage of the synchronous speed:

$$s\,(rpm) = n_s - n\,; \qquad s = \frac{n_s - n}{n_s}; \qquad s\,(\%) = \frac{n_s - n}{n_s} \cdot 100$$

Therefore, for a given slip s (%), the motor speed will be:

$$n = n_s \cdot \left(1 - \frac{s\,(\%)}{100}\right)$$

Example:
What is the slip of a 6-pole motor when the speed is 960 rpm?

$$s\,(\%) = \frac{1000 - 960}{1000} \cdot 100$$

$$s\,(\%) = 4\%$$

1.5.4 Rated Speed

Rated speed is the motor speed (rpm) operating at rated power, at rated voltage and frequency. As described in item 1.5.3, it depends on the slip and on the synchronous speed.

$$n = n_s \cdot \left(1 - \frac{s\,\%}{100}\right) \quad rpm$$

1.6 Insulation Materials and Insulation Systems

Considering that an induction motor is a simple designed and rugged construction machine, its lifetime will exclusively depend on the quality level of the insulation materials. Motor insulation is affected by several factors including moisture, vibration, corrosive environments, and others. Among all these factors, the operating temperature of the insulating materials is the most critical.

The motor lifetime is reduced by half when subject 8% to 10 ºC in operation above the rated temperature of the class of insulating material. To ensure a longer lifetime for the electric motor, the use of thermal sensors is recommended for the winding protection.

When we refer to motor lifetime reduction, we do not refer specifically to excessively high temperatures resulting in sudden insulation burn out. Insulation lifetime (in terms of operating temperature much below the one affecting the insulation) refers to permanent aging of the insulation material which becomes dry and loses its insulation properties. As a result, it will not withstand the voltage applied to it, thus causing short-circuit.

Experience shows that the insulation has a practically unlimited duration, if its temperature is kept below the limit of its thermal class. Any increasing value above such a limit will reduce the insulation lifetime proportionally. Such a limit of temperature is much lower than the temperature that causes insulation burnout and it depends on the type of used material. This limit of temperature refers to insulation's hottest spot and not necessarily to the whole insulation. On the other hand, a single weak spot in the insulation is enough to damage the winding completely.

With the increasing use of frequency inverters for the speed control of induction motors, other application criteria must also be considered for the preservation of the insulation system. For more details see “Influence of the frequency inverter on the motor insulation”.

1.6.1 Insulation Material

The insulation material prevents, limits and directs the electric current flux. Although the insulating material is primarily intended to block the current flux from a cable to the ground or to the lowest potential, it also serves to provide mechanical support, protect the cable from degradation caused by the environment's influences and to transfer the heat to the external environment.

Based on system requirements, gases, liquids, and solid materials are used to insulate electric equipment. Insulation systems affect the quality of the equipment, and the type and quality of the insulation affect the cost, weight, performance and useful lifetime.

1.6.2 Insulation System

A combination of two or more insulation materials applied to an electric equipment is designated insulation system. This combination on an electric motor consists in magnet wire, insulation of the slot, insulation of the slot closing, face to face insulation, varnish and/or impregnation resin, insulation of the connection leads and welding insulation. Any material or component that is not in contact with the coil is not considered as part of the insulation system.

1.6.3 Thermal Classes

Since the temperature of electro-mechanical products is basically the predominant factor for the aging of the insulation material and insulation system, certain basic thermal classifications are recognized and applied all over the world.

Insulation materials and insulation system are classified based on the resistance to temperature for a long period of time. The standards listed below refers to the classification of materials and insulation systems:

Material	Systems	Material and System
UL 746B	UL 1446	IEC 60085
IEC 60216	UL 1561 / 1562	
	IEC 60505	
	IEEE 117	

Table 1.4 - Standards for materials and insulation system

The thermal classes defined for the materials and insulation systems are the following:

	Temperature Class	
Temperature (°C)	IEC 60085	UL 1446
90	Y (90 °C)	-
105	A (105 °C)	-
120	E (120 °C)	120 (E)
130	B (130 °C)	130 (B)
155	F (155 °C)	155 (F)
180	H (180 °C)	180 (H)
200	N (200 °C)	200 (N)
220	R (220 °C)	220 (R)
240	-	240 (S)
above 240°C	-	above 240 (C)
250	250	

Table 1.5 - Thermal classes

IEC - International Electrotechnical Commission - nongovernmental organization for standards in the related electrical, electronic and technology areas.
UL - Underwriters Laboratories - American product certification body.

It is understood that the thermal class represents the maximum temperature that the electromechanical equipment can reach on its hottest spot when operating at rated load without reducing its lifetime. The thermal classification of a material or system is based on a comparison with well-known reference systems or materials. However, for those cases where there is not any reference material, the thermal class can be obtained by exploiting the damage curve (Arhenius Graphic) for a certain time period (IEC 216 specifies 20,000/hours).

1.6.4 Insulating Materials in Insulation Systems

The specification of a product within a certain thermal class does not mean that each insulating material used has the same thermal capacity (thermal class). The temperature limit for an insulation system can not be directly related to the thermal capacity of the individual materials in this system. In a system the thermal performance of a material can be improved by protective characteristics of certain material used with this material. For example: a 155 °C class material can have its performance improved when the set is impregnated with varnish for class 180 °C.

1.6.5 WEG Insulation System

In order to meet different market requirements and specific applications, associated to an excellent technical performance, nine insulation systems are used for WEG motors.

The round enameled wire is one of the most important components used in the motor since the electric current flows through it and creates the magnetic field required for motor operation. During the production process, the wires are submitted to mechanical traction efforts, flexion and abrasion electrical effects that also affect the wire insulating material. During the operation, the thermal and electrical effects act on the wire insulation material. For this reasons, the wire requires an outstanding mechanical, thermal and electrical insulation resistance.
The enamel used currently on the wire ensures such properties, where the mechanical property is assured by the outside enamel coat that resists to abrasion effects while inserting it into the stator slots. The internal enamel coat ensures high dielectric resistance and the set provides thermal class 200 °C to the wire (UL File E234451). This wire is used for all Class B, F and H motors. Smoke Extraction Motors are built with special wire for extremely high temperatures.

Films and laminated insulating materials are intended to isolate thermally and electrically all motor winding parts. The thermal class is indicated on the motor nameplate. These films are aramid and polyester based films and also laminated films are applied to the following areas:

- between the coils and the slot (slot bottom film) to insulate the lamination core (ground) from the enameled wire coil;
- between phases: to isolate electrically one phase from the other phase
- Closing of the stator slot to insulate electrically that coil placed on the top of the stator and for mechanical purposes so as to keep the wires inside the stator slot.

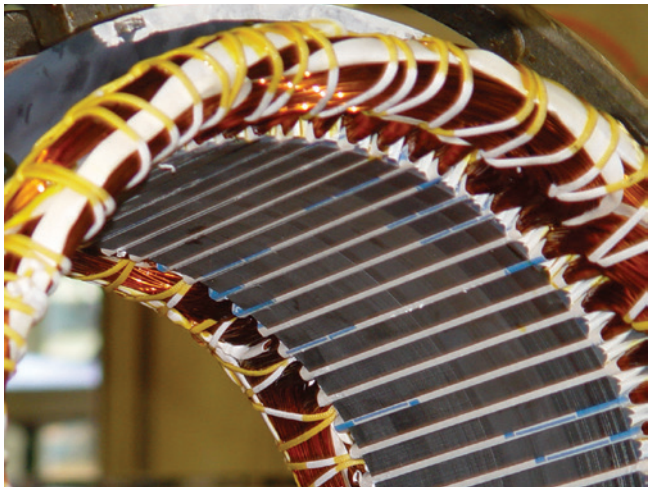


Figure 1.12a - Wires and films used on the stator

The impregnation varnishes and resins are mainly intended to maintain all enameled wire coil as a block with all stator components through agglutination of such materials and to fill all voids inside the slot.
This agglutination avoids vibration and friction between the wires. Such friction could cause failures on the wire enamel, then resulting in a short-circuit.
The agglutination (filling of voids) also helps the heat dissipation generated by the wire and mainly, when motors are fed by frequency inverter, prevents/reduces the formation of partial discharges (corona effect) inside the motor.

Two types of varnishes and two types of impregnation varnishes are currently used; all of them are polyester varnishes so as to meet motor construction and application requirements. Silicon resin is only used for special motors designed for very high temperatures.

Varnishes and resins usually improve thermal and electrical characteristics of the impregnated materials in such a way to classify these impregnated materials in higher thermal class if compared to the same materials without impregnation.

The varnishes are applied by the immersion impregnation process and then oven-dried. Solventless resins are applied by the continuous flow process.

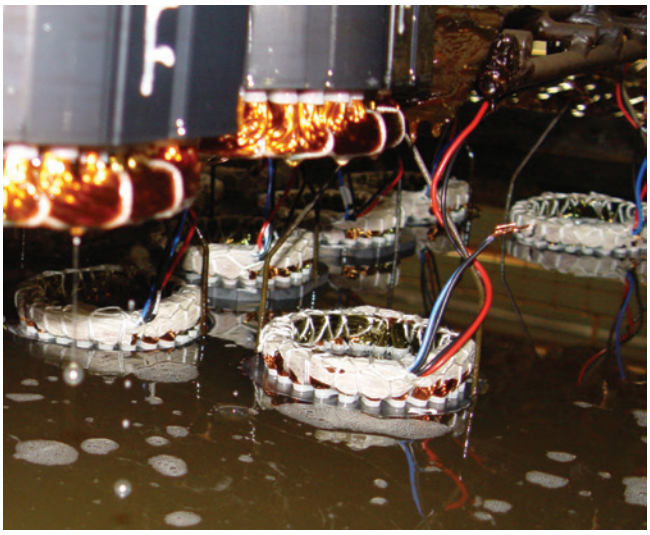


Figure 1.12.b - Immersion impregnation process

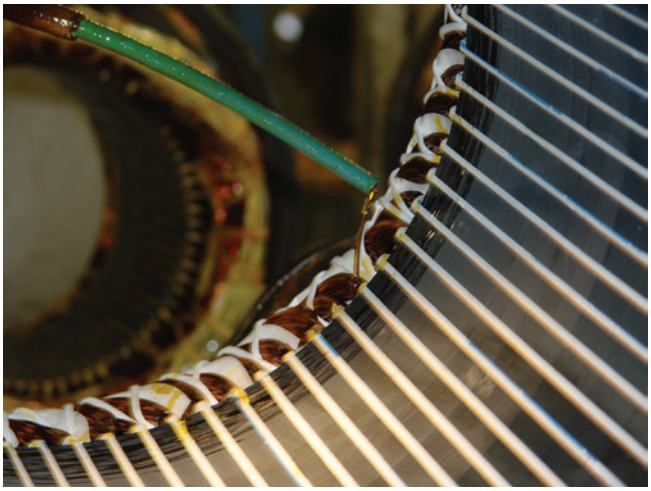


Figure 1.12.c - Resin applied by continuous flow process

The connection leads consist of elastomeric insulation materials that have the same thermal class as the motor. These materials are exclusively used to insulate electrically the lead from the external environment. They have high electric resistance and proper flexibility to allow easy handling during manufacturing process, installation and motor maintenance.

For certain applications, such as submersible pumps, the leads must be chemically resistant to the oil of the pump. The flexible pipes are intended to cover and insulate electrically the welded connections between the coils wires and the leads and the connections between wires. They are flexible to allow them to get shaped to welding points and to the coil head tying. Three types of pipes are currently used:

- Heat-shrink polyester tubing - Class of 130 ºC
- Polyester tube coated with acrylic resin - Class of 155 ºC
- Fiberglass tube coated with silicon rubber - Class of 180 ºC

2. Power Supply Characteristics

2.1 Power Supply System

The power supply system can be single or three-phase. Single-phase system is mostly used in homes, commercial centers, farms, while three-phase system is used in industries. Both operate at 60 Hz or 50 Hz.

2.1.1 Three-Phase System

The three-phase voltages mostly used in industries are:

- Low voltage: 220 V, 380 V and 440 V
- High voltage: 2.300 V, 4.160 V and 6.600 V

The star connected three-phase low voltage system consists of three-phase leads (L_1, L_2, L_3) and a neutral conductor (N). The last one is connected to the generator star point or to the transformer secondary winding (as shown in figure Figure 2.1).

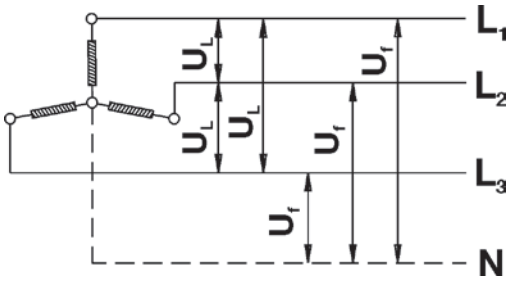


Figure 2.1 - Three-phase system

2.1.2 Single-Phase System

Single phase motors are connected to two phases (U_L line voltage) or to one phase and to neutral conductor (U_f phase voltage). So the single-phase motor rated voltage must be equal to U_L or U_f system voltage. When several single-phase motors are connected to a three-phase system (formed by 3 single-phase systems), care must be taken in order to distribute them uniformly so as to avoid unbalance between phases.

Single wire earth return (SWER)

The single-phase earth return (SWER) is an electric system where the ground lead operates as return lead for the load current. This is applied as solution for the use of single-phase motors from power supply not having neutral available. Depending on the available electric system and on the characteristics of the soil where it will be installed (usually on farm power supply), we have:

a) Single cable system

The single wire earth return (SWER) system is considered the practical and economical option. However, it can be used only where the origin substation outlet is star grounded.

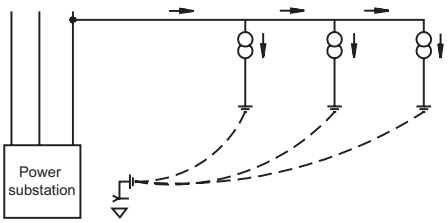


Figure 2.2 - Single cable system

b) Single cable system with insulation transformer

Besides requiring a transformer, this system has a few disadvantages such as:

- Link power limitation to isolation transformer rated power;
- The grounding system of the isolation transformer must be reinforced. Lack of this will result in absence of energy to the whole link.

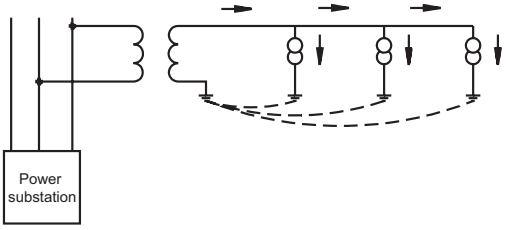


Figure 2.3 - Single cable system with insulation transformer

c) Single wire earth return (SWER) system with partial neutral

It is applied as a solution of the use of single wire earth return (SWER) system in regions with land (soil) of high resistivity when it is difficult to get ground resistance values of the transformer within the maximum design limits.

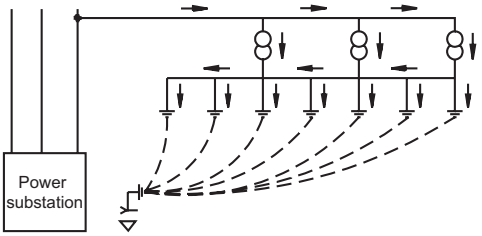


Figure 2.4 - Single wire earth return system with partial neutral

3. Characteristics of the Electric Motor Power Supply

3.1 Rated Voltage

This is the line voltage for which the motor has been designed.

3.1.1 Multiple Rated Voltage

Motors are generally supplied with sufficient terminals to enable alternative connections. This means that they can operate on at least two different voltages. The main types of alternative terminal connections are:

a) Series-parallel connection

The winding of each phase is divided into two equal parts (halves) (please consider that the number of poles is always a multiple of two, so this type of connection is always possible).

- By connecting the two halves in series, each half will have a voltage to the half rated phase voltage of the motor;
- By connecting the two halves in parallel, the motor can be supplied with a voltage equal to one half of the previous voltage, without affecting the voltage applied to each coil. (refer to examples given in figures 3.1a and b).

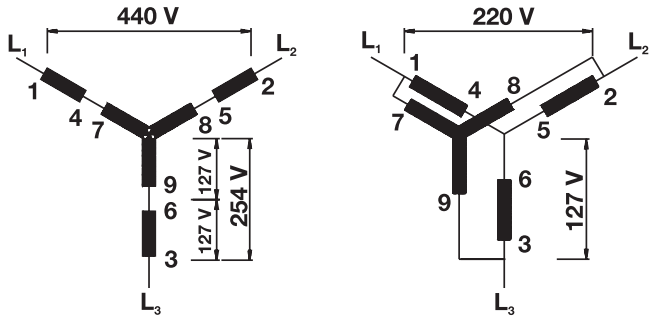


Figure 3.1a - Series-parallel connection Y

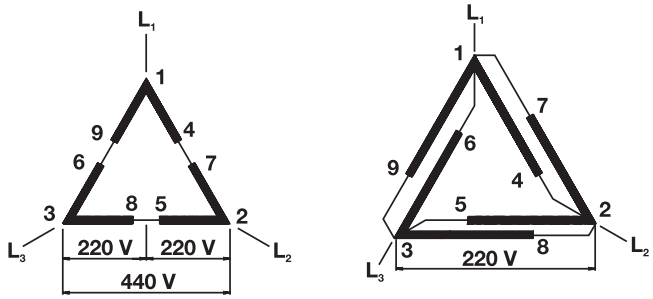


Figure 3.1b - Series-parallel connection Δ

This type of connection requires nine terminals on the motor. The most common dual voltage system is 220/440 V, i. e. the motor is parallel connected when supplied for 220 V, or alternatively, it is series connected when supplied for 440 V. Fig. 3.1a and 3.1b show normal terminal numbering, as well as connection diagrams for this type of motor - both for star or delta connected motors. The same diagrams apply to any other two voltages, provided that one is the double of the other, e.g. 230/460 V.

b) Star-Delta connection

Two ends of each phase winding are brought out to terminals. By connecting the three phases in delta, each phase receives total line voltage, e.g. 220 volts (Fig. 3.2). By connecting the three phases in star, the motor can be connected to a line voltage of 220 x $\sqrt{3}$ = 380 V. The winding voltage remains at 220 volts per phase.

$$U_f = U \sqrt{3}$$

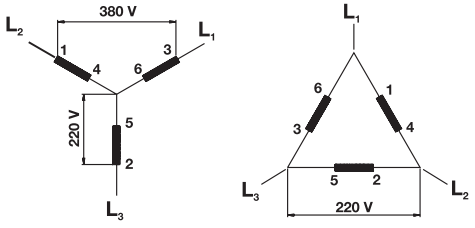


Figure 3.2 - Star-delta connection Y - Δ

This type of connection requires six terminals on the motor and is suitable for any dual voltage provided that the second voltage be equal to the first voltage multiplied by $\sqrt{3}$).

Examples: 220/380 V - 380/660 V - 440/760 V
In the example 440/760 V, the stated higher voltage is used to indicate that the motor can be driven by star-delta switch.

c) Triple rated voltage

The two previous alternative connection arrangements can be obtained in one motor if the winding of each phase is divided into two halves enabling series-parallel connection. All terminals have to be accessible so that the three phases can be connected in star or delta. This means that there can be four alternatives for rated voltage:

1) Parallel-delta connection;
2) Star-parallel connection, being the rated voltage equal to $\sqrt{3}$ x the first one;
3) Series-delta connection, i. e. the rated voltage being twice the value of the first one;
4) Series-star connection, the rated voltage is equal to $\sqrt{3}$ x the third one. However as this voltage would be higher the 690 V, it is only indicated as reference for star-delta connection.

Example: 220/380/440(760) V
Note: 760 V (only for starting)
This type of connection requires twelve terminals and Fig. 2.7 shows the normal numbering on the terminals as well as the connection diagram for the three rated voltages.

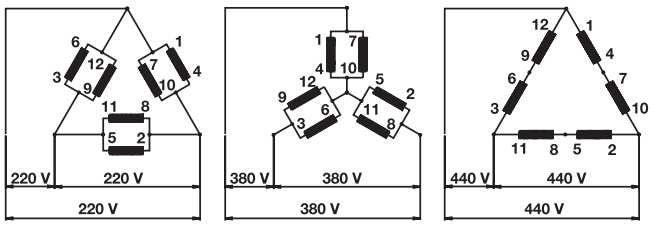


Figure 3.3

3.2 Rated Frequency (Hz)

This is the network frequency for which the motor has been designed.

3.2.1 Connection to Different Frequencies

Three-phase motors wound for 50 Hz can also be connected to a 60 Hz network,

a) By connecting a 50 Hz motor, of the same voltage, to a 60 Hz network, the motor performance will be as follows:

- same output;
- same rated current;
- starting current decreases 17%;
- starting torque decreases 17%;
- breakdown torque decreases 17%;
- rated speed increases 20%.

Note: please consider the required outputs for motors that drive machines with variable torque and speed.

b) If voltage changes proportionally to frequency, the performance will be:

- motor output increase 20%;
- rated current is the same;
- starting current will be approximately the same;
- starting torque will be approximately the same;
- breakdown torque will be approximately the same;
- rated speed increases 20%.

3.3 Voltage and Frequency Variation Tolerance

As per standard IEC 60034-1, for induction motors, the combinations of voltage and frequency variations are classified as Zone A or Zone B (figure 3.4).

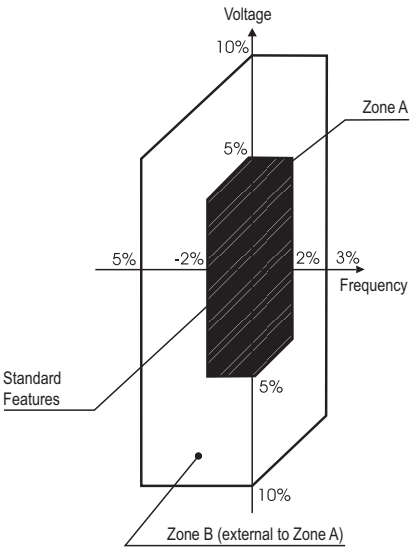


Figure 3.4 - Limits of voltage and frequency variations under operation

A motor must be capable of performing its main function continuously at Zone A, however it may not develop completely its performance characteristics at rated voltage and frequency (see rated characteristics point in figure 3.4.a) showing few deviations. Temperature rises can be higher than those at rated voltage and frequency.

A motor must be capable of performing its main function at Zone B, however it may present higher deviations than those of Zone A in reference to performance characteristics at rated voltage and frequency. Temperature rises can be higher than those at rated voltage and frequency and probably higher than those of Zone A. The extended operation at Zone B is not recommended.

Source: ABNT NBR 17094 (2008)

3.4 Three-Phase Motor Starting Current Limitation

Whenever possible a squirrel cage three-phase motor should be started direct online (D.O.L.) by means of contactors.
It must be taken into account that for a certain motor the torque and current values are fixed, irrespective the load, for a constant voltage. In cases where the motor starting current is excessively high, harmful consequences may occur:

a) High voltage drop in the power supply system. Due to that, equipment connected to the system may be affected;
b) The protection system (cables, contactors) must be overdesigned resulting in higher cost;
c) Utilities regulations limiting the line voltage drop.

If D.O.L starting is not possible due to these problems, indirect connection system can be used so as to reduce starting current

- Star-delta switch
- Compensating switch
- Series-parallel switch
- Electronic start (Soft-Starter)

3.4.1 D.O.L Starting

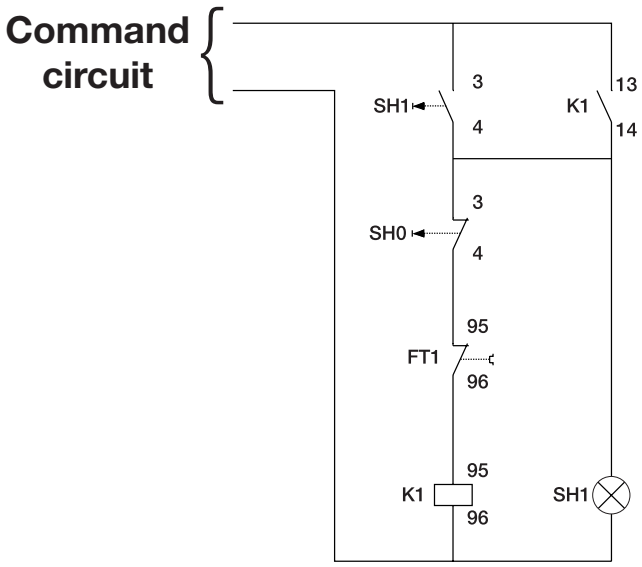


Figure 3.5 - Command circuit - direct starting

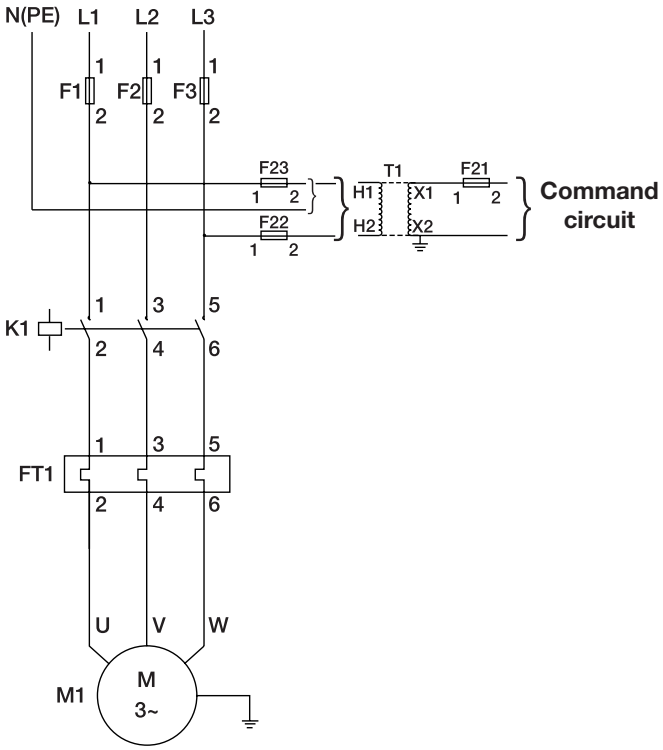


Figure 3.6 - Power circuit - direct starting

F1. F2. F3 - *Power fuses*
F21. F22. F23 - *Control fuses*
T1 - *Control transformer*
K1 - *Contactors*
FT1 - *Overload relay*
SH1 - *Control button*
KT1 - *Time relay*
M1 - *Motor*

Optional accessories
- Phase fault relay
- Minimum/maximum voltage relay
- Ammeter
- Voltmeter
- Ohmmeter

3.4.2 Starting with Star-Delta Switch (Y - Δ)

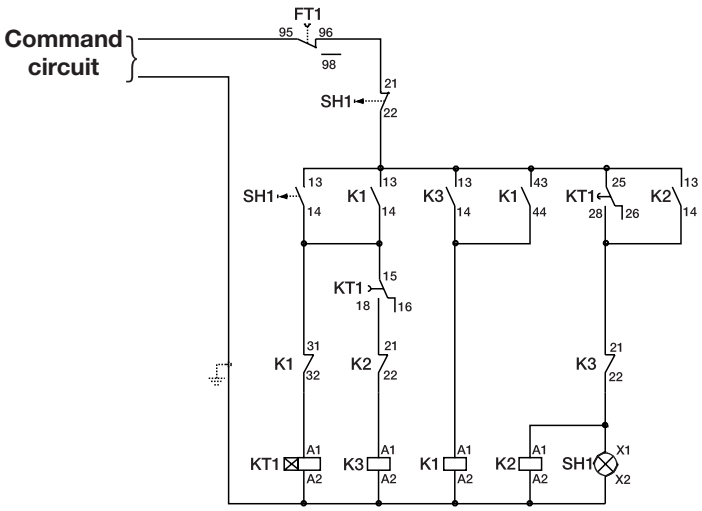


Figure 3.7 - Command circuit - starting with star-delta switch

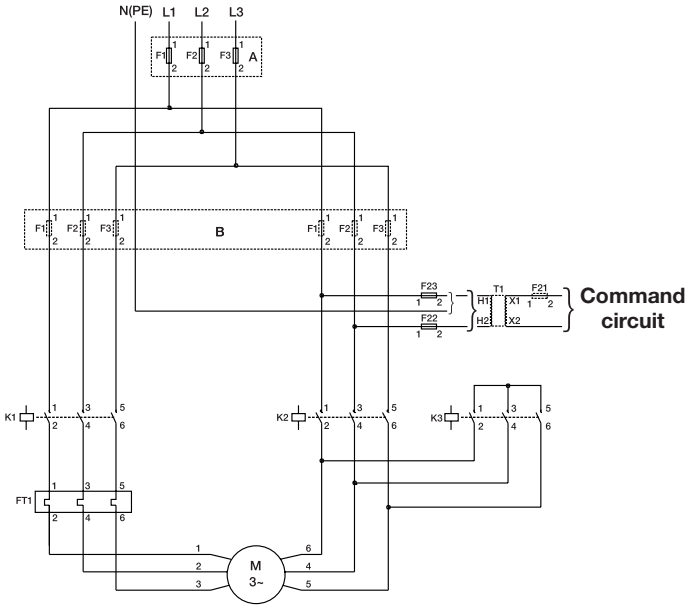


Figure 3.8 - Power circuit - starting with star-delta switch

Note: for outputs up to 75 HP (220 V), 125 HP (380 V) and 175 HP (440 V) You must use connection "A" (protection by 3 fuses). For higher outputs you must use the connection "B" (protection by 6 fuses), where the fuse set F1, F2, F3 is equal to the fuse set F4, F5, F6.

F1. F2. F3 - *Power fuse*
(F1. F2. F3 and F4. F5. F6) - *Power fuse*
F21. F22. F23 - *Control fuse*
T1 - *Control transformer*
K1. K2. K3 - *Contactors*
FT1 - *Overload relay*
SH1 - *Control button*
KT1 - *Time relay*
M1 - *Motor*

Optional accessories
- Phase fault relay
- Minimum/maximum voltage relay
- Ammeter
- Voltmeter
- Ohmmeter

When starting by the Star-Delta method it is essential that the motor windings are suitable for operating on a dual voltage, e.g. 220/380 V, 380/660 V or 440/760 V. Motors must have at least six connection terminals. Star-Delta starting can be used if the torque is high enough to ensure the machine acceleration with reduced current. When star-connected, the current is reduced to 25-33% of the starting current reached when Delta connected.

The resistive load torque can not exceed the motor starting torque (figure 3.9) and during the delta commutation process the achieved values can not exceed the allowed one.
On the other hand, there are cases where this staring method can not be used, as shown in figure 3.10.

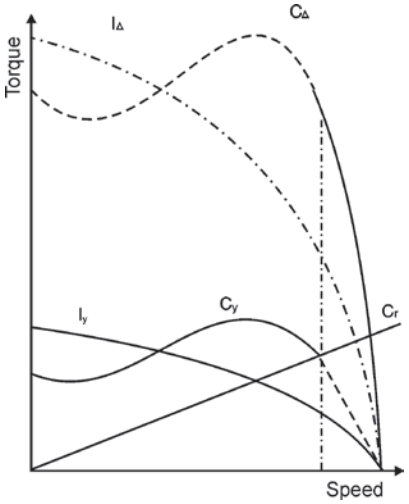


Figure 3.9 - Current and torque for star-delta starting of a squirrel cage motor driving a load with resistive torque C_r

I_Δ - *current in delta*
I_y - *current in star*
C_y - *torque in star*
C_Δ - *torque in delta*
C_r - *resistive torque*

Figure 3.11 shows a high resistive torque Cr.
If the motor is started in star connection it will accelerate the load up to approximately 85% of the rated speed. At this point the starter must be switched to delta. In this example, the current (which is close to its rated value - e.g. 100%) jumps suddenly to 320% which is of no advantage since the starting current was only 190%.

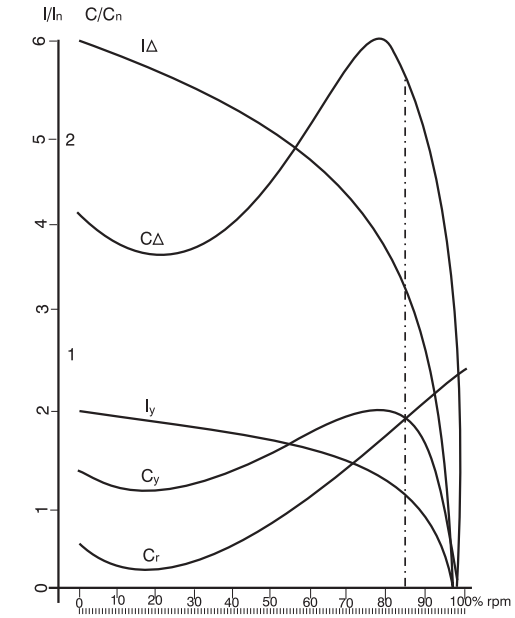


Figure 3.10

Fig. 3.11 shows a motor with the same characteristics, however, the resistive torque CR is much lower. When connected to Y the motor accelerates the load up to 95% of the rated speed. When the starter is switched to Δ, the current, which was approximately 50%, increases to 170%, i. e., practically equal to the starting current in Y.
In this case, the star-delta connection has some advantages, because if it was D.O.L. connected, it would absorb 600% of the rated current. The Star-Delta starter can only be used for starting machines at no loads. In the case of starting at no load, the load can only be applied after the motor has reached 90% of its rated speed. The commutation point from star to delta connection must be determined carefully in order to ensure that this starting method is effectively advantageous in cases where D.O.L starting is not possible.
For triple rated voltage motors (220/380/440/760 V, connection must be at 220/380 V or 440/760 V, depending on the power supply.

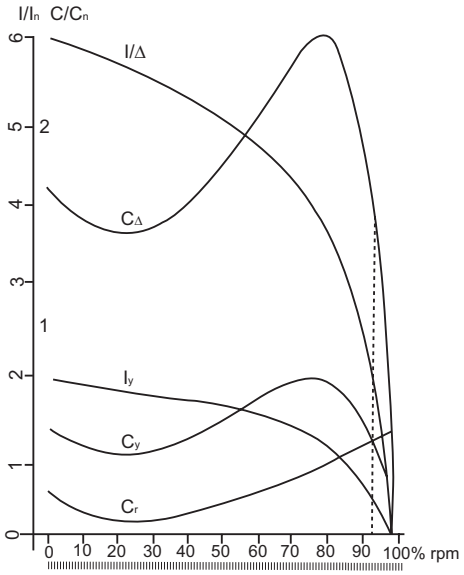


Figure 3.11

I_Δ - *current in delta*
I_y - *current in star*
C_Δ - *torque in delta*
C_y - *torque in star*
C/C_n - *ratio between motor torque and rated torque*
I/I_n - *ratio between motor current and rated current*
C_r - *resistive torque*

Figure 3.12 shows how to connect a motor for Star-Delta starting on a 220 V power supply and indicates that voltage per phase is reduced to 127 V during starting.

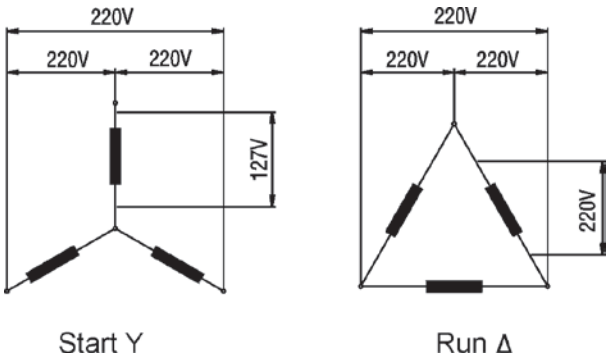


Figure 3.12

3.4.3 Compensating Switch (Autotransformer)

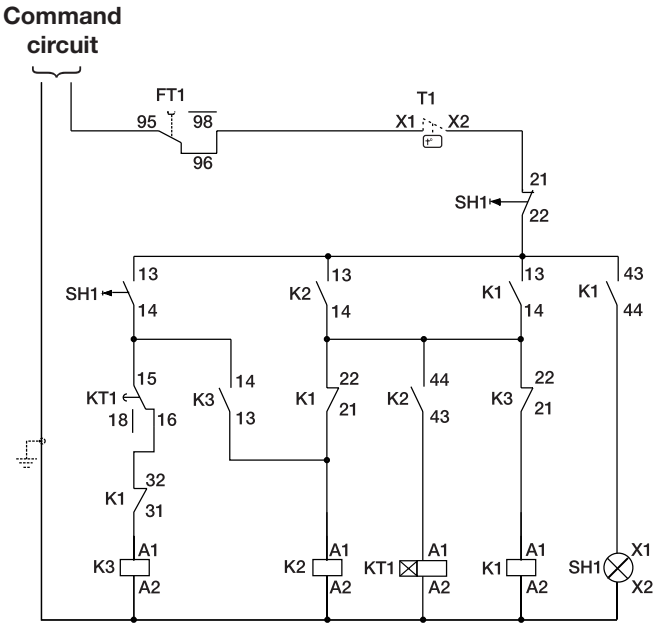


Figure 3.13 - Control circuit - starting by compensating switch

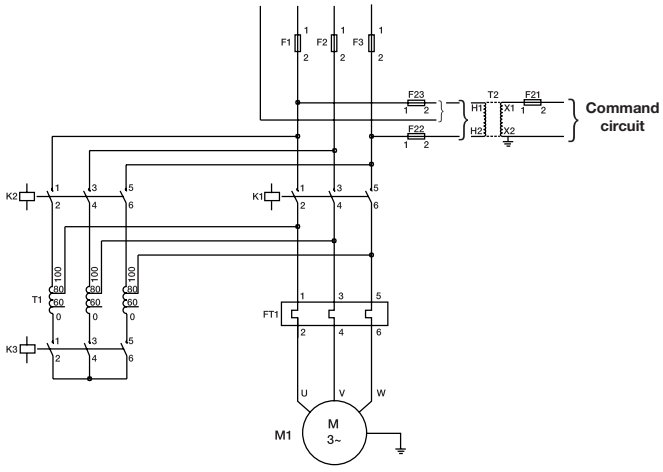


Figure 3.14 - Power circuit - starting by compensating switch

F1. F2. F3 - *Power fuses*
(F1. F2. F3 e F4. F5. F6) - *Power fuses*
F21. F22. F23 - *Control fuses*
T1 - *Control transformer*
K1. K2. K3 e K4 - *Contactors*
1FT1 e 2FT1 - *Overload relay*
SH1 - *Control button*
KT1 - *Time relay*
M1 - *Motor*

Optional accessories
- Phase fault relay
- Minimum/maximum voltage relay
- Ammeter
- Voltmeter
- Ohmmeter

The compensating switch can be used to start motors under load. This switch reduces the staring current preventing overload on the circuit, however ensures that the motor has sufficient torque to star and accelerate the load.
The voltage on the compensating switch is reduced by the autotransformer which has taps of 50%, 65% and 80% of the rated voltage.

For motor starting with voltage below the rated one, starting current and torque must be multiplied by factor K_1 (current multiplying factor) and K_2 (torque multiplying factors) obtained on the chart of figure 3.15.

Example: for 85% of the rated voltage

$$\left(\frac{I_p}{I_n}\right) 85\% = K_1.\left(\frac{I_p}{I_n}\right) 100\% = 0.8 \left(\frac{I_p}{I_n}\right) 100\%$$

$$\left(\frac{C_p}{C_n}\right) 85\% = K_2.\left(\frac{C_p}{C_n}\right) 100\% = 0.66 \left(\frac{C_p}{C_n}\right) 100\%$$

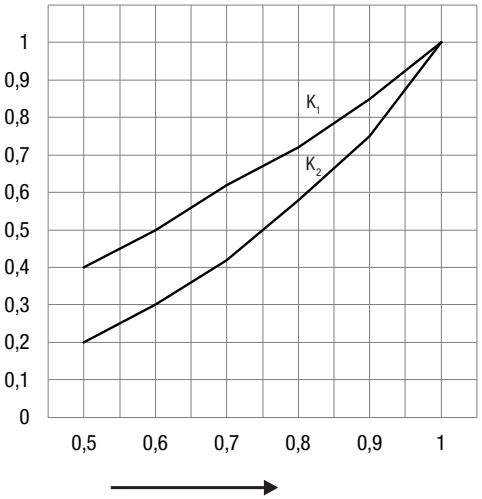


Figure 3.15 - K_1 and K_2 reduction factors as function of the motor and power supply U_m /U_n ratios

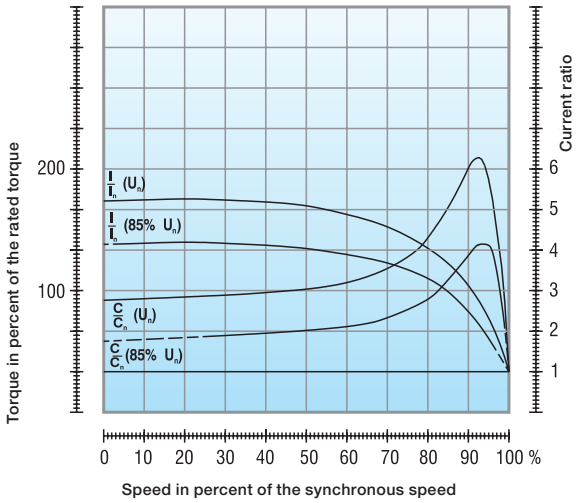


Figure 3.16 - Example performance characteristics of a 425 HP, VI pole motor when starting with 85% of the rated voltage.

3.4.4 Comparing Star-Delta Starters and "Automatic" Autotransformers

1) Star-delta (automatic)
Advantages

a) Star-Delta starters are widely used due to their relatively low price.
b) There are no limits to the number of times they can be operated.
c) The components require very little space.
d) The starting current is reduced to approximately one-third.

Disadvantages

a) The starter can only be applied to motors where the six leads or terminals can be accessed.
b) The supply voltage must be the same as the rated motor voltage for Delta connection.
c) Because the starting current is reduced to approximately one-third of the rated current, the starting torque is also reduced to one-third.
d) If the motor does not reach at least 90% of its rated speed at the time of switching from Star to Delta the current peak will be as high as in a D.O.L. start, thus causing harmful effects to the contacts of the contactors and the connection system brings no advantage to the electrical system.

2) Auto-transformer (automatic)
Advantages:

a) On the 65% tapping the line current is approximately equal tp that of a Star-Delta starter, however, at the time of switching from reduced voltage to the full supply voltage, the motor is not disconnected so that the second peak is very much reduced since the transformer is converted into reactance for a short time.
b) It is possible to vary the tapping from 65% to 80% or even up to 90% of the supply voltage in order to ensure that the motor starts satisfactorily.

Disadvantages:

a) One of its great disadvantages is the limitation of its operation frequency. It is always necessary to know the operation frequency in order to determine a suitably rated auto-transformer.
b) The compensating switch is much more expensive than a Star-Delta starter due to the auto-transformer.
c) Due to the size of the auto-transformer starter, much larger control panels are required which increases the price.

3.4.5 Series-Parallel Starting

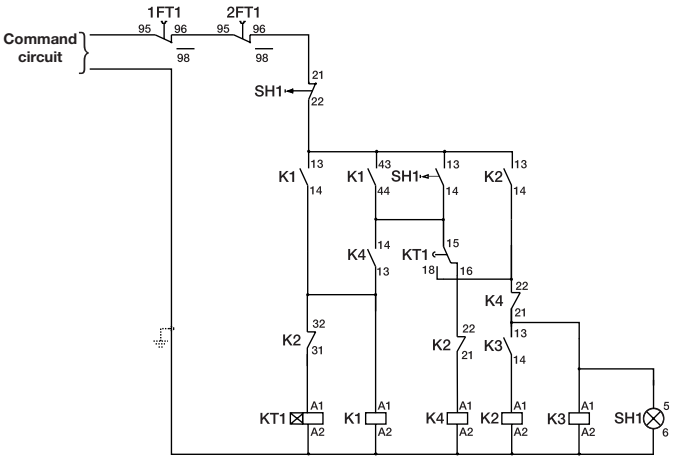


Figure 3.17 - Control circuit - series-parallel starter

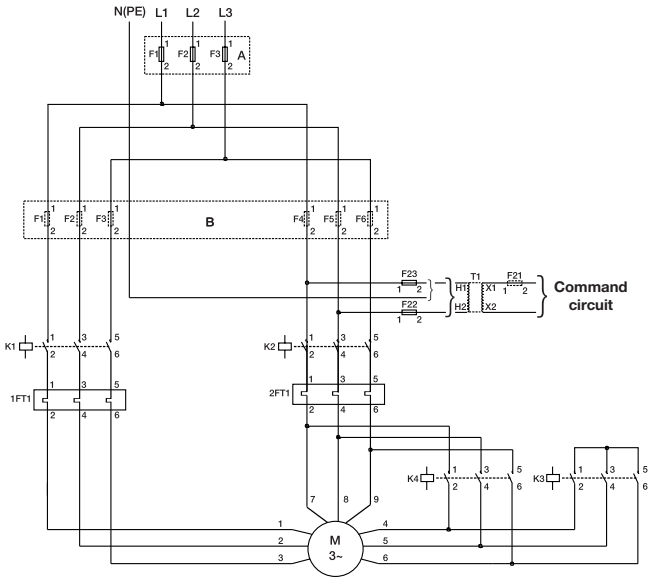


Figure 3.18 - Power circuit - series-parallel starter

F1. F2. F3 - *Power fuses*
F21. F22. F23 - *Control fuses*
T2 - *Control transformer*
K1. K2. K3 - *Contactors*
FT1 - *Overload relay*
T1 - *Autotransformer*
SH1 - *Command button*
KT1 - *Time relay*
M1 - *Motor*

Optional accessories
- Phase fault relay
- Minimum/maximum voltage relay
- Ammeter
- Voltmeter
- Ohmmeter

The series-parallel connection requires the motor to be designed for two rated voltages, the lowest one is equal to the power supply voltage and the other is two times higher.

For this starting method the most common voltage is 220/440 V, i. e., on starting the motor is series connected until it reaches its rated speed and then it is switched to parallel connection.

3.4.6 Electronic Start (Soft-Starter)

New discoveries in electronics have allowed the creation of the solid state starters consisting of a set of pairs of thyristors (SCR) or (combination of thyristors / diodes), one on each motor power terminals.

The trigger angle of each pair of thyristors is controlled electronically for applying a variable voltage to the motor terminals during the “acceleration”. At the end of the start period, adjustable typically between 2 and 30 seconds, the voltage reaches its rated value with a smooth acceleration ramp instead of being submitted to increments or sudden peaks. Applying such starting method the starting current (line current) remains close to the rated current with only smooth variation. Besides the advantage of the voltage (current) control during the start, the electronic switch also has the advantage of not having movable parts or parts that generate electric arcs as the mechanical switches. This is one of the strengths of the electronic switches, since their lifetime becomes longer.

Motor voltage	Operating voltage	Star-Delta Starter	Autotransformer Starter	Series-Parallel Starter	Soft-Starter
220/380 V	220 V 380 V	Yes Não	Yes Yes	No No	Yes Yes
220/440 V	220 V 440 V	No No	Yes Yes	Yes No	Yes Yes
380/660 V	380 V	Yes	Yes	No	Yes
220/380/ 440 V	220 V 380 V 440 V	Yes No Yes	Yes Yes Yes	Yes Yes No	Yes Yes Yes

Table 3.1 - Starting methods x Motors

3.5 Direction of Rotation of Three-Phase Induction Motors

Depending on the electric connection configuration, a three-phase induction motor can operate at any direction of rotation. The direction of rotation can be reversed by exchanging the position of two of the connecting leads. WEG motors are supplied with bi-directional fans unless only one direction of rotation is informed on the data sheet or on additional nameplates. In general the motor allow the operation at any direction of rotation without affecting the motor cooling. Motors without fan, but ventilated by the own load (the fan is the load) must meet the cooling requirements of the motor, independent of the direction of rotation. In case of doubt, contact WEG

4. Acceleration Characteristics

4.1 Torque

4.1.1 Torque X Speed Curve

Definition

The induction motor has zero torque at synchronous speed. As the load increases, the motor speed will decrease gradually until the torque reaches the maximum value which the motor is capable of developing at normal speed. If the load torque continues to increase, the motor speed will suddenly decrease and may even lock the rotor. By graphically representing the torque variation with the speed for a normal motor, we obtain a curve as shown in Figure 4.1.

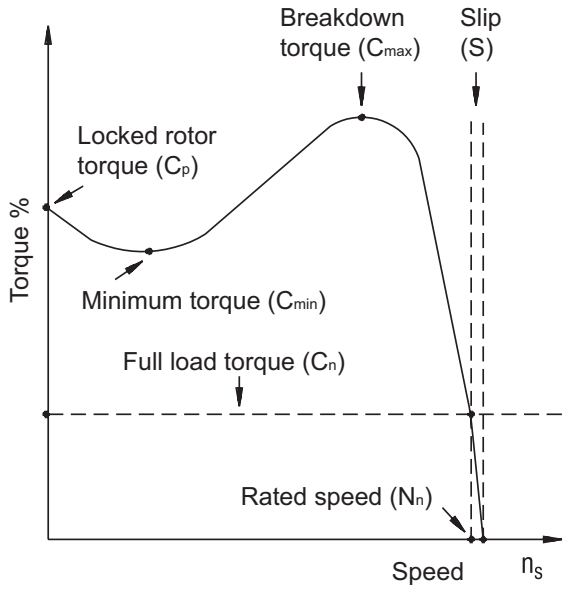


Figure 4.1 - Torque x speed curve

Figure 4.1 highlights and defines some important points. The torque values relative to these points are specified in the standard IEC 60034-1, as shown below:

C_o: **basic torque** - This is the calculated torque relating to the rated output and synchronous speed.

$$C_o\,(Kgfm) = \frac{716 \cdot P\,(cv)}{n_s\,(rpm)} = \frac{974 \cdot P\,(kW)}{n_s\,(rpm)}$$

$$C_o\,(Nm) = \frac{7024 \cdot P\,(cv)}{n_s\,(rpm)} = \frac{9555 \cdot P\,(kW)}{n_s\,(rpm)}$$

C_n: **rated torque or full load torque** - This is the torque developed by the motor at the rated output at rated voltage and frequency.

C_p: **locked rotor torque or starting torque, also called breakaway torque** - this is the minimum torque developed by the locked rotor for different angular positions of the rotor at rated voltage and frequency.

This torque can be indicated in Nm or more frequently as percentage of the rated torque.

$$C_p\,(\%) = \frac{C_p\,(Nm)}{C_n\,(Nm)} \cdot 100$$

In practice, the locked rotor torque should be as high as possible to enable the rotor to overcome the initial load inertia, and quickly accelerate it, especially when started with reduced voltage.

C_{min}: minimum torque or pull up torque: - This is the smallest torque developed by the motor when accelerating from rest or zero speed to the speed corresponding to maximum torque. In practice this value must not be very low, i.e. the speed torque curve should not have a strong depression during acceleration otherwise starting time is too long, resulting in overheating of the motor, especially in cases of high inertia, or starting on reduced voltage.

$C_{máx}$: maximum torque or breakdown torque - This is the maximum torque developed by the motor at rated voltage and frequency, without an abrupt drop in speed.
In practice maximum torque must be as high as possible for two reasons:

1) The motor must be able to easily overcome loading peaks which can occasionally occur with crushers, calandering machines, mixers, etc.
2) The motor speed should not oscillate, i. e., the speed should not drop abruptly when momentary and excessive voltage drops occur.

4.1.2 Designs - Minimum Standardized Torque Values
Based on their torque characteristics in relation to the speed and starting current, three-phase squirrel cage induction motors are classified into designs, each one complying with a specific type of load. Defined by IEC 60034-1 Standard, the designs are the following:

Design N
Regular locked rotor torque, regular locked rotor current, low slip. These are the most common motors in the market and are used in applications such as pumps, machine tools fans, etc.

Design H
High locked rotor torque, regular locked rotor current, low slip. The motors with this design are used on applications that require high starting torques such as screens, conveyors, high inertia loads, crushers, etc.

Design D
High locked rotor torque, regular locked rotor current, high slip (above 5%). Used on applications such as eccentric presses and similar machines that have periodic load peaks. These motors are also used on elevators and loads that require high starting torque and limited locked rotor current. Figure 4.2 shows the torque curves x speed of the different designs.

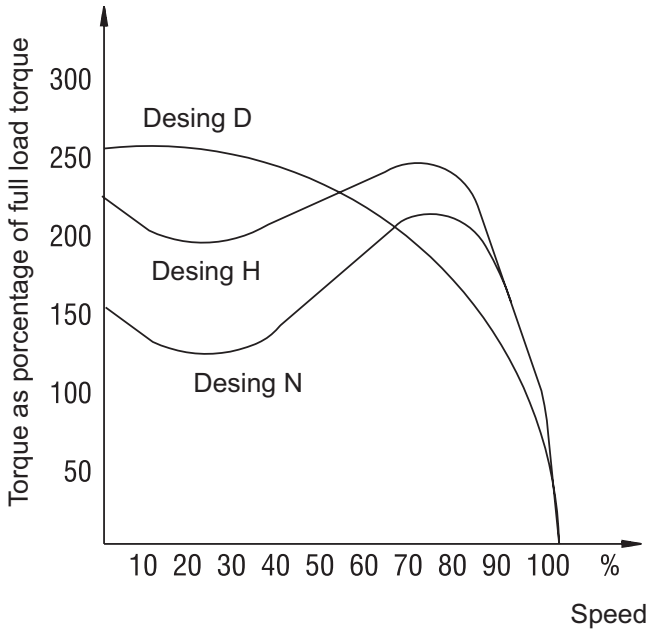


Figure 4.2 - Torque x speed curves for the different designs

Design NY
This design includes motors similar to those of N design; however, they are designed for star-delta starting. For these motors at star connection, the minimum torque values with locked rotor and the pull-in torque values are equal to 25% of the values indicated for Design N motors.

Design HY
This design includes motors similar to those of design N; however, they are designed for star-delta starting. For these motors at star connection, the minimum torque values with locked rotor and the pull-in torque values are equal to 25% of the values indicated for H Design motors.

The minimum torque values required for design N and design H motors, as specified in IEC 60034-1 standard, are shown in tables 4.1and 4.2.

For 4, 6 and 8-pole design D motors and rated power of 150 HP and below, IEC 60034 -1 states that: the locked rotor torque (C_p) shall not be lower than 2.75 of the motor rated torque (C_n,). Pull-up torque ($C_{mín}$) and breakdown torque ($C_{máx}$) are not regulated by this standard.

IEC 60034-1 does not specify minimum torque values required for 2-poles, design H and design D motors.

Number of Poles		2			4			6			8		
Rated Power Range		C_p/C_n	C_{min}/C_n	C_{max}/C_n	C_p/C_n	C_{min}/C_n	C_{max}/C_n	C_p/C_n	C_{min}/C_n	C_{max}/C_n	C_p/C_n	C_{min}/C_n	C_{max}/C_n
kW	cv							pu					
> 0,36 ≤ 0,63	> 0,5 ≤ 0,86	1,9	1,3	2,0	2,0	1,4	2,0	1,7	1,2	1,7	1,5	1,1	1,6
> 0,63 ≤ 1,0	> 0,86 ≤ 1,4	1,8	1,2	2,0	1,9	1,3	2,0	1,7	1,2	1,8	1,5	1,1	1,7
> 1,0 ≤ 1,6	> 1,4 ≤ 2,2	1,8	1,2	2,0	1,9	1,3	2,0	1,6	1,1	1,9	1,4	1,0	1,8
> 1,6 ≤ 2,5	> 2,2 ≤ 3,4	1,7	1,1	2,0	1,8	1,2	2,0	1,6	1,1	1,9	1,4	1,0	1,8
> 2,5 ≤ 4,0	> 3,4 ≤ 5,4	1,6	1,1	2,0	1,7	1,2	2,0	1,5	1,1	1,9	1,3	1,0	1,8
> 4,0 ≤ 6,3	> 5,4 ≤ 8,6	1,5	1,0	2,0	1,6	1,1	2,0	1,5	1,1	1,9	1,3	1,0	1,8
> 6,3 ≤ 10	> 8,6 ≤ 14	1,5	1,0	2,0	1,6	1,1	2,0	1,5	1,1	1,8	1,3	1,0	1,7
> 10 ≤ 16	> 14 ≤ 22	1,4	1,0	2,0	1,5	1,1	2,0	1,4	1,0	1,8	1,2	0,9	1,7
> 16 ≤ 25	> 22 ≤ 34	1,3	0,9	1,9	1,4	1,0	1,9	1,4	1,0	1,8	1,2	0,9	1,7
> 25 ≤ 40	> 34 ≤ 54	1,2	0,9	1,9	1,3	1,0	1,9	1,3	1,0	1,8	1,2	0,9	1,7
> 40 ≤ 63	> 54 ≤ 86	1,1	0,8	1,8	1,2	0,9	1,8	1,2	0,9	1,7	1,1	0,8	1,7
> 63 ≤ 100	>86 ≤ 136	1,0	0,7	1,8	1,1	0,8	1,8	1,1	0,8	1,7	1,0	0,7	1,6
> 100 ≤ 160	> 136 ≤ 217	0,9	0,7	1,7	1,0	0,8	1,7	1,0	0,8	1,7	0,9	0,7	1,6
> 160 ≤ 250	> 217 ≤ 340	0,8	0,6	1,7	0,9	0,7	1,7	0,9	0,7	1,6	0,9	0,7	1,6
> 250 ≤ 400	> 340 ≤ 543	0,75	0,6	1,6	0,75	0,6	1,6	0,75	0,6	1,6	0,75	0,6	1,6
> 400 ≤ 630	> 543 ≤ 856	0,65	0,5	1,6	0,65	0,5	1,6	0,65	0,5	1,6	0,65	0,5	1,6

Table 4.1 - Three-phase motors - Locked rotor torque (C_p), pull-in torque (C_{min}) and breakdown torque (C_{max}), for design N motors, relating to the rated torque (C_n).

Number of poles		4			6			8		
Rated Power Range		C_p/C_n	C_{min}/C_n	C_{max}/C_n	C_p/C_n	C_{min}/C_n	C_{max}/C_n	C_p/C_n	C_{min}/C_n	C_{max}/C_n
kW	cv						pu			
> 0,4 ≤ 0,63	> 0,54 ≤ 0,86	3,0	2,1	2,1	2,55	1,8	1,9	2,25	1,65	1,9
> 0,63 ≤ 1,0	> 0,86 ≤ 1,4	2,85	1,95	2,0	2,55	1,8	1,9	2,25	1,65	1,9
> 1,0 ≤ 1,6	> 1,4 ≤ 2,2	2,85	1,95	2,0	2,4	1,65	1,9	2,1	1,5	1,9
> 1,6 ≤ 2,5	> 2,2 ≤ 3,4	2,7	1,8	2,0	2,4	1,65	1,9	2,1	1,5	1,9
> 2,5 ≤ 4,0	> 3,4 ≤ 5,4	2,55	1,8	2,0	2,25	1,65	1,9	2,0	1,5	1,9
> 4,0 ≤ 6,3	> 5,4 ≤ 8,6	2,4	1,65	2,0	2,25	1,65	1,9	2,0	1,5	1,9
> 6,3 ≤ 10	> 8,6 ≤ 14	2,4	1,65	2,0	2,25	1,65	1,9	2,0	1,5	1,9
> 10 ≤ 16	> 14 ≤ 22	2,25	1,65	2,0	2,1	1,5	1,9	2,0	1,4	1,9
> 16 ≤ 25	> 22 ≤ 34	2,1	1,5	1,9	2,1	1,5	1,9	2,0	1,4	1,9
> 25 ≤ 40	> 34 ≤ 54	2,0	1,5	1,9	2,0	1,5	1,9	2,0	1,4	1,9
> 40 ≤ 63	> 54 ≤ 86	2,0	1,4	1,9	2,0	1,4	1,9	2,0	1,4	1,9
> 63 ≤ 100	>86 ≤ 140	2,0	1,4	1,9	2,0	1,4	1,9	2,0	1,4	1,9
> 100 ≤ 160	> 140 ≤ 220	2,0	1,4	1,9	2,0	1,4	1,9	2,0	1,4	1,9

Table 4.2 - Three-phase motors - Locked rotor torque (C_p), pull-in torque (C_{min}) and breakdown torque (C_{max}), for design H motors, relating to the rated torque (C_n).

Notes: a) The locked rotor torques (C_p / C_n) are 1.5 times the corresponding values of design N; however, not below 2.0;
b) The pull-up torques (C_{min} / C_n) are1.5 times the corresponding values of design N; however, not below1.4;
c) The breakdown torques (C_{max} / C_n) are the same as corresponding values of design N; however, not below 1.9 or the corresponding values of pull-up torques (C_{min} / C_n).

4.1.3 Characteristics of WEG Motors

Although WEG states that their motors usually comply with Design N, in many cases their typical actual torque values far exceed the minimum required by the standard. In most cases the values even exceed the minimum requirements of Design H. This means a very high speed-torque curve, bringing the following benefits:

1) Quick acceleration under heavy starting conditions, e.g. for piston pumps, loaded conveyors, high inertia loads, compressors with open valves, etc.
2) Quick responsiveness for special supplies such as those mentioned since standard motors are always readily available from stock, with price benefits and quick delivery.
3) The possibility of using reduced voltage starting methods, e.g. Star-Delta Starters, in normal cases, without affecting perfect load acceleration.
4) Due to the high value of the breakdown torque, momentary load peaks and temporary voltage drops are accepted without any sudden speed loss. This is a fundamental requirement for the performance of machines that are subjected to heavy load peaks, such as crushers, calender machines, etc.

4.2 Load Inertia

The driven load inertia is one of the most important characteristics to be checked during the acceleration time to ensure that the motor will be able to drive the load within the ambient requirements or the thermal capabilities of the insulation materials.

Inertia is the way how we measure the resistance of an object to change its rotation movement around a shaft. It also depends on the shaft around which it is rotating, the shape of the object and the way its mass is distributed. The unit of the inertia moment is given by kgm².

The total inertia of the system is given by the load inertia plus motor inertia ($J_t = J_c + J_m$).
In cases where the machine has “different speed than the motor” (ex.: belt/pulley assembly or gearboxes), inertia has to be considered for the motor rated speed as indicated below:

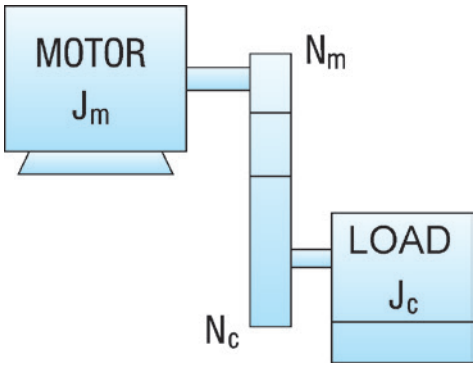


Figure 4.3 - Inertia at different speeds

$$J_{ce} = J_c \left(\frac{N_c}{N_m}\right)^2 \quad (kgm^2)$$

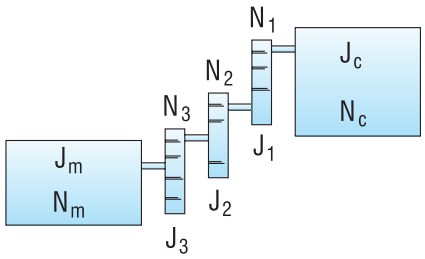


Figure 4.4 - Inertia at different speeds

$$J_{ce} = J_c \left(\frac{N_c}{N_m}\right)^2 + J_1\left(\frac{N_1}{N_m}\right)^2 + J_2\left(\frac{N_2}{N_m}\right)^2 + J_3\left(\frac{N_3}{N_m}\right)^2$$

where: J_{ce} *- Load inertia related to the motor shaft*
J_c *- Load inertia*
N_c *- Load speed*
N_m *- Motor rated speed*

$$J_t = J_m + J_{ce}$$

The total inertia of the load is essential for determining the acceleration time.

4.3 Acceleration Time

In order to check if the motor is suitable to drive the load, or when designing the installation, starting or protection system, the acceleration time must be known (from the moment the motor starts and accelerates up to the rated speed). The starting time can be determined approximately by the average acceleration torque.

$$t_a = \frac{2\,\pi\,.\,rps\,.\,J_t}{C_a} = \frac{2\,\pi\,.\,rps\,.\,(J_m + J_{ce})}{(C_{mmed} - C_{rmed})}$$

t_a - *acceleration time in seconds*
J_t - *total load inertia in kgm²*
rps - *rated speed in revolutions per second*
C_{mmed} - *motor average acceleration torque in Nm.*
C_{rmed} - *load average resistive torque related to the motor shaft in Nm.*
J_m - *Motor inertia*
J_{ce} - *Load inertia related to the motor shaft*
C_a - *Average acceleration torque*

The average acceleration torque can be obtained from the difference of motor torque and the load torque. It should be calculated for each rotation interval (the sum of the intervals would give the total acceleration time). In practical terms, it is enough to calculate graphically the average torque, i.e., the difference between motor average torque and load average torque. This average can be obtained graphically, by ensuring that the sum as the areas A_1 and A_2 is the same of area A_3 and that the area B_1 is the same as the area B_2 (see figure 4.5).

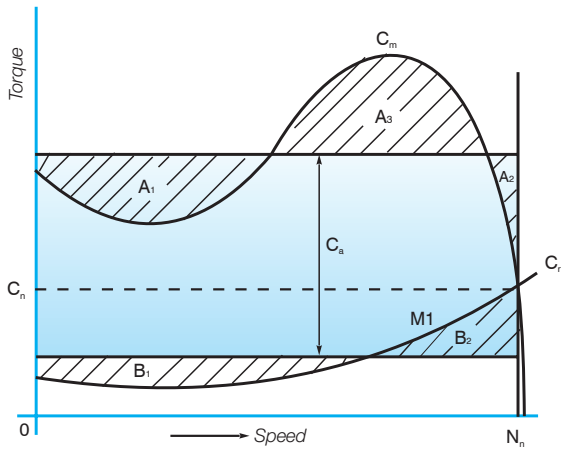


Figure 4.5 - Graphical determination of the average acceleration torque

C_n = *Rated torque*
C_m = *Motor torque*
C_r = *Load torque*
C_a = *Average acceleration torque*
N_n = *Rated speed*

4.4 Duty Cycles

Due to high starting currents on electric induction motors, the time required to accelerate high inertia loads will result in a sudden motor temperature rise. If the interval between successive starts is very short, the motor winding can experience some overheating that will cause some damage or reduce their lifetime. IEC 60034-1 Standard establishes a minimum number of starts (S1) that the motors should withstand in the following conditions:

a) Two consecutive starts: first start with the motor in cold state, i.e., with the winding at ambient temperature and the second start right after, but with de-energized motor and at rest.

b) One hot start, i.e., with the winding at running temperature.

The first condition simulates the case when the first start fails, for example, the protection system trips, allowing a second start right after. The second condition simulates the case of an accidental motor shutdown during normal operation, for example, due to a power supply fault, allowing to start the motor again right after the power supply is re-established. As the motor temperature rise depends on the inertia of the driven load, the standard establishes the maximum load inertia to which the motors should withstand in order to comply with the conditions above. Table 4.3 shows the inertia values for 2, 4, 6 and 8-pole motors.

Rated Power		Number of Poles			
		2	4	6	8
kW	cv	kgm²			
0,4	0,54	0,018	0,099	0,273	0,561
0,63	0,86	0,026	0,149	0,411	0,845
1,0	1,4	0,040	0,226	0,624	1,28
1,6	2,2	0,061	0,345	0,952	1,95
2,5	3,4	0,091	0,516	1,42	2,92
4,0	5,4	0,139	0,788	2,17	4,46
6,3	8,6	0,210	1,19	3,27	6,71
10	14	0,318	1,80	4,95	10,2
18	22	0,485	2,74	7,56	15,5
25	34	0,725	4,10	11,3	23,2
40	54	1,11	6,26	17,2	35,4
63	86	1,67	9,42	26,0	53,3
100	140	2,52	14,3	39,3	80,8
160	220	3,85	21,8	60,1	123
250	340	5,76	32,6	89,7	184
400	540	8,79	49,7	137	281
630	860	13,2	74,8	206	423

Table 4.3 - Moment of inertia (J)

a) The values are given as a function of the mass-radius squared. They were calculated by the following formula:

$$J = 0.04 \cdot P^{0.9} \cdot p^{2.5}$$

where: P - rated Power in kW
p - number of pole pairs

b) For intermediate rated power ratings the external inertia moment should be calculated by the formula above. For loads with higher inertia than the reference values given in table 4.3, which can happen mainly in higher rated power ratings or for the determination of the maximum number of starts per hour, our Application Engineering Department should be contacted informing the following application data:

- Power required by the load. If the duty is intermittent, see the last item: “Duty cycle”.
- Speed of the driven machine.
- Transmission: direct, flat belts, V-belts, chain, etc.
- Transmission ratio with dimensional sketches and distances between pulleys, if transmission is realized by the pulley.
- Abnormal radial loads applied to the shaft end: belt traction in special transmissions, heavy parts coupled to the shaft end, etc.
- High axial loads applied to the shaft end: transmission by helical gears, hydraulic thrusts of pumps, heavy rotating parts mounted vertically, etc.
- Mounting different from B3D, indicate mounting code of the application.
- Required starting torque and breakdown torque
- Description of the driven equipment and operation.
- Moment of inertia or GD2 of the movable parts of the equipment and the related speed.
- Duty cycle, if not continuous duty, provide detailed description of the operation cycles and specify:
  a) Required power and the duration of each load period;
  b) Duration of the no-load periods (motor at no-load or de-energized);
  c) Reversals of the direction of rotation;
  d) Counter current braking.

The motors must have their number of starts per hour limited according to their duty indicated on the nameplate and/or as agreed for the design.
Excessive starts can cause overheating and consequent burning of the electric motor.
In case of doubt, please contact WEG.

4.5 Locked Rotor Current

4.5.1 Standardized Maximum Values

The maximum limits for the locked rotor current, as a function of the rated motor output are valid for any number o poles, are shown in Table 4.4, indicated in terms of apparent power absorbed with locked rotor relating to the rated output, kVA/HP or kVA/kW.

$$kVA/cv = \frac{\text{Locked rotor apparent power}}{\text{Rated power}}$$

$$kVA/cv = \frac{\sqrt{3} \cdot I_p \cdot U}{P\,(cv) \cdot 1000}$$

$$kVA/kW = \frac{\sqrt{3} \cdot I_p \cdot U}{P\,(kW) \cdot 1000}$$

where: I_p *- Locked rotor current or starting current*
U *- Rated voltage (V)*
P *- Rated power (HP or kW)*

Power range		S_p / P_n	
kW	HP	kVA/kW	kVA/cv
> 0,37 ≤ 6,3	> 0,5 ≤ 8,6	13	9,6
> 6,3 ≤ 25	> 8,6 ≤ 34	12	8,8
> 25 ≤ 63	> 34 ≤ 86	11	8,1
> 63 ≤ 630	> 86 ≤ 856	10	7,4

Table 4.4 - Maximum values of the locked rotor apparent Power (S_p / P_n), expressed as per the unit value of the rated output (P_n)

Note: to obtain the ratio I_p / I_n , multiply kVA/kW by the performance product and by the Power factor at full load.

I_p = Locked rotor current;
I_n = Rated current

5. Speed Regulation of Asynchronous Motors

The relationship between speed, frequency, number of poles and slip is given by:

$$n = \frac{2}{(2p)} \cdot f \cdot 60 \cdot (1 - s)$$

where : n *= rpm*
f *= frequency (Hz)*
$2p$ *= number of poles*
s *= slip*

The formula shows that for the speed regulation of asynchronous motors, we can change the following parameters:
a) 2p = number of poles
b) s = slip
c) f = frequency (Hz)

5.1 Changing the Number of Poles

There are three ways to change the number of poles of an asynchronous motor, as follows:
- separated stator winding;
- one winding with pole commutation;
- combination of the two options above.

In all these cases, the speed regulation will be smooth, without losses, but frame size will be larger than for a single-speed motor.

5.1.1 Two Speed Motors with Independent Winding

This type of motor has the advantage of combining winding with any number of poles; however, it is limited by core dimensioning (stator/rotor) and by the frame size that is usually far greater than the frame of a single-speed motor.

5.1.2 Dahlander

Two-speed motors with commutating pole winding is the most used system, also called "Dahlander connection." This connection provides a ratio of a number poles ratio of 1:2 with a consequent speed ratio 2:1.
It can be connected as follows (Figure 5.1):

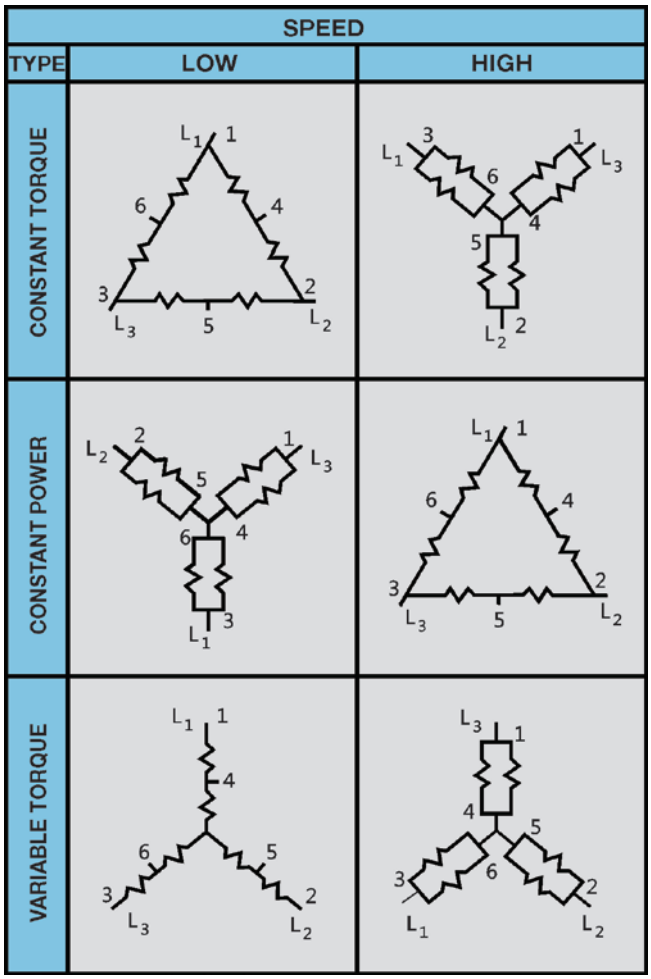


Figure 5.1 - Summary of the Dahlander connection

Constant torque
Torque is constant on both speeds and power ratio is 0.63:1. In this case, the motor is D/YY connected.

Example:
0.63/1HP motor - 4/2 poles - D/YY.
This connection is suitable for applications where the load torque curve remains constant with the speed variation.

Constant power
In this case, the torque ratio is 2:1 and horsepower remains constant. The motor is YY/D connected.
Example: 10/10 HP - 4/2 poles - YY/Δ.

■ **Variable torque**
In this case, the power ratio will be approximately 1:4. It is applied to loads such as pumps and fans.
The connection, in this case, is Y/YY.

Example: 1/4 HP - 4/2 poles - Y/YY.

5.1.3 Motors with Two or More Speeds
It is possible to combine a Dahlander winding with a single winding or more. However, this type of motor is not usual and is used only for special applications.

5.2 Slip Variation
In this case, the rotating field speed is maintained constant, and the rotor speed is changed according to the conditions required by the load, which can be:
a) rotor resistance variation
b) stator voltage variation
c) variation of both simultaneously.

These variations are achieved by increasing rotor losses which limit the use of this system.

5.2.1 Rotor Resistance Variation
This method is used for slip ring motors and is based on the following equation:

$$s = \frac{p_{j2}}{\omega_o \cdot T} = \frac{3 \cdot R_2 \cdot I^2_2}{\omega_o \cdot T}$$

where: p_{j2} = *Rotor losses (W)*
ω_o = *Synchronous speed in rd/s*
T = *Rotor torque*
R_2 = *Rotor resistance (Ohms)*
I_2 = *Rotor current (A)*
s = *slip*

The connection of an external resistance to the rotor increases the motor slip (s) and results in speed variation. The figure 5.2 shows the effect of the increase of R2.

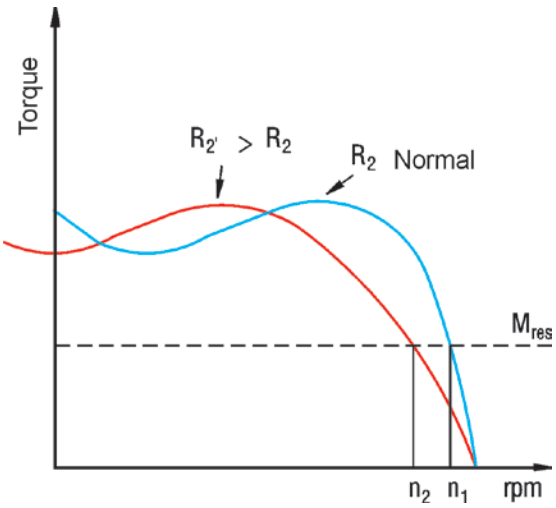


Figure 5.2 - Torque curve with rotor resistance variation

5.2.2 Stator Voltage Variation
This is not a usual method since it also generates rotor losses and the speed variation range is small.

5.3 Frequency Inverters
For further information about the use of frequency inverters for speed control, see chapter *"Application of induction motors fed by frequency inverters"*.

6. Brake Motor

The brake motor consists of an induction motor coupled to a single-disc brake, forming an integral, compact unit. The induction motor is a totally enclosed fan cooled machine with the same mechanical and electrical performance of WEG general purpose motors.

The brake is built with few movable parts which give long life with reduced maintenance. The two faces of the brake pads create a large contact area, requiring only little pressure during the braking process, which reduces the brake heating and the wear is minimal. Besides that, the brake is cooled by the motor cooling system. The electromagnet drive coil, protected with epoxy resin, can be operated continuously with voltages varying 10% above and below the rated voltage.

The electromagnet drive coil is DC powered, supplied by a bridge rectifier made of silicon diodes and varistors, that suppress undesirable voltage spikes and allow a fast current shutdown. The DC power supply provides a faster and smoother brake operation.

The typical applications for brake motors:
- Machine-tools
- Looms
- Packing machines
- Conveyors
- Bottle washing and filling machines
- Winding machines
- Bending machines
- Hoists
- Cranes
- Lifts
- Roll adjustment of rolling machines
- Graphic machines

In general terms, brake motors are used on equipment requiring quick stops based on safety, positioning and time-saving factors.

6.1 Brake Operation

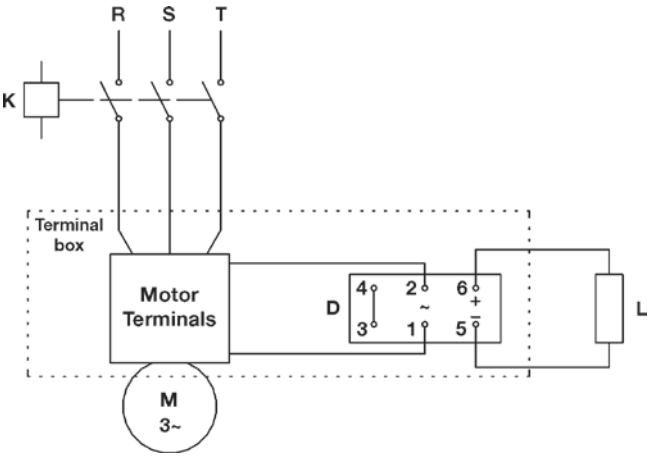
When the motor is disconnected from the power supply, the control also switches off the coil current and the electromagnet stops operating. The pressure springs force the armature towards the motor non-drive-end shield. Fitted in the braking disc, the braking pads are compressed between the two friction surfaces, the armature, and the end shield braking the motor until it stops. When the motor is switched on, the coil is powered and the armature is pulled against the electromagnet frame by eliminating the spring force. Once they are free, the braking pads move axially in their seating, and they remain out of the friction area. Now the braking process is ended and allows starting the motor freely. As optional, WEG can supply the motors with brake lining.

6.2 Connection Diagram

The WEG brake motor allows 3 types of connection diagrams supplying slow, medium and quick braking.

a) Slow braking

The power supply of the brake coil bridge rectifier is applied directly from the motor terminals, without interruption, as shown below:

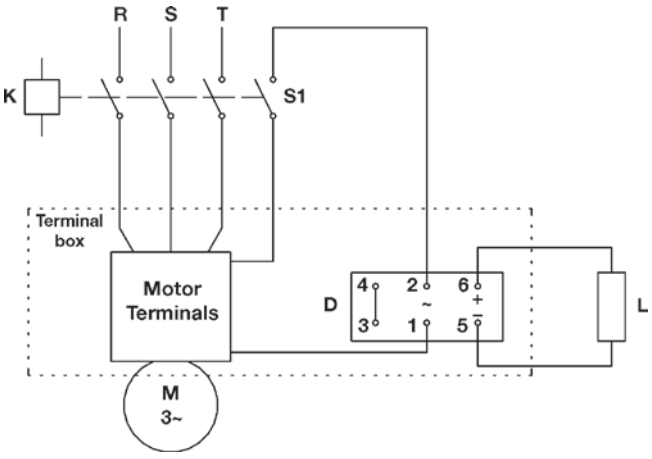


D - Bridge rectifier
L - Electromagnet coil
K - Contactor

Figure 6.1 - Connection diagram for slow braking

b) Medium braking

In this case, a contact for interruption of the bridge rectifier supply current in the AC circuit is interconnected. It is essential that this is a NO auxiliary contact (S1) of the contactor itself or of the motor magnetic switch in order to allow switching on and off of the brake and motor simultaneously.

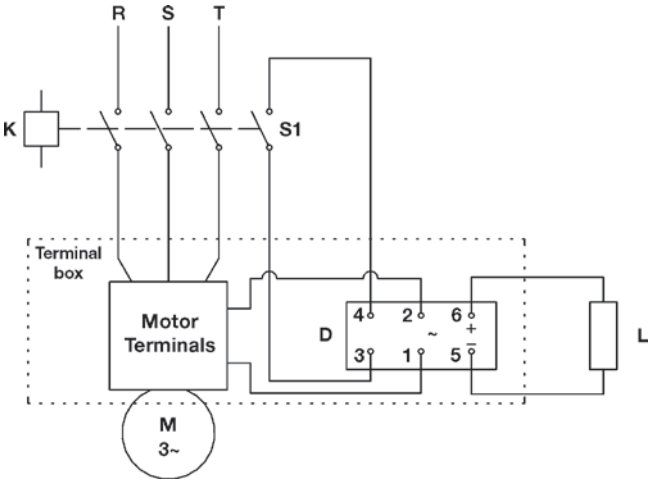


D - Bridge rectifier
L - Electromagnet coil
K - Contactor
S1- NO auxiliary contact

Figure 6.2 - Connection diagram for medium braking

c) Fast braking

A contact for interruption is directly connected to one of the coil supply cables in the DC circuit. It is essential that this is a NO auxiliary contact of the contactor itself or a magnetic switch of the motor.



D - Bridge rectifier
L - Electromagnet coil
K - Contactor
S1 - NO auxiliary contact

Figure 6.3 - Connection diagram for fast braking

6.3 Brake Coil Power Supply

The power supply of the bridge rectifier with AC-current can be obtained from an independent source or from the motor terminals. This power supply may be in 110/220 V, 440 V or 575 V, according to the characteristics of the bridge rectifier/ brake coil set.

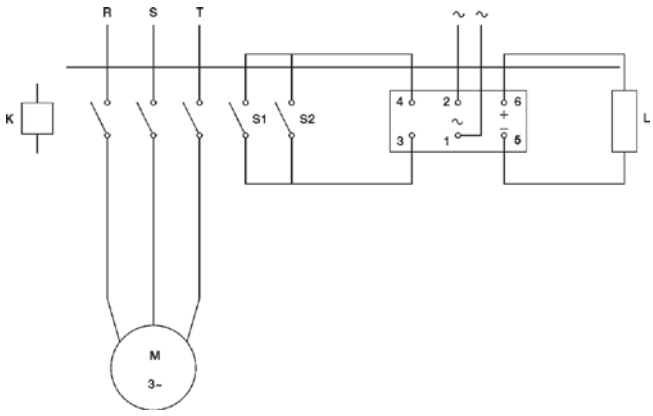
The brake coil can also be supplied for 24 V DC, but in this case, the power supply should be provided through an independent source (direct current), eliminating the use of bridge rectifier (RB).

Through motor terminals

a) Motor 220/380 V: connect motor terminal 1 and 2 of the RB (220 V AC) between the terminals 1 and 4 of the motor.
b) Motor 380/660 V: connect motor terminal 1 and 2 of the RB (220 V AC) between the terminal 2 and the neutral.
c) Motor 220/380/440/760 V: connect the motor terminals 1 and 2 of the RB (220 V AC) between the terminals 1 and 4 of the motor.
d) Motor with 3 leads (single voltage): connect the terminals 1 and 2 of the RB between the 1 and 2 of the motor (if the RB has the Same voltage of the motor).
e) Two-speed motor 220 V (RB 220 V AC):
1. High speed: connect between the motor terminals 4 and 6.
2. Low speed: connect between the motor terminals 1 and 2. Motor 440 V: connect the terminals of the rectifier bridge (440 V AC) to the motor terminals.

Independent power supply (AC):

For motors of other voltages, connect the terminals of the rectifier bridge to the independent 220 V power supply; however, always with the simultaneous interruption when the motor power supply is switched off. With independent power supply, it is possible to electrically release the brake, as shown in figure 6.4.



D - Bridge rectifier
L - Electromagnet coil
K - Contactor
S1 - NO auxiliary contact
S2 - Electric release switch

Figure 6.4 - Connection diagram for independent power supply

6.4 Brake Torque

It is possible to obtain a smoother motor stop by reducing the braking torque value. This is achieved by removing some brake pressure springs.

Important!
The springs must be removed in such a way that the remaining ones stay symmetrically arranged, avoiding in this way any friction even after operating the motor and thus avoid uneven wear of the braking pads.

6.5 Air Gap Adjustment

WEG brake motors are supplied with an initial factory set air gap, that is, the gap between the armature and the frame with the energized brake are pre-adjusted at the factory to the minimum value as indicated in Table 6.1.

As they are simple construction machines, brake motors require low maintenance. Only a periodical air gap adjustment is required. It is recommended to clean internally the brake motor in cases of penetration of water, dust, etc. or at the time motor when the periodical maintenance is carried out.

Frame size	Initial air gap (mm)	Maximum air gap (mm)
71	0,2 - 0,3	0,6
80	0,2 - 0,3	0,6
90S - 60L	0,2 - 0,3	0,6
100L	0,2 - 0,3	0,6
112M	0,2 - 0,3	0,6
132S - 132M	0,3 - 0,4	0,8
160M - 160L	0,3 - 0,4	0,8

Table 6.1

Due to the natural wear of the braking pads, the size of the air gap gradually increases without affecting the performance of the brake until it reaches the maximum value shown in Table 6.1. To adjust the air gap to its initial value, proceed as follows:

a) Unfasten the bolts and remove the fan cover;
b) Remove the seal ring;
c) Measure the air gap at three points, near the adjustment screws, using a set of feeler gauges;
d) If the gap width is equal to or greater than the maximum indicated dimension, or if the three readings are not the same, proceed the adjustment as follows:
1. loosen the lock nuts and the adjustment screws;
2. adjust the air gap to the initial value indicated in Table 6 .1 tightening by equally the three adjustment screws. The value of the air gap must be uniform at the three measured points, and must be such that the feeler gauge corresponding to the minimum gap, moves freely and the feeler gauge corresponding to the maximum gap cannot be inserted into the measured points;
3. tighten the locking bolts screws until the ends touch the motor end shield. Do not overtighten them;

4. Tighten the lock nuts;
5. Re-check the air gap to ensure the measurements are as per Item 2 above;
6. Remount the seal ring;
7. Remount the fan cover and fasten it with its fixing bolts.

The interval between periodical adjustments of the air gap, i.e., the number of braking cycles until brake pads wear to their maximum allowed value depends on the load, the frequency of operations, and the cleanness of the working environment, etc. The ideal interval can only be determined by closely following up the performance of the brake motor during the first months of operation under actual working conditions. The wear of the brake pads also depends on the moment of inertia of the load.

WEG is also able to supply other brake options for more severe applications (e.g., cranes, tractors, gearboxes, etc.). In case of doubt, please contact WEG.

7. Operating Characteristics

7.1.1 Winding Heating Up

Losses

The effective or useful power output supplied by the motor at the shaft end is lower than the power input absorbed by the motor from the power supply, i. e., the motor efficiency is always below 100%. The difference between input and output represents the losses that are transformed into heat. This heat warms up the winding and therefore must be removed from the motor to avoid excessive temperature rise. This heat removal must be ensured for all types of motors. In the automobile engine, for example, the heat generated by internal losses has to be removed from the engine block by water flow through the radiator or by the fan, in the case of air-cooled engines.

Heat dissipation

The heat generated by internal losses is dissipated to the ambient air through the external surface of the frame. In totally enclosed motors this dissipation is usually aided by a shaft mounted fan. Good heat dissipation depends on:

- Efficiency of the ventilating system;
- Total heat dissipation area of the frame;
- Temperature difference between the external surface of the frame and the ambient air (t_{ext} - t_a).

a) A well-designed ventilation system, as well as having an efficient fan capable of driving a large volume of air, must direct this air over the entire circumference of the frame to achieve the required heat exchange.
A large volume of air is absolutely useless if it is allowed to spread out without dissipating the heat from the motor.

b) The dissipation area must be as large as possible. However, a motor with a very large frame requires a very large cooling area and consequently will become too expensive, too heavy, and requires too much space for installation. To obtain the largest possible area while at the same time keeping the size and weight to a minimum (an economic requirement), cooling fins are cast around the frame.

c) An efficient cooling system is one that is capable of dissipating the largest possible amount of heat through the smallest dissipation area. Therefore, it is necessary that the internal drop in temperature, shown in figure 7.1, is minimized. This means that a good heat transfer must take place from the inside to the outer surface of the motor.

As explained, the objective is to reduce the internal drop in temperature (i.e. to improve the heat transfer) in order to obtain the largest possible drop of the outside temperature necessary for good heat dissipation. Internal drop in temperature depends on different factors which are indicated in figure 7.1 where the temperatures of certain important areas are shown and explained as follows:

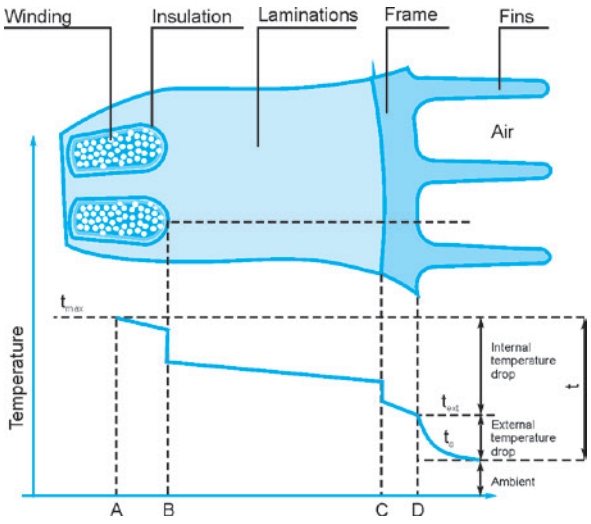


Figure 7.1

A - The winding hottest spot is in the centre of the slots where heat is generated as a result of losses in the conductors.

AB - The drop in temperature is due to the heat transfer from the hottest spot to the outer wires. As the air is a very poor conductor of heat it is very important to prevent voids inside the slots, i.e. the winding must be compact and perfectly impregnated with varnish.

B - The drop in temperature through the slot insulation and through the contact of the insulation material with the conductors and by contact with the core lamination. By employing modern material far better heat transfer is obtained through the insulation materials. Perfect impregnation improves the contact of the inner side by eliminating voids. Perfect alignment of the lamination improves the contact to the outer side, eliminating layers of air, which have a negative effect on heat transfer.

BC - Drop in temperature by the transmission through the stator lamination material.

C - Drop in temperature by contact between the stator core and the frame. Heat transmission depends on the perfect contact between the parts, good alignment of the laminations, and accuracy in the machining of the frame. Uneven surfaces leave empty spaces, resulting in poor contact and consequently bad heat transmission.

CD - Drop in temperature by the transmission through the frame thickness.

Due to modern design, use of first class material, improved manufacturing processes, and continuous quality control, WEG motors ensure excellent heat transfer properties from the motor inside to the outside thus eliminating "hot spots" in the windings.

Outer surface temperature of the motor
The figure 7.2 shows the recommended places where the outer surface temperature of an electric motor should be checked with calibrated temperature measuring instruments:

Figure 7.2

Important!
Measure also the ambient temperature (at a maximum distance of 1 m from the motor).

7.1.2 Motor Lifetime

As already informed in the Item "*Insulation materials and insulation systems*" its useful lifetime of the motor depends almost exclusively on the life of the winding insulation. The lifetime of a motor is affected by many factors, such as moisture, vibration, corrosive environments, and others. Among all these factors, the most important is the working temperature of the employed insulation materials. An increase from 8 to 10 degrees above the rated temperature class of the insulation system can reduce the motor lifetime by half.

When speaking about decreasing the useful lifetime of the motor, we are not talking about high temperatures where the insulation system burns and the winding are suddenly destroyed. For the insulation lifetime, this means gradual aging of the insulation material which becomes dry, losing its insulation properties until it cannot withstand the applied voltage. This results in a breakdown of the insulation system and a consequent short-circuit of the winding. Experience shows that the insulation system has practically an unlimited lifetime if the temperature is kept below a certain limit if this temperature limit is exceeded, the insulation lifetime will shorten as the temperature increases. This temperature limit is well below the "burning" temperature of the insulation system and depends on the type of used insulation material.

This temperature limit refers to the hottest spot in the insulation system, but not necessarily to the whole winding. One weak point in the inner part of the winding will be enough to destroy the insulation system.

It is recommended to use temperature sensors as additional protection devices for the electric motor. These protection devices will ensure a longer lifetime and more process reliability.

The alarm and/or shutdown setting should be performed according to the motor temperature class. In case of doubt, contact WEG.

7.1.3 Insulation Classes

Insulation class definition
As previously mentioned the temperature limit depends on the type of used material used. In order to comply with the standards the insulation material and insulation systems (each one formed by a combination of several materials) are grouped in INSULATION CLASSES. Each one is defined by the particular temperature limit, i.e. by the highest temperature that the insulation material or system can withstand continuously without affecting its useful life.
The insulation classes used for electrical machines and their respective temperature limits are in accordance with IEC 60034-1 are as follows:

Class A (105 °C)
Class E (120 °C)
Class B (130 °C)
Class F (155 °C)
Class H (180 °C)

7.1.4 Winding Temperature Rise Measurement

It would be rather difficult to measure the temperature of the winding with thermometers or thermocouples since the temperature differs from one spot to another and it is impossible to know if the measurement point is near the hottest spot. The most accurate and reliable method for determining the winding temperature is by measuring the variation of the winding resistance as a function of the temperature.

The temperature rise measurement by the resistance method, for copper conductors, is calculated according to the following formula:

$$\Delta t = t_2 - t_a = \frac{R_2 - R_1}{R_1}(235 + t_1) + t_1 - t_a$$

where: Δt = *temperature rise;*
t_1 = *winding temperature prior to testing, which should be practically equal to the cooling medium, measured by thermometer;*
t_2 = *winding temperature at the conclusion of the test;*
t_a = *temperature of the cooling medium at the conclusion of the test;*
R_1 = *winding resistance prior to testing;*
R_2 = *winding resistance at the end of the test.*

7.1.5 Electric Motor Application

The hottest spot temperature in the winding should be maintained below the maximum allowed temperature for the insulation class. The total temperature is the sum of the ambient temperature, plus temperature rise (Δt), plus the difference existing between the average winding temperature and the hottest spot. Motor standards specify the maximum temperature rise Δt, so the temperature of the hottest spot remains within the allowable limit based on the following considerations:

a) Ambient temperature should not exceed 40 °C, as per standard; above this value, working conditions are considered as special operating conditions.

b) The difference between the average temperature of the winding and the hottest spot does not vary very much from the motor to motor and its value specified by the standard, is 5 °C for Classes A and E, 10 °C for Class B and F and 15 °C for Class H.

Therefore, motor standards specify a maximum allowed ambient temperature, as well as a maximum allowed temperature rise for each insulation class. Thus, the temperature of the hottest spot is indirectly limited.
The figures and the allowable temperature composition for the hottest spot are shown in Table 7.1 below:

Insulation Class		A	E	B	F	H
Ambient temperature	°C	40	40	40	40	40
Δt = temperature rise (resistance method)	°C	60	75	80	105	125
Difference between the hottest spot and average temperature	°C	5	5	10	10	15
Total: temperature of the hottest spot	°C	105	120	130	155	180

Table 7.1 - Temperature composition as a function of the insulation class

For marine motors, all requirements specified by the classification societies must be considered, as shown in Table 7.2.

Classification societies for marine motors	Maximum allowable temperature rise for insulation class, Δt in °C (resistance variation method)				
	A	E	B	F	H
Det Norske Veritas and Germanischer Lloyd	-	-	75	100	120
American Bureau of Shipping	55	70	75	100	120
Bureau Veritas	55	70	75	100	120
Lloyds Register of Shipping	50	65	70	95	110
Registro Italiano Navale (RINA)	55	70	75	100	120

Table 7.2 - Temperature correction for marine motors

7.2 Thermal Protection of Electric Motors

Motors used for continuous duty must be protected against overloads by a device integrated to the motor, or an independent device, usually fitted with a thermal relay having rated or setting current equal to or below the value obtained by multiplying the rated motor power supply current (I_n) by the Service Factor (SF), as shown in table below:

Motor Service Factor (SF)	Relay current setting
1,0 to 1,15	I_n.FS
≥ 1,15	(I_n. FS) - 5%

Table 7.3 - Power supply current x Service Factor

The thermal protection is provided by means of thermoresistances (calibrated resistances), thermistors, thermostats or thermal protectors. The temperature detectors to be used are defined in accordance with the temperature class of the insulation materials used for each type of machine as well as based on customer requirements.

7.2.1 Resistance Temperature Detector (Pt-100)

The temperature detectors operate on the principle that the electrical resistance of a metallic conductor varies as a function of the temperature (generally platinum, nickel or copper conductors). The temperature detectors are fitted with calibrated resistance which varies linearly with the temperature, allowing continuous follow up of motor heating on the controller display, with a high degree of accuracy and response sensitivity.

The same detector can be used for alarm (when the motor is operated above the normal working temperature) and for tripping operation (usually set to the maximum temperature of the insulation class). The resistance of the cables, contacts, etc. can interfere with the measurement so there are different types of configurations that can be carried out to minimize these effects.

- The two-wire configuration is usually satisfactory in places where the cable length to the sensor instrument does not exceed 3.0 m, using cables 20 AWG.
- For the three-wire configuration (commonly used in industry) there will be compensation of the electrical resistance by the third wire.
- For the four-wire configuration (more accurate assembly) there are two connections for each bulb terminal (two cables for voltage and two cables for current), thus obtaining a total balancing of the resistance (this configuration is used where high accuracy is required).

Disadvantage

The high cost of the sensor elements and control circuits.

Figure 7.3 - Internal and external view of the thermoresistors

The temperature for the Pt-100 can be obtained from the formula below or on tables provided by manufacturers.

$$t\,°C = \frac{r - 100}{0.385}$$

r - resistance measured in Ohms

7.2.2 Thermistors (PTC and NTC)

Thermistors are temperature sensors consisting of semiconductor materials that vary its resistance very fast when reaching a certain temperature.

PTC - positive temperature coefficient
NTC - negative temperature coefficient

The “PTC” thermistors increase their resistance very fast with temperature increase and some are characterized by the abrupt resistance increase which makes them useful for thermal protection devices. The “NTC” thermistors reduce their resistance when the temperature increases. Thus, these thermal protection devices are used mostly to protect the motor against overheating.

The sudden change in resistance interrupts the current in PTC, activates an output relay, which turns off the main circuit. Thermistors can be used for alarm and tripping purposes. For this purpose, two thermistors are required. They must be series connected, per phase.

The thermistors have reduced size, do not have mechanical wear, and provide a faster response when compared to other temperature sensors. However, they do not allow continuous monitoring of the motor heating process. Thermistors with their electronic circuit controls ensure complete protection against overheating caused by phase-fault, overload, under/overvoltages or frequent reversals of the direction of rotation or on-off cycles. They have a low cost when compared to the Pt-100. However, they require a relay to control the alarm or operation activation.

Figure 7.4 - External view of a thermistor

Please find in the table below the main PTC types used for electric motors. The table shows the colors of the PTC cables with their respective activation temperature.

Cable colors		Temperature ºC
		110
		120
		140
		160
		180

Table 7.4 - Cable colors

WEG also supplies electronic relay RPW that has the specific function to acquire the signal from the PTC and activates its output relay. For further information, please contact WEG.

7.2.3 Bimetal Thermal Protectors - Thermostats

These bimetal thermal protectors (thermostat) with NC silver contacts open when predetermined temperature rise is reached. When the activation temperature of the bimetal thermal protector decreases, the thermostat will return to its original form instantaneously allowing it to close the contacts again. The thermostats can be used on three-phase electric motors for alarm or tripping purposes or both (alarm and tripping).

These thermostats are inserted into the winding heads of different phases and are series connected to the contactor coil where, depending on the required protection and on the customer specifications, three thermostats (one per phase) or six thermostats (two per phase) can be used.

For alarm and tripping operation (two per phase), the alarm thermostats should be suitable for the activation at the high expected motor temperature, while the tripping thermostats should activate at the maximum temperature allowed for the insulation material.

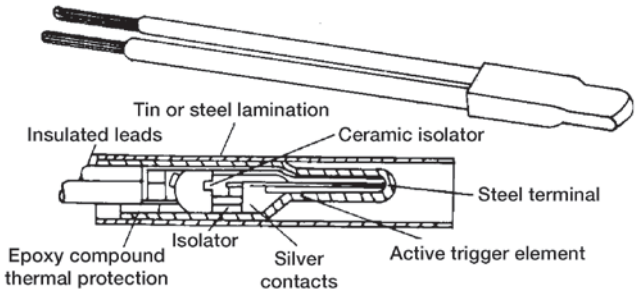


Figure 7.5 - Internal and external view of a thermostat

The thermostats are also used for special applications of single-phase motors. In these applications, the thermostat can be series connected with the motor power supply, provided the motor current does not exceed maximum current allowed for the thermostat. If this occurs, the thermostat must be series-connected with the contactor coil. The thermostats are installed in the winding heads of different phases.

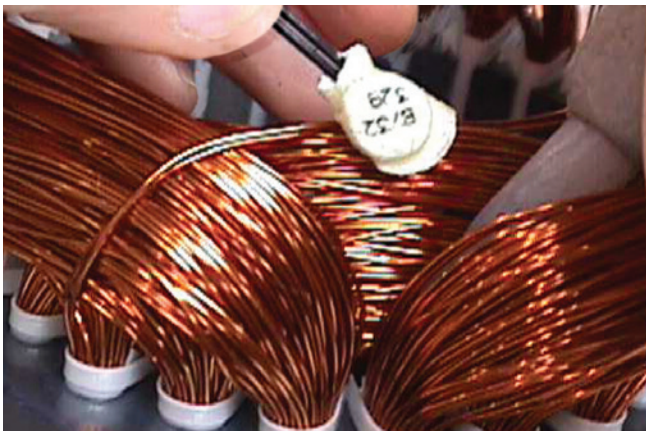


Figure 7.6 - Thermostat installation in the winding

Note: WEG recommends the installation of temperature sensors to protect the winding and bearings of the electric motor and so increase its useful life during operation.

7.2.4 Phenolic Thermal Protection System

These bimetal temperature sensors are fitted with NC contacts and are applied mainly for overheating protection of single-phase induction motors, caused by overloads, locked rotor conditions, voltage drops, etc.

The thermal protector is basically formed by one bimetallic disc that has two moving contacts, one resistance and one pair of fixed contacts. The thermal protector is series-connected with the power supply and, due to the thermal dissipation caused by the current flowing through its internal resistance, the disc is submitted to a deformation that opens the contacts and the motor power supply is interrupted.

After the temperature drops below the specified one, the thermal protector will reset. Depending on the reset method, two types of thermal protectors may be used:
a) Auto-reset thermal protector
b) Manual reset thermal protector

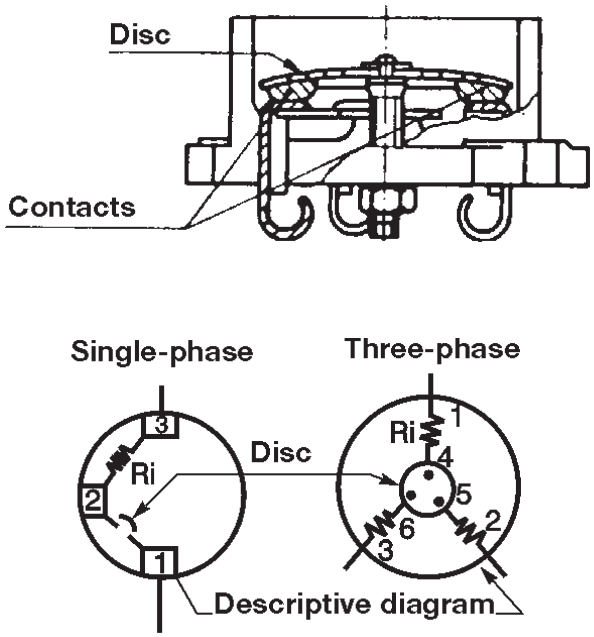


Figure 7.7 - Internal view of the thermal protector

Thermal protectors can also be used for three-phase motors, but only when Y connected. The following connection diagram can be used:

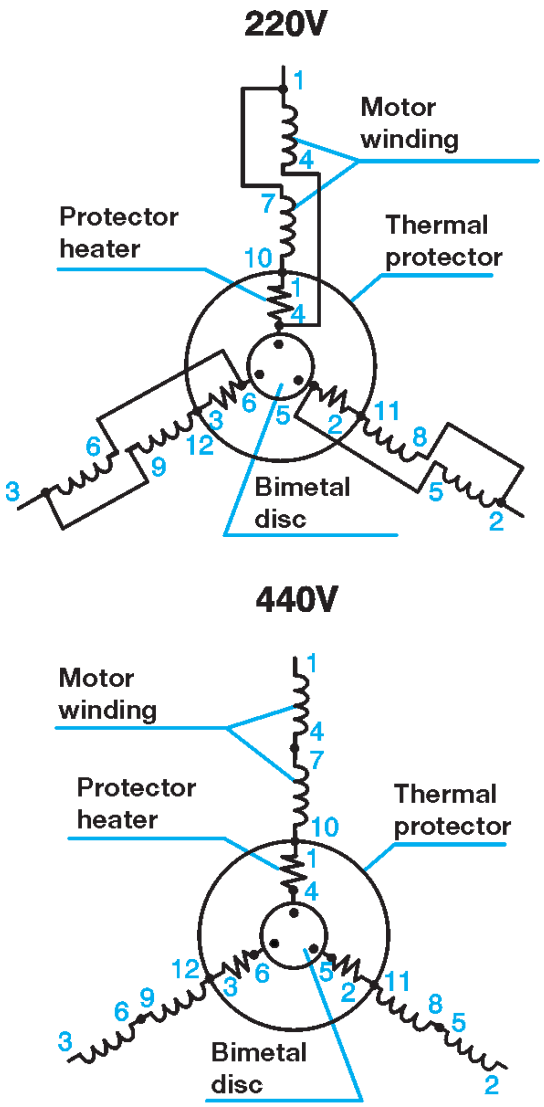


Figure 7.8 - Thermal protector connection diagram for three-phase motors

Advantages

- Combination of a thermal protector sensitive to temperature and current;
- Possibility of automatic reset.

Disadvantages

- Current limitation, since the thermal protector is directly connected to the winding of the single-phase motor;
- Application on three-phase motors only when star-connected.

Note: WEG recommends the installation of temperature sensors to protect the winding and bearings of the electric motor and so increase its useful life during operation.

	Thermoresistor (Pt-100)	Thermistor (PTC and NTC)	Thermostat	Phenolic Thermal protector
Protection device	Calibrated resistance	Semiconductor	■ Moving contacts ■ Bimetal cont.	Moving contacts
Disposition	Winding head	Winding head	■ Inserted in the ■ Inserted in the winding head	Inserted in the circuit
Operation	External control of the protection system	External control of the protection system activation	■ Direct activation ■ External control of the protection system active.	Direct activation
Current limitation	Control current	Control current	■ Motor current ■ Control current	Motor current
Type of sensitivity	Temperature	Temperature	Current and temperature	Current and temperature
Number of Units per motor	3 or 6	3 or 6	3 or 6 1 or 3	1
Type of control	Alarm and/or tripping	Alarm and/or tripping	■ Tripping ■ Alarm and/or tripping	Tipping

Table 7.5 - Thermal protection

Causes of overheating	Current based protection		Protection with thermal probes and thermal realy
	Only fuse or Circuit breaker	Fuse and thermal relay	
Overload with 1.2 times rated current	○	●	●
Duty cycles S1 to S10	○	◑	●
Braking, reversals and frequent starts	○	◑	●
Operating with more than 15 starts per hour	○	◑	●
Locked rotor	◑	◑	●
Phase fault	○	◑	●
Excessive voltage oscillation	○	●	●
Line frequency oscillation	○	●	●
Excessive ambient temperature	○	○	●
External heating caused By bearing, belts, pulleys, etc	○	○	●
Obstructed ventilation	○	○	●

Table 7.6 - Comparison between motor protection systems

Caption: Unprotected ○
Partially protected ◑
Totally protected ●

We do not recommend using “molded case circuit-breaks for distribution and miniature circuit breakers for the protection of electric motor starting since these devices do not meet the electric motor protection standard due to the following reasons:

- Usually these circuit-breakers do not have regulation/setting possibilities for their thermal current/rated overload, having only fixed values of this rated current and in most cases it is not equal to the rated current of the motor.
- In the case of three-phase systems, the thermal device of the circuit-breakers do not have the protection against “phase fault” as its thermal device does not have the “typical bipolar overload” - 2 phases - provided on the normal and the electronic overload relays.

7.3 Service Duty

According to IEC 60034-1, the service duty is the degree of regularity of load to which the motor is submitted. Standard motors are designed for continuous running duty. The load is constant during an indefinite period of time, and it is equal to the rated motor output. It is purchaser's responsibility to state the duty as accurately as possible. In cases where there are no load variations or when variations can be predicted, the duty can be indicated by numbers or by means of charts representing the load variations over time. Whenever the actual load variation in real time cannot be determined a fictitious sequence, no less severe than the actual duty should be indicated by the customer. When another starting duty is used than the informed one on the motor nameplate this may result in motor overheating and consequent motor damage. In case of doubt, contact WEG.

7.3.1 Standardized Service Duties

According to IEC 60034-1, the duty types and the assigned alphanumeric symbols are explained below:

a) Duty type (S1) - continuous running duty

Operation at a constant load maintained for sufficient time to allow the machine to reach the thermal equilibrium, see Figure 7.9.

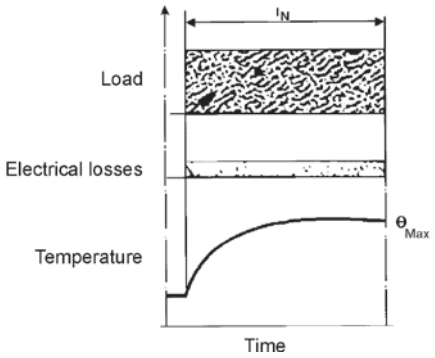


Figure 7.9

t_N = *operation time at constant load*
$\theta_{máx}$ = *maximum temperature attained*

b) Duty type (S2) - Short-time duty

Operation at a constant load for a given time, less than that required to reach thermal equilibrium, followed by a time de-energized and at rest of sufficient duration to re-establish machine temperature within +2 K of the coolant temperature, see figure 7.10.

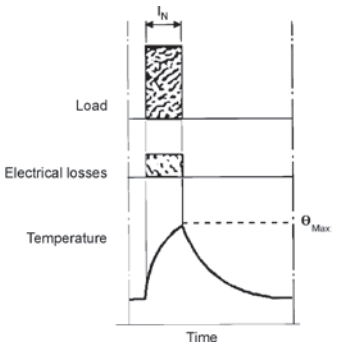


Figure 7.10

t_N = *operation time at constant load*
$\theta_{máx}$ = *maximum temperature attained*

c) Duty type S3 - Intermittent periodic duty

A sequence of identical duty cycles, each including a time of operation at constant load and a time de-energized and at rest. These periods are so short that the thermal equilibrium is not reached during one duty cycle and the starting current does not significantly affect the temperature rise (see Figure 7.11).

$$\text{Cycle duration factor} = \frac{t_N}{t_N + t_R} \cdot 100\%$$

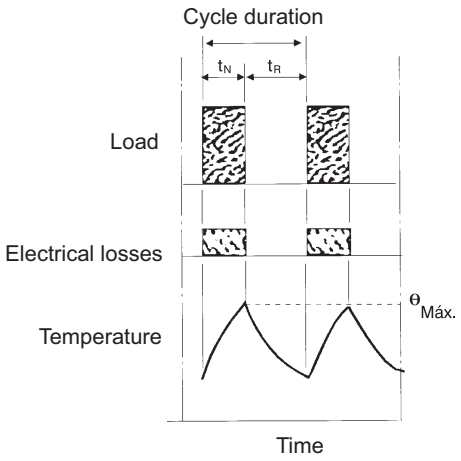


Figure 7.11

t_N = *operation time at constant load*
t_R = *time at rest*
θ_{max} = *maximum temperature attained*

d) Duty type S4 - Intermittent periodic duty with starting

A sequence of identical duty cycles, each cycle consisting of a starting, a time of operation at constant load and a time de-energized and at rest. These periods are so short that the thermal equilibrium is not reached, see Figure 7.12.

$$\text{Cycle duration factor} = \frac{t_D + t_N}{t_D + t_N + t_R} \cdot 100\%$$

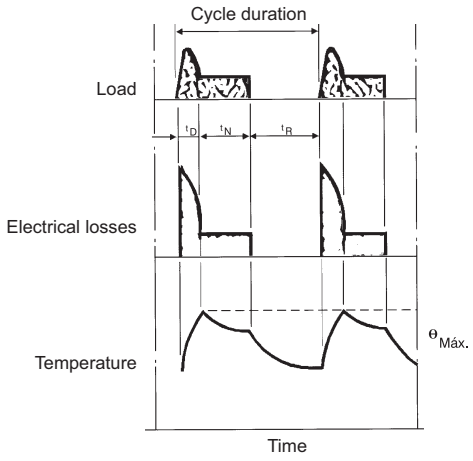


Figure 7.12

t_D = *starting/accelerating time*
t_N = *operation time at constant load*
t_R = *time at rest*
$\theta_{máx}$ = *maximum temperature attained*

e) Duty Type S5 - Intermittent periodic duty with electric braking

A sequence of identical duty cycles, each cycle consisting of a starting time, A time of operation at constant load, a time of electric braking and a time de-energized and at rest. These periods are so short that the thermal equilibrium is not reached, see Figure 7.13.

$$\text{Cycle duration factor} = \frac{t_D + t_N + t_F}{t_D + t_N + t_F + t_R} \cdot 100\%$$

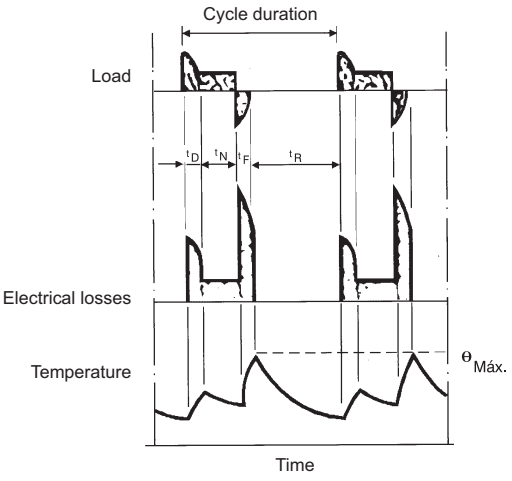


Figure 7.13

t_D = *starting/accelerating time*
t_N = *operation time at constant load*
t_F = *time of electric braking*
t_R = *time at rest*
$\theta_{máx}$ = *maximum temperature attained*

f) Duty Type S6 - Continuous operation periodic duty
A sequence of identical duty cycles, each cycle consisting of a time of operation at constant load and time of operation at no-load. There is no time de-energized and at rest, see Figure 7.14.

$$\text{Cycle duration factor} = \frac{t_N}{t_N + t_V} \cdot 100\%$$

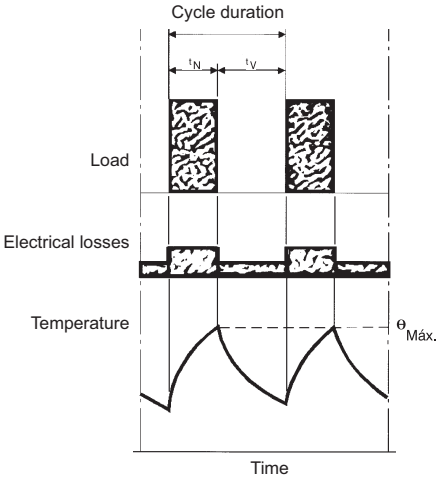


Figure 7.14

t_N = *operation time at Constant load*
t_V = *operation time at no-load*
$\theta_{máx}$ = *maximum temperature attained*

g) Duty type S7 - Continuous operation periodic duty with electric braking
A sequence of identical duty cycles, each cycle consisting of a starting time, a time of operation at constant load and time of electric braking. There is no time de-energized and at rest, see Figure 7.15.

Cycle duration factor = 1

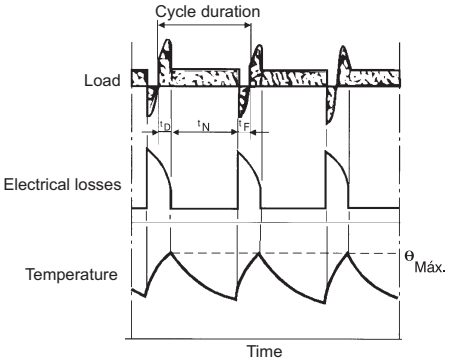


Figure 7.15

t_D = *starting/acceleration time*
t_N = *operation time at constant load*
t_F = *time of electric braking*
$\theta_{máx}$ = *maximum temperature attained*

h) Duty type S8 - Continuous operation periodic duty with related load/speed changes
A sequence of identical duty cycles, each cycle consisting of a time of operation at a constant load corresponding to a predetermined speed of rotation, followed by one or more times of operation at other constant loads corresponding to different speeds of rotation. There is no time de-energized and at rest (see Figure 7.16).

Cycle duration factor:

- For N1 = $\dfrac{t_D + t_{N1}}{t_D + t_{N1} + t_{F1} + t_{N2} + t_{F2} + t_{N3}} \cdot 100\%$
- For N2 = $\dfrac{t_{F1} + t_{N2}}{t_D + t_{N1} + t_{F1} + t_{N2} + t_{F2} + t_{N3}} \cdot 100\%$
- For N3 = $\dfrac{t_{F2} + t_{N3}}{t_D + t_{N1} + t_{F1} + t_{N2} + t_{F2} + t_{N3}} \cdot 100\%$

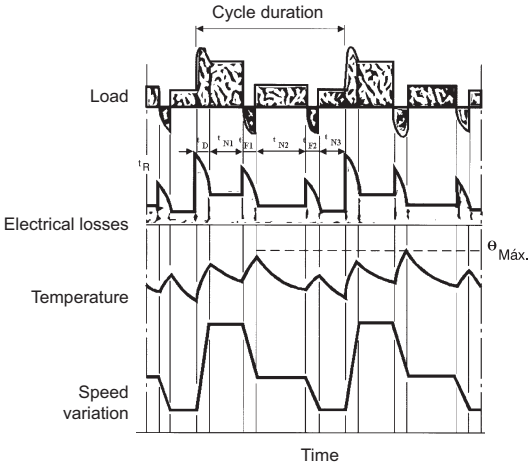


Figure 7.16

$t_{F1} - t_{F2}$ = *time of electric braking*
t_D = *starting/accelerating time*
$t_{N1} - t_{N2} - t_{N3}$ = *operation time at constant load*
$\theta_{máx}$ = *maximum temperature attained*

i) Duty type S9 - Duty with non-periodic load and speed variations
A duty in which generally load and speed vary non=periodically within the permissible operating range. This duty includes frequently applied overloads that may greatly exceed the reference load (see figure 7.17).

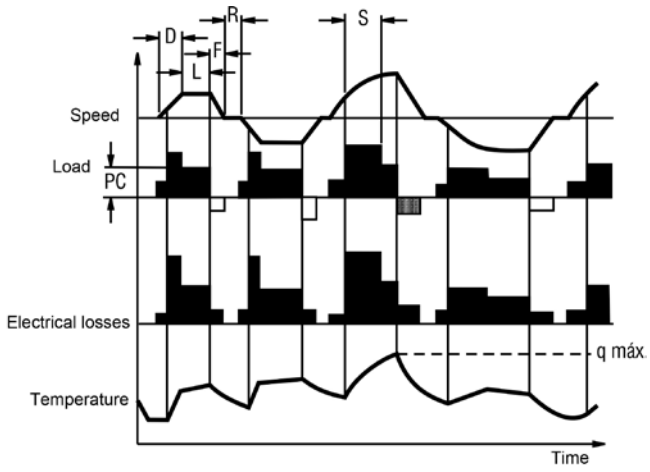


Figure 7.17

j) Duty type S10 - Duty with discrete constant loads and speeds

A duty consisting of a specific number of discrete values of loads (or equivalent loading) and if applicable, speed, each load/speed being maintained for sufficient time to allow the machine to reach thermal equilibrium, see Figures 7.18a, b, and c. The minimum load within a duty cycle may have the zero value (no-load or de-energized and at rest).

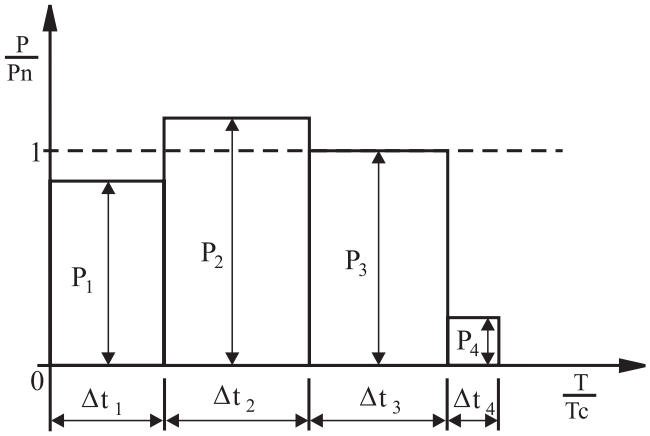


Figure 7.18a

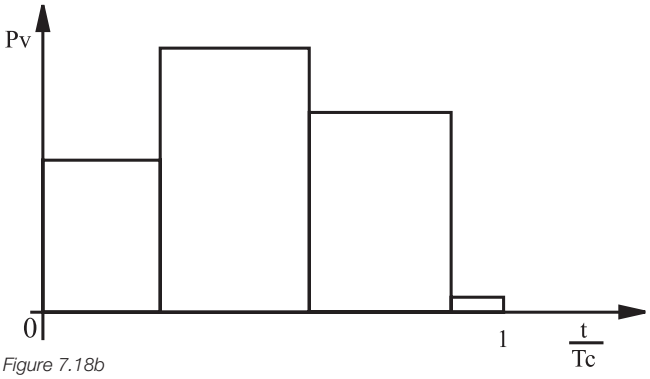


Figure 7.18b

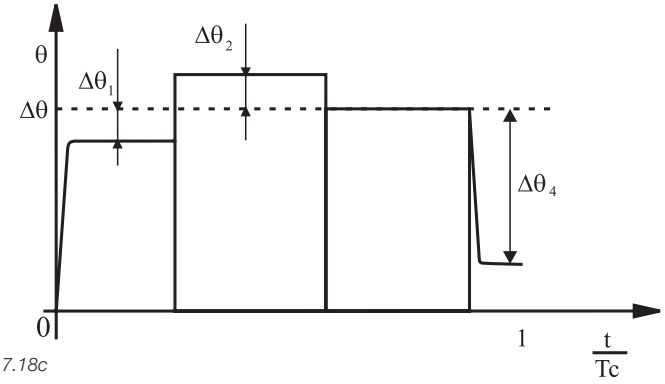


Figure 7.18c

Note: with respect to duties S3 through to S8, the time of operation is generally too short to reach the thermal equilibrium. The motor heats up partially and cools down at every cycle. Only after many cycles, the motor reaches the thermal equilibrium.

k) Special duties

The load can vary during operation time or when reversal or counter-current braking, etc. is activated. The proper motor selection can only be ensured after contacting the factory and providing a complete description of the cycle:

- Motor output required to drive the load. If the load varies cyclically, provide a load x time diagram (as example see Figure 7.15).
- Resistive torque of the load.
- Total moment of inertia (GD2 or J) of the driven machine with reference to its rated speed.
- Number of starts, reversals, counter-current braking, etc.
- Operation time with load and time at rest/no-load.

7.3.2 Duty Type Designation

The duty type shall be designated by the symbol described in item 7.3. The continuous running duty can be indicated alternatively by the word “continuous”. Examples for the duty type designation:

1) S2 60 seconds

The designation of the duties S2 to S8 is given by the following indications:

a) S2, operation time at constant load;
b) S3 to S6, cycle duration factor;
c) S8, each one of the rated speeds that are part of the cycle, followed by its respective rated output and its duration time.

For the duty types S4, S5, S7, and S8 other indications can be added to the designation, however, these indications should be agreed previously between the manufacturer and the customer.

Note: as an example of the indications to be added, previously agreed relating to the duty type designation different from the continuous running duty, following indications can be made relating to the considered duty type:
a) Number of starts per hour;
b) Number of braking per hour;
c) Type of braking;
d) Constant of kinetic energy (H), rated speed of motor and load. The last one can be changed by the inertia factor (FI).

Where: constant of kinetic energy is the ratio between the kinetic energy (stored in the rotor at rated speed) and the rated apparent power. The inertia factor is the ratio between the sum of total inertia moment of load (referred to the motor shaft) and the rotor moment of inertia.

2) S3 25%; S6 40%

3) S8 motor H.1 FI. 10 33 cv 740rpm 3min

Where: - H.1 is a Constant of the kinetic energy of 1s;
- FI.10 is an inertia factor of 10.

4) S10 para Δt = 1.1/0.4; 1.0/0.3; 0.9/0.2; r/0.1; TL = 0.6.

Where: Δt is in p.u. (per unit) for the different loads and their respective operations. The TL value is given p.u. for the expected lifetime of the thermal insulation system. During the time at rest, the load must be indicated by the letter "r".

7.3.3 Rated Output

Rated output is the mechanical power available at shaft end, within its characteristics at continuous running duty. The rated output concept, i. e., the mechanical power available at shaft end, is directly related to the temperature rise of the winding. As you know, the motors can drive much higher power loads than its rated output, until it almost reaches the breakdown torque. However, if the overload exceeds motor output for which it has been designed, overheating will be generated and the motor lifetime will be reduced significantly, or may even result in motor burn out.

Consider that the required motor power is always defined by the load characteristics, for example: a load of 90 HP required from the motor, will be always 90 HP even if the motor has been designed for 75 HP or 100 HP.

7.3.4 Equivalent Power Ratings for Low Inertia Loads

It is assumed that the electric motor must supply to the driven machine the required power. It is also recommended that the motor provides some extra power for eventual overloads; depending on the duty cycle, the motor can occasionally supply more or less power. Although there are many standardized ways to describe the running conditions of a motor, it is often necessary to evaluate the load conditions imposed on the motor by more complex duty cycles than those described in the standards. The formula below gives a usual method to calculate the equivalent power rating:

$$P_m^{\,2} = \frac{1}{T} \sum_{t=0}^{t} P(t)^2 \Delta t$$

Where: P_m = equivalent power required from the motor
$P(t)$ = power, variable with time, required from the motor
T = total cycle time (period)

This method is based on the hypothesis that the effective load applied to the motor will provide the same thermal requirements than a fictitious equivalent load, that requires continuously the power Pm.

It is also based on the fact that load losses vary according to the square of the load, and that the temperature rise is directly proportional to losses. This is true for motors that run continuously but drive intermittent loads.

So:

$$P_m = \sqrt{\frac{P_1^{\,2} \cdot t_1 + P_2^{\,2} \cdot t_2 + P_3^{\,2} \cdot t_3 + P_4^{\,2} \cdot t_4 + P_5^{\,2} \cdot t_5 + P_6^{\,2} \cdot t_6}{t_1 + t_2 + t_3 + t_4 + t_5 + t_6}}$$

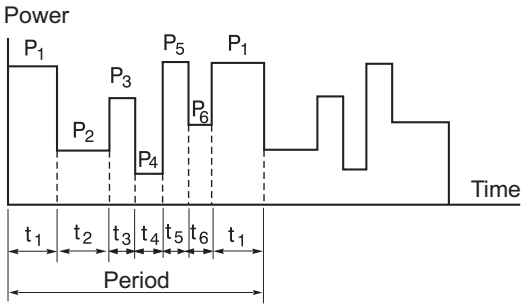


Figure 7.19 - Continuous running with intermittent loads

If the motor is at rest between the operation times, the motor cooling will be reduced. Thus, for motors where the cooling efficiency is directly related to motor operation (for example, TEFC motors), the equivalent power is calculated by the following formula:

$$(P_m)^2 = \frac{\Sigma (P_i^2 \cdot t_i)}{\Sigma (t_i + \frac{1}{3} t_r)}$$

where: t_i = load time
t_r = time at rest
P_i = corresponding loads

$$P_m = \sqrt{\frac{P_1^{\,2} \cdot t_1 + P_3^{\,2} \cdot t_3 + P_5^{\,2} \cdot t_5 + P_6^{\,2} \cdot t_6}{t_1 + t_3 + t_5 + t_6 + \frac{1}{3}(t_2 + t_4 + t_7)}}$$

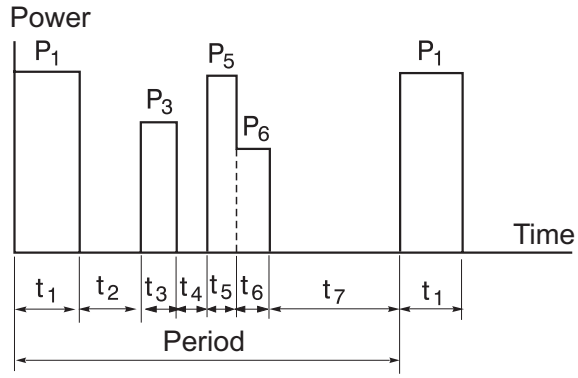


Figure 7.20 - Operation with variable load and at rest between the operations times

7.4 Service Factor (SF)

Service factor (SF) is the factor that, when applied to rated output, represents the allowable load that can be applied to motor continuously, under specified operating conditions. Note that this refers to continuous overload conditions, i.e., a power reserve that gives the motor a better capacity to withstand adverse operating conditions. Service factor should not be confused with momentary overload capacity during a few minutes. A service factor = 1.0 means that the motor has not been designed for continuous operation above its rated output. However, this does not change its capacity to withstand instantaneous overloads. IEC 60034-1 specifies the most common Service Factors per motor output.

8. Environment Characteristics

The selection of electric motor for particular applications should consider some parameters such as:

- Altitude where the motor will be installed;
- Temperature of the cooling medium.

According to IEC 60034-1, the usual service conditions are:

a) Altitude not exceeding 1.000 masl;

b) Cooling medium (in most cases, the ambient air) with temperature not exceeding 40 ºC and free from harmful substances.

Up to altitudes not exceeding 1.000 masl and ambient temperatures not exceeding 40 ºC, the operating conditions are considered normal and the motor must supply its rated output without overheating.

8.1 Altitude

Motors operating at altitudes above 1000 m.a.s.l will have overheating problems caused by the rarefaction of the air which results in the reduction of the cooling capacity. Poor heat exchange between the motor and cooling air will require a loss reduction which will also reduce the motor output.

The motor heating is directly proportional to losses and these vary in quadratic proportion with the motor outputs.
There are some application alternatives to be evaluated:

a) The installation of a motor at altitudes above 1000 masl can be made by using insulating material of higher thermal class;

b) As per IEC 60034-1, temperature rise limits must be reduced by 1% for every 100 m of the altitude above 1000 masl. This rule is valid for altitudes up to 4.000 masl. For higher altitudes, please contact WEG.

Example:
A class B, 100 HP motor, Δt 80 K, operating at an altitude of 1500 masl, the ambient temperature of 40 ºC must be reduced by 5 ºC, resulting in a maximum stable temperature of 36 ºC. The ambient temperature may be evidently higher provided that temperature rise is lower than the temperature class of the insulating materials.

T_{amb} = 40 - 80 . 0.05 = 36 ºC

8.2 Ambient Temperature

Motors operating at temperatures below 20ºC will have the following problems:

a) Excessive condensation, requiring additional condensed water drains or installation of space heaters when motor remains out of service for long periods;

b) Bearing frosting which causes grease or lubricant hardening requiring the use of special lubricants or antifreeze grease (please check our website).

Motors operating continuously at ambient temperatures above 40 ºC, their insulation system can be damaged. A possible solution for this problem is to build the motor with a special design using special insulating materials or oversizing the motor.

8.3 Determining Useful Motor Output at Different Temperature and Altitude Conditions

Combining effects of temperature and altitude variation, the dissipation capacity of motor output can be obtained multiplying the useful output by the multiplying factor of table 8.1 below:
Example:
A Class F Insulation motor, 100 HP, operating at an altitude of 2.000 masl and the ambient temperature of 55 ºC.
Based in table 8.1 - α = 0.83 thus P" = 0.83 , Pn
The motor can only supply 83% of its rated output.

T (°C)	Altitude (m)								
	1000	1500	2000	2500	3000	3500	4000	4500	5000
10							0,97	0,92	0,88
15						0,98	0,94	0,90	0,86
20					1,00	0,95	0,91	0,87	0,83
25				1,00	0,95	0,93	0,89	0,85	0,81
30			1,00	0,96	0,92	0,90	0,86	0,82	0,78
35		1,00	0,95	0,93	0,90	0,88	0,84	0,80	0,75
40	1,00	0,97	0,94	0,90	0,86	0,82	0,80	0,76	0,71
45	0,95	0,92	0,90	0,88	0,85	0,81	0,78	0,74	0,69
50	0,92	0,90	0,87	0,85	0,82	0,80	0,77	0,72	0,67
55	0,88	0,85	0,83	0,81	0,78	0,76	0,73	0,70	0,65
60	0,83	0,82	0,80	0,77	0,75	0,73	0,70	0,67	0,62
65	0,79	0,76	0,74	0,72	0,70	0,68	0,66	0,62	0,58
70	0,74	0,71	0,69	0,67	0,66	0,64	0,62	0,58	0,53
75	0,70	0,68	0,66	0,64	0,62	0,60	0,58	0,53	0,49
80	0,65	0,64	0,62	0,60	0,58	0,56	0,55	0,48	0,44

Table 8.1 Multiplying factor for the useful output as a function of the ambient temperature (T) at "ºC" and altitude (H) in "m".

8.4 Environment

8.4.1 Aggressive Environments

The aggressive environment such as shipyards, port facilities, fish industries, marine applications, chemical, and petrochemical industries require that all equipment operating at such environments are suitable and reliable to withstand such harsh conditions without presenting any problem.

For the application of electric motors in these aggressive environments, WEG has a specific line for each motor type duly designed to meet specific and standardized requirements for the most adverse operating conditions. These motors can be delivered with the following special characteristics:

- Double impregnated winding
- Anticorrosive alkyd paint (inside and outside)
- Galvanized mounting bolts
- Oil seal between the shaft and end shield (may be lip seal, W3Seal, etc.)
- Additional protection by sealing joints.

For environments with a temperature range between -16°C and 40 °C and relative air humidity ≤ 95%, anticorrosive coating for internal surfaces is recommended. For environments with temperatures between 40 °C and 65 °C also anticorrosive coating for internal surfaces is recommended, however, a derating factor to 40 °C should be considered.

Note: for environments with relative air humidity ≥ 95%, anticorrosive coating for internal surfaces with connection of space heater is recommended.

For marine motors, the specific operating characteristics are defined by the type of driven load on board. However, all motors offer the following special features:

- Reduced temperature rise for operation in ambient up to 50 °C
- Capacity to withstand without any problem, sudden overload conditions of short duration up to 60% above the rated torque, as specified in standards of Certification Bodies.

WEG rigid control during the production process ensures reliable operation to the marine motors. They meet the construction and inspection requirements as well as the tests specified in the standards of the Certification Bodies, such as:

- Registro Italiano Navale (RINA)
- American Bureau of Shipping (ABS)
- Bureau Veritas (BV)
- China Certification Society (CCS)
- Det Norske Veritas and Germanischer Lloyd (DNV GL)
- Lloyd's Register (LR)
- Russian Maritime Register of Shipping (RS)
- Korean Register of Shipping (KRS)
- Nippon Kaiji Kyokai (ClassNK)

8.4.2 Environments Containing Dust or Fibers

To analyze whether motors are suitable to operate in these environments, the following information should be available: approximate size and amount of fibers present in the environment. This information is since along the time, the fibers can obstruct the ventilation system resulting in motor overheating. If fiber content is excessive, air filters should be applied or the motor must be cleaned frequently.

Prevent motor cooling impairment

For this case there are two solutions:

1) Use motors without ventilation system;

2) For motor with cooling by ducts, calculate the volume of air to be displaced by the motor fan, by establishing the airflow required for perfect the motor cooling.

8.4.3. Explosive Atmospheres

Explosion-proof, non-sparking, increased safety and dust-proof motors are intended for use in explosive atmospheres containing combustible gases, vapors, or explosive dust or fibers. Chapter 9 (explosive atmospheres) deals specifically with this subject.

8.5 Degree of Protection

Enclosures of electrical equipment, according to characteristics where they will be installed and their maintenance accessibility, should offer a certain degree of protection. Thus, for example, an equipment to be installed in a location subjected to water jets must have housing capable of withstanding the water jets under determined pressure and angle of incidence, without water penetration.

8.5.1 Identification Codes

Standard IEC 60034-5 defines the degrees of protection of electrical equipment by means of the characteristic letters IP, followed by two characteristic numerals.

First characteristic numeral	
1st charact. numeral	Definition
0	No-protected machine
1	Machine protected against solid objects greater than 50 mm
2	Machine protected against solid objects greater than 12 mm
3	Machine protected against solid objects greater than 2,5 mm
4	Machine protected against solid objects greater than 1,0 mm
5	Dust-protected machine
6	Dust-tight machine

Table 8.2 - The first characteristic numeral indicates the degree of protection against the ingress of solid objects and accidental or inadvertent contact.

Second characteristic numeral	
2nd charact. numeral	Definition
0	No-protected machine
1	Machine protected against dripping water
2	Machine protected against dripping water when tilted up to 15°
3	Water falling as a spray at any angle up to 60° from the vertical
4	Water splashing against the machine from any direction
5	Water protected by a nozzle against the enclosure from any direction
6	Water from heavy seas or water projected in powerful jets
7	Machine protected against the effects of immersion
8	Machine protected against the effects of continuous submersion

Table 8.3 - The second characteristic numeral indicates the degree of protection against the ingress of water in the machine

The combination of the two characteristic numerals, i. e., between The two degrees of protection are shown in Table 8.4. According to standards the qualification of a motor is clearly defined for each degree of protection by standardized tests that do not leave any scope of misinterpretation.

Motor	Degree of Protection	First characteristic numeral		Second char. numeral
		Protected against Accidental contact	Protected against solid object	Protected against water
Open motors	IP00	Non-protected	Non-protected	Non-protected
	IP02	Non-protected	Non-protected	Protection against dripping water even when tilted 15º vertically
	IP11	Protection against accidental contact with the hand	Ingress of solid objects exceeding 50 mm in diameter	Protection against dripping water falling vertically
	IP12	Protection against accidental contact with the hand	Ingress of solid objects exceeding 50 mm in diameter	Protection against dripping water even when tilted 15º
	IP13	Protection against accidental contact with the hand	Ingress of solid objects exceeding 50 mm in diameter	Protection against dripping water even when tilted 60º
	IP21	Protection against the touching with the finger	Ingress of solid objects exceeding 12 mm in diameter	Protection against dripping water falling vertically
	IP22	Protection against the touching with the finger	Ingress of solid objects exceeding 12 mm in diameter	Protection against dripping water even when tilted 15º
	IP23	Protection against the touching with the finger	Ingress of solid objects exceeding 12 mm in diameter	Protection against dripping water even when tilted 60º
Closed motors	IP44	Protection against the touching with tools	Ingress of solid objects exceeding 1 mm in diameter	Protection against splashing water from any direction
	IP54	Protection against contacts	Protection against the accumulation of harmful dust	Protection against splashing water from any direction
	IP55	Protection against touches	Protection against the accumulation of harmful dust	Protection against water jets from any direction

Table 8.4 - Degree of Protection

8.5.2 Usual Degrees of Protection

Although some characteristic numerals to indicate the degree of protection can be combined in different ways, only a few degrees of protection are usually employed. They are: IP21 and IP23 (to open motors), IP44 and IP55 (to enclosed motors). For special and more dangerous areas there are other commonly used degrees of protection such as IPW 55 (weather protection) IP56 (protection against water jets), IP65 (totally protected against dust) and IP66 (totally protected against dust and water jets).

Bearing sealing

To meet the degree of protection required for each application, the motors have sealings that prevent the entry of waste through the bearings.

WEG Motors can be supplied with the following bearing sealing:

- V'Ring
- Lip seal / Oil seal
- Labyrinth
- WSeal® - Exclusive WEG's sealing system that consists of a V'Ring with double lips and metal cap mounted on this ring.
- W3 Seal® - Exclusive WEG's sealing system that consists of three seals: V'Ring, O'Ring, and Labyrinth.

The WSeal® and W3 Seal® sealing systems have been developed by WEG to protect the motor against the accumulation of solid and liquid impurities present in the environment.

NOTE: To know the motor sealing, you should consult the seals available by product line and frame size.
The above options suit most applications on the market.
For more information, contact WEG.

8.5.3 Weather Protected Motors

According to IEC 60034-5, the motor will be weather protected when due to its design (technical discussion between customer and WEG), the defined protections provide a correct operation of the motor against rain, dust and snow.

WEG also uses the letter W to indicate the degree of protection of the motor to indicate that the motor has a special paint plan (weather protected). The painting plans may vary according to the environmental severity, which should be informed by the customer during motor specification/order.

Aggressive environments require that equipment be perfectly suitable to support such conditions ensuring high reliability in service without showing any problems.

WEG manufacturers a wide range of electric motors with special characteristics, suitable for use in shipyards, ports, fishing plants and several naval applications, as well as in chemical and petrochemical industries and other aggressive environments. So WEG motors are suitable to operate under the most severe operational conditions.

8.6 Space Heater

The space heater are installed inside the motor when it operates in high-humidity environments, (humidity> 95%) and / or when it remains out of operation for long periods
(longer than 24 h), thus preventing water accumulation water inside the motor by the condensation of humid air.

The space heater heats up the motor inside few degrees above the ambient temperature (5-10 °C), when the motor is switched off. The supply voltage of the space heaters must be specified by customer. The space heaters can be supplied for following supply voltage: 110 V, 220 V and 440 V.

Depending on the frame size, following space heaters will be installed. See Table 8.5:

Frame size	Quantity	Power (W)
63 to 80	1	7.5
90 to 100	1	11
112	2	11
132 to 160	2	15
180 to 200	2	19
225 to 250	2	28
280 to 315	2	70
355 to 315B	2	87

Table 8.5 - Space heaters

WARNING: the space heaters should only be powered on when motor is off, otherwise the motor may overheat, resulting in potential damages. Disconnect input power to the motor before performing any maintenance. Also space heaters must be disconnected from input power.

8.7 Noise Levels

WEG Motors comply with NEMA and IEC standards which specify the maximum sound pressure levels in decibels. The values of Table 8.6 comply with IEC 600034-9 standard.

Frame size	2 poles		4 poles		6 poles		8 poles	
	Sound power level	Sound pressure level	Sound power level	Sound pressure level	Sound power level	Sound pressure level	Sound power level	Sound pressure level
90	83	71	69	57	66	54	66	54
100	87	75	73	61	67	55	67	55
112	88	76	75	63	73	61	73	61
132	90	78	78	66	76	64	74	62
160	92	79	80	67	76	63	75	62
180	93	80	83	70	80	67	79	66
200	95	82	86	73	83	70	82	69
225	97	84	87	74	83	70	82	69
250	97	83	88	74	85	71	83	69
280	99	85	91	77	88	74	85	71
315	103	88	97	82	92	77	91	76
355	105	90	98	83	97	82	95	80

Table 8.6 - Maximum sound power and sound pressure levels for three-phase motors (IC411,IC511,IC611), at no-load, in dB(A), 60 Hz.

Note 1: motors with cooling method IC01,IC11,IC21 may present higher sound power levels: 2 and 4 poles +7dB(A), - 6 and 8 poles +4dB(A).
Note 2: the sound power levels for 2 and 4 poles, frame size 355 are valid for unidirectional fans. The other sound Power levels are valid for bidirectional fans.
Note 3: the values for 50 Hz motors should be decreased by : 2 poles -5dB(A) ; 4, 6 and 8 poles -3dB(A).

Table 8.7 shows the increments to be considered for the sound power and sound pressure levels, in dB (A), for motors operating at load conditions.

Frame size	2 poles	4 poles	6 poles	8 poles
90 to 160	2	5	7	8
180 to 200	2	4	6	7
225 to 280	2	3	6	7
315	2	3	5	6
355	2	2	4	5

Table 8.7 - Maximum estimated increment for the sound power and sound pressure levels, in dB (A).

Note 1: this table provides the maximum expected increment at rated load conditions.
Note 2: the values are valid for 50 Hz and 60 Hz.

9. Explosive Atmosphere

9.1 Hazardous Area

An installation where inflammable products are continually handled, processed or stored requires special care to ensure the maintenance of property and the personnel safety.

Based on their characteristics, electric equipment can become ignition sources causing sparks, when opening or closing contacts or due to overheating of any component, caused intentionally or originated by fault currents.

9.2 Explosive Atmosphere

An atmosphere is considered explosive when the proportion of gas, vapor, dust, fibers, or flyings is such that after sparking caused by short-circuit or overheating of one component causes an ignition and explosion. Three elements are required for an explosion to occur:

Fuel + oxygen + ignition = explosion

9.3 Classification of Hazardous Areas

According to IEC 60079-10-1 Standard, hazardous areas are classified as follows:

Zone 0:
Area where the occurrence of a flammable and/or explosive mixture is continuous, or exists for long periods. For example, inside a fuel tank the explosive atmosphere is always present.

Zone 1:
Area where the probability of occurrence of a flammable and/or explosive mixture is associated with normal equipment and process' operation. The explosive atmosphere is frequently present.

Zone 2:
Area in which an explosive gas atmosphere is not likely to occur in normal operation, but if it does occur, will persist for a short period only. This conditions associated with abnormal operation of equipment and process, losses or negligent use. The explosive atmosphere may accidentally be present.

According to NEC/API 500 Standards, the hazardous areas are classified as follows:

- Division 1 - Area where there is HIGH probability of occurring an explosion.
- Division 2 - Area where there is lower explosion probability.

Standards	Occurrence of flammable mixtures		
	Continuously present	Under normal conditions	Under abnormal conditions
IEC	Zone 0	Zone 1	Zone 2
NEC/API	Division 1		Division 2

Table 9.1 - Comparison between ABNT/IEC and NEC/API

The process of dust storage in confined spaces offers potentially explosive atmospheres. This occurs when dust is mixed with air in the form of a dust cloud or when the dust is deposited on the electrical equipment. Areas where dust, flyings and fibres in air occur in dangerous quantities are classified , according to IEC 61241-10, as hazardous and are divided into three zones according to the level of risk.

Zone 20:
Area in which an explosive atmosphere in the form of a cloud of combustible dust in air is present continuously for long periods.

Zone 21:
Area in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur, occasionally, in normal operation.

Zone 22:
Area in which an explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation but, if it does occur, will persist for a short period only.

Among the products where their powders or dusts create potentially explosive environments inside confined ambient are the coal, wheat, cellulose, fibers and plastics in finely divided particles, etc.

9.3.1. Classes and Groups of the Hazardous Areas

Classes - refer to the nature of the mixture. The concept of classes is only adopted by the NEC standard.

Groups - The definition of groups is associated with the composition of the mixture.

Class I
Explosive gases or steams. Based on the type of gas or steam, we have following classification:

- GROUP A - acetylene
- GROUP B - hydrogen, butadiene, ethane oxide
- GROUP C - ethyl ether, ethylene
- GROUP D - gasoline, naphtha, solvents in general.

Class II
Combustible of conductive dust. Based on the type dust, we have following classification:

- GROUP E
- GROUP F
- GROUP G

Class III
Light and flammable fibers and particles.

According to IEC 60079-0, Hazardous areas are divided into three separate classifications:

- Group I - For mines containing methane gas.
- Group II - For application in other areas with gas explosive atmospheres. These areas are dived in IIA, IIB and IIC.
- Group III - For application in explosive dust atmospheres. These group is divided in:
  - III A - Combustible fibers
  - III B - Non-conductive dust
  - III C - Conductive dust

Gases / Standards	Group of Acetylene	Group of Hydrogen	Group of ethane	Group of propane
IEC	II C	II C	II B	II A
NEC/API	Class I Gr A	Class I Gr B	Class I Gr C	Class I Gr D

Table 9.2 - Comparison between IEC and NEC/API for gases

Explosive atmosphere	ABNT / IEC	NEC
Gases or steams	Zone 0 and Zone 1	Class I Division 1
	Zone 2	Class I Division 2
Combustible dusts	Zone 20 and Zone 21	Class II Division 1
	Zone 22	Class II Division 2

Table 9.4 - Classification per area according to IEC and NEC

Dust and fibres / Standards	High conductive dust	Light conductive dust	Non-conductive dust	Combustible fibers
NBR IEC	III C	III C	III B	III A
NEC/API	Class II Gr E	Class II Gr F	Class II Gr G	Class III

Table 9.3 - Comparison between Standards IEC and NEC/API for combustible dust and fibers

9.3.2 Protection by Enclosure

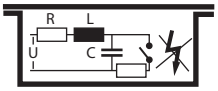
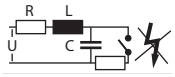
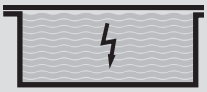
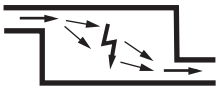
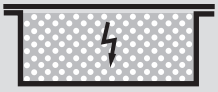
Symbol		Description	Simplified Representation
"db"	Explosion-proof	Type of protection in which the parts capable of igniting an explosive gas atmosphere. Are provided with an enclosure which can withstand the pressure developed during an internal explosion of an explosive mixture, and which prevents the transmission of the explosion to the explosive gas atmosphere surrounding the enclosure.	
"eb", "ec"	Increased safety	Measures that are applied in order to avoid the possibility of excessive temperatures and the occurrence of arcs or sparks inside and on the external parts of the electric material produced under normal conditions.	
"i"	Intrinsic safety “ia”, “ib”, “ic”	Type of protection, in which no spark or any thermal effect produced in the conditions specified in the standard, including normal operation and specified fault conditions, are capable of causing ignition of a given explosive gas atmosphere.	
"m"	Encapsulation “ma”, “mb”, “mc”	Type of protection whereby parts that are capable of igniting an explosive atmosphere by either sparking or heating are enclosed in a compound in such a way that the explosive atmosphere cannot be ignited under operating or installation condition.	
“n”	Non-sparking "nC", "nR"	Type of protection applied to electrical apparatus such that, in normal operation and in certain specified abnormal conditions, it is not capable of igniting a surrounding explosive gas atmosphere. There are two categories of materials: spark generation (nC), encapsulated with limited breathing (nR).	
“o”	Oil immersion	Type of protection in which the electrical apparatus or parts of the electrical apparatus are immersed in a protective liquid in such a way that an explosive gas atmosphere which may be above the liquid or outside the enclosure cannot be ignited.	
“p”	Pressurization “pxb”, “pyb”, “pzc”	Type of protection for guarding against the ingress of the external atmosphere into an enclosure or room by maintaining a protective gas therein at a pressure above that of the external atmosphere.	
“q”	Sand filling	Type of protection in which the parts capable of igniting an explosive gas atmosphere are fixed in position and completely surrounded by filling material to prevent the ignition of an external explosive atmosphere.	
“t”	Protection by enclosure “tb”, “tc”	Type of protection where parts that can cause ignition of an explosive atmosphere are protected by an enclosure providing partially or totally protection against dust ingress and a means to limit surface temperature.	

Table 9.5 - Type of protection by enclosure

9.4 Temperature Classes

The maximum temperature on the outer and/or inner surface of an electric equipment must always be lower than the ignition temperature of the gas or steam. Gases can be classified for temperature classes based on their ignition temperature, where the maximum surface temperature of the corresponding class must be lower than the corresponding temperature of the gases.

IEC		NEC		Ignition temperature of gases and/or steams
Temperature classes	Maximum surface temperature	Temperature classes	Maximum surface temperature	
T1	450	T1	450	> 450
T2	300	T2	300	> 300
T3	200	T3	200	> 200
T4	135	T4	135	> 135
T5	100	T5	100	> 100
T6	85	T6	85	> 85

Table 9.6 - Temperature classes

9.5 Equipment for Explosive Atmospheres

The tables below show the selection of equipment for hazardous areas classified according to IEC 60079-14:

IEC 60079-14	
Zone	Possible types of protection
Zone 0	Ex "ia"
	Ex "ma"
	Equipment specially approved for Zone 0
Zone 1	Equipment certified for Zone 0
	Ex "db"
	Ex "db eb"
	Ex "eb"
	Ex "pxb", Ex "pyb"
	Ex "ib"
	Ex "q"
	Ex "ob"
	Ex "mb"
Zone 2	Equipment certified for Zone 0 and Zone 1
	Ex "pzc"
	Ex "ic"
	Ex "ec"
	Ex "oc"
	Ex "mc"

Table 9.7 - Types of protection for explosive atmospheres with inflammable gases.

Table 9.8 shows the list of equipment according to standard NEC:

DIVISION 1	Equipment with type of protection: ▪ explosion-proof Ex"d" ▪ presurization Ex"p" ▪ oil immersion Ex"o" ▪ intrinsic safety Ex"i"
DIVISION 2	▪ any equipment certified for Division 1 ▪ equipment that do not generate sparks of hot surfaces on general purpose enclosures

Table 9.8

9.6 Increased Safety Equipment

His electrical equipment, under normal operating conditions, does not generate arcs, sparks or sufficient heat to cause ignition of the explosive atmosphere for which it was designed.

Time t_E - time taken for an a.c. rotor or stator winding, when carrying the initial starting current IA, to be heated up to the limiting temperature from the temperature reached in rated service at the maximum ambient temperature. Figures below show how to proceed for correct time "t_E" determination. (Figures 9.1 and 9.2).

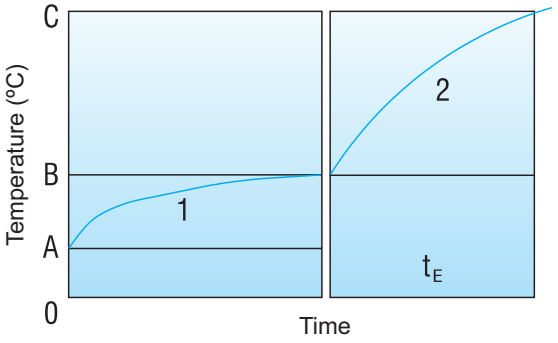


Figure 9.1 - Schematic diagram explaining the method for the time "t_E" determination

A - maximum ambient temperature
B - temperature at rated service condition
C - limit temperature
1 - service temperature rise
2 - locked rotor temperature rise

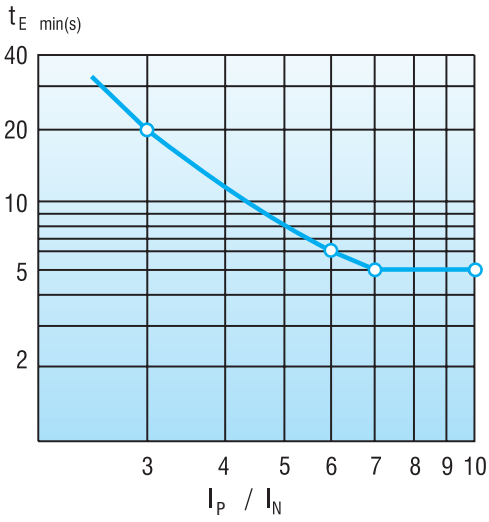


Figure 9.2 - Minimum time "t_E" as function of the starting current ratio I_P / I_N

9.7 Explosion-Proof Equipment

It is a type of protection where the parts that may ignite an explosive atmosphere are confined within enclosures that can withstand the pressure caused by an internal explosion of an explosive atmosphere and prevents the transmission of the explosion to an explosive atmosphere.

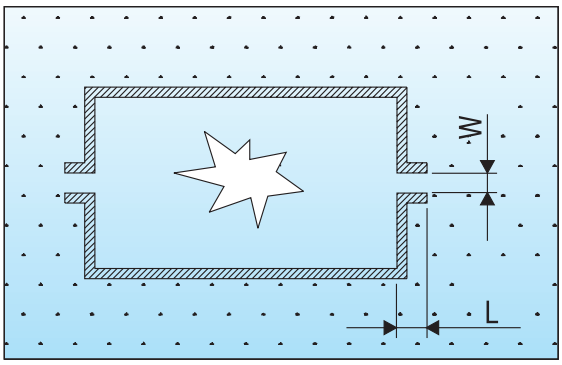


Figure 9.3 - Protection principle

The induction motor (with any type of protection) is not tight protected, i. e., there is air exchange with the environment. During operation, the motor heats up and the inside air will have higher pressure than the outside (air is then blown out); when the power supply is turned off, motor cools down and, as a consequence, the inside pressure decreases allowing penetration of air (which is contaminated). The enclosure will not allow any eventual internal explosion to propagate to the external environment. For the system safety, WEG controls all air gaps - flame paths (tolerances between joints) and the finishing joint since they are responsible for the volume of gases exchanged between the inside and outside the motor.

10. Mounting Arrangements

10.1 Dimensions

Dimensions of WEG electric motors are standardized according to the standard *International Electrotechnical Commission* - IEC-60072. In these standards the basic dimension for the standardization of the assembly dimensions of electric machines is the height from the base to the shaft end center, designated by the letter H (see Figure 10.1).

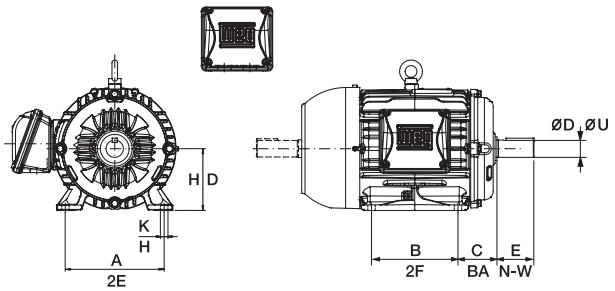


Figure 10.1

To each height of shaft end H, a C dimension is associated, distance from the centerline of mounting hole in the nearest foot to the shoulder on drive end shaft. However, to each H dimension, several B dimension can be associated (distance between centerlines of mounting holes in feet), allowing to have either “longer” or “shorter” motors.

The "A" dimension, distance between centerlines of mounting holes in the feet or base of machine, on the front side, is unique for H values up to 315, however it can have multiple values from frame size H equal to 35 mm. For those customers who require standardized frames size according to NEMA standard, table 10.1 makes a comparison between dimensions H-A-B-C-K-D- E of IEC standard and D; 2E; 2F; BA; H; U-N-W of NEMA standard.

ABNT / IEC NEMA	H D	A 2E	B 2F	C BA	K H	∅ D ∅ U	E N-W
63	63	100	80	40	7	11j6	23
71	71	112	90	45	7	14j6	30
80	80	125	100	50	10	19j6	40
90 S 143 T	90 88.9	140 139.7	100 101.6	56 57.15	10 8.7	24j6 22.2	50 57.15
90 L 145 T	90 88.9	140 139.7	125 127	56 57.15	10 8.7	24j6 22.2	50 57.15
100L	100	160	140	63	12	28j6	60
112 S 182 T	112 114.3	190 190.5	114 114,3	70 70	12 10.3	28j6 28.6	60 69.9
112 M 184 T	112 114.3	190 190.5	140 139.7	70 70	12 10.3	28j6 28.6	60 69.9
132 S 213 T	132 133.4	216 216	140 139.7	89 89	12 10.3	38k6 34.9	80 85.7
132 M 215 T	132 133.4	216 216	178 177.8	89 89	12 10.3	38k6 34.9	80 85.7
160 M 254 T	160 158.8	254 254	210 209.6	108 108	15 13.5	42k6 41.3	110 101.6
160 L 256 T	160 158.8	254 254	254 254	108 108	15 13.5	42k6 41.3	110 101.6
180 M 284 T	180 177.8	279 279.4	241 241.3	121 121	15 13.5	48k6 47.6	110 117.5
180 L 286 T	180 177.8	279 279.4	279 279.4	121 121	15 13.5	48k6 47.6	110 117.5
200 M 324 T	200 203.2	318 317.5	267 266.7	133 133	19 16.7	55m6 54	110 133.4
200 L 326 T	200 203.2	318 317.5	305 304.8	133 133	19 16.7	55m6 54	110 133.4
225 S 364 T	225 228.6	356 355.6	286 285.8	149 149	19 19.0	60m6 60.3	140 149.2
225 M 365 T	225 228.6	356 355.6	311 285.8	149 149	19.0 19.0	60m6 60.3	140 149.2
250 S 404 T	250 254	406 406.4	311 311.2	168 168	24 20.6	65m6 73	140 184.2
250 M 405 T	250 254	406 406.4	349 349.2	168 168	24 20.6	65m6 73	140 184.2
280 S 444 T	280 279.4	457 457.2	368 368.4	190 190	24 20.6	65m6 73	140 184.2
280 M 445 T	280 279.4	457 457.2	419 419.1	190 190	24 20.6	75m6 85.7	140 215.9
315 S 504 Z	315 317.5	508 508	406 406.4	216 215.9	28 31.8	80m6 92.1	170 269.9
315 M 505 Z	315 317.5	508 508	457 457.2	216 215.9	28 31.8	80m6 92.1	170 269.9
355 M	355	610	560	254	28	100m6	210
586	368.3	584.2	558.8	254	30	98.4	295.3
355 L	355	610	630	254	28	100m6	210
587	368.3	584.2	635	254	30	98.4	295.3

Table 10.1 - Dimension comparison between IEC and NEMA

10.2 Standardized Type of Construction and Mounting Arrangement

The types of construction and mounting arrangements designate the arrangement of the machine components with regard to fixings, bearing arrangement and shaft extension, as standardized in IEC 60034-7, DIN 42950 and NEMA MG 1-4.03. Standard IEC 60072 determines the location of the terminal box on the motor that shall be situated with its centerline within a sector ranging from the top to 10° below the horizontal centerline of the motor on the right-hand side, when looking at the D-end of the motor.

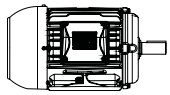
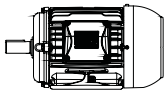
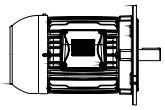
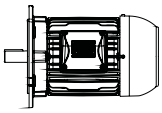
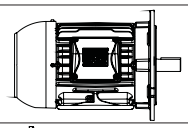
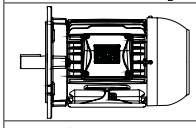
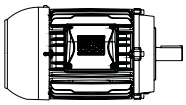
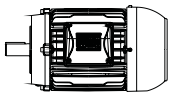
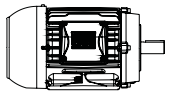
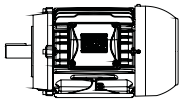
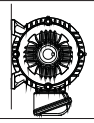
Figure	Symbol for					Mounting configuration
	WEG Designation	DIN 42950	IEC 60034-7		Frame	
			Code I	Code II		
	B3D	B3	IM B3	IM 1001	with feet	mounted on substructure (*)
	B3E					
	B5D	B5	IM B5	IM 3001	footless	fixed by “FF” flange
	B5E					
	B35D	B3/B5	IM B35	IM 2001	with feet	mounted on substructure by feet, with additional fixation by “FF” flange
	B35E					
	B14D	B14	IM B14	IM 3601	footless	fixed by “C” flange
	B14E					
	B34D	B3/B14	IM B34	IM 2101	with feet	mounted on substructure by feet, with additional fixation by “C” flange
	B34E					
	B6D	B6	IM B6	IM 1051	with feet	wall mounted, feet on the right side, looking at the D-en of the motor
	B6E					

Table 10.2a - Standardized mounting arrangements (horizontal mounting)
*(*) Substructure: bases, base plate, foundation, rails, pedestals, etc.*

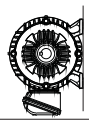
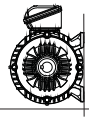
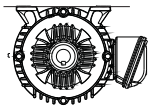
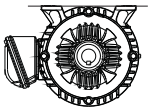
Figure	Symbol for				Frame	Mounting configuration
	WEG Designation	DIN 42950	IEC 60034-7			
			Code I	Code II		
	B7D	B7	B7	IM 1061	with feet	wall mounted, feet on the right side, looking at the D-en of the motor
	B7E					
	B8D	B8	IM B8	IM 1071	with feet	fixed to ceiling
	B8E					

Table 10.2b - Standardized mounting arrangements (horizontal mounting)

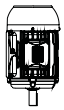
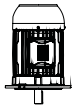
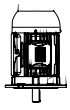
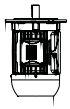
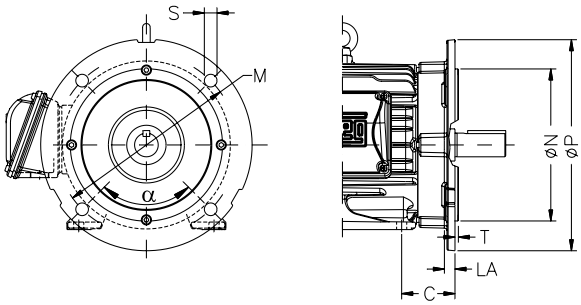
Figure	Symbol for				Frame	Mounting configuration
	WEG Designation	DIN 42950	IEC 60034-7			
			Code I	Code II		
 (*)	V5	V5	IM V5	IM 1011	with feet	wall mounted or mounted on substructure
	V6	V6	IM V6	IM 1031	with feet	wall mounted or mounted on substructure
 (*)	V1	V1	IM V1	IM 3011	footless	fixed by “FF” flange, shaft end down
	V3	V3	IM V3	IM 3031	footless	fixed by “FF” flange shaft end up
 (*)	V15	V1/V5	IM V15	IM 2011	with feet	wall mounted, with additional fixation by “FF” flange shaft end down
	V36	V3/V6	IM V36	IM 2031	with feet	wall mounted, with additional fixation by “FF” flange shaft end up
 (*)	V18	V18	IM V18	IM 3611	footless	fixed by the “C” flange - shaft end down
	V19	V19	IM V19	IM 3631	footless	fixed by the “C” flange - shaft end up

Table 10.3 - Standardized mounting arrangements (vertical mounting)
Note: “We recommend to use drip cover for vertical mounted motors with shaft end down and non-weather protected”.
We recommend to use rubber slinger at the shaft end (coupling side for vertical mounted motors with shaft end up).

10.3 Flanges Dimensions

"FF" Flange

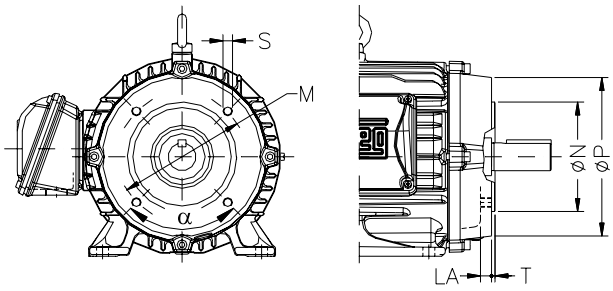
Flange "FF"									
Frame	Flange	LA	M	N	P	S	T	α	Nº of holes
63	FF-115	5,5	115	95	140	10	3	45°	4
71	FF-130	7	130	110	160		3,5		
80	FF-165	9	165	130	200	12			
90		10							
100	FF-215	12,5	215	180	250	15	4		
112									
132	FF-265	12	265	230	300				
160	FF-300	18	300	250	350	19	5		
180									
200	FF-350		350	300	400				
225	FF-400		400	350	450	19	5	22°30'	8
250	FF-500		500	450	550				
280									
315	FF-600	22	600	550	660	24	6		
355	FF-740		740	680	800				



Note: Dimensions in mm.

"C" Flange

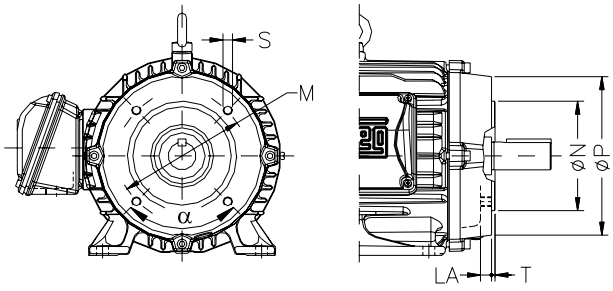
Flange "C"									
Frame	Flange	LA	M	N	P	S	T	α	Nº of holes
63	FC-95	4,5	95,2	76,2	143	UNC 1/4"x20	4	45°	4
71		10							
80									
90	FC-149	15	149,2	114,3	165	UNC 3/8"x16			
100		12							
112	FC-184	13,5	184,2	215,9	225	UNC 1/2"x13	6,3		
132		15,5							
160		19,5							
180	FC-228	20	228,6	266,7	280				
200									
225	FC-279	25	279,4	317,5	395	UNC 5/8"x11	6,3	22°30'	8
250	FC-355		355,6	406,4	455				
280									
315	FC-368	40	368,3	419,1					
355M/L									
355A/B		33,5							



Note: Dimensions in mm.

"C-DIN" Flange

Flange "C-DIN"									
Frame	Flange	LA	M	N	P	S	T	α	Nº of holes
63	C-90	9,5	75	60	90	M5	2.5	45°	4
71	C-105	8	85	70	105	M6			
80	C-120	10,5	100	80	120		3		
90	C-140		115	95	140	M8			
100	C-160	12	130	110	160		3.5		
112		13,5							
132	C-200	15,5	165	130	200	M10			



Note: Dimensions in mm.

10.4 Painting

The painting plan below shows the adopted solutions for each application.

WEG's Painting Plans x ISO 12944 Painting Plans								
WEG Painting Plans	Atmospheric corrosivity categories ISO 12944-2	Environment Indoor / Outdoor	Durability (years to first major maintenance)				Minimum Total Thickness (µm) ISO 12944	Examples considering environments with a typically temperate climate
			> 7	7 to 15	15 to 25	> 25		
203A	C3	Indoor / Outdoor	L				80	Atmospheres with low level of pollution. Mostly rural areas. Unheated buildings where condensation may occur e.g. depots, sport halls.
207A	C3	Indoor / Outdoor	L				80	
207N	C2	Indoor / Outdoor			H		120	
205E	C4	Indoor	L				120	Urban and industrial atmospheres, moderate sulfur dioxide pollution. Coastal areas with moderate salinity. Production rooms with high humidity and some air pollution e.g. foodprocessing plants, laundries, breweries, dairies
205P	C4	Indoor / Outdoor	L				120	
202P	C4	Indoor / Outdoor		M			180	
202E	C4	Indoor		M			180	
214P	C4	Indoor / Outdoor		M			160	
222E	C4	Indoor / Outdoor		M			180	Industrial and urban environments, indoor or outdoor, with moderate contamination of corrosive agents such as SO2 (sulfur dioxide) and Cl- (chloride), which may contain high humidity.
222P	C4	Indoor / Outdoor		M			180	
211P	C5 (I and M)	Indoor / Outdoor		M			240	C5I: Industrial areas with high humidity and aggressive atmosphere. Buildings or areas with almost permanent condensation and with high pollution. C5M: Coastal areas with high salinity. Buildings or areas with almost permanent condensation and with high pollution. CX: Offshore areas with high salinity and industrial areas with extreme humidity and aggressive atmosphere and subtropical and tropical atmospheres. Industrial areas with extreme humidity and aggressive atmosphere.
211E	C5 (I and M)	Indoor		M			240	
212P	CX / C5 (I and M)	Indoor / Outdoor				VH	320	
212E	C5 (I and M)	Indoor				H	320	

Table 10.4 - Painting Plan
Note: WEG Painting Plans meet the Petrobras standards

For painting over the WEG original painting, please make sure with your paint supplier that the new painting system is compatible with the base paint used in WEG motors and that the surfaces are prepared accordingly, otherwise it can affect the performance of the paint plan and void the product warranty.

10.4.1 Tropicalized Painting

High humidity indexes can result in premature insulation system deterioration which is the main component that ensures the motor lifetime. Any ambient with up to 95% of relative humidity does not require additional protection, other than space heaters to avoid water condensation inside the motor. However, for any ambient with relative humidity above 95%, an epoxy painting is applied on all inside motor components which is known as tropic-proof painting.

11. Three-Phase Electric Motor Selection and Application

On application engineering of electric motors it is common to compare load requirements with motor characteristics. A lot of applications can be correctly driven by more than one type of motor.
This means that selection of a specific type of motor does not necessarily exclude other types.

Application of computers has improved significantly motor calculation resulting in more accurate results along with more economical designs of machines.

WEG induction motors, squirrel cage or slip rings, low or high voltage, can be used on a wide range of applications, specially in steel plants, mines, pulp and paper industries, sanitation, chemical and petrochemical areas, cement plants, among others, requiring more and more correct motor selection for each particular application. Proper motor selection with respect to the type, torque, power factor, efficiency, temperature rise, insulation system, voltage and mechanical degree of protection can only be made after careful overall analysis that takes into consideration certain parameters such as:

- Initial cost
- Power supply capacity
- Requirements for Power factor correction
- Required torques
- Effect of load inertia
- Speed control requirements or not
- Exposure of the machine to wet, polluted and/or aggressive environments.

Squirrel cage asynchronous motor is the most commonly used in any industrial application due to its rugged and simple construction characteristics along with economic factors in reference to the motor itself, as control and protection.

Using WEG Premium line motors is regarded the most convenient current means to reduce energy consumption. It has been proved by tests that these motors have 30% less of losses representing a major energy saving. Designed and manufactured with the state-of-the-art technology, these motors are intended to reduce losses and increase efficiency resulting in low energy consumption and reduced energy bills. These motors are also highly recommended for applications with voltage variation. They are tested in conformance with IEC 60034-1 Standard and their efficiency is indicated on the motor nameplate. The efficiency is determined by the test method B of the IEEE STD 112. Efficiency values are obtained through the loss separation method in accordance with IEC 60034-1.

The Premium line motors are standardized according to IEC standards, maintaining the power/frame ratio and are therefore interchangeable with all standard motors available on the market. Although more expensive than the squirrel cage motors, the application of slip ring motors is necessary for starting heavy loads (high inertia), or when variable speed drives or starting current limitation is required while a high starting torque must be maintained.

Type	Squirrel Cage induction motor	Slip ring motor
Starting current	High	Low
Starting torque	Low	High
Starting/rated current	High	Low
Breakdown torque	> 160% of the rated torque	> 160% of the rated torque
Efficiency	High	High
Starting switch	Simple for DOL starting	Relatively simple
Protection device	Simple	Simple
Required space	Small	Rheostat requires large space
Maintenance	Small	For slip rings and brushes
Cost	Low	High

Table 11.1 - Comparison between different types of machines

For correct motor selection it is essential to consider all technical application characteristics, specially load, environment and power supply characteristics allowing the designer to calculate the following:

a) Starting torque

The starting torque required to move and overcome the static inertia of the machine. For any load to be accelerated from zero speed to its rated speed, motor torque must be always higher than the load torque.

b) Acceleration torque

This torque is required to accelerate the load to the rated speed. At all points between zero and rated speed, the motor torque must always be higher than load torque. Right over the intersection point of the two curves, acceleration torque is zero, i.e., the balance point from which the speed remains constant is reached. This intersection point between the two curves should correspond to the rated speed.

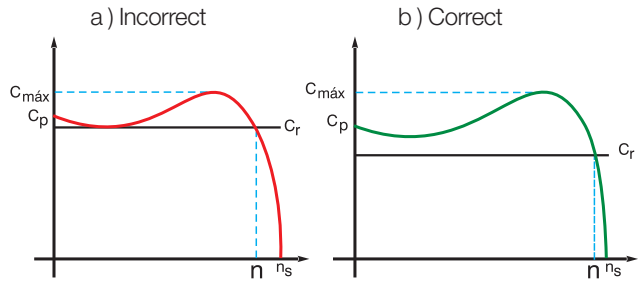


Figure 11.1 - Motor selection considering the resistive load torque

where: $C_{máx}$ = *breakdown torque*
C_p = *starting torque*
C_r = *resistive torque*
n_s = *synchronous speed*
n = *rated speed*

The acceleration torque assumes very different values during the starting stage. The average acceleration torque (C_a) is obtained from the difference between motor torque and resistive load torque.

c) Rated torque

It is the torque required to accelerate the load when operating at a specific speed. The torque required for normal operation of a machine can be constant or can vary between wide limits. For variable torques, the breakdown torque should be sufficiently high to withstand momentary overloads. The operating characteristics of a machine, related to torque, can be divided into three classes:

- **Constant torque**
  On this type of machine, torque remains constant during speed variation and the output increases proportionally with the speed.

---------- Torque required by the machine
- - - - - - - - - Output required by the machine

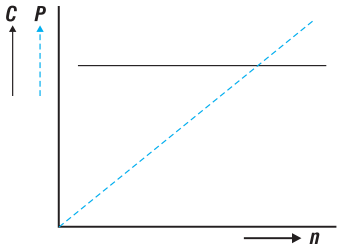


Figure 11.2

C = Constant resistive torque
P = Power: proportional to the speed (n)

Variable torque

Variable torque can be found in pumps and fans.

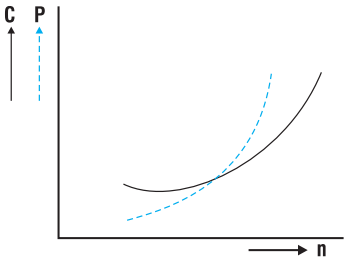


Figure 11.3

C = Resistive torque: proportional to the square of the speed (n^2)
P = Output: proportional to the cube of the speed (n^3)

Constant power

Constant Power applications require a power equal to the rated Power for any speed.

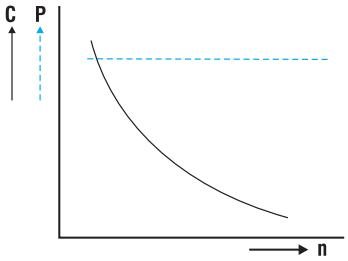


Figure 11.4

C = Resistive torque: inversely proportional to the speed
P = Constant power

11.1 Motor Type Selection for Different Loads

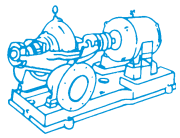
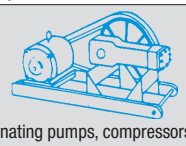
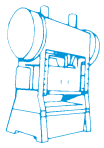
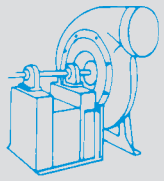
Load type	Required torque		Load characteristics	Used motor type
	Starting	Breakdown		
 Centrifugal pump, fans, drilling machines, compressors, milling machines, crushers.	Between 1 and 1,5 Times the rated torque	Maximum values between 220% and 250% of the rated torque.	■ Easy starting conditions such as intermediate gear boxes, low inertia or application of special couplings simplify starting. ■ Centrifugal machines such as pumps where torque increases with the square of the speed up to a maximum stage reached at rated speed. ■ At rated speed it may be subject to slight overloads.	■ Normal torque ■ Normal starting current ■ Design N
 Alternating pumps, compressors, conveyors, feeders, bar milling machines	Between 2 and 3 Times the rated torque	Not higher than two times rated torque	■ High starting torque to overcome the high inertia, counter pressure, stop friction, strict material process or similar mechanical conditions. ■ During acceleration, required torque decreases to rated torque. ■ It is inadvisable to subject the motor to overloads at rated speed.	■ High starting torque ■ Normal starting current ■ Design N
 Punching presses, cranes, overhead cranes, hoists, mechanical scissors, oil well pumps	3 times the rated torque	It requires two or three times the rated torque. They will be considered as losses during load peaks.	■ Intermittent loads requiring high or low starting torque. ■ They require frequent stops, starts and reversals. ■ Driven machines like punching presses that may require fly wheels to withstand the power peaks. ■ Slight regulation may be required to smooth power peaks and reduce mechanical forces on the driven machine. ■ Power supply must be protected from power peaks resulting from load fluctuations.	■ High starting torque ■ Normal starting current ■ High slip ■ Design D
 Fans, machine tools	Sometimes only part of the rated torque is required, and other times the full rated torque is required.	Once or twice the rated torque at each speed.	■ Two, three or four fixed speeds are sufficient. ■ Speed control is not required. ■ Starting torque can be low (fans) or high (conveyors) ■ Operating characteristics at several speeds may vary between constant power, constant torque or variable torque. ■ Metal cutting machines have constant output power ■ Friction loads are typical examples of constant torque. ■ Fans are typical examples of variable torque.	■ Normal or high torque (multi-speed)

Table 11.2 - Characteristics of different loads.

11.2 W22 Magnet Drive System®

W22 Magnet Drive System® consists of a three-phase synchronous AC motor fitted with high energy magnets in their rotor and driven by a variable frequency drive (VFD)*.

The use of permanent magnets eliminates the Joule losses in the rotor thus ensuring higher efficiency levels than the IE4 efficiency level. As the Joule losses are eliminated, the motor operates colder enabling the use of smaller frame size and increases its lifetime.

The use of frequency inverter enables a continuous control of the motor speed and provides constant torque in the whole speed range, including 0 rpm, without requiring forced ventilation at low frequencies. Due to the rotor design, the used balancing process and the frame size reduction, the vibration and noise levels of W22 Magnet Motors could be reduced when compared to the induction motors with the same output.

Figure 11.5
**W22 Magnet motors must be driven only by the CFW-11 frequency inverter line developed with specific software for this function.*

11.3 Application of Induction Motors with Variable Frequency Drives

Inverter fed induction motor drives (also called static frequency converters) are the most common solution used in the industry and is currently the most efficient method for the speed control of induction motors. These applications provide several benefits when compared to other speed control methods. However, these applications depend on a suitable design to take advantage when compared between energy efficiency and costs. Among the many benefits are the cost reduction, remote control, versatility, increased quality and productivity and better use of the energy performance.

11.3.1 Normative Aspects

The breakthrough occurred in the electric motor application with frequency inverters requires increasingly standards development and standards adoption to standardize the procedures for evaluating these drives.

The main International Standards that deal with this subject are:

- **IEC: 60034-17 -** Rotating Electrical Machines - Part 17: Cage induction motors when fed from converters - application guide
- **IEC 60034-25 -** Rotating Electrical Machines - Part 25: Guide for the design and performance of cage induction motors specifically designed for converter supply
- **NEMA MG1 -** Application considerations for constant speed motors used on a sinusoidal bus with harmonic content and general purpose motors used with adjustable-voltage or adjustable-frequency controls or both
- **NEMS MG1 -** Part 31: Definite purpose inverter-fed polyphase motor

11.3.2 Induction Machine Speed Variation by Frequency Inverter

The relationship between the rotor speed, the supply frequency, the number of poles and the slip of an induction motor is given by the following equation: number of poles and the slip of an induction motor is given by the following equation:

$$n = \frac{120 \cdot f_1 \cdot (1 - s)}{p}$$

where: n = mechanical speed [rpm]
f = line frequency [Hz]
p = number of poles
s = slip

The analysis of the formula shows that the best way to vary the speed of an induction motor is by varying the supply frequency. The frequency inverters transform the line voltage, with constant amplitude and frequency, into a voltage with variable amplitude and frequency. The speed of the rotating field and consequently the mechanical speed of the motor is changed by varying the frequency of the supply voltage. Thus, the inverter operates as a source of variable frequency to the motor. According to the induction motor theory, the electromagnetic torque developed by the motor is given by the following equation:

$$T = K_1 \cdot \Phi_m \cdot I_2$$

When the voltage drop is neglected due to the impedance of the stator winding, the magnetization flux will be:

$$\Phi_m = K_2 \cdot \frac{V_1}{f_1}$$

where: T : torque available on the shaft end (N.m)
Φ_m : magnetization flux (Wb)
I_2 : rotor current (A) (depends on the load)
V_1 : rotor voltage (V)
k1 and k2: constants (depend on the material and on the machine design)

However, to operate the motor in a speed range it is not sufficient to change only the supply frequency. Also, the voltage amplitude must be proportionally changed to the frequency variation. Thus, the current flux and consequently the electromagnetic torque of the motor remain constant, while the slip is maintained. The change of the V/f variation rate is linear up to the base frequency (rated) of motor operation. Above this value, the voltage, that is equal to the rated motor voltage, remains constant and only the stator frequency is changed.

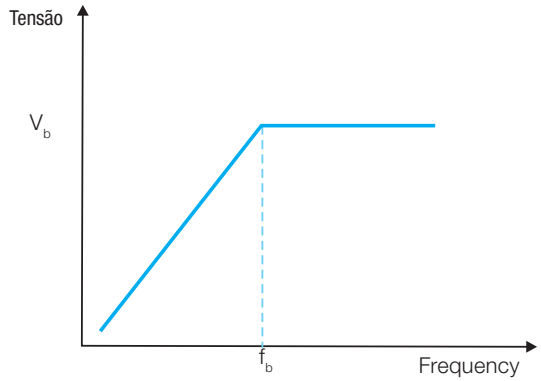


Figure 11.6

Thus, the region above the base frequency is referred to as field weakening, in which the flux decreases causing the motor torque decrease. The torque supplied by the motor remains constant up the base frequency of the operation, decreasing gradually when operating frequencies are increased.

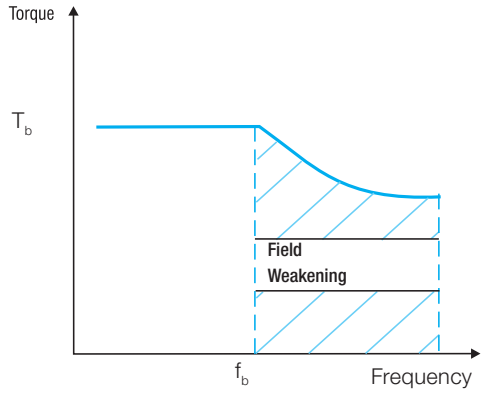


Figure 11.7

Since the output is proportional to torque multiplied by speed, the useful output power of the motor increases linearly up to the base frequency and from that point upwards it is maintained constant.

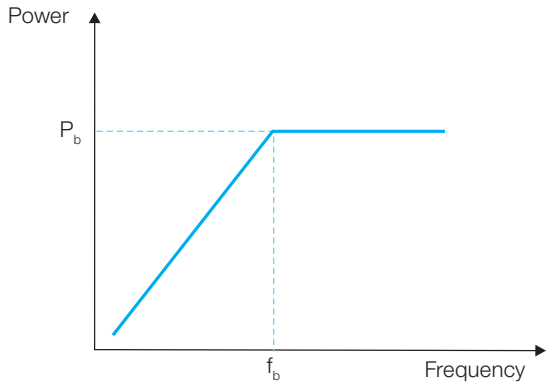


Figure 11.8

11.3.3 Characteristics of the Frequency Inverter

In order to obtain an output signal of desired voltage and frequency, the input signal must accomplish three stages within the frequency inverter:

- Diode bridge - Rectification (converting AC to DC) - voltage coming from the power supply;
- Filter or DC Link - Regulation/smoothing of the rectified signal with storage in a capacitor bank;
- IGBT power transistors - Inversion (converting AC to DC) of the DC link voltage by the Pulse-Width Modulation (PWM) technique. This modulation technique allows the output voltage/frequency variation by means of transistors (electronic switches) without interfering with the DC-voltage link.

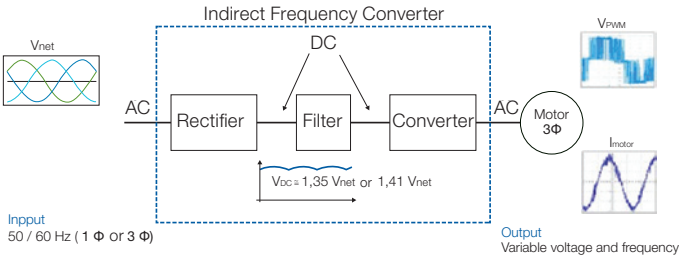


Figure 11.9

11.3.3.1 Control Types

There are basically two electronic inverter control types: scalar and vector.

The scalar control is based on the original concept of a frequency inverter: a signal of certain voltage/frequency ratio is imposed onto the motor terminals and this ratio is kept constant throughout a frequency range, in order to keep the magnetizing flux of the motor practically unchanged. It is generally applied when there is no need of fast responses to torque and speed commands and is particularly interesting when there are multiple motors connected to a single drive. The control is by open loop and the obtained speed precision is a function of the motor slip, which depends on the motor load. To improve the performance of the motor at low speeds, some drives use special functions such as slip compensation (attenuation of the speed variation as function of the load) and voltage boost (increase of the V/f ratio to compensate for the voltage drop due to the stator resistance and maintain the torque capacity of the motor) at low speeds.

This is the most used control type owing to its simplicity and also due to the fact that the majority of applications do not require high precision or fast responses during the speed control.

The vector control enables fast responses and high precision levels on the motor speed and torque control. Essentially the motor current is decoupled into two vectors: one to produce the magnetizing flux and the other to produce the torque, each one regulating the torque and the flux separately. The vector control can be realized by open loop (sensorless) or closed loop (feedback) control.

- Speed feedback - a speed sensor (for instance, an incremental encoder) is required on the motor. This control mode provides great accuracy on both torque and speed of the motor even at very low (and zero) speeds.
- Sensorless control is simpler than the closed loop control, but its action is limited particularly to very low speeds. At higher speeds this control mode is practically as good as the feedback vector control.

11.3.3.2 Harmonics

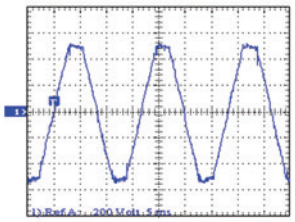
For the AC power line, the system (frequency inverter + motor) is a non-linear load which current include harmonics. The characteristic harmonics generally produced by the rectifier are considered to be of order h = np±1 on the AC side, thus, in the case of a 6 diode (6 pulses) bridge, the most pronounced generated harmonics are the 5th and the 7th ones, which magnitudes may vary from 10% to 40% of the fundamental component, depending on the power line impedance. In the case of rectifier bridges of 12 pulses (12 diodes), the most harmful harmonics generated are the 11th and the 13th ones. The higher the order of the harmonic, the lower can be considered its magnitude.
So higher order harmonics can be filtered more easily.
The most commercially available drives have 6-pulses.

The harmonic distortion of the power system can be quantified by the THD (Total Harmonic Distortion), which is informed by the inverter manufacturer and is defined as:

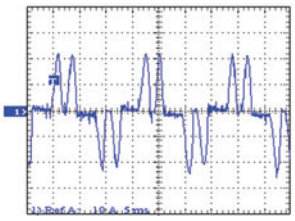
$$THD = \sqrt{\sum_{h=2}^{\infty} \left(\frac{A_h}{A_1} \right)^2}$$

where: Ah : are the rms values of the non-fundamental harmonic components
A1 : is the rms value of the fundamental component
h : harmonic order

The IEEE Std.512 recommends maximum values for current harmonics generated by electric equipment. Most manufacturers of inverters take care during the design of their equipment to ensure that the THD limits established by this standard are fulfilled.



Typical voltage waveform at input of a PWM inverter with 6 pulses (frequency: 50 Hz or 60 Hz)

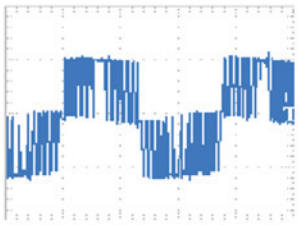


Typical current waveform current at input of a 6-pulse PWM inverter

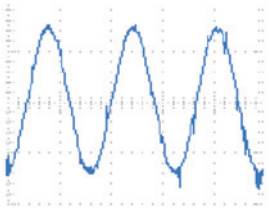
Figure 11.10

11.3.4 Inverter Influencing Motor Performance

Induction motors driven by PWM inverter are subjected to harmonics that can increase the losses and the temperature as well as the noise and vibration levels, when compared to the sinusoidal supply condition. The inverter influence on the motor depends on several factors related to the control, such as switching frequency, the effective pulse width, pulse number, among others.



Typical current waveform current at motor terminals fed by PWM voltage



Typical PWM voltage waveform at inverter output

Figure 11.11

There are basically the following solutions to mitigate the harmonics generated by a PWM frequency inverter:
Installation of output filters (load reactance, dV/dt filters, sinusoidal filters, etc.), use of multi-level inverters (more sophisticated topology), Pulse Width Modulation quality improvement (optimization of pulse patterns) and increase of the switching frequency.

Furthermore, other effects may appear when induction motors are fed by inverters. Although not produced specifically by the harmonics, other important effects may appear and should not be neglected, such as dielectric stress of the insulation system and shaft currents that reduce bearing life.

Considerations regarding energy efficiency

The lack of international standards that specify test procedures to evaluate the system (motor + inverter) efficiency allows such tests to be carried out in many different ways. Therefore, the results obtained should not influence the acceptance (or not) of the motor, except under mutual accordance between customer and manufacturer, as specified by international standards. Experience shows the effectiveness of the considerations below:

- An induction motor fed by PWM voltage provides a lower efficiency level than when fed by purely sinusoidal voltage, due to the losses increase caused by harmonics.
- In applications of motors with frequency inverters, the whole system must be evaluated (inverter + motor), rather than the motor efficiency only.
- Each case must be properly analyzed, taking into account following characteristics: operating frequency, switching frequency, load conditions, motor power, THD supplied by the inverter, etc.
- Special measuring instruments must be used for the correct evaluation of electrical quantities (True RMS meters).
- Higher switching frequencies increase the motor efficiency and decrease the inverter efficiency.

Influence of the inverter on the temperature rise of the winding

Induction motors may heat up more when fed by frequency inverter than when fed by sinusoidal voltage supply. This higher temperature rise results from the motor losses' growth owing to the high harmonic components of the PWM signal and the often reduced heat transfer resulting from speed variation of self-ventilated motors operating at low frequencies. Basically there are following solutions to prevent motor overheating:

- Rated torque derating (frame oversize);
- Use of independent cooling system;
- Utilization of the “Optimal Flux Solution” (exclusive to applications using WEG drives and motors).

Criteria for torque derating

In order to keep the temperature rise of WEG motors, when supplied by PWM, within acceptable levels and the loadability, limits shown in Fig. 11.13 and 11.14 must be met.

Note: Motors rated for explosive atmospheres should be evaluated on a case by case basis - in such case please contact WEG.

Optimal flux condition

The “Optimal Flux” solution was developed for the purpose of making WEG induction motors able to operate at low speeds with constant torque loads still keeping an acceptable temperature rise level, without the need of neither oversizing the machine nor blower cooling it.

The study of the composition of the motor losses and their relation with the frequency, magnetic flux, current and the speed variation allowed the determination of an optimal flux condition for each speed.

The incorporation of the solution obtained for WEG CFW700 / CFW701 and CFW11 inverters allows a continuous mitigation of the motor losses throughout the whole operating range, which is performed automatically by the inverter.

Important!

This solution can only be used for variable torque loads or when applied above the base frequency and when:

- Class IE2 High-Efficiency or Class IE3 Premium Efficiency motors are used;
- The motor is fed by WEG frequency inverter (CFW11 or CFW700 / CFW701 version 2.40 or above);
- Sensorless vector control is used.

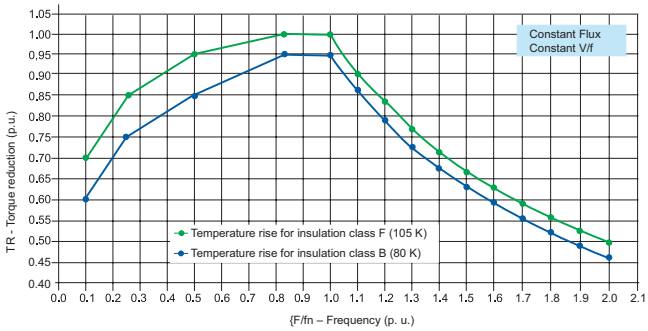


Figure 11.12 - Constant flux condition

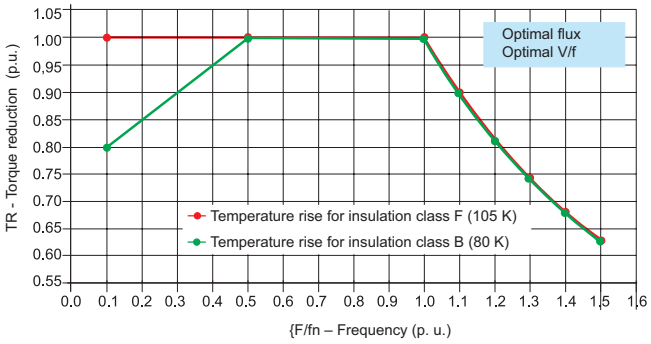


Figure 11.13 - Optimal flux condition

Modern frequency inverters use power transistors (typically IGBTs), whose switching process occurs at very high speed - at kHz frequencies. To achieve such switching, the transistors have very fast times for conducting initiation and blocking which result in voltage pulses with a high dV/dt (rate of voltage change over time). When squirrel cage induction motors are fed by frequency, those pulses combined with the cable and motor impedance may cause repetitive overvoltages (overshoots) at the motor terminals. This pulse train may degrade the motor insulation system and may hence reduce the motor lifetime. The overshoots affect especially the inter turn isolation of random winding and its value is determined primarily by following factors: rise time of the voltage pulse, cable length and type, minimum time between pulses, switching frequency and multi motor operation.

Criteria regarding the insulation system

When WEG low voltage induction motors are used with frequency inverters, the following criteria must be met to protect the insulation system of the motor: if any of the conditions below are not met, filters must be installed between the frequency inverter and the motor.

Note: motors rated for explosive atmospheres should be evaluated on a case by case basis - in such case please contact WEG.

Motor rated voltage	Voltage spikes at motor terminals (phase-phase)	dV/dt* at motor terminals (phase-phase)	Rise Time*	MTBP
$V_{NOM} < 460$ V	≤ 1600 V	≤ 5200 V/µs	≥ 0.1 µs	≥ 6 µs
460 V ≤ V_{NOM} < 575 V	≤ 2000 V	≤ 6500 V/µs		
575 V ≤ V_{NOM} ≤ 1000 V	≤ 2400 V	≤ 7800 V/µs		

Table 11.4

** Definition in accordance with NEMA MG1- Part 30*

The phenomenon of induced shaft voltage/current is caused fundamentally due to unbalanced waveforms present in the magnetic circuit of the motor. The usual causes of this problem that primarily affect large machines are eccentricities and other imperfection resulting from the manufacturing process. The advent of PWM inverters aggravated this problem, now occurring also with lower power machines, since the motors are now fed with unbalanced waveforms that have high frequency components. The causes of shaft induced voltage owing to the PWM inverters supply is added to those intrinsic voltages of the motor which also causes current circulation through the bearings.

The basic reason for bearing currents to occur within a PWM inverter fed motor is due to the common mode voltage. The high frequency of the common mode voltage generated by the frequency inverter ensures that the capacitive reactances within the motor become low, allowing the current to pass through the coupling formed by the rotor, shaft and bearing toward the earth.

Common mode voltage and motor equivalent circuit for high frequencies

The three-phase voltages supplied by the PWM inverter, different from the pure sinusoidal voltage, is not balanced, i.e., the vector sum of the instantaneous voltages at the three phases of the frequency inverter output is not equal to zero, but it is equal to an electric potential of high frequency. This high frequency common mode voltage may result in undesirable common mode currents. Existing stray capacitances between motor and earth may allow current flowing to the earth, passing through rotor, shaft and bearings and reaching the end shield (earthed).

The high frequency model of the motor equivalent circuit, in which the bearings are represented by capacitances shows the paths through which the common mode currents flow. At high speed operation there is no contact between the rotor and the (earthed) outer bearing raceway, due to the plain distribution of the grease.

The electric potential of the rotor may then increase with respect to the earth until the dielectric strength of the grease film is disrupted, occurring voltage sparking and flow of discharge current through the bearings. This current that circulates whenever the grease film is momentarily broken down is often referred to as the “capacitive discharge component”.

These discontinuous electric discharges wear the raceways and erode the rolling elements of the bearings, causing small superimposing punctures. Long term flowing discharge currents result in furrows (fluting), which reduce bearings life and may cause the premature machine failure.
There is still another current component that circulates permanently through the characteristic conducting loop comprising the shaft, bearings, end shields and the housing/ frame, that is often called the conduction component.

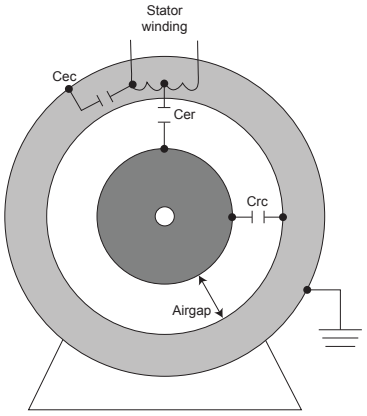


Figure 11.14 - Capacitive discharge current.

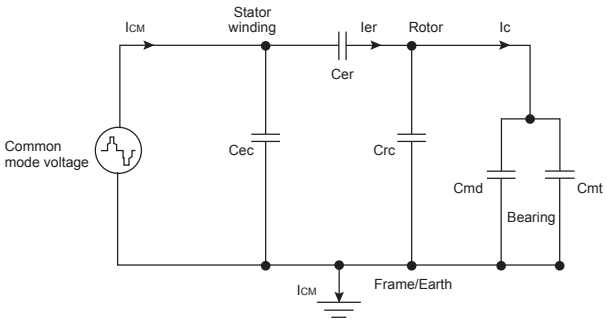


Figure 11.16 - Motor capacitance.

Equivalent circuit for high frequencies:

C_{er} : *capacitor formed by the stator winding and the rotor lamination*
C_{rc} : *capacitor formed by rotor and stators cores*
C_{ec} : *capacitor formed by the stator winding and the frame*
$C_{md/mt}$: *capacitance of the DE/NDE bearings, formed by the inner and the outer bearing raceways with the metallic rolling elements*
I_{CM} : *total common mode current*
I_{er} : *capacitive discharge current flowing from the stator to the rotor*
I_{c} : *capacitive discharge current flowing through the bearings*

Protection criteria against bearing currents

When WEG low voltage three-phase induction motors are fed by frequency inverters, following criteria must be met for the bearing protection:

Note: motors rated for explosive atmospheres should be evaluated on a case by case basis - in such case please contact WEG.

Line W22		
Frame size (IEC)	Standard	Optional
225 ≤ mod < 315	▪ No protected	▪ Insulated NDE bearing ▪ Insulated DE bearing ▪ Earthing system with brush between frame and NDE-shaft
315 and 355	▪ Insulated NDE bearing ▪ Earthing system with brush between frame and DE-shaft	▪ Both bearings are insulated

Table 11.5 - Bearing protection

The rotating electrical machines have basically three noise sources: the ventilation system, the rolling bearings and the electromagnetic excitation. Bearings in perfect operating conditions produce practically despicable noise, in comparison with other sources of the noise generated by the motor.

In motor fed by sinusoidal supply, especially those with reduced number of poles (higher speeds), the main noise source is the ventilation system. On the other hand, in motors with higher number of poles and lower operation speeds often stands out the electromagnetic noise.

However, in variable speed drive systems, especially at low operating speeds when ventilation is reduced, the electromagnetically excited noise can be the main source of noise whatever the motor polarity, owing to the harmonic content of the voltage.

Criteria regarding the noise level

Results of laboratory tests (4 point measurements accomplished in semi-anechoic chamber with the frequency inverter installed outside the chamber) carried out with several WEG motors and frequency inverters using different switching frequencies have shown that WEG three-phase induction motors, when fed by PWM frequency inverters and operating at rated frequency (typically 50 or 60 Hz) present an increment in the sound pressure level of 11 dB(A) at most.

Notes:
- *O switching frequency increase tends to reduce the noise level of electromagnetic origin generated by the motor.*
- *The noise criteria above apply only to motor frame sizes ≤ 355.*

For more information on VSD motor applications, visit our website (www.weg.net) and download the **Technical Guide - Induction motors Fed by PWM (code 50029350)**.

12. Environmental Information

12.1 Packaging

WEG electric motors are supplied in cardboard, plastic, steel or wooden packaging. These materials can be recycled or reused. All wood used in the packaging of WEG motors comes from reforestation.

12.2 Product

As far as constructive aspects are concerned, electric motors are basically manufactured with ferrous metals (steel, cast iron), non-ferrous metals (copper, aluminum), and plastic. In general, the electric motor has long life cycle, however, when its disposal, WEG recommends that the packaging and the product materials are properly separated and sent for recycling. Non-recyclable materials should be properly disposed in landfills, co-processed or incinerated. Service providers of recycling, disposal, co-processing or incineration must be properly licensed by local environmental authorities to carry out these activities.

13. Tests

This chapter defines the witnessed or no witnessed tests that can be performed by WEG upon customer request.

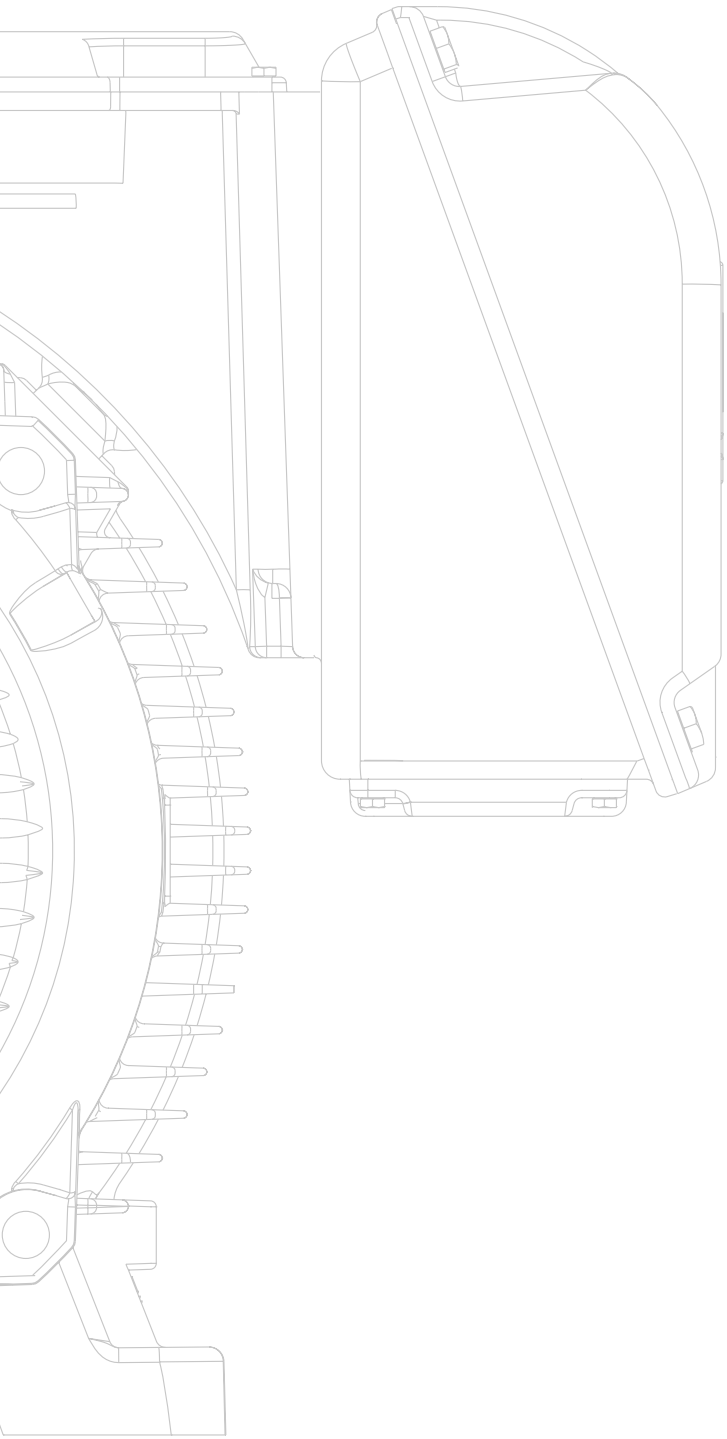
As defined by IEC 60034-1, the tests are grouped in ROUTINE, TYPE and SPECIAL tests. The test procedures are specified in IEC 60034-2. Other tests not listed below can be performed by the manufacturer provided there is an agreement between the parties.

List of tests						
Description		Routine Test	Type test	Special test	According to Standard	
1	Winding resistance - cold	X	X		IEEE 112	IEC 60034-1
2	Tests with locked rotor	X	X		IEEE 112	IEC 60034-1
3	Temperature rise test	N.A.	X		IEEE 112	IEC 60034-1
4	Load test	N.A.	X		IEEE 112	IEC 60034-2-1
5	Breakdown torque test	N.A.	X		IEEE 112	IEC 60034-1
6	No-load test	X	X		IEEE 112	IEC 60034-2-1
7	Mechanical Vibration -measurement	Optional	Optional	X	NEMA MG1 Part 7	IEC 60034-14
8	Noise level-measurement	Optional	Optional	X	NEMA MG1 Part 9	IEC 60034-9
9	High-potential test	X	X		IEEE 112	IEC 60034-1
10	Insulation resistance test	X	X		IEEE 43	IEC 60204-1
11	Polarization index	Optional	Optional	X	IEEE 43	IEC 60204-1
12	Speed-torque curve	N.A.	Optional	X	IEEE 112	-
13	Overspeed	Optional	Optional	X	NEMA MG1 Part 12.52	IEC 60034-1
14	Shaft voltage	Optional	Optional	X	IEEE 112	-
15	Bearing insulation resistance	Optional	Optional	X	IEEE 112	-
16	Momentary excess torque	Optional	Optional	X	NEMA MG1	IEC60034-1
17	Occasional excess current	Optional	Optional	X	NEMA MG1 Part 12.48	IEC60034-2-1

Note: N.A. - Not applicable
Optional - upon request

13.1 Variable Frequency Drive Motors

When motors are driven by frequency inverters the tests are performed directly on the power line (sinusoidal voltage source) except for the temperature rise test that can be carried out with PWM supply, on request.



14. Appendix

14.1. International System of Units

Quantity	Name	Symbol
Acceleration	Meter squared per second	m/s^2
Angular acceleration	Radian per second squared	rad/s^2
Flat angle	Radian	rad
Solid angle	Steradian	sr
Area	Square meter	m^2
Specific heat	Joule per kilogram per kelvin	J/kgK
Capacitance	Farad	
Flow	Cubic meter per second	m^3/s
Conductance	Siemens	S
Thermal conductivity	Watt per meter per kelvin	W/mK
Conductivity	Siemens per meter	S/m
Energy flux density	Watt per square meter	W/m^2
Absorbed dose	Joule per kilogram	J/kg
Energy	Joule	J
Entropy	Joule per kelvin	J/K
Mass flow	Kilogram per second	kg/s
Magnetic flux	Weber	Wb
Frequency	Hertz	Hz
Force	Newton	N
Temperature gradient	Kelvin per meter	K/m
Impulsion	Newton-second	Ns
Magnetic induction	Tesla	T
Inductance	Henri	H
Electric field intensity	Volt per meter	V/m
Magnetic field intensity	Ampere per meter	A/m
Current intensity	Ampere	A
Frequency interval	Octave	
Length	Meter	m
Mass	Kilogram	kg
Specific mass	Kilogram/cubic meter	kg/m^3
Moment of force	Newton-meter	Nm
Moment of kinetic	kilogram-square meter-second	kgm^2/s
Moment of inertia	Kilogram/square meter	kgm^2
Power	Watt	W
Pressure	Newton per square meter	N/m^2
Reluctance	Ampere per Weber	A/Wb
Electric resistance	Ohm	Ω
Mass resistivity	Ohm-kilogram per square meter	$Ωkg/m^2$
Resistivity	Ohm-meter	Ωm
Thermodynamic temperature	Kelvin	K
Voltage	Volt	V
Surface tension	Newton per meter	N/m
Time	Second	s
Angular speed	Radian per second	rad/s
Speed	Meter per second	m/s
Dynamic viscosity	Newton-second per square meter	Ns/m^2
Kinematic viscosity	Square meter per second	m^2/s
Volume	Cubic meter	m^3

Table 14.1

14.2 Unit Convertion

From	Multiply by	To obtain
Acceleration		
Meter/second² (m/s²)	1.000	Milimeter/second² (mm/s²)
	100	Centimeter/second² (cm/s²)
	3,280853	Foot/second² (ft/s²)
	2,23694	Mile/hour second (mi/(h.s))
Angular acceleration		
Radian/second² (rad/s²)	57,29577951	Degree per square second (°/s²)
Radian/second² (rad/s²)	0,159154943	Revolution per square second (s-²)
Flat angle		
Radian (rad)	57,2958	Trigonometric degree (°)
	3.437,748	Minute (')
	206.264,900	Second ('')
	0,1591551	rpm
Area		
Meter² (m²)	0,001482626	Acre (ac)
	60.000	Square centimeter (cm²)
	64,58346	Square foot (ft²)
	0,0006	Hectare (ha)
	9300,019	Square Inch (in²)
	$6x10^{-06}$	Square kilometer (km²)
	$2,32x10^{-06}$	Square mile (mi²)
	6.000.000	Square milimeter (mm²)
	7,17594	Square yard (yd²)
Specific heat		
Joule per kilogram per kelvin (J/kgK)	0,000238846	Calorie (IT)/Gram/Celsius degree (cal/g/°C)
	0,101971621	Kilogram-force meter/Kilogram/K (kgfm/kg/K)
	0,185862535	Pound-force foot/pound/°R (lbf.ft/lb.°R)
	0,000238846	Btu (IT)/Pound/Fahrenheit degrees (BTU/lb/°F)
	0,000429923	Btu (IT)/Pound/Celsius degree (BTU/lb/°C)
Capacitance		
Farad	1	Coulomb/Volt (C/V)
Flow		
Cubic meter per second (m³/s)	1.000	Liter per second (l/s)
	33.814,0227	Ounce per second (oz/s)
	1,307950619	Cubic yard per second (yd³/s)
	35,31466672	Cubic foot per second (ft³/s)
	61.023,74409	Cubic inch per second (in³/s)
	1.629,941563	Pound per second (lb/s)
	739,3290564	Kilogram per second (kg/s)
Conductance		
Siemens (S)	1	Ampere per Volt (A/V)
Thermal conductivity		
Watt per meter per kelvin (W/mK)	0,002388459	Calorie (IT)/Second/Centimeter/Celsius degrees (cal/s/cm/°C)
	0,001925964	Btu (IT) Inch/Second/Square foot/°F (BTU.in/s/ft²)
Conductivity		
Siemens per meter (S/m)	$8,99x10^{+11}$	Statmho/meter
Energy flux density		
Watt per square meter(W/m²)	0,00064516	Watt/square inch (W/in²)
	1	Joule/second/square meter (J/s.m²)
	0,000023901	Calorie (th)/second/square centimeter (cal/s/cm²)
	3.600.000	Dyne/hour/centimeter (dyn/h/cm)
	36.000	Erg/hour/square milimeter (erg/h/mm²)
	4,111305952	Foot pound/minute/square foot (lb.ft/min/ft²)
	0,000126313	Horsepower(metric)/square foot (HP/ft²)
	0,000088055	Btu (IT)/second/square foot (BTU/s/ft²)
	0,000000612	Btu (th)/second/square inch (BTU/s/in²)
Absorbed dose		
Joule per kilogram (J/kg)	100	rad
	1	Gray
Energy		
Joule (J)	0,000947817	BTU
	0,2388459	Calorie (cal)
	$1x10^{+07}$	Dyne-centimeter (dyn.cm)
	$6,24x10^{+18}$	Electron volt (eV)
	$1x10^{+07}$	Erg (erg)
	$2,78x10^{-07}$	Kilowatt-hour (kWh)
	10.197,16	Gram force-centimeter (gf.cm)
	$3,73x10^{-07}$	Horsepower-hour (HP.h)
	1	Newton-meter (N.m)
	141,6119	Ounce force-inch (ozf.in)
	8,850746	Pound force-inch (lbf.in)
	0,7375621	Pound force-foot (lbf.ft)
	1	Watt-second (Ws)
Entropy		
Joule per kelvin (J/K)	$7,24x10^{+22}$	Boltzmann constant (k(B))
	$2,39x10^{-01}$	Calories/Kelvin (cal/K)
	$2,39x10^{-01}$	Clausius (Cl)
	1	Newton-meter/Kelvin (Nm/K)
	$3,42x10^{+03}$	Pound square inch per Kelvin square second (lb.in²/K.s²)

From	Multiply by	To obtain
Mass flow		
Kilogram per second (kg/s)	0,001	Ton (metric)/second (t/s)
	2,204622622	Pound/second (lb/s)
Magnetic flux		
Weber (Wb)	1	Volt second (V.s)
	7.957.747,155	Unit pole
	100	Megaline
	100.000.000	Maxwell (Mx)
	1	Tesla square meter (T.m²)
	100.000.000	Gauss square centimeter (G.cm²)
	$4,84x10^{+14}$	Magnetic flux quantum
Frequency		
Hertz (Hz)	1	Cycle/second
Force		
Newton (N)	100.000	Dyne (dyn)
	101,9716	Gram force (gf)
	0,1019716	Kilogram force (kgf)
	3,596943	Ounce-force (ozf)
	0,2248089	Pound-force (lbf)
Temperature gradient		
Kelvin per meter (K/m)	0,9144	Kelvin per Yard (K/yd)
	0,3048	Kelvin per Foot (K/ft)
	0,0254	Kelvin per Inch (K/in)
Magnetic induction		
Tesla (T)	1	Weber/square meter (Wb/m²)
	0,00064516	Weber/square inch (Wb/in²)
	1	Maxwell/square meter (Mx/m²)
	64.516	Maxwell/square inch (Mx/in²)
	10.000	Gauss (G)
	1.000.000.000	Gamma
Inductance		
Henry (H)	1	Weber/Ampere (Wb/A²)
Electric field intensity		
Volt per meter (V/m)	0,0254	Volt/Inch (V/in)
	1	Newton/Coulomb (N/C)
Magnetic field intensity		
Ampere per meter (A/m)	0,012566371	Oersted (Oe)
Current intensity		
Ampere (A)	0,1	Biot (Bi)
Length		
Meter (m)	3,28083	Foot (ft)
	0,00497097	Furlong (fur)
	39,36996	Inch (in)
	$1,05702x10^{-16}$	Lightyear (ly)
	0,000621371	Mile (mi)
	0,000539957	Nautical mile (M)
	$3,24078x10^{-17}$	Parsec (pc)
	1,09361	Yard (yd)
Mass		
Kilogram (kg)	5.000	Carat (ct)
	15.432,4	Grain (gr)
	35,27392	Ounce (avdp) (oz)
	32,1505	Ounce (troy) (ozt)
	2,20462	Pound (lb)
	0,1574728	Stone (st)
	0,0009842	Ton (long)
	0,0011023	Ton (short) (tn)
	0,001	Tonne (metric ton) (t)
Specific mass		
Kilogram per cubic meter (kg/m³)	0,000001	Gram/Cubic milimeter (g/mm³)
	0,000001	Kilogram/Cubic centimeter (kg/cm³)
	0,001	Kilogram/Liter (kg/l)
	0,06243	Pound/Cubic foot (lb/ft³)
Moment of force		
Newton-meter (Nm)	$1x10^{+07}$	Dyne centimeter (dyn.cm)
	10.197,2	Gram-force centimeter (gf.cm)
	0,1019716	Kilogram-force meter (kgf.m)
	11,80097	Ounce-force foot (ozf.ft)
	141,6116	Ounce-force inches (ozf.in)
	0,737561	Pound-force foot (lbf.ft)
	8,85075	Pound-force inches (lbf.in)
Moment of inertia		
Kilogram square meter (kgm²)	54.674,74983	Ounce square inch (oz.in²)
	23,7303604	Pound square foot (lb.ft²)
	3.417,171898	Pound square inch (lb.in²)
	0,737562142	Slug square foot (slug.ft²)

From	Multiply by	To obtain
Power		
Watt (W)	3,415179	BTU/hour (BTU/h)
	0,05691965	BTU/minute (BTU/min)
	0,000948661	BTU/second (BTU/s)
	0,2390585	Calorie/second (cal/s)
	0,001341022	Horsepower (HP)
	44,25373	Pound-feet/minute (lb.ft/min)
	0,7375621	Pound-feet/second (lb.ft/s)
	0,00135962	Vaporhorse (cv)
	0,001	Kilowatt (kW)
Pressure		
Newton per square meter (N/m²)	1	Pascal (Pa)
	0,00001	Bar
	10	Dyne/Square centimeter (Dye/cm²)
	0,101971621	Kilogram-force/Square meter (kgf/m²)
	$1,04427x10^{-05}$	Ton-force (short)/Foot² (ton.f/ft²)
	$9,32385x10^{-06}$	Ton-force (long)/Foot² (ton.f/ft²)
	$1,45x10^{-07}$	Force-kip/Square inches (kip/in²) (ksi)
	0,000145038	Pound-force/Square inches (lbf/in², psi)
Reluctance		
Ampere per Weber (A/Wb)	1	Ampere/volt-second (A/V.s)
	$1x10^{-08}$	Ampere/maxell (A/Mx)
	$1x10^{-01}$	Biot/Weber (Bi/Wb)
Electric resistance		
Ohm (Ω)	1	Volt per Ampere (V/A)
	1	(1/S)
Resistivity		
Ohm-meter (Ωm)	1	Siemens per meter (S/m)
Thermodynamic temperature		
Kelvin (K)	(K)-273,15	Degree Celsius (°C)
	(K-273,15)x9/5+32	Degree Fahrenheit (°F)
	1,8	Rankine (Ra)
Degree Fahrenheit (°F)	(F-32)x 5/9	Degree Celsius (°C)
Degree Celsius (°C)	(9/5x°C)+32	Degree Fahrenheit (°F)
	(°C) + 273,15	Kelvin (K)
Trigonometric degree	0,01745	Radian (rad)
Surface tension		
Newton per meter (N/m)	1	Joule per square meter (J/m²)
dyn/cm	0,001	Newton per meter (N/m)
	1	Erg/Square centimeter (Erg/cm²)
Time		
Second (s)	$3,17x10^{-10}$	Century
	$1,16x10^{-05}$	Day
	$8,27x10^{-07}$	Fortnight
	0,000277778	Hour (h)
	0,01666667	Minute (')
Angular speed		
Radian per second (rad/s)	0,1592	rpm
Speed		
Meter per second (m/s)	11.811,02	Foot/hour (ft/h)
	196,8504	Foot/minute (ft/min)
	3,28084	Foot/second (ft/s)
	1,943844	Knot (kn)
	0,003016955	Mach (Ma)
	3.600	Meter/hour (m/h)
	60	Meter/minute (m/min)
	2,236936	Mile/hour (Mi/h)
Dynamic viscosity		
Pascal-second (Pa.s)	1	Newton-second per square meter (Ns/m²)
	1	Kilogram per meter-second (kg/(m.s))
	0,67197	Pound per foot-second (lbm/(ft.s))
	0,67197	Slug per foot second (slug/(ft.s))
	0,02089	Pound-force second per square foot (lbf.s/ft²)
Poise	1	Dyne second per square centimeter (dyn.s/cm²)
	1	Gram per centimeter second (g/(cm.s))
	0,1	Pascal-second (Pa.s)
	0,1	Newton-second per square meter (Ns/m²)
Kinematic viscosity		
Stokes (St)	0,0001	Square meter per second (m²/s)
	1	Square centimeter per second (cm²/s)
Volume		
Cubic meter (m³)	35,31467	Cubic foot (ft³)
	61.023,74	Cubic inch (in³)
	1,307951	Cubic yard (yd³)
	264,1721	Gallon (gal)
	1.000	Liter (l)
	1.000.000	Cubic milimeter (mm³)
	33.814,02	Ounce (oz)

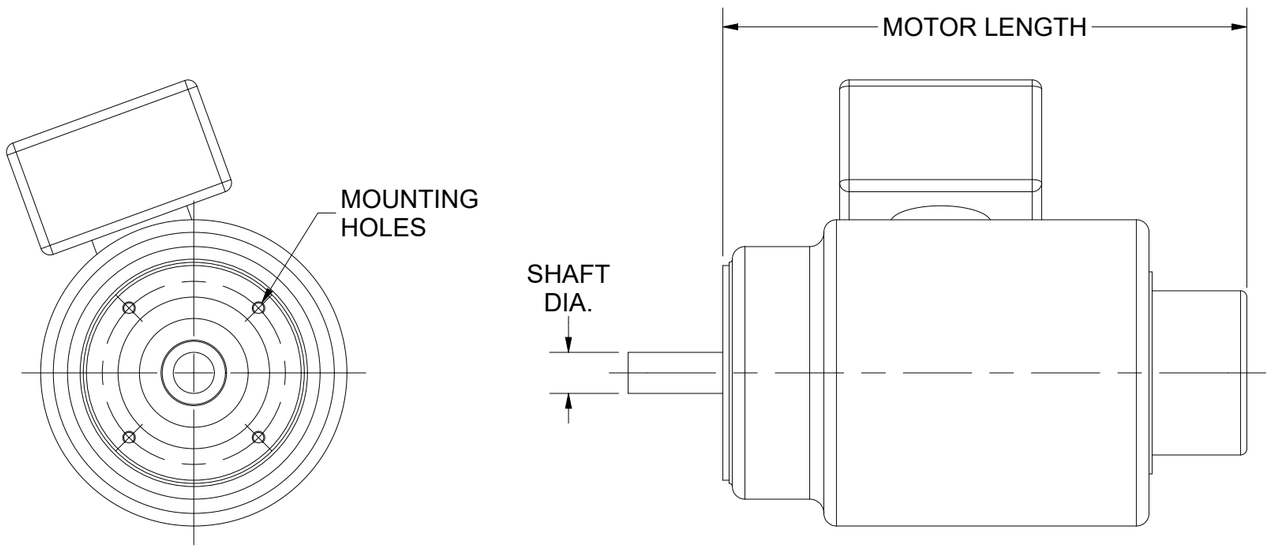
Table 14.2

14.3 Standards

Main standards used for Rotating Electrical Machines			
IEC	**Title**	**NEMA**	**Title**
IEC 60034-7	Rotating. Electrical Machines: Part 7: Classification types of construction, mounting, arrangements and terminal box position (IM Code)	NEMA MG 1 Part 4	Motor and Generators - Part 4: Dimensions, tolerances, and mounting
IEC 60034-6	Rotating. Electrical Machines: Part 6: Methods of cooling(IC Code)	NEMA MG 1 Part 6	Motor and Generators - Part 6: Rotating electrical machines - Method of cooling (IC code)
IEC 60034-1	Rotating Electrical Machines - Part 1: Rating and Performance	IEEE 112	Test procedures for polyphase induction motors and generators
IEC 60072-1/2	Dimensions and output series for rotating electrical machines- Part 1 and Part 2	NEMA MG 1 Part 4	Motor and Generators - Part 4: Dimensions, tolerances, and mounting
IEC 60085	Electrical insulation - Thermal evaluation and designation	IEEE 1	General Principles for Temperature Limits in the Rating of Electric Equipment and for the Evaluation Electrical Insulation
IEC 60034-9	Rotating Electrical Machines: Part 9: Noise limits	NEMA MG 1 Part 9	Motor and Generators - Part 9: Sound power limits and measurement procedures
IEC 60034-1	Rotating Electrical Machines: Part 1: Rating and performance	NEMA MG 1	Motor and Generators
IEC 60079	Safety standard series applied to explosive atmospheres	UL 60079 UL 674 CSA C22.2 N°145	Electrical Apparatus for Explosive Gas Atmospheres Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations Motors and Generators for Use in Hazardous Locations
IEC 60529	Degrees of protection provided by enclosures (IP Code)	NEMA MG 1 Part 5	Motor and Generators - Part 5: Classification of degrees of protection provided by enclosures for rotating machines

Table 14.3

MOTOR DATA							
HWEC P/N	MAKE	POLES	FRAME SIZE	SHAFT DIA	MOTOR LENGTH	WEIGHT	MOUNTING HOLES
CMTR1001	BALDOR	6	256TC	1.625	23.67	255	4X 1/2-13 UNC
CMTR1505	BALDOR	4	254TC	1.625	23.67	287	4X 1/2-13 UNC
CMTR2001	WEG	6	284/6TC	1.875	23.55	398	4X 1/2-13 UNC
CMTR2501	BALDOR	6	324TC	2.125	25.74	378	4X 5/8-11 UNC
CMTR3001	WEG	6	324/6TC	2.125	25.50	539	4X 5/8-11 UNC
CMTR3005	BALDOR	4	286TC	1.875	24.74	375	4X 1/2-13 UNC
CMTR4005	BALDOR	4	324TC	2.125	25.24	378	4X 5/8-11 UNC
CMTR5001	WEG	6	364/5TC	2.375	27.29	828	8X 5/8-11 UNC
CMTR5005	BALDOR	4	326TC	2.125	25.79	549	4X 5/8-11 UNC
CMTR6005	BALDOR	4	364TC	2.375	28.16	565	8X 5/8-11 UNC



NOTES UNLESS OTHERWISE SPECIFIED:

1. VIEW FOR REFERENCE ONLY. ACTUAL APPEARANCE MAY BE DIFFERENT.

E	ADDED MAKE COLUMN TO TABLE, PUR #1817	DRO 09/18/23			
D	UPDATED 22" WHEEL 5500# AND 6000# RATINGS AT 100 FPM 2:1, PUR #1808	DRO 08/18/23	C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR/RATINGS, PUR #1801	DRO 07/27/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: MOTOR, 208/230/460V, C-FLANGE

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO	1:6	N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

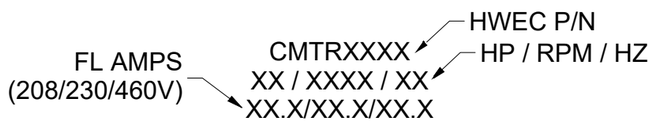
SHEET SIZE	DATE	
B	5/2/2023	CMTR SHEET 1 OF 10

GT11 1:1 ROPING DUTY TABLES

SPEED	(ft/min)	50	75	100	125	150	175	200	250	300	350	400	450	500
CAP (lbs)	SHEAVE SIZE (in)													
1000	22	CMTR1001 1.8 / 426 / 22 18.7/19.3/9.7	CMTR1001 2.6 / 639 / 32 18.7/19.3/9.7	CMTR1001 3.5 / 851 / 43 18.7/19.3/9.7	CMTR1001 4.3 / 1064 / 54 18.7/19.3/9.7	CMTR1505 5.8 / 1277 / 43 21.7/21.7/10.9	CMTR1505 6.8 / 1489 / 50 21.7/21.7/10.9	CMTR1001 7.0 / 851 / 43 29.6/28.6/14.3	CMTR2001 9.7 / 1064 / 54 30.2/29.2/14.6	CMTR3005 11.6 / 1277 / 43 42.5/41.4/20.7	CMTR3005 13.5 / 1489 / 50 42.5/41.4/20.7	CMTR2001 16.4 / 1135 / 57 45.7/42.0/21.0	CMTR3005 18.5 / 1277 / 43 63.9/59.5/29.8	CMTR3005 20.5 / 1418 / 48 63.9/59.5/29.8
1000	26	CMTR1001 1.8 / 360 / 18 20.4/20.7/10.4	CMTR1001 2.6 / 540 / 27 20.4/20.7/10.4	CMTR1001 3.5 / 720 / 36 20.4/20.7/10.4	CMTR1001 4.3 / 900 / 45 20.4/20.7/10.4	CMTR1001 5.8 / 1080 / 54 21.9/22.0/11.0	CMTR1505 6.8 / 1260 / 42 24.7/24.3/12.2	CMTR2001 7.0 / 720 / 36 32.0/30.5/15.3	CMTR2001 9.7 / 900 / 45 34.7/32.8/16.4	CMTR2001 11.6 / 1080 / 54 34.6/32.7/16.4	CMTR3005 13.5 / 1260 / 42 48.7/46.5/23.2	CMTR2501 16.4 / 960 / 48 56.2/54.0/27.0	CMTR2501 18.5 / 1080 / 54 56.2/54.0/27.0	CMTR2501 20.5 / 1200 / 60 56.2/54.0/27.0
1000	30	CMTR1001 1.8 / 312 / 16 22.3/22.3/11.2	CMTR1001 2.6 / 468 / 24 22.3/22.3/11.2	CMTR1001 3.5 / 624 / 32 22.3/22.3/11.2	CMTR1001 4.3 / 780 / 39 22.3/22.3/11.2	CMTR1001 5.8 / 936 / 47 24.1/23.8/11.9	CMTR1001 6.8 / 1092 / 55 24.1/23.8/11.9	CMTR1505 7.8 / 1248 / 42 28.1/27.1/13.6	CMTR2001 9.7 / 780 / 39 39.9/36.9/18.5	CMTR2001 11.6 / 936 / 47 39.4/36.7/18.4	CMTR2001 13.5 / 1092 / 55 39.4/36.8/18.4	CMTR3005 17.0 / 1248 / 42 60.3/56.3/28.2	CMTR3005 19.1 / 1404 / 47 60.3/56.3/28.2	CMTR3005 21.2 / 1560 / 52 60.3/56.3/28.2
1500	22	CMTR1001 2.4 / 426 / 22 22.4/22.4/11.2	CMTR1001 3.6 / 639 / 32 22.4/22.4/11.2	CMTR1001 4.8 / 851 / 43 22.4/22.4/11.2	CMTR1001 5.9 / 1064 / 54 22.4/22.4/11.2	CMTR1505 7.8 / 1277 / 43 27.5/26.6/13.3	CMTR1505 9.1 / 1489 / 50 27.5/26.6/13.3	CMTR2001 9.3 / 851 / 43 35.3/33.2/16.6	CMTR2001 12.6 / 1064 / 54 37.7/35.3/17.7	CMTR3005 15.1 / 1277 / 43 52.9/50.0/25.0	CMTR3005 17.6 / 1489 / 50 52.9/50.0/25.0	CMTR2501 20.9 / 1135 / 57 60.1/57.2/28.6	CMTR4005 23.5 / 1277 / 43 79.6/81.4/40.7	CMTR4005 26.1 / 1418 / 48 79.6/81.4/40.7
1500	26	CMTR1001 2.4 / 360 / 18 25.1/24.6/12.3	CMTR1001 3.6 / 540 / 27 25.1/24.6/12.3	CMTR1001 4.8 / 720 / 36 25.1/24.6/12.3	CMTR1001 5.9 / 900 / 45 25.1/24.6/12.3	CMTR1001 7.8 / 1080 / 54 26.8/26.1/13.1	CMTR1505 9.1 / 1260 / 42 32.2/30.7/15.3	CMTR2001 9.3 / 720 / 36 41.6/38.3/19.2	CMTR2001 12.6 / 900 / 45 44.5/40.8/20.4	CMTR2001 15.1 / 1080 / 54 44.0/40.6/20.3	CMTR3005 17.6 / 1260 / 42 61.7/57.5/28.8	CMTR3001 20.9 / 960 / 48 69.7/64.6/32.3	CMTR3001 23.5 / 1080 / 54 69.4/64.5/32.3	CMTR3001 26.1 / 1200 / 60 71.0/65.6/32.8
1500	30	CMTR1001 2.4 / 312 / 16 28.0/27.1/13.6	CMTR1001 3.6 / 468 / 24 28.0/27.1/13.6	CMTR1001 4.8 / 624 / 32 28.0/27.1/13.6	CMTR1001 5.9 / 780 / 39 28.0/27.1/13.6	CMTR1001 7.8 / 936 / 47 29.9/28.8/14.4	CMTR1001 9.1 / 1092 / 55 29.9/28.8/14.4	CMTR1505 10.3 / 1248 / 42 37.3/34.9/17.5	CMTR2001 12.6 / 780 / 39 52.5/47.0/23.5	CMTR2001 15.1 / 936 / 47 51.5/46.5/23.3	CMTR2001 17.6 / 1092 / 55 50.9/46.2/23.1	CMTR4005 21.6 / 1248 / 42 75.3/77.9/39.0	CMTR4005 24.3 / 1404 / 47 75.3/77.9/39.0	CMTR4005 27.0 / 1560 / 52 75.3/77.9/39.0
2000	22	CMTR1001 3.1 / 426 / 22 26.5/25.8/12.9	CMTR1001 4.6 / 639 / 32 26.5/25.8/12.9	CMTR1001 6.1 / 851 / 43 26.5/25.8/12.9	CMTR1001 7.6 / 1064 / 54 26.5/25.8/12.9	CMTR1505 9.7 / 1277 / 43 34.1/32.2/16.1	CMTR1505 11.3 / 1489 / 50 34.1/32.2/16.1	CMTR2001 11.6 / 851 / 43 43.5/39.9/20.0	CMTR2001 15.4 / 1064 / 54 45.9/42.1/21.1	CMTR3005 18.5 / 1277 / 43 64.1/59.7/29.9	CMTR3005 21.6 / 1489 / 50 64.1/59.7/29.9	CMTR3001 25.4 / 1135 / 57 71.2/66.0/33.0	CMTR4005 28.5 / 1277 / 43 95.7/94.4/47.2	CMTR4005 31.7 / 1418 / 48 95.7/94.4/47.2
2000	26	CMTR1001 3.1 / 360 / 18 30.2/29.1/14.6	CMTR1001 4.6 / 540 / 27 30.2/29.1/14.6	CMTR1001 6.1 / 720 / 36 30.2/29.1/14.6	CMTR1001 7.6 / 900 / 45 30.2/29.1/14.6	CMTR2001 9.7 / 1080 / 54 29.9/28.9/14.5	CMTR3005 11.3 / 1260 / 42 42.1/41.1/20.6	CMTR2001 11.6 / 720 / 36 52.8/47.2/23.6	CMTR2501 15.4 / 900 / 45 56.3/54.2/27.1	CMTR2501 18.5 / 1080 / 54 56.3/54.2/27.1	CMTR4005 21.6 / 1260 / 42 74.7/77.4/38.7	CMTR5001 25.4 / 960 / 48 82.4/77.1/38.6	CMTR5001 28.5 / 1080 / 54 82.3/77.1/38.6	CMTR5001 31.7 / 1200 / 60 84.0/78.3/39.2
2000	30	CMTR2001 3.1 / 312 / 16 34.6/31.8/15.9	CMTR2001 4.6 / 468 / 24 32.9/30.9/15.5	CMTR2001 6.1 / 624 / 32 32.3/30.6/15.3	CMTR2001 7.6 / 780 / 39 32.0/30.5/15.3	CMTR2001 9.7 / 936 / 47 33.6/31.9/16.0	CMTR2001 11.3 / 1092 / 55 33.7/32.1/16.1	CMTR3005 12.9 / 1248 / 42 47.2/45.2/22.6	CMTR2501 15.4 / 780 / 39 64.4/60.6/30.3	CMTR2501 18.5 / 936 / 47 64.4/60.6/30.3	CMTR2501 21.6 / 1092 / 55 64.4/60.6/30.3	CMTR4005 26.2 / 1248 / 42 90.2/89.9/45.0	CMTR4005 29.5 / 1404 / 47 90.2/89.9/45.0	CMTR4005 32.8 / 1560 / 52 90.2/89.9/45.0
2500	22	CMTR2001 3.7 / 426 / 22 29.6/28.3/14.2	CMTR2001 5.5 / 639 / 32 29.5/28.4/14.2	CMTR2001 7.3 / 851 / 43 29.2/28.2/14.1	CMTR2001 9.2 / 1064 / 54 29.0/28.2/14.1	CMTR3005 11.6 / 1277 / 43 42.6/41.5/20.8	CMTR3005 13.6 / 1489 / 50 42.6/41.5/20.8	CMTR2001 13.9 / 851 / 43 53.1/47.7/23.9	CMTR2501 18.3 / 1064 / 54 56.6/54.4/27.2	CMTR4005 22.0 / 1277 / 43 75.0/77.7/38.9	CMTR4005 25.6 / 1489 / 50 75.0/77.7/38.9	GT31	GT31	GT31
2500	26	CMTR2001 3.7 / 360 / 18 35.2/32.4/16.2	CMTR2001 5.5 / 540 / 27 34.3/32.1/16.1	CMTR2001 7.3 / 720 / 36 33.6/31.7/15.9	CMTR2001 9.2 / 900 / 45 33.2/31.5/15.8	CMTR2001 11.6 / 1080 / 54 34.8/32.9/16.5	CMTR3005 13.6 / 1260 / 42 48.8/46.6/23.3	CMTR2501 13.9 / 720 / 36 62.8/59.4/29.7	CMTR2501 18.3 / 900 / 45 66.2/62.1/31.1	CMTR2501 22.0 / 1080 / 54 66.2/62.1/31.1	CMTR4005 25.6 / 1260 / 42 87.5/87.7/43.9	GT31	GT31	GT31
2500	30	CMTR2001 3.7 / 312 / 16 42.9/37.7/18.9	CMTR2001 5.5 / 468 / 24 40.1/36.5/18.3	CMTR2001 7.3 / 624 / 32 38.6/35.7/17.9	CMTR2001 9.2 / 780 / 39 37.9/35.3/17.7	CMTR2001 11.6 / 936 / 47 39.7/36.9/18.5	CMTR2001 13.6 / 1092 / 55 39.4/36.8/18.4	CMTR3005 15.5 / 1248 / 42 55.4/52.1/26.1	CMTR3001 18.3 / 780 / 39 76.6/69.8/34.9	CMTR3001 22.0 / 936 / 47 75.4/69.2/34.6	CMTR3001 25.6 / 1092 / 55 74.9/69.0/34.5	GT31	GT31	GT31

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE SHEET 1 FOR FRAME SIZE INFORMATION.
2. CELL FORMAT IS AS FOLLOWS:



E	ADDED MAKE COLUMN TO TABLE, PUR #1817	DRO 09/18/23			
D	UPDATED 22" WHEEL 5500# AND 6000# RATINGS AT 100 FPM 2:1, PUR #1808	DRO 08/18/23	C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR/RATINGS, PUR #1801	DRO 07/27/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: MOTOR, 208/230/460V, C-FLANGE

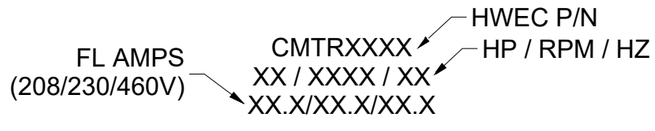
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/2/2023	CMTR SHEET 2 OF 10

GT11 1:1 ROPING DUTY TABLES

SPEED	(ft/min)	50	75	100	125	150	175	200	250	300	350	400	450	500
CAP (lbs)	SHEAVE SIZE (in)													
3000	22	CMTR2001 4.3 / 426 / 22 34.7/32.3/16.2	CMTR2001 6.5 / 639 / 32 33.5/31.6/15.8	CMTR2001 8.6 / 851 / 43 33.3/31.6/15.8	CMTR2001 10.8 / 1064 / 54 33.0/31.4/15.7	CMTR3005 13.6 / 1277 / 43 48.3/46.1/23.1	CMTR3005 15.8 / 1489 / 50 48.3/46.1/23.1	CMTR2501 16.2 / 851 / 43 62.1/58.8/29.4	GT31	GT31	GT31	GT31	GT31	GT31
3000	26	CMTR2001 4.3 / 360 / 18 42.9/38.2/19.1	CMTR2001 6.5 / 540 / 27 39.6/36.4/18.2	CMTR2001 8.6 / 720 / 36 38.9/36.1/18.1	CMTR2001 10.8 / 900 / 45 38.3/35.7/17.9	CMTR2001 13.6 / 1080 / 54 39.8/37.1/18.6	CMTR3005 15.8 / 1260 / 42 55.9/52.6/26.3	CMTR3001 16.2 / 720 / 36 73.8/67.5/33.8	GT31	GT31	GT31	GT31	GT31	GT31
3000	30	CMTR2001 4.3 / 312 / 16 57.0/46.2/23.1	CMTR2001 6.5 / 468 / 24 47.5/42.2/21.1	CMTR2001 8.6 / 624 / 32 45.7/41.3/20.7	CMTR2001 10.8 / 780 / 39 44.4/40.6/20.3	CMTR2001 13.6 / 936 / 47 46.1/42.1/21.1	CMTR2001 15.8 / 1092 / 55 45.9/42.0/21.0	CMTR3005 18.1 / 1248 / 42 63.9/59.5/29.8	GT31	GT31	GT31	GT31	GT31	GT31

NOTES UNLESS OTHERWISE SPECIFIED:
1. SEE SHEET 1 FOR FRAME SIZE INFORMATION.
2. CELL FORMAT IS AS FOLLOWS:



E	ADDED MAKE COLUMN TO TABLE, PUR #1817	DRO 09/18/23				
D	UPDATED 22" WHEEL 5500# AND 6000# RATINGS AT 100 FPM 2:1, PUR #1808	DRO 08/18/23	C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR/RATINGS, PUR #1801	DRO 07/27/23	

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: MOTOR, 208/230/460V, C-FLANGE

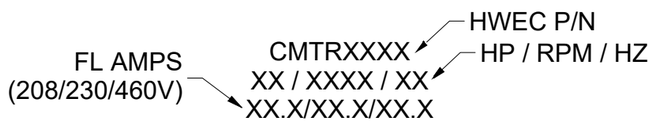
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/2/2023	CMTR SHEET 3 OF 10

GT11 2:1 ROPING DUTY TABLES

SPEED	(ft/min)	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400
CAP (lbs)	SHEAVE SIZE (in)															
1000	22	CMTR1001 1.8 / 851 / 43 15.0/16.4/8.2	CMTR1505 2.7 / 1277 / 43 14.5/15.7/7.8	CMTR1001 3.3 / 851 / 43 18.1/18.9/9.5	CMTR1001 4.1 / 1064 / 54 18.1/18.9/9.5	CMTR1505 5.5 / 1277 / 43 20.7/20.8/10.4	CMTR1505 6.4 / 1489 / 50 20.7/20.8/10.4	CMTR1001 7.0 / 1135 / 57 24.0/23.7/11.9	CMTR1505 8.8 / 1277 / 43 30.8/29.5/14.8	CMTR1505 9.7 / 1418 / 48 30.8/29.5/14.8	N/A	N/A	N/A	N/A	N/A	N/A
1000	26	CMTR1001 1.8 / 720 / 36 15.6/16.9/8.5	CMTR1001 2.7 / 1080 / 54 15.6/16.9/8.5	CMTR1001 3.3 / 720 / 36 19.7/20.1/10.1	CMTR1001 4.1 / 900 / 45 19.7/20.1/10.1	CMTR1001 5.5 / 1080 / 54 21.0/21.2/10.6	CMTR1505 6.4 / 1260 / 42 23.4/23.2/11.6	CMTR1001 7.0 / 960 / 48 27.1/26.4/13.2	CMTR1001 8.8 / 1080 / 54 29.4/28.4/14.2	CMTR1001 9.7 / 1200 / 60 29.4/28.4/14.2	N/A	N/A	N/A	N/A	N/A	N/A
1000	30	CMTR1001 1.8 / 624 / 32 16.3/17.4/8.7	CMTR1001 2.7 / 936 / 47 16.3/17.4/8.7	CMTR1505 3.6 / 1248 / 42 16.4/17.3/8.7	CMTR1001 4.1 / 780 / 39 21.4/21.5/10.8	CMTR1001 5.5 / 936 / 47 23.0/22.9/11.5	CMTR1001 6.4 / 1092 / 55 23.0/22.9/11.5	CMTR1505 7.3 / 1248 / 42 26.4/25.7/12.9	CMTR1505 9.1 / 1404 / 47 29.0/28.0/14.0	CMTR1505 10.1 / 1560 / 52 29.0/28.0/14.0	CMTR2001 10.7 / 1144 / 58 30.8/29.7/14.9	CMTR3005 11.7 / 1248 / 42 43.4/42.2/21.1	CMTR3005 12.6 / 1352 / 46 43.4/42.2/21.1	CMTR3005 13.6 / 1456 / 49 43.4/42.2/21.1	CMTR3005 16.0 / 1560 / 52 47.0/45.0/22.5	CMTR3005 17.1 / 1664 / 56 47.0/45.0/22.5
1500	22	CMTR1001 2.5 / 851 / 43 16.3/17.5/8.8	CMTR1505 3.7 / 1277 / 43 16.5/17.3/8.7	CMTR1001 4.5 / 851 / 43 21.5/21.6/10.8	CMTR1001 5.6 / 1064 / 54 21.5/21.6/10.8	CMTR1505 7.3 / 1277 / 43 25.9/25.3/12.7	CMTR1505 8.5 / 1489 / 50 25.9/25.3/12.7	CMTR1001 9.3 / 1135 / 57 29.8/28.7/14.4	CMTR3005 11.4 / 1277 / 43 41.9/40.9/20.5	CMTR3005 12.6 / 1418 / 48 41.9/40.9/20.5	N/A	N/A	N/A	N/A	N/A	N/A
1500	26	CMTR1001 2.5 / 720 / 36 17.3/18.3/9.2	CMTR1001 3.7 / 1080 / 54 17.3/18.3/9.2	CMTR1001 4.5 / 720 / 36 24.0/23.7/11.8	CMTR1001 5.6 / 900 / 45 24.0/23.7/11.8	CMTR1001 7.3 / 1080 / 54 25.5/24.9/12.5	CMTR1505 8.5 / 1260 / 42 30.1/28.9/14.5	CMTR2001 9.3 / 960 / 48 32.0/30.6/15.3	CMTR2001 11.4 / 1080 / 54 34.1/32.3/16.2	CMTR2001 12.6 / 1200 / 60 34.8/32.8/16.4	N/A	N/A	N/A	N/A	N/A	N/A
1500	30	CMTR1001 2.5 / 624 / 32 18.5/19.2/9.6	CMTR1001 3.7 / 936 / 47 18.5/19.2/9.6	CMTR1505 5.0 / 1248 / 42 19.7/20.0/10.0	CMTR1001 5.6 / 780 / 39 26.6/25.9/13.0	CMTR1001 7.3 / 936 / 47 28.4/27.4/13.7	CMTR1001 8.5 / 1092 / 55 28.4/27.4/13.7	CMTR1505 9.7 / 1248 / 42 34.7/32.8/16.4	CMTR1505 11.8 / 1404 / 47 37.8/35.3/17.7	CMTR1505 13.1 / 1560 / 52 37.8/35.3/17.7	CMTR2001 13.9 / 1144 / 58 38.5/36.0/18.0	CMTR3005 15.2 / 1248 / 42 54.3/51.2/25.6	CMTR3005 16.4 / 1352 / 46 54.3/51.2/25.6	CMTR3005 17.7 / 1456 / 49 54.3/51.2/25.6	CMTR3005 20.4 / 1560 / 52 58.1/54.4/27.2	CMTR3005 21.7 / 1664 / 56 58.1/54.4/27.2
2000	22	CMTR1001 3.2 / 851 / 43 17.9/18.7/9.4	CMTR1505 4.7 / 1277 / 43 18.8/19.3/9.7	CMTR1001 5.7 / 851 / 43 25.3/24.7/12.4	CMTR1001 7.1 / 1064 / 54 25.3/24.7/12.4	CMTR1505 9.1 / 1277 / 43 31.8/30.3/15.2	CMTR1505 10.6 / 1489 / 50 31.8/30.3/15.2	CMTR2001 11.7 / 1135 / 57 33.4/31.8/15.9	CMTR3005 14.0 / 1277 / 43 49.6/47.2/23.6	CMTR3005 15.5 / 1418 / 48 49.6/47.2/23.6	N/A	N/A	N/A	N/A	N/A	N/A
2000	26	CMTR1001 3.2 / 720 / 36 19.4/19.9/10.0	CMTR1001 4.7 / 1080 / 54 19.4/19.9/10.0	CMTR1001 5.7 / 720 / 36 28.6/27.7/13.9	CMTR1001 7.1 / 900 / 45 28.6/27.7/13.9	CMTR1001 9.1 / 1080 / 54 30.2/29.1/14.6	CMTR1505 10.6 / 1260 / 42 37.8/35.4/17.7	CMTR2001 11.7 / 960 / 48 38.7/36.1/18.1	CMTR2001 14.0 / 1080 / 54 40.9/38.0/19.0	CMTR2001 15.5 / 1200 / 60 42.0/38.8/19.4	N/A	N/A	N/A	N/A	N/A	N/A
2000	30	CMTR1001 3.2 / 624 / 32 21.0/21.2/10.6	CMTR1001 4.7 / 936 / 47 21.0/21.2/10.6	CMTR1505 6.3 / 1248 / 42 23.4/23.2/11.6	CMTR2001 7.1 / 780 / 39 30.3/29.1/14.6	CMTR2001 9.1 / 936 / 47 31.8/30.4/15.2	CMTR2001 10.6 / 1092 / 55 31.8/30.4/15.2	CMTR3005 12.1 / 1248 / 42 44.7/43.2/21.6	CMTR3005 14.5 / 1404 / 47 47.1/45.1/22.6	CMTR3005 16.1 / 1560 / 52 47.1/45.1/22.6	CMTR2001 17.1 / 1144 / 58 47.0/43.0/21.5	CMTR3005 18.6 / 1248 / 42 65.9/61.3/30.7	CMTR3005 20.2 / 1352 / 46 65.9/61.3/30.7	CMTR3005 21.7 / 1456 / 49 65.9/61.3/30.7	CMTR3005 24.7 / 1560 / 52 69.9/64.9/32.5	CMTR3005 26.4 / 1664 / 56 69.9/64.9/32.5
2500	22	CMTR1001 3.8 / 851 / 43 19.7/20.1/10.1	CMTR1505 5.7 / 1277 / 43 21.4/21.5/10.8	CMTR1001 6.9 / 851 / 43 29.2/28.2/14.1	CMTR1001 8.6 / 1064 / 54 29.2/28.2/14.1	CMTR3005 10.9 / 1277 / 43 40.4/39.8/19.9	CMTR3005 12.7 / 1489 / 50 40.4/39.8/19.9	CMTR2001 14.0 / 1135 / 57 39.1/36.5/18.3	CMTR3005 16.6 / 1277 / 43 57.9/54.2/27.1	CMTR3005 18.5 / 1418 / 48 57.9/54.2/27.1	N/A	N/A	N/A	N/A	N/A	N/A
2500	26	CMTR1001 3.8 / 720 / 36 21.7/21.8/10.9	CMTR1001 5.7 / 1080 / 54 21.7/21.8/10.9	CMTR2001 6.9 / 720 / 36 31.6/30.2/15.1	CMTR2001 8.6 / 900 / 45 31.4/30.1/15.1	CMTR2001 10.9 / 1080 / 54 32.8/31.3/15.7	CMTR3005 12.7 / 1260 / 42 46.1/44.3/22.2	CMTR2001 14.0 / 960 / 48 46.2/42.2/21.1	CMTR2001 16.6 / 1080 / 54 48.8/44.4/22.2	CMTR2001 18.5 / 1200 / 60 49.9/45.3/22.7	N/A	N/A	N/A	N/A	N/A	N/A
2500	30	CMTR1001 3.8 / 624 / 32 23.9/23.6/11.8	CMTR1001 5.7 / 936 / 47 23.9/23.6/11.8	CMTR1505 7.6 / 1248 / 42 27.6/26.8/13.4	CMTR2001 8.6 / 780 / 39 35.6/33.5/16.8	CMTR2001 10.9 / 936 / 47 37.2/34.8/17.4	CMTR2001 12.7 / 1092 / 55 37.0/34.8/17.4	CMTR3005 14.5 / 1248 / 42 52.1/49.3/24.7	CMTR3005 17.2 / 1404 / 47 54.7/51.5/25.8	CMTR3005 19.1 / 1560 / 52 54.7/51.5/25.8	CMTR2501 20.3 / 1144 / 58 58.1/55.6/27.8	CMTR4005 22.1 / 1248 / 42 77.0/79.3/39.7	CMTR4005 24.0 / 1352 / 46 77.0/79.3/39.7	CMTR4005 25.8 / 1456 / 49 77.0/79.3/39.7	CMTR4005 29.1 / 1560 / 52 80.7/82.2/41.1	CMTR4005 31.0 / 1664 / 56 80.7/82.2/41.1

NOTES UNLESS OTHERWISE SPECIFIED:
1. SEE SHEET 1 FOR FRAME SIZE INFORMATION.
2. CELL FORMAT IS AS FOLLOWS:



E	ADDED MAKE COLUMN TO TABLE, PUR #1817	DRO 09/18/23			
D	UPDATED 22" WHEEL 5500# AND 6000# RATINGS AT 100 FPM 2:1, PUR #1808	DRO 08/18/23	C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR/RATINGS, PUR #1801	DRO 07/27/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: MOTOR, 208/230/460V, C-FLANGE

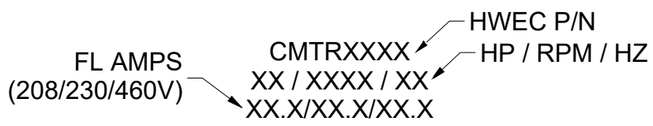
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/2/2023	CMTR SHEET 4 OF 10

GT11 2:1 ROPING DUTY TABLES

SPEED	(ft/min)	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400
CAP (lbs)	SHEAVE SIZE (in)															
3000	22	CMTR1001 4.5 / 851 / 43 21.7/21.7/10.9	CMTR1505 6.7 / 1277 / 43 24.3/23.9/12.0	CMTR2001 8.1 / 851 / 43 31.4/30.0/15.0	CMTR2001 10.1 / 1064 / 54 31.2/30.0/15.0	CMTR3005 12.7 / 1277 / 43 45.6/43.9/22.0	CMTR3005 14.8 / 1489 / 50 45.6/43.9/22.0	CMTR2001 16.3 / 1135 / 57 45.4/41.7/20.9	CMTR3005 19.2 / 1277 / 43 66.4/61.8/30.9	CMTR3005 21.4 / 1418 / 48 66.4/61.8/30.9	N/A	N/A	N/A	N/A	N/A	N/A
3000	26	CMTR1001 4.5 / 720 / 36 24.2/23.8/11.9	CMTR1001 6.7 / 1080 / 54 24.2/23.8/11.9	CMTR2001 8.1 / 720 / 36 36.4/34.1/17.1	CMTR2001 10.1 / 900 / 45 36.0/33.9/17.0	CMTR2001 12.7 / 1080 / 54 37.4/35.1/17.6	CMTR3005 14.8 / 1260 / 42 52.6/49.7/24.9	CMTR2501 16.3 / 960 / 48 55.9/53.8/26.9	CMTR2501 19.2 / 1080 / 54 58.3/55.7/27.9	CMTR2501 21.4 / 1200 / 60 58.3/55.7/27.9	N/A	N/A	N/A	N/A	N/A	N/A
3000	30	CMTR1001 4.5 / 624 / 32 26.8/26.1/13.1	CMTR1001 6.7 / 936 / 47 26.8/26.1/13.1	CMTR1505 9.0 / 1248 / 42 32.2/30.7/15.4	CMTR2001 10.1 / 780 / 39 41.5/38.2/19.1	CMTR2001 12.7 / 936 / 47 43.0/39.6/19.8	CMTR2001 14.8 / 1092 / 55 42.7/39.5/19.8	CMTR3005 16.9 / 1248 / 42 60.0/56.0/28.0	CMTR3005 19.9 / 1404 / 47 62.6/58.4/29.2	CMTR3005 22.1 / 1560 / 52 62.6/58.4/29.2	CMTR2501 23.5 / 1144 / 58 66.8/62.6/31.3	CMTR4005 25.6 / 1248 / 42 88.2/88.3/44.2	CMTR4005 27.8 / 1352 / 46 88.2/88.3/44.2	CMTR4005 29.9 / 1456 / 49 88.2/88.3/44.2	CMTR4005 33.5 / 1560 / 52 92.0/91.4/45.7	CMTR4005 35.7 / 1664 / 56 92.0/91.4/45.7
3500	22	CMTR1001 5.2 / 851 / 43 23.7/23.5/11.7	CMTR1505 7.8 / 1277 / 43 27.4/26.6/13.3	CMTR2001 9.3 / 851 / 43 35.3/33.2/16.6	CMTR2001 11.6 / 1064 / 54 35.0/33.1/16.6	CMTR3005 14.5 / 1277 / 43 51.1/48.5/24.3	CMTR3005 16.9 / 1489 / 50 51.1/48.5/24.3	CMTR2001 18.6 / 1135 / 57 52.0/47.1/23.6	CMTR4005 21.8 / 1277 / 43 74.5/77.4/38.7	CMTR4005 24.3 / 1418 / 48 74.5/77.4/38.7	N/A	N/A	N/A	N/A	N/A	N/A
3500	26	CMTR1001 5.2 / 720 / 36 26.7/26.0/13.0	CMTR1001 7.8 / 1080 / 54 26.7/26.0/13.0	CMTR2001 9.3 / 720 / 36 41.6/38.3/19.2	CMTR2001 11.6 / 900 / 45 41.0/37.9/19.0	CMTR2001 14.5 / 1080 / 54 42.3/39.2/19.6	CMTR3005 16.9 / 1260 / 42 59.4/55.6/27.8	CMTR2501 18.6 / 960 / 48 63.2/59.7/29.9	CMTR2501 21.8 / 1080 / 54 65.8/61.8/30.9	CMTR2501 24.3 / 1200 / 60 65.8/61.8/30.9	N/A	N/A	N/A	N/A	N/A	N/A
3500	30	CMTR1001 5.2 / 624 / 32 29.9/28.8/14.4	CMTR1001 7.8 / 936 / 47 29.9/28.8/14.4	CMTR1505 10.3 / 1248 / 42 37.2/34.9/17.5	CMTR2001 11.6 / 780 / 39 47.9/43.4/21.7	CMTR2001 14.5 / 936 / 47 49.3/44.7/22.4	CMTR2001 16.9 / 1092 / 55 48.8/44.4/22.2	CMTR3005 19.3 / 1248 / 42 68.1/63.3/31.7	CMTR3005 22.6 / 1404 / 47 70.9/65.8/32.9	CMTR3005 25.1 / 1560 / 52 70.9/65.8/32.9	CMTR3001 26.7 / 1144 / 58 74.1/68.4/34.2	CMTR5005 29.1 / 1248 / 42 104.0/95.8/47.9	CMTR5005 31.5 / 1352 / 46 104.0/95.8/47.9	CMTR5005 34.0 / 1456 / 49 104.0/95.8/47.9	N/A	N/A
4000	22	CMTR1001 5.9 / 851 / 43 25.9/25.3/12.7	CMTR1505 8.8 / 1277 / 43 30.8/29.4/14.7	CMTR2001 10.5 / 851 / 43 39.4/36.6/18.3	CMTR2001 13.1 / 1064 / 54 39.0/36.4/18.2	CMTR3005 16.3 / 1277 / 43 56.8/53.3/26.7	CMTR3005 19.0 / 1489 / 50 56.8/53.3/26.7	CMTR2501 21.0 / 1135 / 57 60.3/57.4/28.7	CMTR4005 24.5 / 1277 / 43 82.7/83.8/41.9	CMTR4005 27.2 / 1418 / 48 82.7/83.8/41.9	N/A	N/A	N/A	N/A	N/A	N/A
4000	26	CMTR1001 5.9 / 720 / 36 29.4/28.4/14.2	CMTR1001 8.8 / 1080 / 54 29.4/28.4/14.2	CMTR2001 10.5 / 720 / 36 47.2/42.8/21.4	CMTR2001 13.1 / 900 / 45 46.3/42.2/21.1	CMTR2001 16.3 / 1080 / 54 47.6/43.4/21.7	CMTR3005 19.0 / 1260 / 42 66.5/61.8/30.9	CMTR3001 21.0 / 960 / 48 70.0/64.9/32.5	CMTR3001 24.5 / 1080 / 54 72.2/66.8/33.4	CMTR3001 27.2 / 1200 / 60 74.0/68.0/34.0	N/A	N/A	N/A	N/A	N/A	N/A
4000	30	CMTR2001 5.9 / 624 / 32 31.4/29.9/15.0	CMTR2001 8.8 / 936 / 47 31.0/29.7/14.9	CMTR3005 11.7 / 1248 / 42 43.4/42.2/21.1	CMTR2001 13.1 / 780 / 39 54.9/48.9/24.5	CMTR2501 16.3 / 936 / 47 57.0/54.7/27.4	CMTR2501 19.0 / 1092 / 55 57.0/54.7/27.4	CMTR4005 21.7 / 1248 / 42 75.6/78.2/39.1	CMTR4005 25.3 / 1404 / 47 78.1/80.2/40.1	CMTR4005 28.1 / 1560 / 52 78.1/80.2/40.1	CMTR5001 29.9 / 1144 / 58 81.3/76.3/38.2	CMTR5005 32.6 / 1248 / 42 116.4/106.2/53.1	N/A	N/A	N/A	N/A
4500	22	CMTR1001 6.5 / 851 / 43 28.1/27.2/13.6	CMTR1505 9.8 / 1277 / 43 34.3/32.4/16.2	CMTR2001 11.7 / 851 / 43 43.9/40.2/20.1	CMTR2001 14.6 / 1064 / 54 43.2/39.9/20.0	CMTR3005 18.1 / 1277 / 43 62.7/58.4/29.2	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
4500	26	CMTR2001 6.5 / 720 / 36 30.5/29.2/14.6	CMTR2001 9.8 / 1080 / 54 30.1/29.1/14.6	CMTR2001 11.7 / 720 / 36 53.4/47.6/23.8	CMTR2001 14.6 / 900 / 45 52.0/46.8/23.4	CMTR2001 18.1 / 1080 / 54 53.1/47.9/24.0	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
4500	30	CMTR2001 6.5 / 624 / 32 34.6/32.5/16.3	CMTR2001 9.8 / 936 / 47 33.9/32.1/16.1	CMTR3005 13.0 / 1248 / 42 47.5/45.5/22.8	CMTR2501 14.6 / 780 / 39 60.9/57.8/28.9	CMTR2501 18.1 / 936 / 47 62.9/59.5/29.7	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A

NOTES UNLESS OTHERWISE SPECIFIED:
1. SEE SHEET 1 FOR FRAME SIZE INFORMATION.
2. CELL FORMAT IS AS FOLLOWS:



E	ADDED MAKE COLUMN TO TABLE, PUR #1817	DRO 09/18/23			
D	UPDATED 22" WHEEL 5500# AND 6000# RATINGS AT 100 FPM 2:1, PUR #1808	DRO 08/18/23	C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR/RATINGS, PUR #1801	DRO 07/27/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: MOTOR, 208/230/460V, C-FLANGE

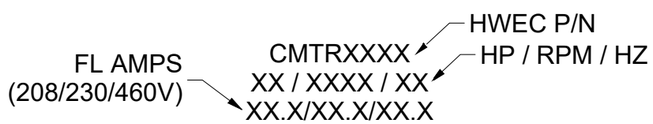
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/2/2023	CMTR SHEET 5 OF 10

GT11 2:1 ROPING DUTY TABLES

SPEED	(ft/min)	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400
CAP (lbs)	SHEAVE SIZE (in)															
5000	22	CMTR1001 7.2 / 851 / 43 30.3/29.2/14.6	CMTR1505 10.8 / 1277 / 43 38.0/35.5/17.8	CMTR2001 12.9 / 851 / 43 48.6/44.0/22.0	CMTR2001 16.1 / 1064 / 54 47.7/43.6/21.8	CMTR3005 19.9 / 1277 / 43 68.7/63.8/31.9	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
5000	26	CMTR2001 7.2 / 720 / 36 32.8/31.1/15.6	CMTR2001 10.8 / 1080 / 54 32.6/31.1/15.6	CMTR2501 12.9 / 720 / 36 58.4/55.9/28.0	CMTR2501 16.1 / 900 / 45 58.4/55.9/28.0	CMTR2501 19.9 / 1080 / 54 60.1/57.2/28.6	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
5000	30	CMTR2001 7.2 / 624 / 32 37.6/34.9/17.5	CMTR2001 10.8 / 936 / 47 36.9/34.6/17.3	CMTR3005 14.3 / 1248 / 42 51.7/48.9/24.5	CMTR2501 16.1 / 780 / 39 67.0/62.7/31.4	CMTR3001 19.9 / 936 / 47 68.2/63.4/31.7	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
5500	22	CMTR2001 7.9 / 851 / 43 30.7/29.5/14.8	CMTR3005 11.8 / 1277 / 43 43.0/41.8/20.9	CMTR2001 14.1 / 851 / 43 53.6/48.0/24.0	GT31	GT31	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
5500	26	CMTR2001 7.9 / 720 / 36 35.6/33.4/16.7	CMTR2001 11.8 / 1080 / 54 35.1/33.2/16.6	CMTR2501 14.1 / 720 / 36 63.6/60.0/30.0	GT31	GT31	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
5500	30	CMTR2001 7.9 / 624 / 32 41.2/37.8/18.9	CMTR2001 11.8 / 936 / 47 40.0/37.2/18.6	CMTR3005 15.7 / 1248 / 42 56.0/52.6/26.3	GT31	GT31	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
6000	22	CMTR2001 8.5 / 851 / 43 33.0/31.3/15.7	CMTR3005 12.8 / 1277 / 43 45.9/44.2/22.1	CMTR2501 15.3 / 851 / 43 58.7/56.1/28.1	GT31	GT31	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
6000	26	CMTR2001 8.5 / 720 / 36 38.5/35.8/17.9	CMTR2001 12.8 / 1080 / 54 37.7/35.3/17.7	CMTR3001 15.3 / 720 / 36 69.1/63.8/31.9	GT31	GT31	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A
6000	30	CMTR2001 8.5 / 624 / 32 45.1/40.9/20.5	CMTR2001 12.8 / 936 / 47 43.3/39.9/20.0	CMTR3005 17.0 / 1248 / 42 60.4/56.4/28.2	GT31	GT31	GT31	GT31	GT31	GT31	N/A	N/A	N/A	N/A	N/A	N/A

NOTES UNLESS OTHERWISE SPECIFIED:
1. SEE SHEET 1 FOR FRAME SIZE INFORMATION.
2. CELL FORMAT IS AS FOLLOWS:



E	ADDED MAKE COLUMN TO TABLE, PUR #1817	DRO 09/18/23			
D	UPDATED 22" WHEEL 5500# AND 6000# RATINGS AT 100 FPM 2:1, PUR #1808	DRO 08/18/23	C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR/RATINGS, PUR #1801	DRO 07/27/23

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: MOTOR, 208/230/460V, C-FLANGE

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

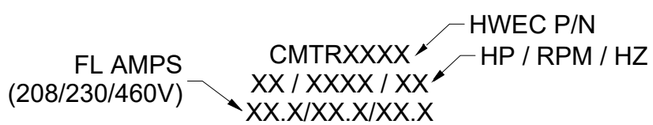
SHEET SIZE	DATE	
B	5/2/2023	CMTR SHEET 6 OF 10

GT31 1:1 ROPING DUTY TABLES

SPEED	(ft/min)	50	75	100	125	150	175	200	250	300	350	400	450	500
CAP (lbs)	SHEAVE SIZE (in)													
2000	26	CMTR1001 3.1 / 522 / 27 23.4/23.2/11.6	CMTR1001 4.7 / 783 / 40 23.4/23.2/11.6	CMTR1001 6.2 / 1044 / 53 23.4/23.2/11.6	CMTR1505 7.7 / 1304 / 44 26.9/26.2/13.1	CMTR1505 9.9 / 1565 / 53 28.6/27.6/13.8	CMTR2001 10 / 913 / 46 35.6/33.5/16.8	CMTR2001 11.5 / 1044 / 53 35.3/33.4/16.7	CMTR3005 15.3 / 1304 / 44 52.6/49.7/24.9	CMTR3005 18.3 / 1565 / 53 52.6/49.7/24.9	CMTR2501 20.7 / 1217 / 61 55.8/53.8/26.9	CMTR4005 25.1 / 1391 / 47 78.2/80.2/40.1	CMTR4005 28.2 / 1565 / 53 78.2/80.2/40.1	CMTR4005 31.3 / 1739 / 58 78.2/80.2/40.1
2000	30	CMTR1001 3.1 / 453 / 23 25.9/25.3/12.7	CMTR1001 4.7 / 679 / 34 25.9/25.3/12.7	CMTR1001 6.2 / 905 / 46 25.9/25.3/12.7	CMTR1001 7.7 / 1131 / 57 25.9/25.3/12.7	CMTR1505 9.9 / 1357 / 46 32.9/31.2/15.6	CMTR2001 10 / 792 / 40 40.8/37.7/18.9	CMTR2001 11.5 / 905 / 46 40.4/37.5/18.8	CMTR2001 15.3 / 1131 / 57 42.6/39.4/19.7	CMTR3005 18.3 / 1357 / 46 59.9/56.0/28.0	CMTR2501 20.7 / 1055 / 53 63.8/60.1/30.1	CMTR2501 25.1 / 1206 / 61 67.7/63.3/31.7	CMTR4005 28.2 / 1357 / 46 89.3/89.2/44.6	CMTR4005 31.3 / 1507 / 51 89.3/89.2/44.6
2500	26	CMTR1001 3.8 / 522 / 27 26.9/26.1/13.1	CMTR1001 5.7 / 783 / 40 26.9/26.1/13.1	CMTR1001 7.5 / 1044 / 53 26.9/26.1/13.1	CMTR1505 9.4 / 1304 / 44 32.3/30.7/15.4	CMTR1505 11.9 / 1565 / 53 34.2/32.4/16.2	CMTR2001 12 / 913 / 46 42.1/38.9/19.5	CMTR2001 13.8 / 1044 / 53 41.7/38.7/19.4	CMTR3005 18.1 / 1304 / 44 61.5/57.4/28.7	CMTR3005 21.7 / 1565 / 53 61.5/57.4/28.7	CMTR2501 24.5 / 1217 / 61 65.6/61.6/30.8	CMTR4005 29.5 / 1391 / 47 91.0/90.6/45.3	CMTR4005 33.2 / 1565 / 53 91.0/90.6/45.3	CMTR4005 36.9 / 1739 / 58 91.0/90.6/45.3
2500	30	CMTR1001 3.8 / 453 / 23 30.0/28.9/14.5	CMTR1001 5.7 / 679 / 34 30.0/28.9/14.5	CMTR1001 7.5 / 905 / 46 30.0/28.9/14.5	CMTR1001 9.4 / 1131 / 57 30.0/28.9/14.5	CMTR3005 11.9 / 1357 / 46 41.4/40.6/20.3	CMTR2001 12 / 792 / 40 49.2/44.5/22.3	CMTR2001 13.8 / 905 / 46 48.6/44.1/22.1	CMTR2001 18.1 / 1131 / 57 50.8/46.1/23.1	CMTR3005 21.7 / 1357 / 46 70.6/65.6/32.8	CMTR3001 24.5 / 1055 / 53 74.4/68.5/34.3	CMTR3001 29.5 / 1206 / 61 80.5/73.2/36.6	CMTR5005 33.2 / 1357 / 46 109.0/100.0/50.0	CMTR5005 36.9 / 1507 / 51 109.0/100.0/50.0
3000	26	CMTR2001 4.4 / 522 / 27 29.2/28.1/14.1	CMTR2001 6.6 / 783 / 40 28.9/27.9/14.0	CMTR2001 8.8 / 1044 / 53 28.7/27.9/14.0	CMTR1505 11 / 1304 / 44 38.2/35.7/17.9	CMTR3005 13.9 / 1565 / 53 41.8/40.9/20.5	CMTR2001 14 / 913 / 46 49.3/44.7/22.4	CMTR2001 16 / 1044 / 53 48.7/44.4/22.2	CMTR3005 21 / 1304 / 44 70.9/65.8/32.9	CMTR3005 25.2 / 1565 / 53 70.9/65.8/32.9	CMTR3001 28.4 / 1217 / 61 77.3/70.5/35.3	CMTR5005 33.9 / 1391 / 47 108.7/99.7/49.9	CMTR5005 38.2 / 1565 / 53 108.7/99.7/49.9	CMTR5005 42.4 / 1739 / 58 108.7/99.7/49.9
3000	30	CMTR2001 4.4 / 453 / 23 33.4/31.3/15.7	CMTR2001 6.6 / 679 / 34 32.5/30.8/15.4	CMTR2001 8.8 / 905 / 46 32.2/30.7/15.4	CMTR2001 11 / 1131 / 57 32.1/30.7/15.4	CMTR3005 13.9 / 1357 / 46 46.9/45.0/22.5	CMTR2501 14 / 792 / 40 58.0/55.5/27.8	CMTR2501 16 / 905 / 46 58.0/55.5/27.8	CMTR2501 21 / 1131 / 57 60.6/57.6/28.8	CMTR4005 25.2 / 1357 / 46 80.3/81.9/41.0	CMTR5001 28.4 / 1055 / 53 83.7/78.2/39.1	CMTR5001 33.9 / 1206 / 61 89.6/82.9/41.5	CMTR5005 38.2 / 1357 / 46 125.4/114.0/57.0	CMTR5005 42.4 / 1507 / 51 125.4/114.0/57.0
3500	26	CMTR2001 5.1 / 522 / 27 33.1/31.2/15.6	CMTR2001 7.6 / 783 / 40 32.3/30.7/15.4	CMTR2001 10.2 / 1044 / 53 32.0/30.6/15.3	CMTR3005 12.7 / 1304 / 44 44.9/43.4/21.7	CMTR3005 15.9 / 1565 / 53 46.5/44.7/22.4	CMTR2501 16 / 913 / 46 57.5/55.1/27.6	CMTR2501 18.3 / 1044 / 53 57.5/55.1/27.6	CMTR4005 23.8 / 1304 / 44 79.1/81.0/40.5	CMTR4005 28.6 / 1565 / 53 79.1/81.0/40.5	CMTR5001 32.3 / 1217 / 61 85.3/79.3/39.7	CMTR5005 38.3 / 1391 / 47 122.9/111.8/55.9	CMTR5005 43.1 / 1565 / 53 122.9/111.8/55.9	CMTR5005 47.9 / 1739 / 58 122.9/111.8/55.9
3500	30	CMTR2001 5.1 / 453 / 23 38.6/35.3/17.7	CMTR2001 7.6 / 679 / 34 36.8/34.4/17.2	CMTR2001 10.2 / 905 / 46 36.2/34.0/17.0	CMTR2001 12.7 / 1131 / 57 35.9/33.9/17.0	CMTR3005 15.9 / 1357 / 46 52.6/49.7/24.9	CMTR2501 16 / 792 / 40 65.9/61.9/30.9	CMTR2501 18.3 / 905 / 46 65.9/61.9/30.9	CMTR3001 23.8 / 1131 / 57 67.4/62.9/31.5	CMTR4005 28.6 / 1357 / 46 90.5/90.2/45.1	CMTR5001 32.3 / 1055 / 53 94.3/87.1/43.6	CMTR5001 38.3 / 1206 / 61 100.8/92.3/46.2	CMTR6005 43.1 / 1357 / 46 138.6/126.3/63.2	CMTR6005 47.9 / 1507 / 51 138.6/126.3/63.2
4000	26	CMTR2001 5.8 / 522 / 27 36.7/34.0/17.0	CMTR2001 8.6 / 783 / 40 35.9/33.7/16.9	CMTR2001 11.5 / 1044 / 53 35.3/33.4/16.7	CMTR3005 14.3 / 1304 / 44 49.8/47.4/23.7	CMTR3005 17.9 / 1565 / 53 51.4/48.7/24.4	CMTR2501 18 / 913 / 46 64.3/60.6/30.3	CMTR2501 20.6 / 1044 / 53 64.3/60.6/30.3	CMTR4005 26.7 / 1304 / 44 88.0/88.1/44.1	CMTR4005 32 / 1565 / 53 88.0/88.1/44.1	CMTR5001 36.1 / 1217 / 61 95.1/87.5/43.8	CMTR6005 42.8 / 1391 / 47 134.0/122.7/61.4	CMTR6005 48.1 / 1565 / 53 134.0/122.7/61.4	N/A
4000	30	CMTR2001 5.8 / 453 / 23 43.5/39.1/19.6	CMTR2001 8.6 / 679 / 34 41.5/38.1/19.1	CMTR2001 11.5 / 905 / 46 40.4/37.5/18.8	CMTR2001 14.3 / 1131 / 57 40.2/37.4/18.7	CMTR3005 17.9 / 1357 / 46 58.5/54.8/27.4	CMTR3001 18 / 792 / 40 74.0/67.8/33.9	CMTR3001 20.6 / 905 / 46 73.5/67.6/33.8	CMTR3001 26.7 / 1131 / 57 75.1/69.2/34.6	CMTR5005 32 / 1357 / 46 105.2/96.8/48.4	CMTR5001 36.1 / 1055 / 53 105.4/96.4/48.2	CMTR5001 42.8 / 1206 / 61 112.7/102.1/51.1	N/A	N/A
4500	26	CMTR2001 6.4 / 522 / 27 41.3/37.6/18.8	CMTR2001 9.6 / 783 / 40 39.8/36.8/18.4	CMTR2001 12.8 / 1044 / 53 39.2/36.5/18.3	CMTR3005 16 / 1304 / 44 54.8/51.6/25.8	CMTR3005 19.8 / 1565 / 53 56.5/53.1/26.6	CMTR3001 20 / 913 / 46 70.7/65.4/32.7	CMTR3001 22.9 / 1044 / 53 70.0/64.9/32.5	CMTR4005 29.5 / 1304 / 44 97.0/95.5/47.8	CMTR4005 35.4 / 1565 / 53 97.0/95.5/47.8	CMTR5001 40 / 1217 / 61 105.2/96.0/48.0	CMTR6005 47.2 / 1391 / 47 148.2/133.6/66.8	N/A	N/A
4500	30	CMTR2001 6.4 / 453 / 23 50.0/44.0/22.0	CMTR2001 9.6 / 679 / 34 46.6/42.1/21.1	CMTR2001 12.8 / 905 / 46 45.3/41.5/20.8	CMTR2001 16 / 1131 / 57 44.8/41.2/20.6	CMTR3005 19.8 / 1357 / 46 64.6/60.2/30.1	CMTR3001 20 / 792 / 40 81.9/72.0/36.0	CMTR3001 22.9 / 905 / 46 81.7/71.9/35.8	CMTR5001 29.5 / 1131 / 57 81.5/76.4/38.2	CMTR5005 35.4 / 1357 / 46 116.5/106.3/53.2	CMTR5001 40 / 1055 / 53 117.3/106.1/53.1	CMTR5001 47.2 / 1206 / 61 125.2/112.3/56.2	N/A	N/A

NOTES UNLESS OTHERWISE SPECIFIED:

1. SEE SHEET 1 FOR FRAME SIZE INFORMATION.
2. CELL FORMAT IS AS FOLLOWS:



E	ADDED MAKE COLUMN TO TABLE, PUR #1817	DRO 09/18/23				
D	UPDATED 22" WHEEL 5500# AND 6000# RATINGS AT 100 FPM 2:1, PUR #1808	DRO 08/18/23	C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR/RATINGS, PUR #1801	DRO 07/27/23	

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: MOTOR, 208/230/460V, C-FLANGE

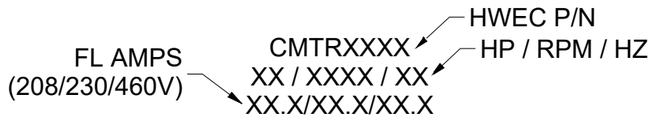
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/2/2023	CMTR SHEET 7 OF 10

GT31 1:1 ROPING DUTY TABLES

SPEED	(ft/min)	50	75	100	125	150	175	200	250	300	350	400	450	500
CAP (lbs)	SHEAVE SIZE (in)													
5000	26	CMTR2001 7.1 / 522 / 27 45.5/40.9/20.5	CMTR2001 10.6 / 783 / 40 43.9/40.1/20.1	CMTR2001 14.1 / 1044 / 53 42.9/39.6/19.8	CMTR3005 17.7 / 1304 / 44 60.0/56.1/28.1	CMTR3005 21.8 / 1565 / 53 61.8/57.6/28.8	CMTR3001 22 / 913 / 46 77.9/71.2/35.6	CMTR3001 25.2 / 1044 / 53 77.0/70.6/35.3	CMTR5005 32.4 / 1304 / 44 110.7/101.4/50.7	CMTR5005 38.9 / 1565 / 53 110.7/101.4/50.7	CMTR5001 43.9 / 1217 / 61 115.8/104.5/52.3	N/A	N/A	N/A
5500	26	CMTR2001 7.8 / 522 / 27 50.8/45.0/22.5	CMTR2001 11.6 / 783 / 40 48.2/43.6/21.8	CMTR2001 15.5 / 1044 / 53 46.9/42.8/21.4	CMTR3005 19.3 / 1304 / 44 65.3/60.8/30.4	CMTR3005 23.8 / 1565 / 53 67.1/62.4/31.2	CMTR5001 24 / 913 / 46 82.4/77.0/38.5	CMTR5001 27.5 / 1044 / 53 82.0/76.8/38.4	CMTR5005 35.3 / 1304 / 44 120.5/109.7/54.9	CMTR5005 42.3 / 1565 / 53 120.5/109.7/54.9	N/A	N/A	N/A	N/A
6000	26	CMTR2001 8.4 / 522 / 27 56.8/47.2/23.9	CMTR2001 12.6 / 783 / 40 52.3/46.9/23.5	CMTR2001 16.8 / 1044 / 53 51.0/46.2/23.1	CMTR3005 21 / 1304 / 44 70.8/65.7/32.9	CMTR3005 25.8 / 1565 / 53 72.6/67.4/33.7	CMTR5001 26 / 913 / 46 88.7/82.3/41.2	CMTR5001 29.7 / 1044 / 53 88.2/82.0/41.0	CMTR6005 38.1 / 1304 / 44 127.4/117.6/58.8	N/A	N/A	N/A	N/A	N/A

NOTES UNLESS OTHERWISE SPECIFIED:
1. SEE SHEET 1 FOR FRAME SIZE INFORMATION.
2. CELL FORMAT IS AS FOLLOWS:



E	ADDED MAKE COLUMN TO TABLE, PUR #1817	DRO 09/18/23				
D	UPDATED 22" WHEEL 5500# AND 6000# RATINGS AT 100 FPM 2:1, PUR #1808	DRO 08/18/23	C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR/RATINGS, PUR #1801	DRO 07/27/23	

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: MOTOR, 208/230/460V, C-FLANGE

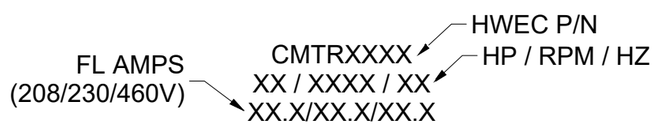
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/2/2023	CMTR SHEET 8 OF 10

GT31 2:1 ROPING DUTY TABLES

SPEED	(ft/min)	50	75	100	125	150	175	200	225	250
CAP (lbs)	SHEAVE SIZE (in)									
2500	26	CMTR1001 3.9 / 1044 / 53 18.0/18.8/9.4	CMTR1505 5.9 / 1565 / 53 19.0/19.4/9.7	CMTR1001 6.8 / 1044 / 53 24.9/24.4/12.2	CMTR1505 8.5 / 1304 / 44 29.2/28.1/14.1	CMTR1505 10.7 / 1565 / 53 30.8/29.5/14.8	CMTR2001 12.1 / 1217 / 61 33.1/31.4/15.7	CMTR3005 13.8 / 1391 / 47 45.7/44.0/22.0	CMTR3005 16.4 / 1565 / 53 47.8/45.8/22.9	CMTR3005 18.3 / 1739 / 58 47.8/45.8/22.9
2500	30	CMTR1001 3.9 / 905 / 46 19.3/19.9/9.9	CMTR1505 5.9 / 1357 / 46 20.9/21.0/10.5	CMTR1001 6.8 / 905 / 46 27.6/26.8/13.4	CMTR1001 8.5 / 1131 / 57 27.6/26.8/13.4	CMTR1505 10.7 / 1357 / 46 35.6/33.5/16.8	CMTR2001 12.1 / 1055 / 53 36.9/34.7/17.4	CMTR2001 13.8 / 1206 / 61 37.5/35.0/17.5	CMTR3005 16.4 / 1357 / 46 54.2/51.1/25.6	CMTR3005 18.3 / 1507 / 51 54.2/51.1/25.6
3000	26	CMTR1001 4.6 / 1044 / 53 19.5/20.0/10.0	CMTR1505 6.9 / 1565 / 53 21.2/21.3/10.7	CMTR1001 8.0 / 1044 / 53 28.1/27.2/13.6	CMTR1505 10.0 / 1304 / 44 34.2/32.4/16.2	CMTR1505 12.5 / 1565 / 53 36.0/33.9/17.0	CMTR2001 14.1 / 1217 / 61 37.9/35.3/17.7	CMTR3005 16.1 / 1391 / 47 52.2/49.4/24.7	CMTR3005 19.0 / 1565 / 53 54.4/51.2/25.6	CMTR3005 21.1 / 1739 / 58 54.4/51.2/25.6
3000	30	CMTR1001 4.6 / 905 / 46 21.2/21.4/10.7	CMTR1505 6.9 / 1357 / 46 23.6/23.4/11.7	CMTR2001 8.0 / 905 / 46 29.5/28.6/14.3	CMTR2001 10.0 / 1131 / 57 29.6/28.6/14.3	CMTR3005 12.5 / 1357 / 46 43.1/41.9/21.0	CMTR2001 14.1 / 1055 / 53 42.5/39.3/19.7	CMTR2001 16.1 / 1206 / 61 43.3/39.9/20.0	CMTR3005 19.0 / 1357 / 46 62.1/57.9/29.0	CMTR3005 21.1 / 1507 / 51 62.1/57.9/29.0
3500	26	CMTR1001 5.3 / 1044 / 53 21.2/21.3/10.7	CMTR1505 8.0 / 1565 / 53 23.6/23.3/11.7	CMTR2001 9.2 / 1044 / 53 29.5/28.5/14.3	CMTR3005 11.4 / 1304 / 44 41.3/40.5/20.3	CMTR3005 14.3 / 1565 / 53 42.7/41.6/20.8	CMTR2001 16.1 / 1217 / 61 43.0/39.5/19.8	CMTR3005 18.4 / 1391 / 47 58.9/55.1/27.6	CMTR3005 21.6 / 1565 / 53 61.2/57.1/28.6	CMTR3005 24.0 / 1739 / 58 61.2/57.1/28.6
3500	30	CMTR1001 5.3 / 905 / 46 23.2/23.0/11.5	CMTR1505 8.0 / 1357 / 46 26.6/25.9/13.0	CMTR2001 9.2 / 905 / 46 33.1/31.4/15.7	CMTR2001 11.4 / 1131 / 57 33.0/31.5/15.8	CMTR3005 14.3 / 1357 / 46 48.0/45.9/23.0	CMTR2001 16.1 / 1055 / 53 48.5/44.2/22.1	CMTR2001 18.4 / 1206 / 61 49.7/45.0/22.5	CMTR3005 21.6 / 1357 / 46 70.2/65.2/32.6	CMTR3005 24.0 / 1507 / 51 70.2/65.2/32.6
4000	26	CMTR1001 6.0 / 1044 / 53 22.9/22.7/11.4	CMTR1505 9.0 / 1565 / 53 26.1/25.5/12.8	CMTR2001 10.4 / 1044 / 53 32.5/31.0/15.5	CMTR3005 12.9 / 1304 / 44 45.6/43.9/22.0	CMTR3005 16.1 / 1565 / 53 47.0/45.1/22.6	CMTR2001 18.2 / 1217 / 61 48.4/44.0/22.0	CMTR3005 20.7 / 1391 / 47 65.8/61.2/30.6	CMTR3005 24.2 / 1565 / 53 68.2/63.4/31.7	CMTR3005 26.9 / 1739 / 58 68.2/63.4/31.7
4000	30	CMTR1001 6.0 / 905 / 46 25.2/24.7/12.4	CMTR1505 9.0 / 1357 / 46 29.8/28.6/14.3	CMTR2001 10.4 / 905 / 46 36.8/34.5/17.3	CMTR2001 12.9 / 1131 / 57 36.7/34.5/17.3	CMTR3005 16.1 / 1357 / 46 53.2/50.2/25.1	CMTR2501 18.2 / 1055 / 53 56.5/54.3/27.2	CMTR2501 20.7 / 1206 / 61 56.5/54.3/27.2	CMTR4005 24.2 / 1357 / 46 77.4/79.6/39.8	CMTR4005 26.9 / 1507 / 51 77.4/79.6/39.8
4500	26	CMTR1001 6.7 / 1044 / 53 24.6/24.2/12.1	CMTR1505 10.0 / 1565 / 53 28.8/27.8/13.9	CMTR2001 11.5 / 1044 / 53 35.6/33.6/16.8	CMTR3005 14.4 / 1304 / 44 50.0/47.5/23.8	CMTR3005 17.9 / 1565 / 53 51.5/48.8/24.4	CMTR2001 20.2 / 1217 / 61 54.1/48.6/24.3	CMTR3005 23.0 / 1391 / 47 73.0/67.7/33.9	CMTR4005 26.8 / 1565 / 53 74.6/77.4/38.7	CMTR4005 29.8 / 1739 / 58 74.6/77.4/38.7
4500	30	CMTR1001 6.7 / 905 / 46 27.4/26.6/13.3	CMTR1505 10.0 / 1357 / 46 33.1/31.4/15.7	CMTR2001 11.5 / 905 / 46 40.8/37.8/18.9	CMTR2001 14.4 / 1131 / 57 40.5/37.7/18.9	CMTR3005 17.9 / 1357 / 46 58.6/54.8/27.4	CMTR2501 20.2 / 1055 / 53 62.3/59.0/29.5	CMTR2501 23.0 / 1206 / 61 62.3/59.0/29.5	CMTR4005 26.8 / 1357 / 46 85.1/85.8/42.9	CMTR4005 29.8 / 1507 / 51 85.1/85.8/42.9
5000	26	CMTR1001 7.4 / 1044 / 53 26.5/25.8/12.9	CMTR1505 11.0 / 1565 / 53 31.7/30.2/15.1	CMTR2001 12.7 / 1044 / 53 38.9/36.3/18.2	CMTR3005 15.9 / 1304 / 44 54.5/51.3/25.7	CMTR3005 19.7 / 1565 / 53 56.1/52.7/26.4	CMTR2501 22.2 / 1217 / 61 59.6/56.8/28.4	CMTR4005 25.3 / 1391 / 47 78.9/80.8/40.4	CMTR4005 29.4 / 1565 / 53 81.1/82.6/41.3	CMTR4005 32.6 / 1739 / 58 81.1/82.6/41.3
5000	30	CMTR1001 7.4 / 905 / 46 29.5/28.5/14.3	CMTR1505 11.0 / 1357 / 46 36.6/34.4/17.2	CMTR2001 12.7 / 905 / 46 45.0/41.2/20.6	CMTR2001 15.9 / 1131 / 57 44.5/41.0/20.5	CMTR3005 19.7 / 1357 / 46 64.1/59.7/29.9	CMTR3001 22.2 / 1055 / 53 67.1/62.5/31.3	CMTR3001 25.3 / 1206 / 61 68.6/63.5/31.8	CMTR4005 29.4 / 1357 / 46 92.8/92.1/46.1	CMTR4005 32.6 / 1507 / 51 92.8/92.1/46.1

NOTES UNLESS OTHERWISE SPECIFIED:
1. SEE SHEET 1 FOR FRAME SIZE INFORMATION.
2. CELL FORMAT IS AS FOLLOWS:



E	ADDED MAKE COLUMN TO TABLE, PUR #1817	DRO 09/18/23				
D	UPDATED 22" WHEEL 5500# AND 6000# RATINGS AT 100 FPM 2:1, PUR #1808	DRO 08/18/23	C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR/RATINGS, PUR #1801	DRO 07/27/23	

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

TITLE: MOTOR, 208/230/460V, C-FLANGE

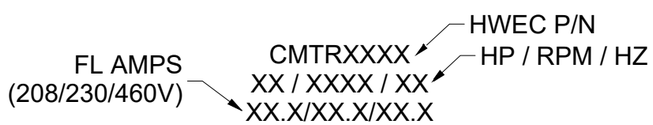
DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/2/2023	CMTR SHEET 9 OF 10

GT31 2:1 ROPING DUTY TABLES

SPEED	(ft/min)	50	75	100	125	150	175	200	225	250
CAP (lbs)	SHEAVE SIZE (in)									
5500	26	CMTR1001 8.1 / 1044 / 53 28.3/27.4/13.7	CMTR1505 12.1 / 1565 / 53 34.6/32.7/16.4	CMTR2001 13.9 / 1044 / 53 42.3/39.1/19.6	CMTR3005 17.4 / 1304 / 44 59.2/55.4/27.7	CMTR3005 21.4 / 1565 / 53 60.7/56.7/28.4	CMTR2501 24.2 / 1217 / 61 64.7/60.9/30.5	CMTR4005 27.6 / 1391 / 47 85.6/86.2/43.1	CMTR4005 32.0 / 1565 / 53 87.8/88.0/44.0	CMTR4005 35.5 / 1739 / 58 87.8/88.0/44.0
5500	30	CMTR2001 8.1 / 905 / 46 29.8/28.8/14.4	CMTR3005 12.1 / 1357 / 46 41.8/40.9/20.5	CMTR2001 13.9 / 905 / 46 49.4/44.7/22.4	CMTR2001 17.4 / 1131 / 57 48.4/44.2/22.1	CMTR3005 21.4 / 1357 / 46 69.7/64.7/32.4	CMTR3001 24.2 / 1055 / 53 73.0/67.3/33.7	CMTR3001 27.6 / 1206 / 61 74.9/68.5/34.3	CMTR5005 32.0 / 1357 / 46 105.0/96.7/48.4	CMTR5005 35.5 / 1507 / 51 105.0/96.7/48.4
6000	26	CMTR1001 8.8 / 1044 / 53 30.2/29.1/14.6	CMTR1505 13.1 / 1565 / 53 37.7/35.3/17.7	CMTR2001 15.1 / 1044 / 53 45.9/42.1/21.1	CMTR3005 18.9 / 1304 / 44 63.9/59.6/29.8	CMTR3005 23.2 / 1565 / 53 65.5/61.0/30.5	CMTR3001 26.2 / 1217 / 61 70.5/65.0/32.5	CMTR4005 29.9 / 1391 / 47 92.3/91.7/45.9	CMTR4005 34.5 / 1565 / 53 94.6/93.6/46.8	CMTR4005 38.4 / 1739 / 58 94.6/93.6/46.8
6000	30	CMTR2001 8.8 / 905 / 46 31.9/30.5/15.3	CMTR3005 13.1 / 1357 / 46 44.6/43.1/21.6	CMTR2001 15.1 / 905 / 46 54.1/48.5/24.3	CMTR2001 18.9 / 1131 / 57 52.8/47.8/23.9	CMTR4005 23.2 / 1357 / 46 74.6/77.4/38.7	CMTR3001 26.2 / 1055 / 53 79.7/72.8/36.4	CMTR3001 29.9 / 1206 / 61 81.4/73.8/36.9	CMTR5005 34.5 / 1357 / 46 113.5/103.8/51.9	CMTR5005 38.4 / 1507 / 51 113.5/103.8/51.9
7000	26	CMTR2001 10.1 / 1044 / 53 32.0/30.6/15.3	CMTR3005 15.2 / 1565 / 53 44.8/43.2/21.6	CMTR2001 17.5 / 1044 / 53 53.3/48.0/24.0	CMTR3005 21.8 / 1304 / 44 73.8/68.4/34.2	CMTR4005 26.8 / 1565 / 53 74.6/77.4/38.7	CMTR3001 30.2 / 1217 / 61 81.6/74.0/37.0	CMTR5005 34.5 / 1391 / 47 110.7/101.4/50.7	CMTR5005 39.7 / 1565 / 53 113.1/103.4/51.7	CMTR5005 44.1 / 1739 / 58 113.1/103.4/51.7
7000	30	CMTR2001 10.1 / 905 / 46 36.2/34.0/17.0	CMTR3005 15.2 / 1357 / 46 50.5/47.9/24.0	CMTR2501 17.5 / 905 / 46 62.9/59.5/29.8	CMTR2501 21.8 / 1131 / 57 62.9/59.5/29.8	CMTR4005 26.8 / 1357 / 46 85.1/85.8/42.9	CMTR5001 30.2 / 1055 / 53 93.0/83.4/41.7	CMTR5001 34.5 / 1206 / 61 90.7/83.8/41.9	CMTR6005 39.7 / 1357 / 46 127.6/117.8/58.9	CMTR6005 44.1 / 1507 / 51 127.6/117.8/58.9
8000	26	CMTR2001 11.5 / 1044 / 53 35.6/33.6/16.8	CMTR3005 17.2 / 1565 / 53 49.8/47.4/23.7	CMTR2501 19.9 / 1044 / 53 62.0/58.8/29.4	CMTR4005 24.8 / 1304 / 44 82.2/83.4/41.7	CMTR4005 30.4 / 1565 / 53 83.7/84.6/42.3	CMTR5001 34.3 / 1217 / 61 89.2/82.5/41.3	CMTR5005 39.2 / 1391 / 47 125.5/114.0/57.0	N/A	N/A
8000	30	CMTR2001 11.5 / 905 / 46 40.8/37.8/18.9	CMTR3005 17.2 / 1357 / 46 56.6/53.1/26.6	CMTR3001 19.9 / 905 / 46 70.5/65.1/32.6	CMTR3001 24.8 / 1131 / 57 69.9/64.9/32.5	CMTR4005 30.4 / 1357 / 46 95.9/94.6/47.3	CMTR5001 34.3 / 1055 / 53 100.0/91.8/45.9	CMTR5001 39.2 / 1206 / 61 102.4/93.7/46.9	N/A	N/A
9000	26	CMTR2001 12.9 / 1044 / 53 39.2/36.5/18.3	CMTR3005 19.3 / 1565 / 53 55.1/51.8/25.9	CMTR3001 22.2 / 1044 / 53 68.2/63.5/31.8	CMTR4005 27.8 / 1304 / 44 91.4/90.9/45.5	CMTR4005 33.9 / 1565 / 53 93.0/92.2/46.1	CMTR5001 38.3 / 1217 / 61 99.2/90.9/45.5	CMTR6005 43.8 / 1391 / 47 137.1/125.1/62.6	N/A	N/A
9000	30	CMTR2001 12.9 / 905 / 46 45.3/41.5/20.8	CMTR3005 19.3 / 1357 / 46 62.9/58.6/29.3	CMTR3001 22.2 / 905 / 46 79.4/72.4/36.2	CMTR3001 27.8 / 1131 / 57 78.1/71.5/35.8	CMTR5005 33.9 / 1357 / 46 111.5/102.1/51.0	CMTR5001 38.3 / 1055 / 53 111.8/101.6/50.8	CMTR5001 43.8 / 1206 / 61 114.9/103.9/52.0	N/A	N/A
10000	26	CMTR2001 14.2 / 1044 / 53 43.2/39.9/20.0	CMTR3005 21.3 / 1565 / 53 60.5/56.5/28.3	CMTR3001 24.6 / 1044 / 53 75.5/69.4/34.7	CMTR5005 30.8 / 1304 / 44 105.1/96.7/48.4	CMTR5005 37.5 / 1565 / 53 106.8/98.1/49.1	N/A	N/A	N/A	N/A
12000	26	CMTR2001 17.0 / 1044 / 53 51.6/46.7/23.4	CMTR3005 25.5 / 1565 / 53 71.7/66.6/33.3	CMTR5001 29.4 / 1044 / 53 87.1/81.1/40.6	CMTR5005 36.7 / 1304 / 44 125.5/114.0/57.0	CMTR6005 44.6 / 1565 / 53 124.4/115.2/57.6	N/A	N/A	N/A	N/A

NOTES UNLESS OTHERWISE SPECIFIED:
1. SEE SHEET 1 FOR FRAME SIZE INFORMATION.
2. CELL FORMAT IS AS FOLLOWS:



E	ADDED MAKE COLUMN TO TABLE, PUR #1817	DRO 09/18/23				
D	UPDATED 22" WHEEL 5500# AND 6000# RATINGS AT 100 FPM 2:1, PUR #1808	DRO 08/18/23	C	CORRECTED VARIOUS GT31 2:1 30" WHEEL MOTOR/RATINGS, PUR #1801	DRO 07/27/23	

THIRD ANGLE PROJECTION

HOLLISTER-WHITNEY
ELEVATOR CO. LLC

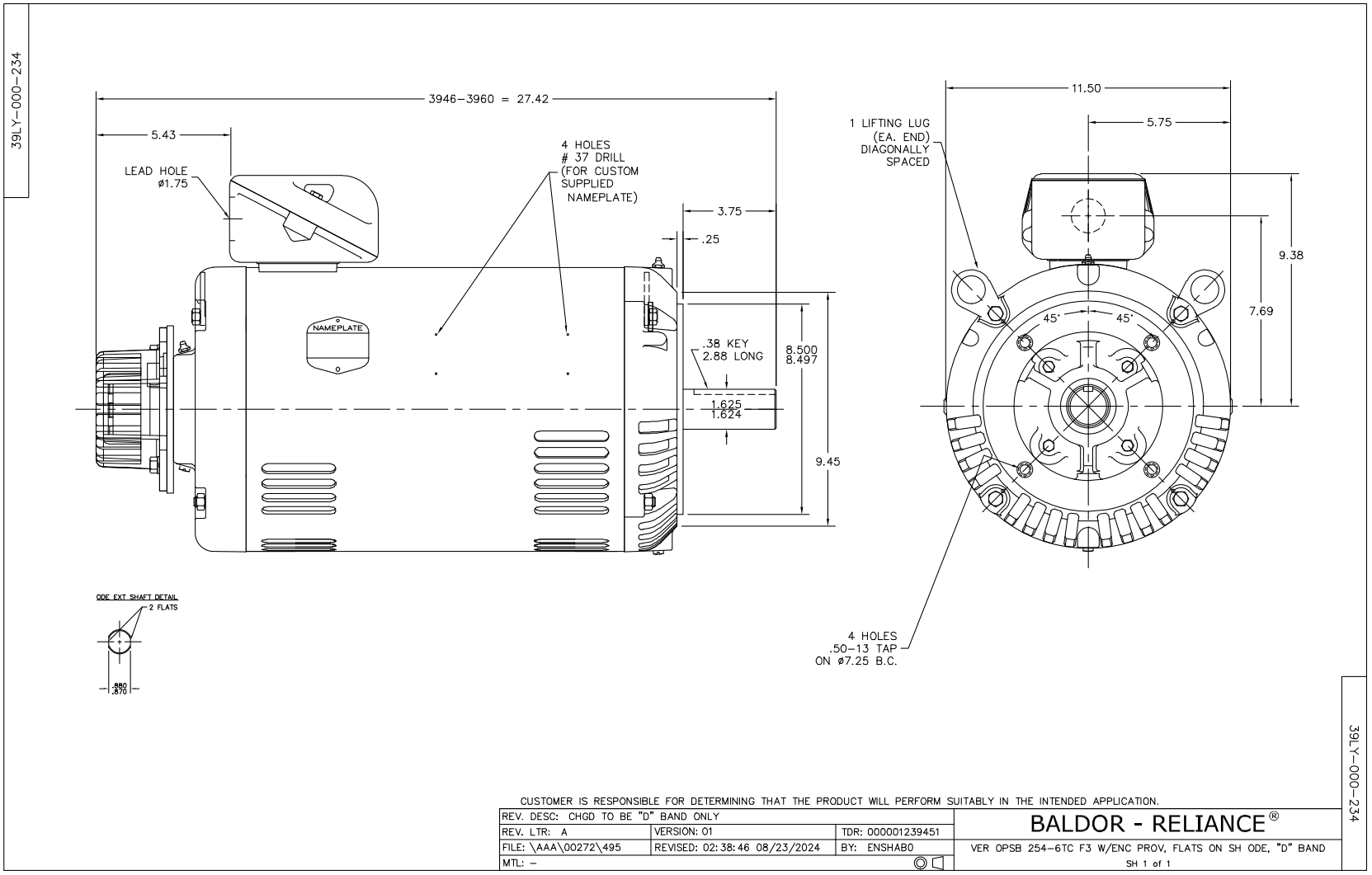
TITLE: MOTOR, 208/230/460V, C-FLANGE

DRAWN BY	SCALE	MATERIAL	REFERENCE TOL.
DRO		N/A	ALL DIMENSIONS REFERENCE UNLESS OTHERWISE SPECIFIED

SHEET SIZE	DATE	
B	5/2/2023	CMTR SHEET 10 OF 10

Nameplate

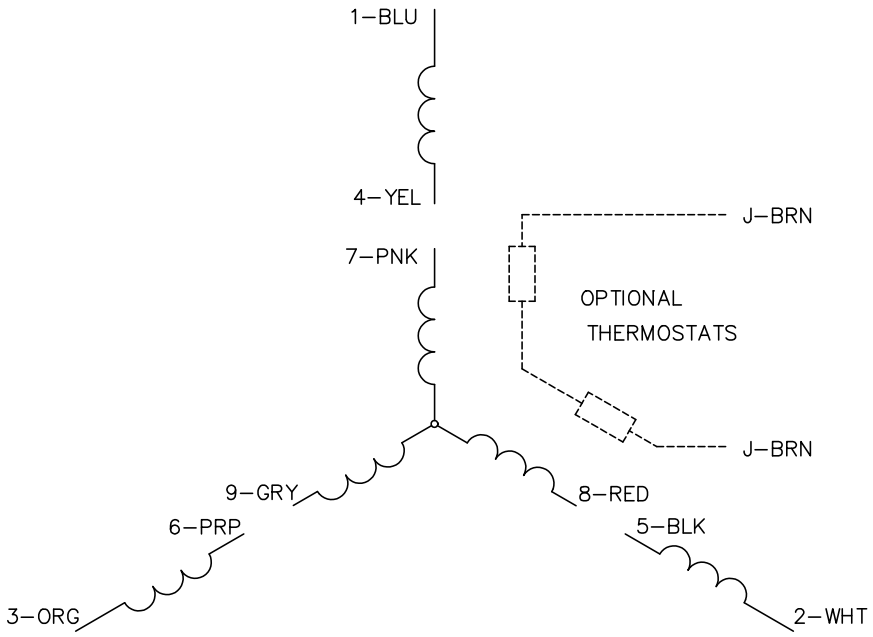
NP4389L									
CAT.NO.	CMTR1001								
SPEC.	39-0000-0731								
FRAME	256TC		**H.P.**	10					
VOLTS	230/460								
MAG. CUR.	13.4/6.7			**F.L. AMPS**	27/13.5				
R.P.M.	1175			**R.P.M. MAX**	1800				
HZ.	60	**PH.**	3	**CLASS**	F				
SER.F.	1.00	**DES.**	A	**SL HZ**	1				
NEMA NOM. EFF.	91.7	**WK2**	4.34						
BLOWER		**V**		**PH**		**HZ**		**AMPS**	
RATING	40C AMB-CONT								
DE	6309	**ODE**	6311						
CC	010A	**SN**							
	1.15SF ON SINEWAVE 5:1 CT								

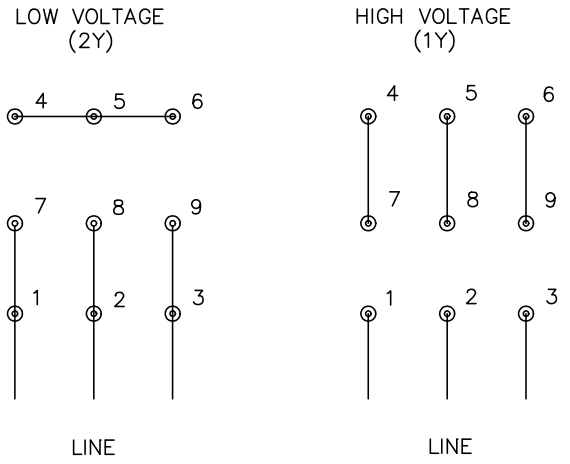


CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT THE PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.

REV. DESC: CHGD TO BE "D" BAND ONLY		BALDOR - RELIANCE®
REV. LTR: A	VERSION: 01	TDR: 000001239451
FILE: \AAA\00272\495	REVISED: 02:38:46 08/23/2024	BY: ENSHABO
MTL: –		VER OPSB 254-6TC F3 W/ENC PROV, FLATS ON SH ODE, "D" BAND
		SH 1 of 1

CD0005





NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

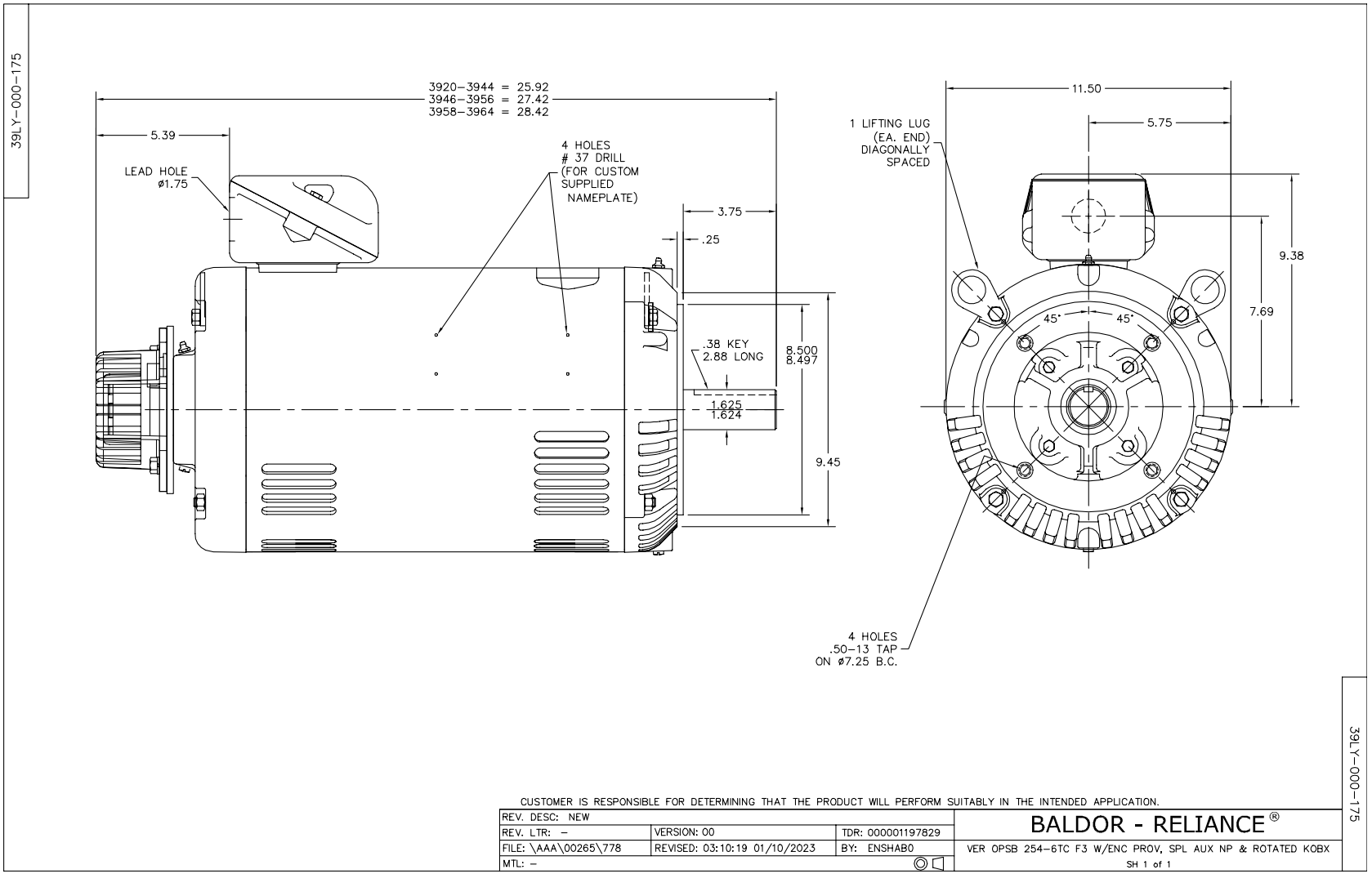
CD0005

REV. DESC: REVISE TO SHOW OPTIONAL COLORS			BALDOR ELECTRIC Co.
REV. LTR: E	BY: JLP	REVISED: 01/19/99 10:15	TDR: 0171435
CD0005		FILE: AAA00005140	MDL: –
		MTL: –	3PH, DV, 9 LEADS

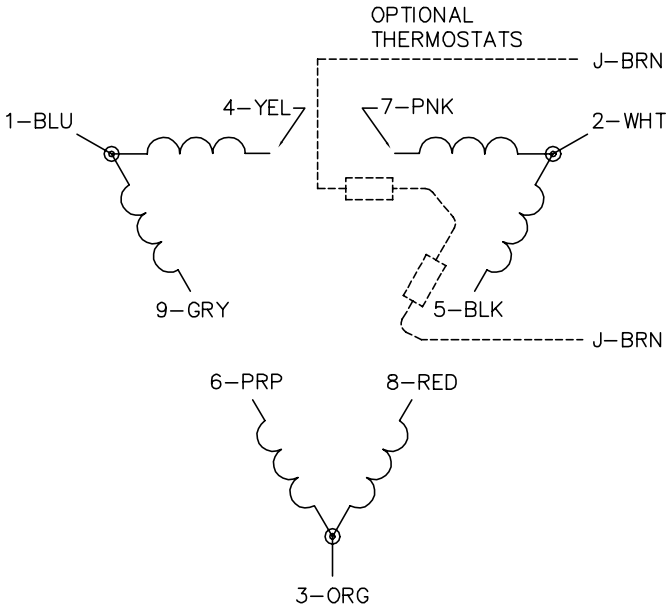
Notes:	Class null Division null

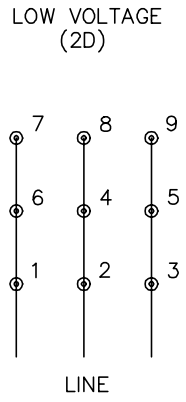
Nameplate NP4389L

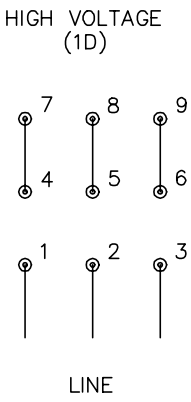
CAT.NO.	CMTR1505								
SPEC.	39-0000-0574								
FRAME	254TC	**H.P.**	15						
VOLTS	230/460 USABLE@208V:39A								
MAG. CUR.	15.2/7.6	**F.L. AMPS**	36.4/18.2						
R.P.M.	1770	**R.P.M. MAX**	2700						
HZ.	60	**PH.**	3	**CLASS**	F				
SER.F.	1.00	**DES.**	A	**SL HZ**	1				
NEMA NOM. EFF.	93	**WK2**	2.1						
BLOWER		**V**		**PH**		**HZ**		**AMPS**	
RATING	40C AMB-CONT								
DE	6309	**ODE**	6311						
CC	010A	**SN**							
	1.15SF ON SINEWAVE 5:1 CT								


39LY-000-175
3920–3944 = 25.92
3946–3956 = 27.42
3958–3964 = 28.42
5.39
LEAD HOLE
ø1.75
4 HOLES
37 DRILL
(FOR CUSTOM
SUPPLIED
NAMEPLATE)
3.75
.25
.38 KEY
2.88 LONG
8.500
8.497
1.625
1.624
9.45
11.50
5.75
1 LIFTING LUG
(EA. END)
DIAGONALLY
SPACED
9.38
7.69
45°
45°
4 HOLES
.50–13 TAP
ON ø7.25 B.C.
39LY-000-175
CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT THE PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.
REV. DESC: NEW
REV. LTR: –
VERSION: 00
TDR: 000001197829
FILE: \AAA\00265\778
REVISED: 03:10:19 01/10/2023
BY: ENSHAB0
MTL: –
BALDOR - RELIANCE®
VER OPSB 254–6TC F3 W/ENC PROV, SPL AUX NP & ROTATED KOBX
SH 1 of 1

CD0180







NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

CD0180

REV. DESC: ADD CLASS CONN00000007		
REV. LTR: D	VERSION: 01	TDR: 000001099922
FILE: \AAA\00005\148	REVISED: 10:25:29 02/19/2019	BY: ENBRIR0
MTL: –		

BALDOR - RELIANCE®

3PH, DV, 9 LEADS, DELTA CONNECTION

SH 1 of 1

DATA SHEET

Three Phase Induction Motor - Squirrel Cage

Customer	:	
Product line	:	W40 NEMA Premium Efficiency

Frame	:	284/6T	Locked rotor time	: 15 s (hot) 27 s (cold)
Output	:	20 HP (15 kW)	Temperature rise[4]	: 105 K
Poles	:	6	Duty cycle	: S2, 60 min
Frequency	:	60 Hz	Ambient temperature	: -20 °C to +40 °C
Rated voltage	:	208-230/460 V	Altitude	: 1000 m.a.s.l
Rated current	:	53,7-48,5/24,3 A	Degree of protection	: IP23
L. R. Amperes	:	311/155 A	Cooling method	: IC01 - ODP
LRC (p.u.)	:	6,4 Code G	Mounting	: F-3
No load current	:	18,0/9,00 A	Direct of rotation[1]	: Both
Rated speed	:	1175 rpm	Noise level[2]	: 59,0 dB(A)
Slip	:	2,08 %	Starting method	: VFD
Rated torque	:	89,4 ft.lb	Approx. weight[3]	: 410 lb
Locked rotor torque	:	230 %	Design	: B
Pull up torque	:	195 %		
Breakdown torque	:	260 %		
Insulation class	:	F		
Service factor	:	1,00		
Moment of inertia (J)	:	6,89 sq.ft.lb		

Output	Start	25%	50%	75%	100%
Efficiency (%)	-	88,4	91,7	92,4	92,4
Power factor	0,54	0,47	0,71	0,80	0,84

Load type	:	Constant torque
Load torque	:	88,2 ft.lb
Load inertia (J=GD²/4)	:	6,8864 sq.ft.lb

Operation limits with inverter
20 Hz up to 60 Hz (Constant torque): 88,2 ft.lb

Maximum peak voltage phase-to-phase	<= 2000 V
dV/dt	<= 6500 V/µs
Rise time	>= 0,1 µs

	Drive end	Non drive end
Bearing type	6311-Z-C3	6211-Z-C3
Lubrication interval	20000 h	20000 h
Lubricant amount	18 g	11 g
Lubricant type	MOBIL POLYREX EM	

Notes:
Elevator Duty Motor

Quantity of starts per hour: 182

Standards

Specification	: MG1 - Part 10	Vibration	: MG1 - Part 7
Tests	: MG1 - Part 12	Tolerance	: MG1 - Part 12
Noise	: MG1 - Part 9		

This revision replaces and cancels the previous one, which must be eliminated.

(1) When viewed from the drive end.

(2) Measured at 1m and with tolerance of +3dB(A).

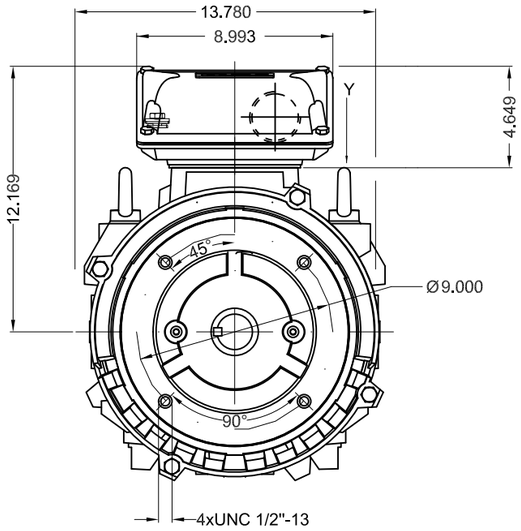
(3) Approximate weight subject to changes after manufacturing process.

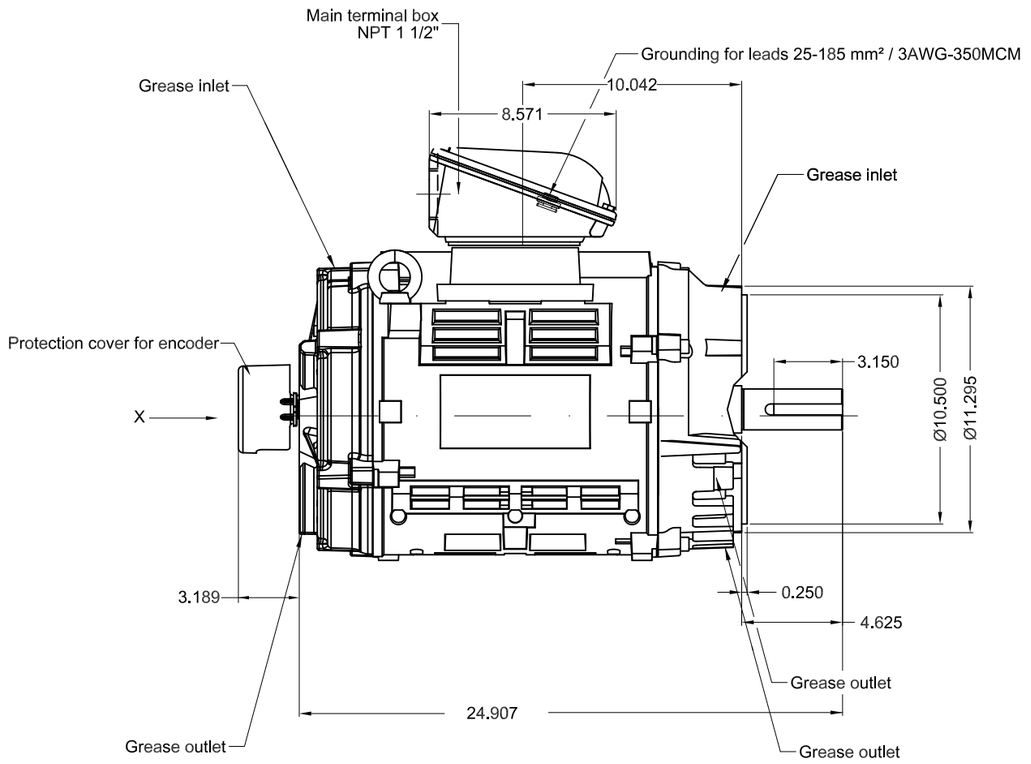
(4) At the rated point.

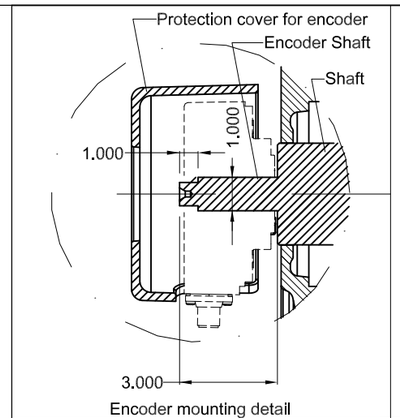
These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG 1-12.

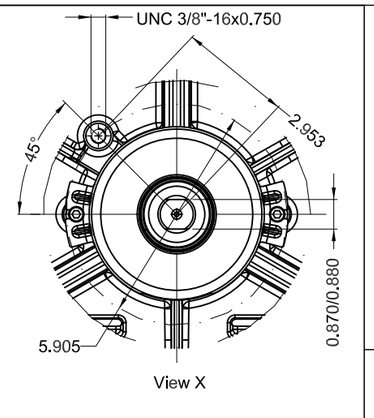
Rev.	Summary of changes	Performed	Checked	Date

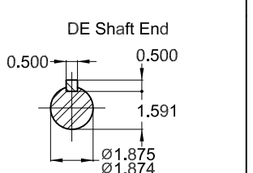
Performed by	jhonatas	FD-026398/2023	
Checked by		Page	Revision
Date	05/03/2024	1/1	3

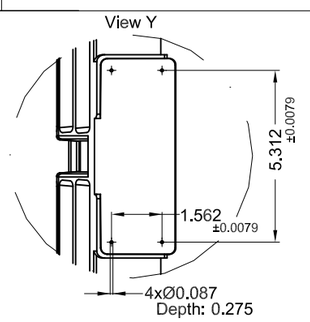












Cables outlet directed to NDE
Designed for encoder Kübler
Duty S3
Bearing cap
Thermal protection to switch off - thermistors 155°C
Color CINZ HW SILVER GRAY 19
Painting plan 203A
Service factor 1.0
Mounting NEMA F-3
Mounting B14T

	Bearing	Lubricant
DE	6311-Z-C3	MOBIL POLYREX EM
NDE	6211-Z-C3	MOBIL POLYREX EM

20 HP 06 Poles 60 Hz — A

1:7

		DOCUMENTO NOVO 422149903	CRANGHETTI	PALMEIDA			02
		DOCUMENTO NOVO 422149903	CRANGHETTI	PALMEIDA	JHONATAS	16.02.2024	01
ECM	LOC	SUMMARY OF MODIFICATIONS	EXECUTED	CHECKED	RELEASED	DATE	VER

EXECUTED	CRANGHETTI	THREE PH. MOTOR W40 NEMA PREM. EFF.	1494678946
CHECKED	PALMEIDA	FRAME 284/6TC IP23 ODP	WDD 02
RELEASED	JHONATAS		
REL. DATE	16.02.2024	WMO Jaragua do Sul Product Engineering	SHEET 1 / 1

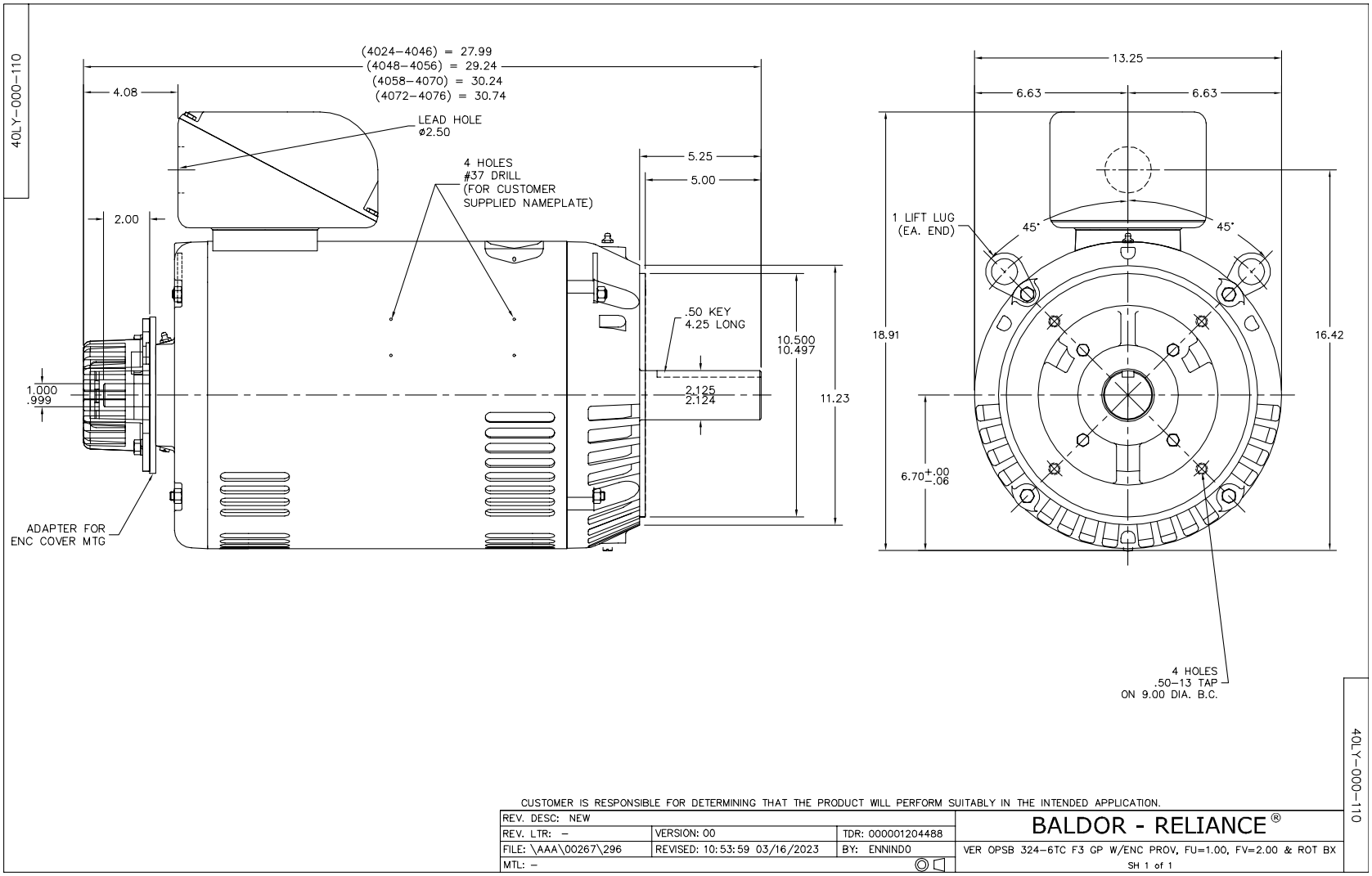
Dimensions in inches

XME A3

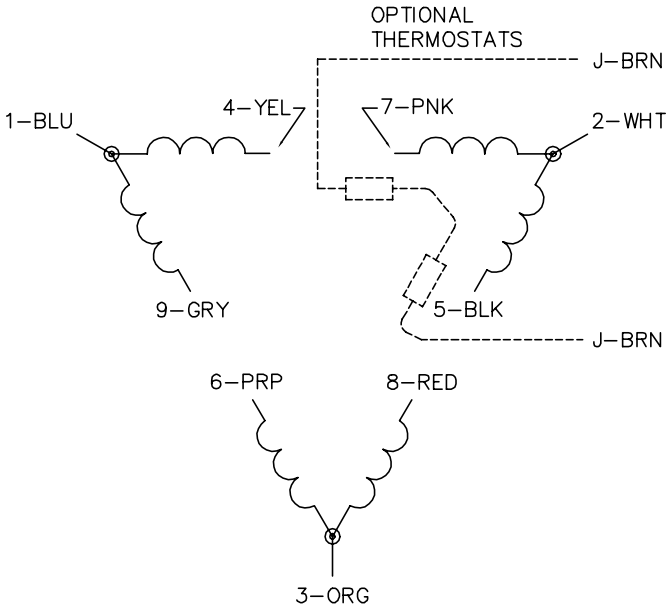
Notes:	Class null Division null

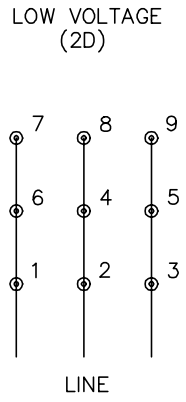
Nameplate NP4389L

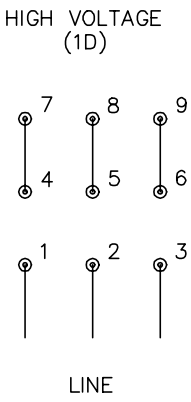
CAT.NO.	CMTR2501								
SPEC.	40-0000-0338								
FRAME	324TC	**H.P.**	25						
VOLTS	208-230/460								
MAG. CUR.	14.6	**F.L. AMPS**	68-64/32						
R.P.M.	1180	**R.P.M. MAX**	1800						
HZ.	60	**PH.**	3	**CLASS**	F				
SER.F.	1.00	**DES.**	A	**SL HZ**	1				
NEMA NOM. EFF.	93	**WK2**	9.31						
BLOWER		**V**		**PH**		**HZ**		**AMPS**	
RATING	40C AMB-CONT								
DE	6312	**ODE**	6309						
CC	010A	**SN**							
	1.15SF ON SINEWAVE 5:1 CT								


40LY-000-110
(4024-4046) = 27.99
(4048-4056) = 29.24
(4058-4070) = 30.24
(4072-4076) = 30.74
4.08
LEAD HOLE
ø2.50
4 HOLES
#37 DRILL
(FOR CUSTOMER
SUPPLIED NAMEPLATE)
5.25
5.00
2.00
.50 KEY
4.25 LONG
10.500
10.497
1.000
.999
2.125
2.124
11.23
ADAPTER FOR
ENC COVER MTG
13.25
6.63
6.63
1 LIFT LUG
(EA. END)
45°
45°
18.91
16.42
6.70 +.00 -.06
4 HOLES
.50-13 TAP
ON 9.00 DIA. B.C.
40LY-000-110
CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT THE PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.
REV. DESC: NEW
REV. LTR: –
VERSION: 00
TDR: 000001204488
FILE: \AAA\00267\296
REVISED: 10:53:59 03/16/2023
BY: ENNIND0
MTL: –
BALDOR - RELIANCE®
VER OPSB 324-6TC F3 GP W/ENC PROV, FU=1.00, FV=2.00 & ROT BX
SH 1 of 1

CD0180







NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

CD0180

REV. DESC: ADD CLASS CONN00000007		
REV. LTR: D	VERSION: 01	TDR: 000001099922
FILE: \AAA\00005\148	REVISED: 10:25:29 02/19/2019	BY: ENBRIR0
MTL: –		

BALDOR - RELIANCE®

3PH, DV, 9 LEADS, DELTA CONNECTION

SH 1 of 1

DATA SHEET

Three Phase Induction Motor - Squirrel Cage

Customer	:	
Product line	:	W40 NEMA Premium Efficiency

Frame	:	324/6T	Locked rotor time	: 17 s (hot) 31 s (cold)
Output	:	30 HP (22 kW)	Temperature rise[4]	: 105 K
Poles	:	6	Duty cycle	: S2, 60 min
Frequency	:	60 Hz	Ambient temperature	: -20 °C to +40 °C
Rated voltage	:	208-230/460 V	Altitude	: 1000 m.a.s.l
Rated current	:	79,6-72,0/36,0 A	Degree of protection	: IP23
L. R. Amperes	:	453/227 A	Cooling method	: IC01 - ODP
LRC (p.u.)	:	6,3 Code G	Mounting	: F-3
No load current	:	30,2/15,1 A	Direct of rotation[1]	: Both
Rated speed	:	1182 rpm	Noise level[2]	: 62,0 dB(A)
Slip	:	1,50 %	Starting method	: VFD
Rated torque	:	133 ft.lb	Approx. weight[3]	: 545 lb
Locked rotor torque	:	200 %	Design	: B
Pull up torque	:	170 %		
Breakdown torque	:	240 %		
Insulation class	:	F		
Service factor	:	1,00		
Moment of inertia (J)	:	9,56 sq.ft.lb		

Output	Start	25%	50%	75%	100%
Efficiency (%)	-	88,2	92,4	93,0	93,6
Power factor	0,47	0,43	0,66	0,77	0,82

Load type	:	Constant torque
Load torque	:	132 ft.lb
Load inertia (J=GD²/4)	:	9,5608 sq.ft.lb

Operation limits with inverter
20 Hz up to 60 Hz (Constant torque): 132 ft.lb

Maximum peak voltage phase-to-phase	<= 2000 V
dV/dt	<= 6500 V/µs
Rise time	>= 0,1 µs

	Drive end	Non drive end
Bearing type	6312-Z-C3	6211-Z-C3
Lubrication interval	20000 h	20000 h
Lubricant amount	21 g	11 g
Lubricant type	MOBIL POLYREX EM	

Notes:
Elevator Duty Motor

Quantity of starts per hour: 257

Standards

Specification	: MG1 - Part 10	Vibration	: MG1 - Part 7
Tests	: MG1 - Part 12	Tolerance	: MG1 - Part 12
Noise	: MG1 - Part 9		

This revision replaces and cancels the previous one, which must be eliminated.

(1) When viewed from the drive end.

(2) Measured at 1m and with tolerance of +3dB(A).

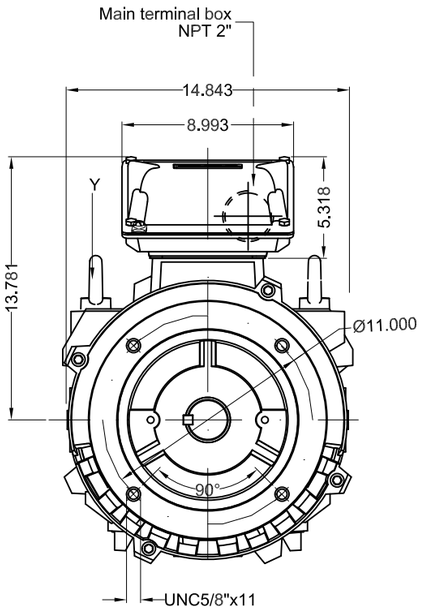
(3) Approximate weight subject to changes after manufacturing process.

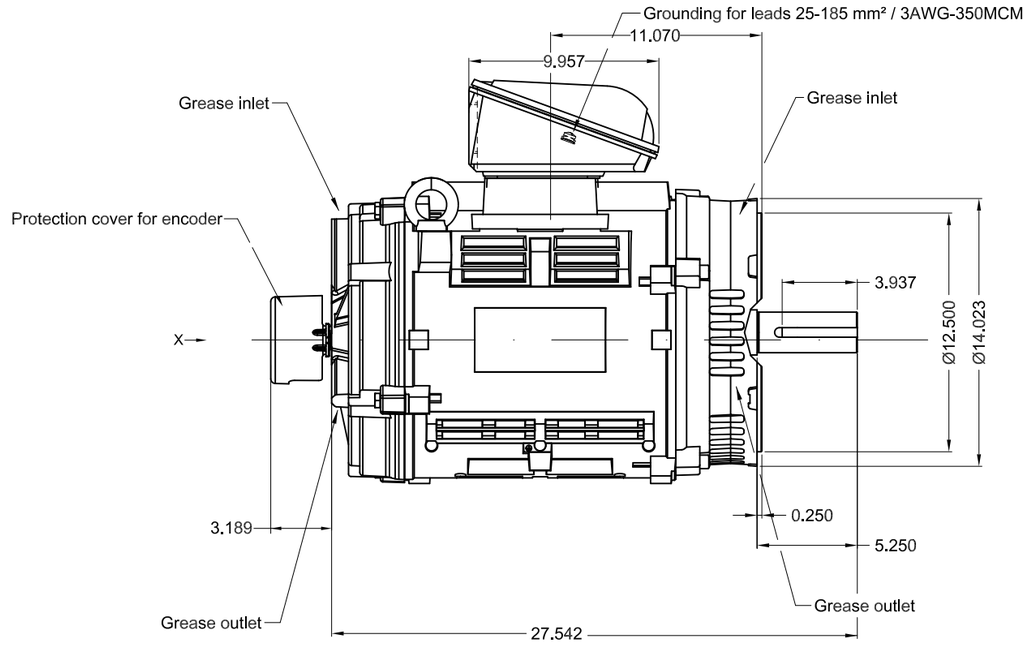
(4) At the rated point.

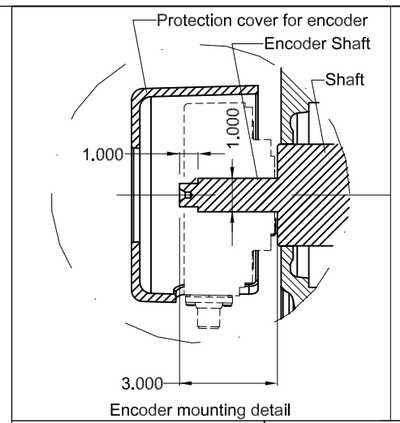
These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG 1-12.

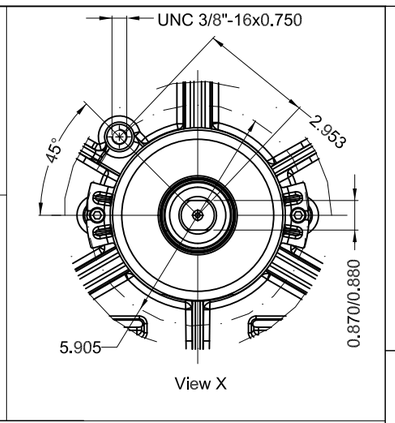
Rev.	Summary of changes	Performed	Checked	Date

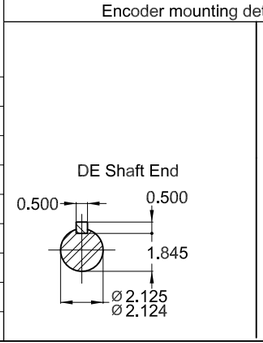
Performed by	jhonatas	FD-024030/2023	
Checked by		Page	Revision
Date	05/03/2024	1/1	3

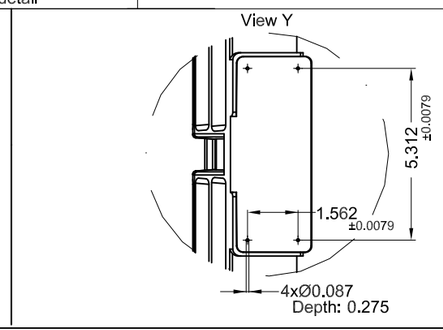












Cables outlet directed to NDE
Designed for encoder Kübler
Duty S3
Thermal protection to switch off - thermistors 155°C
Color CINZ HW SILVER GRAY 19
Painting plan 203A
Service factor 1.0
Mounting NEMA F-3
Mounting B14T

Bearing		Lubricant
DE	6312-Z-C3	MOBIL POLYREX EM
NDE	6211-Z-C3	MOBIL POLYREX EM

30 HP 06 Poles 60 Hz — A

1:8

		DOCUMENTO NOVO 422149922	CRANGHETTI				01
		DOCUMENTO NOVO 422149922	CRANGHETTI	PALMEIDA	JHONATAS	19.02.2024	00
ECM	LOC	SUMMARY OF MODIFICATIONS	EXECUTED	CHECKED	RELEASED	DATE	VER

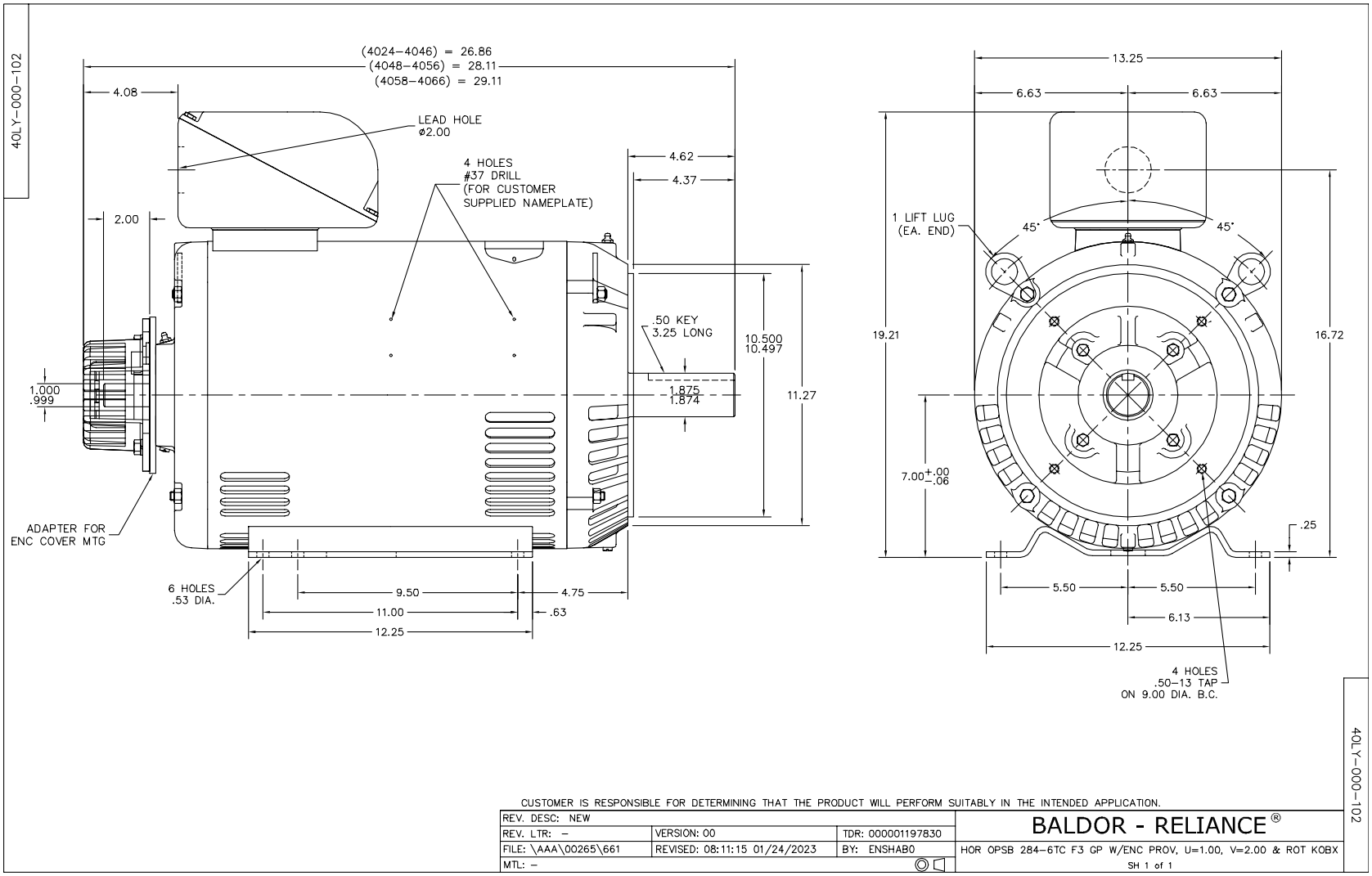
EXECUTED	CRANGHETTI	THREE PH. MOTOR W40 NEMA PREM. EFF.	1495873771
CHECKED	PALMEIDA	FRAME 324/6TC IP23 ODP	WDD 01
RELEASED	JHONATAS		
REL. DATE	19.02.2024	WMO Jaraguá do Sul Product Engineering	SHEET 1 / 1

Dimensions in inches — XME — A3

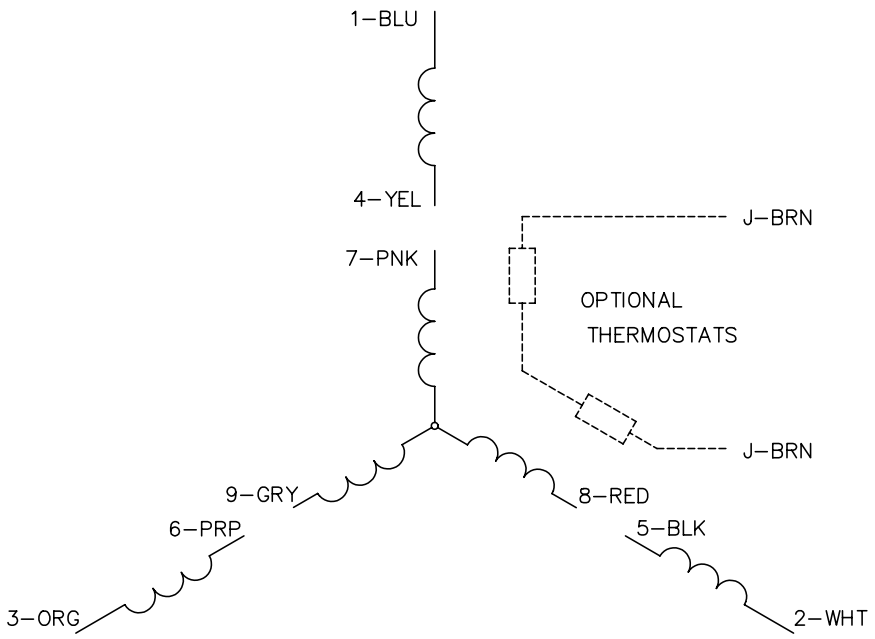
Notes:	Class null Division null

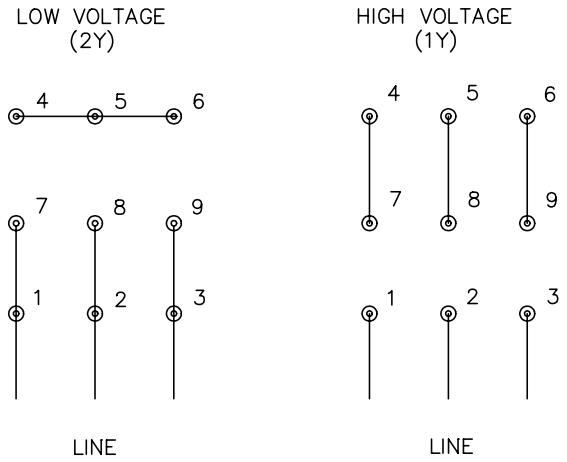
Nameplate NP4389L

CAT.NO.	CMTR3005								
SPEC.	40-0000-0312								
FRAME	286TC	**H.P.**	30						
VOLTS	230/460 USABLE@208V:76A								
MAG. CUR.	23.8/11.9	**F.L. AMPS**	70/35						
R.P.M.	1770	**R.P.M. MAX**	2700						
HZ.	60	**PH.**	3	**CLASS**	F				
SER.F.	1.00	**DES.**	B	**SL HZ**	1				
NEMA NOM. EFF.	94.1	**WK2**	4.91						
BLOWER		**V**		**PH**		**HZ**		**AMPS**	
RATING	40C AMB-CONT								
DE	6311	**ODE**	6309						
CC	010A	**SN**							
	1.15SF ON SINEWAVE 5:1 CT								


40LY-000-102
(4024-4046) = 26.86
(4048-4056) = 28.11
(4058-4066) = 29.11
4.08
LEAD HOLE
ø2.00
4 HOLES
#37 DRILL
(FOR CUSTOMER
SUPPLIED NAMEPLATE)
4.62
4.37
2.00
.50 KEY
3.25 LONG
10.500
10.497
1.000
.999
1.875
1.874
11.27
ADAPTER FOR
ENC COVER MTG
6 HOLES
.53 DIA.
9.50
4.75
11.00
.63
12.25
13.25
6.63
6.63
1 LIFT LUG
(EA. END)
45°
45°
19.21
16.72
7.00 +.00 -.06
.25
5.50
5.50
6.13
12.25
4 HOLES
.50-13 TAP
ON 9.00 DIA. B.C.
40LY-000-102
CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT THE PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.
REV. DESC: NEW
REV. LTR: –
VERSION: 00
TDR: 000001197830
FILE: \AAA\00265\661
REVISED: 08:11:15 01/24/2023
BY: ENSHAB0
MTL: –
BALDOR - RELIANCE®
HOR OPSB 284-6TC F3 GP W/ENC PROV, U=1.00, V=2.00 & ROT KOBX
SH 1 of 1

CD0005





NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

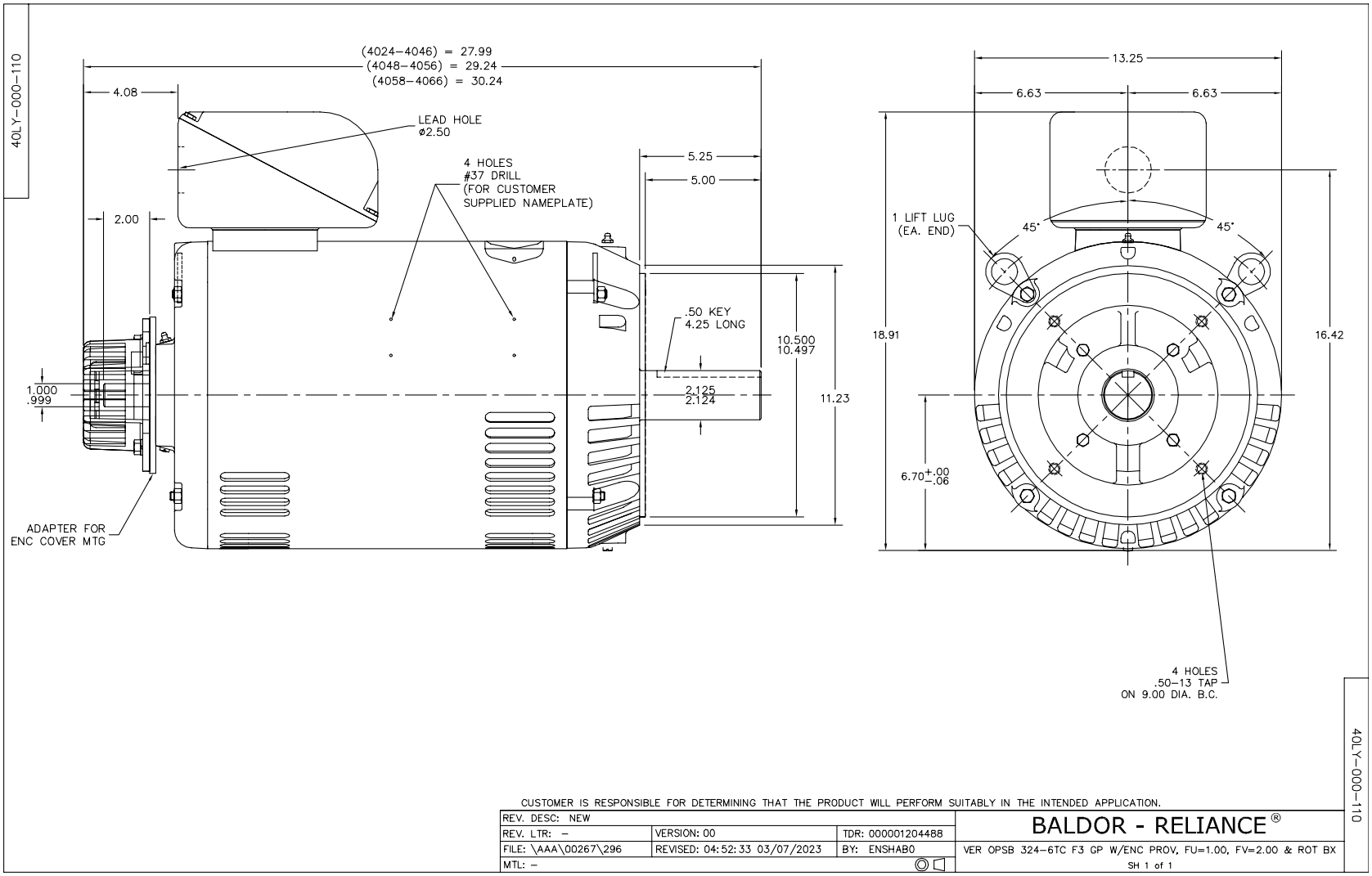
CD0005

REV. DESC: REVISE TO SHOW OPTIONAL COLORS			BALDOR ELECTRIC Co.
REV. LTR: E	BY: JLP	REVISED: 01/19/99 10:15	TDR: 0171435
CD0005		FILE: AAA00005140	MDL: –
		MTL: –	3PH, DV, 9 LEADS

Notes:	Class null Division null

Nameplate NP4389L

CAT.NO.	CMTR4005								
SPEC.	40-0000-0336								
FRAME	324TC	**H.P.**	40						
VOLTS	208-230/460								
MAG. CUR.	21			**F.L. AMPS**	99-98/49				
R.P.M.	1770			**R.P.M. MAX**	2700				
HZ.	60	**PH.**	3	**CLASS**	F				
SER.F.	1.00	**DES.**	A	**SL HZ**	1				
NEMA NOM. EFF.	94.1	**WK2**	4.91						
BLOWER		**V**		**PH**		**HZ**		**AMPS**	
RATING	40C AMB-CONT								
DE	6312	**ODE**	6309						
CC	010A	**SN**							
	1.15SF ON SINEWAVE 5:1 CT								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(4048-4056) = 29.24
(4058-4066) = 30.24
4.08
LEAD HOLE
ø2.50
4 HOLES
#37 DRILL
(FOR CUSTOMER
SUPPLIED NAMEPLATE)
5.25
5.00
2.00
.50 KEY
4.25 LONG
10.500
10.497
1.000
.999
2.125
2.124
11.23
ADAPTER FOR
ENC COVER MTG
13.25
6.63
6.63
1 LIFT LUG
(EA. END)
45°
45°
18.91
16.42
6.70 +.00 -.06
4 HOLES
.50-13 TAP
ON 9.00 DIA. B.C.
40LY-000-110
CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT THE PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.
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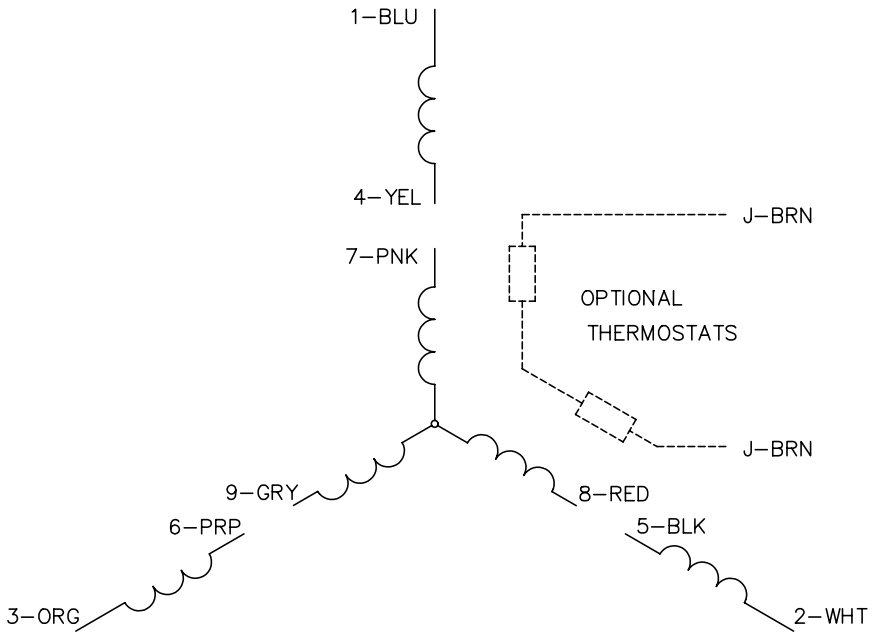
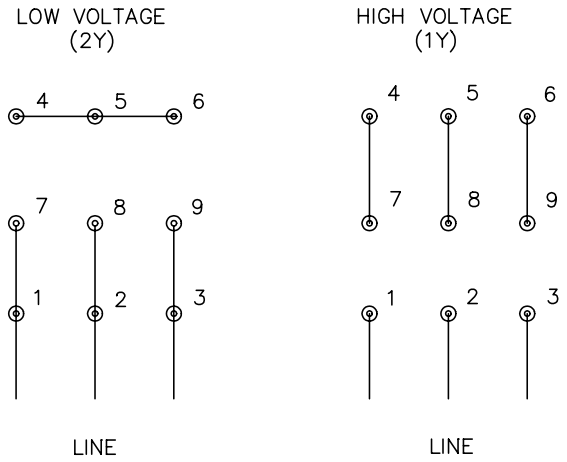
REV. LTR: –
VERSION: 00
TDR: 000001204488
FILE: \AAA\00267\296
REVISED: 04:52:33 03/07/2023
BY: ENSHAB0
MTL: –
BALDOR - RELIANCE®
VER OPSB 324-6TC F3 GP W/ENC PROV, FU=1.00, FV=2.00 & ROT BX
SH 1 of 1

CD0005





NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

CD0005

REV. DESC: REVISE TO SHOW OPTIONAL COLORS			BALDOR ELECTRIC Co.
REV. LTR: E	BY: JLP	REVISED: 01/19/99 10:15	TDR: 0171435
CD0005		FILE: AAA00005140	MDL: –
		MTL: –	3PH, DV, 9 LEADS

DATA SHEET

Three Phase Induction Motor - Squirrel Cage

Customer	:	
Product line	:	W40 NEMA Premium Efficiency

Frame	:	364/5T	Locked rotor time	: 15 s (hot) 27 s (cold)
Output	:	50 HP (37 kW)	Temperature rise[4]	: 105 K
Poles	:	6	Duty cycle	: S2, 60 min
Frequency	:	60 Hz	Ambient temperature	: -20 °C to +40 °C
Rated voltage	:	208-230/460 V	Altitude	: 1000 m.a.s.l
Rated current	:	128-116/58,1 A	Degree of protection	: IP23
L. R. Amperes	:	778/389 A	Cooling method	: IC01 - ODP
LRC (p.u.)	:	6,7 Code G	Mounting	: F-3
No load current	:	37,0/18,5 A	Direct of rotation[1]	: Both
Rated speed	:	1183 rpm	Noise level[2]	: 68,0 dB(A)
Slip	:	1,42 %	Starting method	: VFD
Rated torque	:	222 ft.lb	Approx. weight[3]	: 820 lb
Locked rotor torque	:	200 %	Design	: B
Pull up torque	:	170 %		
Breakdown torque	:	220 %		
Insulation class	:	F		
Service factor	:	1,00		
Moment of inertia (J)	:	24,0 sq.ft.lb		

Output	Start	25%	50%	75%	100%
Efficiency (%)	-	90,7	93,6	94,1	94,1
Power factor	0,44	0,52	0,74	0,82	0,85

Load type	:	Constant torque
Load torque	:	219 ft.lb
Load inertia (J=GD²/4)	:	23,97 sq.ft.lb

Operation limits with inverter
30 Hz up to 60 Hz (Constant torque): 219 ft.lb

Maximum peak voltage phase-to-phase	<= 2000 V
dV/dt	<= 6500 V/µs
Rise time	>= 0,1 µs

	Drive end	Non drive end
Bearing type	6314-C3	6212-Z-C3
Lubrication interval	20000 h	20000 h
Lubricant amount	27 g	13 g
Lubricant type	MOBIL POLYREX EM	

Foundation loads

Maximum traction	:	1242 lb
Maximum compression	:	2062 lb

Notes:
Elevator Duty Motor

Quantity of starts per hour: 184

Standards

Specification	: MG1 - Part 10	Vibration	: MG1 - Part 7
Tests	: MG1 - Part 12	Tolerance	: MG1 - Part 12
Noise	: MG1 - Part 9		

This revision replaces and cancels the previous one, which must be eliminated.

(1) When viewed from the drive end.

(2) Measured at 1m and with tolerance of +3dB(A).

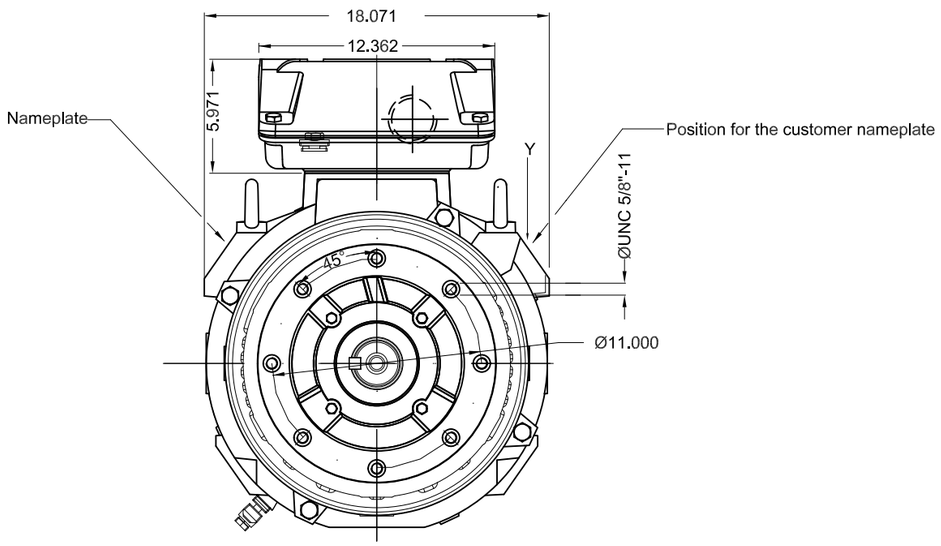
(3) Approximate weight subject to changes after manufacturing process.

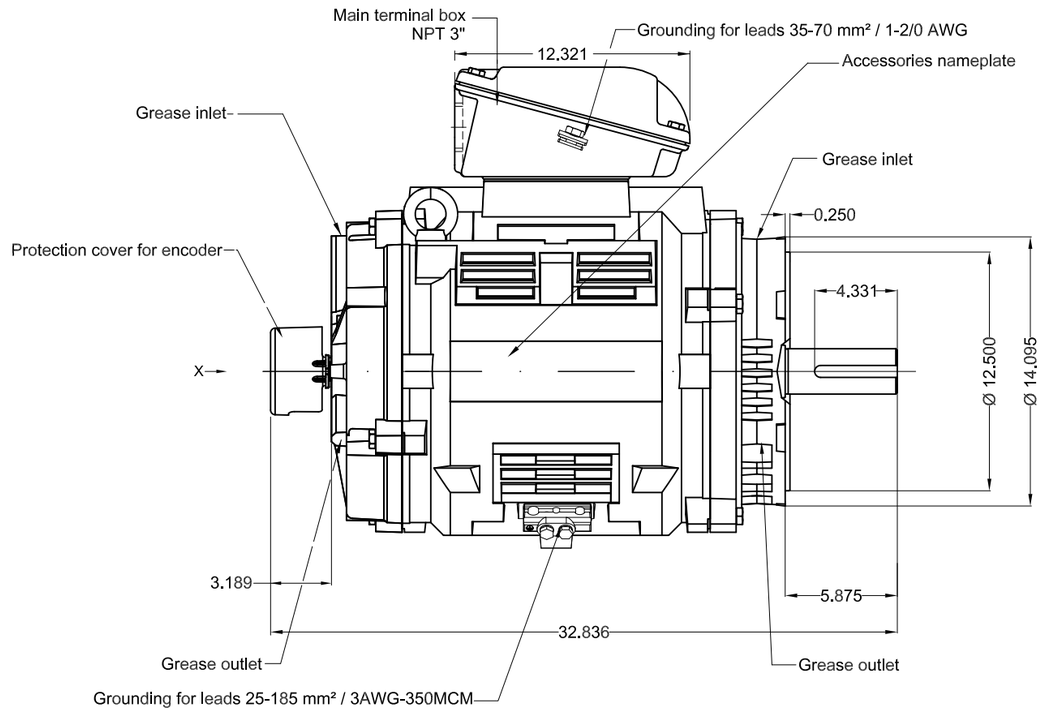
(4) At the rated point.

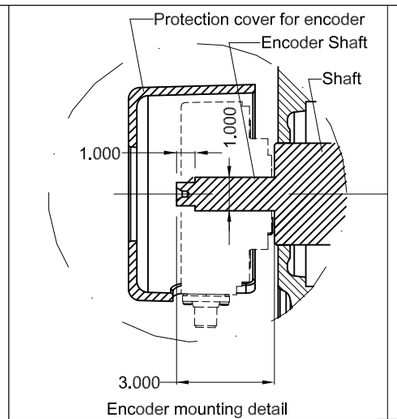
These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG 1-12.

Rev.	Summary of changes	Performed	Checked	Date

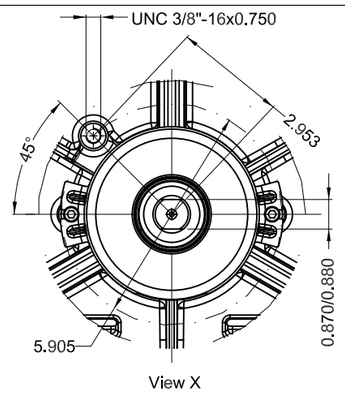
Performed by	lkist		FD-024039/2023	
Checked by	AUTOMATICO		Page	Revision
Date	01/03/2024		1/1	3



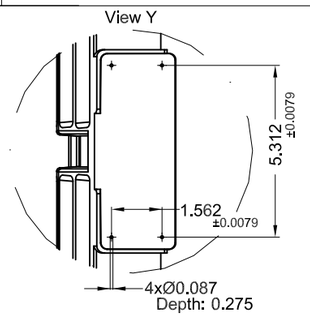


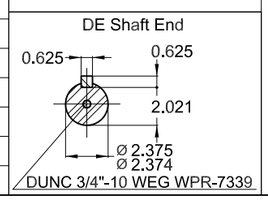


Encoder mounting detail



View X





- Cables outlet directed to NDE
- Designed for encoder Kübler
- Thermal protection to switch off - thermistors 155°C
- Color CINZ HW SILVER GRAY 19
- Painting plan 203A
- Mounting NEMA F-3
- Mounting B14T

Bearing		Lubricant
DE	6314-C3	MOBIL POLYREX EM
NDE	6212-Z-C3	MOBIL POLYREX EM

50 HP 06 Poles 60 Hz — A

1:8

ECM	LOC	SUMMARY OF MODIFICATIONS	EXECUTED	CHECKED	RELEASED	DATE	VER
		DOCUMENTO NOVO:422173287	CRANGHETTI				00

EXECUTED	CRANGHETTI	THREE PH. MOTOR W40 NEMA PREM. EFF.	1493684460
CHECKED		FRAME 364/5TC IP23 ODP	WDD 00
RELEASED			
REL. DATE		WMO Jaraguá do Sul Product Engineering	SHEET 1 / 1

Dimensions in inches

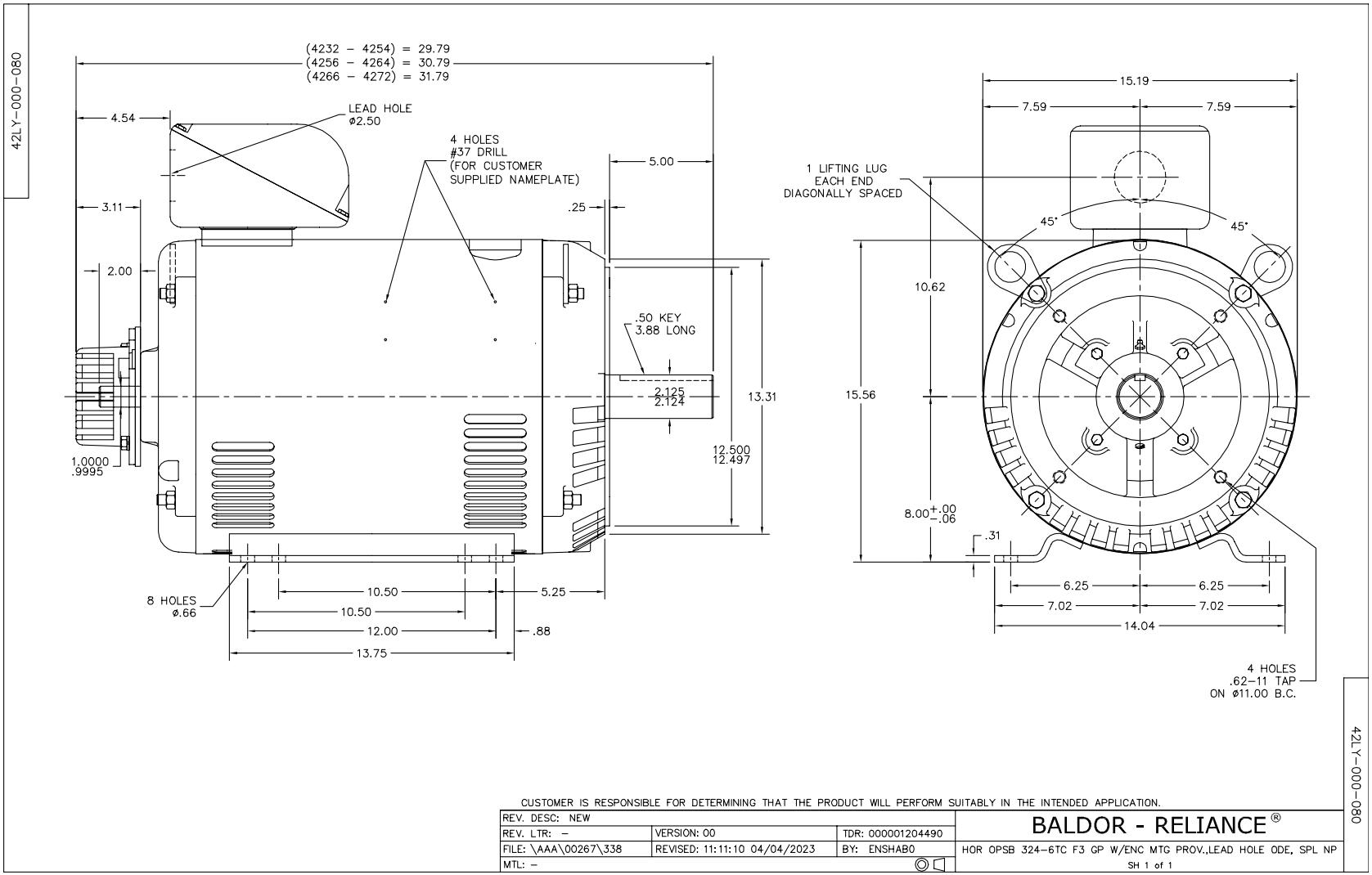
A3

XME

Notes:	Class null Division null

Nameplate NP4389L

CAT.NO.	CMTR5005								
SPEC.	42-0000-0174								
FRAME	326TC	**H.P.**	50						
VOLTS	208-230/460								
MAG. CUR.	33-40/20			**F.L. AMPS**	122/114/57				
R.P.M.	1775			**R.P.M. MAX**	2700				
HZ.	60	**PH.**	3	**CLASS**	F				
SER.F.	1.00	**DES.**	A	**SL HZ**	0.83				
NEMA NOM. EFF.	94.5	**WK2**	8.53						
BLOWER		**V**		**PH**		**HZ**		**AMPS**	
RATING	40C AMB-CONT								
DE	6312	**ODE**	6311						
CC	010A	**SN**							
	1.15SF ON SINEWAVE 5:1 CT								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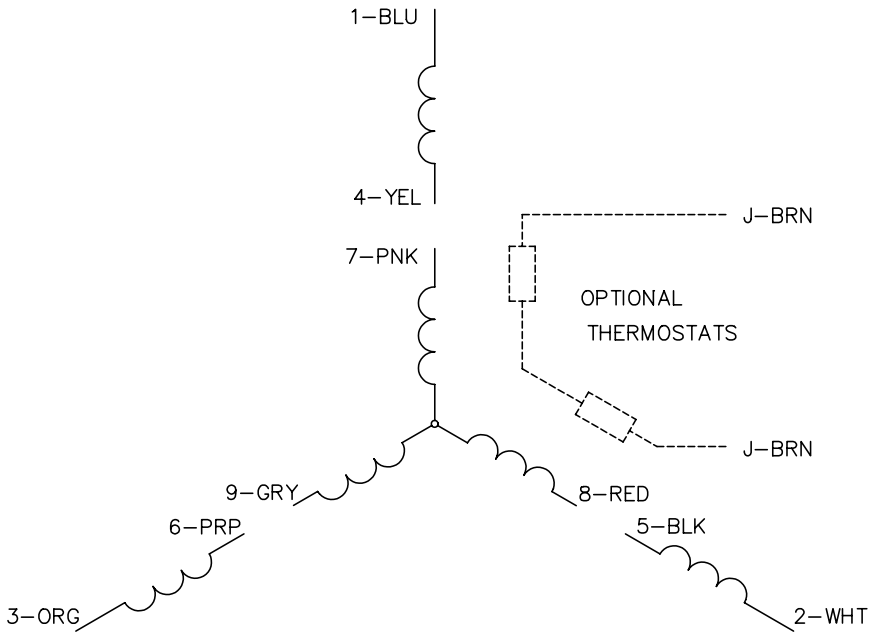
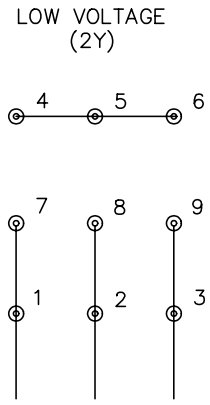
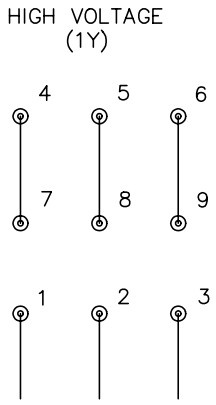
(4232 – 4254) = 29.79
(4256 – 4264) = 30.79
(4266 – 4272) = 31.79
4.54
LEAD HOLE
ø2.50
4 HOLES
#37 DRILL
(FOR CUSTOMER
SUPPLIED NAMEPLATE)
5.00
.25
3.11
2.00
.50 KEY
3.88 LONG
2.125
2.124
13.31
12.500
12.497
1.0000
.9995
8 HOLES
ø.66
10.50
5.25
10.50
12.00
.88
13.75
15.19
7.59
7.59
1 LIFTING LUG
EACH END
DIAGONALLY SPACED
45°
45°
10.62
15.56
8.00 +.00 -.06
.31
6.25
6.25
7.02
7.02
14.04
4 HOLES
.62–11 TAP
ON ø11.00 B.C.
42LY-000-080
CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT THE PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.
REV. DESC: NEW
REV. LTR: –
VERSION: 00
TDR: 000001204490
FILE: \AAA\00267\338
REVISED: 11:11:10 04/04/2023
BY: ENSHAB0
MTL: –
BALDOR - RELIANCE®
HOR OPSB 324–6TC F3 GP W/ENC MTG PROV.,LEAD HOLE ODE, SPL NP
SH 1 of 1

CD0005







NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

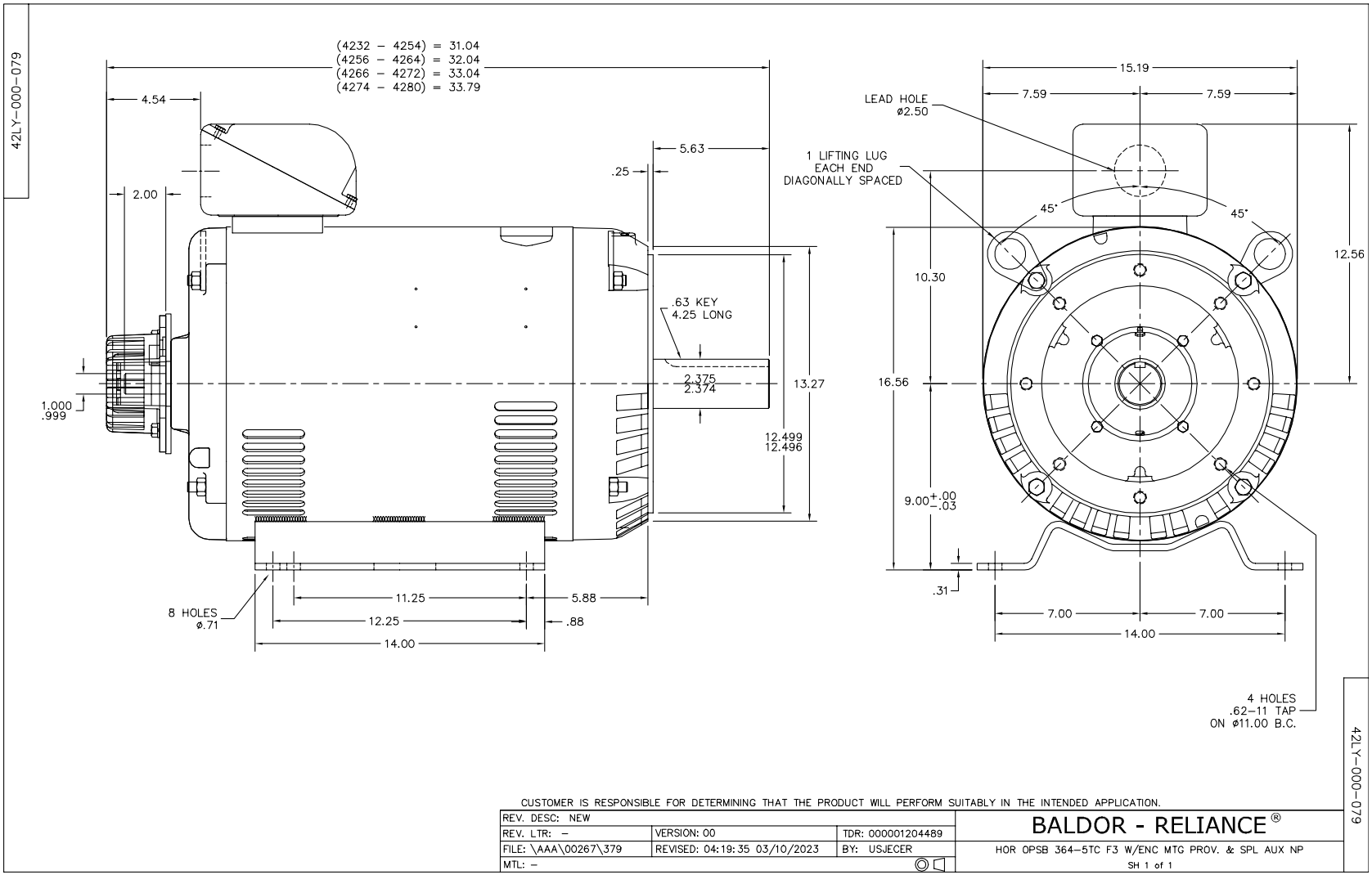
CD0005

REV. DESC: REVISE TO SHOW OPTIONAL COLORS			BALDOR ELECTRIC Co.
REV. LTR: E	BY: JLP	REVISED: 01/19/99 10:15	TDR: 0171435
CD0005		FILE: AAA00005140	MDL: –
		MTL: –	3PH, DV, 9 LEADS

Notes:	Class null Division null

Nameplate NP4389L

CAT.NO.	CMTR6005						
SPEC.	42-0000-0173						
FRAME	364TC	**H.P.**	60				
VOLTS	208-230/460						
MAG. CUR.	24	**F.L. AMPS**	148-136/68				
R.P.M.	1775	**R.P.M. MAX**	2700				
HZ.	60	**PH.**	3	**CLASS**	F		
SER.F.	1.00	**DES.**	A	**SL HZ**	0.83		
NEMA NOM. EFF.	95	**WK2**	10.4				
BLOWER		**V**		**PH**		**HZ**	**AMPS**
RATING	40C AMB-CONT						
DE	6313	**ODE**	6311				
CC	010A	**SN**					
	1.15SF ON SINEWAVE 5:1 CT						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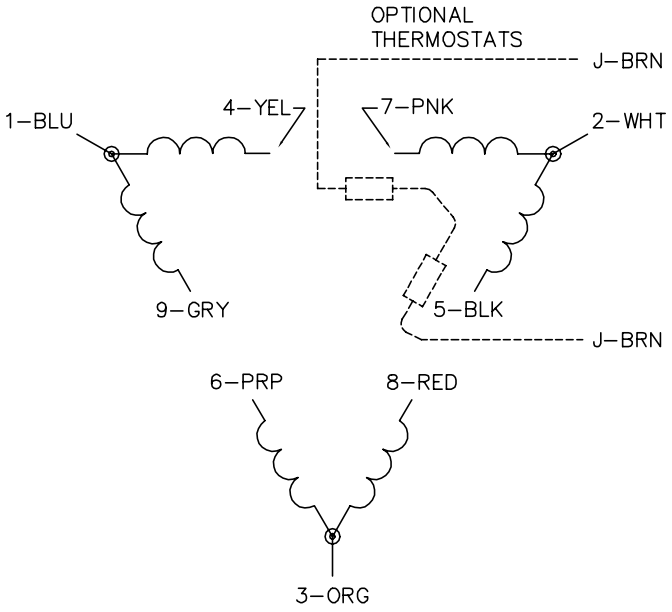
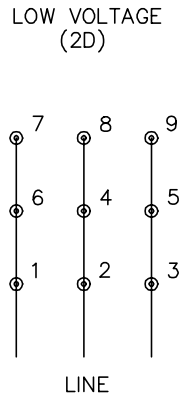
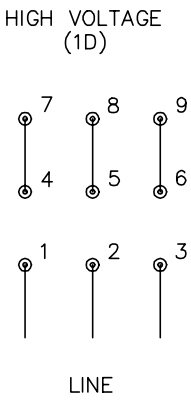
(4256 – 4264) = 32.04
(4266 – 4272) = 33.04
(4274 – 4280) = 33.79
4.54
2.00
5.63
.25
.63 KEY
4.25 LONG
2.375
2.374
13.27
12.499
12.496
1.000
.999
8 HOLES
ø.71
11.25
12.25
14.00
5.88
.88
15.19
7.59
7.59
LEAD HOLE
ø2.50
1 LIFTING LUG
EACH END
DIAGONALLY SPACED
45°
45°
12.56
10.30
16.56
9.00 +.00 -.03
.31
7.00
7.00
14.00
4 HOLES
.62–11 TAP
ON ø11.00 B.C.
CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT THE PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.
REV. DESC: NEW
REV. LTR: –
VERSION: 00
TDR: 000001204489
FILE: \AAA\00267\379
REVISED: 04:19:35 03/10/2023
BY: USJECER
MTL: –
BALDOR - RELIANCE®
HOR OPSB 364–5TC F3 W/ENC MTG PROV. & SPL AUX NP
SH 1 of 1
42LY-000-079

CD0180







NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
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CD0180

REV. DESC: ADD CLASS CONN00000007		
REV. LTR: D	VERSION: 01	TDR: 000001099922
FILE: \AAA\00005\148	REVISED: 10:25:29 02/19/2019	BY: ENBRIR0
MTL: –		

BALDOR - RELIANCE®

3PH, DV, 9 LEADS, DELTA CONNECTION

SH 1 of 1

Certificate of Compliance

Certificate: 80009860 **Master Contract:** 155941

Project: 80009860 **Date Issued:** 2019-12-11

Issued To: **Hollister-Whitney Elevator Co., LLC**
2603 North 24th St
Quincy, Illinois, 62305
United States

Attention: Brent Henderson

Issued by: Kevin Chieu
Kevin Chieu

CSA B44.1/ASME A17.5

PRODUCTS

CLASS - C241101 - ELEVATOR EQUIPMENT-Open and Enclosed Elevator Electrical Equipment
CLASS - C241181 - ELEVATOR EQUIPMENT - Open and Enclosed Elevator Electrical Equipment - Certified to US Standards
Elevator Brake solenoid GT31-314

Ratings: Pick 190Vdc, 2.5A max
Hold 80Vdc, 1A max
60% duty cycle, 180 starts/hr

Note: Open type equipment is investigated for use only as a component of electrical equipment where the acceptability of the final assembly is determined by CSA.

APPLICABLE REQUIREMENTS

CSA B44.1/ASME A17.5 - Elevator and Escalator Electrical Equipment

Supplement to Certificate of Compliance

Certificate: 80009860 **Master Contract:** 155941

The products listed, including the latest revision described below, are eligible to be marked in accordance with the referenced Certificate.

Product Certification History

Project	Date	Description
80009860	2019-12-11	Original certification of GT31-314 elevator brake solenoid

Certificate of Compliance

Certificate:	80009860	**Master Contract:**	155941
Project:	80160014	**Date Issued:**	11/27/2023

Issued to: **Hollister-Whitney Elevator Co., LLC**
2603 North 24th St
Quincy, Illinois 62305
United States

Attention: Brent Henderson

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.

Issued by: *Tai Pham*
Tai Pham

CSA B44.1/ASME A17.5

PRODUCTS

C241101 ELEVATOR EQUIPMENT-Open and Enclosed - Elevator Electrical Equipment
C241181 ELEVATOR EQUIPMENT - Open and Enclosed Elevator - Electrical Equipment - Certified to US Standards

Elevator Brake solenoid

Models	Current (A max)	Duty Cycle	Voltage (VDC)
GT31-314	Pick: 2.5	60% duty cycle, 180 starts/hr	Pick: 190
	Hold: 1	60% duty cycle, 180 starts/hr	Hold: 80

Models	Current (A max)	Duty Cycle	Voltage (VDC)
GT31-314-110	Pick: 1.9 / 3.4	60% duty cycle, 180 starts/hr	Pick: 190 / 110

	Hold: 0.8 / 1.9	60% duty cycle, 180 starts/hr	Hold: 80 / 60

Note: Open type equipment is investigated for use only as a component of electrical equipment where the acceptability of the final assembly is determined by CSA.

APPLICABLE REQUIREMENTS

CSA B44.1:19/ASME A17.5-2019 - Elevator and escalator electrical equipment

Certificate: 80009860 **Master Contract**: 155941

Project: 80160014 **Date Issued**: 11/27/2023

Notes:

Products certified under Class C241101, C241181 have been certified under CSA's ISO/IEC 17065 accreditation with the Standards Council of Canada (SCC). www.scc.ca

Supplement to Certificate of Compliance

Certificate: 80009860 **Master Contract:** 155941

The products listed, including the latest revision described below, are eligible to be marked in accordance with the referenced Certificate.

Product Certification History

Project	Date	Description
80160014	November 27, 2023	Update report 80009860 to add new winding configuration and model GT31-314-110
80009860	December 11, 2019	Original certification of GT31-314 elevator brake solenoid