Cenovus Energy
Foster Creek West Pads SAP

FINAL DATABOOK

TECO Westinghouse

Produced Gas Compressor Driver

KM-9650

1250 hp

PO: P483599

Table of Contents:

PO #	Job #	W191126
P483599	Doc #	V2537-191126- 1001
Equip #	VDR:	
KM-9650	Rev:	02

Document #	Rev
1. Approved (Work May Proceed)	
2. Approved with Comments - Work May Proceed (Revise and Resubmit)	
3. Not Approved (Stop Work per Attached Instructions)	
X 4. Information Only	

AUTHORIZATION TO PROCEED DOES NOT WAIVE SUPPLIER'S RESPONSIBILITY FOR LIABILITY UNDER THE CONTRACT / PURCHASE ORDER FOR COMPLIANCE WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATION

TSHEN 20/04/30

Signature YY/MM/DD

PROPAK SYSTEMS LTD – AIRDRIE, AB

SPECIFICATION TABLE OF 3-PHASE SQUIRREL CAGE INDUCTION MOTOR

CUSTOMER	CENOVUS	USER	
INQ. NO.		EQUIPMENT	
JOB NO.	FD203210T1	MACHINE	
TOTAL SETS	1	ITEM NO.	

Item	Terms	Description			
1	Model	ANCK-S2			
2	Code or Standard	Dimensions	Frame Assignment	Performance	Test
		IEC	TWMI	NEMA MG-1 & IEEE 112	NEMA MG-1 & IEEE 112
3	Rating	1250 HP 8 Pole 4000 Volt 3 Phase 60 Hz			
4	Service Duty	Continuous Rating , Service Factor 1.15 on Sine Power, 1.0 SF on VFD Power			
5	Starting Method	D.O.L(Direct On Line) or VFD(Variable Frequency Drive)			
6	Rotation	Facing The Non Drive End : CW(ClockWise), Available for Bi-Direction			
7	Drive Method	Direct Flexible Coupling			
8	Environment	Amb. Temp. : -20 ~ 40 ℃			
		Humidity : Less Than 90 %RH			
		Altitude : Up to 1000 M			
9	Enclosure & Protection	WPII : NEMA Weather Protected Type II Indoor			
10	Cooling	IC01 : Self Ventilated Interior Cooling			
11	Mounting	IM1001 : HS, Foot			
12	Dimensions	Dr# 3B040B415 (REV.02) Frame No : 500A *			
13	Frame & Bracket	Frame : Steel Plate Bracket : Steel Plate			
14	Fan & Fan Cover	Fan :-- Fan Cover :--			
15	Main Terminal Box	Steel Plate			
16	Lead Terminals	(TLK50-10)X3			
17	Lubricant	Oil Viscosity : ISO VG46			
18	Painting	Color : MUNSELL 7.5B 3.5/0.5			
19	Stator Winding	Insulation Class: F			
20	Rotor Conductor	Cu-Alloy	WK^2 : 1404 Lb-ft^2		
21	Starting Performance	LRC 1130 Amp	LRT/FLT 90 %		
22	Operating Performance	Hz/V	60/4000		Break Down Torque
		%Load	100	75	50	210 %FLT
		Amp.	175	137	108	
	*LRC=Lock Rotor Current	Eff.%	95.0	94.8	94.0	Temp. Rise Limit. (Resistance)
	*LRT/FLT=Lock Rotor Torque/Full Load Torque	P.F.%	81.0	78.0	66.0	Stator 80 ℃
	*FLT=Full Load Torque	R.P.M.	891	893	895	at S.F.1.0 on Sine Power
23	Approximate Weight	Motor : 4900 kg Rotor : 1650 kg			
24	Note	1. Rated Torque : Tf= 7366 lb-ft 2. Power Factor Can be Corrected to 94.0% With The Addition of 360KVAR Correction Capacitors Note : Damage to VFD could occur if correction capacitors are not bypassed or removed 3. No-Load Power Factor : 3.3% 4. No-Load Current : 63.4 amp 5. X'd Transient Reactance Value : 0.178 6. X"d Subtransient Reactance Value : 0.139 7. Locked Rotor Torque/Pull Up Torque/ Break Down Torque Note : [*] at the end represent revised item			

Final Certified As-Built

TECO Westinghouse MOTORS (CANADA) INC.

TWMI SAP#	1000157683
Customer PO#	P483599
Customer Name#	Propak
Project Name#	FC WS2 Recovery Facility
Equipment ID Tag#	FC1-WS2-KM-9650

APPD.	Spencer Chien	MAR. 09 2020
CHKD.	H.CHEN	MAR. 09 2020
DWN.	WANG	MAR. 03 2020

TECO Westinghouse

DWG NO. 3A057M186-04846

REV.02 1/2

Item	Terms	Description
24	Note	: 6629.4/7734.3/15468.6 lb-ft 8. Number of Stator Slots and Rotor Bars : 96/115 9. Running Thermal Time Constants & Stopped Cooling Time Constants : 80/210min 10. Safe Stall Time (Hot/Cold) at 100% Rated Voltage : 20/25sec 11. Starting Frequency Per Hour: 2 Cold/ 1 Hot 12. Suitable For VFD Speed Range 50%~100% · Constant Torque 13. Inverter Source:not to Exceed 90℃ Rise by Resistance Method at S.F. 1.0 14. CSA Certified for Class I, Zone 2, Groups IIA , T3 Accessories : Refer to motor outline drawing

Final Certified As-Built

TECO Westinghouse MOTORS (CANADA) INC.

TWMI SAP#	**1000157683**
Customer PO#	P483599
Customer Name#	**Propak**
Project Name#	**FC WS2 Recovery Facility**
Equipment ID Tag#	FC1-WS2-KM-9650

Note : [*] at the end represent revised item

PO #	Job #	W191126
P483599	Doc #	V2537-191126- 1002
Equip #	VDR:	
KM-9650	Rev:	02

Document # | Rev

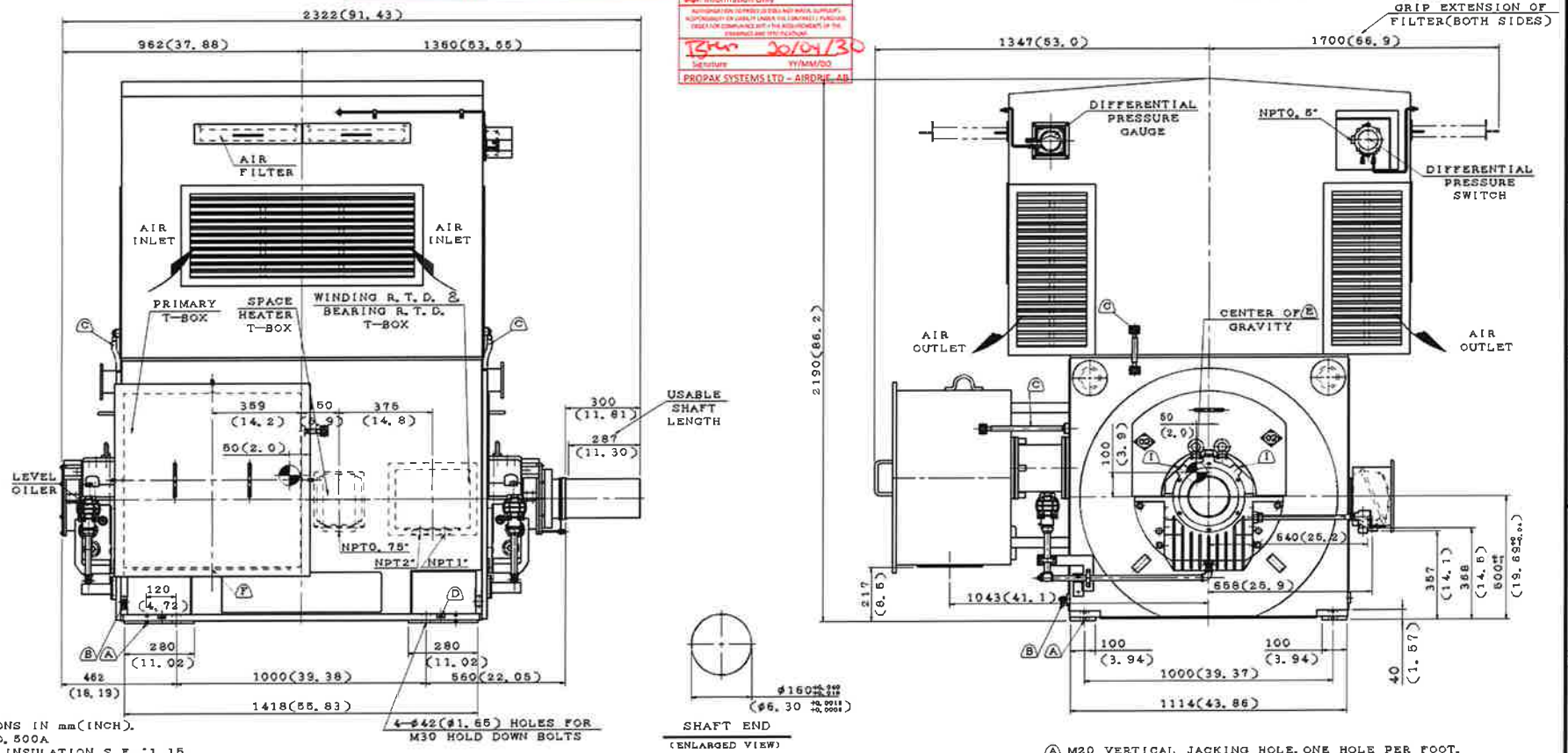
- ☐ 1. Approved (Work May Proceed)
- ☐ 2. Approved with Comments - Work May Proceed (Revise and Resubmit)
- ☐ 3. Not Approved (Stop Work per Attached Instructions)
- ☒ 4. Information Only

Signature 30/04/30 YY/MM/DD

PROPAK SYSTEMS LTD - AIRDRIE, AB

TYPE	OUTPUT HP.	OUTPUT kW.	POLE	TIME RATING	VOLTAGE V	Hz	SYN. SPEED R. P. M.
ANCK-S2	1250		8	CONT	4000	60	900

WEATHER PROTECTED TYPE II, SQUIRREL-CAGE ROTOR



SHAFT END
(ENLARGED VIEW)

NOTE:
1. DIMENSIONS IN mm(INCH).
2. FRAME NO. 500A
3. F CLASS INSULATION, S.F.:1.15.
4. FOR DIRECT FLEXIBLE COUPLING.
5. SLEEVE TYPE BEARING, AXIAL THRUST LOAD NOT ALLOWED.
6. THE MOTOR ENDPLAY IS 7mm. A LIMITED END FLOAT TYPE COUPLING IS REQUIRED TO LIMIT ENDPLAY TO 2.4mm
7. BEARING SIZE: DRIVE END: 14-160(INSULATED)
   NON-DRIVE END: 14-160(INSULATED)
8. BOTH BEARING LINERS(SHELL) ARE INSULATED FROM THE HOUSING. ANY METAL CONNECTIONS MADE TO THE BEARING SHELL MUST BE INSULATED TO PREVENT AN INSULATION SHORT CIRCUIT. METAL CONNECTIONS MADE TO THE HOUSING DO NOT NEED TO BE INSULATED.
   A GROUND STRAP IS PROVIDED AT THE DRIVE END. BEARING INSULATION SHOULD BE CHECKED WITH AN OHMMETER OR MEGGER BEFORE OPERATING MOTOR. DRIVE END BEARING MUST BE GROUNDED BY MEANS OF THE GROUND STRAP WHILE THE MOTOR IS OPERATING.
9. BEARING LUBRICATION: SELF OIL LUBRICATION
   A. OIL VISCOSITY: ISO VG46(180~220SSU AT 100°F)
   B. OIL QUANTITY: 5.3 L FOR EACH BEARING
10. WITH SPACE HEATER(MOTOR):RATED 1ø 360V 4600W.
    OPERATION 1ø 120V 500W.
11. WITH WINDING R.T.D.:PT 100Ω/0°C, 6PCS.
    SETTING:ALARM 145°C, TRIP 155°C AT S.F.:1.0.
    ALARM 155°C, TRIP 165°C AT S.F.:1.15.
12. WITH BEARING R.T.D.:PT 100 Ω/0°C, DUAL ELEMENTS, 2PCS.
    SETTING:ALARM 100°C, TRIP 105°C
13. WITH CONSTANT LEVEL OILER:TRICO 30010, 16 OZ. 2PCS.
14. WITH DIFFRENTIAL PRESSURE SWITCH:
    DWYER MODEL NO. 1950-00, 1PCS.
    SETTING: ALARM 0.12" W.C.
15. WITH DIFFRENTIAL PRESSURE GAUGE:DWYER MODEL NO. 2001, 1PCS.
16. NOISE:BELOW 85dBA AT ONE METER DISTANCE NO LOAD.
17. VIBRATION:BELOW 3.0mm/s(0-P) ON BEARING HOUSING NO LOAD.
18. CORROSION PROOF & TROPIC PROOF.
19. CSA CERTIFIED FOR CLASS I, ZONE II, GROUPS IIA, T3.
20. MOTOR APPROX. WEIGHT: 4900 kg.
    ROTOR APPROX. WEIGHT: 1650 kg.
21. TWMI IS NOT RESPONSIBLE FOR FOUNDATION DESIGN. THE SUPPORT REACTIONS NECESSARY FOR FOUNDATION DESIGN ARE AS FOLLOWS -kgf PER BOLT AT CENTERLINE OF HOLD DOWN BOLT HOLES:

STATIC	X = MOTOR WEIGHT/4
RATED MOTOR TORQUE	X = MOTOR WEIGHT/4 ± 505 kgf.
MAXIMUM MOTOR TORQUE	X = MOTOR WEIGHT/4 ± 4990 kgf.

Final Certified As-Built

Ⓐ M20 VERTICAL JACKING HOLE, ONE HOLE PER FOOT. WITH VERTICAL JACKING SCREWS 4PCS. MOUNTED ON FOOT.
Ⓑ FOUR M12 TAPPED GROUNDING PADS. WITH ONE GROUNDING STUD & (R60-12) TERMINAL LOCATED AS SHOWN.
Ⓒ BONDING STRAP.
Ⓓ 4-ø7 DOWELING HOLES ON MOTOR FOOT, LOCATED AS SHOWN.
Ⓔ LOCATION OF CENTER OF GRAVITY IS FOR REFERENCE ONLY.
Ⓕ REMOVABLE COVER FOR CABLE ENTRY TO BE DRILLED BY THE CUSTOMER.
Ⓘ 2-NPT1/4" TAPPED HOLES ON EACH BEARING HOUSING. PROVISIONS ONLY FOR CUSTOMER'S VIBRATION SENSOR.

TECO Westinghouse MOTORS (CANADA) INC.

TWMI SAP#	1000157683
Customer PO#	P483599
Customer Name#	Propak
Project Name#	FC WS2 Recovery Facility
Equipment ID Tag#	FC1-WS2-KM-9650

OUTLINE DIMENSIONS
3-PHASE INDUCTION MOTOR

Westinghouse

DWG NO. 3B040B415 REV: 02

TYPE	OUTPUT HP.	OUTPUT kW.	POLE	TIME RATING	VOLTAGE V	Hz	SYN. SPEED R. P. M.
ANCK-S2	1250		8	CONT	4000	60	900

WEATHER PROTECTED TYPE II, SQUIRREL-CAGE ROTOR

3-PHASE INDUCTION MOTOR

1250HP kW		TYPE ANCK-S2	
		FRAME 500A	WP II
VOLTS	4000	PHASE 3	KVA CODE G
AMPS	175	AMB. 40° C	INS. CL. F
Hz	60	S. F. 1.15	RATING CONT.
RPM	891	BEARINGS 14-150/14-160	
NOM. EFF. 96.0	MIN. EFF.		DESIGN B
SERIAL NO.		WEIGHT	kg
SORT CODE:MI:CBT1982			

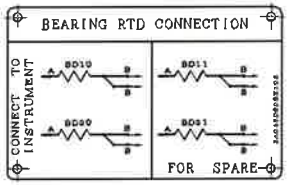
LR47823

TECO Westinghouse
MOTORS (CANADA) INC.

MADE IN TAIWAN 3A048H3140001

SUITABLE FOR INVERTER DUTY
SPEED RANGE 50 %-100 %, CONSTANT TORQUE

BEARING RTD CONNECTION



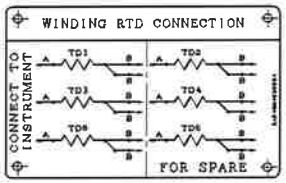
CERTIFIED MOTOR FOR HAZARDOUS LOCATIONS

CLASS I DIVISION 2 GROUP B, C & D
CLASS I ZONE 2 GROUP IIB+H2, IIB & IIA
TEMP. CODE(S. F. 1.0/S. F. 1.15):T3 /
TYPE ANCK-S2 SER. NO.
REFER TO THE MAIN PLATE FOR ELECTRIC RATING

TECO Westinghouse

RATED	VOLTS 360	WATTS 4500	CONNECTION
OPERATION	VOLTS 120	WATTS 500	
CAUTION: ANTI CONDENSATION HEATER CIRCUIT LIVE WHEN THE MOTOR IS SWITCHED OFF.			H1 H2
NOMINALE TENSION	360	WATTS 4500	CONNEXIONS
OPERATION TENSION	120	WATTS 500	
ATTENTION: CIRCUIT DE CHAUFFAGE ANTI-CONDENSATION SOUS TENSION LORS DE L'ARRET DU MOTEUR.			H1 H2

WINDING RTD CONNECTION



Final Certified As-Built

FC1-WS2-KM-9650

TECO Westinghouse
MOTORS (CANADA) INC.

TWMI SAP#	**1000157683**
Customer PO#	P483599
Customer Name#	**Propak**
Project Name#	**FC WS2 Recovery Facility**
Equipment ID Tag#	FC1-WS2-KM-9650

NOTE:
1. SERIAL NO. FD203210T1-1

DWN.	S. WANG	DEC-03-2019
CHKD.	S. WANG	DEC-16-2019
APPD.	W. CHENG	DEC-16-2019

DATE

OUTLINE DIMENSIONS
3-PHASE INDUCTION MOTOR

TECO Westinghouse

DWG NO. 3B040B415 REV: 02

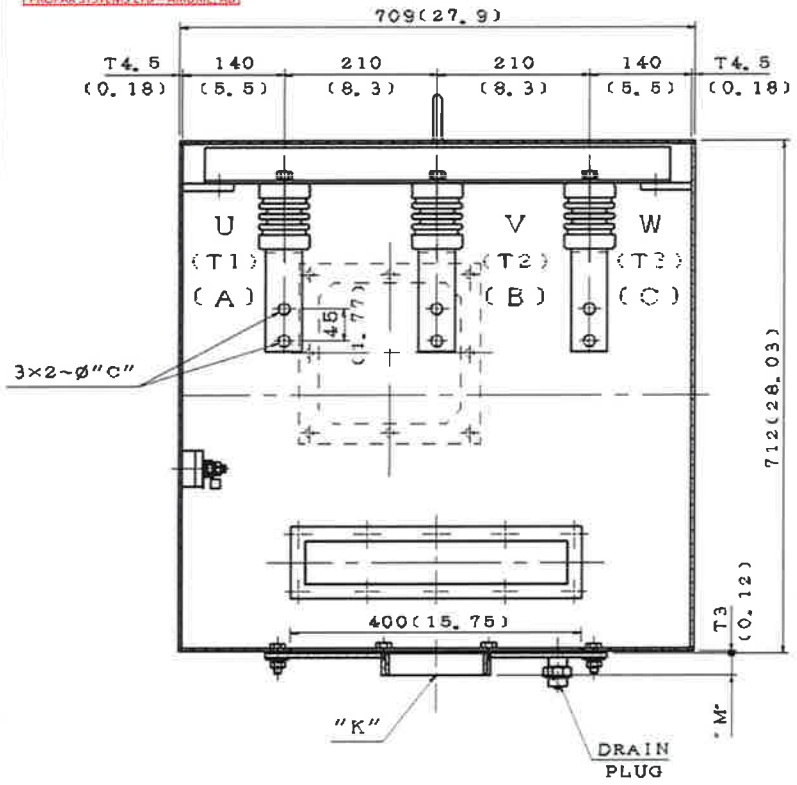
Document #	Rev
1. Approved (Work May Proceed)	
2. Approved with Comments - Work May Proceed (Revise and Resubmit)	
3. Not Approved (Stop Work per Attached Instructions)	
4. Information Only	

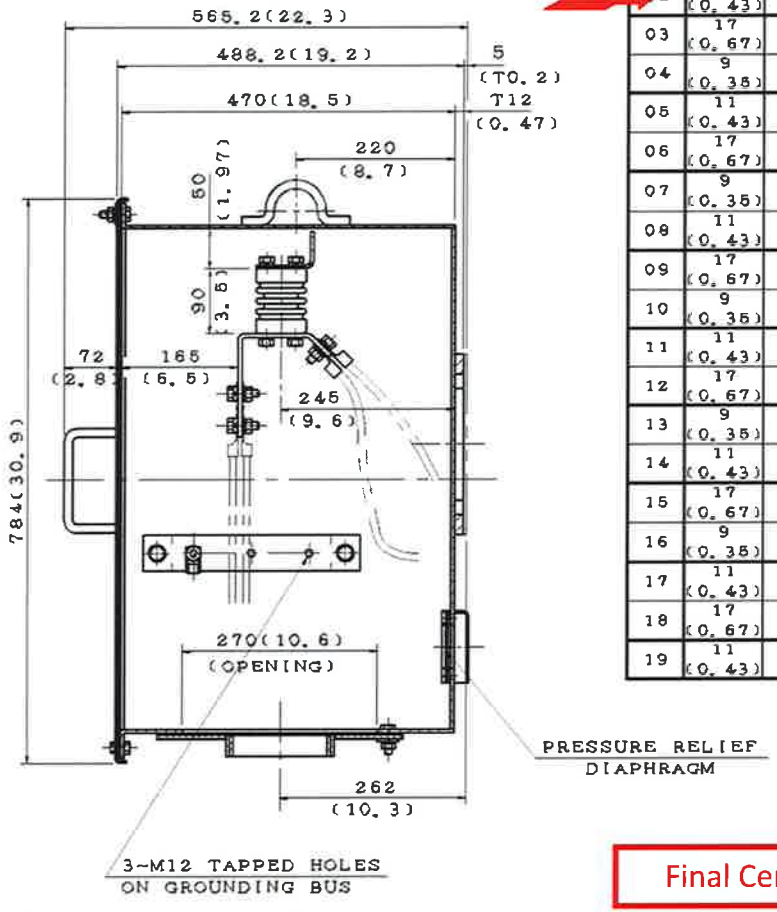
AUTHORIZATION TO PROCEED DOES NOT WAIVE SUPPLIER'S RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT PURCHASE ORDER FOR COMPLIANCE WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS

Signature 20/04/30 YY/MM/DD

PROPAK SYSTEMS LTD – AIRDRIE, AB

PO #	Job #	W191126
P483599	Doc #	V2537-191126- 1003
Equip #	VDR:	
KM-9650	Rev:	01





ITEM	C	K	M
01	9 (0.35)	O	6 (0.24)
02	11 (0.43)	O	6 (0.24)
03	17 (0.67)	O	6 (0.24)
04	9 (0.35)	NPT2.5"	30 (1.18)
05	11 (0.43)	NPT2.5"	30 (1.18)
06	17 (0.67)	NPT2.5"	30 (1.18)
07	9 (0.35)	NPT3"	30 (1.18)
08	11 (0.43)	NPT3"	30 (1.18)
09	17 (0.67)	NPT3"	30 (1.18)
10	9 (0.35)	NPT3.5"	30 (1.18)
11	11 (0.43)	NPT3.5"	30 (1.18)
12	17 (0.67)	NPT3.5"	30 (1.18)
13	9 (0.35)	NPT4"	30 (1.18)
14	11 (0.43)	NPT4"	30 (1.18)
15	17 (0.67)	NPT4"	30 (1.18)
16	9 (0.35)	NPT5"	30 (1.18)
17	11 (0.43)	NPT5"	30 (1.18)
18	17 (0.67)	NPT5"	30 (1.18)
19	11 (0.43)	NPT2"	30 (1.18)

Final Certified As-Built

NOTE:
1. DIMENSIONS IN mm(INCH).
2. PRIMARY T-BOX.
3. FOR NOMINAL VOLTAGE: 1801 - 4200 V. (ANSI C50.41-2000 TYPE II)
4. WHEN "K" IS 0, REMOVABLE COVER FOR CABLE ENTRY TO BE DRILLED BY THE CUSTOMER.

TECO Westinghouse MOTORS (CANADA) INC.

TWMI SAP#	1000157683
Customer PO#	P483599
Customer Name#	Propak
Project Name#	FC WS2 Recovery Facility
Equipment ID Tag#	FC1-WS2-KM-9650

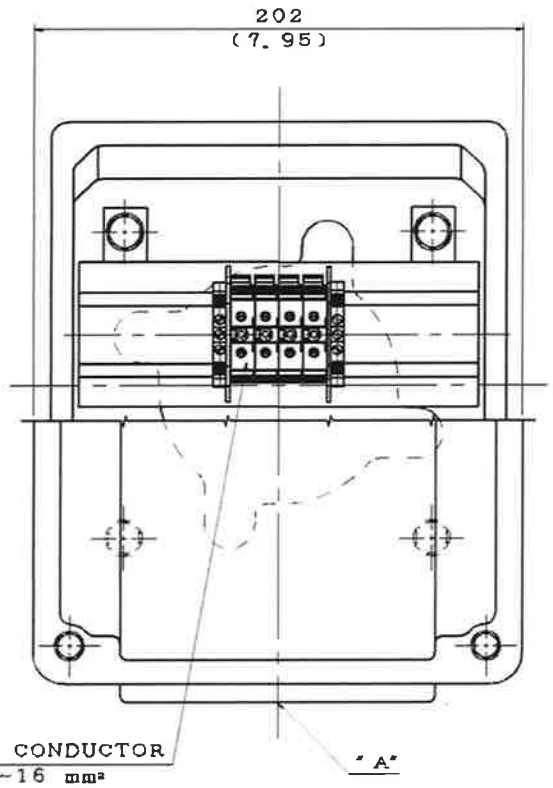
APPD.	C. LIU	APR-11-2017

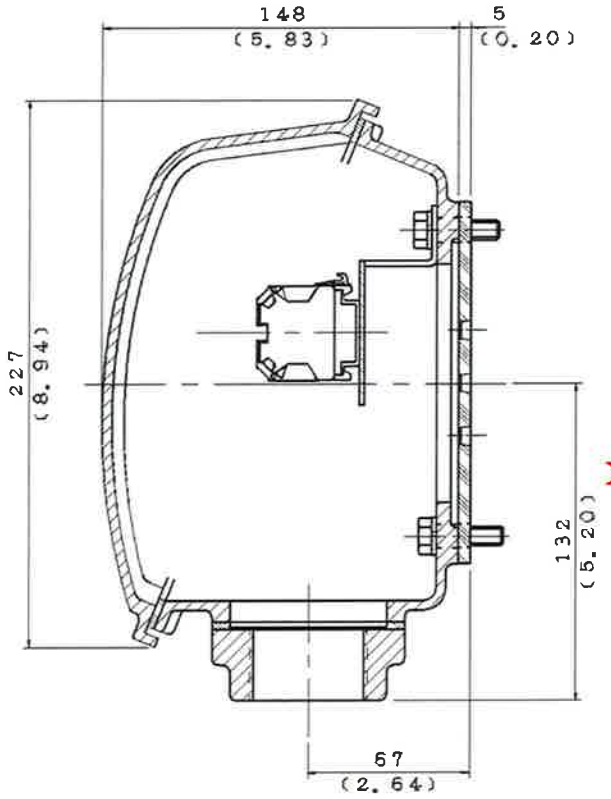
SCHEMATIC DRAWING

TERMINAL BOX

Westinghouse

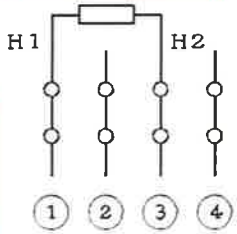
DWG NO. 3B040R234XA REV:01





ITEM	A
01	PF-1"
02	PF-1.5"
03	PF-2"
04	NPT-1"
05	NPT-1.5"
06	NPT-2"
07	M25×1.5
08	M32×1.5
09	M50×1.5
10	NPT-0.75"
11	M20×1.5
12	NPT-1.25"
13	M16×1.5
14	
15	
16	
17	
18	
19	
20	

PO #	Job #	W191126
P483599	Doc #	V2537-191126- 1004
Equip #	VDR:	
KM-9650	Rev:	00



TECO Westinghouse MOTORS (CANADA) INC.

TWMI SAP#	**1000157683**
Customer PO#	P483599
Customer Name#	**Propak**
Project Name#	**FC WS2 Recovery Facility**
Equipment ID Tag#	FC1-WS2-KM-9650

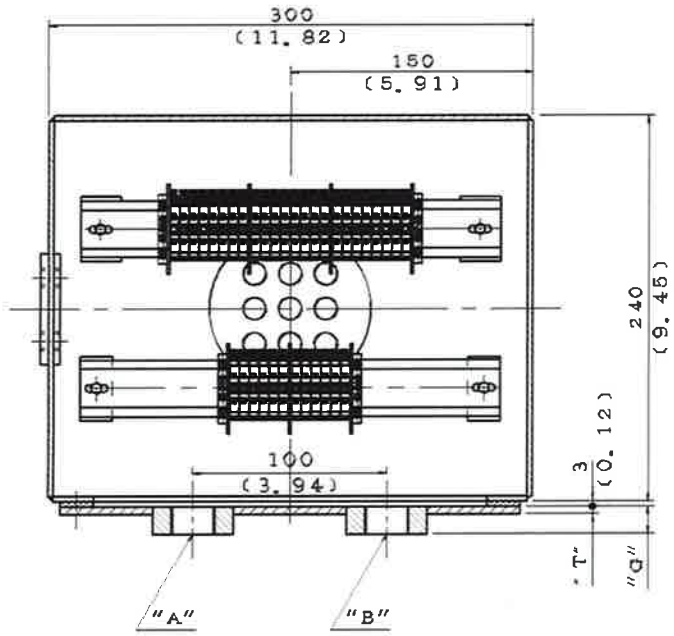
NOTE:
1. DIMEMSION IN mm(INCH).
2. TW-36.
3. SPACE HEATER T-BOX.
4. ENCLOSURE: IP55
5. MATERIAL: CAST IRON

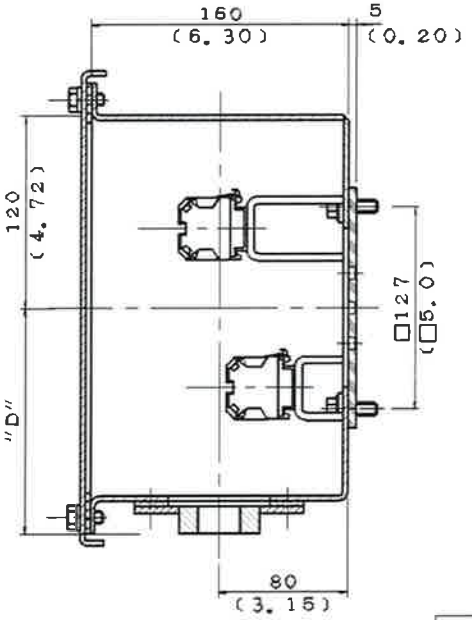
Document #	Rev
☐ 1. Approved (Work May Proceed)	
☐ 2. Approved with Comments - Work May Proceed (Revise and Resubmit)	
☐ 3. Not Approved (Stop Work per Attached Instructions)	
☑ 4. Information Only	
AUTHORIZATION TO PROCEED DOES NOT WAIVE SUPPLIER'S RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT / PURCHASE ORDER FOR COMPLIANCE WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS	
Signature	2019/12/30 YY/MM/DD
PROPAK SYSTEMS LTD – AIRDRIE, AB	

Final Certified As-Built

		DEC.03.2019
		DEC.16.2019
APPD.	W. CHENG	DEC.16.2019

DATE	SCHEMATIC DRAWING
	TERMINAL BOX
TECO Westinghouse	DWG NO. 3B040X634XN REV:00





PO #	Job #	W191126
P483599	Doc #	V2537-191126- 1005
Equip #	VDR:	
KM-9650	Rev:	00

Document # | Rev

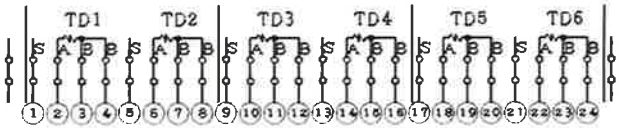
☐ 1. Approved (Work May Proceed)
☐ 2. Approved with Comments - Work May Proceed (Revise and Resubmit)
☐ 3. Not Approved (Stop Work per Attached Instructions)
☐ Information Only

INFORMATION TO PROJECT DOES NOT MEAN SUPPLIER'S RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT / PURCHASE ORDER FOR COMPLIANCE WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS

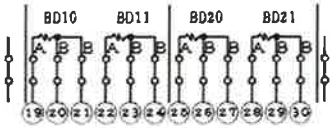
Signature | YY/MM/DD

PROPAK SYSTEMS LTD – AIRDRIE, AB

WINDING R. T. D.



BEARING R. T. D.



ITEM	A	B	D	G	T
01	0	0	127.5 (5.02)	4.5 (0.18)	4.5 (0.18)
02	M20×1.5	M50×1.5	143 (5.63)	20 (0.79)	4.5 (0.18)
03	NPT1"	NPT2"	143 (5.63)	20 (0.79)	4.5 (0.18)
04	PF1"	PF2"	143 (5.63)	20 (0.79)	4.5 (0.18)
05	PT1"	PT2"	143 (5.63)	20 (0.79)	4.5 (0.18)
06	0	0	143 (5.63)	20 (0.79)	4.5 (0.18)
07	NPT0.75"	NPT1.5"	143 (5.63)	20 (0.79)	4.5 (0.18)
08	0	0	143 (5.63)	20 (0.79)	4.5 (0.18)
09	NPT0.75"	NPT1.25"	143 (5.63)	20 (0.79)	4.5 (0.18)
10	NPT0.75"	NPT2"	143 (5.63)	20 (0.79)	4.5 (0.18)
11	NPT0.75"	NPT0.5"	143 (5.63)	20 (0.79)	4.5 (0.18)
12	M25×1.5	M25×1.5	143 (5.63)	20 (0.79)	4.5 (0.18)

TECO Westinghouse MOTORS (CANADA) INC.

TWMI SAP#	**1000157683**
Customer PO#	P483599
Customer Name#	**Propak**
Project Name#	**FC WS2 Recovery Facility**
Equipment ID Tag#	FC1-WS2-KM-9650

Final Certified As-Built

NOTE:
1. DIMENSIONS IN mm (INCH).
2. WINDING & BEARING R.T.D. T-BOX.
3. TD1 & TD2 FOR U PHASE
   TD3 & TD4 FOR V PHASE
   TD5 & TD6 FOR W PHASE
   BD10 & BD11 FOR DRIVE END BEARING
   BD20 & BD21 FOR NON-DRIVE END BEARING.
4. ENCLOSURE: IP65

DWN.	S. WANG	DEC.03.2019
CHKD.	S. WANG	DEC.16.2019
APPD.	W. CHENG	DEC.16.2019

DATE

SCHEMATIC DRAWING

TERMINAL BOX

TECO Westinghouse

DWG NO. 3B040D609X9 REV:00

PO #	Job #	W191126
P483599	Doc #	V2537-191126- 1006
Equip #	VDR	
KM-9650	Rev.	01

Document #	Rev
1. Approved (Work May Proceed)	
2. Approved with Comments - Work May Proceed (Revise and Resubmit)	
3. Not Approved (Stop Work per Attached Instructions)	
4. Information Only	

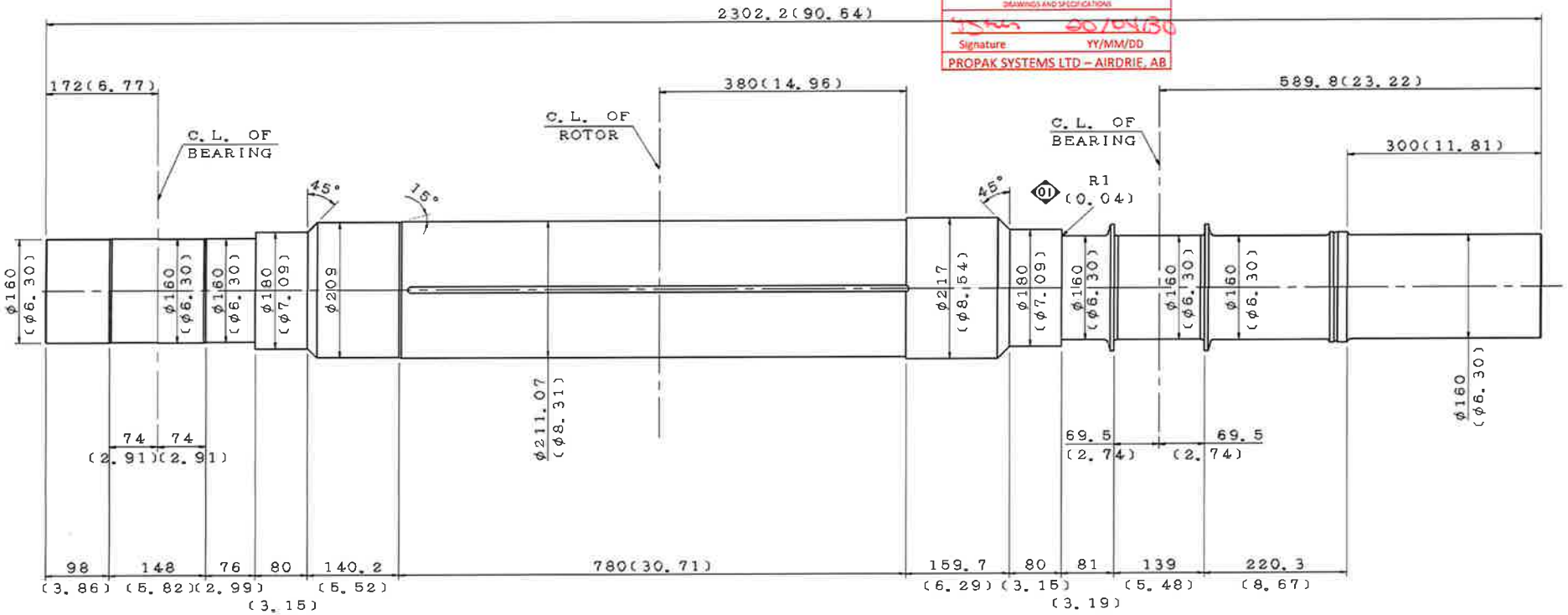
AUTHORIZATION TO PROCEED DOES NOT WAIVE SUPPLIER'S RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT / PURCHASE ORDER FOR COMPLIANCE WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS

Signature YY/MM/DD

PROPAK SYSTEMS LTD – AIRDRIE, AB

NON—DRIVE END

DRIVE END



NOTE:
1. DIMENSIONS IN mm(INCH).

Final Certified As-Built

TORSIONAL ANALYSIS DATA

ROTOR WR²: 59.25 kg—m²

SHAFT TORSIONAL STIFFNESS: 6.26E08 kgf—mm/rad (FOR REFERENCE ONLY)
(FROM ROTOR CENTERLINE TO COUPLING END OF SHAFT)

SHAFT MATERIAL: JIS G 4105 SCM440 (AISI 4140 EQUIV.)

SHAFT ULTIMATE TENSILE STRENGTH: 100 kgf/mm² MIN

SHAFT YIELD STRENGTH IN TENSION: 85 kgf/mm² MIN

SHAFT SHEAR MODULUS OF RIGIDITY: 8300 kgf/mm²

TECO Westinghouse MOTORS (CANADA) INC.

TWMI SAP#	1000157683
Customer PO#	P483599
Customer Name#	Propak
Project Name#	FC WS2 Recovery Facility
Equipment ID Tag#	FC1-WS2-KM-9650

DWN.	S. WANG	DEC-03-2019
CHKD.	S. WANG	DEC-16-2019
APPD.	W. CHENG	DEC-16-2019

SCHEMATIC DRAWING

SHAFT

TECO Westinghouse

DWG NO. 5A040C949 REV:01

TECO Westinghouse MOTORS (CANADA) INC.

TWMI SAP#	1000157683
Customer PO#	P483599
Customer Name#	Propak
Project Name#	FC WS2 Recovery Facility
Equipment ID Tag#	FC1-WS2-KM-9650

RECOMMENDED SPARE PARTS LIST

MODEL

Document #	Rev

1. Approved (Work May Proceed)
2. Approved with Comments - Work May Proceed (Revise and Resubmit)
3. Not Approved (Stop Work per Attached Instructions)
4. Information Only

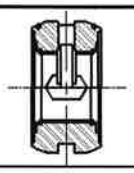
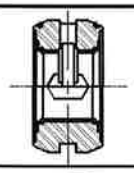
AUTHORIZATION TO PROCEED DOES NOT WAIVE SUPPLIER'S RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT / PURCHASE ORDER FOR COMPLIANCE WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS

TSh 20/04/30
Signature YY/MM/DD

PROPAK SYSTEMS LTD – AIRDRIE, AB

PO #	Job #	W191126
P483599	Doc #	V2537-191126- 1007
Equip #	VDR:	
KM-9650	Rev:	00

Final Certified As-Built

ITEM	PART NAME	SKETCH	SPEC.	QUANTITY		PART NUMBER
				WORKING FOR 1 SET	TOTAL (PCS/UNIT)	
1	SLEEVE BEARING		BRG SIZE #14—160 (D. E.)	1	1	3A231C0151901
2	OIL RING		BRG SIZE #14 (D. E.)	1	1	3A236C0251406
3	FLOATING LABYRINTH SEAL		BRG SIZE #14 (D. E.)	2	2	3A206C0080505
1	SLEEVE BEARING		BRG SIZE #14—160 (N. D. E.)	1	1	3A231C0151901
2	OIL RING		BRG SIZE #14 (N. D. E.)	1	1	3A236C0251406
3	FLOATING LABYRINTH SEAL		BRG SIZE #14 (N. D. E.)	1	1	3A206C0080505

DWN.	S. WANG	DEC• 14•2005
CHKD.	S. WANG	DEC• 14•2005
APPD.	C. WANG	DEC• 14•2005

TECO Westinghouse

DWG NO. 3B040H620 REV: 00

R

Part Name	Manufacturer	Part NO.	Quantity	Spec.	Alarm	Trip	Note
Winding RTD	MINCO	3A951D0342102	6 pcs	PT100Ω/0°C Single Element	145°C 155°C	155°C 165°C	at S.F. :1.0 at S.F. :1.15
Bearing RTD	MINCO	3A955C1624501 3A955C1624501	1 pc 1 pc	PT100Ω/0°C Dual Elements	100°C	105°C	D.E. N.D.E.
Space Heater	CHROMALOX	3A956C0350308	6 pcs	1ϕ 120 750W	—	—	Assembling RATED 1ϕ 360V 4500W OPERATED 1ϕ 120V 500W
Differential Pressure Switch	DWYER	3A800D0880207	1 pc	1950—00	0.12" W.C.	—	
Differential Pressure Gauge	DWYER	3A800D0600204	1 pc	2001	—	—	

PO #	Job #	W191126
P483599	Doc #	V2537-191126-1008
Equip #	VDR:	
KM-9650	Rev:	00

TECO Westinghouse
MOTORS (CANADA) INC.

TWMI SAP#	**1000157683**
Customer PO#	P483599
Customer Name#	**Propak**
Project Name#	**FC WS2 Recovery Facility**
Equipment ID Tag#	FC1-WS2-KM-9650

Final Certified As-Built

Document # | Rev
1. Approved (Work May Proceed)
2. Approved with Comments - Work May Proceed (Revise and Resubmit)
3. Not Approved (Stop Work per Attached Instructions)
4. Information Only
AUTHORIZATION TO PROCEED DOES NOT WAIVE SUPPLIER'S RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT/PURCHASE ORDER FOR COMPLIANCE WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS
TSH 20/04/30
Signature YY/MM/DD
PROPAK SYSTEMS LTD – AIRDRIE, AB

DWN.	S. WANG	DEC•03•2019
CHKD.	S. WANG	DEC•16•2019
APPD.	W. CHENG	DEC•16•2019

DATE

SCHEMATIC DRAWING
ACCESSORY LIST

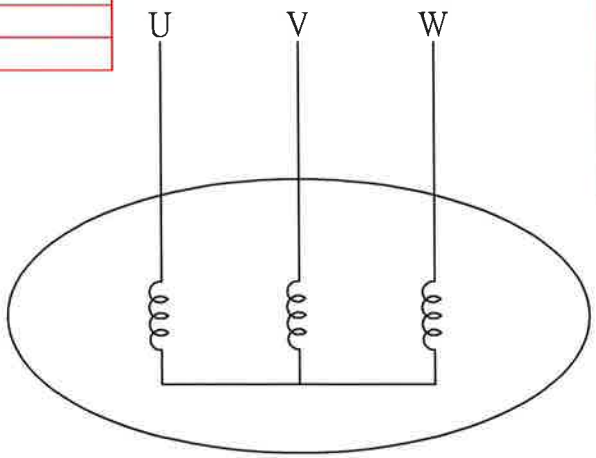
TECO Westinghouse

DWG NO. 4B040X519 REV:00

1/1

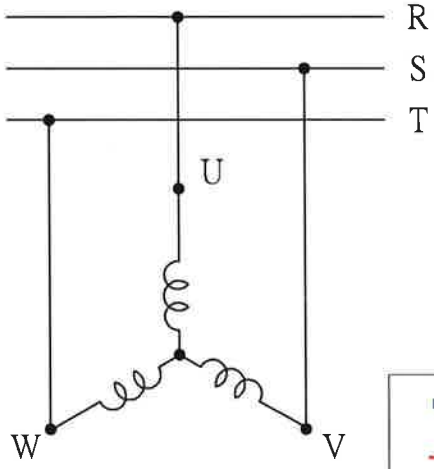
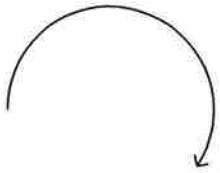
DATE	SCHEMATIC WYE CONN 3 LEADS	MODEL

PO #	Job #	W191126
P483599	Doc #	V2537-191126-1009
Equip #	VDR:	
KM-9650	Rev:	00



Document #	Rev
1. Approved (Work May Proceed) 2. Approved with Comments - Work May Proceed (Revise and Resubmit) 3. Not Approved (Stop Work per Attached Instructions) Information Only	
AUTHORIZATION TO PROCEED DOES NOT WAIVE SUPPLIER'S RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT / PURCHASE ORDER FOR COMPLIANCE WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS	
TShen 2010/03/30 Signature YY/MM/DD	
PROPAK SYSTEMS LTD – AIRDRIE, AB	

SCHEMATIC - WYE CONN - 3 LEADS

CONNECTION	ROTATION (VIEWED FROM NON-DRIVE END)
	

Final Certified As-Built

TECO Westinghouse
MOTORS (CANADA) INC.

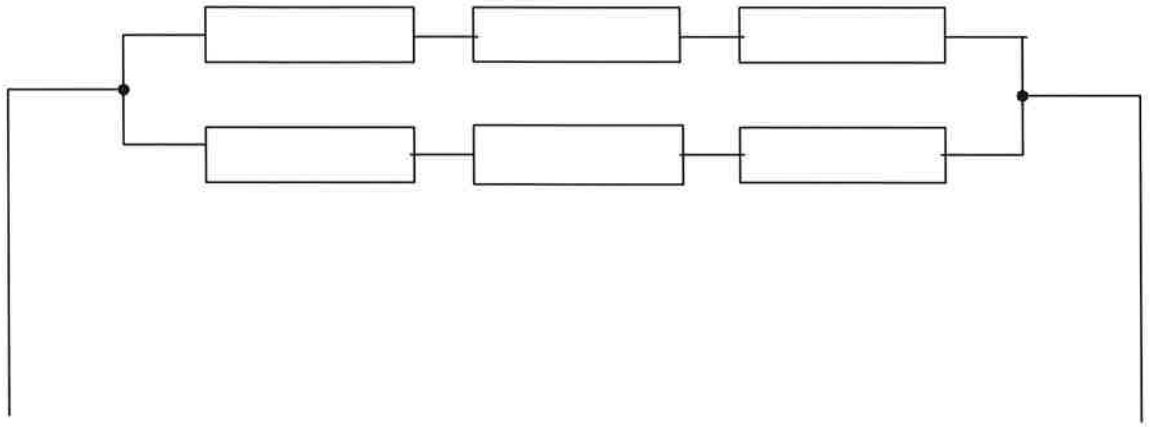
TWMI SAP#	**1000157683**
Customer PO#	P483599
Customer Name#	**Propak**
Project Name#	**FC WS2 Recovery Facility**
Equipment ID Tag#	FC1-WS2-KM-9650

DWN.	S.HUANG	MAR • 03 • 2003	TECO Westinghouse	DWG NO. REV: 00
CHKD.	T.HSIAO	MAR • 03 • 2003		3A061H636W
APPD.	T.HSIAO	MAR • 03 • 2003		

DATE	SCHEMATIC SPACE HEATER	MODEL

PO #	Job #	W191126
P483599	Doc #	V2537-191126- 1010
Equip #	VDR:	
KM-9650	Rev:	00

Document #	Rev
☐ 1. Approved (Work May Proceed)	
☐ 2. Approved with Comments - Work May Proceed (Revise and Resubmit)	
☐ 3. Not Approved (Stop Work per Attached Instructions)	
☒ 4. Information Only	
AUTHORIZATION TO PROCEED DOES NOT WAIVE SUPPLIER'S RESPONSIBILITY OR LIABILTY UNDER THE CONTRACT / PURCHASE ORDER FOR COMPLIANCE WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS	
Signature	YY/MM/DD 2016/4/30
PROPAK SYSTEMS LTD – AIRDRIE, AB	



Rated 1φ 360V 4500W
Operation 1φ 120V 500W

TECO Westinghouse
MOTORS (CANADA) INC.

TWMI SAP#	**1000157683**
Customer PO#	P483599
Customer Name#	**Propak**
Project Name#	**FC WS2 Recovery Facility**
Equipment ID Tag#	FC1-WS2-KM-9650

Final Certified As-Built

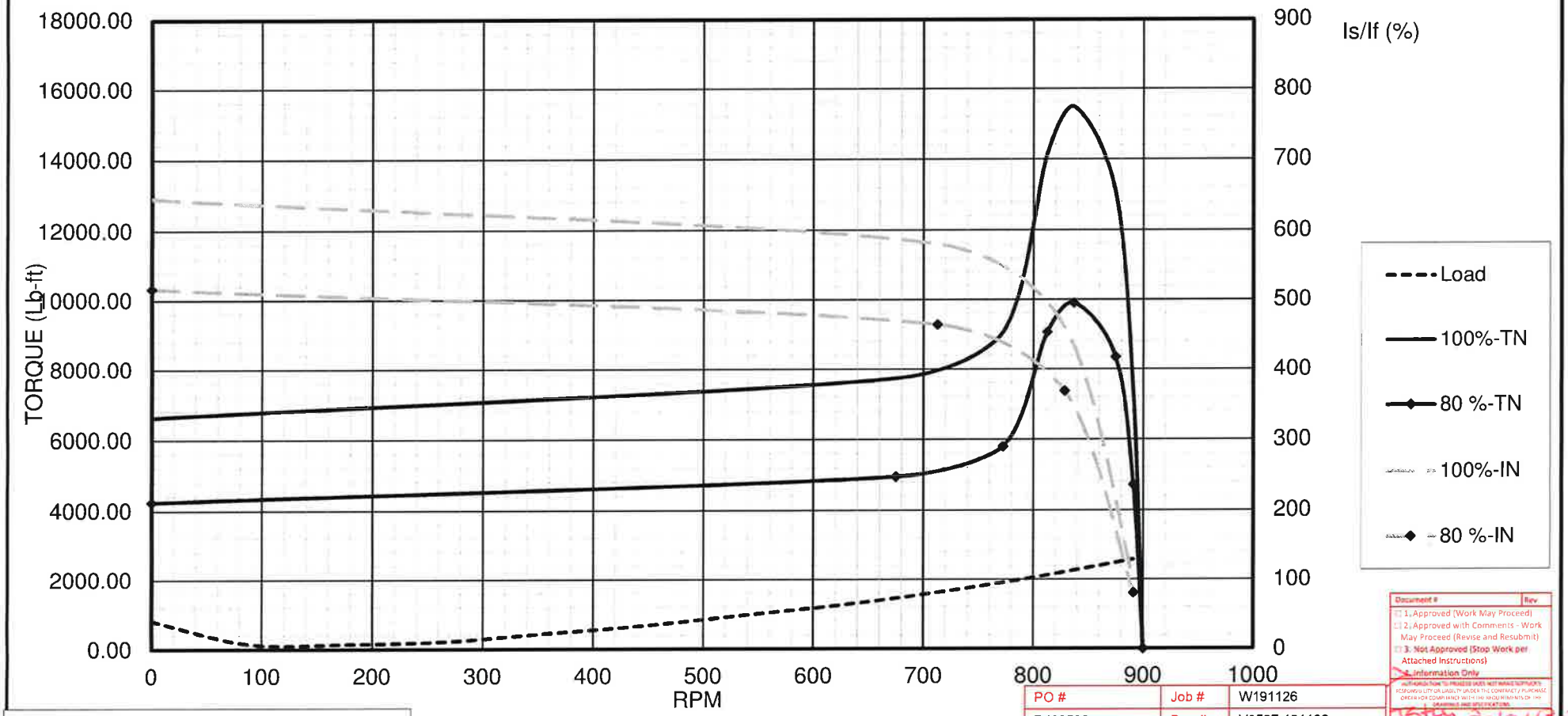
DWN.	ANDREA	JUL • 03 • 2012	TECO Westinghouse	DWG NO. REV: 00
CHKD.	HB.LIN	JUL • 03 • 2012		3A061H589W
APPD.	H.CHIANG	JUL • 03 • 2012		

T-N & I-N CURVE

NO.: FD203210T1
TYPE: ANCK POLE: 8 HP : 1250
HZ: 60 VOLT.: 4000

Ts : 6629.4 Lb-ft
Tmin. : 7734.3 Lb-ft
Tmax. : 15468.6 Lb-ft
Tf : 7366.0 Lb-ft

Full load current : 175 A
Lock rotor current / Full load current : 645 %



PO #		Job #	W191126
P483599		Doc #	V2537-191126-1011
Equip #		VDR:	
KM-9650		Rev:	00

Document # Rev
1. Approved (Work May Proceed)
2. Approved with Comments - Work May Proceed (Revise and Resubmit)
3. Not Approved (Stop Work per Attached Instructions)
Information Only
Signature YY/MM/DD
PROPAK SYSTEMS LTD – AIRDRIE, AB

TECO Westinghouse MOTORS (CANADA) INC.

TWMI SAP#	1000157683
Customer PO#	P483599
Customer Name#	Propak
Project Name#	FC WS2 Recovery Facility
Equipment ID Tag#	FC1-WS2-KM-9650

Final Certified As-Built

TECO Westinghouse

DWG NO. Rev.00
FD203210T1
T-I-L

PO #	Job #	W191126
P483599	Doc #	V2537-191126- 1012
Equip #	VDR:	
KM-9650	Rev:	00

Document # | Rev

1. Approved (Work May Proceed)
2. Approved with Comments - Work May Proceed (Revise and Resubmit)
3. Not Approved (Stop Work per Attached Instruction)
4. Information Only

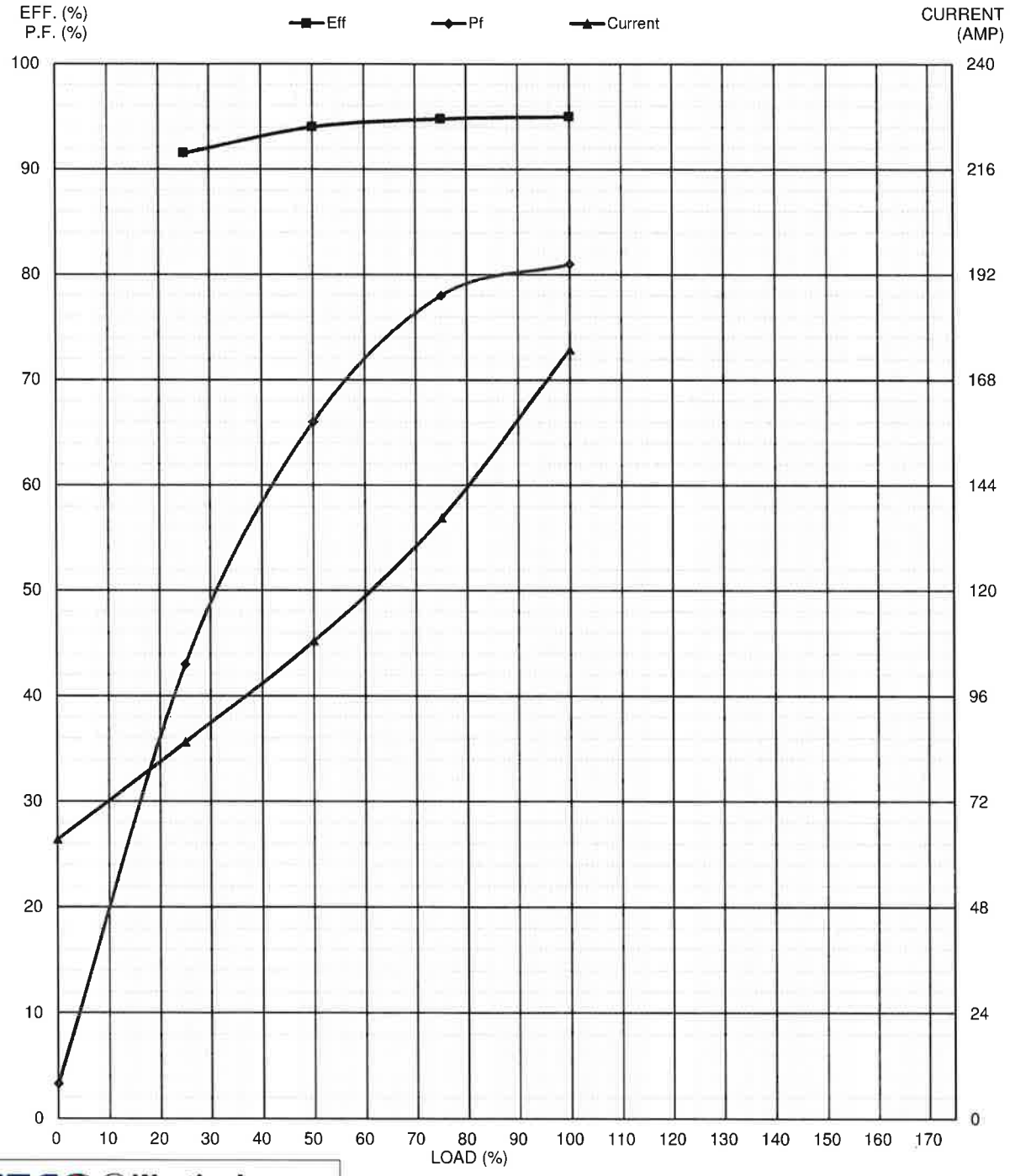
AUTHORIZATION TO PROCEED DOES NOT WAIVE SUPPLIER'S RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT / PURCHASE ORDER FOR COMPLIANCE WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS

Signature YY/MM/DD

PROPAK SYSTEMS LTD – AIRDRIE, AB

THREE PHASE INDUCTION MOTOR
LOAD CHARACTERISTIC CURVE

NO.	**: FD203210T1**		**TYPE**	**:**	**ANCK**
POLE	**:**	**8**	**HP**	**:**	**1250**
HZ	**:**	**60**	**VOLT.**	**:**	**4000**



TECO Westinghouse MOTORS (CANADA) INC.

TWMI SAP#	**1000157683**
Customer PO#	P483599
Customer Name#	**Propak**
Project Name#	**FC WS2 Recovery Facility**
Equipment ID Tag#	FC1-WS2-KM-9650

TECO Westinghouse

DWG NO. Rev.00
FD203210T1
E-P-C

PO #	Job #	W191126
P483599	Doc #	V2537-191126-1013
Equip #	VDR:	
KM-9650	Rev:	00

Document #	Rev
1. Approved (Work May Proceed)	
2. Approved with Comments - Work May Proceed (Revise and Resubmit)	
3. Not Approved (Stop Work per Attached Instructions)	
4. Information Only	

AUTHORIZATION TO PROCEED DOES NOT RELIEVE SUPPLIER'S RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT / PURCHASE ORDER FOR COMPLIANCE WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS

Signature YY/MM/DD

PROPAK SYSTEMS LTD - AIRDRIE, AB

THERMAL LIMIT CURVES

NO. : FD203210T1 TYPE : ANCK

POLE : 8 HP : 1250

HZ : 60 VOLT. : 4000

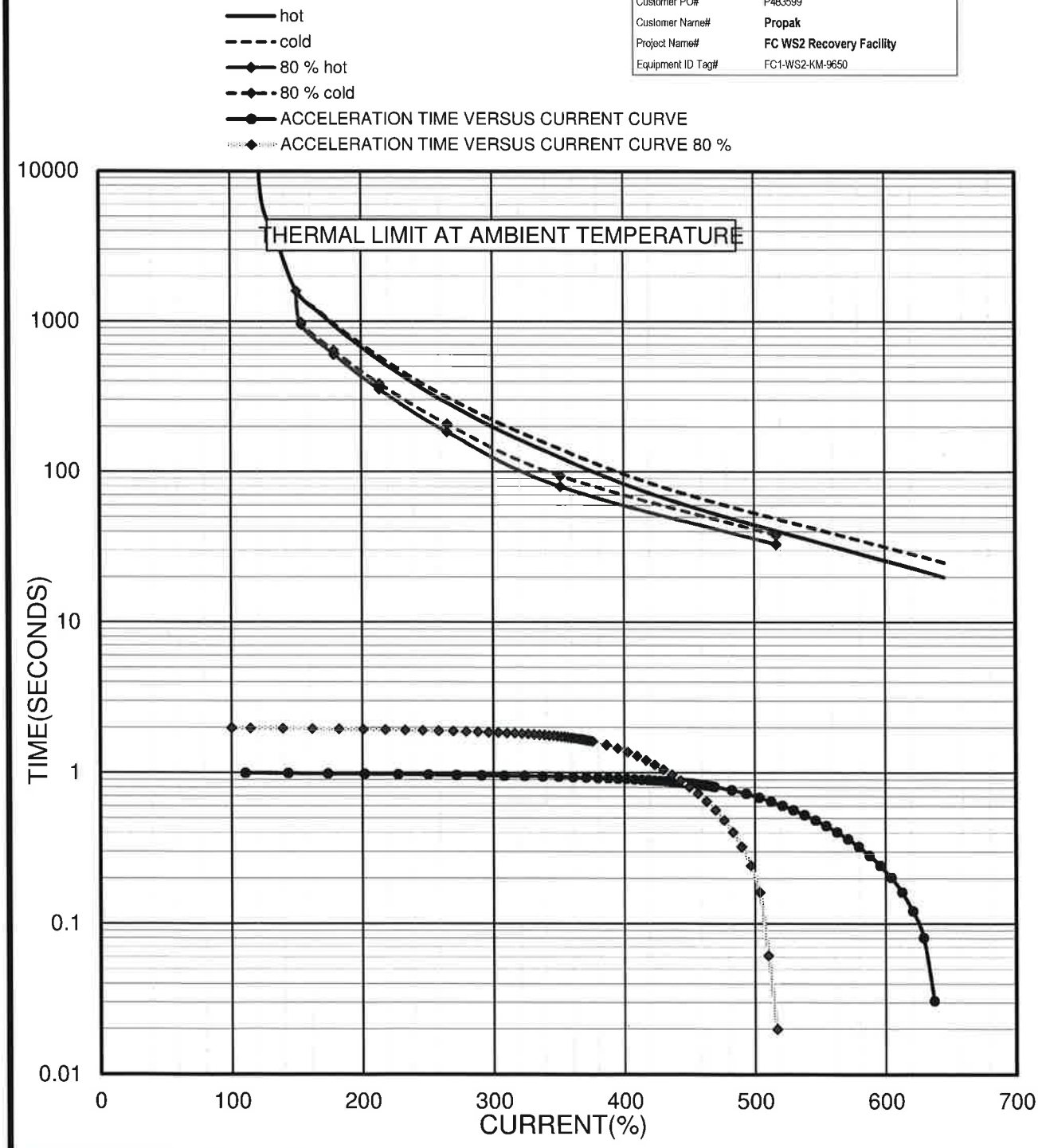
Load WK2 (LB-FT2) : 129

Motor WK2 (LB-FT2) : 1404

Full load current : 175 A

TECO Westinghouse MOTORS (CANADA) INC.

TWMI SAP#	1000157683
Customer PO#	P483599
Customer Name#	Propak
Project Name#	FC WS2 Recovery Facility
Equipment ID Tag#	FC1-WS2-KM-9650



Final Certified As-Built

		28
CHKD.	Eric.Lu	20191128
DWN.	CF.WENG	20191128

TECO Westinghouse

DWG NO. Rev.00
FD203210T1
TIME

Input Ver:00

PO #	P483599	Job #	W191126
Doc #	V2537-191126-1014		
Equip #	KM-9650	VDR:	
Rev:	2		

Document # | Rev
☐ 1. Approved (Work May Proceed)
☐ 2. Approved with Comments - Work May Proceed (Revise and Resubmit)
☐ 3. Not Approved (Stop Work per Attached Instructions)
☒ 4. Information Only
AUTHORIZATION TO PROCEED DOES NOT WAIVE SUPPLIER'S RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT / PURCHASE ORDER FOR COMPLIANCE WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS
Signature: BSH YY/MM/DD: 20/03/30
PROPAK SYSTEMS LTD – AIRDRIE, AB

cenovus ENERGY

ELECTRIC MOTOR DATA SHEET > 185 kW

TAG NO.	FC1-WS2-KM-9650	MR No.	
SPEC NO.	TR-46-SPC-00-005-01	PROJECT No.	W191126
PROJECT	FC WS2 RECOVERY FACILITY	LOCATION	SW21-070-05-W4M
SERVICE	PRODUCED GAS COMPRESSOR	PG	1 of 2

MANUFACTURER	*	DRIVEN EQUIPMENT	Compressor
MODEL	*	NO. REQUIRED	1

MOTOR DESIGN DATA

NAMEPLATE RATING
- NAMEPLATE HP (kw): 1250 — SYNC SPEED (rpm): 900
- SERVICE FACTOR: 1.15 — POWER FACTOR: 81%
- VOLTS: 4160 — PHASE: 3 — FREQUENCY: 60 Hz
- NEMA MG-1: ☒ YES ☐ NO
- API 541: ☐ YES ☒ NO

SERVICE CONDITIONS
- ☒ INDOOR — ☐ OUTDOOR
- ☐ TROPICAL — ☐ DUST
- ALT (m): 560 — MIN TEMP (°C): 10 — MAX TEMP (°C): 35
- ☐ OTHER
- ☐ NON-HAZARDOUS — ☒ HAZARDOUS
- CLASS: 1 — ZONE: 2 — GROUP: IIA — TEMP. CODE: T3

MOTOR TYPE
- ☒ SQUIRREL CAGE INDUCTION — ☒ NEMA DESIGN: B

ENCLOSURE
- ☐ TEFC — ☒ WP II
- ☐ TEXP — ☐ TEWAC
- ☐ OTHER

MOUNTING
- ☒ HORIZONTAL
- ☐ VERTICAL — SHAFT (UP/DOWN):
- ☐ FOOT MOUNTED
- ☐ FLANGE MOUNTED — FLANGE DETAIL:

INSULATION SYSTEM
- ☒ INSULATION CLASS: F — TYPE: VPI
- ☒ TEMP RISE (°C): 80 — ABOVE (°C): 40 — BY: RESISTANCE Note 8

STARTING
- ☐ FULL VOLTAGE — ☒ REDUCED VOLT (%):
- ☒ STARTING METHOD: VFD Note 7
- ☐ LOADED ☐ UNLOADED ☒ PARTIALLY LOADED (%):
- ☐ SYSTEM IMPEDANCE AT MOTOR TERMINALS
  - R% + jX% ____ @ ____ MVA ____ VOLT
- ☒ MAXIMUM VOLTAGE DIP AT MOTOR TERMINALS (%):
- ☒ MAXIMUM LRA AT MOTOR TERMINALS (Amp): 1130

ADJUSTABLE SPEED DRIVE
- ☐ APPLICABLE
  - ASD MANUFACTURER:
  - LOAD CHARACTERISTIC:
  - FREQUENCY RANGE: 30 TO 60 Hz — 450 TO 900 RPM
  - DISPLACED NEUTRAL:
  - ☐ PERFORM TORSIONAL STUDY
- ☐ OTHER CONDITIONS

MAIN TERMINAL BOX
- LOCATION FROM ODE: * ☐ LHS ☒ RHS
- FEEDER SIZE: — TYPE: — QTY / PH:
- DIRECTION OF CABLE ENTRY: Bottom (Plate)
- ☒ LUGS REQUIRED
- ☐ LIGHTNING ARRESTERS:
- ☐ SURGE CAPACITORS
- ☐ DIFFERENTIAL CTs — MOUNTED BY:
  - ☐ SELF BALANCING (3- CTs)
  - ☐ PERCENTAGE DIFFERENCE (6-CTs)
  - RATIO:
  - ACCURACY:
- ☐ SPACE FOR STRESS CONES
- ☒ WEATHER PROOF TERMINAL AND AUXILIARY JUNCTION BOXES
- ☒ OTHER: Stator windings shall be designed to have surge withstand capability as defined in NEMA MG-1 20.35.6. See also Note 2

MOTOR ACCESSORIES
- ☒ WPII AIR FILTERS — MFR: TECO — TYPE: Stainless Steel
  - ☒ PRESSURE SWITCH — ☒ PRESSURE GAUGE
- ☒ SPACE HEATERS
  - POWER (kw): 0.5 — VOLT / PH / HZ: 120 / 1 / 60
  - QUANTITY: 1
  - MAX SHEATH TEMP: 200 C OR TEMP. CODE: T3
  - LOCATION: Separate Space Heater Junction Box
- TEMPERATURE DETECTION
  - ☒ WINDING RTDs
    - TYPE: 3 Wire, 100 Ohm Platinum, 2 per Phase
    - LOCATION: Leads to Separate Stator RTD Junction Box
  - ☒ BEARING RTDs
    - TYPE: 3 Wire, 100 Ohm Platinum, Dual Element (one spare)
    - LOCATION: Leads in Stator Junction Box
- ☐ VIBRATION MONITORING
  - PROBE TYPE:
  - PROBE MFR.:
  - PROBE LOCATION:
  - ☐ KEY PHASOR
  - ☒ PROVISION FOR PROBES ONLY
  - ☐ SWITCH

DRIVEN EQUIPMENT INFORMATION
- LOAD TYPE: ☒ COMPRESSOR ☐ PUMP ☐ FAN
- SHAFT: ☒ SINGLE ☐ DOUBLE
- ROTATION (Viewed from ODE): *
  - ☐ CLOCKWISE ☐ COUNTER-CLOCKWISE ☐ BI-DIRECTIONAL
- COUPLING: ☒ DIRECT ☐ GEAR BOX ☐ BELT DRIVE
  - MFR.: — MODEL:
  - SUPPLIED BY: ☐ MOTOR MFR. ☒ DRIVEN EQM MFR.
  - MOUNTED BY: ☐ MOTOR MFR. ☒ DRIVEN EQM MFR.

BEARINGS
- TYPE: DE: Sleeve — ODE: Sleeve
- PART NUMBER: DE: 3A231C0151901 — ODE: 3A231C0151901
- ☐ INSULATED ODE BEARING
- ☒ BOTH BEARINGS INSULATED c/w DE GND STRAP
- SHAFT END PLAY: +/- 7.0 mm
- ANTIFRICTION BEARING RETAINER RING MATERIAL: N/A

LUBRICATION
- ☐ GREASE ☒ OIL ☐ FORCED FEED OIL ☐ OIL MIST
- MANUFACTURER: *
- NAME: *
- OIL FLOW RATE: * l/Hr AT * kPa
- OIL CAPACITY: * Litre/Bearing

MISCELLANEOUS
- FANS: ☐ MFR STANDARD ☒ UNIDIRECTIONAL
- MOUNTING PLATES: ☐ SOLE ☐ BASE
- PAINT: ☒ MFR STANDARD ☐ OTHER

OTHER
1) Stainless Steel Hardware

REV	DESCRIPTION	DATE	ELEC	MECH	CHKR	PE/PM
E	Re-Issued for Quotation	5-Nov-19	AP			
1	Issued for Purchase	14-Jan-20	AP			
2	Re-IFP (Tag update)	10-Feb-20	AP			TJS
D	Re-Issued for Quotation	10-Oct-19	AP			

Data Sheet Number	Rev.
DS-FC1-WS2-KM-9650	2

TECO Westinghouse MOTORS (CANADA) INC.

TWMI SAP#	1000157683
Customer PO#	P483599
Customer Name#	Propak
Project Name#	FC WS2 Recovery Facility
Equipment ID Tag#	FC1-WS2-KM-9650

Final Certified As-Built

cenovus ENERGY

ELECTRIC MOTOR DATA SHEET > 185 kW

TAG NO.	FC1-WS2-KM-9650	MR No.	PG 2 of 2
SPEC NO.	TR-46-SPC-00-005-01	PROJECT No.	W191126
PROJECT	FC WS2 RECOVERY FACILITY	LOCATION	SW21-070-05-W4M
SERVICE	PRODUCED GAS COMPRESSOR		

MANUFACTURER'S DATA

MOTOR NAMEPLATE DATA

MANUFACTURER	TECO-WESTINGHOUSE
TYPE/MODEL No.	ANCK
FRAME SIZE	500A
SERIAL NUMBER(S)	FD203210T1

STARTING PERFORMANCE

RATED STARTING VOLTAGE 4000 V
REDUCED VOLTAGE 80 %
LOCKED ROTOR VALUES (AT RATED VOLTAGE)
CURRENT 645 % FULL LOAD 1130 AMP
POWER FACTOR 81.00%
SAFE STALL TIME: COLD 25 Sec HOT 20 Sec
TORQUE (% FLT AT RATED VOLTAGE)
LOCKED ROTOR 90
PULL UP 105
BREAKDOWN 210
GD² INERTIA
ROTOR 237 kg.m²
FLYWHEEL N/A kg.m²
LOAD 21.8 kg.m²
ACCELERATION TIME
MOTOR ONLY * AT 100% V
WITH LOAD 1 AT 100% V 2 AT 80% V
NUM STARTS PER HOUR: 2 COLD 1 HOT
COOL DOWN TIME N/A Sec

RUNNING PERFORMANCE

FULL LOAD CURRENT 175 AMP
FULL LOAD TORQUE 10003.7 N.m
EFFICIENCY:

LOAD (%)	50	75	100	115
EFFICIENCY (%)	94	94.8	95	94.9
POWER FACTOR (%)	66	78	81	81

EFFICIENCY COST FACTOR: N/A
EFFICIENCY STD 12 TEST METHOD Routine / F1 for one unit only
STRAY LOSS LOAD ALLOWANCE 0.90
OPEN CIRCUIT TIME CONSTANT 0.81
REACTANCES(Ω) X"d 0.139 X'd 0.178 Xd 2.12
SYMMETRICAL CONTRIBUTION TO 3 PH TERMINAL FAULT AT:
(1/2 cycles) N/A (5 cycles) N/A

BEARING TEMPERATURE SETPOINT DATA

	ALARM	SHUTDOWN
WINDINGS (°C)	140	155
BEARINGS (°C)	100	105

MANUFACTURER'S DATA (continued)

MISCELLANEOUS

RECOMMENDED MAX PFCC 360 kvar
NO LOAD SOUND LEVEL ≤ 85 dBA @ 1m

FOR TEWAC & TEFV MOTORS

COOLING WATER REQ'D m3/hr
C.W. TEMP RISE C PRESS DROP kpag
AIR/GAS REQ'D sm3/min PRESS MAINT mm H2O

EQUIPMENT WEIGHTS

NET WT 4900 kg SHIPPING WT * kg
ROTOR WT 1650 kg MAX ERECT WT * kg
MAX MAINT. WT (IDENTIFY) * kg

OUTLINE DIMENSIONS

L 2350 mm W 2180 mm H 2200 mm

MOTOR PERFORMANCE CURVES

■ SPEED vs MOTOR TORQUE AND AT 100 % RATED VOLT
■ SPEED vs LOAD TORQUE AND AT 100 % RATED VOLT
■ SPEED vs POWER FACTOR ■ ACCELERATION
■ SPEED vs CURRENT ■ DAMAGE (cold & hot)
■ OTHER Combined Speed / Torque

SHOP INSPECTION AND TESTS

	NON WITNESSED	WITNESSED	1 MOTOR ONLY
SHOP INSPECTION	☐	☐	☐
MFG STD SHOP TEST	■	☐	☐
ROUTINE COMMERCIAL TEST	■	☐	☐
COMPLETE TEST	☐	☐	☐
IMMERSION TEST	☐	☐	☐
CHECK BALANCE W/ 1/2 COUPLING	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐

SHIPMENT

☐ DOMESTIC ☐ EXPORT ☐ EXPORT BOXING REQ'D
■ INDOOR STORAGE OVER 6 MONTHS
☐ OTHER

QUALITY CONTROL

■ ISO 9001:2008
☐ OTHER

NOTES:

1. All auxiliary equipment shall be CSA approved and labeled.
2. The terminal blocks for the RTD leads in the auxiliary conduit box shall be Weidmuller SAK 2.5 type. Spare RTDs to be labeled as SPARE.
3. All electrical and instrumentation equipment shall be pre-wired to junction boxes
4. No yellow metal may be used for exterior components of motors and accessories.
5. Motor shall be complete with a fabricated copper bar rotor.
6. The main terminal box shall be oversized.
7. Motor shall be capable of operating at constant full rated torque over the entire speed range from 450 rpm to 900 rpm.
8. The temperature rise shall be with the VFD connected to the motor and shall be within Class B limits over the specified speed range

TECO Westinghouse MOTORS (CANADA) INC.

TWMI SAP#	1000157683
Customer PO#	P483599
Customer Name#	Propak
Project Name#	FC WS2 Recovery Facility
Equipment ID Tag#	FC1-WS2-KM-9650

Final Certified As-Built

REV	DESCRIPTION	DATE	ELEC	MECH	CHKR	PE/PM
E	Re-Issued for Quotation	5-Nov-19	AP			
1	Issued for Purchase	14-Jan-20	AP			
2	Re-IFP (Tag update)	10-Feb-20	AP			TJS
D	Re-Issued for Quotation	10-Oct-19	AP			

Data Sheet Number	Rev.
DS-FC1-WS2-KM-9650	2

TECO Westinghouse Your Industry, Our Legacy.

Storage and Preservation Procedure
Three Phase Induction Motors

1. General

When motors are not in operation, the following precautionary measures must be taken to insure the motors do not suffer deterioration or damage from moisture, dust and dirt, or careless handling. The climate, length of storage time, and the adequacy of the storage facilities will determine the storage precautions required. This also includes long idle period of time (when a motor is installed on site but not in operation).

It is the customer's responsibility to ensure the following procedures are followed and a maintenance log is documented. Any deterioration or damages due to improper storage (such as condensation, deterioration of insulation, rust, bearing damage due to moisture or "false brinelling", winding damage or contamination from spilled oil, etc…are not covered by the warranty.

2. Location

The ideal storage area is a clean, dry, heated, and well-ventilated building.

(a) Well-ventilated indoor, without exposure to direct sun light, free from dust, corrosive gas (such as chlorine, sulfur, dioxide, and nitrous oxides) and fumes.

(b) The ideal temperature range is 10˚C to 50˚C (50˚F to 125˚F), and with a relative humidity of ≤60%.

(c) Not close to a boiler or freezer.

(d) Precautions should be taken to prevent rodents, snakes, birds or other small animals from nesting inside the motors. In areas where they are prevalent, precautions must be taken to prevent insects, such as dauber wasps, from gaining access to the interior of motors.

(e) Entirely free from vibration. Vibration levels above 0.15in/s velocity could damage the bearings and cause "false brinelling" of the bearing races.

(f) Motors should be put on pallets to prevent moisture from accumulating underneath.

(h) When indoor storage is not possible, motors must be well covered with rain-proof tarpaulin and protected from contamination and moisture. The cover should be so applied that a space around the bottom is allowed to allow the captive air to breath, thereby minimizing the formation of condensation. Outdoor storage should be for a very short period of time (over one month is not recommended).

3. Motor Position

Horizontal shaft motors must be stored in horizontal position, and vertical motors must be stored in vertical position. Where motors are mounted to machinery, the mounting must be such that drains and breathers are fully operable and are at the lowest point of the motor.

4. Moisture Prevention

Since moisture can be very detrimental to electrical components, the motor's temperature should be maintained about 5℃ above the dew point temperature by providing either external or internal heat. If the motor is equipped with space heaters, they should be energized at the voltage shown by the space heater nameplate attached to the motor. Check weekly that the space heaters are operating.

Incandescent light bulbs can be used as a heat source to provide heat if the anti-condensation space heaters are not fitted. However, if used, they must not be allowed to contact with any parts of the motor because of the concentrated hot spot that could result.

If the storage area is ideal, (dry, well ventilated, temperature controlled including summer), where condensation is not possible, the above procedure may be omitted at customer's discretion.

5. Prevent Corrosion

When motors are shipped from the factory, external machined surfaces, including shaft extension and bearing journals on sleeve bearing motors, are covered with a protective coating. This coating should be examined periodically to make sure that it has not been accidently removed. If necessary, re-coat the surfaces with a rust preventative material, such as Rust Veto No.342 or an equivalent. Care should be taken to keep parts such as fitted surfaces, key, shaft extension, mounting feet or face, and axial central hole from any collision with foreign matters, and to have rust preventative in place. It is a good practice to seal any shaft openings with silicone, rubber caulking, or tape. If any rust is observed, measures should be taken to remove the rust and protect against it. Grease or anti-corrosion agent should also be generously applied to prevent rusting.

 **Immediately remove any shrink wrap may be used during shipping. Never wrap any motor in plastic for storage. This can turn the motor into a moisture trap causing severe damage.**

6. Insulation Resistance Test

Even during storage, the insulation resistance should be kept above the specified values.

(a) For measurement of insulation resistance and acceptable standard values, please refer to Section 9. Measurement of Insulation Resistance.

(b) For Insulation resistance measurement of temperature detectors (such as PT 100Ω/0℃, Cu 10Ω/25℃), please also refer to Section 9.

(c) Insulation resistance test should be performed once every three months.

7. Long Period of Standing Idle

If the motor is not in operation for a long period of time after installation (one month and longer) or has been in operation but stopped for a period of time, the following precautions must be taken.

(a) Protect the motor per measures stated in section 4 and 5.

(b) Insulation resistance test should be performed as stated in section 6.

(c) Bearing Protection per Section 8.

(d) Operation test should be performed once every three months.

(e) If external vibration is present, the shaft coupling should be opened.

(f) If motors are mounted shaft up, a solid protective plate or shield shall be mounted above the installation if needed.

(g) If motors are mounted shaft down, drip covers are to be mounted over the fan cover to give satisfactory protection if needed.

(h) If motors are equipped with drain plugs, they should be removed.

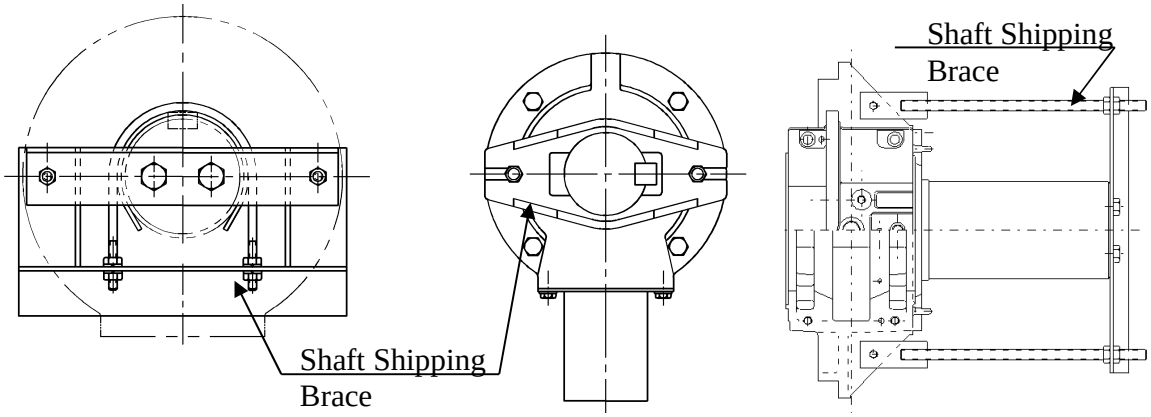
(i) When motors are equipped with brushes and there is no protective strip (such as MYLAR) between the brushes and collector rings, the brushes should be lifted in the brush holder.

(j) For water-cooled motors or motors using bearings with water-cooled coils, ensure that the water is dried off to prevent tube corrosion or frost damage.

(k) Maintenance log must be documented for warranty and reference purposes.

8. Bearing Protection

(a) If the motor has been provided with a shaft shipping brace to prevent shaft movement during transit, it must be removed and stored for future use. The brace must be reinstalled exactly as it was originally, before the motor is moved from storage or any time when the motor is being transported. This prevents axial rotor movement that might damage the bearings.



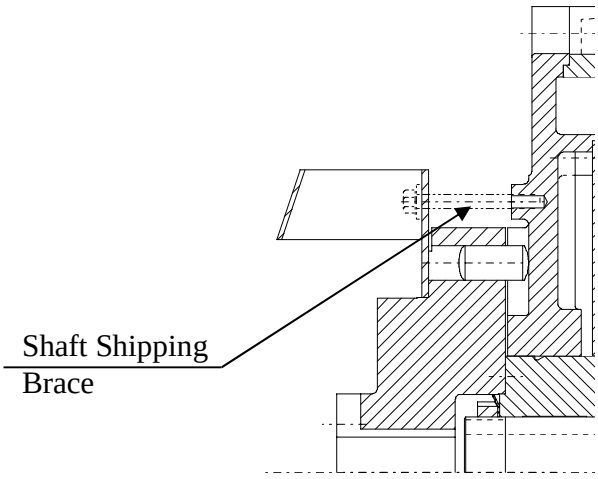


Fig. 3 Shaft shipping brace

(b) Motors equipped with sleeve bearings are shipped from the factory with the bearing oil reservoirs drained. For storage over one month, the oil reservoirs should be filled to the center of the oil level gauge with a good grade of rust inhibiting oil (VpCI_329 added operation oil can be used as well). The motor shaft should be rotated several revolutions every month to maintain an oil film on bearing surfaces. While the shaft is rotating, it should be pushed to both extremes of the endplay. If the motor is not in operation over six months, dismount the upper cover of sleeve bearing housing and check the anti-corrosion protection.

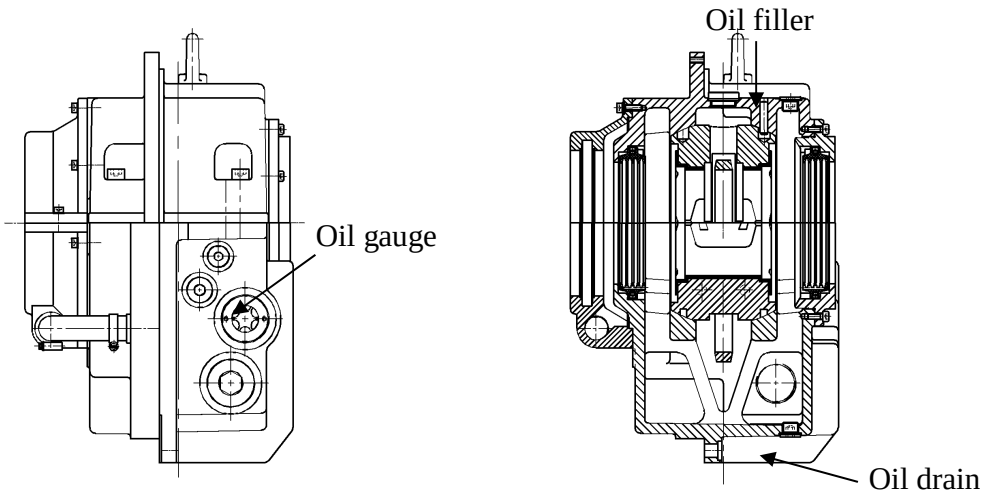


Fig. 4 Sleeve Bearing

(c) Motors with re-greaseable anti-friction bearings are properly lubricated with the correct grade of grease at the factory and no further greasing is required for short period storage. For motors have been in storage or not in operation over six months, add small amount of grease (please refer to TWMI Re-grease Guidelines) to each bearing. Make sure adding grease into a motor (not running) in a very slow rate.

(d) Tilt-pad bearings are a type of sleeve bearing used in special design applications. Due to the nature of this bearing, a loose oil ring for delivering lubricant cannot be provided. Therefore, during the storage interval, oil must be manually introduced periodically into the pads and housing to prevent the occurrence of oxidation of the precision machined components.

(1) Remove the pipe plug from the bearing cap located above the tilt-bearing shell.

(2) Pour in approximately one cup of oil every month and rotate the shaft a few revolutions every two (2) weeks.

For long periods of storage, the oil that accumulates in the housing should be removed.

(e) The bearing assembly parts of motors with oil mist lubrication are put on with anti-rust oil, so they can be preserved for several months in good conditions. The motor should be stored indoor & well-ventilated environment and prevent to contact with contaminated or corrosive air. The following points should be noted:

(1) During preservation, the Inpro seal cannot prevent moisture from entering into the bearings. Please use the oil mist to lubricate the bearings every two (2) weeks.

(2) If the color of flow out oil is changed, the bearing might be rusted or have contamination in it. Please contact us.

(3) Avoid using grease as it will plug the vent/drain.

(4) All assembly surfaces are painted with seal bonds, don't disassemble them anytime.

(5) Don't remove the plugs in vent/drain to prevent possible damage from moisture.

(6) The Inpro seal is a labyrinth type seal. Therefore it cannot contain a pressure differential.

(f) If the storage is over 2 years, it is recommended that the bearing assembly is dismantled and the bearing parts are inspected before commissioning. Any corrosion has to be removed with fine emery clothes.

(g) Motors with anti-friction bearings with provisions for oil mist are shipped from factory with the correct grade of grease in the bearings. It is not necessary to hook up the motors to the oil mist system. The shaft should be rotated several revolutions every month to maintain proper distribution of the grease within the bearings. If customers choose to hook up to the oil mist system, all grease must be removed from the bearings.

(h) Vertical motors equipped with oil lubricated thrust bearings are shipped from the factory with the bearing oil reservoirs drained. For storage over one month, the oil reservoirs should be filled to the center of the oil level gauge with a good grade of rust inhibiting oil. If the motor is not in operation for over six months, dismount the upper cover of the bearing housing and check the anti-corrosion protection.

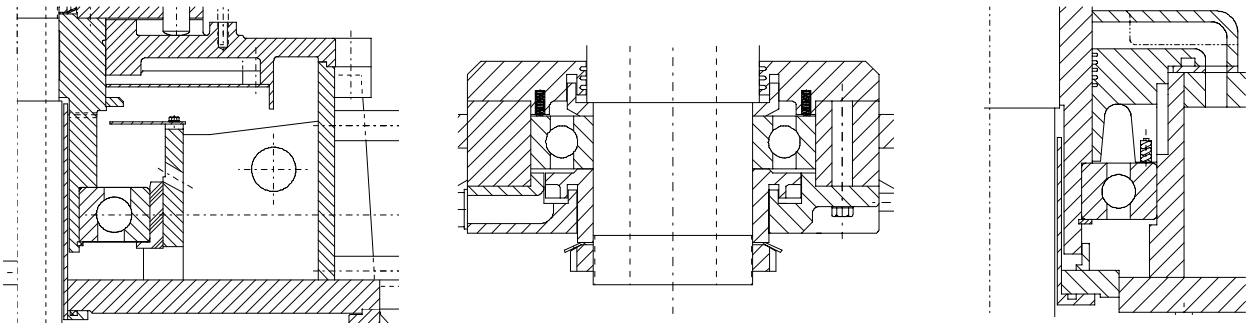


Fig. 5 Upper and lower bearings

Motor must not be moved with oil in reservoir. Drain oil before moving to prevent sloshing and possible damage. Refill oil when motor has been moved to the new location.

(i) All motors must have the shaft rotated at least 15-20 revolutions every month, to maintain a lubricant film on the bearing races and journals and to prevent bearings from damaging.

9. Measurement of Insulation Resistance

During and immediately after measuring, the terminals must not be touched as they may carry dangerous residual voltages. Furthermore, if power cables are connected, make sure that the power supplies are clearly disconnected and there are no moving parts.

(a) For rated voltage below 1000V, measure with a 500VDC megger. For RTD (such as PT 100Ω/0℃, Cu 10Ω/25℃) insulation resistance measurement, please use a 500VDC megger. For rated voltage above 1000V, measure with a 1000VDC megger.

(b) The following minimum insulation resistance values (corrected to 40℃) are recommended:

(1) kV+1 in Megohms for most windings made before 1970, all field windings and windings not otherwise described.

(2) 100 Megohms for most DC armatures and AC windings built after about 1970 with form wound coils.

(3) 5 Megohms for machines with random wound stator coils and for form wound coils rated below 1kV.

(4) 5 Megohms for RTDs.

ATTENTION !

After measurement the winding must be grounded to discharge residual voltages.

(c) On a new winding, where the contaminant causing low insulation resistance is generally moisture, drying the winding through the proper application of heat will normally increase the insulation resistance to an acceptable level. The following are several accepted methods for applying heat to a winding:

(1) If the motor is equipped with space heaters, they can be energized to heat the winding.

(2) Direct current (as from a welder) can be passed through the winding. The total current should not exceed approximately 20% of rated full load current. If the motor has only three leads, two must be connected together to form one circuit through the winding. In this case, one phase will carry the full applied current and each of the others, one-half each. If the motor has six leads (3 mains and 3 neutrals), the three-phase should be connected into one series circuit.

Ensure there is adequate guarding so live parts cannot be touched.

(3) Heated air can be either blown directly into the motor or into a temporary enclosure surrounding the motor. The source of heated air should preferably be electrical as opposed to fueled (such as kerosene) where a malfunction of the fuel burner could result in carbon entering the motor.

ATTENTION !

Caution must be exercised, when heating the motor with any source of heat other than self contained space heaters, to raise the winding temperature at a gradual rate to allow any entrapped moisture to vaporize and escape without rupturing the insulation. The entire heating cycle should extend over 15-20 hours.

Insulation resistance measurements can be made while the winding is being heated. However, they must be corrected to 40℃ for evaluation since the actual insulation resistance will decrease with increasing temperature. As an approximation for a new winding, the insulation resistance will be approximately halved for each 10℃ increase in insulation temperature above the dew point temperature.

(d) Should the resistance fail to attain the specified value even after drying, careful examination should be undertaken to eliminate all other possible causes.

10. Removal from Storage

After a long storage or idle period (6 months or longer) of time, and prior to energizing the motor, a thorough inspection is required. This inspection shall include but not limited to:

1. Meggar test of winding insulation;
2. Internal inspection to determine that the winding has not been damaged and that the apparatus is clean and dry;
3. Inspection of the bearings to determine they have not been damaged and that there is no water in the oil reservoirs. If moisture and oxidation and any other contamination is noted, the grease or oil must be completely removed and replaced.
4. External inspection to determine that no damage has been done.

If any of the following conditions pertain, then re-conditioning may be required before putting a motor into service.

a) Winding resistance is less than recommended;
b) Evidence of rust or other indications of moisture inside the motor;
c) Water in the oil reservoir (if applicable);
d) Corrosion or brinelling or deformation occurred in bearings;
e) Idle or storage longer than the warranty period;
f) Idle or storage in dirty or damp surroundings;
g) Storage in unheated area where the temperature and humidity fluctuate;
h) Idle or storage where it has been subject to vibration, such as from nearby machinery or passing traffic;
i) Outdoor storage;
j) External damages.

Any reconditioning required, as noted by the inspections, should be performed prior to putting the motor into service. Such inspection and testing or re-conditioning are available from local TECO-Westinghouse service/facilities. Reconditioning after idle or storage is not covered by factory warranty.

If a motor carries a **Deferred Warranty** (coverage for storage or idle time longer than 6 months), the following procedures have to be followed to keep the warranty valid:

- Within thirty days prior to initial operation, a TWMI Service Engineer or TWMI approved equivalent shall be hired by the customer to thoroughly inspect the apparatus to ascertain that the apparatus is in "as shipped" condition.
- Make any corrections as noted by the inspection. These corrections will be made at the customer's expense if corrections required are due to storage conditions.
- That an affidavit certifying that the apparatus has successfully passed the inspection and is in "as shipped" condition be supplied to TWMI by the customer. Failure to provide TWMI with the affidavit certifying that the apparatus has passed inspection and is in "as shipped" condition will result in voiding the warranty.

11. Recommendation for Shipments

This process specification defines the requirements of packaging for shipment of components, sub-assemblies and assembled TWMI products in order to provide adequate protection against corrosion, contamination and physical damage.

a) Domestic shipment of product from TWMI will be fully cleaned and preserved and packaged as indicated below. Closed van shipment will not, in general require any additional covering. Flatbed truck shipments will require carrier tarpaulins.

b) Cleaning: Prior to preserving and packaging, all unprotected, critical or non-critical metal surfaces, shall be thoroughly cleaned to insure the removal of corrosion, soil, grease and oil residues. After cleaning, all surfaces shall require the application of a preservative not detrimental to the surfaces coated.

c) Protection of Critical Surfaces and Openings: All machined, bright finished, close tolerances or unpainted surfaces, shall be protected by preserving, wrapping, taping, capping, plugging, blocking, coating or covering, to assure protection from dust, dirt, moisture or abrasion.

d) Skidding: Skidding shall be used to provide a foundation for heavy motors. These items shall be bolted through the skids (runners) and additionally blocked, braced or secured to the skid to assure protection during transit and handling.

e) Transit: Vertical motors must be shipped in a safe, stable, vertical position. Horizontal motor shaft must remain lengthwise on trailer. Motors should be lifted only by eyebolts or rings per instruction manual, and lifting a motor with the motor shaft is not permitted. Raising & lowering must be steady and gentle without jolting, otherwise the bearings may be damaged.

f) Shipping brace: Reinstall the original shipping brace if the motor is to be moved.