-- OPERATING CHARACTERISTICS AND GENERAL DATA (cont.) --

III. REGULATION:

A. Starting Unloading

Solenoid controlled air operated blowdown valves mounted in the interstage and discharge piping.

B. Capacity Reduction

The Variable Volume Clearance Pocket is used to keep total BHP at 4000 or less when discharge pressure is increased.

See attached curve.

IV. ELECTRIC MOTOR DRIVER:

Make & Type C.G.E. Eng. Type Brushless Synchronous Comp. Motor

BHP 4000 RPM 327 Voltage 4000

Phase 3 Frequency 60 Power Factor 1.0

Deg. C. Rise 70 Service Factor 1.0

Special Features Enclosure - open guarded self ventilated items supplied and mounted by Mobil: 3-Lightning arresters: 1- 3 phase surge capacitor: 3- current transformers for differential protection.

Gear Reducer Make & Model ---

High Speed Coupling ---

Low Speed Coupling ---

PGEI 3722

INSTRUCTIONS

BRUSHLESS SYNCHRONOUS MOTORS

TS-22-4000HP-4000V-1.0PF-327RPM-60Hz-3PH

Canadian Ingersoll Rand Co. For Mobil Oil Canada Ltd.
(Battrum Combustion Recovery)

Reqn. 9280-660-100 Model #114512 Serial #931735-6

CANADIAN GENERAL ELECTRIC COMPANY
LIMITED

A.

MOTOR SPECIFICATION

TYPE :	TS
MODEL :	114512
SERIAL #:	931735 & 931736
HP :	4000
KVA :	3120
VOLTS:	4000
F.L. AMPS:	450
P.F. :	1.0
SPEED:	327 RPM
FREQUENCY:	60 Hz
SUPPLY:	3 PH
EXCITATION VOLTS (NOM):	125
EXCITATION AMPS:	240
TEMP RISE: - Stator	80°C RTD
Rotor	80°C RES
APPLICATION:	Reciprocating Compressor Drive
ENCLOSURE:	Open
STARTING TORQUE (NOM):	70% FLT at full voltage
PULL IN TORQUE (NOM):	50% FLT at full voltage
PULL OUT TORQUE (NOM):	150% FLT
STARTING METHOD:	Autotransformer

B.

EXCITER SPECIFICATION

TYPE:	AF - brushless exciter
MODEL:	106673
SERIAL # :	931737 & 931738
KW :	33
SPEED:	327 RPM
EXCITATION VOLTS (NOM):	125
EXCITATION AMPS:	6.0
TEMP RISE:	60° RES
DRIVE:	Direct - shaft mounted
ENCLOSURE:	Open - screen protected

C.

BRUSHLESS SYNCHRONOUS MOTOR CONTROL DATA SHEET

CUSTOMER CIR/Mobil Requisition 9280-660-100

MOTOR Eng. Notice 114512 Serial No. Control Reqn.

EXCITER Eng. Notice 106673 Serial No. 931737-931738

RATING

Type TS Poles 22 HP 4000 KVA 3120 RPM 327 Volts 4000 Phases 3

Hz 60 PF 1.0 Amps 450 Temperature rise 80 °C

Service Factor 1.0 Driven Load Compressor

EXCITER FIELD DATA

Field amps at rated load 6.0 Resistance at 25°C 14.5 Ohms

Rated Excitation Volts 125 Discharge Resistance -- Ohms

Minimum Field amps+ 2.0 Field volts (cold) 29

Overload field amps -- Field volts (hot) 105

MOTOR ROTOR DATA

++Allowable stalled time at full voltage (secs.) zero speed 4.0

50% speed 5.0 75% speed 9.0 Pull-in speed 60

Estimated starting time on 61% Tap Autotransformer % voltage 5.5 Sec. with connected load.

MOTOR STATOR DATA

Stator amps at rated load 450 Stator amps at overload --

Starting current at full voltage *‡ zero speed 430 % Pull-in Speed 190 %

Compensator taps** 58 % 61 % 64 %

Start on 61 % Voltage Synchronize on 100 % Voltage

Maximum full voltage armature current on first slip cycle at pull out with rated excitation 226 %

Pull out torque 150 %

OTHER DATA***

Xd 1.45 P.U. X'd 0.36 P.U.

NOTE:- System short circuit capacity assumed 110MVA

Transformer 6750 KVA with 6.5% reactance.

Average starting KVA 1.5 P.U. (See graph 352HA862 Rev.1)

Starting sequence: auto transformer on for 5.5 sec., full voltage for 3.0 seconds, then actuate the synchronizing sequence.

NOTES

* Motor starting current is proportional to the voltage at motor terminals.

\+ For all synchronous motors rated 1000 HP or less, except those forming parts of MG sets the minimum field current will be taken as 90% of the ½ load excitation at rated P.F. For all other motors the minimum field current will be taken as 90% of no load excitation. The total rheostat resistance will be that required to obtain minimum field current.

++ Minimum value of stalled time is 1.5 sec.

‡ Unless otherwise noted rms starting current over starting period may be taken as 85% of the locked rotor value.

** Actual voltage at motor terminals. Standard auto transformer taps are 50%, 65%, 80%.

*** Specify all terminal arrangements other than 3 leads. Special data for part winding or reactor starting and dynamic braking.

Prepared by GW Herzog/DS Hyndman Date 26 August 1968

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

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COMPONENTS INSIDE DASHED LINE ROTATE WITH MOTOR (TYP.)
B1 - B6 INDICATE SILICON RECTIFIERS.
SCR1 - SCR6 INDICATE SILICON THYRISTORS (SCR'S)
Z1 - Z4 INDICATE ZENER DIODES - B2 VOLTAGE
F1 - F2, E5 - EXCITER ARMATURE TERMINALS
A & B - MOTOR FIELD TERMINALS.
ARMATURE MAY ALSO BE CONNECTED
EXCITER ROTOR
MOTOR LEADS
MOTOR

D.

ACCESSORIES

Stator Winding RTD's:- Six 10 ohm copper resistance temperature detectors embedded in the stator winding, 2 per phase.

Surge Capacitor:- One three pole capacitor to provide surge and voltage peak protection between phases. Supplied loose - Cat.# 473L801-2.

Lightning Arrestors:- Three arrestors, one per phase to provide surge and voltage peak protection to ground - supplied loose. - Model 9L11LAB904.

Current Transformers:- Three current transformers for differential protection - supplied loose.
Type JCBO rated 50/5 amps. Ref. A8949891.

GENERAL DESCRIPTION

These motors are "engine type" units supplied with the stator mounted on sole plates, a rotor less shaft and bearings, and an AC brushless exciter.

Stator

The stator is of conventional construction and contains a winding made up of "vacuum pressure impregnated" coils. The stator winding endheads are enclosed by fibre glass endshields which are split at the horizontal centre line and are gasketed against the stator "side plates". The stator leads are brought out of the bottom of the frame for customer's connections in the motor pit.

Rotor

The rotor consists of a fabricated spider, with bolted-on poles and a fully interconnected amortisseur winding. The rotor hub is split and has a machined keyway for attachment to customer's shaft. Two lengths of field cables are provided for connection to the AC brushless exciter.

Exciter Magnet Frame

The magnet frame consists of a solid circular frame to which the poles are bolted. The frame is foot mounted to a pipe support which sits astride the sole plates. Provision is made for shimming under the magnet frame feet and also between the pipe support and the sole plates.

Exciter Armature and Heat Sink Assembly

The exciter armature is spigotted and bolted to the compressor shaft. The heat sink, which carries the rectifier diodes, thyristors and zener diodes, is bolted to the armature and mounted between the armature and the rotor spider. There are two terminals for the field lead connections

INSTALLATION

Setting the Air Gaps

The air gap should be set such that all gaps are uniform. The air gap is the radial iron to iron distance from the circumferential centre of the pole face to the face of a tooth. The rotor should be rotated into different positions measuring the air gap at all points. All air gaps should be within plus or minus 10% of the average of all readings. When the stator frame is positioned such that the air gap is correct and the core is located correctly axially and radially with respect to the rotor, dowel the stator feet to the sole plates with the liquid dowel kit supplied.

The air gap of the exciter should be set in a similar manner to that of the motor. The air gap of the exciter may be adjusted by placing shims between the exciter pipe support and the frame feet. When the air gap has been set, dowel the exciter support to the sole plates with the liquid dowelling kit supplied.

Electrical Connections

Connect the incoming cable to the three line leads (T_1, T_2, T_3) via the differential current transformers, the surge capacitor and lightning arrestors which are mounted in the motor pit, and short the neutral cables (T_4, T_5, T_6) with the neutral bar supplied. Insulate all joints for 4000 volts.

After the exciter armature has been bolted to the shaft it is necessary to connect the DC output from the heat sink assembly to the field winding.

Connect the two rotor cables (A, B) to the two terminals located on the "compressor side" of the heat sink. Reversal of these cables will have

no effect on the performance of the motor. The cables must be secured to the shaft by the cable clamp supplied. It will be necessary to drill and tap holes in the shaft at site, to locate the cable clamp.

If the heat sink assembly is supplied as a loose item, then it will be necessary to connect the three phase AC output from the exciter armature to the three terminals on the heat sink. Connect cables E_1, E_2, E_3 to their respective terminals on the heat sink. Check that the heat sink is correctly located on the armature steel supports such that the three armature cables line up with the terminals on the heat sink.

Connect and insulate the DC supply to the exciter magnet frame.

A.C. BRUSHLESS EXCITER

Description

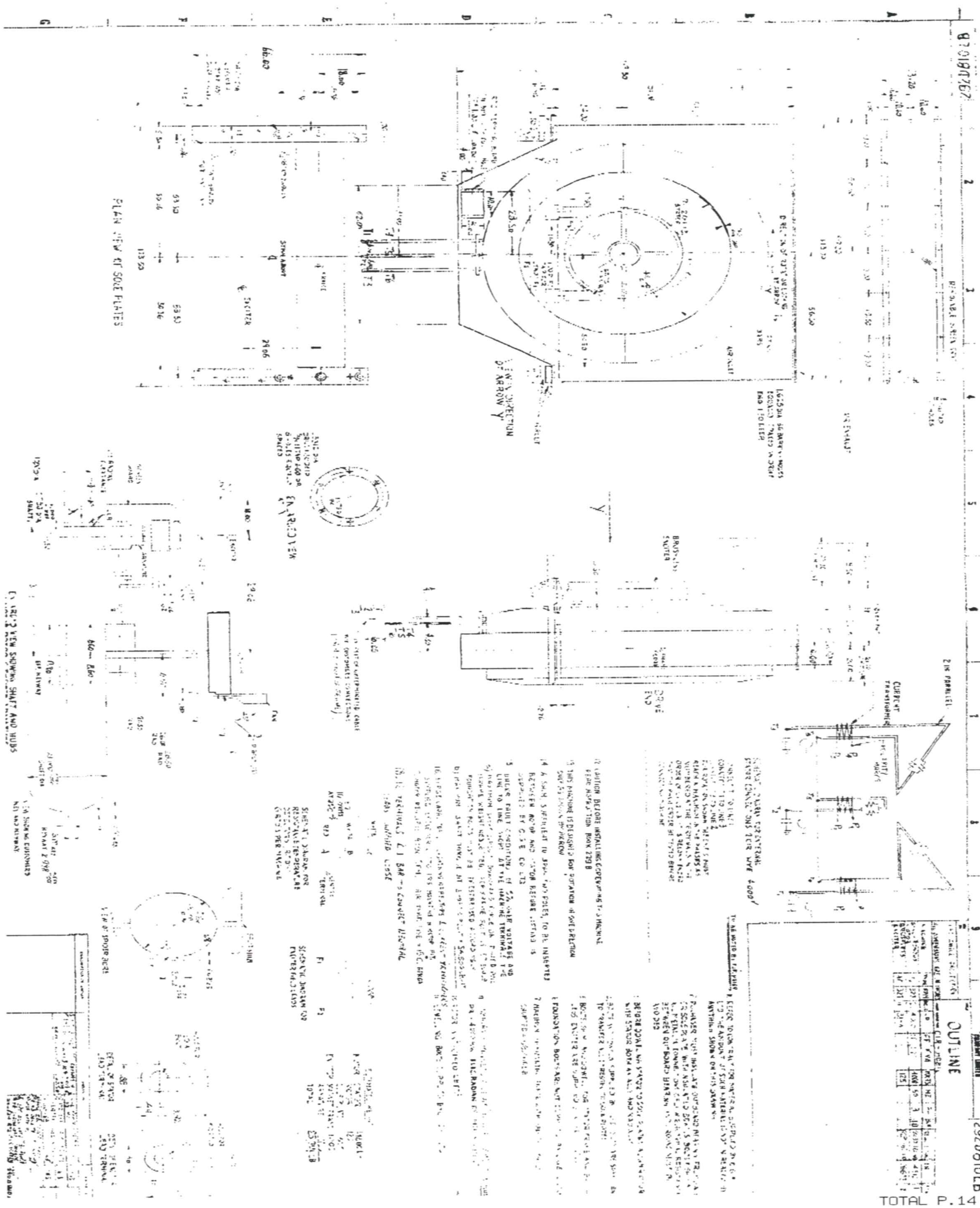
The brushless exciter furnished with this motor is an A.C. generator of the stationary-field, rotating-armature type. Since the armature of the exciter and the field of the motor share a common shaft there is no need for collector rings or brushes to carry excitation current from the exciter to the motor field.

D.C. power for the field of the exciter is furnished from a 125V source. Since the output of the exciter is A.C., it is rectified to provide D.C. power necessary for motor field excitation. This is accomplished by mounting silicon rectifiers on an insulating support which is mounted on the exciter rotor. The output of the exciter is fed to the rectifiers, converted to D.C. power and carried to the motor field.

During the starting period, the motor field must be shorted to carry the induced field current, otherwise the rectifiers would be destroyed by the high field voltage. The shorting is accomplished by the use of silicon-controlled rectifiers (SCR) and zener diodes arranged as shown in Figure 1.

The rectifiers, silicon-controlled rectifiers and zener diodes are mounted on heat sinks, attached to, but insulated from the rotor. The rotation of these heat sinks in the air stream provides sufficient cooling for all the components under all normal values of field current.

SECTION A-A
SECTION B-B
ASSEMBLY OF EXCITER


PLAN VIEW OF SOLE PLATES
VIEW IN DIRECTION OF ARROW Y
CURRENT TRANSFORMER
DRIVE END
OUTLINE