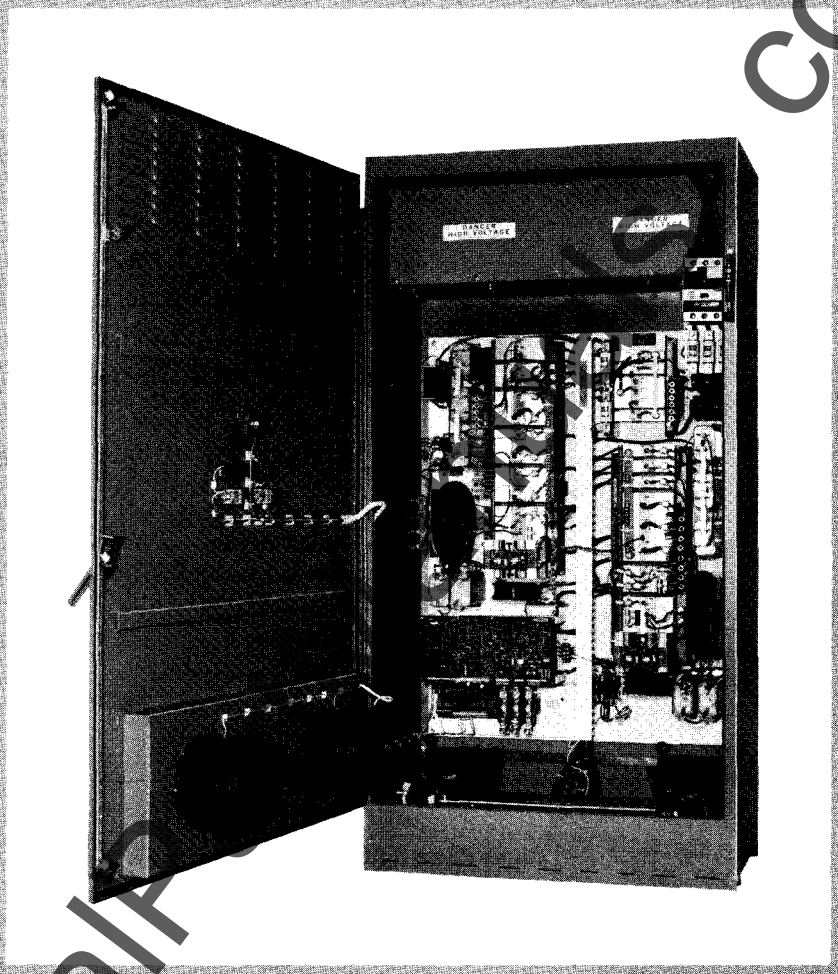


omegapak™

Adjustable Frequency Controller

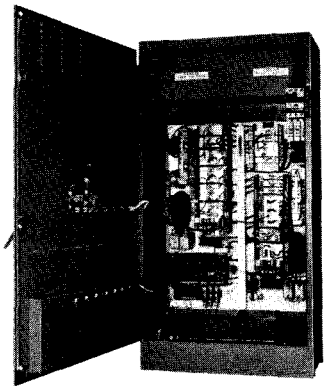
15-150 HP

CONTENTS

AC ADJUSTABLE SPEED CONTROL SYSTEMS
SELECTION GUIDE

AC adjustable speed control systems are coordinated solid state ac adjustable speed controllers for all variable torque loads and with proper application, many constant torque and constant horsepower loads. These systems consist of: Class 8807 or Class 8808 adjustable speed controllers and Class 8809 director automatic speed reference and sequence controls.

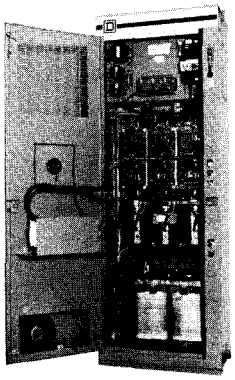
CONTROL SYSTEMS



Class 8807 OMEGAPAK™ Adjustable Frequency Controller

- 6 to 60 Hertz or 12 to 120 Hertz Speed Range Capability
- Current Source Design
- Stepless Speed Control
- Control for Standard NEMA B Design Squirrel Cage Motors
- High Efficiency
- MCC Construction

Refer to Class 8807 Catalog



Class 8808 ECONOPAK™ Slip Power Recovery Controller

- 50% and 100% Speed Range Adjustable Speed Controllers
- Simplex and Duplex Adjustable Speed Control
- Stepless Speed Control
- Control for Wound Rotor Motors
- High Efficiency
- MCC Construction

Refer to Class 8808 Catalog

Class 8809 Director Solid State Automatic Speed Reference Controller

- Simplex and Duplex Solid State Level, Pressure, Flow, or Temperature Control
- Programs Adjustable and Constant Speed AC Adjustable Speed Motors
- MCC Construction

Refer to Class 8809 Catalog

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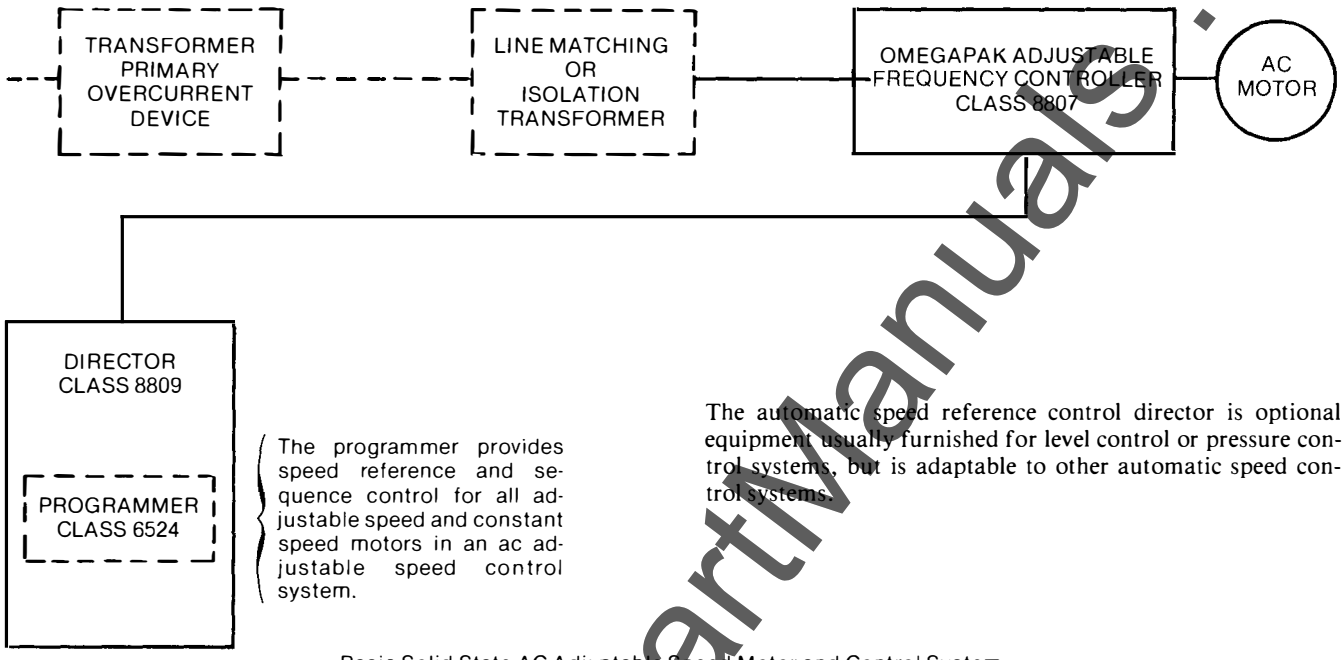
CLASS 8807

ADJUSTABLE FREQUENCY CONTROLLER

FOR AC ADJUSTABLE SPEED CONTROL SYSTEMS

Class 8807 adjustable frequency controllers are for use with standard ac squirrel cage induction motors operating constant or variable torque loads in an adjustable speed control system.



Basic Solid State AC Adjustable Speed Motor and Control System

PRICING INSTRUCTIONS

1. ADJUSTABLE SPEED CONTROLLERS — Determine the quantity of adjustable frequency ac adjustable speed controllers. Determine horsepower ratings, type of load, speed range, motor voltage and current. Refer to pricing information. Include the appropriate controller modifications.

2. ISOLATION OR LINE MATCHING TRANSFORMER — Determine the quantity of transformers specified, primary voltage, secondary voltage and KVA rating. Refer to the current Square D Digest for transformer prices. This transformer will be for separate mounting.

3. TRANSFORMER PRIMARY OVERCURRENT DEVICE — Determine the quantity of overcurrent devices specified, voltage and current rating. Refer to Class 8998 catalog for pricing.

4. EMERGENCY BYPASS AND ISOLATION CONTACTORS — When specified each motor will require bypass and isolation contactors to permit full speed emergency operation. Refer to Item 3 in the Additions and Modifications table.

5. AUTOMATIC SPEED REFERENCE CONTROL SYSTEM — Determine the process to be controlled and refer to the Class 8809 catalog for pricing.

ORDERING INFORMATION REQUIRED

Controller Information:
- Class
- Type
- List of Modifications

Application Data:
- Minimum Speed
- Maximum Speed
- Application Description
- Supply Voltage

Motor Data:
- Horsepower
- Voltage
- Full Load Current
- Service Factor
- Enclosure Type
- Temperature Rise
- Frame Size

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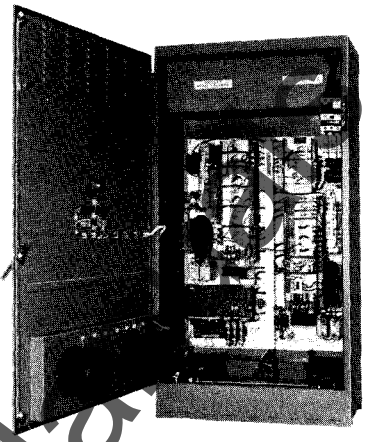
ADJUSTABLE FREQUENCY CONTROLLER

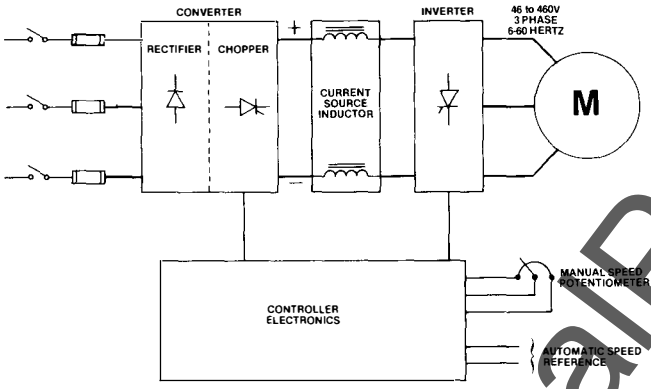
PRICING INFORMATION AND MODIFICATIONS

Adjustable frequency controllers provide stepless speed control for standard 460V, 3 phase, NEMA Design B, ac squirrel cage induction motors. Thyristors (SCR's), diodes and their associated circuits vary the frequency applied to the motor for speed control. Basic controller includes:

Basic controller includes:

- Three phase bridge rectifier
- Thyristor current source chopper
- Thyristor inverter
- Output voltage clamp
- Disconnect switch with external operator, door interlocked
- Hand - Off - Automatic selector switch
- Manual speed adjustment
- Power on light
- Run light
- Speed indicating meter
- NEMA Type 1 enclosure





460V, 3 Phase, 50/60 Hertz ▲		0 to 40°C Ambient	
460 Volt Horsepower†	Maximum Full Load Current Amperes†	Variable and Constant Torque Applications 150% Current for 60 Seconds Type	Price*
15	21	CT-015	**$17,430.**
20	28	CT-020	**20,084.**
25	34	CT-025	**21,960.**
30	40	CT-030	**23,790.**
40	53	CT-040	**26,352.**
50	65	CT-050	**27,816.**
60	77	CT-060	**30,012.**
75	98	CT-075	**37,371.**
100	126	CT-100	**44,447.**
125	156	■VT-125	**44,447.**
150	188	■VT-150	**45,741.**

† Select controller based on motor horsepower and full load current.
* A motor starter is not recommended or required. Refer to Use of Contactors section of Application Data.
▲ For 230V applications consult factory.
■ Variable torque applications only. Rated 110% for 60 seconds.

ADDITIONS AND MODIFICATIONS

Item	Description		Price
	POWER CIRCUIT MODIFICATIONS:		
1	Power Bus (Per Controller)	HP @ 460V	
	600 Amp	15 - 30	**$ 360.**
		40 - 60	**541.**
		75 - 150	**Consult Factory**
	1000 Amp	15 - 30	**561.**
		40 - 60	**842.**
		75 - 150	**Consult Factory**
	1200 Amp	15 - 30	**629.**
		40 - 60	**943.**
		75 - 150	**Consult Factory**
	1600 Amp	15 - 30	**763.**
		40 - 60	**1141.**
		75 - 150	**Consult Factory**
2	Ground Bus		
	300 Amp	15 - 30	**143.**
		40 - 60	**214.**
		75 - 150	**Consult Factory**
	600 Amp	15 - 30	**285.**
		40 - 60	**427.**
		75 - 150	**Consult Factory**

Item	Description	Price
3	Bypass and isolation contactors to permit emergency full speed operation.	
	HP @ 460V	
	15 - 25	**2336.**
	30 - 50	**3004.**
	60 - 100	**4801.**
	125 - 150	**7471.**
	CONTROL CIRCUIT MODIFICATIONS	
4	Push Button or Selector Switch	**92.**
5	Pilot Light (specify color)	**48.**
6	Remote operator station instead of cabinet mounted devices	**Consult Factory**
	METERING	
7	Elapsed Time Indicator	**233.**
8	Ammeter with CT	**540.**
9	Voltmeter	**270.**
10	Test meter to aid troubleshooting	**960.**

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ADJUSTABLE FREQUENCY CONTROLLER

APPLICATION DATA

When applying adjustable frequency controllers, the following items must be considered — as described below and in the following pages.

Maximum and Minimum Speed
Motor Selection
Type of Load
Efficiency
Power Factor
Speed Regulation
Controller Ventilation, Heat Loss, Ambient Temperature
Use of Contactors

MAXIMUM SPEED AND MINIMUM SPEED

The standard controller can produce an output frequency of from 6 Hz to 60 Hz. This corresponds to a motor speed range of 10% to 100% of rated speed. Many applications do not require the motor to operate below 10% speed; consequently, the controller has been designed to allow the motor to operate down to 10% speed (6 Hz) but is adjustable up to 40% speed (24 Hz). Although maximum operating frequency is normally 60 Hz and is factory set at that point, the maximum operating frequency is adjustable from 30 Hz to 63 Hz (50% to 105% rated speed).

Some special applications require the motor to operate at 150% rated or as much as 200% rated speed. The controller can be modified to operate within these extended motor speeds but the motor manufacturer must be consulted to verify that the motor will not be damaged and can withstand speeds above its 100% rating.

MOTOR SELECTION

Motors used with the controller will normally be industry standard NEMA Design B squirrel cage induction motors; however, in some cases where very precise speed regulation is required, synchronous motors may be required. When selecting a motor for use with an adjustable frequency controller or applying a controller with an existing motor, the effects of reduced speed operation on the motor must be considered. The cooling air flow through or over the motor is a function of the speed at which internal or external fans are turning. As a result, the motor will run hotter at reduced speed unless its loading is reduced (see Type of Loads). Also, additional heating will occur when the motor runs at reduced speeds, because the motor input power will contain some harmonics. In general, most open drippproof and totally enclosed fan cooled (TEFC) motors will tolerate operation from 50% to 100% rated speed without difficulty (see Types of Loads). A 1.15 motor service factor is recommended.

TYPES OF LOADS

Motor loads generally fall into three categories: variable torque, constant torque and constant horsepower. In general, application of adjustable speed controllers to motors driving variable torque loads is relatively simple. Motor heating is not normally a problem, as the torque requirements are less as the speed is reduced. Constant torque and constant horsepower loads are more difficult. The motor manufacturer should be consulted before applying adjustable speed controllers to motors driving these type loads. Forced ventilation may be recommended and the minimum and/or maximum speed may be limited.

EFFICIENCY

The controller controls the synchronous speed of an ac induction motor and does not cause slip loss power to be produced when the motor operates at less than rated speed. The controller efficiency remains high, approximately 94%, while the motor efficiency varies according to the motor size, operating speed, and loading. Generally, larger motors have higher efficiencies and motor efficiency drops as the load becomes less.

POWER FACTOR

The displacement power factor of the standard controller remains essentially constant at .95 lagging regardless of motor speed, motor load, or motor power factor.

SPEED REGULATION

AC motors are considered constant speed machines; however, this is not entirely true. The motor speed will deviate with loading. As load increases, motor speed will decrease slightly due to increased slip (the difference between the stator rotating field speed and rotor speed). The controller includes a feature called slip compensation which will correct for speed variations due to load changes. Speed regulation with slip compensation is ±1% of full speed. If better regulation is required it will be necessary to use a synchronous motor.

CONTROLLER VENTILATION, HEAT LOSS, AMBIENT TEMPERATURE

The standard controller is equipped with fans to circulate air through the enclosure. A slight amount of heat, approximately 152 BTU per hour per horsepower, will be dissipated into the control room. Normal control room ventilation will usually keep the ambient temperature within the required 0° to 40°C range. If temperatures below 0°C are expected, space heaters should be added to the controller. If temperatures higher than 40°C are expected, additional cooling will be required or the controller must be derated.

BYPASS AND ISOLATION CONTACTORS

The standard controller does not include the provision for emergency full speed operation. If this feature is desired, bypass and isolation contactors will be required. The isolation contactor isolates the controller from the line, while the bypass contactor applies 60 Hertz line power to the motor. Care should be taken to ensure that the isolation contactor does not open while the controller is operating. A contactor should not be used between the ac supply line and the controller 460 volt input.

CURRENT LIMIT

The OMEGAPAK controller employs a current regulator circuit that limits the inrush current during starting and acceleration. This feature when properly utilized can often result in lower KVA ratings on stand-by emergency power equipment. The controller current limit is adjustable between 50% and 150% of motor nameplate full load current; which can be field adjusted by a potentiometer on the main control board.

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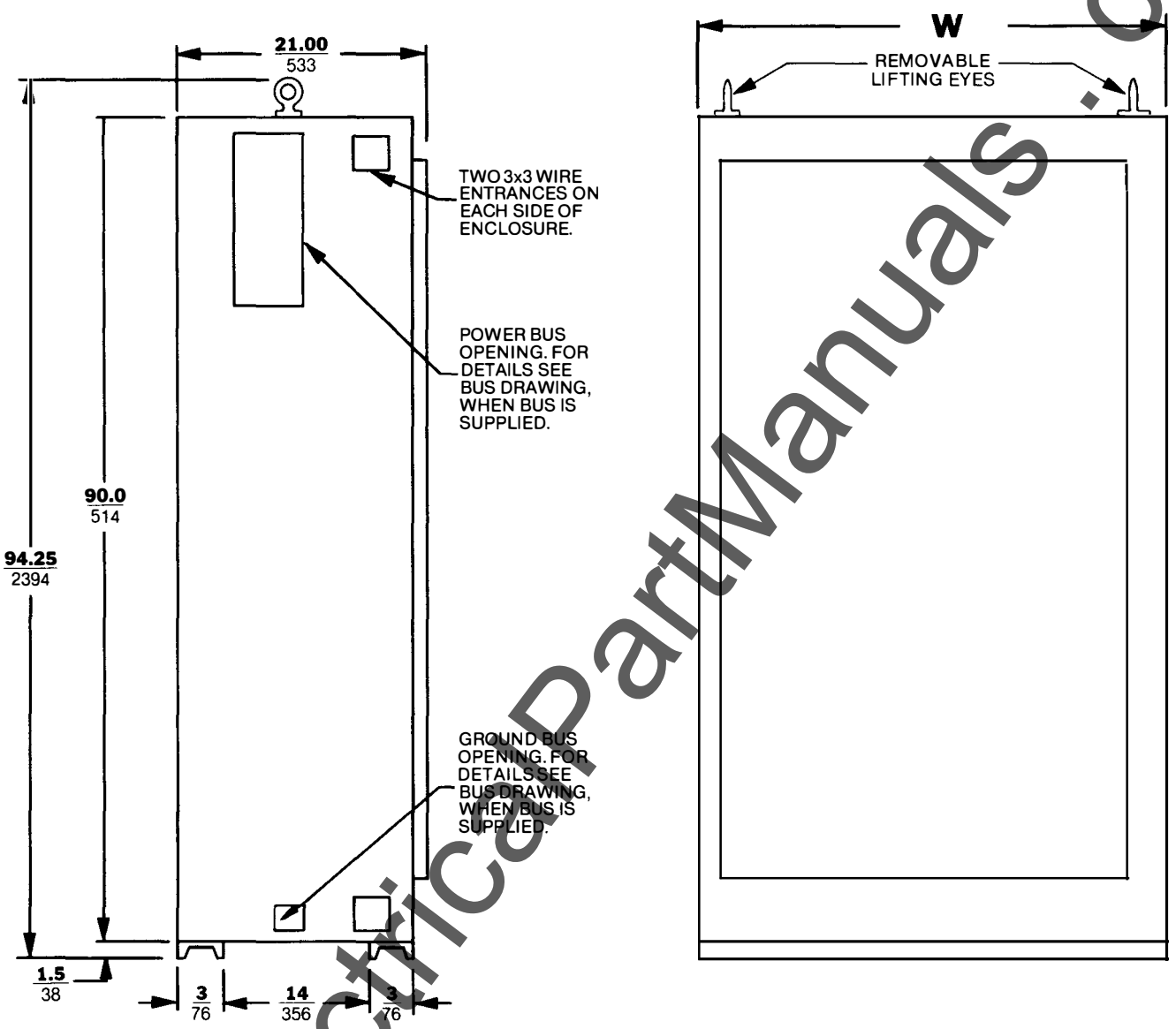
ADJUSTABLE FREQUENCY CONTROLLER

DIMENSIONS



HORSEPOWER 460V	DIMENSION WIDTH	APPROXIMATE WEIGHT
15 - 30	37 / 940	1000 lbs.
40 - 60	48.5 / 1232	1500 lbs.
75 - 150	72 / 1829	2000 lbs.

Dual Dimensions: INCHES / Millimeters

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ADJUSTABLE FREQUENCY CONTROLLER

GENERAL SPECIFICATIONS

CLASS 8807

1.0 GENERAL

An adjustable speed control system shall be supplied to control the speed of a standard ac squirrel cage induction motor by controlling the frequency applied to the motor driving the load. A separate adjustable speed controller shall be supplied for each motor. Failure of an adjustable speed controller shall not prevent other system loads, which normally operate as adjustable speed loads, from operating in an adjustable speed manner. The adjustable speed control system shall be designed to operate from a manual speed control potentiometer or accept an automatic speed reference signal.

2.0 ADJUSTABLE CONTROLLERS

The adjustable speed controls shall be Square D Company, OMEGAPAK™ adjustable frequency controller to control the speed of a ____ HP, 460 volt squirrel cage motor from ____% to full rated speed. The controller shall be of the adjustable frequency type and shall be fully rated to control the motor under all speed and load conditions. The controller shall not cause system displacement power factor to be less than .95 at any speed.

The adjustable frequency controller shall accept 460 volt, 3 phase, 50/60 Hertz input power, convert it to dc, and regulate the current to a thyristor inverter, and clamp the output voltage to a level which will not degrade the insulation of a standard squirrel cage induction motor.

The adjustable frequency controller shall be inherent electronic short circuit protected in that a short circuit placed on the inverter output terminals shall not damage the controller or cause a protective fuse to blow. The controller shall be equipped with adjustable current limit, individually adjustable acceleration and deceleration rates, and adjustable minimum and maximum speeds. Speed regulation shall be ± 1% of full speed without the use of a tachometer. A door mounted speed indicating meter shall be supplied.

The controller shall be equipped with a main disconnect switch interlocked with the controller door. A Hand-Off-Automatic selector switch and manual speed control shall be provided. The controller shall also accept an input signal of 0-10 vdc or 4-20 ma dc as an automatic speed control signal when the controller is in the automatic mode.

Electronic circuitry shall include diagnostic light emitting diodes (LED's) which monitor circuit operation.

The controller shall be housed in a NEMA Type 1, free-standing enclosure and shall be designed to operate in an ambient temperature range of 0 °C to 40 °C.

SQUARE D COMPANY

10/82 CS 20M

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