World Class Design | World Class Function | 30 Years Expertise in Industrial Motor Control

ENCLOSED DC DRIVE

370E / 400E / 800E / 1200E
400ER / 800ER / 1200ER



SPRINT ELECTRIC

Product Manual

HG105275EN00 Issue 1 (04/2022)

Please read this information before installing or using the product.

Install, use and maintain this product following the procedures provided.
The manual(s) cannot provide all details, variations and contingencies required for your installation, operation and maintenance of this product or the apparatus with this product installed. For further help or information, refer to your local Supplier sales office.

Application area

The equipment described is intended for industrial (non-consumer) motor speed control.

Intended users

To safely enable the user to obtain maximum benefit from the equipment:

- Ensure this information is available to all persons required to install, configure or service the described equipment or any other associated operation.
- Always store the manual in a conveniently accessible area for quick reference.
- Make it available for the next user/owner of the product.

This product is of the restricted sales distribution class according to IEC 61800-3 and has a "professional equipment" designation as defined in EN 61000-3-2.

Safety

Ensure all users and operators understand the included WARNINGS, CAUTIONS and NOTES, which alert the user to safety issues. COMPLY WITH WARNINGS AND CAUTIONS AT ALL TIMES. Each of these carries a special meaning and should be read carefully:



WARNING!

A WARNING is given when non-compliance with the warning may result in personal injury and/or equipment damage.



CAUTION!

A CAUTION is given when non-compliance with the caution may result in permanent equipment damage.

NOTE A note provides specific information to make important instructions clear.

Symbols

 **Attention**	 **Electrostatic Discharge (ESD)**	 **Electric Shock Hazard**
See the instructions for use. Specific warnings not found on the label.	This equipment contains ESD sensitive parts. Observe static control precautions when handling, installing and servicing this product.	Disconnect the mains supply before working on the unit. **Do not touch presets, switches and jumpers!** Always use the correct insulated adjustment tools.

WARNING!

Only qualified personnel must install, operate and maintain this equipment.
A qualified person is someone technically competent and familiar with all safety information, established safety practices, installation, operation, maintenance and the hazards involved with this equipment and any associated machinery.

Hazards

This equipment can endanger life through rotating machinery and high voltages.

WARNING!

PERSONAL INJURY AND/OR ELECTRICAL SHOCK HAZARD

- Always isolate all power supplies from the equipment before starting any work.
- Never perform high voltage resistance checks on the wiring without first disconnecting the product from the circuit under test.
- Use guarding and additional safety systems to prevent injury and electric shock.
- Metal parts may reach 90°C during operation.

CAUTION!

EQUIPMENT DAMAGE HAZARD

- We thoroughly test our products. However, before installation and start-up, inspect all equipment for transit damage, loose parts, packing materials, etc.
- Installation must observe the required environmental conditions for safe and reliable operation.
- In a domestic environment, this product may cause radio interference, requiring adequate measures to be taken. Obtain the permission of the supply authority before connecting to the low voltage supply.

General risks

Installation

- Ensure mechanically secure fixings are in use as recommended.
- Ensure cooling airflow around the product is as recommended.
- Ensure cables/wire terminations are as recommended and are torqued correctly.
- Ensure the product rating is correct - do not exceed the rating.

Application risk

Electromechanical safety is the responsibility of the user. The integration of this product into other apparatus or systems is not the manufacturer's or distributor of the product's responsibility. It is the user's responsibility to ensure the compliance of the installation with any regulations in force.

Health and safety at work

Electrical devices can constitute a safety hazard. Thorough personnel training is an aid to SAFETY and productivity. SAFETY awareness not only reduces the risk of accidents and injuries in your plant but also has a direct impact on improving product quality and costs. If you have any doubts about the SAFETY of your system or process, consult an expert immediately. Do not proceed without doing so. If in doubt, refer to the Supplier.

Weight

Consideration should be given to the weight of our heavier products when handling.

Risk assessment

Under fault conditions or conditions not intended: the motor speed may be incorrect; the motor speed may be excessive; the direction of rotation may be incorrect; the motor may be energised.

In all situations, the user should provide sufficient guarding and/or additional redundant monitoring and safety systems to prevent risk of injury.

NOTE: During a power loss event, the product will commence a sequenced shut-down procedure. Therefore, the system designer must provide suitable protection for this case.

Maintenance

Only qualified personnel should maintain and effect repair using only the recommended spares, alternatively return the equipment to the factory for repair. The use of unapproved parts may create a hazard and risk of injury.



WARNING!

PERSONAL INJURY AND/OR EQUIPMENT DAMAGE HAZARD

When replacing a product, all user-defined parameters that define the product's operation must be installed correctly before returning to use. Failure to do so may create a hazard and risk of injury.

The packaging is inflammable and incorrect disposal may lead to the generation of lethal toxic fumes.

Repairs

Repair reports can only be given if the user makes sufficient and accurate defect reporting. Remember that the product without the required precautions can represent an electrical hazard and risk of injury, and that rotating machinery is a mechanical hazard.

Protective insulation

Non-isolated product



WARNING!

The motor must be connected to an appropriate safety earth.
Failure to do so presents an electrical shock hazard. Exposed metal work in this equipment is protected by basic insulation and bonding to a safety earth.

1. **There is no isolation between the Power and Control Circuits. ALL connections to the Drive are HAZARDOUS.**
2. **The Installer MUST provide Protection for the End User** by using Double or Re-inforced Insulation. The drive's Control signal terminals operate at the output voltage of the drive. Therefore, User controls **MUST** be made safe by the use of suitably insulated components, i.e. Potentiometer, Run Switch.
3. **DO NOT** connect these Control signal terminals to low voltage equipment or any non-isolated potential as this will cause significant damage to both the Drive and attached equipment.

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Disposal

This product contains materials that are consignable waste under the Hazardous Waste Regulations 2005. Metal and plastic materials can be recycled, however, disposal of the printed circuit board requires compliance with all valid environmental control laws.



Products that must be recycled in accordance with the WEEE Regulations are marked with the symbol opposite. Contact us when recyling the product.

1 Introduction

APPLICATION AREA: Industrial (non-consumer) "Motor speed control utilising DC Motors".

The enclosure contains a Sprint-Electric 370, 400, 800 or 1200 DC drive. The drive is a non-isolated DC drive for controlling the speed of small brushed shunt wound or permanent magnet DC motors.

- **E** suffix enclosures are for single-direction motor control.
- **ER** suffix enclosures are for bi-directional motor control and have a Reversing Unit fitted.

The enclosed drive uses speed feedback from the armature voltage or shaft-mounted tachogenerator and incorporates a current control loop to protect the drive and motor.

This manual describes the enclosure. For set-up and commissioning of the unit(s) refer to:

- The enclosed Drive Product Manual
  370: HG105269EN00 400 / 800/ 1200: HG105270EN00
- The Reversing Unit Product Manual (**ER** suffix enclosures only): HG105280EN00



WARNING!

PERSONAL INJURY AND/OR EQUIPMENT DAMAGE HAZARD

This drive is NON-ISOLATED:

ALL terminals and electronics are at dangerous line potential with power applied to the drive.

Do not connect the electronics to earth or other non-isolated voltage.

Remember, all wires, potentiometers, contacts, etc., connected to the terminals will be floating at mains potential.

Ensure that connected items (e.g. Tacho etc.) are NOT earthed and have sufficient dielectric strength to avoid breakdown.

Connecting to other instruments, e.g. a panel meter: ensure the instrument can float safely at high voltage.

Never work on any control equipment without first isolating all power supplies from the equipment.

Protection must be provided by a correctly rated HRC fuse, fitted upstream of the drive. Refer to "6.4 Fusing" on page 9. The built-in line fuse is a semi-conductor protection type.



WARNING!

PERSONAL INJURY HAZARD

RUN is an electronic inhibit function. The field remains energised, and all power terminals 'live'. During hazardous operations, remove the power source to the system. **RUN must not be relied on to ensure the machine is stationary.**

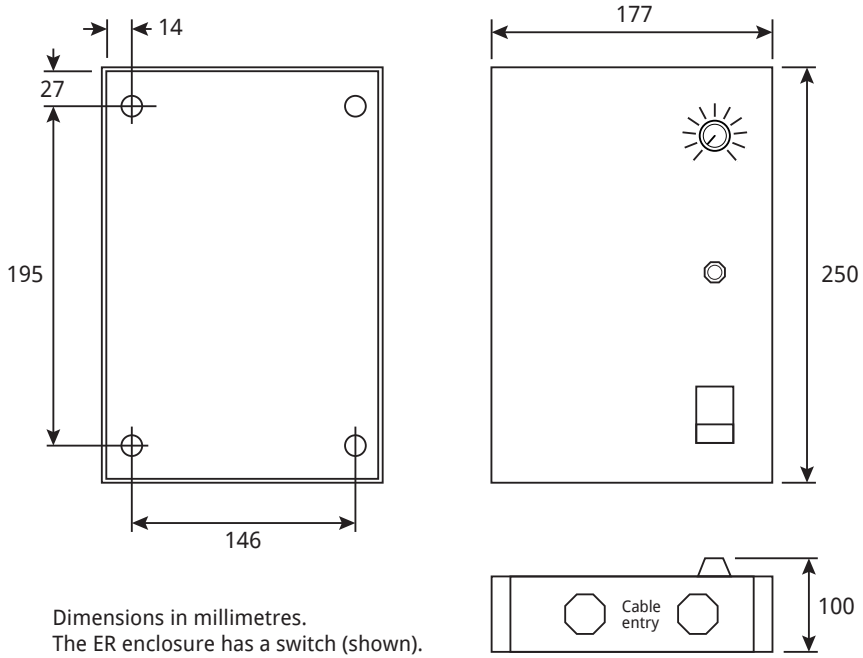
1.1 Enclosure controls

- Mains ON/OFF switch
- Set speed potentiometer
- Toggle switch for forward, stop and reverse (**ER** suffix enclosures only)

2 Mechanical dimensions

WARNING!
PERSONAL INJURY AND/OR
EQUIPMENT DAMAGE HAZARD

The enclosed drive (and Reversing Unit, if fitted) is NON-ISOLATED.
Do not allow contact of the enclosure with the drive card electronics.



Dimensions in millimetres.
The ER enclosure has a switch (shown).

Backplate mounting details: 4 off holes for M5 fixings.

Heatsink: The backplate acts as the heatsink for the all-aluminium construction of the IP22 rated enclosure.

SPRINT ELECTRIC LTD. does not accept any liability whatsoever for the installation, fitness for purpose or application of its products. It is the users responsibility to ensure that the unit is correctly used and installed.

Health and Safety at Work
Devices constitute a safety hazard. It is the responsibility of the user to ensure compliance with any Acts or By-Laws in force. **ONLY skilled persons should install this equipment.**

Figure 1 Mechanical dimensions (E and ER suffix enclosures)

3 Guide for systems used in the EU

Special consideration must be given to installations in member states of the European Union regarding noise suppression and immunity. According to IEC 1800-3 (EN61800-3) the drive units are classified as complex components only for professional assemblers, with no CE marking for EMC.

The drive manufacturer is responsible for the provision of installation guidelines. The resulting EMC behaviour is the responsibility of the manufacturer of the system or installation. The units are subject to the LOW VOLTAGE DIRECTIVE 73/23/EEC and are CE marked accordingly.

Following the procedures outlined below will normally be required for the drive system to comply with the European regulations, some systems may require different measures. Installers must have a level of technical competence to correctly install. Although the drive unit itself is not subject to the EMC directive, considerable development work has been undertaken to ensure that the noise emissions and immunity are optimised.

* EN618003 specifies two alternative operating environments. These are the Domestic (1st environment) and Industrial (2nd environment). There are no limits specified for conducted or radiated emissions in the industrial environment, hence it is usual for the AC supply filter to be omitted in Industrial systems.

Definition of an industrial environment: all establishments, other than those directly connected to a low-voltage power supply network that supplies buildings used for domestic purposes.

4 Multiple drives

The arrangement shown below is for multiple drives with one filter, showing the star point earthing method.

The filter should be rated for the worst case total armature current load. The drive units are designed to function normally on unfiltered AC supplies shared with other thyristor DC drives. (Not AC drives).

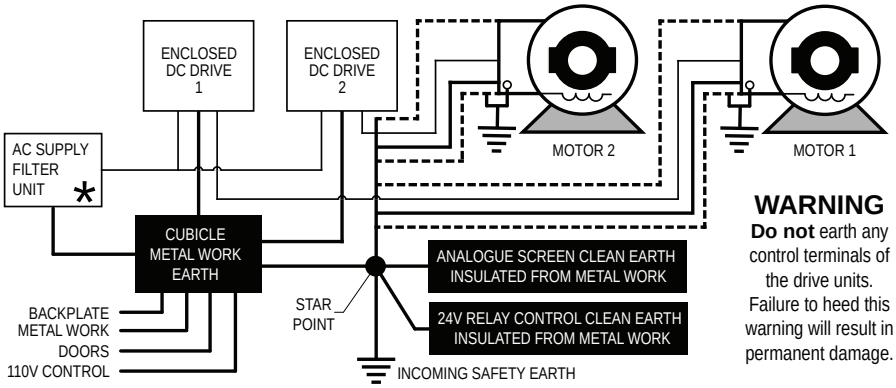


Figure 2 Star point connections for multiple drives

5 Requirements for EMC compliance

- Keep parallel runs of power and control cables at least 0.3 metres apart. Cross-overs must be at right angles.
- Keep sensitive components at least 0.3 metres from the drive and power supply cables.
- The AC connections from the filter to the drive must be less than 0.3 metres or, if longer, correctly screened.
- Do not run filtered and unfiltered AC supply cables together.
- Control signals must be filtered or suppressed, e.g. control relay coils and current carrying contacts. The drive module has built-in filters on signal outputs.
- The AC supply filter must have a good earth connection to the enclosure back plane. Take care with painted metal to ensure good conductivity.
- The AC input filter has earth leakage currents. Earth RCD devices may need to be set at 5% of rated current.
- The metal enclosure will be RF ground. The AC filter, drive earth and motor cable screen should connect directly to the metal cabinet for best performance.
- Linear control signal cables must be screened, with the screen earthed at the drive end only. Minimise the length of screen stripped back and connect it to an analogue earth point.
- **(1)** The motor cable must be screened or armoured with 360 degree screen terminations to earth at each end. The cable must have an internal earth cable and the screen must extend into the enclosure and motor terminal box to form a Faraday cage without gaps.
- **(2)** The internal earth cable must be earthed at each end. The incoming earth must be effective at RF. **WARNING! The earth safety must always take precedence.**



WARNING!
ELECTRIC SHOCK HAZARD

AC supply filters must not be used on supplies that are unbalanced or float with respect to earth.

The drive and AC filter must only be used with a permanent earth connection. No plugs/sockets are allowed in the AC supply.

The AC supply filter contains high voltage capacitors and should not be touched for a period of at least 20 seconds after the removal of the AC supply.

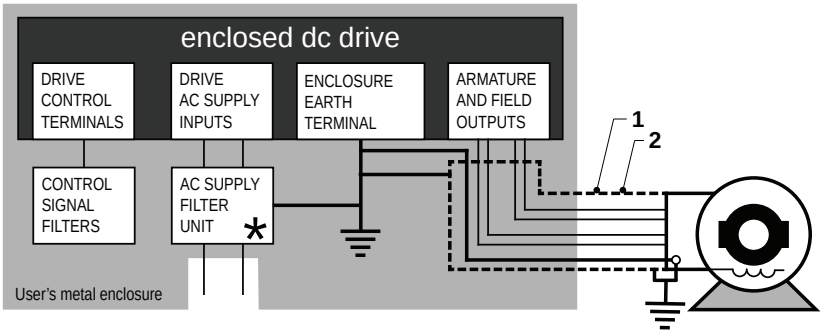


Figure 3 Connections for EMC compliance

6 Installation



WARNING!

ELECTRIC SHOCK HAZARD

Disconnect the mains supply before working on the unit. DO NOT TOUCH PRESETS, SWITCHES AND JUMPERS! Always use the correct insulated adjustment tools.

6.1 Motor installation

- Foot-mounted motors must be level and secure.
- Ensure accurate alignment of the motor shaft and couplings.
- Do not hammer pulleys or couplings onto the motor shaft.
- Protect the motor from ingress of foreign matter during installation.

Earthing: Connect the motor to the system enclosure earth.

6.2 Drive Installation

Requirements during installation and operation:

HEATSINK AIRFLOW: Optimise the heatsink airflow.

- Avoid vibration.
- Protect the drive from pollutants.
- The ambient operating temperature must be within -10ºC and +40ºC.

POWER CABLING: Use correctly rated cable: minimum 600 Vac, 2 x armature current

FUSING: Refer to "6.4 Fusing" on page 9.

CONTROL SIGNALS: All control inputs to these drives are NON-ISOLATED. Do not connect any of the terminals to earth or other low voltage. A common HAZARD is accidental earthing of the external pot and contact wiring. Avoid running signal cables close to power cables.

SUPPRESSION: The drives have excellent noise immunity. However, installations involving electrical welding or RF induction heating may require additional filters on the line and armature terminals. Contactor coils and sparking contacts may also require suppression. A 100 Ω resistor in series with a 0.1 µF capacitor is usually adequate in these situations. Refer to page 4 for EMC guidelines.



CAUTION!

EQUIPMENT DAMAGE HAZARD

Reversing systems: do not transpose the armature connections until the motor has stopped, otherwise damage will occur.

SUPPLY: Connect the incoming AC supply to the rocker switch on the enclosure front panel.

NOTE: units are Factory preset for 240 Vac (or 60 Vac for LV units). **To use with 110 Vac (or 30 Vac for LV units), change the mains selector jumper on the drive unit and move the AC input from Terminal 21 to Terminal 22 on the reversing unit.**

Please ensure that the supply selection jumper on the drive matches the incoming supply. Failure to do this may result in permanent damage to the drive unit and will invalidate any warranty.



CAUTION!

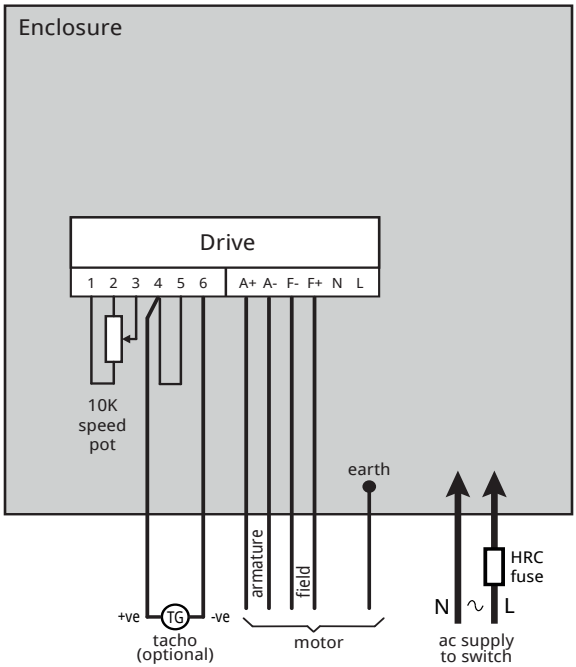
EQUIPMENT DAMAGE HAZARD

For frequent stopping, it is not good practice to rely on switching the supply off and on again to stop and start the drive with the run contact permanently closed.

This practice may result in an uncontrolled current pulse for one half mains cycle under certain conditions, e.g. main contact bounce, and might lead to undesired motor movement or device damage.

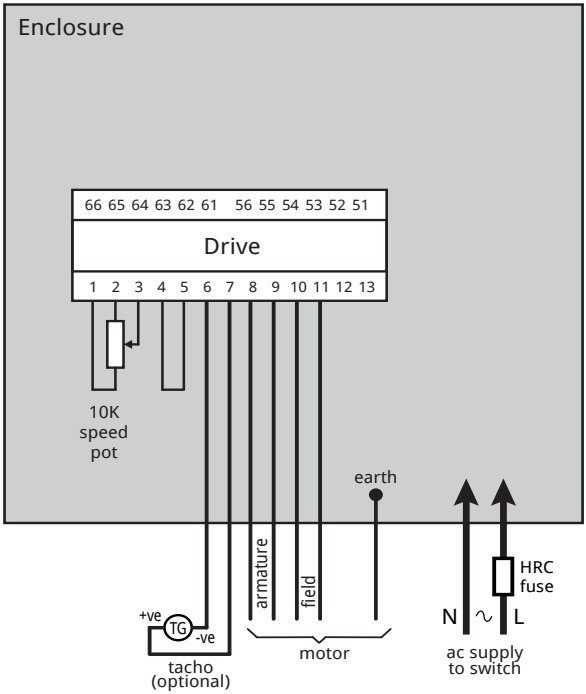
6.3 Enclosure terminals

6.3.1 370E



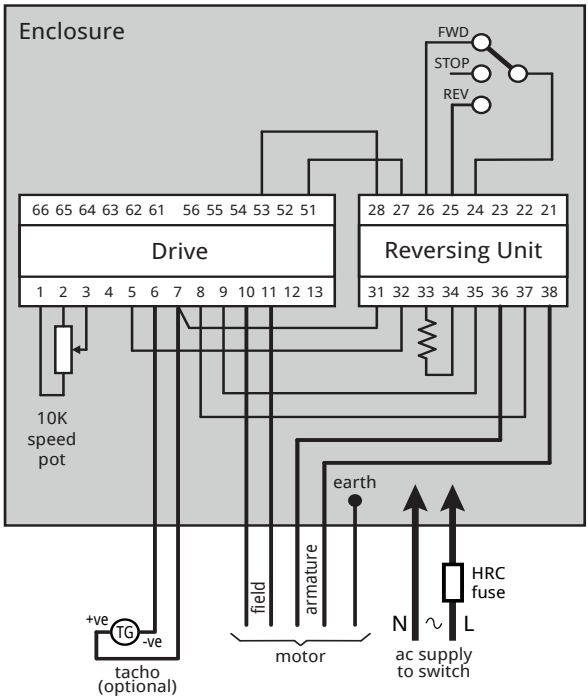
Connection	Terminal	
RUN	4	Common. 0 V (zero).
	5	Internal 12K pull-up resistor to +10 V. Open to stop; close to COMMON to run. Reset release time 0.1 to 0.5 s.
tacho	4	Common. 0 V (zero).
	6	Tacho input 12-200 V full scale. When using Tach feedback, the tach feedback polarity must be negative with respect to COMMON, Terminal 4.
motor	A+	A+ armature output
	A-	A- armature output
	F-	F- field output For half wave field Volts 0.45 x AC, connect field to F– and N.
	F+	F+ field output
	screw	Enclosure earth
ac supply	switch	N Neutral AC supply input according to supply select jumper
	switch	L Line AC supply input according to supply select jumper

6.3.2 400E / 800E / 1200E



Connection	Terminal	
RUN	4	Common. 0 V (zero).
	5	Internal 12K pull-up resistor to +10 V. Open to stop; close to COMMON to run. Reset release time 0.1 to 0.5 s.
tacho	6	Tacho input 12-200 V full scale. When using Tach feedback, the tach feedback polarity must be negative with respect to COMMON, Terminal 4.
	7	Common. 0 V (zero).
motor	8	A+ armature output
	9	A- armature output
	10	F- field output For half wave field Volts 0.45 x AC, connect field to F– and N.
	11	F+ field output
	screw	Enclosure earth
ac supply	switch	N Neutral AC supply input according to supply select jumper
	switch	L Line AC supply input according to supply select jumper

6.3.3 400ER / 800ER / 1200ER



Connection	Terminal	
tacho	6	Tacho input 12-200 V full scale. When using Tach feedback, the tach feedback polarity must be negative with respect to COMMON, Terminal 4.
	7	Common. 0 V (zero).
motor	10	F- field output For half wave field Volts 0.45 x AC, connect field to F– and N.
	11	F+ field output
	36	A+ OUT armature output
	38	A- OUT armature output
	screw	Enclosure earth
ac supply	switch	N Neutral AC supply input according to supply select jumper
	switch	L Line AC supply input according to supply select jumper

6.4 Fusing

NOTE: The following fuse requirements override fuse information in the respective Product Manuals.

Sprint Electric integral fuse parts

The enclosure contains an integral high-speed fuse mounted in a fuse holder on the drive assembly to protect the drive unit only:

Internal fuses for drive units in models 370E, 400E, 400ER

6.3 A fuse, 5 x 20 mm, Part number CH0036A3

Alternatively, fit an AC supply semi-conductor fuse with an I^2t rating below 50 A^2s.

Internal fuses for drive units in models 800E, 800ER, 1200E, 1200ER

20 A fuse, 6 x 32 mm, Part number CH00620A
Alternatively, fit an AC supply semi-conductor fuse with an I^2t rating below 365 A^2s.

External fuses - complete enclosed unit

Protect the enclosed models using suitable external fusing. Use ceramic HRC type fuses rated at least 1.5 x the maximum continuous armature current.

6.5 Enclosure ratings

MODEL	AC SUPPLY RANGE	TYPICAL ARMATURE VOLTAGE	FIELD VOLTAGE	MAX CONTINUOUS ARMATURE CURRENT	FIELD CURRENT**	NOMINAL POWER* @ 180 Vdc
370E	110/240 V	90/180 Vdc	100/210 V	3.7 A	0.5 A	0.55 kW (0.75 hp)
400E				4 A	0.5 A max	0.55 kW (0.75 hp)
800E				8 A	0.5 A max	1.1 kW (1.5 hp)
1200E				12 A	0.5 A max	1.8 kW (2.0 hp)
400ER				4 A	0.5 A max	0.55 kW (0.75 hp)
800ER				8 A	0.5 A max	1.1 kW (1.5 hp)
1200ER				12 A	0.5 A max	1.8 kW (2.0 hp)

* Note that the power output of LV versions will be proportionately lower than is shown above.
** Volts DC = 0.9 x AC supply Volts (0.45 x AC supply Volts for field connected to F- and N)

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We accept no liability whatsoever for the installation, fitness for purpose or application of this product.

It is the user's responsibility to ensure the unit is correctly used and installed.

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The information in this publication was correct at the time of going to print.

We reserve the right to modify or improve the product without notification.

The contents of this manual shall not become part of or modify any prior existing agreement, commitment, or relationship. The sales contract contains the entire obligation of Sprint Electric. The warranty contained in the contract between the parties is the sole warranty of Sprint Electric. Any statements contained herein do not create new warranties or modify the existing warranty.

We will be under no liability for any defect arising from fair wear and tear, negligence, wilful damage, misuse, abnormal working conditions, failure to follow the manufacturer's instructions, unauthorised alteration or repair of hardware, unauthorised or accidental alteration of software or configuration, lost profits, commercial loss, economic loss, or loss arising from personal injury. We may, at our discretion, raise a charge for any faults repaired that fall outside the warranty cover.

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