

514C

DC Controller

Product Manual

HA463296 Issue 6

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WARRANTY

Parker SSD Drives warrants the goods against defects in design, materials and workmanship for the period of 12 months from the date of delivery on the terms detailed in Parker SSD Drives Standard Conditions of Sale IA058393C.

Parker SSD Drives reserves the right to change the content and product specification without notice.

Safety Information



Requirements

IMPORTANT: Please read this information BEFORE installing the equipment.

Intended Users

This manual is to be made available to all persons who are required to install, configure or service equipment described herein, or any other associated operation.

The information given is intended to highlight safety issues, EMC considerations, and to enable the user to obtain maximum benefit from the equipment.

Complete the following table for future reference detailing how the unit is to be installed and used.

INSTALLATION DETAILS	
Serial Number <i>(see product label)</i>	
Where installed <i>(for your own information)</i>	
Unit used as a: <i>(refer to Certification for the Inverter)</i>	<input type="checkbox"/> Component <input type="checkbox"/> Relevant Apparatus
Unit fitted:	<input type="checkbox"/> Wall-mounted <input type="checkbox"/> Enclosure




Application Area

The equipment described is intended for industrial motor speed control utilising AC induction or AC synchronous machines.

Personnel

Installation, operation and maintenance of the equipment should be carried out by qualified personnel. A qualified person is someone who is technically competent and familiar with all safety information and established safety practices; with the installation process, operation and maintenance of this equipment; and with all the hazards involved.

Product Warnings

	Caution Risk of electric shock		Caution Refer to documentation		Earth/Ground Protective Conductor Terminal
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Safety Information



Hazards

DANGER! - Ignoring the following may result in injury

1. This equipment can endanger life by exposure to rotating machinery and high voltages.
2. The equipment must be permanently earthed due to the high earth leakage current, and the drive motor must be connected to an appropriate safety earth.
3. Ensure all incoming supplies are isolated before working on the equipment. Be aware that there may be more than one supply connection to the drive.
4. There may still be dangerous voltages present at power terminals (motor output, supply input phases, DC bus and the brake, where fitted) when the motor is at standstill or is stopped.
5. For measurements use only a meter to IEC 61010 (CAT III or higher). Always begin using the highest range. CAT I and CAT II meters must not be used on this product.
6. Allow at least 5 minutes for the drive's capacitors to discharge to safe voltage levels (<50V). Use the specified meter capable of measuring up to 1000V dc & ac rms to confirm that less than 50V is present between all power terminals and earth.
7. Unless otherwise stated, this product must NOT be dismantled. In the event of a fault the drive must be returned. Refer to "Routine Maintenance and Repair".

WARNING! - Ignoring the following may result in injury or damage to equipment

SAFETY

Where there is conflict between EMC and Safety requirements, personnel safety shall always take precedence.

- Never perform high voltage resistance checks on the wiring without first disconnecting the drive from the circuit being tested.
- Whilst ensuring ventilation is sufficient, provide guarding and/or additional safety systems to prevent injury or damage to equipment.
- When replacing a drive in an application and before returning to use, it is essential that all user defined parameters for the product's operation are correctly installed.
- All control and signal terminals are SELV, i.e. protected by double insulation. Ensure all external wiring is rated for the highest system voltage.
- Thermal sensors contained within the motor must have at least basic insulation.
- All exposed metalwork in the Inverter is protected by basic insulation and bonded to a safety earth.
- RCDs are not recommended for use with this product but, where their use is mandatory, only Type B RCDs should be used.

EMC

- In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.
- This equipment contains electrostatic discharge (ESD) sensitive parts. Observe static control precautions when handling, installing and servicing this product.
- This is a product of the restricted sales distribution class according to IEC 61800-3. It is designated as "professional equipment" as defined in EN61000-3-2. Permission of the supply authority shall be obtained before connection to the low voltage supply.

CAUTION!

APPLICATION RISK

- The specifications, processes and circuitry described herein are for guidance only and may need to be adapted to the user's specific application. We can not guarantee the suitability of the equipment described in this Manual for individual applications.

RISK ASSESSMENT

Under fault conditions, power loss or unintended operating conditions, the drive may not operate as intended.

In particular:

- Stored energy might not discharge to safe levels as quickly as suggested, and can still be present even though the drive appears to be switched off
- The motor's direction of rotation might not be controlled
- The motor speed might not be controlled
- The motor might be energised

A drive is a component within a drive system that may influence its operation or effects under a fault condition.

Consideration must be given to:

- Stored energy
- Supply disconnects
- Sequencing logic
- Unintended operation

514C

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Chapter 1 Product Overview

DESCRIPTION

The 514C controller is intended for use in an Industrial Environment, it should be mounted within an enclosure which provides protection to the controller and the user.

The controller should be permanently earthed at the terminals provided.

The 514C controller is designed to control the speed of a DC Shunt wound or permanent magnet motor. It will provide control of the motor speed in all 4 Quadrants of operation.

The controllers are designed to operate from a single phase AC mains supply in the range of 110 Vac to 415 Vac at 50 or 60 Hz. An auxiliary supply is required for internal power supply generation and main supply contactor sequencing. Coding is derived from the main power terminals and is functional over the whole input voltage range.

The Speed of the DC Motor is controlled using a linear closed loop system with a feedback signal from either tachogenerator or armature voltage, the feedback source being switch selectable.

A current loop within the speed loop always ensures that controlled levels of current are applied to the motor, actual levels being scaleable via programmable switches.

Motor protection is provided by a Stall detection circuit which will remove current from the motor after approximately 60 seconds.

Controller protection is provided by a Instantaneous Overcurrent trip circuit overriding control in the event of a Short Circuit.

PRODUCT RANGE

Product	Rating
514C/04	4A DC Full Load Current
514C/08	8A DC Full Load Current
514C/16	16A DC Full Load Current
514C/32	32A DC Full Load Current

540 TO 514C UPGRADE

The 514C is designed to be functionally equivalent to the 540 series controllers not a direct replacement. Comparisons between the two controllers connectors are included throughout the manual.

Chapter 2 describes the terminal connectors to the 514C controller, in that section on page 2.4 is given a terminal to terminal comparison of 540/1 to 514C.

EUROPEAN DIRECTIVES AND THE CE MARK

The following information is supplied to provide a basic understanding of the EMC and low voltage directives CE marking requirements. The following literature is recommended for further information:

- *Recommendations for Application of Power Drive Systems (PDS), European Council Directives - CE Marking and Technical Standardisation - (CEMEP)*

Available from your local trade association or Parker SSD Drives office

- *EMC Installation Guidelines for Modules and Systems - (SSD Drives)*

Available from your local Parker SSD Drives office, part number HA388879

- *Short Form Overview of European Directives for Variable Speed Drives and Applications - (SSD Drives)*

Available from your local Parker SSD Drives office, part number HA389770

The European machines and drives manufacturers via their national trade associations have formed the European Committee of Manufacturers of Electrical Machines and Power Electronics (CEMEP). Parker SSD Drives and other major European drives manufacturers are working to the CEMEP recommendations on CE marking. The CE mark shows that a product complies with the relevant EU directives, in our case the Low Voltage Directive and, in some instances, the EMC Directive.

CE Marking for Low Voltage Directive

When installed in accordance with this manual, the 590 Series Converter is CE marked by Parker SSD Drives Ltd in accordance with the low voltage directive (S.I. No. 3260 implements this LVD directive into UK law). An EC Declaration of Conformity (low voltage directive) is included at the end of this chapter.

CE Marking for EMC - Who is Responsible?

NOTE: THE SPECIFIED EMC EMISSION AND IMMUNITY PERFORMANCE OF THIS UNIT CAN ONLY BE ACHIEVED WHEN THE UNIT IS INSTALLED TO THE EMC INSTALLATION INSTRUCTIONS GIVEN IN THIS MANUAL.

According to S.I. No. 2373 which implements the EMC directive into UK law, the requirement for CE marking this unit falls into two categories:

1. Where the supplied unit has an intrinsic/direct function to the end user, then the unit is classed as *relevant apparatus*.
2. Where the supplied unit is incorporated into a higher system/apparatus or machine which includes (at least) the motor, cable and a driven load but is unable to function without this unit, then the unit is classed as a *component*.

■ Relevant Apparatus - Parker SSD Drives Responsibility

Occasionally, say in a case where an existing fixed speed motor - such as a fan or pump - is converted to variable speed with an add-on drive module (*relevant apparatus*), it becomes the responsibility of Parker SSD Drives to apply the CE mark and issue an EC Declaration of Conformity for the EMC Directive. This declaration and the CE mark is included at the end of this chapter.

■ Component - Customer Responsibility

The majority of Parker SSD Drives' products are classed as *components* and therefore we cannot apply the CE mark or produce an EC Declaration of Conformity in respect of EMC. It is therefore the manufacturer/supplier/installer of the higher system/apparatus or machine who must conform to the EMC directive and CE mark.

Legal Requirements for CE Marking

IMPORTANT: Before installation, clearly understand who is responsible for conformance with the EMC directive. Misappropriation of the CE mark is a criminal offence.

It is important that you have now defined who is responsible for conforming to the EMC directive, either:

■ Parker SSD Drives Responsibility

You intend to use the unit as *relevant apparatus*.

When the specified EMC filter is correctly fitted to the unit following EMC installation instructions, it complies with the relevant standards indicated in the following tables. The fitting of the filter is mandatory for the CE marking of this unit to apply.

The relevant declarations are to be found at the end of this chapter. The CE mark is displayed on the EC Declaration of Conformity (EMC Directive) provided at the end of this chapter.

■ Customer Responsibility

You intend to use the unit as a *component*, therefore you have a choice:

1. To fit the specified filter following EMC installation instructions, which may help you gain EMC compliance for the final machine/system.
2. Not to fit the specified filter, but use a combination of global or local filtering and screening methods, natural migration through distance, or the use of distributed parasitic elements of the existing installation.

NOTE: WHEN TWO OR MORE EMC COMPLIANT COMPONENTS ARE COMBINED TO FORM THE FINAL MACHINE/SYSTEM, THE RESULTING MACHINE/SYSTEM MAY NO LONGER BE COMPLIANT, (EMISSIONS TEND TO BE ADDITIVE, IMMUNITY IS DETERMINED BY THE LEAST IMMUNE COMPONENT). UNDERSTAND THE EMC ENVIRONMENT AND APPLICABLE STANDARDS TO KEEP ADDITIONAL COMPLIANCE COSTS TO A MINIMUM.

Applying for CE Marking for EMC

We have supplied a Manufacturer's EMC Declaration at the end of this chapter that you can use as a basis for your own justification of overall compliance with the EMC directive. There are three methods of demonstrating conformity:

1. Self-certification to a relevant standard
2. Third party testing to a relevant standard
3. Writing a technical construction file stating the technical rationale as to why your final machine/system is compliant. An EMC "competent body" must then assess this and issue a technical report or certificate to demonstrate compliance.

Refer to Article 10(2) of Directive 89/336/EEC.

With EMC compliance, an EC Declaration of Conformity and the CE mark will be issued for your final machine/system.

IMPORTANT: Professional end users with EMC expertise who are using drive modules and cubicle systems defined as components who supply, place on the market or install the relevant apparatus must take responsibility for demonstrating EMC conformance and applying the CE mark and issuing an EC Declaration of Conformity.

Which Standards Apply?

Basic and Generic Standards

The standards that may apply to this unit come under two broad categories:

1. Emission - these standards limit the interference caused by operating (this) drive module.
2. Immunity - these standards limit the effect of interference (on this unit) from other electrical and electronic apparatus.

The following table indicates the standards that the unit may comply with, dependent upon how it is installed and used.




			Unit used as Relevant Apparatus		Unit used as a Component	
			filter (EMC compliance)	no filter	filter (EMC compliance may be applied for)	no filter
Installation	Basic and Generic Standards		enclosure	enclosure	enclosure	enclosure
Residential 	Radiated RF Emission	EN55022 Class B (1994) or EN50081-1 (1992)	✓	✓	✓	✓
	Conducted RF Emission	EN55022 Class B (1994) or EN50081-1 (1992)				
	Immunity	EN50082-1 (1992)	✓	✓	✓	✓
Commercial & Light Industry 	Radiated RF Emission	EN55022 Class B (1994) or EN50081-1 (1992)	✓	✓	✓	✓
	Conducted RF Emission	EN55022 Class B (1994) or EN50081-1 (1992)				
	Immunity	EN50082-1 (1992)	✓	✓	✓	✓
Industrial 	Radiated RF Emission	EN55011 Class A (1991) or EN50081-2 (1994)	✓	✓	✓	✓
	Conducted RF Emission	EN55011 Class A (1991) or EN50081-2 (1994)	✓		✓	
	Immunity	prEN50082-2 (1992)	✓	✓	✓	✓

Table 1-1 Applicable Basic and Generic Standards

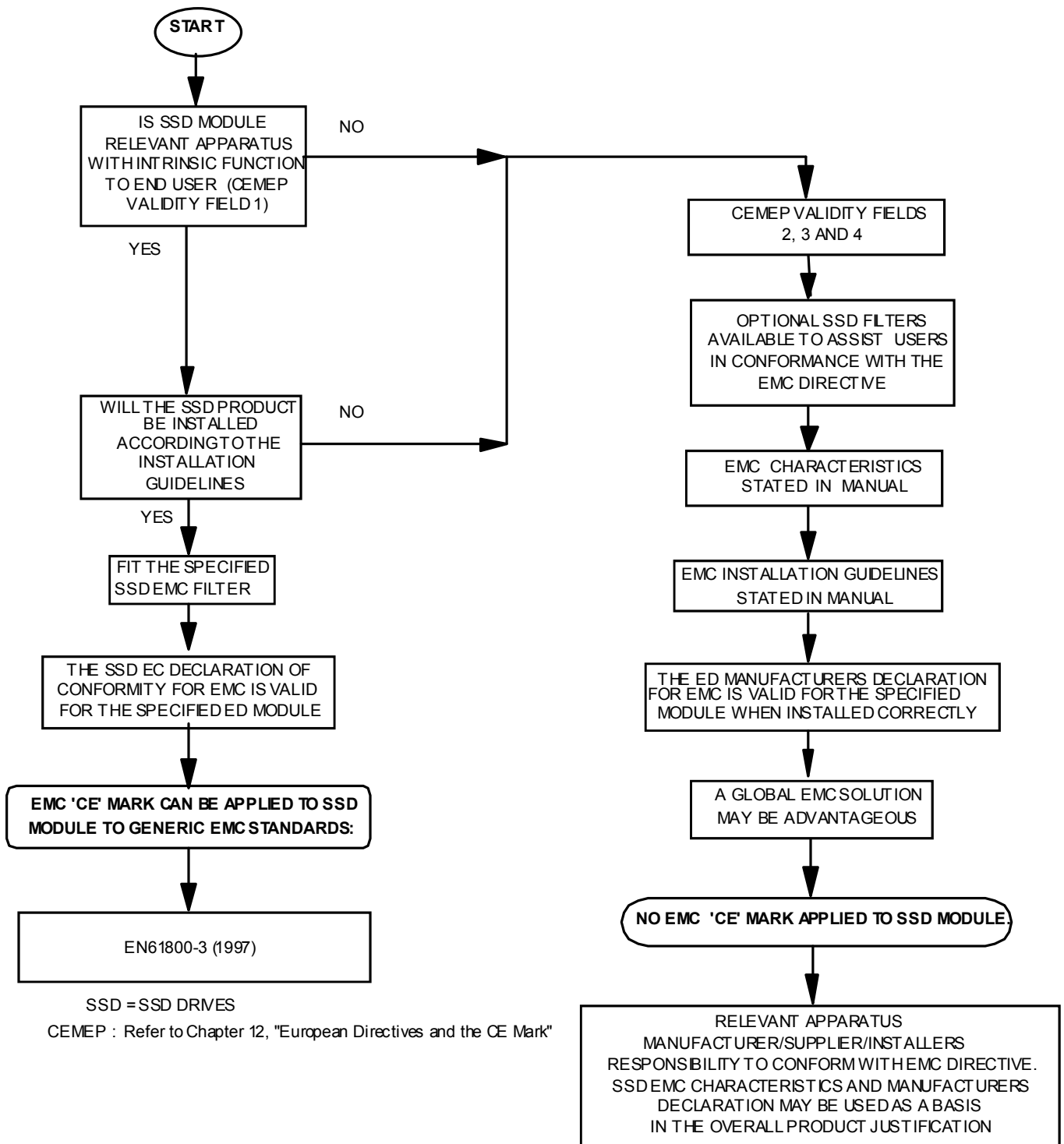




Figure 1-1 Parker SSD Drives EMC 'CE' Mark Validity Chart

CERTIFICATES

Issued for compliance with the EMC Directive when the unit is used as *relevant apparatus*.

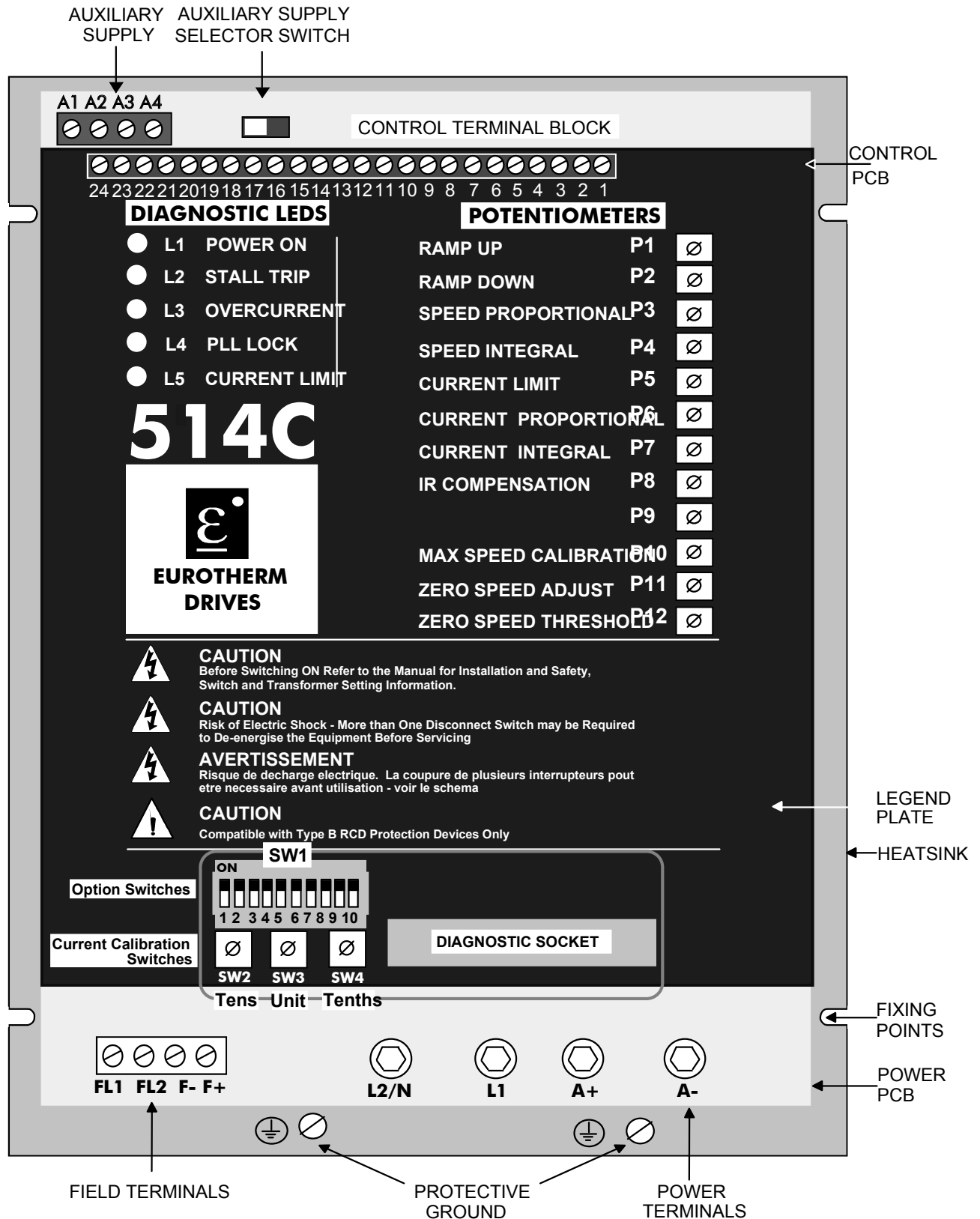
This is provided to aid your justification for EMC compliance when the unit is used as a *component*.

514C	
<div>  EC DECLARATIONS OF CONFORMITY </div> <p>Date CE marked first applied: 01.04.2000</p>	
<div> EMC Directive </div> <p>In accordance with the EEC Directive 2004/108/EC</p> <p>We Parker SSD Drives, address as below, declare under our sole responsibility that the above Electronic Products when installed and operated with reference to the instructions in the Product Manual (provided with each piece of equipment) is in accordance with the relevant clauses from the following standard:-</p> <p>* BSEN61800-3 (2004)</p>	<div> Low Voltage Directive </div> <p>In accordance with the EEC Directive 2006/95/EC</p> <p>We Parker SSD Drives, address as below, declare under our sole responsibility that the above Electronic Products when installed and operated with reference to the instructions in the Product Manual (provided with each piece of equipment), is in accordance with the relevant clauses from the following standard :-</p> <p>EN50178 (1998)</p>
<div> MANUFACTURERS DECLARATIONS </div>	
<div> EMC Declaration </div> <p>We Parker SSD Drives, address as below, declare under our sole responsibility that the above Electronic Products when installed and operated with reference to the instructions in the Product Manual (provided with each piece of equipment) is in accordance with the relevant clauses from the following standard:-</p> <p>* BSEN61800-3 (2004)</p>	<div> Machinery Directive </div> <p>The above Electronic Products are components to be incorporated into machinery and may not be operated alone. The complete machinery or installation using this equipment may only be put into service when the safety considerations of the Directive 89/392/EEC are fully adhered to.</p> <p>Particular reference should be made to EN60204-1 (Safety of Machinery - Electrical Equipment of Machines).</p> <p>All instructions, warnings and safety information of the Product Manual must be adhered to.</p>
<div>  </div> <p>Dr Martin Payn (Conformance Officer)</p> <p>* Compliant with the immunity requirements of the Standard without specified EMC filters.</p> <p>* 690PB only when fitted with an internal or external filter.</p> <p>PARKER SSD DRIVES NEW COURTWICK LANE, LITTLEHAMPTON, WEST SUSSEX BN17 7RZ TELEPHONE: +44(0)1903 737000 FAX: +44(0)1903 737100 Registered Number: 4806503 England. Registered Office: 55 Maylands Avenue, Hemel Hempstead, Herts HP2 4SJ</p>	

The drive is CE marked in accordance with the low voltage directive for electrical equipment and appliances in the voltage range when installed correctly.

Since the potential hazards are mainly electrical rather than mechanical, the drive does not fall under the machinery directive. However, we do supply a manufacturer's declaration for when the drive is used (as a *component*) in machinery.

PRODUCT IDENTIFICATION



TECHNICAL SPECIFICATION

General

SPEED CONTROL

Control Action	Closed Loop with Proportional Integral Control and Adjustable Stability	
Speed Feedback	Armature Voltage	Tachogenerator
100% Load Regulation	2 % Typical	0.1 % Typical
Maximum Torque/Speed Range	20:1	100:1
Overload	150% for 60 seconds.	

TORQUE CONTROL

Control Action	Closed Loop with Proportional Integral Control.
Accuracy	2 %
Overspeed	Inherent.
Overload	None 100% continuous (consideration must be given to motor when operating at low speed).

INPUTS / OUTPUTS

Analogue Inputs	Setpoint Ramp	0 to $\pm 10V$	100 Kohm
	Positive Trim Setpoint	0 to $\pm 10V$	100 Kohm
	Negative Trim Setpoint	0 to $\pm 10V$	100 Kohm
	Current Limit	0 to +7.5V	50 Kohm
	Current Demand	0 to $\pm 10V$	100 Kohm
	Tachogenerator Input	0 to $\pm 350Vdc$	220 Kohm
	Thermistor / Microtherm Input	<200 ohm = Normal >1800 ohm = Overtemperature	5 Kohm
Outputs Analogue	Setpoint Ramp	0 to $\pm 10V$	5 mA
	Total Setpoint	0 to $\pm 10V$	5 mA
	Speed	0 to $\pm 10V$	5 mA
	Current Demand	0 to $\pm 10V$	5 mA
	Current Meter Bipolar or Modulus	0 to $\pm 5V$ (0 to 1cal) See SW1/8	5 mA
	+10V Reference	+10V	5 mA
	-10V Reference	-10V	5 mA
Digital Inputs	Run	+10 to +24V	100 Kohm
	Enable	+10 to +24V	100 Kohm
	Stall Override	+10	100 Kohm
Digital Outputs	Health	+24V	50 mA Source
	Zero Speed or Setpoint	+24V	50 mA Source

Electrical Ratings

INPUT RATINGS	SYMBOL	514C/04	514C/08	514C/16	514C/32
Supply Voltage	Vs	110 - 480 Vac \pm 10%			
Maximum Supply Voltage (Derived from Three Phase Supply)		480Vac L - L Non earth referenced (IT) or earth referenced (TN) 480Vac L - N Earth referenced (TN)			
Supply Current	Is	6A	12A	24A	48A
Supply Frequency	fs	50/60 Hz \pm 5 Hz			
Auxiliary Supply	Vaux	110/120 or 220/240 Vac \pm 10%			
Aux. Supply Current	Iaux	3A (Includes Contactor Coil Current)			
Contactor Coil Current		3A Maximum			
Installation Category		Overvoltage Category III			
Earth Leakage Current at 480Vac		Without Filter - 5mA ⁽¹⁾ With Filter - 50mA			

OUTPUT RATINGS					
Nominal Armature Voltage	Va	90 Vdc at 110/120 Vac 180 Vdc at 220/240 Vac 320 Vdc at 380/415 Vac			
Maximum Armature Current	Ia	4A dc \pm 10%	8A dc \pm 10%	16A dc \pm 10%	32A dc \pm 10%
Armature Current Calibration 100%	Ical	0.1 to 4A in 0.1A steps	0.1 to 8A in 0.1A steps	0.1 to 16A in 0.1A steps	0.1 to 32A in 0.1A steps
Nominal Motor Power at 320 Vdc Armature	Pm HP	1.125kW 1 1/2 HP	2.25 kW 3 HP	4.5 kW 6 HP	9 kW 12 HP
Overload		150% for 60 seconds			
Field Current	If	3 A dc			
Field Voltage	Vf	0.9 X Supply Voltage (Vs)			
Maximum Armature Form Factor		1.5			
Thyristor I ² t		300 A ² s			
Typical Controller Dissipation at Ia 100%		15W ⁽²⁾	25W ⁽²⁾	50W ⁽²⁾	75W ⁽²⁾
UL Listed Rating @ 180V dc	HP	1 1/2 HP	1 HP	3 HP	5 HP

Notes:- (1) Permanent earthing mandatory.

(2) See page 3-2 for filter watt loss information.

Mechanical

	514C/04	514C/08	514C/16	514C/32
Overall Width	160mm			
Overall Height	240mm			
Overall Depth	90mm	90mm	130mm	130mm
Weight	1.6Kg	1.6Kg	3.0Kg	3.0Kg
Airflow Clearance	75mm Above and Below			
Mounting Centres	210mm Vertical x 148mm Horizontal			
Control Terminals - 1 to 24	Screw Terminals will accept 2.5mm ² stranded wire. Terminal Tightening Torque 0.45 Nm, 4.0 lbf-in.			
Auxiliary Supply Terminals - A1 to A4	Screw Terminals will accept 4mm ² stranded wire. Terminal Tightening Torque 0.5 Nm, 4.5 lbf-in.			
Field Terminals - FL1, FL2, F-, F+	Screw Terminals will accept 4mm ² stranded wire. Terminal Tightening Torque 0.5 Nm, 4.5 lbf-in.			
Power Terminals - L2/N, L1, A+, A-	M5 Studs with Clamp. Terminal Tightening Torque 2.7 Nm, 24 lbf-in.			
Earth (Grounding) Terminals 	M5 Cheese Head Screw. Terminal Tightening Torque 7.1 Nm, 63 lbf-in.			

ENVIRONMENTAL REQUIREMENTS

Enclosure	Chassis Mounting IP00 (UL open-type)
Operating Temperature	0 to +40°C. (Derate 1.5%/Degree above 40°C).
Humidity	85% R.H. at 40°C. (Non-condensing).
Altitude	Above 1000m derate at 1% / 100m.
Storage Temperature	-25°C to +55°C.
Pollution	Pollution Degree 2.
Transport Temperature	-25°C to +70°C.
Overvoltage	III

EMC TECHNICAL RATINGS

Immunity

Port	Phenomenon	Test Standard	Level	Criterion	Generic Standard
Enclosure Port	ESD	BS EN 61000-4-2 (1995)	8kV AD	Self Recovery	EN50082-1 (1992), and EN50082-2 (1995)
	RF Field		10V/m, 1kHz, AM	No Change	
	RF Field Pulse Modulation	ENV 50140 ENV 50204	10 V/m P.M.	Self Recovery	
Power Ports	Fast Transient Burst	BS EN 61000-4-4 (1995)	2kV	Self Recovery	
	Bulk Current Injection	ENV 50141	10V, 1kHz, AM	No Change	
	Surge Test	BS EN 61000-4-5 (1995)	2kV Common Mode 2kV Differential Mode	Self Recovery	
Signal & Control	Fast Transient Burst	BS EN 61000-4-4 (1995)	2kV	Self Recovery	
	Bulk Current Injection	ENV 50141	10V, 1kHz, AM	No Change	
Power Interfaces	Fast Transient Burst	BS EN 61000-4-4 (1995)	2kV	Self Recovery	
	Bulk Current Injection	ENV 50141	10V, 1kHz, AM	No Change	

Emissions

Port	Phenomenon	Test Standard	Level	Generic Standard
Enclosure Port	Radiated	EN55011	Class B #	EN50081-1 (1992), EN50081-2 (1994)
Power Port	Conducted	EN55011	Class B *	

Notes: These levels of performance are achieved when installed as specified with the recommended Supply Filter.

* Achieved with up to 50m of motor cable.

Achieved with unscreened signal and control cables.

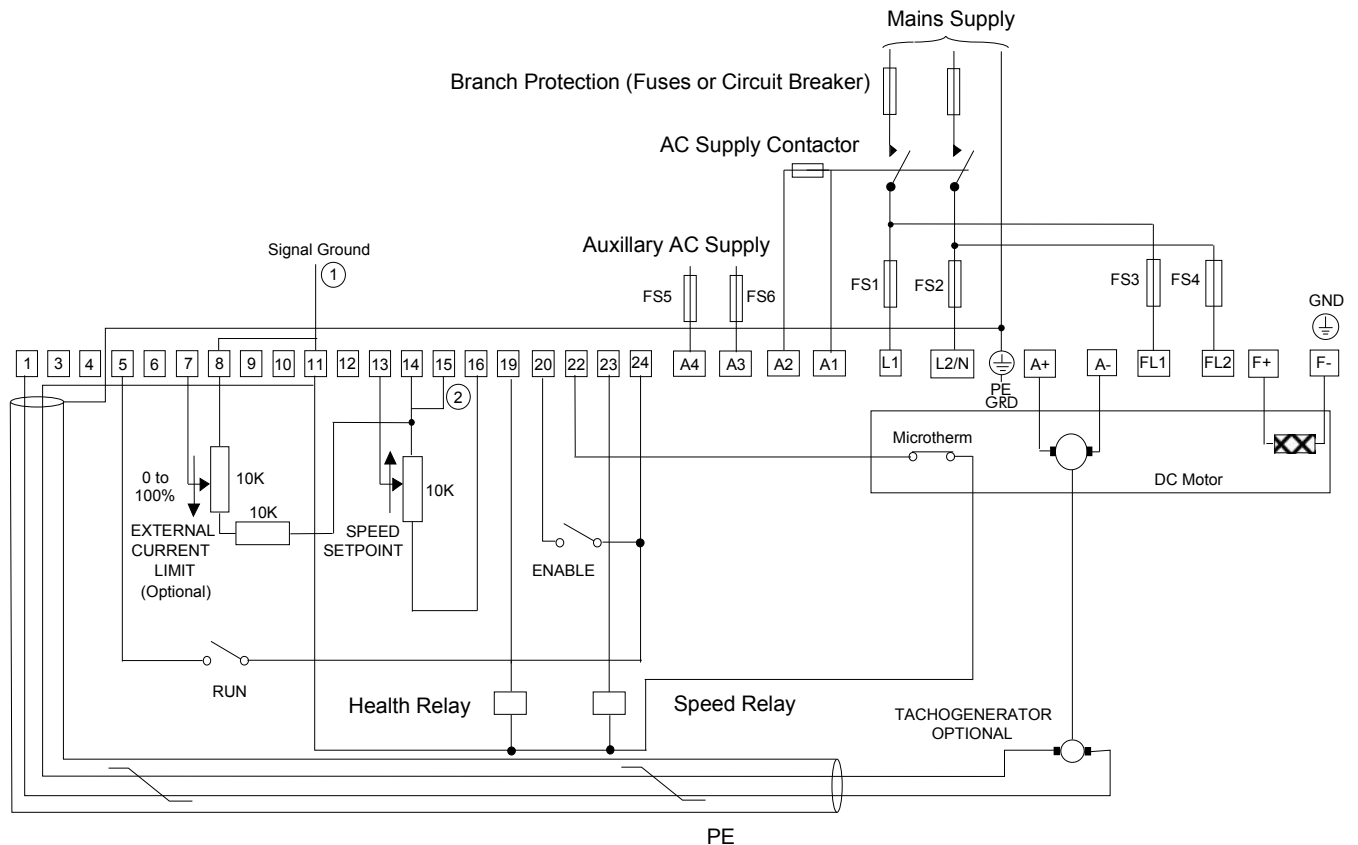
PRODUCT CODE

Block	Product	Code	Feature
1	Basic Product	514C	
2	Current Rating	04 08 16 32	4 amp 8 amp 16 amp 32 amp
3	Livery	00 01 to 99	Standard Customer
4	Cover	00	IP00 Open Frame
5	Special Options	00 01-99	Standard Documented Special Options

Chapter 2 Pre-Installation Planning

BASIC WIRING DIAGRAMS

Basic Connection



- ① It is recommended that the “0V/common” be connected to protective earth/ground for safety reasons. In a system comprising of more than one controller, the 0V/common” signals should be connected together and joined to protective earth/ground at **one** point only.
- ② Stall override link between terminals 14 and 15 required when using controller in current control.

EMC Connections With Filter

