DEEP SEA ELECTRONICS

DSE BC1205 & BC2405 Operator Manual

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DSE BC1205 & DSE BC2405 Operator Manual

Amendments Since Last Publication

Issue No.	Comments
1	Initial Release

Typeface: The typeface used in this document is *Arial*. Care must be taken not to mistake the upper-case letter I with the numeral 1. The numeral 1 has a top serif to avoid this confusion.

TABLE OF CONTENTS

SECTION PAGE

1 INTRODUCTION

This document details the installation and operation requirements of the DSE BC1205 & the DSE BC2405 battery chargers and are part of the DSEPower® range of products.

The manual forms part of the product and should be kept for the entire life of the product. If the product is passed or supplied to another party, ensure that this document is passed to them for reference purposes.
This is not a *controlled document.* DSE do not automatically inform on updates. Any future updates of this document are included on the DSE website at www.deepseaelectronics.com

The DSE BC1205 & the DSE BC2405 are intended for mounting within a customer enclosure or panel, fastened by the integral DIN rail mounting point or by screws / bolts.

The DSE BC1205 & the DSE BC2405 are designed to fulfil the most common functions required of a charger in the generating set industry. Combining a range of display options, protected outputs and power supply operation within a robust enclosure.

1.1 CLARIFICATION OF NOTATION

Clarification of notation used within this publication.

NOTE:	**Highlights an essential element of a procedure to ensure correctness.**
CAUTION!	**Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.**
WARNING!	**Indicates a procedure or practice, which could result in injury to personnel or loss of life if not followed correctly.**

1.2 BIBLIOGRAPHY

This document refers to, and is referred by the following DSE publications which are obtained from the DSE website: www.deepseaelectronics.com or by contacting DSE Technical Support: support@deepseaelectronics.com.

1.2.1 INSTALLATION INSTRUCTIONS

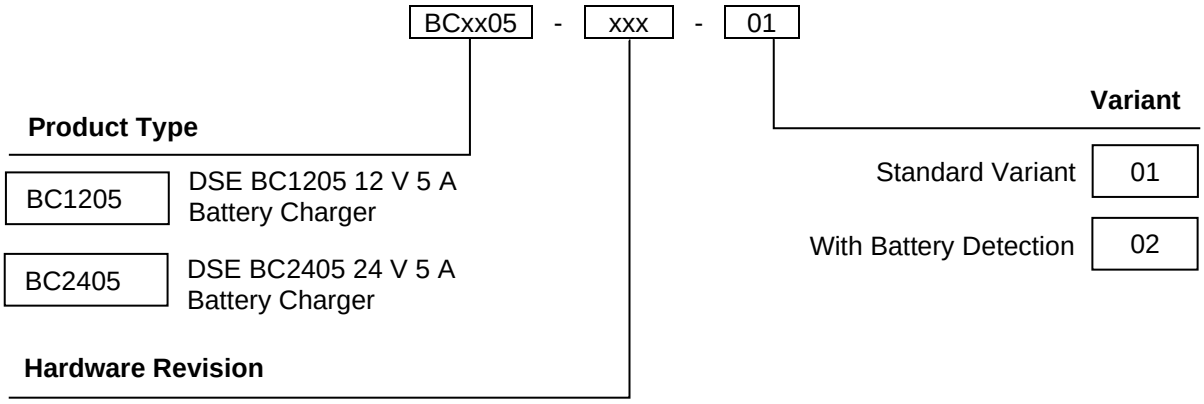
Installation instructions are supplied with the product in the box and are intended as a 'quick start' guide only.

DSE Part	Description
053-267	DSE BC1205 & DSEBC2405 Installation Instructions

2 SPECIFICATION

2.1 PART NUMBERING

At the time of this document production, there are four variants of this product.



2.2 OPERATING TEMPERATURE

NOTE: The battery charger's maximum output current de-rates due to excessive temperature. This is done to prevent damage to battery charger and the connected battery/equipment. For further information see section entitled *Output De-rate Curves* elsewhere in this document.

Parameter	Specification
Operating Temperature	-25 °C to +55 °C (-13 °F to +131 °F)
Operating Temperature With De-rate to Output	-25 ºC to +80 ºC (-13 ºF to +176 ºF)
Storage Temperature	-40 ºC to +85 ºC (-40 ºF to +185 ºF)

2.3 TERMINAL SPECIFICATION

Parameter	Specification	
Connection Type	Two-part connector. Male part fitted to module Female part supplied in module packing case - Screw terminal, rising clamp, no internal spring.	 Example showing cable entry and screw terminals of a 10-way connector
Minimum Cable Size	0.5 mm² (AWG 20)	
Maximum Cable Size	2.5 mm² (AWG 13)	
Tightening Torque	0.4 Nm (3.5 lb-in)	
Wire Strip Length	7 mm (9/32")	

2.4 AC SUPPLY

NOTE: The battery charger's maximum output current de-rates due to excessive temperature to prevent damage to itself and the battery/connected equipment. For further information see section entitled Output De-rate Curves elsewhere in this document.

NOTE: The battery charger's efficiency varies depending on supply voltage. For further information see section entitled *Efficiency Curves* elsewhere in this document.

DSE BC1205

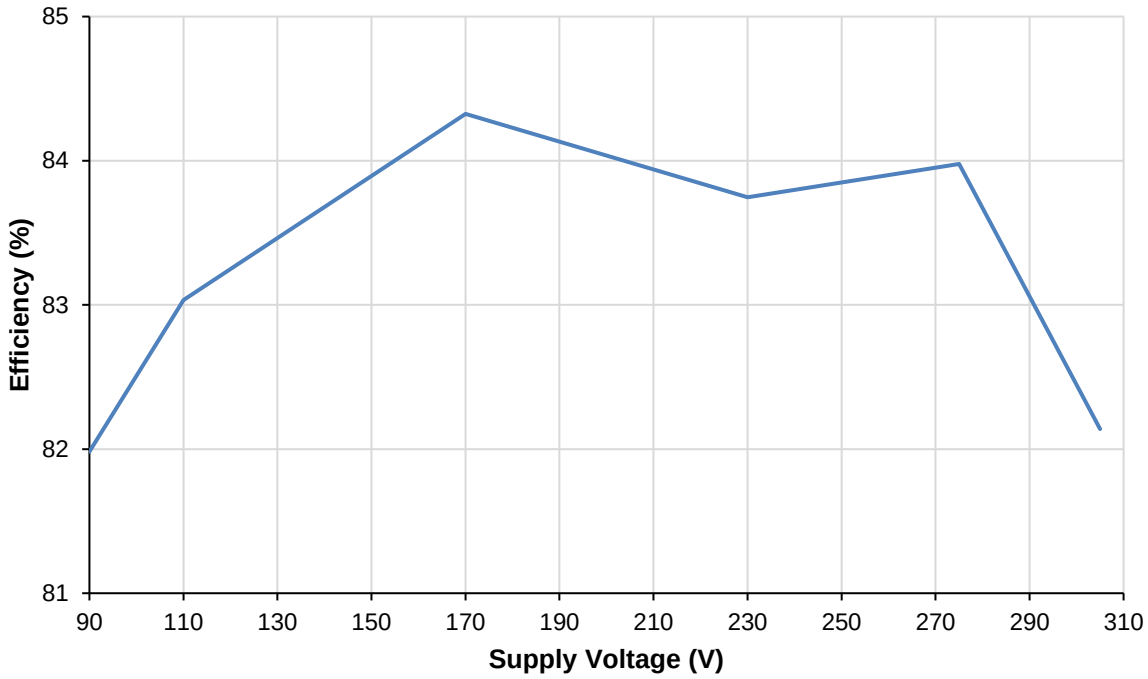
Parameter	Specification
Minimum Supply Voltage	90 V
Maximum Supply Voltage	305 V
Minimum Supply Frequency	45 Hz
Maximum Supply Frequency	65 Hz
Maximum Supply Current	1.4 A_{AC} at V_{in}=110 V_{AC}, V_{out}=14.1 V_{DC}, I_{out}=5.1 A_{DC} 0.9 A_{AC} at V_{in}=230 V_{AC}, V_{out}=14.1 V_{DC}, I_{out}=5.1 A_{DC}
Typical Supply Current with Charge Output Turned Off/Disconnected	0.05 A_{AC} Irrespective of Supply Voltage
Supply Inrush Current	50 A for 10 ms
Recommended Fuse	6.3 A anti-surge for 110 V 3.5 A anti-surge for 230 V
Efficiency	More Than 83 % at V_{out}=13.6 V_{DC}, I_{out}=5.1 A_{DC}
Maximum Power Loss	35.2 W

DSE BC2405

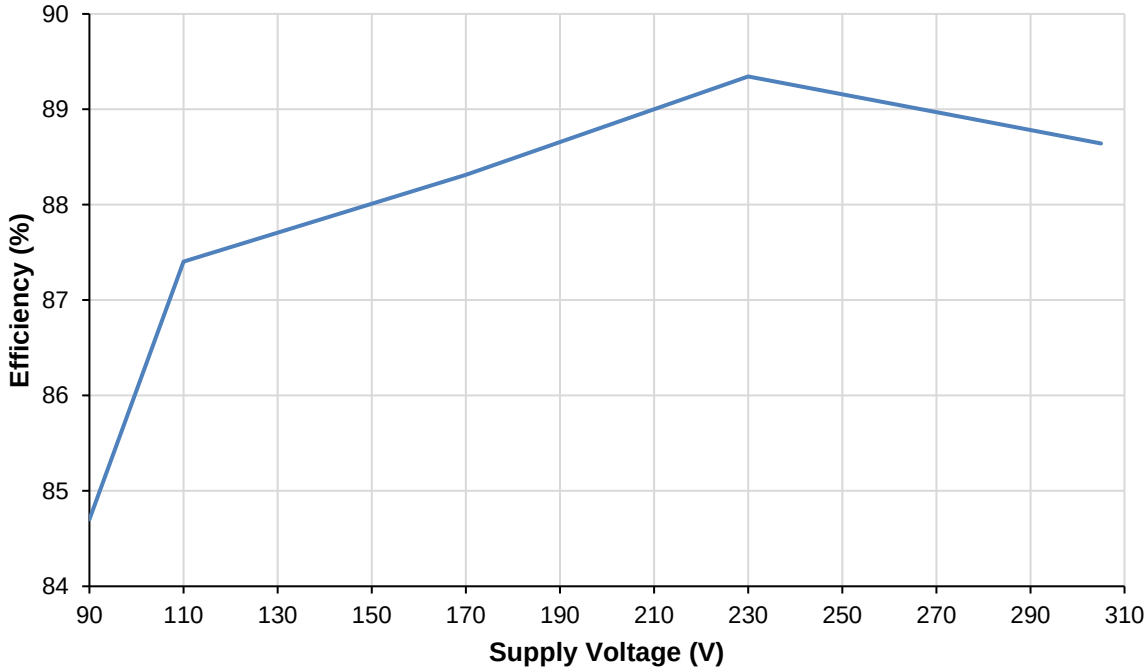
Parameter	Specification
Minimum Supply Voltage	90 V
Maximum Supply Voltage	305 V
Minimum Supply Frequency	45 Hz
Maximum Supply Frequency	65 Hz
Maximum Supply Current	2.5 A_{AC} at V_{in}=110 V_{AC}, V_{out}=27.7 V_{DC}, I_{out}=5.1 A_{DC} 1.5 A_{AC} at V_{in}=230 V_{AC}, V_{out}=27.7 V_{DC}, I_{out}=5.1 A_{DC}
Typical Supply Current with Charge Output Turned Off/Disconnected	0.07 A_{AC} Irrespective of Supply Voltage
Supply Inrush Current	50 A for 10 ms
Recommended Fuse	6.3 A anti-surge for 110 V 3.5 A anti-surge for 230 V
Efficiency	More Than 88 % at V_{out}=26.4 V_{DC}, I_{out}=5.1 A_{DC}
Maximum Power Loss	41.4 W

2.4.1 EFFICIENCY CURVES

BC1205 Efficiency With a Supply Voltage Between 90 V and 305 V, and a Charge Output at 13.6 V, 5.1 A



BC2405 Efficiency With a Supply Voltage Between 90 V and 305 V, and a Charge Output at 26.5 V, 5.1 A



2.5 DC OUTPUT

NOTE: The DSE battery charger's DC output voltage is adjustable via the pot accessible through the hole situated on the top-left part of the device. This is useful to adjust the charge voltage level to meet some battery types' charge requirements.
The output voltage range is compatible with 18 & 20 cell Ni-Cd batteries (adjustable via pot).
For more info on adjusting the output voltage refer to the section entitled *Float Voltage Adjustment* elsewhere in this document.

NOTE: The battery charger's maximum output current de-rates due to excessive temperature to prevent damage to itself and the battery/connected equipment. For further information see section entitled *Output De-rate Curves* elsewhere in this document.

NOTE: The DSE BC1205 & DSE BC2405 chargers cannot be powered up by the battery, during a mains failure there is no leakage current from the battery back into the charger.

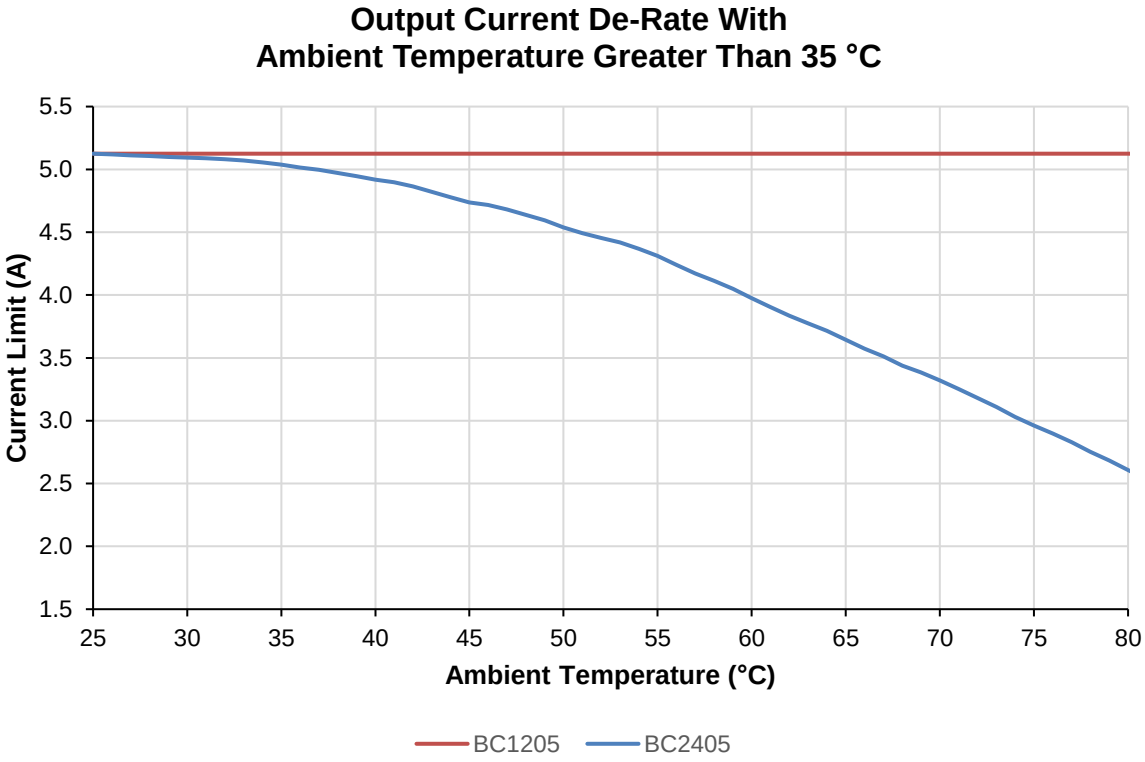
DSE BC1205

Parameter	Specification
Output Voltage Range	12.5 V to 14.5 V
Output Current Range	0 A to 5.1 A
Current Limit Threshold	5.16 A
Output Voltage Ripple and Noise	Less Than 2 % of Requested Output Voltage
Output Voltage Load Regulation	Less Than 3.3 % of Requested Output Voltage
Output Voltage Line Regulation	Less Than 0.4 % of Requested Output Voltage
Output Voltage Overshoot %	Less Than 5 % of Requested Output Voltage
Transient Response Peak Deviation (at 50% to 100% load step)	Less Than 2 % of Requested Output Voltage
Warm Up Voltage	Less Than 1 % of Requested Output Voltage
Output Voltage Rise Time	Less Than 120 ms
Short Circuit Protection Type	Hiccup (Auto Recovery)
Switching Frequency	65 kHz

DSE BC2405

Parameter	Specification
Output Voltage Range	25.6 V to 30.3 V
Output Current Range	0 A to 5 A without Output Current De-rate
Current Limit Threshold	5.16 A
Output Voltage Ripple and Noise	Less Than 2 % of Requested Output Voltage
Output Voltage Load Regulation	Less Than 2 % of Requested Output Voltage
Output Voltage Line Regulation	Less Than 0.05 % of Requested Output Voltage
Output Voltage Overshoot %	Less Than 5 % of Requested Output Voltage
Transient Response Peak Deviation (at 50% to 100% load step)	Less Than 1.5 % of Requested Output Voltage
Warm Up Voltage	Less Than 1 % of Requested Output Voltage
Output Voltage Rise Time	Less Than 250 ms
Short Circuit Protection Type	Hiccup (Auto Recovery)
Switching Frequency	65 kHz

2.5.1 OUTPUT DE-RATE CURVES



2.6 BOOST INPUT

Activation of this input instructs the battery charger to operate in its boost charging mode.

Parameter	Specification
Arrangement	Connect the two BOOST terminals together to activate.
Operation	Battery charger switches to Boost operation when active.
Max Resistance	400 Ω between BOOST terminals (includes cable and switch contact resistance).

2.7 CHARGE FAIL OUTPUT RELAY

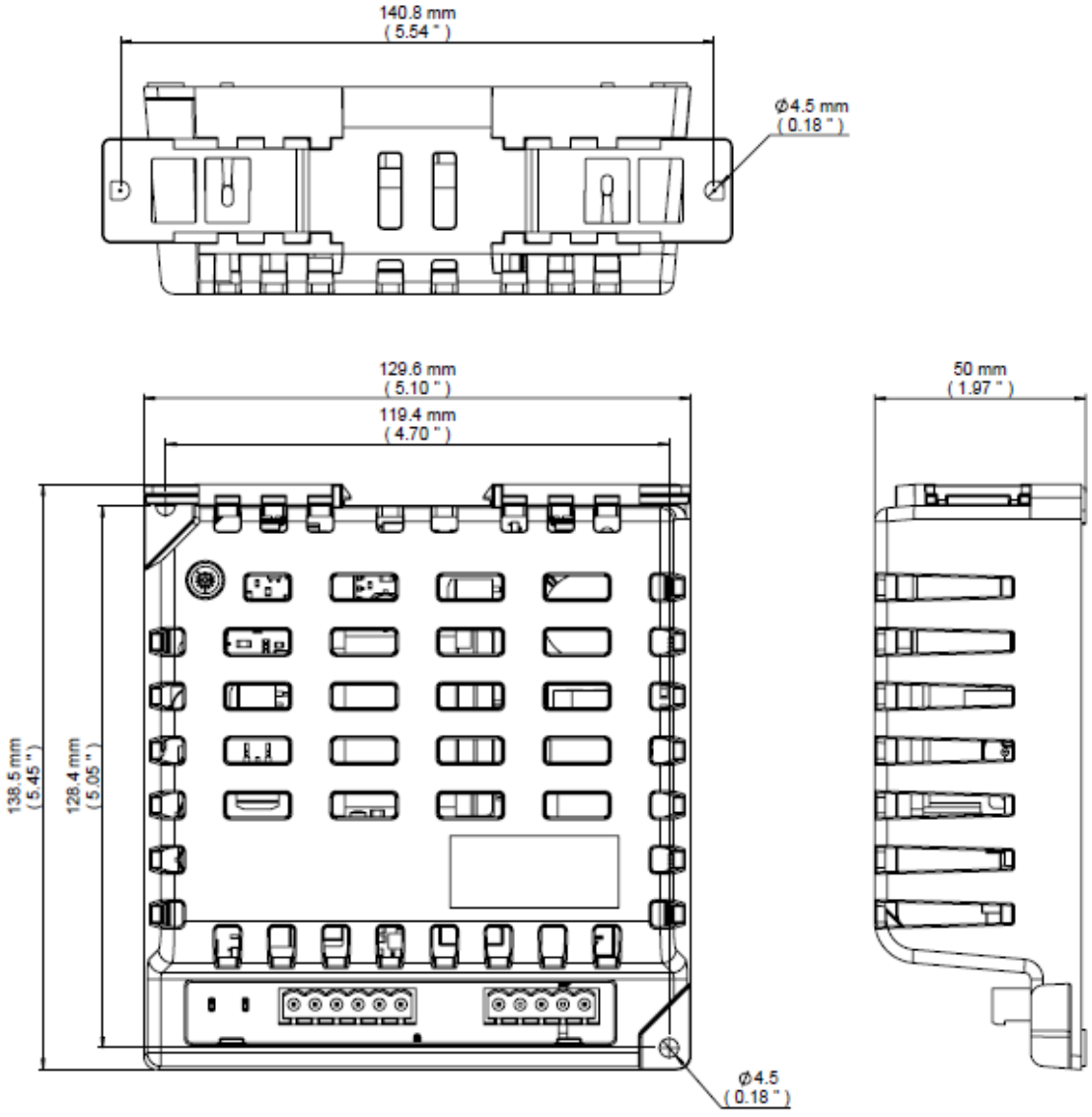
The Charge Fail Output Relay energises (opens) when the charger is healthy and in operation, it de-energises (closes) on one or more of the following:

- AC Supply input failure (below 90 V_{AC})
- Short circuit detection on the DC output
- Reverse polarity detection on the DC output
- Battery disconnected (only applicable on the DSE BC1205-02 & DSE BC2405-02 variants)

Parameter	Specification
Type	Volt-free changeover Normally Closed contact used to switch an auxiliary circuit to indicate charger output failure.
Rating	3 A resistive at 30 V DC

2.8 DIMENSIONS AND MOUNTING

Parameter	Specification
Cabinet Type	Custom cabinet for indoor use only
Overall Size	129.6 mm X 138.5 mm X 49 mm (5.10 ” X 5.45 ” X 1.93 ”)
Perimeter Distance for Ventilation	50 mm (2 ”)
Material	Polycarbonate
Surface Finish	Black Resin
Protection Category	IP20, NEMA 1
Weight	0.42 kg (0.93 lb 14.81 oz)
Mounting Type	DIN Rail or Chassis Mounting. Base mounted to a vertical surface with connection terminals to the bottom.
Mounting Holes	Diameter 4.5 mm (0.18 ”), 119.4 mm X 128.4 mm (4.7 ” x 5.05”) centres
Operating Temperature	-25 °C to +55 °C (-13 °F to +131 °F)
Operating Temperature (With De-rate To Output)	-25 °C to +80 °C (-13 °F to +176 °F)



2.9 APPLICABLE STANDARDS

Standard	Description
BS 4884-1	This document conforms to BS4884-1 1992 Specification for presentation of essential information.
BS 4884-2	This document conforms to BS4884-2 1993 Guide to content.
BS 4884-3	This document conforms to BS4884-3 1993 Guide to presentation.
BS EN 60068-2-1 (Minimum temperature)	-25 °C (-13 °F)
BS EN 60068-2-2 (Maximum temperature)	+80 °C (176 °F)
BS EN 60950 **BS EN 60335-1** **BS EN 60335-2-29:2004+A2:2010**	Safety of information technology equipment, including electrical business equipment.
BS EN 61000-6-2	EMC Generic Immunity Standard (Industrial).
BS EN 61000-6-4	EMC Generic Emission Standard (Industrial).
BS EN 60529 (Degrees of protection provided by enclosures)	IP20 Protected against penetration by solid objects with a diameter of more than 12 mm. Fingers or similar objects prevented from approach. No protection against water
UL508 **NEMA Rating**	Enclosure type 1 Provides a degree of protection against contact with the enclosure equipment and against a limited amount of falling dirt
UK WEEE Regulations	Producer Registration Number WEE/BE0052TQ

In line with our policy of continual development, Deep Sea Electronics, reserve the right to change specification without notice.

2.9.1 ENCLOSURE CLASSIFICATIONS

2.9.1.1 IP CLASSIFICATIONS

The modules specification under BS EN 60529 Degrees of protection provided by enclosures

IP20 Highlighted fields give a description of the of the protection level

First Digit Protection against contact and ingress of solid objects		Second Digit Protection against ingress of water	
0	No protection	0	No protection
1	Protected against ingress solid objects with a diameter of more than 50 mm. No protection against deliberate access, e.g. with a hand, but large surfaces of the body are prevented from approach.	1	Protection against dripping water falling vertically. No harmful effect must be produced (vertically falling drops).
2	Protected against penetration by solid objects with a diameter of more than 12 mm. Fingers or similar objects prevented from approach.	2	Protection against dripping water falling vertically. There must be no harmful effect when the equipment (enclosure) is tilted at an angle up to 15° from its normal position (drops falling at an angle).
3	Protected against ingress of solid objects with a diameter of more than 2.5 mm. Tools, wires etc. with a thickness of more than 2.5 mm are prevented from approach.	3	Protection against water falling at any angle up to 60° from the vertical. There must be no harmful effect (spray water).
4	Protected against ingress of solid objects with a diameter of more than 1 mm. Tools, wires etc. with a thickness of more than 1 mm are prevented from approach.	4	Protection against water splashed against the equipment (enclosure) from any direction. There must be no harmful effect (splashing water).
5	Protected against harmful dust deposits. Ingress of dust is not totally prevented but the dust must not enter in sufficient quantity to interface with satisfactory operation of the equipment. Complete protection against contact.	5	Protection against water projected from a nozzle against the equipment (enclosure) from any direction. There must be no harmful effect (water jet).
6	Protection against ingress of dust (dust tight). Complete protection against contact.	6	Protection against heavy seas or powerful water jets. Water must not enter the equipment (enclosure) in harmful quantities (splashing over).

2.9.1.2 NEMA CLASSIFICATIONS

⚠NOTE: There is no direct equivalence between IP / NEMA ratings. IP figures shown are approximate only.

NEMA1 Highlighted fields give a description of the of the protection level

1 **IP30**	Provides a degree of protection against contact with the enclosure equipment and against a limited amount of falling dirt.
2 **IP31**	Provides a degree of protection against limited amounts of falling water and dirt.
3 **IP64**	Provides a degree of protection against windblown dust, rain and sleet; undamaged by the formation of ice on the enclosure.
3R **IP32**	Provides a degree of protection against rain and sleet; undamaged by the formation of ice on the enclosure.
4 (X) **IP66**	Provides a degree of protection against splashing water, windblown dust and rain, hose directed water; undamaged by the formation of ice on the enclosure. (Resist corrosion).
12/12K **IP65**	Provides a degree of protection against dust, falling dirt and dripping non-corrosive liquids.
13 **IP65**	Provides a degree of protection against dust and spraying of water, oil and non-corrosive coolants.

3 INSTALLATION

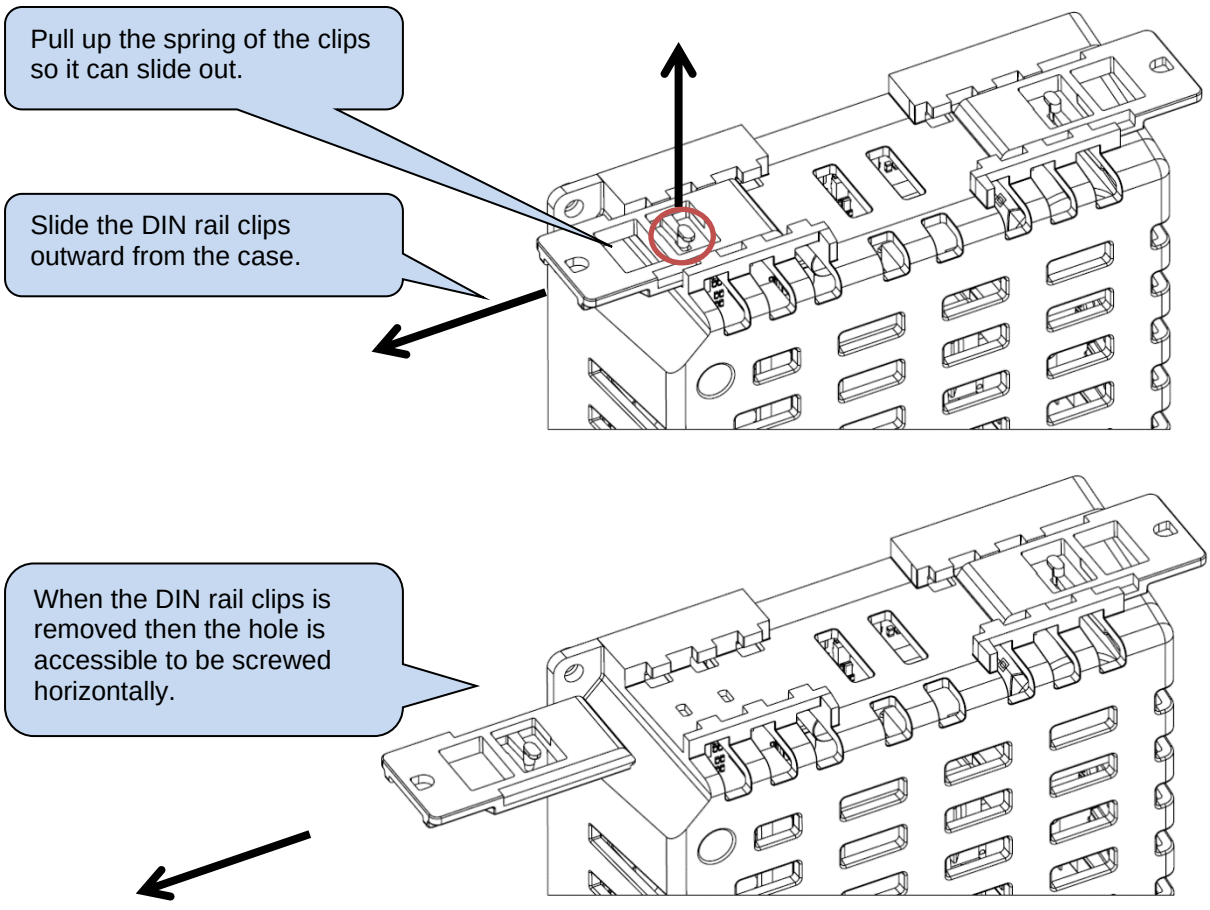
NOTE: If the DSE charger is used to charge an automobile batteries:
First connect the battery terminal that isn't connected to the chassis, then the other connection is to be made to the chassis. The battery charger is then to be connected to the supply mains.
After charging, disconnect the battery charger from the mains. Then remove the chassis connection and then the battery connection.

NOTE: If the mounting holes are to be used then the DIN rail clips must be removed. For more details refer to section entitled *Chassis Mounting* elsewhere in this document.

The DSE BC1205 (12 V, 5 A) & DSE BC2405 (24 V, 5 A) battery chargers are designed to be mounted vertically on the panel DIN rail utilising the integral mounts or horizontally on a chassis utilising the mounting holes within a control panel. For dimension and mounting details, see overleaf. DSE battery chargers are designed as a fit-and-forget device therefore, are permanently connected to the supply and the load, with no requirement to disable the charger during times of heavy load such as engine cranking, or when in parallel with a charge alternator.

3.1 CHASSIS MOUNTING

To mount the charger in the horizontal way, the DIN rail clips must be removed to gain access to the holes.



3.2 BATTERY SUITABLILITY

WARNING!: Do not connect the DSE chargers to non-rechargeable batteries.

WARNING!: Non-sealed Lead Acid batteries must be placed in a well ventilated area.

NOTE: The DSE BC1205 & DSE BC2405 are two stage battery chargers, consisting of a boost and float stage. Refer to section entitled Operation in this manual for more info.

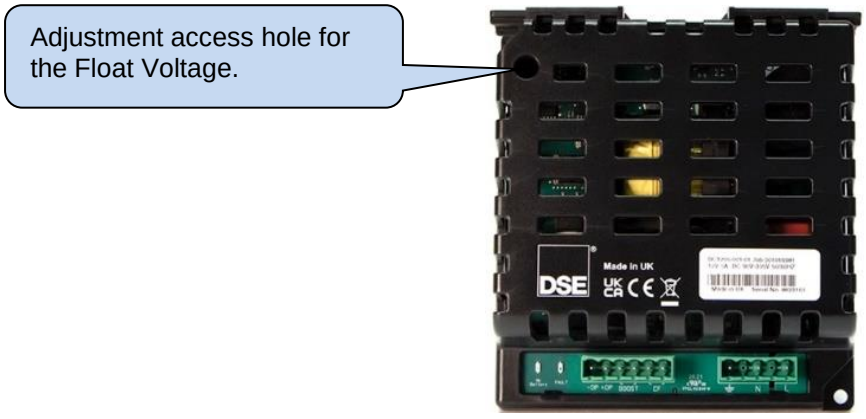
NOTE: The charge output voltage level can be varied via the pot accessible from the hole. This is to suit the required battery type charge profile. For more info refer to section entitled *Float Voltage Adjustment* elsewhere in this document.

NOTE: Typically a 5 A battery charger is suitable for 50 Ah battery when rated at C/10. A 5 A battery charger can be used to charge a battery with a greater than a 50 Ah rating but it will take longer to be fully charged.

The battery charger is factory set by DSE to suit Lead Acid batteries but its DC output voltage is adjustable to suit any 6 cell battery type and 18 & 20 cell Ni-Cd batteries.
The charger's DC output voltage is adjusted via its pot that is accessible through the hole on the case, for more info refer to section entitled *Float Voltage Adjustment* elsewhere in this document.
Care must be taken to ensure the batteries connected to the charger are of the correct technology to suit the setting of the charger.

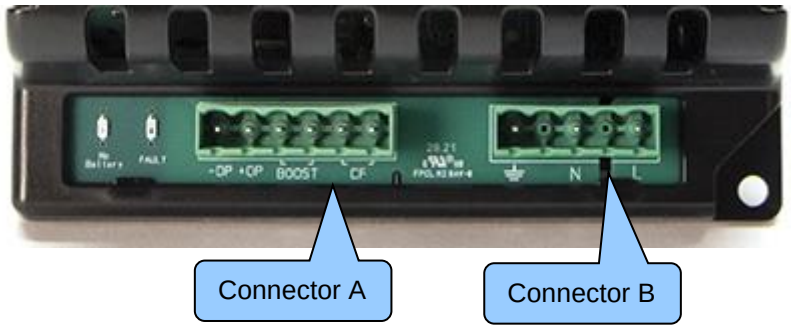
3.3 FLOAT VOLTAGE ADJUSTMENT

The DSE BC1205 & DSE BC2405 chargers' pot for the float voltage adjustment is accessible from the hole as shown in the image below. This will modify the DC output voltage from 12.5 V to 14.5 V on the DSE BC1205 and 25.6 V to 30.3 V on the DSE BC2405.
Turn clockwise to increase the output voltage, and turn anti-clockwise to reduce the output voltage.



3.4 USER CONNECTIONS

3.4.1 CONNECTION DESCRIPTIONS



3.4.1.1 CONNECTOR A

NOTE: The battery charger must be connected directly to the battery.

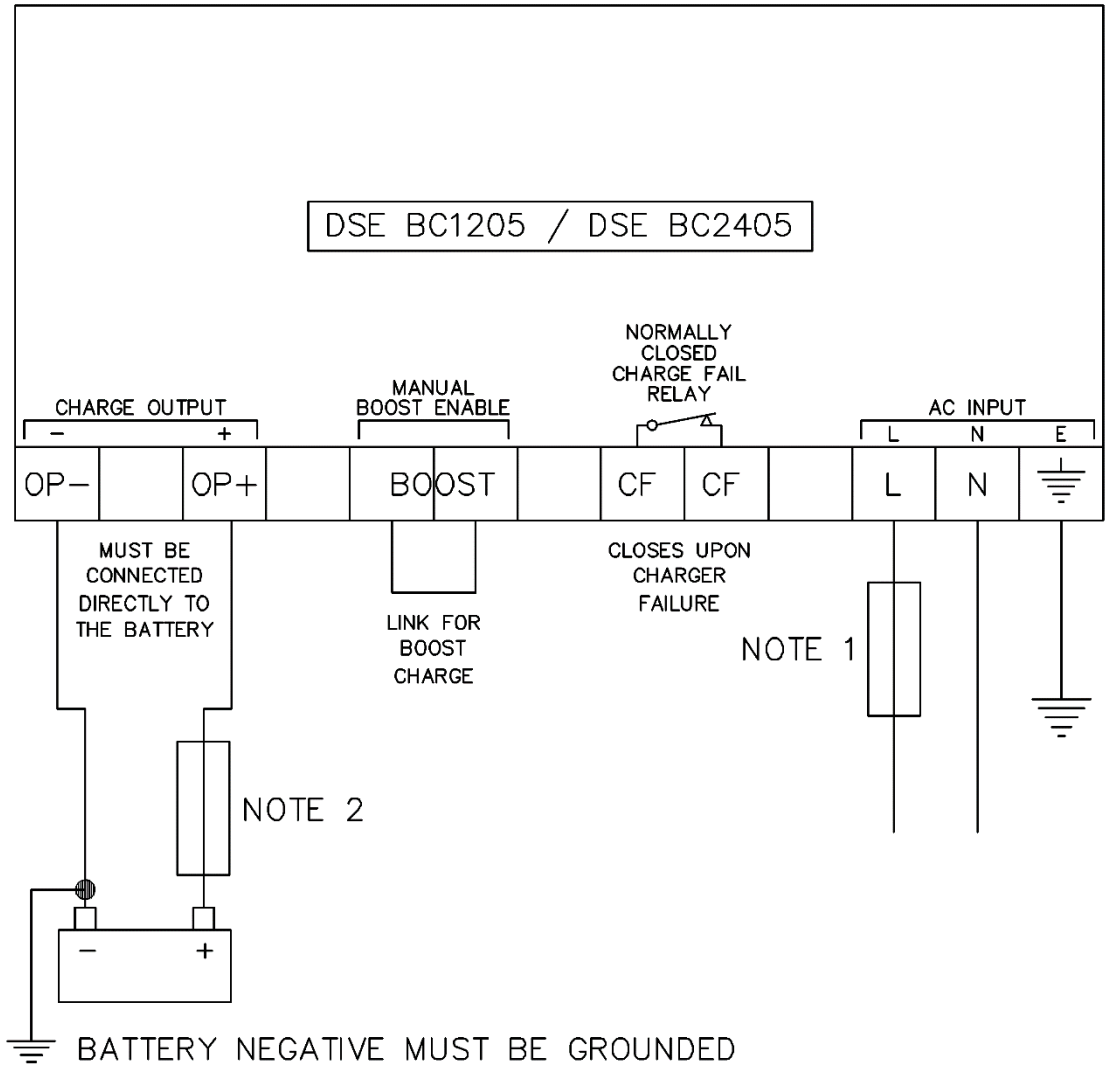
Terminal	Function	Recommended Size	Comments
-OP	Charge Output	1 mm² (AWG 16)	Connected directly to the battery negative terminal
+OP	Charge Output	1 mm² (AWG 16)	Connected directly to the battery positive terminal
BOOST	Boost Mode	1 mm² (AWG 16)	Link for Boost Charge
BOOST	Boost Mode	1 mm² (AWG 16)	
CF	Contact of the Charge Failure Relay	1 mm² (AWG 16)	Changes State Under Charge Fail Conditions
CF	Contact of the Charge Failure Relay	1 mm² (AWG 16)	

3.4.1.2 CONNECTOR B

Parameter	Specification	
Recommended AC Fuse	**230 V_{AC} Input** 3.5 A anti-surge	**110 V_{AC} Input** 6.3 A anti-surge

Terminal	Function	Recommended Size
⏚	Earth	1mm² (AWG 16)
N	AC Neutral	1mm² (AWG 16)
L	AC Live	1mm² (AWG 16)

3.5 TYPICAL WIRING DIAGRAM



BATTERY NEGATIVE MUST BE GROUNDED

NOTE 1

FUSE APPROPRIATELY AND AS CLOSE TO THE BATTERY CHARGER AS POSSIBLE TO PROTECT THE CABLES

NOTE 2

FUSE APPROPRIATELY AND AS CLOSE TO THE BATTERY AS POSSIBLE TO PROTECT THE CABLES AND BATTERY

3.5.1 EARTH SYSTEMS

3.5.1.1 NEGATIVE EARTH

The typical wiring diagrams located within this document show connections for a negative earth system (the battery negative connects to Earth).

3.5.1.2 POSITIVE EARTH

When using a DSE module with a Positive Earth System (the battery positive connects to Earth), the following points must be followed:

Follow the typical wiring diagram as normal for all sections ***except*** the earth points.
All points shown as Earth on the typical wiring diagram should connect to ***battery negative*** (not earth).

3.5.1.3 FLOATING EARTH

Where neither the battery positive nor battery negative terminals are connected to earth the following points must be followed:

Follow the typical wiring diagram as normal for all sections ***except*** the earth points.
All points shown as Earth on the typical wiring diagram should connect to ***battery negative*** (not earth).

4 INDICATIONS

The DSE BC1205 & BC2405 chargers have an LED to indicate the status.

4.1 STATUS LED

The *Status LED* indicates the operating state of the battery charger.

Status LED	Condition
Off	AC supply failure / Low output DC voltage
Red Constant	Charging with AC Supply above the min operating voltage (90 Vac)
Red Flashing	Connected to an operating charging alternator
Red Pulsing	DC output overload (DC output current rises above 5.3 A)

4.2 NO BATTERY LED

NOTE: The *No Battery* LED is only available on the DSE BC1205-02 & DSE BC2405-02 variants. Refer to the section entitled *Battery Detection* elsewhere in this document for more info.

The *No Battery LED* indicates if a battery is connected to the charger. This LED is only available on the DSE BC1205-02 & DSE BC2405-02 variants. The state of the LED updates every 60 minutes.

No Battery LED	Condition
Off	Battery detected (test passed)
Red Constant	Battery not detected (test failed)
Red Flashing	Battery detection test in progress

5 OPERATION

The battery charger is usable as a battery charger, DC Power Supply Unit (PSU), or both at the same time. For instance, the battery charger can be used to power the control panel and charge the control panel's batteries or engine starter batteries at the same time.

When a suitable AC supply is connected and no fault is detected, the operation of the battery charger depends upon the load/batteries connected to its output terminals.

5.1 CHARGE FAIL RELAY

When the battery charger detects a fault that prevents it charging the battery, the *Charge Fail Relay* is de-energised (closes). This is used to provide indication that the battery charger is no longer charging the battery due to an AC supply failure or a general battery charger alarm.

The Charge Fail Output Relay de-energises (closes) on one or more of the following faults:

- AC Supply input failure (below 90 V_{AC})
- Short circuit detection on the DC output
- Reverse polarity detection on the DC output
- Battery disconnected (only applicable on the DSE BC1205-02 & DSE BC2405-02 variants)

5.2 BOOST INPUT

NOTE: For more information on how the Boost operates, refer to section entitled *Charging Mode* elsewhere in this document.

The Battery Charger is fitted with a switch input to activate the boost mode. This is achieved by linking the battery charger's BOOST terminals.

5.3 CHARGING MODE

NOTE: Ensure any standing load (loads connected to the battery charger other than the battery) are less than 75 % of the battery charger's current rating. This helps to ensure the charger correctly detects the battery's charge state.

Constant Current (Bulk)

The battery charger enters this mode once the charger's output current reaches 5 A.
In this mode the battery charger maintains a constant current of 5 A and the output voltage is reduced.

Constant Voltage (Float or Boost)

The battery charger enters this mode once the charger's output current falls below 5 A.
In this mode, the battery charger's voltage rises to either the Float or Boost voltage levels, this is determined by activation of the Boost Input. During this time, the voltage is constantly maintained at either Float or Boost and the charge current continues to decrease.

Float Charge is used to provide a small amount of charge current to the battery to overcome internal losses and keep the battery at its 100% charged state. The Float Voltage is adjustable between 12.8 V to 16.6 V on the DSE BC1205, and 25.6 V to 30.3 V on the DSE BC2405 by the access hole using an isolated potentiometer adjustment tool.

Boost Charge is used to provide a larger amount of charge current to the battery to provide a quick charge to a depleted battery. With a Lead Acid type battery, it may also be used to remove sulfation from the battery plates and helping the cells to equalise in voltage.
Boost mode is operated manually by connecting the battery charger's BOOST terminals together for instance with an external switch or timer circuit. Manual boost raises the float voltage by 0.6 V on the DSE BC1205 or by 1.2 V on the DSE BC2405.

Charging Time

Charge time is often of little consequence when the battery is used in a *standby* operation. An example of this is when the battery is used to supply the starting system of a diesel generator. During normal operation, the battery is at full capacity and the battery charger is used to maintain the *Float Voltage* of the battery. The battery is only drained when the generator is called to start. As the generator has a DC charging alternator fitted, the battery is quickly recharged when the generator is running. Should the generator stop before the battery is fully recharged, the battery charger continues to recharge the battery until it is fully charged.

Typically, a battery charges from 0 % capacity to 80 % capacity in roughly 16 hours when charged at C/10. For example, charging a 50 Ah battery for 16 hours at 5 A (50 Ah / 10) charges the battery to 80 % of its full capacity.
Remember to consider any other standing load such as control panel requirements when calculating how much power is 'left' to charge the battery.

5.4 BATTERY DETECTION

NOTE: The Battery Detection feature is only available on the DSE BC1205-02 & DSE BC2405-02 variants.

NOTE: The Battery Detection option is not configurable and cannot be switched off on the DSE BC1205-02 & DSE BC2405-02 chargers.

NOTE: The DSE BC1205-02 & DSE BC2405-02 chargers feature a *No Battery* LED beside the *Status* LED.

The DSE Battery Charger performs a Battery Detection test every 60 minutes. To detect the presence of a battery, the DSE BC1205 reduces its output voltage to 9 V and the DSE BC2405 reduces its output voltage to 18 V. If the voltage measured on the charger's output terminals is higher than 9 V (DSE BC1205) or 18 V (DSE BC2405), the battery charger considers that the battery is connected.

Once the charger determines the battery is disconnect it de-energises (closes) the *Charge Fail Relay,* activates the *No Battery* LED, and then raises its output voltage to the float voltage level. The fault only resets if the battery is connected with a voltage higher than 9 V (DSE BC1205) or 18 V (DSE BC2405) during the next Battery Detection test, or if the charger is powered down.

6 FAULT DIAGNOSIS

Problem	Suggestion
The charger is not operating	Check that the incoming AC supply is correctly connected and within limits and check the integrity of any external fuse that may be fitted. Ensure the charger is not being operated above the maximum temperature specification.
Charge fail relay continuously operated	Check the connected load of the charger is not reverse connected or short circuit.
Batteries fail to charge	Check the batteries using the battery manufacturers recommendations.
Charge time is too long	Typically, a battery will charge from flat to 80% capacity in 16 hours when charged at C/10. For example, charging a 50 Ah battery for 16 hours at 5 A charges the battery to 80% of its full capacity. Remember to consider any other standing load such as control panel requirements when calculating how much power is ‘left’ to charge the battery.

7 EFFICIENCY CALCULATIONS

The power dissipation, power consumption and power factor of a device are often required during the design process of an application. These values are calculated using the following equations and values listed in the section entitled *Specification* found elsewhere in this document.

7.1 MAXIMUM POWER DISSIPATION

$$P_{DC} = V_{DC} \times I_{DC}$$

$$P_{Loss} = P_{DC} \times \left({}^{100 - \eta}/_{100}\right)$$

Where:

V_{DC} = Maximum DC voltage of the charger
I_{DC} = DC current rating of the charger
P_{DC} = Calculated maximum DC power generation
η = Battery charger efficiency at supply AC voltage (V_{AC})
P_{Loss} = Calculated Dissipated Power

7.2 MAXIMUM POWER CONSUMPTION

$$P_{DC} = V_{DC} \times I_{DC}$$

$$P_{AC} = P_{DC} \times \left({}^{100}/_{\eta}\right)$$

Where:

V_{DC} = Maximum DC voltage of the charger
I_{DC} = DC current rating of the charger
P_{DC} = Calculated maximum DC power generation
η = Battery charger efficiency at supply AC voltage (V_{AC})
P_{AC} = Calculated AC power consumption

7.3 POWER FACTOR AT MAXIMUM POWER

$$S_{AC} = V_{AC} \times I_{AC}$$

$$pf = {}^{P_{AC}}/_{S_{AC}}$$

Where:

V_{AC} = Supply AC voltage
I_{AC} = Maximum battery charger current draw at maximum load
S_{AC} = Calculated apparent power
P_{AC} = Calculated AC power consumption
pf = Calculated power factor at full load

8 MAINTENANCE, SPARES, REPAIR AND SERVICING

The DSE battery chargers are designed to be *Fit and Forget*. As such, there are no user serviceable parts. In the case of malfunction, contact the Original Equipment Supplier (OEM).

9 WARRANTY

DSE provides limited warranty to the equipment purchaser at the point of sale. For full details of any applicable warranty, you are referred to your original equipment supplier (OEM).

10 DISPOSAL

10.1 WEEE (WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT)

If you use electrical and electronic equipment you must store, collect, treat, recycle and dispose of WEEE separately from your other waste.

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