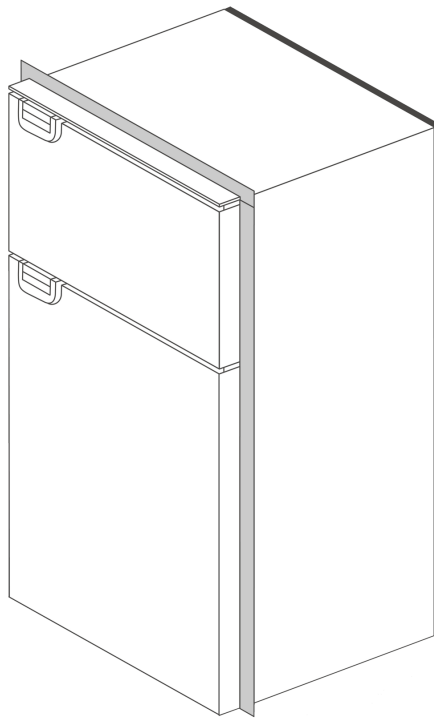


Owners Manual & Operating Instructions



BUSHMAN DC230-X DIGITAL

230L 12V / 24V DC Upright Fridge

Congratulations on your purchase of a Bushman DC230-X. Please read these instructions carefully before installation and use.

IMPORTANT INFORMATION

Do not lay your fridge on its back, top or sides or at any angle exceeding 30°. If your fridge has been handled this way, stand the fridge upright for 12 hrs to allow the internal fluids to redistribute evenly before use.

Never operate your fridge directly from a 240 V or AC power supply.

Do not use a modified sine wave inverter to operate your fridge.

PRIOR TO INSTALLATION

DELIVERY

At delivery, please check that the fridge is complete and is not damaged in any way. Remove all packaging and securing tapes from the fridge. Do not connect an appliance that has been damaged, contact Bushman immediately.

INSTALLATION

Installation of the DC230-X must be completed by a trained professional only.

POWER SUPPLY

Your fridge must be connected to a stable and regulated 12 V or 24 V DC power supply only. The compressor will automatically detect which voltage is present and adjust accordingly.

If you are using a generator or other power supply, the output must be only a pure sine wave.

WIRING

Always wire your fridge directly to your battery terminals. Do not run the wires via a buss bar, battery management system or shared circuit. Please also ensure the earth is wired directly to your battery, not to a chassis.

Ensure the wiring polarity is correct. Connect the red wire to the positive terminal (+) and the black wire to the negative terminal (-). Never connect bare electric wires. Use only connections of a size suitable for the cross section of the wire being used.

CROSS SECTION IN MM ²	AWG (AMERICAN WIRE GAUGE)	MAXIMUM LENGTH OF WIRE IN METRES	
		12 V	24 V
2.5	14	2.5	5
4	12	4	8
6	10	6	12
10	8	10	20

ISOLATION SWITCH AND FUSE

We recommend installing an isolation switch for the fridge circuit as close to your battery bank as possible. Any switches must have a breaking load not less than 20 A on 12 V or 10 A on 24 V.

The power supply wiring must also be protected with a 15 A fuse.

INSTALLATION IN A CAVITY

Your new fridge is designed to be installed in a cavity. We recommend allowing a minimum 5mm gap on each side and the top for ease of installation. A minimum gap of 35mm is required for the rear. Refer to the following table for the recommended cut-out dimensions.

MODEL	MINIMUM CUT-OUT CAVITY DIMENSIONS (MM)		
	WIDTH	DEPTH	HEIGHT
DC230-X	605	550	1460

MOUNTING KIT

Position the mounting kit flush with the front edge of the fridge cabinet and mark the position of the holes. Drill shallow, 3mm drill bit, pilot holes through the sheet metal cabinet. Affix the mounting kit to the side and top of the fridge cabinet using the screws provided.

Once the fridge has been connected to the power supply and moved into its final position, the mounting kit can be affixed to the front of the cavity.

INTERNAL MOUNTING SLEEVES

There are 4 internal mounting sleeves on the inside of the fridge cabinet, and 2 internal mounting sleeves in the inside of the freezer compartment. Access is provided by gently levering off the plastic caps. M5 screws or bolts need to be used. Drill 4mm pilot holes through the plastic sleeve and right through the fridge cabinet sides. Put a small nylon washer onto the screw / bolt heads before inserting. Ensure that the exterior of the fridge cabinet is flush with your cabinetwork before affixing the screws / bolts. If there is a gap, pack it out with a suitable hard material. Check for screw / bolt tightness after your first trip.

BOLTING THROUGH THE REAR CHASSIS

You can bolt through the rear metal chassis (where the compressor sits). We recommend using M8 or M10 bolts for this application. Adding bolts here provides extra strength for you installation to compliment the mounting kit or internal mounting sleeves.

VENTILATION

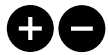
Ventilation will have a critical impact on the efficient operation of your fridge. A minimum of 2 vents needs to be provided from the rear of the fridge cavity to the outside environment, or to the main room where the fridge is located. The vents should be located at the bottom and top of the fridge cavity and have a free cross section of minimum 600cm² each. Note that a 500mm x 250mm vent will have only a free cross section of approximately 600 cm² (not 1250 cm²).

OPERATING THE FRIDGE



ON / OFF Toggles the fridge between “standby” and “power on” modes.

- **Standby** In Standby mode, the screen is blank.
- **Power on** In Power on mode, the screen displays the fridge temperature.






PLUS / MINUS Increase or decrease the fridge set temperature (0°C to 10°C)

ADVANCED SETTINGS

To enter the advanced settings mode, put the fridge into standby mode, then press and hold both the PLUS and MINUS buttons for 3 seconds. Use the ON / OFF button to toggle between Battery Protection settings and Celsius / Farenheit settings:

- **Battery Protection / Low Voltage**

We strongly recommend using the default battery protection settings because all 12V / 24V circuits will have voltage drop between your battery and the fridge compressor. If you change these settings, your fridge may turn off and on intermittently and without your knowledge and perform poorly. Use the PLUS and MINUS button to switch between Low, Medium and High as follows:

		12 V		24 V	
		Cut out	Cut in	Cut out	Cut in
	High	11.1	12.4	24.3	25.7
	Medium	10.4	11.7	22.8	24.2
	Low (Default)	9.6	10.9	21.3	22.7

- **Celsius C° or Farenheit F°**

Default setting is Celsius. To change your temperature setting from Celsius to Farenhenheit, use the PLUS and MINUS buttons.

EQUALISING THE FRIDGE

During the first 24 hours of operation, your compressor will operate for longer than usual. This process allows the internal air temperature, food, drinks, condenser, compressor, and insulation to equalise.

KEEP HOT / WET ITEMS OUT OF THE FRIDGE

Try and keep hot or wet items out of the fridge as they are a prime source of moisture and ice build-up.

SPACE ITEMS, ESPECIALLY ON THE TOP SHELF

It's important to keep some space between your items in the fridge so that the cold air can circulate. This is critically important on the top shelf so the cold air from the cooling element can fall into the fridge cabinet. Round items like cans and jars are good for the top shelf as they allow space around them. Packets of meat etc are probably the worst items as they create an insulated barrier between the top shelf and the rest of the fridge.

RUBBER SEALS ARE CLEAN

Keep your rubber seals clean and free from stickiness. You can clean the rubber seals and the front edge of the fridge cabinet with warm, soapy water.

HAVE GOODS INSIDE THE FRIDGE

The fridge will not operate properly if it is empty, as air does not hold temperature well. If you are using a wireless thermometer the temperature readout will fluctuate significantly with the changes in air temperature, whilst your drinks inside the fridge will not vary much at all.

DEFROSTING

Defrosting needs to be carried out when the ice layer reaches a thickness of 5 - 10mm.

Turn off the power to the fridge and move your food and beverages to another cool place. Do not use any objects to remove the ice or frost, it must be allowed to melt naturally. Once the ice has melted, thoroughly dry the inside of the fridge and freezer compartment. Re-start the fridge on setting 4 and monitor after 24 hours.

CLEANING

Wash the inside of your fridge with a soft cloth, lukewarm water, and a mild soap. Never use abrasive or corrosive cleaning agents, steel wool, scouring sponges or scrapers of any kind.

STORAGE

When the fridge is not in use, please disconnect power to the fridge completely. Keep the doors of the fridge ajar when the fridge is not in use, to allow fresh air to circulate inside the fridge.

MOVING THE DOOR HINGES FROM ONE SIDE TO THE OTHER

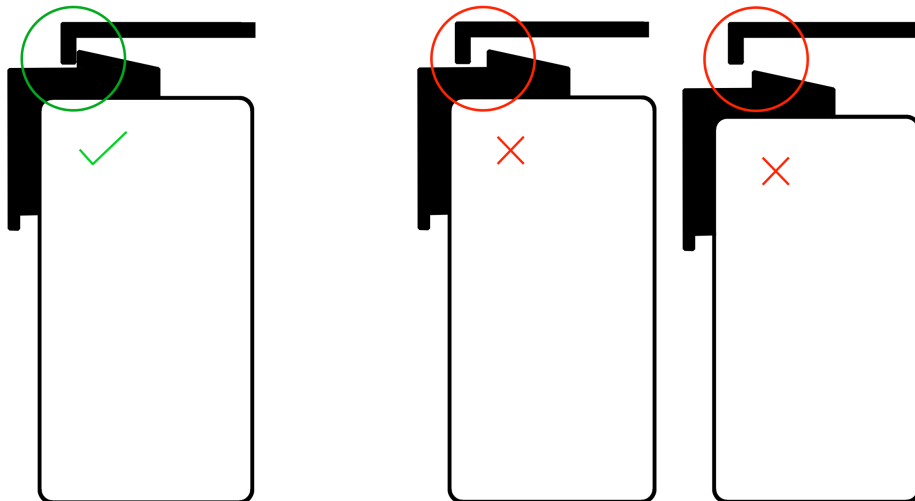
Please follow these instructions carefully. It is imperative that the doors are aligned correctly when the hinges are moved from one side to the other. Incorrectly aligned the doors will cause significant ice build-up and failure of the door latch while underway.

In our experience this is a 2-person job.

If you are unsure at any stage, please call Bushman head office on (03) 8080 9990 for assistance.

SWAPPING THE DOOR HINGES AND CORRECTLY ALIGNING THE DOOR HANDLE & CATCH

1. Tilt the fridge backwards 45° and lean it gently against a wall for support.
2. Carefully remove the top, middle and bottom hinges and both doors. Ensure all hinge pin washers are kept in place. You will need to remove the freezer door catch and fridge door catch at the same time.
3. Move the bottom hinge to the preferred side of fridge cabinet. Only tighten screws finger tight.
4. Move the bottom hinge pin to the other side of the hinge.
5. Locate main door onto the bottom hinge. Ensure any washers are still in place.
6. Affix middle hinge to fridge cabinet. Only tighten screws finger tight.
7. Follow step 1 to 7 in MOVING THE DOOR HANDLE below to reposition the fridge door handle.
8. Position the main door so it is square with the fridge cabinet.
9. **The door handle must be snug under the door catch. See diagram below.** If not, manipulate the position of the door and both door hinges until the door handle is making light contact directly under the catch. Tighten bottom and middle hinge screws fully in this position.
10. Check the fridge door opens and closes freely without rubbing and clips snug under the door catch.
11. Locate freezer door onto the middle hinge. Ensure any washers are still in place.
12. Affix top hinge to fridge cabinet. Only tighten screws finger tight.
13. Follow step 1 to 7 in MOVING THE DOOR HANDLE below to reposition the freezer door handle.
14. Align the freezer door until it is square with the fridge cabinet. Tighten top hinge screws fully.
15. Position the freezer door catch on the top of the fridge cabinet and slide it backwards until the door handle is snug under the door catch. Tighten the freezer door catch fully.



MOVING THE DOOR HANDLE

1. Remove the 2 screws which hold the door handle in place. Access is provided under the logo sticker. You can more easily remove the sticker by applying moderate heat from a hair dryer.
2. Gently lift the door handle off.
3. Reposition the door handle on the preferred side. Note there are 2 small grooves in the top of the door for the door handle to click into place.
4. Drill 2 small (3mm drill bit) pilot holes through the door handle holes and 10mm deep into the door.
5. Reaffix the door handle using the original screws. Ensure the screws are fully embedded into the door.
6. Reapply the logo sticker onto the door handle by applying moderate heat to the sticker.
7. Use the supplied DC-X Series sticker to cover the old screw holes.

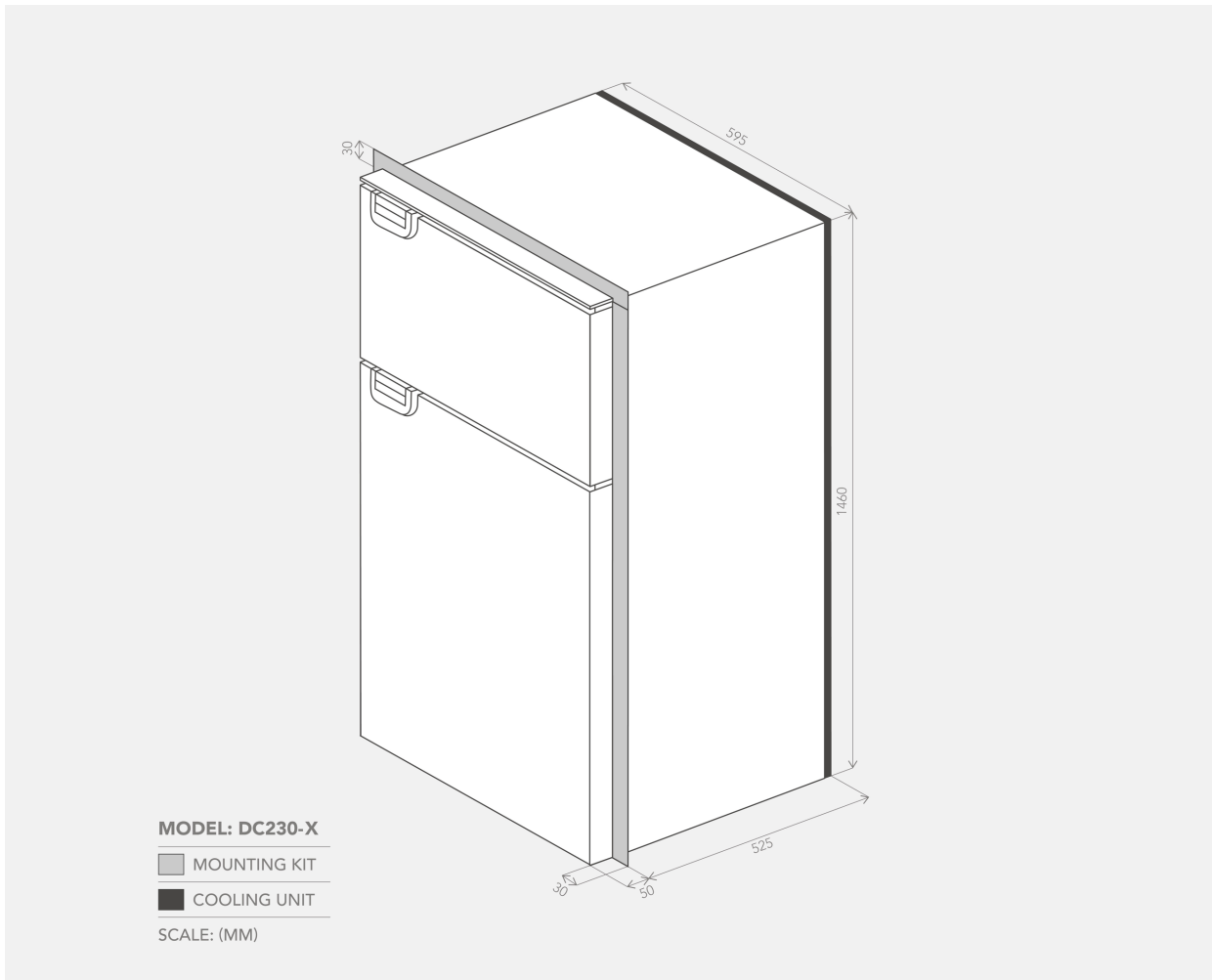
REPLACING THE FRONT DOOR PANEL

1. Follow steps 1 to 2 under “Moving the door handle” above.
2. Gently remove the bottom, horizontal door profile which supports the door panel. Using a screwdriver gently lever the bottom door profile outwards only. Do not lever it down or it will break.
3. Gently slide the original door panel down and out of the door.
4. Note, for the fridge door you will need to loosen the bottom door hinge and pivot out of the way.
5. Slide the new door panel upwards and into place.
6. Reposition the bottom door profile to be flush.
7. Continue from steps 3 to 7 under “Moving the door handle” above.

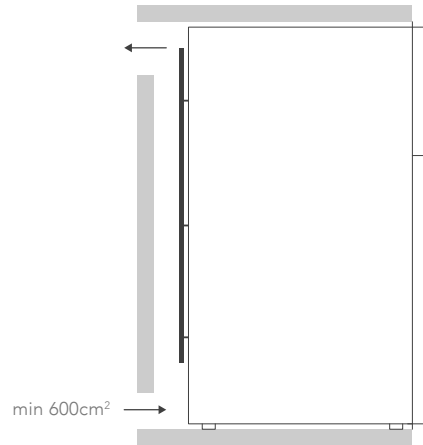
WARRANTY

DP Refrigeration Pty Ltd trading as Bushman Fridges ABN 94 615 295 255 (Bushman) warrants, to the original owner, that this product is free from defects in workmanship and material for a period of three (3) years from the purchase date. This warranty shall be limited to repairing or replacing, at Bushman's option and without charge to the purchaser, defective components. All warranty work shall be performed at a Bushman approved facility. Shipping charges related to returning the product to the Bushman facility are not covered under this warranty. However, this warranty covers shipping charges related to returning the repaired product to the customer. This warranty does not apply to damage or wear to the product caused by accident, abuse, misuse, neglect, unauthorized alteration or repair, or if the product was not used in accordance with Bushman printed installation and operating instructions. To obtain service under this warranty, the defective product must be returned to Bushman together with a copy of the original purchase receipt. Any product repaired or replaced under this warranty will be warranted for the balance of the warranty period with respect to the original purchased product. Bushman is not liable for any incidental or consequential loss or damages whatsoever as a result of use or misuse of this product. Any statutory warranty also applies.

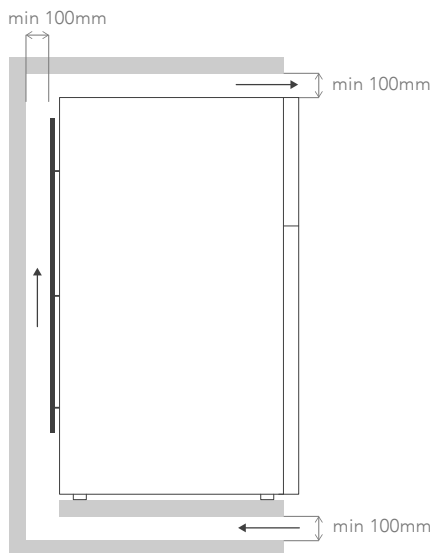
FRIDGE DIAGRAM



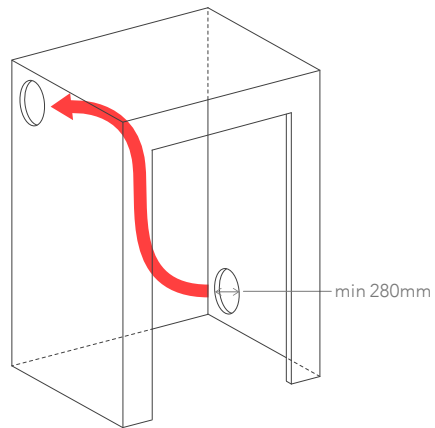
VENTILATION OPTIONS DC230-X



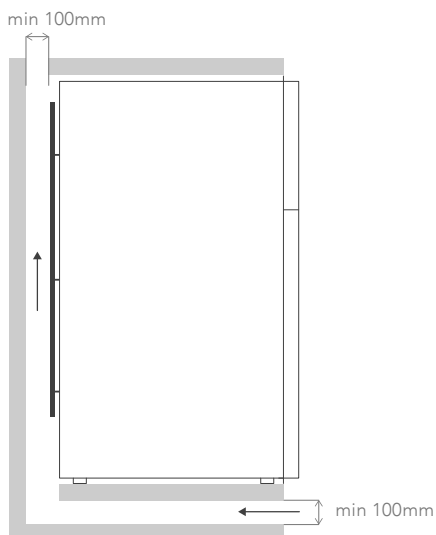
▲ Exterior Ventilation



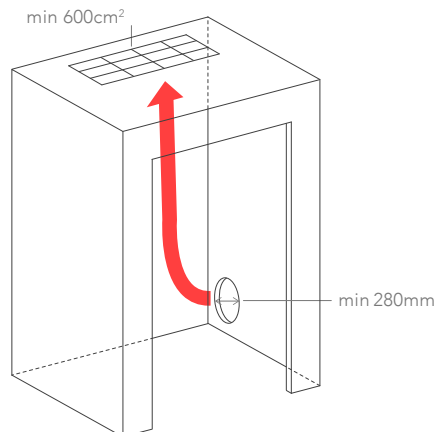
▲ Interior Ventilation Option 1



▲ Interior Ventilation Option 2



▲ Interior Ventilation Option 3



▲ Interior Ventilation Option 4

TROUBLESHOOTING GUIDE

Please check each of these 4 points. All 4 need to be right for your fridge to operate correctly.

1. VOLTAGE

The most common cause of an incorrectly functioning fridge, or a fridge that starts and stops and doesn't get cold, is a lack of consistent voltage. Danfoss compressors have built in battery protection and need the following minimum default voltage for the compressor to start (Cut-in) or continue running (Cut-out). If you have changed these settings, we strongly recommend only using the default Low setting - **see page 3**

VOLTAGE	CUT OUT	CUT IN
12 V	9.6 V	10.9 V
24 V	21.3 V	22.7 V

Note that when the compressor starts it will draw approximately 8A for 1/2 second to turn the compressor over. When this 8A load is applied, the voltage can drop by 2V - 3V, causing the compressor to turn off again. This often happens at night when the battery gets a bit lower (no solar input) or when the car alternator hasn't been started for a while (no alternator input) or if there is a weak spot somewhere in the electrical system (weak join, weak solder, undersized wire, worn battery).

To isolate this problem, use a different, direct power supply

Connect the red and black power wires from the compressor directly to a different 12V power source (for example a fully charged deep cycle 12V battery). It is important to run these two wires directly to the power source, without any unnecessary connections, plugs, solar, battery management, power distribution or buss bars. If the fridge now runs correctly, there is a power supply issue somewhere.

Get an electrician to check

- The polarity of the connections are correct
- The wiring between the fridge and battery is correctly sized – **see page 2**
- Any connections or joins in the wire between the fridge and the power source are 100%
- The battery is not wearing out and is capable of consistently providing 12 volts when a 10 amp load is placed on it
- The voltage to the compressor is still 12V when a 10 A load is placed on the wires

2. VENTILATION AND AIR-FLOW

- There is adequate ventilation and free air flow to the compressor area – **see pages 2 + 6**
- The fridge is not installed in a sealed cavity, container or canopy
- The condensor fan is operating

3. ICE BUILD UP

Ice will slowly build up on the back of the fridge wall over many weeks. This is a normal part of the operation of a low-power cooling system. Excessive ice build-up is a problem as the ice eventually insulates the cooling element and hinders the fridge's ability to cool. In this instance, turning the thermostat up to flat out (0° C) will cause ice to build up even faster. Therefore, slowing the ice build-up from the start is the key. Please follow these 4 steps:

- a) Check the rubber door seal is touching the fridge cabinet all the way around on all 4 sides - **see page 4**
- b) Check the door closes freely without rubbing on anything – **see page 4**
- c) Check the fridge door handle has a snug fit directly under the door catch when closed – **see page 4**
- d) Defrost the fridge, dry it out and start again on thermostat setting 3°C, monitor after 24hrs - **see page 3**

4. OPERATING THE FRIDGE

- Space items in the fridge, this is critically important on the top shelf – **see page 3**
- Only open the fridge or freezer door for short periods of time and when necessary
- Do not place hot or wet items inside the fridge

RED LED ERROR LIGHT

A red LED light is installed inside the fridge light. The number of flashes corresponds to the following error type.

NO. OF FLASHES	ERROR CODE
1	BATTERY PROTECTION CUT-OUT The voltage is outside the cut-out setting.
2	TOO MANY START ATTEMPTS (OR FAN OVER CURRENT) This generally indicates the compressor has had too many start attempts due to low voltage cut-out. It could also indicate fan overload of more than 0.5A but this is extremely rare.
3	MOTOR START ERROR The rotor is blocked or the pressure in the refrigeration system is too high (>5 bar)
4	MINIMUM MOTOR SPEED ERROR Refrigeration system is overloaded, and motor cannot maintain minimum speed (1850 rpm)
5	THERMAL CUT-OUT Refrigeration system overloaded or ambient temperature is too high.

THERMOSTAT FAILURE

If the NTC thermistor has a short circuit or no connection, E6 will display on the screen.

TECHNICAL SPECIFICATIONS

	DC230-X
COMPRESSOR	Secop BD50
VOLTAGE	12 V / 24 V DC
MAX CURRENT	7.5 A / 3.75 A
POWER	80 W
REFRIGERANT	R134a (100g)
EXTERNAL DIMENSIONS (mm)	W 595 D 575 H 1460
NETT WEIGHT	51kg

For after sales service and enquiries, please contact:

BUSHMAN FRIDGES
3 Contour Close Research VIC 3095
(03) 8080 9990
info@bushman.com.au