



# Installation Manual

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## PowerBox Containers (20' & 40')



## Foreword

The purpose of this manual is to provide the user with sound general information for installing, handling and maintenance of a PowerBox container. It is for guidance and assistance with recommendations for correct and safe procedure. Cummins Power Generation Limited cannot accept any liability whatsoever for problems arising as a result of following recommendations in this manual. The tasks in this manual are to be undertaken by suitably trained and qualified service personnel **only**.

The information contained within the manual is based on information available at the time of going to print. In line with Cummins Power Generation Limited policy of continuous development and improvement, information may change at any time without notice. The user should therefore ensure that before commencing any work, he has the latest information available.

Users are respectfully advised that it is their responsibility to employ competent persons to carry out any installation work in the interests of good practice and safety. It is essential that the utmost care is taken with the application, installation and operation of any diesel engine due to their potentially dangerous nature.

Careful reference should also be made to the other Cummins Power Generation Limited literature supplied with the generator set. Particular attention should be paid to the Health and Safety Manual (0908-0110-00), the Product Operation and Maintenance, and Engine Operation Manuals.

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## SECTION 1 - CONCEPT OF POWERBOX 20S AND 40S.

### 1 CONCEPT

PowerBox S models are built to the dimensions included in Standards ISO 668 and ISO 1496-1.

They are certified CSC for international maritime transport and port handling.

#### **PowerBox 20S (1CC):**

Length 6058 mm, Width 2438 mm, Height 2591 mm. Max. Weight 20,320 kg.

#### **PowerBox 40S (1AAA):**

Length 12192 mm, Width 2438 mm, Height 2896 mm (high cube), Max. Weight 30,480 kg.

#### **PowerBox 20S and 40S can be installed:**

1. On a concrete platform incorporating passages for cables and fuel lines, (with civil-engineered bunding if required).
2. On a sufficiently firm ground surface.
3. On a container carrying trailer.

PowerBox 20S and 40S have two side doors for routine maintenance operations. They have a double door at the front which gives access for removal of the generator set for heavy maintenance.

The construction of PowerBox 20S and 40S is based on standard ISO containers. The cooling system, the silencers and the sound traps are integrated in PowerBox 20S and 40S making it possible to reduce installation costs or to create a mobile unit.

#### **Sound Proofing**

Noise reduction type "85 dB(A) @ 1m" at 75% load.

Ceiling of the generator set compartment is treated with Rock Wool 50 mm thick and protected by a perforated metal sheet 1mm thick. Measurements based on Cummins' internal Design Verification Plan & Report standards.

Sound traps on the air inlet and outlet from the generator set compartment in Rock Wool with anti-erosion coating.

Noise @ operating position: Refer to Section 4.3.

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## SECTION 2 – HANDLING

### 2 HANDLING

**Note:** *This task is to be undertaken by suitably trained and qualified service personnel **only**.*



Figure 2-1 *Lifting-eye (positioned at each top corner of the container)*

#### 2.1 Container Lifting – BS 3951: Part 1: Section 1.2: 1985

Top corner fitting (twistlock, hook or shackle). Design loads 150kN.

Minimum bearing area for top corner fitting: It is assumed that lifting devices which only use the top apertures of the four top corner fittings will have a minimum total bearing area on the horizontal part of the inner top surfaces of the top corner fittings of  $800\text{mm}^2$  ( $1.24\text{ in}^2$ ), for each of the top corner fittings.

Bottom corner fittings: Sling at  $30^\circ$  to horizontal. Design loads, 300kN.

##### 2.1.1 Lifting from the bottom corner fitting.

- The line of action of the sling is assumed to be parallel to and not more than 38mm (1.5 in) from the outer face of the corner fitting.
- The load values quoted are for slings at the angles stated, but it is recognised that slings may be used at every angle between the angle stated and the vertical.

## 2.1.2 Lifting using Fork Lift Pockets – 20S Only

If lifting using the fork lift pockets, refer to the General Arrangement drawings for further reference information including the Centre of Gravity.



Figure 2-2 Fork Lift Pockets

## SECTION 3 - INSTALLATION

### 3 INSTALLATION

**Note:** *This task is to be undertaken by suitably trained and qualified service personnel only.*

#### 3.1 Positioning

Select a position for the PowerBox that is as close as possible to the load to be supplied, ensuring that the following conditions are met:

##### 3.1.1 Ground Condition

The ground must be dry, level and firm enough to support the weight of the container without any sinking with time.

#### 3.2 Bunding

Bunding is not included in the PowerBox. If bunding is required, a separate civil engineering solution should be implemented in accordance with local legislation.

#### 3.3 Access

There are two doors fitted, both having an Emergency Stop button fitted externally. One door is for access to the controls, and the other one is for maintenance only. Access via this latter door must only be when the generator set is not operational.

There must be unrestricted access for installation, commissioning and maintenance of the genset at all times to comply with local health & safety requirements. In addition, there must always be complete unrestricted access for opening and closing of cargo, operation, and maintenance doors at all times.

#### 3.4 Ventilation and Exhaust

The positioning of the PowerBox should be such that generator exhaust and cooling air flows do not create a nuisance, or potential source of danger to personnel, or buildings etc. It is critical that inlet and outlet sections have unrestricted air-flows.

##### 3.4.1 Air outlet.

The sound trap is fitted with a protective screen against birds and debris. A rain protection screen (weather louvre) is available as an option.

##### 3.4.2 Exhaust

Every PowerBox is fitted with a 35 dB type exhaust silencer mounted inside the container. It is insulated to limit the temperature rise in the container. (For exhaust commissioning see section 4.4 and 4.5).

The exhaust has two outlets with stacks which can be removed for transport. The stacks are fitted with flap valves.

The pipe work between the engine and the silencer incorporates one or two expansion bellows according to engine type.

### 3.5 Preparing for Installation

Prepare for installation as follows:

1. Position the PowerBox in the required place.
2. Open **and secure** the PowerBox doors and carry out the full installation procedure as described in the Generator Operation & Maintenance manual.

## SECTION 4 – HEALTH AND SAFETY

### 4 HEALTH & SAFETY

Refer to genset controller manual for full Health & Safety Instructions.

#### 4.1 General Access

There should be unrestricted physical access for commissioning, operation & maintenance procedures around the PowerBox.

#### 4.2 Roof Access

Roof access should only be available to qualified personnel. After commissioning, roof access should only be necessary for periodic exhaust maintenance in accordance with section 6.4. Roof-access equipment (ladders, etc) should be removed from the vicinity of the PowerBox to prevent unqualified personnel from falling, or being burnt by contact with a hot exhaust.

#### 4.3 Noise

**WARNING: RISK OF DAMAGE TO HEARING**

Generator sets emit noise. Ensure that the doors of the enclosure display a suitable pictogram warning that hearing protection must be worn. It is the responsibility of personnel exposed to noise to ensure that they are provided with suitable ear protection, e.g. ear defenders.

Whilst there is a correlation between the emission and exposure levels, this cannot be used reliably to determine whether or not further precautions are required. Many factors influence the actual level of exposure of work-force including adjacent processes and the length of time for which an operator is exposed to the noise. The permissible exposure level can also vary from country to country.

The following information, however, will enable the user of the machine to make a better evaluation of the hazard and risk.

BS EN 458:1994 Hearing protectors – Recommendations for selection, use, care and maintenance – Guidance document.

Noise level measurement taken at control panel (operation point) – resultant spectrum as below:

Based on KTA50G3 50Hz full load								
Sound Pressure Level, time weighed F (SPL F)								
Hz	63	125	250	500	1000	2000	4000	8000
dB, (A)	73.0	91.7	95.8	100.6	103.2	103.1	106.5	110.3

**Note:** *The figures quoted are from a single generator set and do not constitute a guarantee of performance for any particular engine. The data is subject to instrumentation, measurement, and engine to engine variability.*

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## SECTION 5 - COMMISSIONING

### 5 COMMISSIONING

**Note:** *This task is to be undertaken by suitably trained and qualified service personnel only.*

#### 5.1 Control System manual

1. Carry out generator commissioning as described in the Generator Control System manual. Plugs / wiring of adequate current, voltage and insulation rating must be used.
2. All non-current carrying metalwork associated with the equipment must be bonded to a suitable earth connection.

#### 5.2 Cable-Entry and Earth Connection Point

Cable entry is through an aluminium plate in the side of the container. This entry-plate can be cut and fitted with appropriate plastic glands as required.



Figure 5-1

Cable Entry Position

#### 5.3 Fuel Connections

All internal fuel connections are fully fitted and installed before factory-dispatch.

## 5.4 Transport/Blanking Plates

The exhaust extension openings are covered with blanking plates for transport. The 4 bolts used to secure these plates must be retained for subsequently securing the extension pipes.



Figure 5-2 Blanking Plates

## 5.5 Exhaust Extension Installation

During transit the exhaust extension pipes are secured to the floor of the container. During commissioning the blanking plates should be removed and exhaust extension fitted using bolts supplied.



Figure 5-3 Exhaust Extensions



## SECTION 6 - OPERATION

### 6 OPERATION

#### 6.1 PowerBox Doors

These are retained for transport. In operation, the double front door is held in the open position by door catches located on each side of the PowerBox.

**WARNING:** OPEN POWERBOX DOORS BEFORE STARTING GENERATOR.

It is critical that the PowerBox container doors are open before the generator is started.

If the generator is started with the doors closed there will be an air-pressure build up inside the container against the end-doors which could cause injury to generator operators if the doors are opened.

**WARNING:** IF THE GENERATOR IS BEING USED IN A CRITICAL START APPLICATION, THE GENERATOR DOORS SHOULD BE SECURED IN THE OPEN POSITION TO AVOID AN INCREASE IN AIR TEMPERATURE INSIDE THE CONTAINER THAT COULD RESULT IN THE GENERATOR GOING INTO AUTOMATIC SHUT-DOWN. THE MEANS THAT IN A CRITICAL-START APPLICATION, THE GENERATOR DOORS MUST BE SECURED IN THE OPEN POSITION PERMANENTLY.



Figure 6-1 Operation Doors

Operation doors must be secured to side of container before genset is started.



Figure 6-2 Secure Doors

**WARNING:** ONLY CLOSE POWERBOX DOORS AFTER THE GENERATOR HAS BEEN SHUT-DOWN AND BEEN GIVEN ADEQUATE TIME TO COOL DOWN. OTHERWISE, THERE WILL BE SAFETY IMPLICATIONS FROM ATTEMPTING TO CLOSE DOORS AGAINST A HIGH-PRESSURE AIR-FLOW.

## 6.2 Fuel

### 6.2.1 Standard fuel tank

By default, the PowerBox 20S and 40S are equipped with a 500 litre, single walled fuel tank mounted inside the container, to the side. (There is the option available to omit this tank). The tank is made in 3 mm steel. Direct filling inside the PowerBox. For health and safety/spillage reasons the PowerBox fuel tank must always be shipped empty.

The tank is fitted with:

- Piping between tank and engine, flexible hoses are compliant to SAE 100 R1AT
- Drain valve (1/4 turn)
- Cut off valve between tank and engine
- An emergency shut-down valve is available as an option
- A bunded version is available as an option



Figure 6-3 40S PowerBox fuel tank positioned behind alternator against wall

### 6.2.2 Optional fuel tank for PowerBox 40S

As an option the PowerBox 40S can be supplied with a 2000 litre fuel tank. The tank is made in 3mm steel. Note this option is not available on the PowerBox 20S.

The 2000 litre tank **must not** be used in a critical start application (no positive fuel-head guarantee).

## 6.2.3 Automatic Filling

Automatic filling with an electrically powered pump is offered as an option. This system consists of; a direct reading gauge with dry contacts, a low level and stop/go switch for the pump and a vent. Fittings are available on the outside of the container for connection to the main tank.

If the automatic fuel-filling option is chosen it will be pre-installed in the PowerBox prior to factory dispatch.

### 6.2.3.1 External Fuel Connections

External connections are located on both sides of the container. They are dispatched, covered with black rubber blanking-caps.

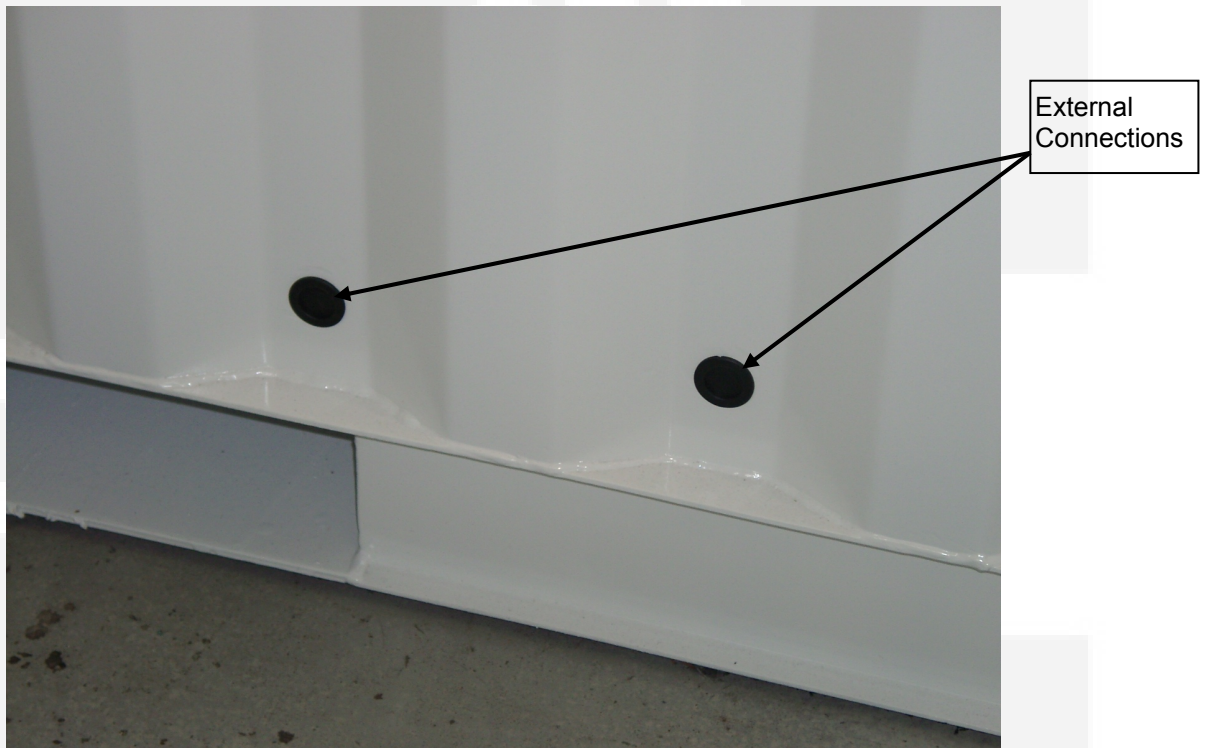


Figure 6-4 Fuel connection points

## 6.2.4 Fueling for critical start applications

If the PowerBox/Generator combination is being employed in a critical start application, it is essential that the fuel set-up arrangement ensures that a positive head of fuel is available at all start times.

If an external bulk tank is to be directly coupled to the engine, refer to the engine Installation Manual and the datasheet for allowable fuel heads.

## 6.3 Electricity

### 6.3.1 Lighting

#### 6.3.1.1 Standard Lighting 24v.

Lighting 24v / 8w by one lamp situated beside main access door.

Two timer switches situated inside the container, next to each side door.

**WARNING: PROLONGED USE OF THE DC LIGHTING WITHOUT A BATTERY CHARGER CONNECTED WILL DRAIN THE BATTERIES, RESULTING IN THE POSSIBILITY OF THE GENERATOR SET NOT STARTING.**

**THE DC LIGHTING CAN BE USED CONTINUOUSLY WHILE THE GENERATOR IS RUNNING**

#### 6.3.1.2 Optional lighting.

Lighting Two, 230v / 28w, with switch inside the container beside main access of PowerBox.

Two Schucco (European domestic) type sockets 230v / 10A

#### 6.3.1.3 Optional safety lighting

Mains failure lighting is supplied by batteries.

### 6.3.2 Cables and auxiliaries.

The cables are installed in TOLFIL (or similar) type cable passages at the top of the side walls.

### 6.3.3 Connection to PowerBox Consumer Unit

**Note:** This task is to be undertaken by suitably trained and qualified service personnel **only**.

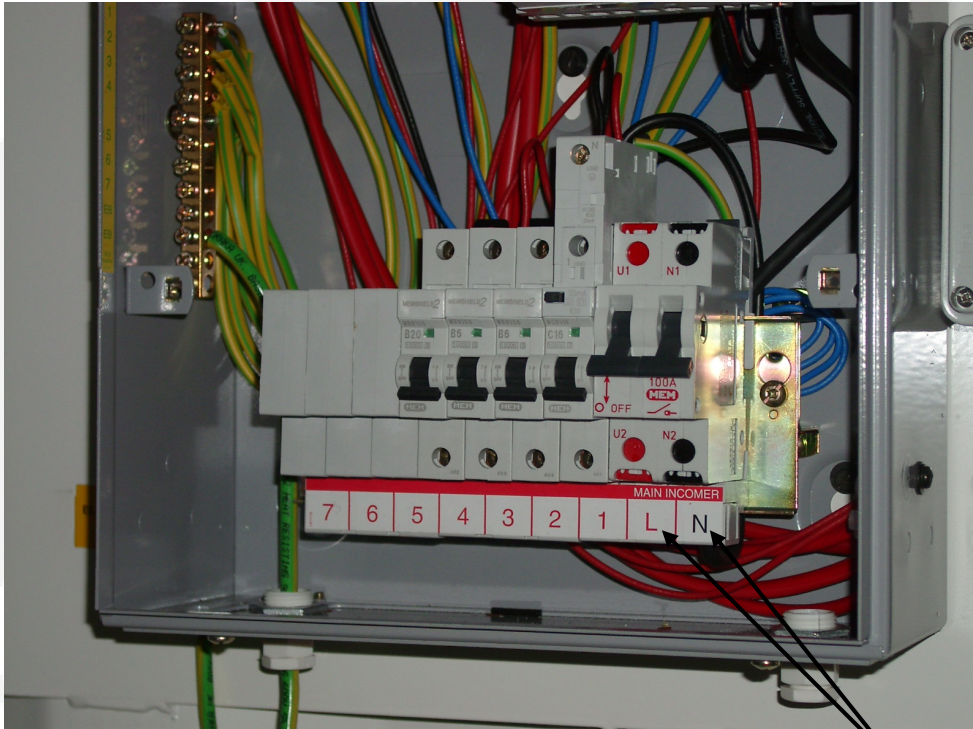


Figure 6-5 Customer Connections to Consumer Unit.

**WARNING:** THE CONSUMER UNIT REQUIRES A 230V / 100A SUPPLY FROM THE CUSTOMER, A TRANSFORMER MAY BE REQUIRED TO OBTAIN THE CORRECT VOLTAGE.

### 6.3.3.1 PowerBox Consumer Unit & Optional Battery



Consumer Unit

Optional  
Battery Charger

Figure 6-6 Position of Optional Wall Mounted Battery Charger

### 6.3.3.2 Optional Battery Charger

If required, a 5A battery charger can be fitted next to the consumer unit.

## 6.4 Water Ingress

Whilst a degree of water ingress is a normal expectation in generator set containers, the PowerBox has been designed and tested to Cummins' standards to ensure such ingress is minimal. Drainage holes are provided in the floor of the PowerBox 40S container to facilitate unassisted water drainage.



Figure 6-7 Drainage-hole position

## 6.5 Emergency E-Stops



Figure 6-8 Emergency Stops (E-stops) are fitted next to the service doors.



## SECTION 7 - MAINTENANCE

### 7 MAINTENANCE

**Note:** *This task is to be undertaken by suitably trained and qualified service personnel only.*

#### 7.1 External Surfaces

All external surfaces should be inspected for damage periodically, and cleaned to remove any build-up of dirt.

#### 7.2 Doors

1. Side doors are fitted with an “anti-panic” internal opening system. The external handle is designed to operate normally against the air pressure difference caused when the machine is running and against the resistance of the door seals. The handle incorporates a key-operated lock, the handle and hinges are treated against corrosion. All external fittings are stainless steel.
2. Openings. These are fitted with seals where necessary, their handles and accessories are treated against corrosion.
3. Inspect the neoprene seal for damage and replace if necessary.
4. Apply grease to the door hinges.
5. Check the door handles, locks and internal panic-release mechanisms for correct operation.

#### 7.3 Inlets / Outlets

Check that the air inlet and outlet ventilation louvres are free from clogging by debris, and that no objects are placed against them.

#### 7.4 Exhaust System

1. The exhaust system should be inspected periodically for leaks and damage.
2. Check that the exhaust pipe exit is free from obstruction and clear of debris.
3. Ensure that no materials or debris have come into contact with the exhaust system, particularly surfaces that become hot when the generator is in operation.

#### 7.5 Air filters

The engine air filters are mounted close to the cool air inlet of the generator set compartment.

**Note:** *Heavy duty air cleaners (dusty atmosphere) cannot be installed on any engines located in the PowerBox because of their large size.*

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