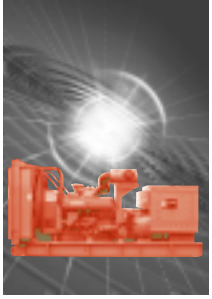
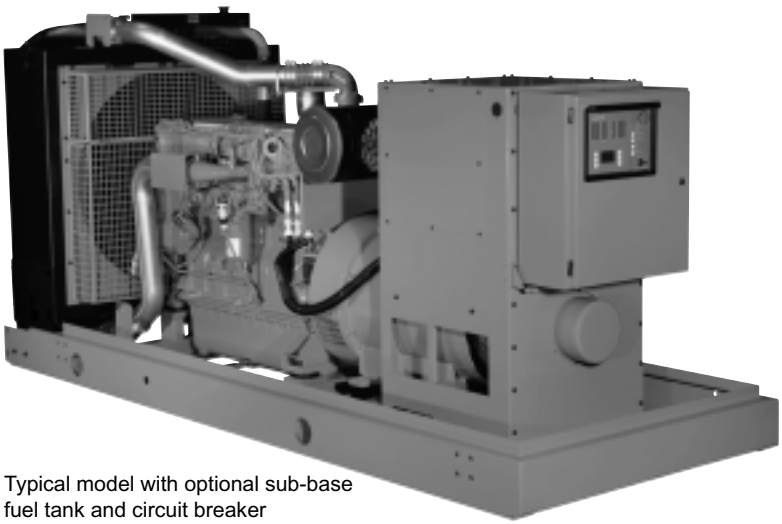


Power Generation

Diesel Powered Generating Sets 410 kW - 500 kW 60 Hz QSX15 Series Engine



Typical model with optional sub-base fuel tank and circuit breaker

Standard Genset Features

Single Source Responsibility
- Design, manufacturer and test of all components and accessories are made by Cummins Power Generation and Cummins companies

International Integrity
- Assurance and strength of a worldwide, world class corporation

Global Backing
- 24 hour spares and service support – in 72 countries

Single Source Warranty
- Complete genset covered by Cummins Power Generation comprehensive warranty

Packaged Self-Contained Units
- Units with built in antivibration systems with provision for base fuel tank and other accessories

Cummins Engine
- Heavy duty 4 cycle water cooled engine
- Electronic governor control

Cooling System
- 40°C cooling package (50°C option)

Ready Filled
- Every set comes filled with lube oil and anti-freeze

Alternator
- Brushless Group made machine
- Close voltage regulation
- Rotor and exciter impregnated with oil and acid resisting resin
- 12 lead reconnectable
- Exceptional short circuit capability
- Low waveform distortion with non linear loads

Ratings
All kW Power ratings based on a 40°C ambient temperature reference

Chassis
Built-in anti-vibration system
Bonded rubber units fitted as standard eliminates need for rubber mats or spring mountings

Low Emissions
- Integral cooling systems which deliver low NOx, CO, HC, PM and SO_2 exhaust emissions

PowerCommand Control System PCC II
- Microprocessor control
- Integrates governor and voltage regulation systems
- Superior alternator and genset protection system
- Accurate battery monitoring system
- Totally reliable and proven system
- CE Compliant

Quality Assurance
Registered Firm Certificate Number FM509 in accordance with: BS EN ISO 9001

Quality Assurance Schedule 3420/1

One Source — Engine — Alternator — Controls — Generating Set — One Name

Cummins Power Generation, Cummins Engines and Newage Alternators are all part of the same group

60 Hz Ratings				
Model Prime	**Prime kW** (kVA)	**Model Standby**	**Standby kW** (kVA)	**Engine Model**
410 DFEJ	**410** (513)	**450 DFEJ**	**450** (563)	**QSX15G9**
455 DFEK	**455** (569)	**500 DFEK**	**500** (625)	**QSX15G9**

A Single Source for *all* Power System Solutions

Specifications

Generator Set Performance

Voltage Regulation
Maintains voltage output to within ±1.0%.
At any power factor between 0.8 lagging and unity.
At any variations from No load to Full load.
At any variations from Cold to Hot.
At speed droop variations up to 4.5%.

Frequency Regulation
Isochronous under varying loads from no load to 100% full load.

Random Frequency Variation
Will not exceed ±0.25% of its mean value for constant loads – no load to full load.

Waveform
Total harmonic distortion open circuit voltage waveform in the order of 1.5%. Three-phase balanced load in the order of 5.0%.

Telephone Influence Factor (TIF)
TIF better than 50.
THF to BS4999 Part 40 better than 2%.

Alternator Temperature Rise
Class H insulation. Temperature rise up to 125°C permitted.

Radio Interference
In compliance with BS800 and VDE levels G and N.

Engine

Cummins QSX15G9 direct injection engines. Six-cylinder, in-line. 14.9 litres.

Type
Water cooled, four cycle, turbo charged and aftercooled.

Construction
Four valves per cylinder, forged steel crankshaft and connecting rods, cast iron block, replaceable wet liners.

Starting
24 volt negative earth. Battery charging 35 amp alternator. Cranking current 900 amps at 0°C.

Fuel System
24 volt fail safe fuel actuator. Spin-on element fuel filters. Cummins HPI - TP fuel injection system with integral electronic governor. Dual flexible fuel lines and connectors. Fuel/water separator.

Filters
Dry element air filters with restriction indicator and spin-on combination element oil filter with full flow and bypass filteration. Spin on corrosion resistor filter.

Cooling
40°C radiator as standard with 50°C ambient as option.

Alternator

Type
Brushless, single bearing, revolving field, 4-pole, drip proof, screen protected.
Class H insulation.
Enclosed to IP22 (NEMA 1) standard.
IC 01 cooling system.
Fully interconnected damper winding.
AC exciter and rotating rectifier unit.
Epoxy coated stator winding.
Rotor and exciter impregnated with tropical grade insulating oil and acid resisting polyester resin. Dynamically balanced rotor to BS5625 grade 2.5.
Sealed for life bearings.
Layer wound mechanically wedged rotor.

Exciter
Triple dipped in moisture, oil and acid resisting polyester varnish and coated with anti-tracking varnish.
Sealed solid state automatic voltage regulator – self-exciting, self-regulating.
Output windings with 2/3 pitch for improved harmonics and paralleling ability.
Close coupled engine/alternator for perfect alignment.

Compliance Standards

To BS4999/5000 pt 99,
VDE 0530, UTE5100,
NEMA MG1-22, CEMA,
IEC 34, CSA A22.2,
AS1359, BSS5514,
ISO 3046, ISO 8528

Chassis

Fabricated and welded steel chassis
Built-in anti-vibration mountings
Optional sub-base fuel tank with eight hour capacity, dual flexible fuel lines, dial type fuel gauge and drain bung

Finish
Etch undercoated and finished in high gloss durable green

General
Complete set of operating and instruction manuals

Generator Set Options

Engine
- o Heavy duty air cleaner
- o Coolant heater and thermostat
- o Tool kit
- o Lead acid batteries, cable and fitted tray
- o NiCad batteries
- o Sump drain pump
- o Oil and water drain taps
- o CE Compliance (guarding)
- o Exhaust temperature monitoring

Cooling
- o Oil temperature indication

Alternator
- o Anti-Condensation heater
- o Thermistors
- o PMG Exciter and MX321 AVR

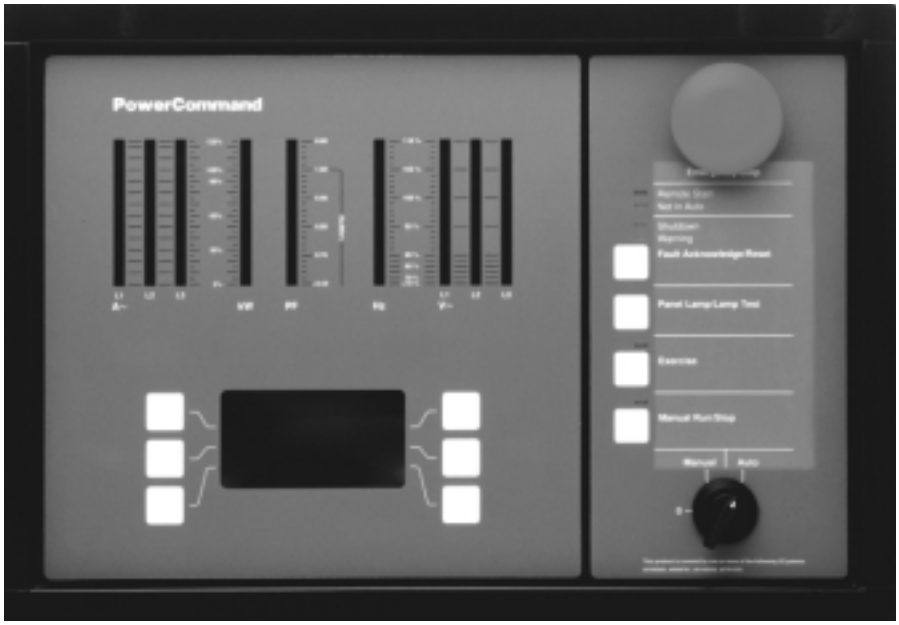
Exhaust System
- o Industrial type silencer
- o Residential type silencer
- o Length of flexible exhaust and bellows

Fuel System
- o Sub-base tanks
- o Hand fuel transfer pump
- o Automatic fuel transfer pump
- o Free-standing 450, 900 and 1350 litre fuel tanks with stand
- o Fuel tank level switch
- o High fuel level warning
- o Low fuel level warning
- o Low fuel level shutdown

Generator Set
- o Silenced enclosures
- o Super silenced enclosures

Control Panel
- o See separate list on Control Panel pages
- o 3 or 4 pole circuit breaker
- o Battery charger 5 amp or 10 amp
- o Cable entrance box

PowerCommand Digital Generator Set Control PCC II



Operator Panel Features

- Emergency stop switch
- Indicating lamps for remote start, not in auto, common shutdown, and common warning
- Fault reset switch
- Panel lamp/lamp test switch
- Exercise switch and indicating lamp
- Manual run/stop switch
- Off/Manual/Auto mode select switch
- Graphical display panel with pushbutton switches capable of displaying up to 9 lines of data approximately 26 characters wide, as well as graphical characters
- Analog AC metering panel for simultaneous monitoring of 3-phase AC voltage and current, kW, powerfactor, and frequency. Voltage, current and kW are scaled in % of nominal values, and all values are color coded to indicate normal, warning, and abnormal operating conditions
- Single membrane front panel with enclosure rated NEMA 3R/IP53

Control Functions

- Isochronous governing
- 3-phase sensing voltage regulation with single and three phase fault current regulation
- AC output protection including over/under voltage, over/under frequency, overcurrent, short circuit, and over load (kW)
- Engine control and monitoring system with displays for oil pressure, oil temperature, engine coolant temperature, engine speed, battery voltage and other values
- Generator set protection system including AC output protection alarms, engine pressure, temperature warning, Shutdown functions, low coolant temperature, low coolant level, low fuel level, failure to crank, failure to start and overspeed
- Operator adjustments for time delay, start/stop, engine speed, and overspeed
- Technician setup menu
- Status and data display functions including engine operating hours, kW hour productions, AC metering functions and fault history

Control Options

- Alternator temperature alarms
- Audible alarm module
- Automatic mains failure control
- Control anti-condensation heater
- Digital paralleling controls
- Echelon LonWorks interface
- Generator running relay contacts
- Key-type mode control switch

Major Control Features Include:

- Digital full authority electronic engine controls for Cummins HPI-PT fuel system, including engine monitoring and protection, and governing. These functions are integrated with voltage regulation, synchronizing, and load sharing controls, including import/export controls for paralleling with an infinite (utility/mains) bus
- AmpSentry™ Protection for true alternator overcurrent protection
- Analog and Digital AC Output Metering
- Battery Monitoring System to sense and warn against a weak battery condition
- Digital Alarm and Status Message Display
- Generator set Monitoring: Displays status of all critical engine and alternator generator set functions
- Smart Starting Control System: Integrated fuel ramping to limit black smoke and frequency overshoot, in addition to optimized cold weather starting
- Advanced Serviceability using InPower, a PC-based software service tool
- PowerCommand Communications Network Capability (optional)

Control Switches and Functions

- OFF/MANUAL/AUTO Mode Control Switch
- MANUAL RUN/STOP Control Switch and Indicating LED
- EXERCISE Control Switch and Indicating LED
- PANEL LAMP/LAMP TEST Control Switch
- EMERGENCY STOP Control Switch
- Graphical Operator Panel

Graphical Display Panel

- Generator Set Hardware Data
- Data Logs
- Adjustment History
- Fault History
- Load Profile Data
- Generator Set Output Voltage
- Generator Set Output Current
- Generator Set Output Frequency
- Generator Set Power Output
- Generator Set kWh Power Output
- Digital Synchroscope
- Engine Starting Battery Voltage
- Engine Lube Oil Pressure
- Engine Coolant Temperature
- Engine Coolant Pressure
- Engine Fuel Rail Temperature and Pressure
- Engine Fuel Input and Output Temperature
- Intake Manifold Temperature and Pressure
- Engine Fuel Consumption
- Ambient Air Pressure
- Crankcase Blowby Flow
- Aftercooler Inlet Coolant Temperature
- Engine Exhaust Temperature (optional)

Internal Control Functions

General Functions

- Emergency Start Mode
- Non-Emergency Start Mode
- Sleep Mode
- Data Logging
- Fault Simulation Mode
- Built In Test
- First Start Sensor System
- Synchronizer
- Load Demand Mode
- Load Govern Mode
- Manual (Semi-Automatic) Parallel Mode

Engine Control

- Engine Starting
- Cycle Cranking
- Programmable Idle Speed Control
- Time Delay Start and Stop (cooldown)

Engine Governing

- Isochronous Governing
- Droop Governing
- Temperature Dynamics
- Idle Mode
- Isochronous (kW) Load Sharing Control

Alternator Control

- Digital Output Voltage Regulation
- Torque-Matched Volts/Hz Overload Control
- Fault Current Regulation
- Isochronous (kVar) Load Sharing Control
- Droop (kVar) Load Sharing Control

Protective Functions

- Ground Fault Warning (option-600VAC class generator sets)
- Configurable Alarm and Status Inputs
- Breaker Fail To Close and Breaker Auxiliary Contact Warning or Shutdown
- Breaker Fail To Open Warning
- Bus or Generator Set PT Input Calibration Error
- Emergency Stop

AmpSentry™

- Over Current Warning
- Over Current Shutdown
- Short Circuit Shutdown
- High AC Voltage Shutdown
- Low AC Voltage Shutdown
- Under Frequency Shutdown
- Over Frequency Shutdown/Warning
- Over Load (kW) Warning
- Reverse Power Shutdown
- Sync Check
- Fail To Synchronize Warning or Shutdown
- Phase Sequence Sensing Shutdown
- Reverse Var Shutdown
- Breaker Fail to Close
- High Alternator Temperature (Option)

Engine Protection

- Overspeed Shutdown
- Low Lube Oil Pressure Shutdown
- Low Lube Oil Pressure Warning
- High Lube Oil Temperature Warning/Shutdown
- High Coolant Temperature Shutdown
- High Coolant Temperature Warning
- Low Coolant Pressure Warning/Shutdown
- Low Coolant Level Warning/Shutdown
- Low and High Battery Voltage Warning
- Discharged Battery Protection
- Weak battery warning
- Fail to Start (Overcrank) Shutdown
- Fail to Crank Shutdown
- Redundant Starter Disconnect
- Redundant Speed Sensors
- Low Fuel – Day Tank and Low Fuel – Main Tank warning
- Cranking Lockout
- Sensor Failure Indication
- High Crankcase Blowby Level warning
- High Fuel Temperature Warning
- High Intake Manifold Temperature/Pressure
- Aftercooler Cooler Inlet Over Temperature
- Low Oil Level warning
- Low coolant temperature (warning)
- Low Fuel – Daytank (warning, external input signal)
- High coolant temperature (shutdown)

Control Interface

Input signals to the PowerCommand control include:

- Remote Start signal
- Remote Emergency Stop
- Configurable Customer Inputs
- Low Main Fuel Level warning
- Remote Alarm Reset
- Load Demand Stop
- Utility Parallel (Load Govern) Mode command

Output signals from the control include:

- Generator Set Running signal
- Generator Set Common Shutdown signal
- Load Shed signal
- Ready to Load signal
- Modem Control signal

Network connections include:

- Serial Interface.
- Echelon LonWorks Interface (Option)
- Paralleling Breaker Interface

Certifications

PowerCommand meets or exceeds the requirements of the following codes and standards:

- **NFPA110** for level 1 systems.
- **UL508** Listed, Category NIWT7 for US and Canada.
- **CSA C282**-M1999 Compliance
- **CSA 22.2** No. 14 M91 Industrial Controls.
- **ISO 8528-4: 1993 Compliance,** Controls and Switchgear
- **NFPA99:** Standard for Health Care Facilities

EC Marking

- **EN 50081-1** Residential, commercial, light industrial
- **EN 50081-2** Industrial
- **EN 50082-1** Residential, commercial, light industrial
- **EN 50082-2** Industrial
- **ISO 7637, pulses #2b, 4;** DC supply surge voltage test
- **Mil Std 202C, Method 101** Salt Fog test
- **ANSI C62.41** Surge Withstand
- **Mil Std 461**
- **IEC 801.2, 3, 4, 5**
- **IEEE 587**

Software

InPower

Software Functions:

- View active and inactive faults, time stamp for last fault, number of times each fault has occurred. Clear inactive faults (this also can be done with the control operator interface, but is easier to do with the service tool.)
- Display snapshot data for all the latest active and inactive faults. Information on the last 20 fault conditions is displayed. Produce "strip chart" recordings for up to 6 monitored functions at a time
- Perform control simulations
- Download calibrations and feature changes. Allows the user to save generator set configuration data for use in other machines. This is particularly useful in transfer switch and paralleling applications where multiple machines may be set up in the same way
- Display generator set data plate information, including model, serial number
- Verify functional operation of the control by simulating fault conditions within the control, and manipulating input parameters in the control
- Conveniently adjust operating parameters of the generator set, and protective equipment set points
- Generate standard reports describing generator set settings, test report data
- Establish and maintain passwords for users and system administrators. InPower also offers the ability to bypass passwords (by qualified user) in the event that a password is lost or forgotten
- Allows the active testing of all warning and shutdown devices. Provide control simulations to allow testing of the generator set or transfer switch without operation of the device
- Allows operation of the engine with the excitation switched off for some service modes

PowerCommand for Windows

Features include:

- Ability to locally or remotely monitor on-site power systems from a personal computer
- Data logging
- Notifies user of alarm conditions in the power system, and forwards alarm conditions to a paging system when needed
- Provides multiple level security access
- Stores system data in encrypted secure formats
- Allows easy report generation

Options and Accessories

- Key-type Mode Select Switch
- Ground Fault Alarm Module
- Semi-Automatic Paralleling
- Isolated Bus Paralleling
- Full Function Paralleling
- Exhaust Temperature Monitoring
- Alternator Temperature Monitoring
- Digital Remote Annunciator
- Digital Output Relay Module

Technical Data

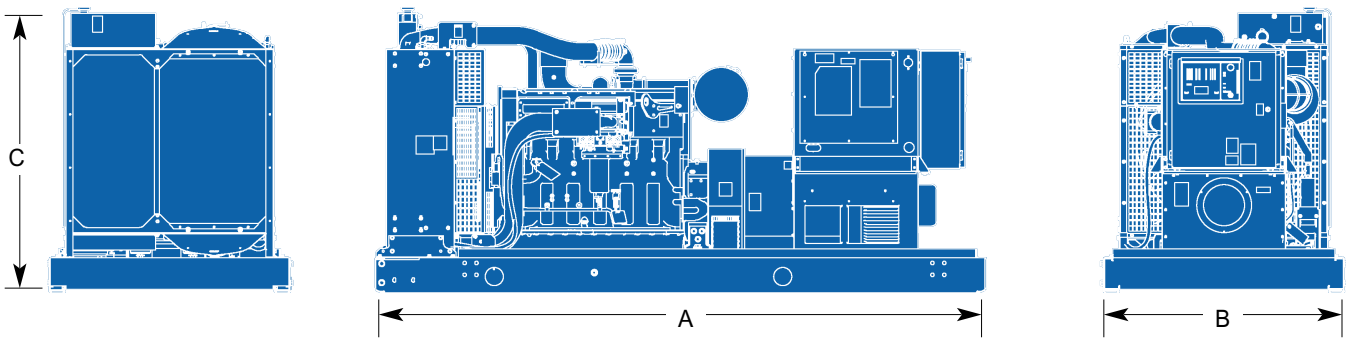
QSX15G9 Generating Sets – 60 Hz

	Prime	Standby	Prime	Standby
Model	410 DFEJ	450 DFEJ	455 DFEK	500 DFEK
Ratings	410 kW	450 kW	455 kW	500 kW
	513 kVA	563 kVA	569 kVA	625 kVA
Engine Model	QSX15G9	QSX15G9	QSX15G9	QSX15G9
Aspiration: Turbo-charged with air-to-air aftercooling	Yes	Yes	Yes	Yes
Gross Engine Power	506 kWm	562 kWm	506 kWm	562 kWm
Break Mean Effective Pressure	2006 kPa	2213 kPa	2193 kPa	2433 kPa
Bore	137 mm	137 mm	137 mm	137 mm
Stroke	169 mm	169 mm	169 mm	169 mm
Piston Speed	10.1 m/s	10.1 m/s	10.1 m/s	10.1 m/s
Compression Ratio	17:1	17:1	17:1	17:1
Lubricating Oil Capacity	83 Litres	83 Litres	83 Litres	83 Litres
Overspeed Limit	2150 rpm ±50	2150 rpm ±50	2150 rpm ±50	2150 rpm ±50
Dry Weight	4082 kg	4082 kg	4309 kg	4309 kg
Wet Weight	4218 kg	4218 kg	4445 kg	4445 kg
Fuel Consumption Load	1/4 | 1/2 | 3/4 | Full	1/4 | 1/2 | 3/4 | Full	1/4 | 1/2 | 3/4 | Full	1/4 | 1/2 | 3/4 | Full
Fuel Consumption L/hr	37 | 60 | 81 | 104	40 | 55 | 88 | 114	41 | 65 | 89 | 115	42 | 59 | 96 | 132
Maximum Fuel Flow	424 L/hr	424 L/hr	424 L/hr	424 L/hr
Maximum Fuel Inlet Restriction	127 mm Hg	127 mm Hg	127 mm Hg	127 mm Hg
Maximum Fuel Return Restriction	77 mm Hg	77 mm Hg	77 mm Hg	77 mm Hg
Fan Load	26 kW	26 kW	26 kW	26 kW
Coolant Capacity	58 Litres	58 Litres	58 Litres	58 Litres
Coolant Flow	485 L/Min	485 L/Min	485 L/Min	485 L/Min
Heat Rejection to Eng Jacket Coolant	144 kW	155 kW	153 kW	182 kW
Heat Rejected to Ambient	54 kW	60 kW	59 kW	67 kW
Combustion Air	34 m^3/min	36 m^3/min	36 m^3/min	41 m^3/min
Maximum Air Cleaner Restriction	6.2 kPa	6.2 kPa	6.2 kPa	6.2 kPa
Alternator Cooling Air	62 m^3/min	62 m^3/min	62 m^3/min	62 m^3/min
Radiator Cooling Air	707 m^3/min	707 m^3/min	707 m^3/min	707 m^3/min
Minimum Air Opening to Room	2.3 m^2	2.3 m^2	2.3 m^2	2.3 m^2
Minimum Discharge Opening	1.6 m^2	1.6 m^2	1.6 m^2	1.6 m^2
Maximum Static Restriction	13 mm Wg	13 mm Wg	13 mm Wg	13 mm Wg
Exhaust Gas Flow (Full Load)	82 m^3/min	89 m^3/min	88 m^3/min	102 m^3/min
Exhaust Gas Temperature	468°C	477°C	473°C	498°C
Maximum Exhaust Back Pressure	6.7 kPa	6.7 kPa	6.7 kPa	6.7 kPa
Derate	RTF	RTF	RTF	RTF

Typical figures only, based on an engine at full working temperature.
Load acceptance performance varies with site conditions.

Ratings
Standby
Applicable for supplying emergency power for the duration of normal power interruption. No sustained overload capability is available for this rating. Nominally Rated (equivalent to fuel stop power in accordance with ISO 3046).
Prime
Applicable for supplying power in lieu of commercially purchased power. Prime power is the maximum power available at a variable load for an unlimted number of hours. A 10% overload capability is available for limited time. Nominally rated.

Dimensions and Weights – 50 Hz



Model	Engine	Dimensions and Weights (mm/kg)			Set Weight kg Dry	Set Weight kg Wet
		A	B	C		
DFEJ	QSX15G9	3868	1524	1534	4082	4218
DFEK	QSX15G9	3868	1524	1534	4309	4445

RTF = Refer to Factory.

Set weights are **without** sub-base tank.
Dimensions and weights are for **guidance** only. Do not use for installation design. Ask for certified drawings on your specific application.
Specifications may change without notice.

See your distributor for more information.

Power Generation

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