

Date: 22/11/2022

Ashley Road East – Planning Condition E16 Diesel Generator

Tottenham Hale Centre Development Plot E (Ashley Road East)

This document has been prepared to discharge condition E16 – Back-Up Diesel Generators – Details of EU Stage V Emission Standards Compliance HGY/2018/2223. Site Wide Condition E16 states that:

"Prior to the installation of back up diesel generators on the application site, details of generator compliance with EU Stage V Emission Standards for Generator Set Engines shall be provided in writing to and for approval by the Local Planning Authority. Installation shall be in compliance with the approved details and maintained thereafter."

Please refer to the relevant details appended as follows:

- Technical Submittal No. TH-ARE-01-001-X-WP0710-60-TS039 - Generator
- TH-ARE-X-WP0710-TR-001 – Offsite FAT test

Please note that the proposed engine complies with emission legislation for stationary standby application. The 'Medium Combustion Plant Directive (MCPD)' does not apply to this Generator application, which came into effect from 1st January 2019, due to its infrequent use where EU Stage V emission standards are not required. The low run time brings it under the requirement of the EU Stage V emission standards. The emergency system is only in operation if there is total power failure to the building and it will be used to power critical life-safety systems.

Excerpt from the guidance as below:

Emergency backup generators

From 1 January 2019, a backup generator only used to provide power at a site during an emergency is excluded.

For an on-site emergency, there's no restriction on the total number of hours:

- *a backup generator can operate for – operators must try to reduce the period and frequency of emergency use 'black start' backup generators can operate for.*
- *Number of hours you can test backup generators:*
 - *You must not carry out more than 50 hours testing a year for each backup generator.*
 - *For each backup generator, you must record the number of hours you test during the year. This is to demonstrate that you meet the exclusion criteria.*

We trust this is sufficient to discharge the applicable condition, but should you require any additional information please don't hesitate to contact Galliford Try.

Regards

Phillip Elgarf-Weir (Galliford Try)



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Technical Submission

FOR APPROVAL

Date:	15/03/2021	Ref & Rev.:	TH-ARE-01-001-X-WP0710-60-TS-039 (C01)
To:	Ian Brookes	Company:	Galliford Try
Project No.:	GT04	Project Title:	Ashley Road East

Details:	Generator
Please find technical details for Generator: BELLS: Model: F.G.Wilson, Ireland P550-3 Rating: PRP: 500KVA, 400KW at 0.8 pf (400v / 50Hz / 3ph) ESP: 550kVA, 440kW at 0.8 pf (400v / 50Hz / 3ph) Engine: Manufacturer: Perkins Model: 2506A-E15TAG2 Response to Galliford Try comments - P&R M Comments in green Generator control panel provides all items indicated in Sweco specification - linked to BMS, including status and fault? Generator control panel includes for the status and faults including a modbus connection for the BMS Engine instrumentation provided as indicated in the Sweco specification? Instrumentation as per SWECO spec Double skin daily storage tank? The fuel day tank is within the base of the generator and is not double skinned however containment can be achieved by sealing the demountable enclosure to ground Daily storage tank incorporate all fittings indicated in Sweco specification including BMS connections? Daily tank as per manufacturers specification including BMS connection. Fuel polishing system c/w remote BMS monitoring system to be indicated? Fuel polishing not required as per manufacturers recommendations.	

Achieve 100% load in 15 seconds? **Yes**

Fuel filter micron rating not greater than 5? **Not required at this size as there is not external fuel system**

Oil leak detection system in generator room? **We have allowed for leak detection within the generator enclosure**

Accessories being provided by generator supplier as Sweco specification? **All equipment as detailed within manufacturers specification**

Generator off site test to be arranged. **Noted, this has been allowed**

Response to SWECO comments dated 1/2/21 - **P&R Morson comments shown in green**

Please provide a letter of conformity: **P&R Morson confirm the SWECO specification has been considered and no non-conformances to report.**

Signed:	<i>T Smith</i>	Print:	Tim Smith
Respond by:	29/3/21	Please note failure to respond by this date may result in delays to the programme and additional costs.	

Response:			
Status:	A - Approved ☐	B - Approved with comments ☐	C - Not Approved ☐
Signed:		Print:	Date:



TECHNICAL SUBMITTAL SHEET

TS No: 001

Project: Ashley Road East

Date: 21st January 2021

Job No: 2849

To: Paul Morris

Company: PR Morson

Date answer is required:

From: John Kirby

Technical Enclosures: Generator System

Date answer was received:

SUBJECT:

Please find attached for approval technical information for the Generator:-

Technical Offer
P500-3 F.G. Wilson Data Sheet,
Perkins Engine Data Sheet,
FG Wilson Alternator Datasheet,
DSE7410 Datasheet,
Open Set Generator GA
Generator room GA proposal
Room Acoustics TS
Exhaust Silencers data sheet MA31
Under base AV mounts data sheet



RESPONSE / STATUS

A

B

C

COMMENTS:

REPLY DATE:

COMPANY:

NAME:

SIGNATURE:





Technical offer

Manufacturer: F.G.Wilson, Ireland

Model: P550-3

Rating: PRP: 500KVA, 400KW at 0.8 pf
(400v / 50Hz / 3ph)

ESP: 550kVA, 440kW at 0.8 pf
(400v / 50Hz / 3ph)



Prime (PRP)

These ratings are applicable for supplying continuous electrical power (at variable load) in lieu of commercially purchased power. There is no limitation to the annual hours of operation and this model can supply 10% overload power for 1 hour in 12 hours.

Standby(ESP)

These ratings are applicable for supplying continuous electrical power (at variable load) in the event of a utility power failure. No overload is permitted on these ratings. The alternator on this mode is peak continuous rated (as defined in ISO 8528-3).

Engine:

Manufacturer: Perkins

Model: 2506A-E15TAG2

Governor: Electronic

Class: ISO 8528 G2

6 inline, 4 Stroke, direct injection, compression ignition, continuously rated, water-cooled industrial diesel engine arranged for electric start and stop.

Complete with base frame mounted radiator, lubricating oil filters, air cleaners, start motor, battery charging alternator and regulator, multi-cylinder, electronic fuel injection management system, fuel control solenoid, fuel lift pump, electronic engine speed adjustment. The engine will be fitted with a heavy dynamically balanced flywheel suitable for constant speed generator duty. An efficient approved engine speed governor is fitted to maintain engine speed at all conditions of load in line with the requirements of ISO 8528 G2.

Cooling System:

The engine will be complete with set mounted radiator suitable for cooling the machine in UK ambient temperatures and fin design will take into account the compensation for possible ingress of dirt which would normally clog the fins. A thermostatically controlled "stand still" heater will be fitted to aid cold starting and an improved first load step capability.

Filtration System:

The engine will be fitted with dry type air filters with replaceable elements. The engine will be complete with fuel and lubricating oil filters with replaceable elements.

Starting System:

The engine will be dual electric start with starter motor, and dual heavy-duty lead acid batteries, battery racks and interconnecting cables.

**Battery Charging System:**

The engine will be complete with battery charging alternator unit complete with voltage regulator.

Static Battery Charging System:

The generating set will be complete with a constant voltage current limiting type static battery trickle charger. The design of this charger will be fully automatic which continuously monitors the battery voltage and automatically switches the charger via solid state switching device. At the same time the current is fully controlled and overcharging of the battery is therefore impossible.

Dual battery charging arrangement

Coupling Arrangements:

The engine and alternator will be directly coupled by means of an SAE flange so that there is no possibility of misalignments being found after prolonged use. A flexible coupling is used in all cases and the coupling is completely guarded for safety purposes.

Alternator:

Manufacturer: Leroy Somer

Model: FGL60020

Excitation: PMG **AVR:** R450M

The alternator will be coupled directly to the engine and will include an automatic voltage regulator, voltage adjusting potentiometer and under speed protection.

The alternator will be tropically insulated and the windings will be impregnated with thermosetting insulated varnish for use in tropical climates. The rotor is dynamically balanced to reduce vibration. A shaft mounted centrifugal fan provides ample ventilation. A screen protected enclosure is standard and the automatic voltage regulator is readily accessible at the non-drive end.

An alternator anti-condensation heater shall be provided.

Mounting Arrangements:

The engine and alternator will be mounted as a whole on a heavy duty fabricated steel base frame constructed from folded channel sections.

Anti-Vibration Mounts:

The above mentioned base frame will be complete with anti-vibration mountings affixed between the engine / alternator feet and the base frame itself thus ensuring complete vibration isolation of the rotating assemblies and enabling the machine to be placed on an uneven surface without any detrimental effects.





DSE7410 Control panel – set mounted

The generator control panel shall be constructed in substantial gauge sheet steel. The control cubicle and digital display will be wall mounted within the generator enclosure. All information on the status of the generating set is displayed in the various gauges as listed below;

Panel Construction and Finish

Components installed in a heavy duty sheet steel enclosure
Phosphate chemical pre-coating of steel provides corrosion resistant surface
Polyester composite powder topcoat forms high gloss and extremely durable finish
Lockable-hinged panel door provides easy component access

Mounting

Mounted to generating set baseframe on robust tower type stand.

Instrumentation

LCD display with adjustable contrast and backlight with auto power off

A.C. Metering

Volts 3-phase (L-L & L-N)
Amps (per phase & average)
Frequency

D.C. Metering

Battery Volts
Hours Run
Engine Jacket Water Temperature (in °C or °F)
Lube Oil Pressure (in psi, kPa or bar)
Engine Speed (RPM)

Protection

Fail to Start
Low Oil Pressure.
The low level water sender and high temperature are as one input. High temperature or low water level generator will shutdown
High Engine Temperature
Under Speed, Over Speed
Loss of Engine Speed Detection
Low/High Battery Voltage
Battery Charger Failure, High and low battery charging failure will indicate that there is a fault with the batteries
3 Spare Fault Channels
20 Event Fault Log (name of each event, time & engine hours at first occurrence of event, time & engine hours at latest occurrence of event, number of occurrences of event)

Controls

2 LED status indicators (1 red shutdown, 1 amber warning)
Run key, Auto key and Stop key with LED indicators
Lamp test key
Alarm Acknowledge key
Menu navigation keys
Engine and AC metering shortcut keys
Control module keys with tactile feedback
Lock down emergency stop push button



The panel would be complete with all necessary internal wiring, control circuit relays, control switches push buttons and terminals. The generator set control panel start signal shall be derived from a set of volt free contacts (to be wired from the change over panel, by others).

Circuit Breaker:

The circuit breaker for the generator set is set mounted directly adjacent to the generator set control panel within frame mounted panel with gland plate beneath for external cable connection.

The circuit breaker shall be a 3 Pole MCCB.

Finish:

For durability and corrosion resistance all sheet metal components are first treated with a phosphate chemical conversion coating, which provides an excellent corrosion resistant surface. These metal components are then painted by applying a polyester powder to melt and form a continuous high gloss and extremely durable coating. The engine and alternator are thoroughly cleaned and finished in temperature controlled ovens with industrial high gloss paint. All fasteners are electroplated.

BMS:

The generator set will be equipped with a Modbus communications port for connection to the BMS (BMS is by others) utilizing the RS 422 communications protocol.

We assume that the change over panels are by others and will be equipped with the necessary start delay, return delay and run on timers.

A 7-core 1.5sqmm cable as a minimum should be installed between each of the changeover panels and generator panel.

A 30A 1ph supply should be provided at the generator control panel for auxiliary power.

Remote Signals/Contacts

Terminals for Remote Emergency Stop and volt free contacts for common alarm and generator set running.

Audible Alarm:

A common audible alarm will be provided and will sound in the event of any of the above mentioned faults occurring. The alarm will remain in operation until manually reset by the operator after the fault condition has been corrected.





Standards Applicable to All FG Wilson Product:

The following standards are applicable to FG Wilson generators.

1. BS 4999-0 – General requirements for rotating electrical machines
2. BS 4999-105 – General requirements for rotating electrical machines – classification of degrees of protection by enclosures (identical to BS EN IEC 60034-5)
3. BS 4999-140 – General requirements for rotating electrical machines – voltage regulation and parallel operation of ac synchronous machines
4. BS 4999-142 – General requirements for rotating electrical machines – vibration
5. BS 4999-143 – General requirements for rotating electrical machines – tests
6. BS 5000-99 – Rotating electrical machines of particular types or for particular applications – miscellaneous applications
7. BS 5514-1 – Reciprocating internal combustion engines – standard reference conditions, declarations of power, fuel and lubricating oil consumptions and test methods (identical to ISO 3046-1)
8. BS 7698-1 to -6, -9, -10 – Reciprocating internal combustion engine driven alternating current generating sets (identical to ISO 8528-1 to -6, -9, -10)
9. BS EN IEC 60034-1 – Rotating electrical machines – rating and performance
10. BS EN IEC 60034-22 – Rotating electrical machines – AC generators for reciprocating internal combustion driven generating sets
11. BSEN 292 – Safety of machinery – Basic concepts, general principles for design
12. BSEN 953 – Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards
13. BSEN 12601 – Reciprocating internal combustion engine driven generating sets - safety
14. BSEN 61000-6-3 & -4 – Electromagnetic compatibility – generic emission standard
15. BSEN 61000-6-1 & -2 – Electromagnetic compatibility – generic immunity standard
16. BSEN 60204-1 – Safety of machinery – electrical equipment of machines
17. BSEN 60439-1 – Low voltage switchgear and control gear assemblies
18. BSEN 60529 – Degrees of protection provided by enclosures





Room Acoustic Package

The attenuators offered have cases from pre galvanised sheet and have a minimum thickness of 1.2mm.

Attenuating splitters are constructed from a formed framework of pre-galvanised mild steel sheet and incorporate a highly absorbent, inert mineral wool infill with a density of 48 Kg/m² and pre-galvanised perforated mild steel sheet facing to the airway surfaces.

The “straight through” design coupled with resonant cavity absorptive splitters gives maximum noise reduction with minimum resistance to airflow.

Engine: 2806A-E18TAG1

Air Flow: 6.22 m³/s Cooling @ 125Pa Resistance & 0.62m³/sec Combustion air.

Noise spec: 75 db(A)@ 1mtr **with 1 Running**

Plant room attenuation equipment to suit a PERKINS powered diesel generating set as technical data above.

The following equipment is included:-

- 1 x Air intake attenuator.
- 1 x Air discharge attenuator.
- 1 x Canvas duct c/w installation frames.
- Air inlet & Outlet fixed blade weather louvers c/w bird guards – Built into attenuator casings.
- Primary only Exhaust Silencer.
- Finish Painting.

EQUIPMENT DETAILS

Enclosure Size: 5150 Long x 1800 Wide x 2500 High

Inlet Atten Size: 1700 Long x 1500 Wide x 1800 High

Discharge Atten Size: 1800 Long x 1500 Wide x 1800 High

Primary Bore: 200 mm / Body Dia: 660 mm / Body Length: 1800 mm

Enclosure Size: 8450 Long x 1950 Wide x 3500 High

It is assumed that the plant room walls, ceiling and floor are constructed to match or better the performance of the above equipment





Fuel System

The generator will be complete with a base mounted day tank including a fuel level gauge. Total usable capacity of 888 litres. This will allow for 8 hours minimum running on 100% load.

For such a small capacity fuel tank within the base frame of the generator and the fact the generator will normally be tested at least once per month, we feel the need for a Fuel Polisher is not a requirement specifically for this type of installation.

As the base fuel tank (day tank) fuel is being agitated we do not expect there to be any bacterial growth within the fuel, if a large storage facility remote to the generator base tank is to be installed then a Fuel Polisher therefore would be needed to clean the large main Bulk storage facility.





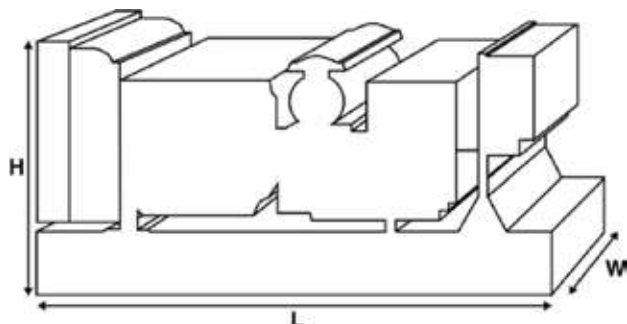
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Output Ratings

Voltage, Frequency		Prime	Standby
400/230 V, 50 Hz	kVA	500	550
	kW	400	440
	kVA		
	kW		

Ratings at 0.8 power factor.

Please refer to the output ratings technical data section for specific generator set outputs per voltage.



Dimensions and Weights

Length	mm	3800 (149.6)
Width	mm	1131 (44.5)
Height	mm	2215 (87.2)
Weight (Dry)	kg	3656 (8060)
Weight (Wet)	kg	3714 (8188)

Ratings in accordance with ISO 8528, ISO 3046, IEC 60034, BS5000 and NEMA MG-1.22.

Generator set pictured may include optional accessories.

Prime Rating

These ratings are applicable for supplying continuous electrical power (at variable load) in lieu of commercially purchased power. There is no limitation to the annual hours of operation and this model can supply 10% overload power for 1 hour in 12 hours.

Standby Rating

These ratings are applicable for supplying continuous electrical power (at variable load) in the event of a utility power failure. No overload is permitted on these ratings. The alternator on this model is peak continuous rated (as defined in ISO 8528-3).

Standard Reference Conditions

Note: Standard reference conditions 25°C (77°F) Air Inlet Temp, 100m (328 ft) A.S.L. 30% relative humidity.

Fuel consumption data at full load with diesel fuel with specific gravity of 0.85 and conforming to BS2869: 1998, Class A2.

FG Wilson offer a range of optional features to allow you to tailor our generator sets to meet your power needs.

Options available include:

- Upgrade to CE Certification
- A wide range of Sound Attenuated Enclosures
- A variety of generator set control and synchronising panels
- Additional alarms and shutdowns
- A selection of exhaust silencer noise levels

For further information on all of the standard and optional features accompanying this product please contact your local Dealer or visit:

www.fgwilson.com

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Ratings and Performance Data

Engine Make		Perkins	
Engine Model:		2506A-E15TAG2	
Alternator Make		FG Wilson	
Alternator Model:		FGL60020	
Control Panel:		FG100	
Base Frame:		Heavy Duty Fabricated Steel	
Circuit Breaker Type:		3 Pole MCCB	
Frequency:		50 HZ	60 HZ
Engine Speed: RPM	rpm	1500	
Fuel Tank Capacity:	litres (US gal)	888 (234.58)	
Fuel Consumption Prime	litres (US gal)/hr	97.2 (25.7)	
Fuel Consumption Standby	litres (US gal)/hr	107.2 (28.3)	

Engine Technical Data

No. of Cylinders		6
Alignment		IN LINE
Cycle		4 STROKE
Bore	mm (in)	137 (5.4)
Stroke	mm (in)	171 (6.7)
Induction		TURBOCHARGED AIR TO AIR CHARGE COOLED
Cooling Method		WATER
Governing Type		ELECTRONIC
Governing Class		ISO 8528 G2
Compression Ratio		16.0:1
Displacement	L (cu. in)	15.2 (927.6)
Moment of Inertia:	kg m ² (lb/in ²)	4.29 (14660)
Voltage		24
Ground		Negative
Battery Charger Amps		70
Engine Weight Dry	kg (lb)	1633 (3600)
Engine Weight Wet	kg (lb)	1714 (3779)

Engine Performance Data

		50 Hz	60 Hz
Engine Speed	rpm	1500	
Gross Engine Power Prime	kW (hp)	451 (605)	
Gross Engine Power Standby	kW (hp)	495 (664)	
BMEP Prime	kPa (psi)	2405 (346)	
BMEP Standby	kPa (psi)	2640 (379.8)	

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Fuel System

Fuel Filter Type:		Replaceable Element			
Recommended Fuel:		Class A2 Diesel			
Fuel Consumption at		110 % Load	100 % Load	75 % Load	50 % Load
50 Hz Prime:	l/hr (US gal/hr)	107.2 (28.3)	97.2 (25.7)	73.8 (19.5)	52.8 (13.9)
50 Hz Standby	l/hr (US gal/hr)	-	107.2 (28.3)	80.6 (21.3)	56.8 (15)
60 Hz Prime	l/hr (US gal/hr)				
60 Hz Standby	l/hr (US gal/hr)	-			

(Based on diesel fuel with a specific gravity of 0.82 and conforming to BS2869 classA2,EN590)

Air System

		50 Hz	60 Hz
Air Filter Type:		Non Canister	
Combustion Air Flow Prime	m ³ /min (cfm)	35.8 (1264)	
Combustion Air Flow Standby	m ³ /min (cfm)	36.6 (1293)	
Max. Combustion Air Intake Restriction	kPa	6.2 (24.9)	

Cooling System

		50 Hz	60 Hz
Cooling System Capacity	l (US gal)	58.1 (15.3)	
Water Pump Type:		Centrifugal	
Heat Rejected to Water & Lube Oil: Prime	kW (Btu/min)	147 (8360)	
Heat Rejected to Water & Lube Oil: Standby	kW (Btu/min)	165 (9383)	
Heat Radiation to Room*: Prime	kW (Btu/min)	55.6 (3162)	
Heat Radiation to Room*: Standby	kW (Btu/min)	61.8 (3515)	
Radiator Fan Load:	kW (hp)	13.7 (18.4)	
Radiator Cooling Airflow:	m ³ /min (cfm)	476.4 (16824)	
External Restriction to Cooling Airflow:	Pa (in H ₂ O)	125 (0.5)	

*: Heat radiated from engine and alternator
Designed to operate in ambient conditions up to 50°C (122°F).
Contact your local FG Wilson Dealer for power ratings at specific site conditions.

Lubrication System

Oil Filter Type:		Eco, Full Flow
Total Oil Capacity:	l (US gal)	62 (16.4)
Oil Pan Capacity:	l (US gal)	53 (14)
Oil Type:		API CI4 15W-40
Oil Cooling Method:		WATER

Exhaust System

		50 Hz	60 Hz
Maximum Allowable Back Pressure:	kPa (in Hg)	6.8 (2)	
Exhaust Gas Flow: Prime	m ³ /min (cfm)	94 (3320)	
Exhaust Gas Flow: Standby	m ³ /min (cfm)	98 (3461)	
Exhaust Gas Temperature: Prime	°C (°F)	500 (932)	
Exhaust Gas Temperature: Standby	°C (°F)	550 (1022)	

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Alternator Physical Data

No. of Bearings:	1
Insulation Class:	H
Winding Pitch:	2/3
Winding Code	6S
Wires:	6
Ingress Protection Rating:	IP23
Excitation System:	SHUNT
AVR Model:	R150

* dependant on voltage code selected

Alternator Operating Data

Overspeed: rpm	2250
Voltage Regulation: (Steady state) %	+/- 1.0
Wave Form NEMA = TIF:	50
Wave Form IEC = THF: %	2
Total Harmonic content LL/LN: %	1.5
Radio Interference:	EN61000-6
Radiant Heat: 50 Hz kW (Btu/min)	26.8 (1524)
Radiant Heat: 60 Hz kW (Btu/min)	

Alternator Performance Data 50 Hz:

		415/240 V	400/230 V	380/220 V	
Voltage Code					
Motor Starting Capability*	kVA	945	882	801	
Short Circuit Capacity**	%	270	270	270	270
Reactances	Xd	3.08	3.32	3.679	
	X'd	0.156	0.168	0.186	
	X''d	0.117	0.117	0.13	

Alternator Performance Data 60 Hz

Voltage Code					
Motor Starting Capability*	kVA				
Short Circuit Capacity**	%	270	270	270	270
Reactances	Xd				
	X'd				
	X''d				

Reactances shown are applicable to prime ratings.

*Based on 30% voltage dip at 0.6 power factor.

** With optional independant excitation system (PMG / AUX winding)

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Output Ratings 50 Hz

		Prime		Standby	
Voltage Code	kVA	kW	kVA	kW	
415/240V	500	400	550	440	
400/230V	500	400	550	440	
380/220V	475	380	522.5	418	
230/115V					
220/127V					
220/110V					
200/115V					
240V					
230V					
220V					

Output Ratings 60 Hz

		Prime		Standby	
Voltage Code	kVA	kW	kVA	kW	
480/277V					
440/254V					
416/240V					
400/230V					
380/220V					
240/139V					
240/120V					
230/115V					
220/127V					
220/110V					
208/120V					
240/120					
220/110					



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Dealer Contact Details

Documentation

Operation and maintenance manual including circuit wiring diagrams.

Generator Set Standards

The equipment meets the following standards: BS5000, ISO 8528, ISO 3046, IEC 60034, NEMA MG-1.22.

Warranty

6.8 – 750 kVA electric power generation products in prime applications the warranty period is 12 months from date of start-up, unlimited hours (8760). For standby applications the warranty period is 24 months from date of start-up, limited to 500 hours per year.

730 – 2500 kVA electric power generation products in prime applications the warranty period is 12 months from date of start-up, unlimited hours (8760 hours) or 24 months from date of start-up, limited to 6000 hours. For standby applications the warranty period is 36 months from date of start-up, limited to 500 hours per year.

FG Wilson manufactures product in the following locations:

Northern Ireland • Brazil • China • India

With headquarters in Northern Ireland, FG Wilson operates through a Global Dealer Network.

To contact your local Sales Office please visit the FG Wilson website at www.fgwilson.com.

FG Wilson is a trading name of Caterpillar (NI) Limited.

In line with our policy of continuous product development, we reserve the right to change specification without notice.

2020-07-20

2500 Series 2506A-E15TAG2

Diesel Engine – ElectropaK – Non-Emissions compliant

478 kWm at 1500 rpm

The 2500 Series engine has been developed using the latest engineering techniques and builds on the strengths of the already very successful 2000Series family and addresses today's uncompromising demands within the power generation industry. Developed from a proven heavy-duty industrial base these products offer superior performance and reliability.

The 2506A-E15TAG2 is a turbocharged and air-to-air charge-cooled, 6 cylinder diesel engine. Its premium features provide exceptional power-to-weight ratio resulting in exceptional fuel consumption.

The overall performance and reliability characteristics make this the prime choice for today's power generation industry.



Specification		
Number of cylinders	6 vertical in-line	
Bore and stroke	137 x 171 mm	5.4 x 6.7 in
Displacement	15.2 litres	927 in ³
Aspiration	Turbocharged and air-to-air charge cooled	
Cycle	4 stroke	
Combustion system	Direct injection	
Compression ratio	16:1	
Rotation	Anti-clockwise, viewed on flywheel	
Total lubricating capacity	62 litres	16.4 US gal
Cooling system	Water-cooled	
Total coolant capacity	58 litres	15.3 US gal

www.perkins.com

Photographs are for illustrative purposes only and may not reflect final specification.
All information in this document is substantially correct at time of printing and may be altered subsequently.
Final weight and dimensions will depend on completed specification.

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 **Perkins®**

THE HEART OF EVERY GREAT MACHINE

2500 Series 2506A-E15TAG2

Diesel Engine – ElectropaK – Non-Emissions compliant

478 kWm at 1500 rpm

Features and benefits

Economic power

- Mechanically operated unit fuel injectors with advanced electronic control, combined with carefully matched turbocharging, give excellent fuel atomisation which leads to exceptional low fuel consumption

Reliable power

- Developed and tested using the latest engineering techniques and finite element analysis for high reliability
- Low oil usage and low wear rates
- High compression ratio ensures clean rapid starting in all conditions
- Perkins global product support is designed to enhance the customer experience of owning a Perkins powered machine. We deliver this through the quality of our distribution network, extensive global coverage and a range of Perkins supported OEM partnership options. So whether you are an end-user or an equipment manufacturer our engine expertise is essential to your success

Compact, clean and efficient power

- Exceptional power to weight ratio and compact size gives optimum power density for ease of installation and more cost effective transportation
- Designed to provide excellent service access for ease of maintenance

Product support

- Perkins actively pursues product support excellence by ensuring our distribution network invest in their territory – strengthening relationships and providing more value to you, our customer
- Through an experienced global network of distributors and dealers, fully trained engine experts deliver total service support around the clock, 365 days a year. They have a comprehensive suite of web based tools at their fingertips covering technical information, parts identification and ordering systems, all dedicated to maximising the productivity of your engine
- Throughout the entire life of a Perkins engine, we provide access to genuine OE specification parts and service. We give 100% reassurance that you receive the very best in terms of quality for lowest possible cost .. wherever your Perkins powered machine is operating in the world

This engine does not comply with harmonized international regulated emissions limits

2500 Series 2506A-E15TAG2

Diesel Engine – ElectropaK – Non-Emissions compliant

478 kWm at 1500 rpm

Technical information

Air inlet

- Mounted air filter

Fuel system

- Mechanically actuated electronically controlled unit fuel injectors with full authority electronic control
- Governing to ISO 8528-5 class G3 with isochronous capability
- Replaceable 'Ecoplus' fuel filter elements with primary filter/water separator
- Fuel cooler

Lubrication system

- Wet sump with filler and dipstick
- Full-flow replaceable 'Ecoplus' filter
- Oil cooler integral with filter header

Cooling system

- Gear-driven circulating pump
- Mounted belt-driven fan
- Radiator supplied loose incorporating air-to-air charge cooler
- System designed for ambients up to 50°C

Electrical equipment

- 24 volt starter motor and 24 volt 70 amp alternator with DC output
- ECM mounted on engine with wiring looms and sensors
- 3 level engine protection system

Flywheel and housing

- High inertia flywheel to SAE J620 size 14
- SAE ½ flywheel housing

Mountings

- Front engine mounting bracket

Optional equipment

- 110 volt/240 volt immersion heater
- Additional speed sensor
- Temperature and pressure sensors for gauges
- Air filter rain hood
- Twin starters/facility for second starter
- Tool kit
- Additional manuals
- Closed circuit crankcase ventilation system

www.perkins.com

Photographs are for illustrative purposes only and may not reflect final specification.
All information in this document is substantially correct at time of printing and may be altered subsequently.
Final weight and dimensions will depend on completed specification.

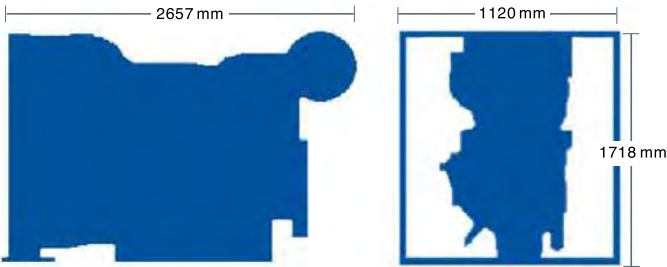
Publication No. PN1842A/12/14 Produced in England ©2014 Perkins Engines Company Limited

 **Perkins®**

THE HEART OF EVERY GREAT MACHINE

2500 Series 2506A-E15TAG2

Diesel Engine – ElectropaK – Non-Emissions compliant
478 kWm at 1500 rpm



Engine package weights and dimensions		
Length	2657 mm	105 in
Width	1120 mm	44 in
Height	1718 mm	68 in
Weight (dry)	1633 kg	3600 lb

2500 Series 2506A-E15TAG2

Diesel Engine – ElectropaK – Non-Emissions compliant

478 kWm at 1500 rpm

Speed rpm	Type of operation	Typical generator output (Net)		Engine power			
				Gross		Net	
		kVA	kWe	kWm	hp	kWm	hp
1500	Prime power	500	400	451	605	435	583
	Standby power	550	440	495	664	478	641

The above ratings represent the engine performance capabilities to conditions specified in ISO 8528/1, ISO 3046/1:1986, BS 5514/1. **Derating may be required for conditions outside these; consult Perkins Engines Company Limited.**

Generator powers are typical and are based on an average alternator efficiency and a power factor (cos. θ) of 0.8. **Fuel specification:** BS 2869: Part 2 1998 Class A2 or ASTM D975 D2. **Lubricating oil:** 15W40 to API CI4.

Rating definitions

Prime power: Power available at variable load with a load factor not exceeding 80% of the prime power rating. Overload of 10% is permitted for 1 hour in every 12 hours' operation. **Standby power:** Power available in the event of a main power network failure up to a maximum of 500 hours per year of which up to 300 hours may be run continuously. Load factor may be up to 100% of standby power. No overload is permitted.

Percent of prime power	Fuel consumption at 1500 rpm g/kWh	Fuel consumption at 1500 rpm l/hr
Standby power	200	111
Prime power	199	100
75%	201	76
50%	211	53

FRAME

FGL60020

WINDING

6



MODELS

FGL60020

REF: FGL60020W6-1 SEP 2020

WINDING DETAILS

Code	6	Insulation class	H
Phase	3	Leads	12
Pole number	4	Pitch	2/3

MECHANICAL DETAILS

Standard protection	IP23
Overspeed	rpm 2250
Air flow 50Hz/60Hz	m ³ /s 0.9 / 1.10

EXCITATION DETAILS

Excitation system	SHUNT	PMG
AVR model	R150	R180
Sustained short-circuit current	-	270%:5s
Steady state voltage regulation	±1.0%	±1.0%

WAVEFORM

Line voltage on no load	
Total harmonic content THC	< 1.5%
Telephone influence factor TIF (NEMA)	< 50
Telephone harmonic factor THF (IEC)	< 2%

LINE VOLTAGE

No overvoltage tolerance for 440V 50Hz excitation level

Frequency / speed

		50Hz / 1500rpm				60Hz / 1800rpm					
Series Star	V	380	400	415	440	380	400	416	440	460	480
Series Delta	V	220	230	240		220	230	240			
Parallel star	V		200	208	220		200	208	220	230	240

RATING

Power factor 0.8, Altitude <=1000m

Class H rise BR	125/40	kVA	500	500	500	490	520	537	555	590	607	625
		kW	400	400	400	392	416	430	444	472	486	500
Class H rise PR	150/40	kVA	530	530	530	519	551	569	588	625	643	663
		kW	424	424	424	416	441	455	471	500	515	530
Class H rise PR	163/27	kVA	550	550	550	539	572	591	611	649	668	688
		kW	440	440	440	431	458	473	488	519	534	550
Class F rise BR	105/40	kVA	455	455	455	446	473	489	505	537	552	569
		kW	364	364	364	357	379	391	404	430	442	455

EFFICIENCIES

Power factor 0.8

110% Class H BR	%	94.1	94.3	94.2	93.9	93.8	94.1	94.2	94.3	94.4	94.4
100% Class H BR	%	94.4	94.5	94.4	94.1	94.1	94.3	94.4	94.6	94.6	94.6
75% Class H BR	%	95.0	94.9	94.8	94.2	94.7	94.8	94.9	95.0	94.9	94.9
50% Class H BR	%	95.1	94.9	94.6	93.6	94.8	94.9	94.9	94.9	94.8	94.6
25% Class H BR	%	93.8	93.1	92.5	90.6	93.2	93.2	93.1	93.0	92.7	92.3

CHARACTERISTIC PARAMETERS

Reactance base class H BR rating

K _c	Short-circuit ratio		0.37	0.45	0.55	0.79	0.24	0.26	0.29	0.32	0.37	0.44
X _d	D-Axis synchronous reactance (unsaturated)	pu	3.68	3.32	3.08	2.69	4.59	4.28	4.09	3.89	3.66	3.46
X' _d	D-Axis transient reactance (saturated)	pu	0.19	0.17	0.16	0.14	0.23	0.22	0.21	0.20	0.18	0.17
X'' _d	D-Axis sub-transient reactance (saturated)	pu	0.130	0.117	0.109	0.095	0.162	0.151	0.144	0.137	0.129	0.122
X _q	Q-Axis synchronous reactance (unsaturated)	pu	1.88	1.69	1.57	1.37	2.34	2.18	2.09	1.98	1.87	1.76
X'' _q	Q-Axis sub-transient reactance (saturated)	pu	0.166	0.150	0.139	0.121	0.207	0.193	0.184	0.175	0.165	0.156
X ₂	Negative-sequence reactance (saturated)	pu	0.148	0.134	0.124	0.108	0.185	0.172	0.164	0.156	0.147	0.139
X ₀	Zero-sequence reactance (independent)	pu	0.008	0.007	0.006	0.006	0.010	0.009	0.008	0.008	0.008	0.007
T' _d	D-Axis transient time constant	ms		100						100		
T'' _d	D-Axis sub-transient time constant	ms		10						10		
T' _{do}	D-Axis open-circuit time constant	ms		1982						1982		
T _a	Armature time constant	ms		15						15		
T _r	Voltage recovery time	ms		< 500						< 500		

EXCITATION VOLTAGE AND CURRENT

No load excitation voltage	V	9.4	11.1	12.8	17.0	6.3	6.9	7.4	8.5	9.6	11.1
No load excitation current	A	0.91	1.07	1.24	1.64	0.61	0.67	0.72	0.82	0.93	1.07
Class H BR excitation voltage	V	36.3	37.4	39.1	43.6	32.7	32.9	33.4	34.9	36.2	38.1
Class H BR excitation current	A	3.51	3.62	3.78	4.22	3.16	3.18	3.23	3.38	3.50	3.68

WINDING RESISTANCE

At 20 °C

Stator line-to-line (series star)	Ω	0.010				Exciter field - Shunt	Ω	10.3
Main field	Ω	0.56						

According to: IEC 60034, UTE NFC51.111, VDE 0530, BS 4999/5000, NEMA MG 1-33

Values quoted are typical. In line with our policy of continuous improvement, we reserve the right to change specification without notice.

Manufactured for FG Wilson by Leroy Somer - Nidec.

FRAME FGL60020 WINDING 6



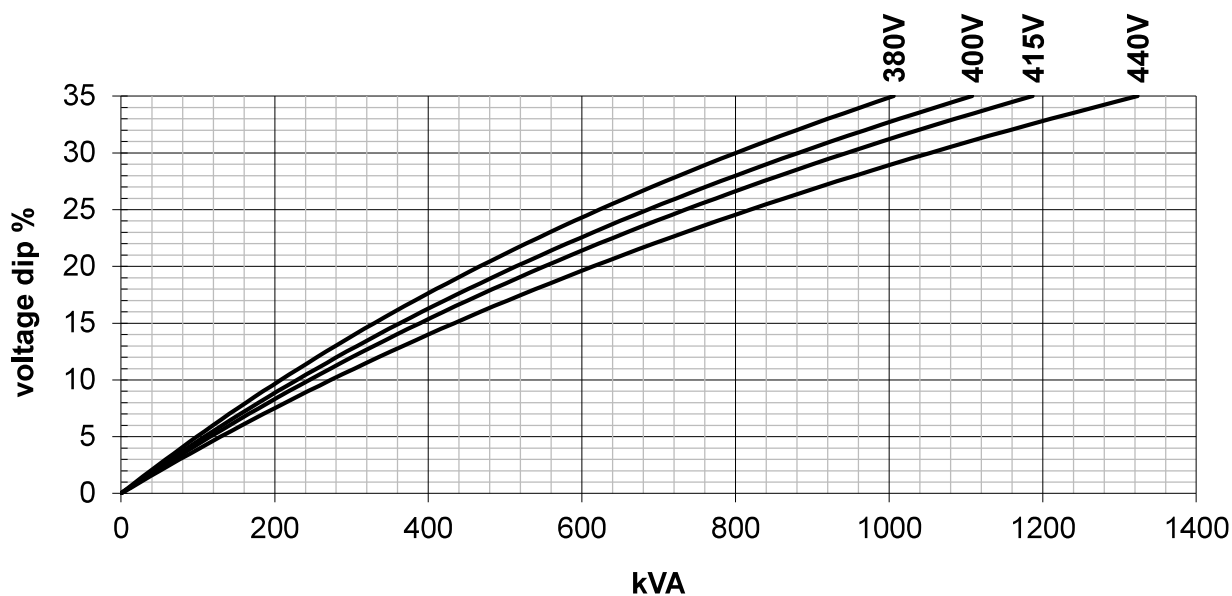
MODELS FGL60020

REF: FGL60020W6-1 SEP 2020

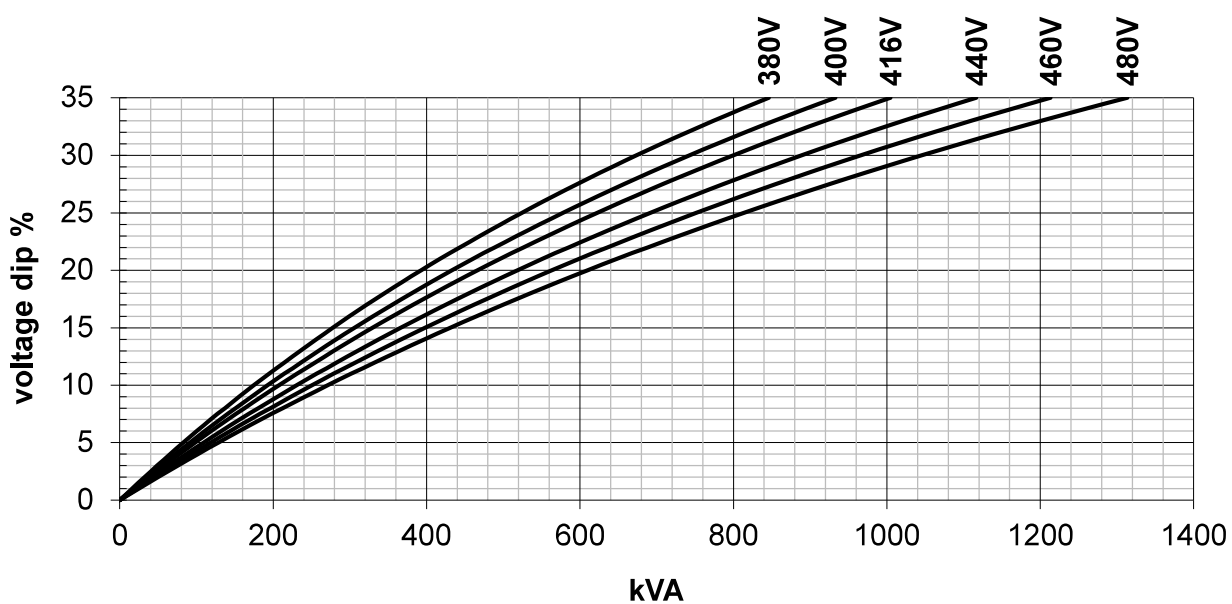
LOCKED ROTOR MOTOR STARTING CURVES

Power factor 0.6

50 Hz SHUNT



60 Hz SHUNT



According to: IEC 60034, UTE NFC51.111, VDE 0530, BS 4999/5000, NEMA MG 1-33

Values quoted are typical. In line with our policy of continuous improvement, we reserve the right to change specification without notice.

Manufactured for FG Wilson by Leroy Somer - Nidec.

FRAME FGL60020 WINDING 6



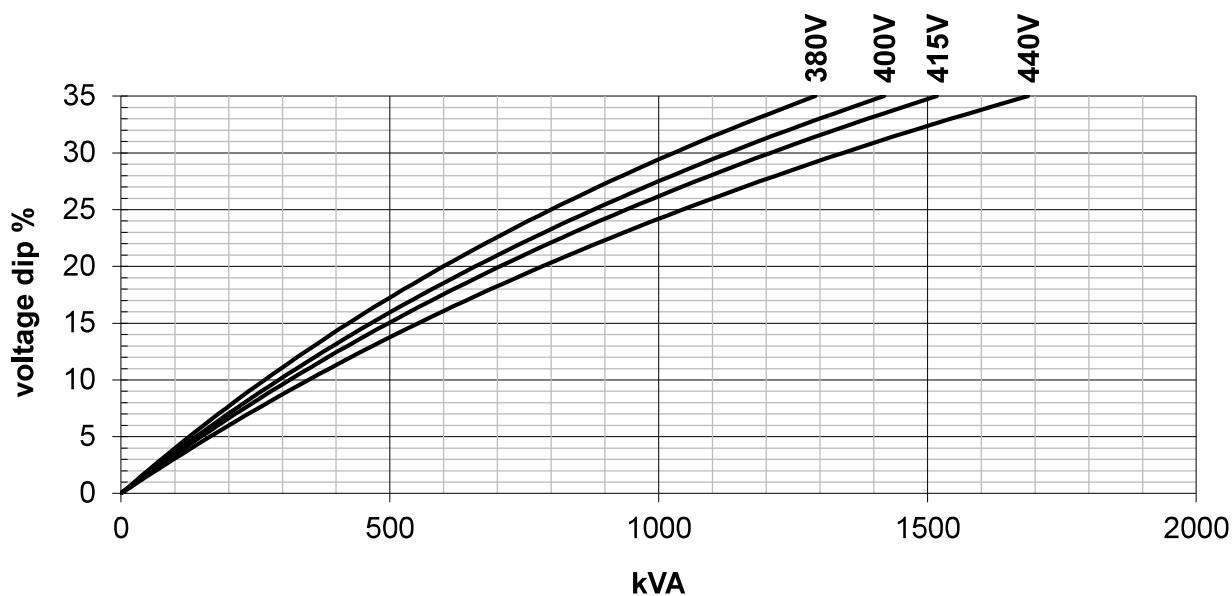
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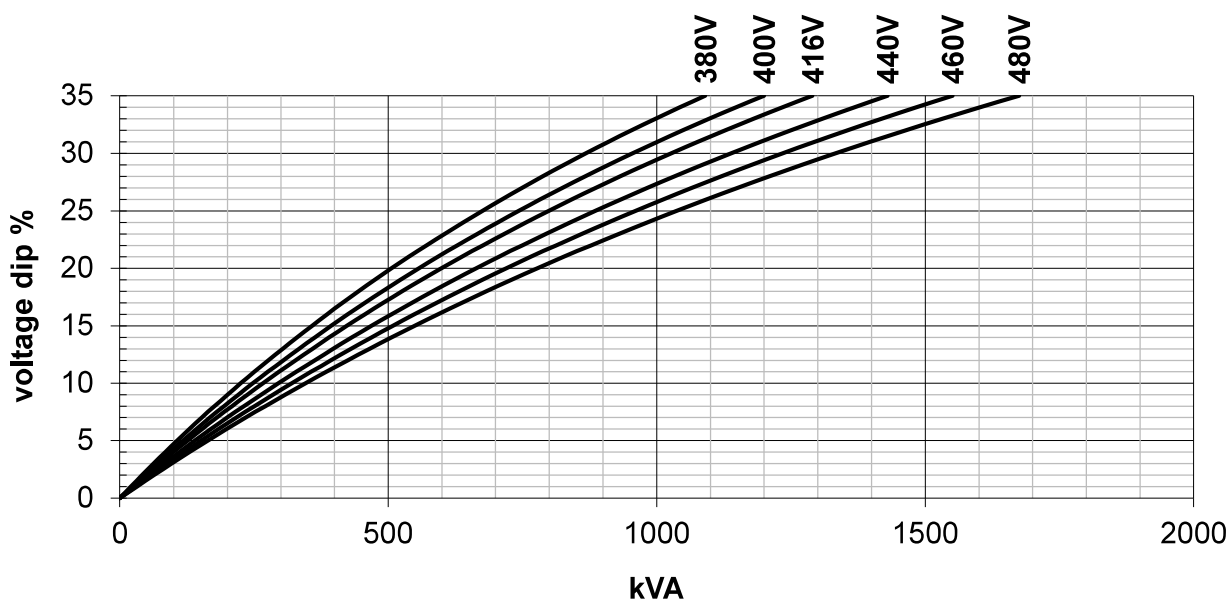
LOCKED ROTOR MOTOR STARTING CURVES

Power factor 0.6

50 Hz PMG



60 Hz PMG



According to: IEC 60034, UTE NFC51.111, VDE 0530, BS 4999/5000, NEMA MG 1-33

Values quoted are typical. In line with our policy of continuous improvement, we reserve the right to change specification without notice.

Manufactured for FG Wilson by Leroy Somer - Nidec.



MODELS FGL60020

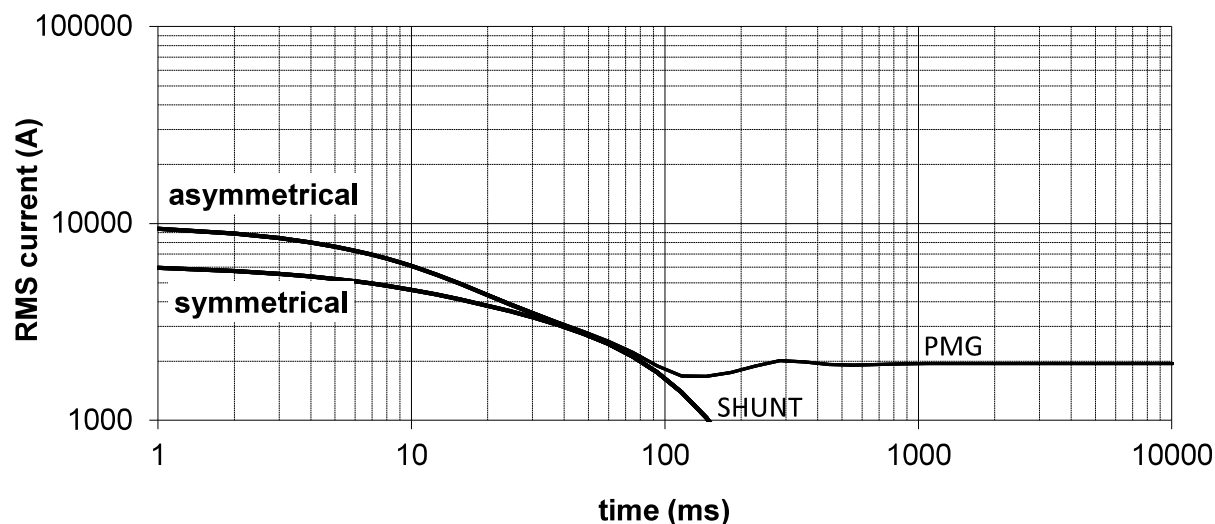
REF: FGL60020W6-1 SEP 2020

THREE-PHASE SHORT-CIRCUIT DECREMENT CURVES

No-load excitation at rated speed

400V 50Hz, 480V 60Hz

Star



Multiplication Factors

50Hz Voltages 380 400 415 440

Multiplication Factor 0.95 1.00 1.04 1.10

Apply factor up to $2 \times T'd$, remainder of curve unchanged

60Hz Voltages 380 400 416 440 460 480

Multiplication Factor 0.79 0.83 0.87 0.92 0.96 1.00

Apply factor up to $2 \times T'd$, remainder of curve unchanged

Winding Connection Series Star Parallel Star Series Delta
Multiplication Factor 1.00 2.00 1.73

Apply factor to complete the curve

According to: IEC 60034, UTE NFC51.111, VDE 0530, BS 4999/5000, NEMA MG 1-33

Values quoted are typical. In line with our policy of continuous improvement, we reserve the right to change specification without notice.

Manufactured for FG Wilson by Leroy Somer - Nidec.

DSE7410/20

AUTO START & AUTO MAINS FAILURE MODULES

FEATURES



The DSE7410 is an Auto Start Control Module and the DSE7420 is an Auto Mains (Utility) Failure Control Module suitable for a wide variety of single, diesel or gas, gen-set applications.

A sophisticated module monitoring an extensive number of engine parameters, the DSE74xx will announce warnings, shutdown and engine status information on the back-lit LCD screen, illuminated LED, remote PC, and audible alarms. The module includes RS232, RS485 & Ethernet ports as well as dedicated terminals for system expansion.

The DSE7400 Series modules are compatible with electronic (CAN) and non-electronic (magnetic pick-up/alternator sensing) engines and offer a comprehensive number of flexible inputs, outputs and extensive engine protections so the system can be easily adapted to meet industry requirements.

The modules can be easily configured using the DSE Configuration Suite Software. Selected front panel editing is also available.

ENVIRONMENTAL TESTING STANDARDS

ELECTRO-MAGNETIC COMPATIBILITY

BS EN 61000-6-2
EMC Generic Immunity Standard for the Industrial Environment
BS EN 61000-6-4
EMC Generic Emission Standard for the Industrial Environment

ELECTRICAL SAFETY

BS EN 60950
Safety of Information Technology Equipment, including Electrical Business Equipment

TEMPERATURE

BS EN 60068-2-1
Ab/Ae Cold Test -30 °C
BS EN 60068-2-2
Bb/Be Dry Heat +70 °C

VIBRATION

BS EN 60068-2-6
Ten sweeps in each of three major axes
5 Hz to 8 Hz @ +/-7.5 mm,
8 Hz to 500 Hz @ 2 gn

HUMIDITY

BS EN 60068-2-30
Db Damp Heat Cyclic 20/55 °C
@ 95% RH 48 Hours
BS EN 60068-2-78
Cab Damp Heat Static 40 °C
@ 93% RH 48 Hours

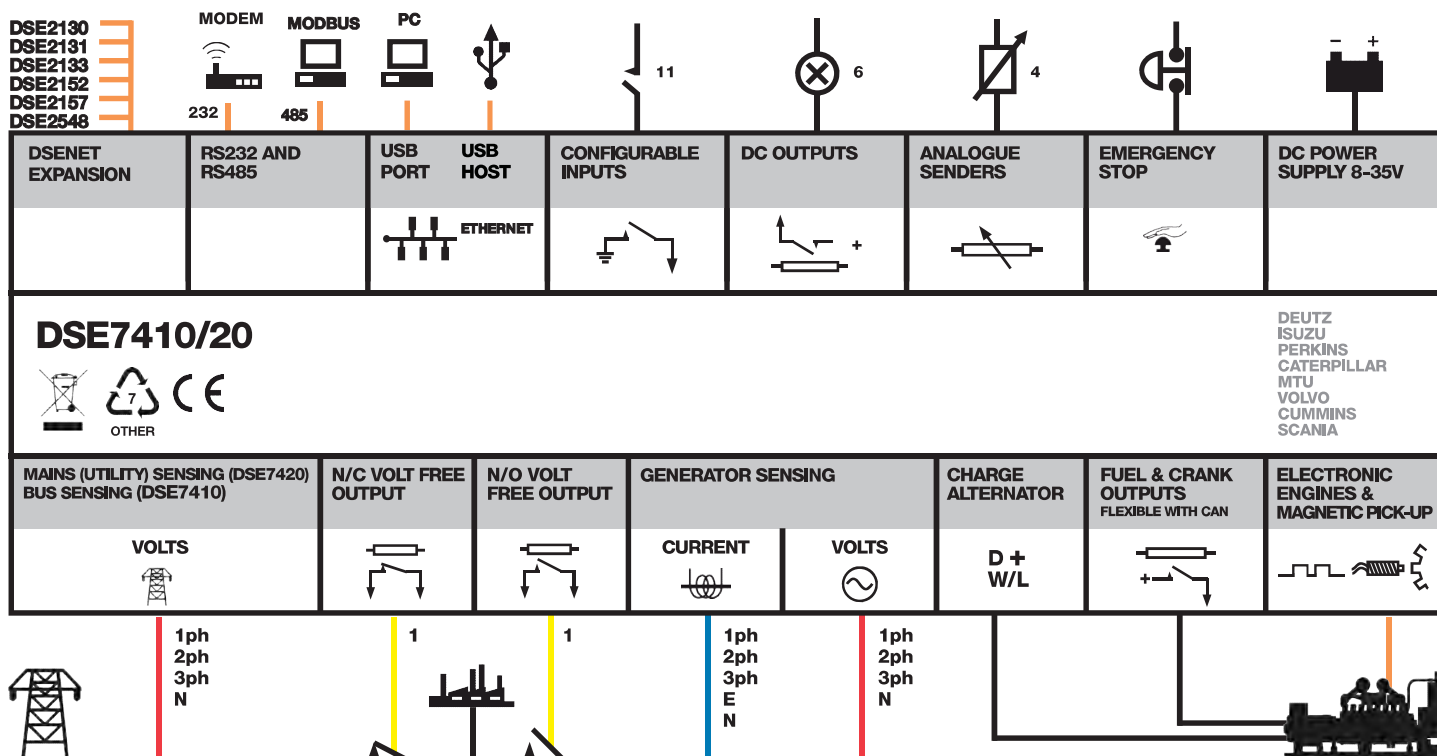
SHOCK

BS EN 60068-2-27
Three shocks in each of three major axes
15 gn in 11 ms

DEGREES OF PROTECTION PROVIDED BY ENCLOSURES

BS EN 60529
IP65 - Front of module when installed into the control panel with the supplied sealing gasket.

COMPREHENSIVE FEATURE LIST TO SUIT A WIDE VARIETY OF GEN-SET APPLICATIONS



DSE7410/20

AUTO START & AUTO MAINS FAILURE MODULES

FEATURES



DSE7420

DSE7410



KEY FEATURES

- 4-Line back-lit LCD text display
- Five key menu navigation
- Front panel editing with PIN protection
- Customisable status screens
- Power save mode
- 11 configurable inputs
- 8 configurable outputs
- Flexible sensor inputs
- Configurable timers and alarms
- 3 configurable maintenance alarms
- Multiple date and time scheduler
- Configurable event log (250)
- Tier 4 CAN engine support
- Integral PLC editor
- Easy access diagnostic page
- CAN and Magnetic Pick-up/Alt. sensing
- Fuel usage monitor and low fuel alarms
- Charge alternator failure alarm
- Manual speed control (on compatible CAN engines)
- Manual fuel pump control
- Engine exerciser
- "Protections disabled" feature
- kW protection
- Reverse power (kW) protection

- LED and LCD alarm indication
- Power monitoring (kW h, kV Ar, kV A h, kV Ar h)
- Load switching (load shedding and dummy load outputs)
- Automatic load transfer (DSE7420)
- Unbalanced load protection
- Independent Earth Fault trip
- USB connectivity
- Backed up real time clock
- Fully configurable via DSE Configuration Suite PC software
- Configurable display languages
- Remote SCADA monitoring via DSE Configuration Suite PC software
- User selectable simultaneous RS232, RS485 & Ethernet communications
- Configurable MODBUS pages
- MODBUS RTU & TCP support
- Advanced SMS messaging (additional external modem required)
- Additional display screens to help with modem diagnostics
- Idle control for starting
- DSENet® expansion compatible
- 20 parameter data logging

KEY BENEFITS

- 132 x 64 pixel ratio display for clarity
- Real-time clock provides accurate event logging
- Multiple date and time scheduler
- Set maintenance periods can be configured to maintain optimum engine performance
- Built in ethernet communications provides advanced remote monitoring
- Modules can be integrated into building management systems (BMS) using MODBUS
- Increased input and output expansion capability via DSENet®
- Licence-free PC software
- IP65 rating (with supplied gasket) offers increased resistance to water ingress
- PLC editor allows user configurable functions to meet specific application requirements
- Data logging to assist with fault finding

RELATED MATERIALS

TITLE

DSE7410 Installation Instructions
DSE7420 Installation Instructions
DSE74xx Quick Start Guide
DSE74xx Operator Manual
DSE74xx PC Configuration Suite Manual

PART NO'S

053-085
053-088
057-162
057-161
057-160

DEEP SEA ELECTRONICS PLC UK

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TELEPHONE +1 (815) 316 8706 **FACSIMILE** +1 (815) 316 8708
EMAIL sales@deepseausa.com **WEBSITE** www.deepseausa.com

SPECIFICATION

DC SUPPLY

CONTINUOUS VOLTAGE RATING
8 V to 35 V Continuous

CRANKING DROPOUTS

Able to survive 0 V for 50 mS, providing supply was at least 10 V before dropout and supply recovers to 5 V. This is achieved without the need for internal batteries

MAXIMUM OPERATING CURRENT

260 mA at 12 V, 130 mA at 24 V

MAXIMUM STANDBY CURRENT

120 mA at 12 V, 65 mA at 24 V

CHARGE FAIL/EXCITATION RANGE

0 V to 35 V

OUTPUTS

OUTPUT A (FUEL)

15 A DC at supply voltage

OUTPUT B (START)

15 A DC at supply voltage

OUTPUTS C & D

8 A AC at 250 V AC (Volt free)

AUXILIARY OUTPUTS E,F,G,H,I & J

2 A DC at supply voltage

GENERATOR

VOLTAGE RANGE

15 V to 333 V AC (L-N)

FREQUENCY RANGE

3.5 Hz to 75 Hz

MAINS (UTILITY) (DSE7420)

VOLTAGE RANGE

15 V to 333 V AC (L-N)

FREQUENCY RANGE

3.5 Hz to 75 Hz

BUS (DSE7410)

VOLTAGE RANGE

15 V to 333 V AC (L-N)

FREQUENCY RANGE

3.5 Hz to 75 Hz

MAGNETIC PICK UP

VOLTAGE RANGE

+/- 0.5 V to 70 V

FREQUENCY RANGE

10,000 Hz (max)

DIMENSIONS

OVERALL

240 mm x 181 mm x 42 mm
9.4" x 6.8" x 1.6"

PANEL CUTOUT

220 mm x 160 mm
8.7" x 6.3"

MAXIMUM PANEL THICKNESS

8 mm
0.3"

STORAGE TEMPERATURE RANGE

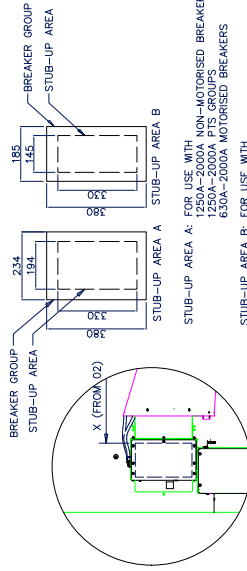
-40 °C to +85 °C
-40 °F to +185 °F

OPERATING TEMPERATURE RANGE

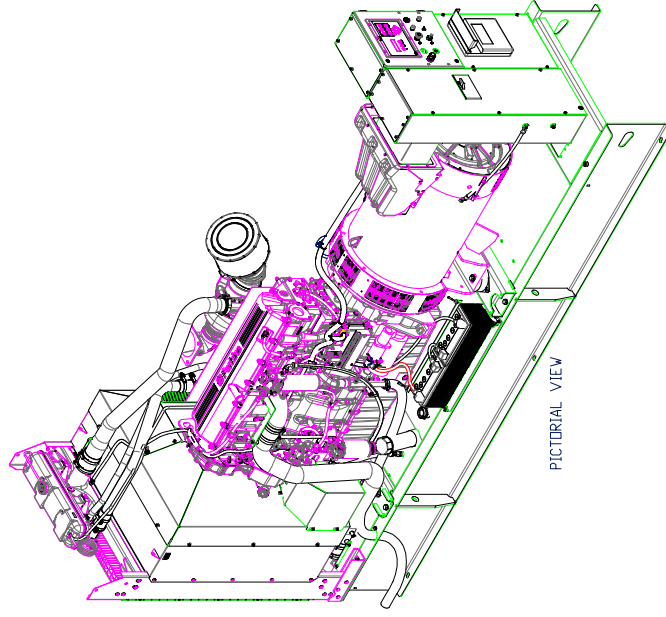
-30 °C to +70 °C
-22 °F to +158 °F

ENG. / ALT.	MASS (KG) WITH OIL & WATER	SWD. MASS (KG) WITH OIL & WATER	CENTER OF GRAVITY FROM 02	SWD CENTER OF GRAVITY FROM 02	STUE UP AREA POSITION FROM 02
2506 / F293440	3603	3661	3342	1827	3489
2506 / F293440	3641	3699	3380	1827	3489
2506 / F6460020	3556	3714	3595	1824	3389
2506 / F6460020	3670	3838	3517	1862	3489

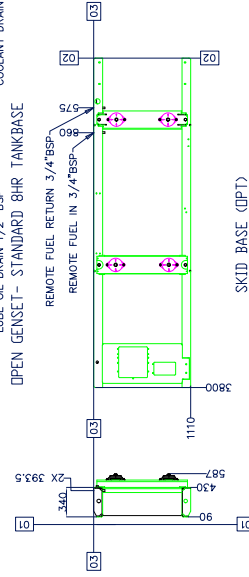
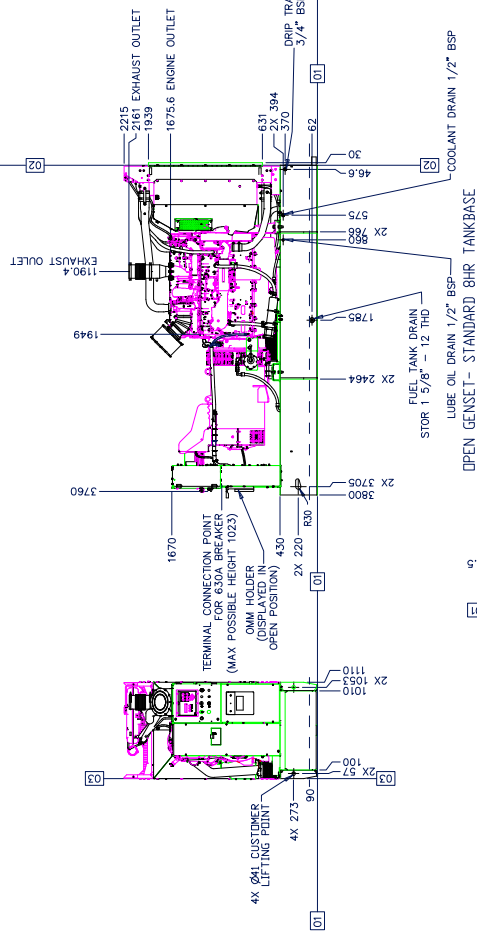
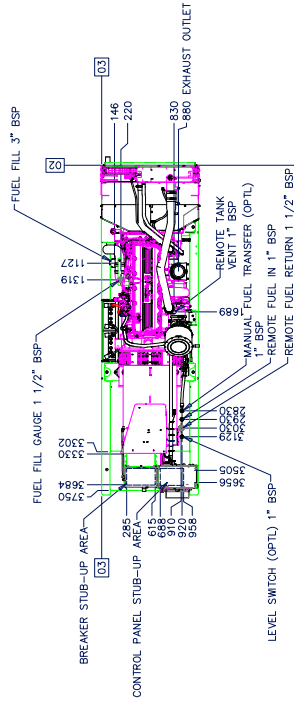
TANK BASE	TANK CAPACITY (L)	
	GROSS	FILLABLE USEABLE
STANDARD	935	888 839
NOTE : DESIGN PRESSURE HEAD 3.7M		



BREAHER STUB-UP LOCATION



PICTORIAL VIEW



SKID BASE (OPT)

[illegible]

VIEWS SHOWS LL6114G ALTERNATOR, 1250A BREAKER (OPT)
 JACKET WATER (OPT) AND MANUAL FUEL TRANSFER (OPT),
 STONE GUARD (OPT), RADIATOR TRANSITION FLANGE (OPT),
 STANDARD EXHAUST FLEX.

DIM. W/O TOL ARE REF



01
GA-141

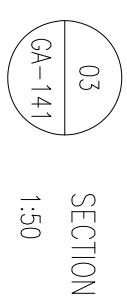
HIGH LEVEL PLAN
1:50



02
GA-141

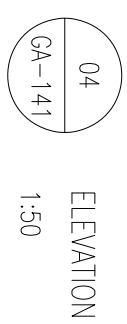
LOW LEVEL PLAN

1:50



03
GA-141

SECTION
1:50



04
GA-141
ELEVATION
1:50

BELLS POWER SOLUTIONS LTD
70-72, Clifton Street, London EC2A 4HB
Tel: 0203 259 0100
Email : contact@bellspowergroup.co.uk
Web : www.bellspowergroup.co.uk

PROPOSED

Bells Job Number
2849

Project
TOTTENHAM HALE, ASHLEY ROAD BUILDING
GENERATOR SERVICES

Title
MEZZANINE LEVEL GENERATOR ROOM FOR
P550-3 GENSET - 750BA@1M ATTENUATION
800BA@1M EXHAUST - GENERAL ARRANGEMENT

Scale	Date
1:50@A1	JUN 18

Q3751-GA-141

04

ACOUSTIC DESIGN SUMMARY**Sound Engineering Ltd**

Unit 4, Vanguard Industrial Estate,
Henwood,
Ashford,
Kent. TN24 8DH
Tel: 44(0)1233 643333

Date: 17/04/2020
Sound Eng Ref: EA 14031/C
Client: Bells
FAO: J Kirby
Project Ref: Ashley Rd East

DESIGN DATA

Engine Make	PERKINS	Model Ref	2806A-E18TAG1	KVA	550	Ambient Temp °C	43
Combustion Air Vol	0.62	M³/sec	Cooling Air Vol	6.22	M³/sec	@ Resistance (Pa)	125
Exhaust Gas Flow	1.467	M³/sec	Gas Temp °C	521	(Max) Exhaust Gas Resistance (pa)		6.9

Silenced Noise Criteria Req'd	75	dB(A) @	1	Meter/s	With	1	Sets Running
-------------------------------	----	---------	---	---------	------	---	--------------

NOISE SOURCE *(unless Stated all levels below relate to 1 meter distance)*

Frequency Hz	63	125	250	500	1000	2000	4000	8000	
Plant Noise Level dB	102	101	99	101	103	103	98	96	Lp dB
A' Weighting	-26	-16	-9	-3	0	1	1	-1	dB
Unsilenced Lp dB(A)	76	85	90	98	103	104	99	95	dB(A)

AIR INLET SYSTEM

Frequency Hz		63	125	250	500	1000	2000	4000	8000	
Unsilenced Lp dB(A)		76	85	90	98	103	104	99	95	dB(A)
Multi Set Correction		0	0	0	0	0	0	0	0	dB(A)
Combined Lp dB(A)		76	85	90	98	103	104	99	95	dB(A)
Attenuation										
RVS 100	Length 1500									
		-8	-15	-26	-43	-53	-53	-45	-32	dB(A)
Acoustic Bend		0	0	0	0	0	0	0	0	dB(A)
Other		0	0	0	0	0	0	0	0	dB(A)
Silenced SPL dB(A)		68	70	64	55	50	51	54	63	dB(A)
Resultant Silenced Noise Level		73.3	dB(A)	1	Sets Running	Attenuator 1800		1500		
						(H) mm		(W)mm		
						PV m/sec	7.60	BP	45.99	Pa
						Resistance Through W/Louvre		16.04		Pa

AIR OUTLET SYSTEM

Frequency Hz		63	125	250	500	1000	2000	4000	8000	
Unsilenced Lp dB(A)		76	85	90	98	103	104	99	95	Pa
Multi Set Correction		0	0	0	0	0	0	0	0	dB(A)
Combined Lp dB(A)		76	85	90	98	103	104	99	95	dB(A)
Attenuation										
RVS	Length									
100	1500	-8	-15	-26	-43	-53	-53	-45	-32	dB(A)
Acoustic Bend		0	0	0	0	0	0	0	0	dB(A)
Other		0	0	0	0	0	0	0	0	dB(A)
Silenced SPL dB(A)		68	70	64	55	50	51	54	63	dB(A)
Resultant Silenced Noise Level		73.3	dB(A)	1	Sets Running	Attenuator 1800 (H) mm		1500 (W)mm		
						PV m/sec	6.91	BP	38.03	Pa
						Resistance Through W/Louvre		19.90		Pa

TOTAL SYSTEM RESISTANCE	119.96	Pa
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PANEL CONSTRUCTION

Frequency Hz		63	125	250	500	1000	2000	4000	8000	
Unsilenced Lp dB(A)		76	85	90	98	103	104	99	95	Pa
Multi Set Correction		0	0	0	0	0	0	0	0	dB(A)
Combined Lp dB(A)		76	85	90	98	103	104	99	95	dB(A)
Attenuation										
Thickness	Density									
50	45kg	-17	-15	-23	-31	-37	-43	-47	-52	dB(A)
Additional Panelwork		0	0	0	0	0	0	0	0	dB(A)
Other		0	0	0	0	0	0	0	0	dB(A)
Silenced SPL dB(A)		59	70	67	67	66	61	52	43	dB(A)
Resultant Silenced Noise Level		74.2	dB(A)	Panel Type			SE A	Panel Notes Standard Build		

Please Note

The Plant Noise level data used in the calculations used to generate this document are taken from manufacturers data held on record for the engine / equipment in question. Sound Engineering Ltd takes no responsibility for the accuracy of this data and we recommend the client checks the data used against any current information they may hold or as may be published by the engine manufacturer

All noise levels are based on 'Free Field Conditions'

Absorptive Exhaust Gas Silencer

The M31 range of semi-residential reactive silencers are a medium attenuation design recommended for use where equipment must operate with a reduced noise level. Highly efficient and of advanced acoustical design, they are suitable for the exhausts or intakes of all two-stroke and four-stroke internal combustion engines, compressors and blowers.

The units can be mounted vertically, horizontally or inclined, without affecting efficiency.

The M31 'semi-residential grade' reactive exhaust silencer range are of all welded design, sturdily constructed in carbon steel with a heat resisting aluminium or black paint finish to ensure a long service life. All units are fitted with drain points to remove exhaust condensate.

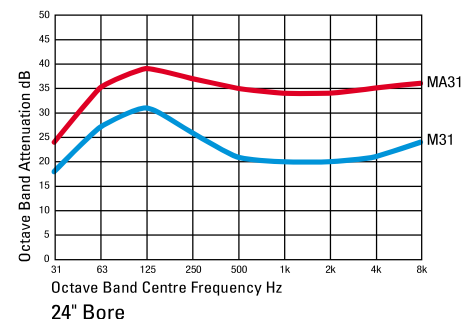
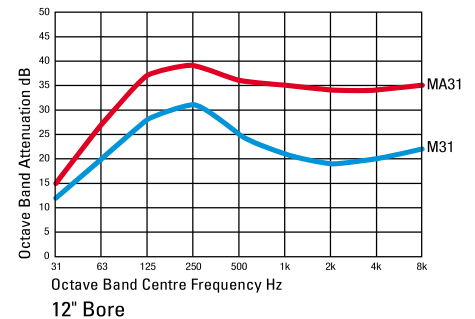
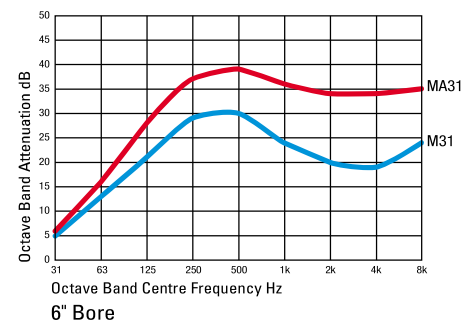
MA31 Range

The acoustically treated MA31 type silencer increases the higher frequency performance by up to 11dB(A), reducing casing breakout as well as lowering the surface temperature. The units can be used where good overall acoustic performance is required without a secondary or terminal silencer.

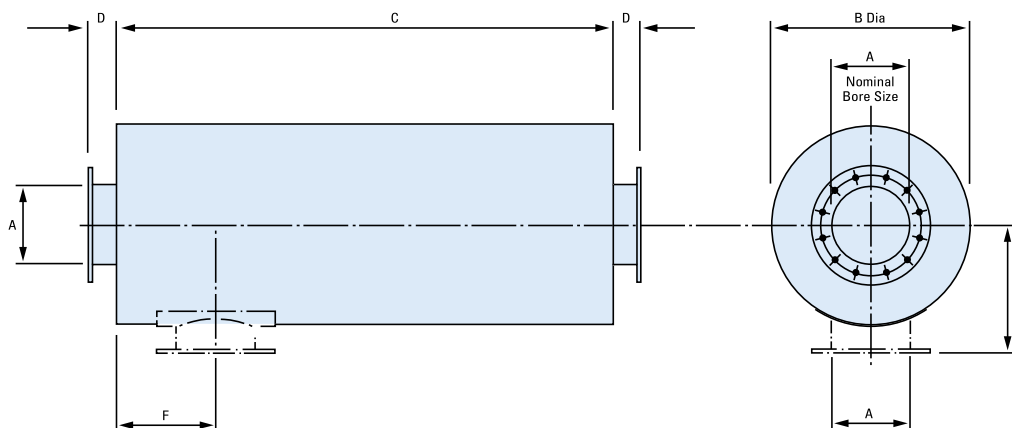
Options

- BS10 Table 'D' flanges fitted as standard.
- Alternative flange patterns available on request.
- B.S.P. connections available on smaller sizes.
- Radial/axial inlet.
- Radial/axial outlet.
- Heat resisting aluminium or black paint.
- Shot blast and aluminium metal sprayed.
- Stainless steels.
- Corten steel.
- Support feet and brackets.
- Lifting lugs.
- Catalytic converters.

Back pressure figures can vary greatly with temperature and gas velocity, please contact IMS for advice.



M31 series



	All	M31	MA31	All	All	M31	MA31	All	All	Weight	Weight
Silencer Ref	A	B	B	C	D	E	E	F min	F max	M31	MA31
	inch	mm	mm	mm	mm	mm	mm	mm	mm	kgs	kgs
M31/MA31 038	1.5	160	260	600	50	155	205	60	250	3	4
M31/MA31 050	2	210	310	600	50	180	230	60	250	5	6
M31/MA31 063	2.5	260	360	700	50	205	255	70	380	8	10
M31/MA31 075	3	310	410	800	50	230	280	90	430	14	16
M31/MA31 090	3.5	360	460	900	75	255	305	150	480	32	36
M31/MA31 100	4	360	460	1000	75	255	305	160	490	45	50
M31/MA31 125	5	410	510	1200	75	280	330	180	530	54	62
M31/MA31 150	6	460	560	1400	75	305	355	190	590	78	95
M31/MA31 175	7	540	640	1400	75	350	400	200	590	100	135
M31/MA31 200	8	560	660	1800	75	355	405	220	810	130	170
M31/MA31 225	9	660	760	1800	75	420	470	235	810	190	230
M31/MA31 250	10	660	760	2100	75	420	470	250	1100	210	280
M31/MA31 300	12	760	860	2500	100	470	520	280	1150	340	390
M31/MA31 350	14	920	1020	2800	100	550	600	320	1350	440	500
M31/MA31 400	16	1020	1120	2900	100	600	650	340	1450	610	700
M31/MA31 450	18	1170	1270	3000	100	685	735	370	1500	840	940
M31/MA31 500	20	1270	1370	3400	100	735	785	400	1700	990	1050
M31/MA31 550	22	1370	1470	3700	100	785	835	430	1800	1200	1400
M31/MA31 600	24	1470	1570	4000	100	915	965	460	2000	1550	1800

Larger sizes available on request.

Enclosed Spring Mountings

Type ES - Enclosed Spring and ECS - Enclosed Captive Spring Mounting



A unique range of mountings designed primarily for building services applications where the control of low frequency vibration and noise emanating from mechanical plant is of paramount importance.

The benefits of a combined rubber and steel housing for the spring have helped establish the ES and ECS mountings as industry standards accepted by specifiers, equipment manufacturers and mechanical services installers alike.

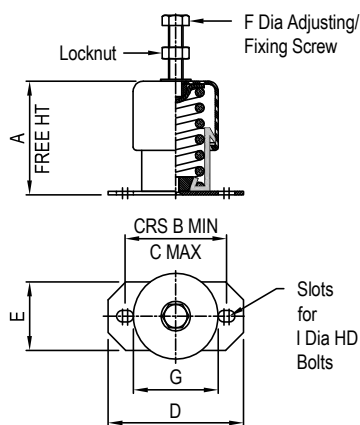
DESIGN FEATURES

- Nitrile rubber (oil resistant) lower spring housing eliminates the possibility of metallic continuity and ensures excellent acoustic performance. Steel reinforced on ECS range.
- Full enclosed captive assembly protects the spring and controls transient motion.
- All steel components are zinc plated.
- Nominal 15, 20, 25 & 50 mm deflection colour coded helical steel springs to BS1726 Class B, laterally stable with 50% overload capacity.
- Simple single screw height adjustment.
- 6 mm thick ribbed rubber seating pads available for ES25 and ECS ranges.
- Colour coded labels for easy identification.
- Stainless Steel variants available.

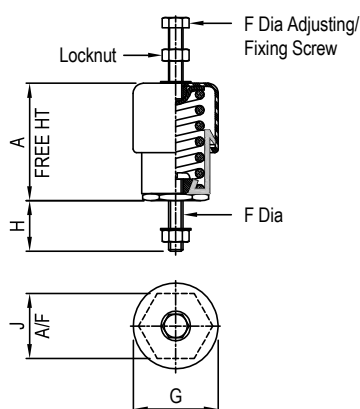
TYPICAL APPLICATIONS

- Axial and Centrifugal Fans.
- Air Handling Units.
- Chillers and Cooling Towers.
- Rotary and Multi Cylinder Compressors.
- Diesel Generating Sets (ECS only).
- Mechanical Test Rigs.
- Isolation of Sensitive Equipment.

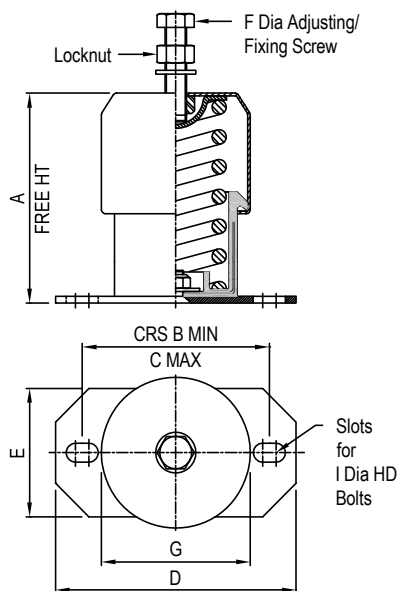
TYPE ES



TYPE ESB



TYPE ECS



TYPE ES, ESB, ES25, ECS25 & ECS50 MOUNTINGS

PART No.	COLOUR CODE	RATED LOAD (kg)	DEFLECTION AT RATED LOAD (mm)	DIMENSIONS (mm)										WT (kg) MAX
				A	B	C	D	E	F	G	H	I	J	
ES20/10	PURPLE	10	20											
ES20/15	YELLOW	15	20											
ES20/20	GREY	20	20	63	54	60	76	38	M8	48	-	M6	-	0.25
ES20/40	GREEN	40	20											
ES20/70	RED	70	20											
ES15/100	BLUE	100	15											
ESB20/10	PURPLE	10	20											
ESB20/15	YELLOW	15	20											
ESB20/20	GREY	20	20	65	-	-	-	-	M8	48	26	-	36	0.25
ESB20/40	GREEN	40	20											
ESB20/70	RED	70	20											
ESB15/100	BLUE	100	15											
ES25/30	YELLOW	30	25											
ES25/60	GREEN	60	30											
ES25/100	BLUE	100	25	88	85	90	110	70	M10	78	-	M8	-	1.0
ES25/160	WHITE	160	25											
ES25/250	RED	250	25											
ECS25/100	WHITE/YELLOW	100	25											
ECS25/200	WHITE/RED	200	25											
ECS25/300	WHITE/PURPLE	300	25											
ECS25/400	WHITE/GREY	400	25											
ECS25/500	WHITE/ORANGE	500	25											
ECS25/600	WHITE/BROWN	600	25	127	130	150	180	95	M16	111	-	M12	-	3.0
ECS25/700	WHITE/BLACK*	700	25											
ECS25/800	WHITE/GOLD	800	25											
ECS25/1000	WHITE/1000	1000	25											
ECS25/1200	WHITE/1200*	1200	25											
ECS25/1400	WHITE/1400*	1400	25											
ECS50/100	BLACK/YELLOW	100	50											
ECS50/200	BLACK/GREEN	200	50											
ECS50/300	BLACK/BLUE	300	50	155	130	150	180	95	M16	111	-	M12	-	2.8
ECS50/400	BLACK/WHITE	400	50											
ECS50/500	BLACK/RED	500	50											

* Internal nested spring.

Seating Pads

Ribbed rubber seating pads can now be fitted as standard, suffix Pt. No. /B e.g. ES25/100/B.

Stainless Steel.

This option is available across the entire range for external and other hostile environments.

When ordering the Pt. No. should be suffixed with /S for Stainless Steel or if fitted with a seating pad /SB e.g. ECS25/500/S or ECS25/500/SB.

Spring Deflection

Spring stiffness is linear over its working range therefore the actual deflection for a given load can be calculated as follows:-

$$\text{Actual Deflection (mm)} = \frac{\text{Actual Load (kg)} \times \text{Rated Deflection (mm)}}{\text{Rated Load (kg)}}$$

ISOLATION EFFICIENCY AT TYPICAL MACHINE SPEEDS

MACHINE SPEEDS (rpm)	EFFICIENCY %		
	15 mm DEFL.	25 mm DEFL.	50 mm DEFL.
300	DO NOT USE	34.0	75.2
500	68.7	83.3	92.3
750	88.1	93.2	96.7
1000	93.7	96.3	98.2
1200	95.7	97.4	98.7
1500	97.3	98.4	99.2
1750	98.0	98.8	99.4
2000	98.5	99.1	99.5

The above figures are theoretical values only based on the vertical natural frequency of the sprung system assuming infinitely stiff structural supports.

The effects of high frequency spring coil resonances on low frequency performance are also ignored.

For full installation instructions please refer to our data sheet DS026.

For more detailed information and technical assistance please contact our Technical Department.

In the interests of continual development, the Company reserves the right to make modifications to these details without notice.



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Testing and Commissioning
Generator Set

ISSUE - 1
DATE 23/03/2021

**Offsite
Testing and Commissioning
For
Ashley Road
At
Unit 13
Erith, Kent
DA8 2AN**



	Testing and Commissioning Generator Set	ISSUE - 1 DATE 23/03/2021
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Commissioning Procedure for the Generator Ashley Road

TESTING AND COMMISSIONING DETAILS

Introduction

This commissioning procedure describes the methodology for testing of the generator.

No deviation from this commissioning procedure is permissible without prior approval of the BELLS POWER SOLUTIONS Ltd Director/Manager

Testing:

A full visual and mechanical inspection will be carried out on the set before any connections are made.

After all the temporary loadbank connections have been completed the genset will be ready for the witness tests.

The set will be tested via the Control System to a load testing unit to simulate site load conditions.

All shutdowns, alarms, auxiliaries, metering, input/outputs and full functional tests will be carried out.

The genset will be subject to 100% load and 10% overload using a loadbank with complex load acceptance and rejection tests being carried out.

Sequencing and various failure scenarios will be demonstrated. Once the generating set has been proved and passed, the client will be required to sign the test completion certificate.

The tests are summarised as follows:

- Set Test
- Load Run.
- Complex Load Testing and Rejection testing.