PROJECT	**60091 – West Yorkshire Fire & Rescue**
LOCATION	**HQ Building**
WORK ELEMENT	**Back Up Generator**
TECHNICAL SUBMISSION No.	**HQC004-HEB-XX-XX-TS-E-00011**
REVISION.	**0**
DATE	**24th April 2023**

Rev 0 – Design Intent issued for Approval

Diesel Supply Generator for LVM – Secondary Switchboard for back up during primary power failure to any of the ATS Units (SB-ICT, DB-C&C, EVAC Lift, MCP-C&C). The generator will start up during power failure any one or more of these ATS Units and act as a secondary back up to the UPS Unit.

Sized to suit requirement of minimum 110kVA for 10 Hour Autonomy on daytank. No separate fuel tank is required.

REVISION CONTROL REGISTER

Revision	Amendment	Date	Prepared by	Approved by
0	First Issue	24.04.23	J Bowden	

Clients Representative Comments

This Document has been checked By: Name: J Bowden	(Clients Representative Sign Off) Signature: Mark Ventress ----------
This Document has been checked By: Name: J Bowden	(Clients Representative Sign Off) Signature: ----------
This Document has been checked By: Name: ----------	(Clients Representative Sign Off) Signature: ----------

Digitally signed by Mark Ventress
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Reason: I am approving this document
Contact Info: mark.ventress@cad21.co.uk
Date: 2023.05.02 15:24:41+01'00'

SECTION	CONTENTS
SECTION 1	COMPLIANCY
SECTION 2	INTRODUCTION
SECTION 3	TECHNICAL DATA SHEETS
SECTION 4	CERTIFIED DRAWINGS
SECTION 5	SPECIFICATION
SECTION 6	NON COMPLIANCE
SECTION 7	OFF SITE TESTING

SECTION 01 – TECHNICAL COMPLIANCY STATEMENT

Project: West Yorkshire Fire & Rescue	TS Ref: HQC004-HEB-XX-XX-TS-E-00011
Material Item: Back Up Generator	Rev: 0

Proposed Specialist Contractor/Supplier: Powertecnique

Specification Reference (s): See below

Information Attached:-

✓ Equipment / Manufacturers Schedules:

Certified Performance Levels: N/A

Certified Drawings: N/A

✓ Non Compliance Schedule

☐ Specification Clauses:-

☐ Design Calculations: N/A

☐ Off Site Testing : N/A

Compliance Statement:

All equipment selected is suitable and compliant to meet the specification and design intent.

Further Information to be Issued:- None

Off Site Testing Required : No

Method Statements Required: No

Scope:-

Signed:	Approval Status: ----------
Name:	Reviewer: ----------
On Behalf of:	On Behalf of: ----------
Date:	Date: ----------

SECTION 02 – INTRODUCTION

2.1 – Powertecnique

SECTION 03 – TECHNICAL DATA SHEETS

	Refer to attached data sheets

SECTION 04 – CERTIFIED DRAWINGS

HQC004-HEB-XX-XX-DR-E-41000_Single Line Diagram HQ Building

SECTION 05 – SPECIFICATIONS

Stage 4 – HQC004-CAD-XX-XX-SP-E-00002_HQ Electrical Services Particular Specification

SECTION 06 – NON-COMPLIANCE

6.1

DEVIATION	EMPLOYERS REQUIREMENTS	HE BARNES PROPOSAL	REASON FOR CHANGE
N/A			

SECTION 07 – OFF SITE TESTING

N/A

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E: sales@powertecnique.com **W:** www.powertecnique.com

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E:	james.bowden@hebarnes.com
M:	07950 754 334
FAO:	James Bowden
Date:	21st April 2023
Quote ref:	0046026v3 – TECH SUBMISSION
Project title:	Yorkshire Fire Station

Further to your request, we are pleased to present the following for your consideration.

CONTENTS:

We trust that the attached meets with your approval. Should you have any queries or require any further information please do not hesitate to contact us.

Best regards

Mark Hamilton
Hardware Sales Engineer

Power Tecnique Ltd, Unit 4, Concorde Close, Fareham PO15 5RT, UK
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GENERATOR GENERAL SPECIFICATION

GENERAL

Prime output is suitable for supplying continuous electrical power at variable load. A ~10% overload is permitted.
Standby output is available a variable load in the event of a main power network failure. No overload is permitted.
All outputs stated are based at 40°C of ambient temperature and 1000m altitude in accordance with ISO 8528 with 400v / 230V, 3 phases, 50 Hz @ 1500 rpm.

DIESEL ENGINE

The prime mover will be a diesel ignition, direct injection, industrial pattern, turbo-charged and after-cooled engine and will be supplied with full flow fuel and lubricating oil filters together with a medium duty, dry type air filter with paper replacement element. The engine control system is c/w a heavy-duty lead acid battery pack. These will be suitable to permit at least six consecutive starts. The set will be complete with a battery condition meter and charger unit, with trickle / boost selector switching. The coolant and oil drains will be extended to base edge to assist with general servicing.

STARTING

Electric starting system comprising of a lead acid sealed maintenance free battery pack, with a fully automatic charger, constant voltage, current limiting, trickle battery charger, designed to maintain the starter battery during prolonged periods of genset inactivity.

COOLING

Water cooled through a heavy-duty radiator suitable for continuous or intermittent stand-by operations in high ambient temperatures. Cooling Water Pre-heaters will be fitted as standard.

FILTRATION

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

ALTERNATOR

Stamford or similar directly coupled to the engine by means of an SAE flange to minimise torsional vibration and to provide smooth running of the set. Alternator is of brushless, Class H insulated for optimum performance in tropical environment, single bearing, self-exciting, self-regulating and drip-proof and includes underspeed protection. BS4900 / BS5000 standards are applicable. Voltage regulation accuracy is maintained to within +/- 1% with load from 0 to 100%, speed from 2% to 5% and power factor range from 0.8 to 1 and balanced load. The rotor system is dynamically balanced to minimize vibration. Ample ventilation is provided by a shaft mounting centrifugal fan.

GOVERNOR

Electronic governor is provided as standard to provide rapid response to load changes - this is suitable for applications where the generator regulation is to be kept with tight parameters.

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GENERATOR CONTROL AND OUPUT EXPANSION MODULES:

DSE7320 controller configured with a DSE2157 output module to provide 8no. programmable VFC alarms. Please refer to additional page and attached datasheets for further details.

SAFETY AND PROTECTION:

The generator is fitted with engine manifold guard, alternator screen protection, and protection circuits for low oil pressure, high engine temperature, low coolant level, over-current and over-speed conditions, battery condition indicator and emergency stop button. Internal circuits (including terminals, relays, fittings and cables) are clearly identified by numbers or named plates.

MOUNTING ARRANGEMENT

The engine and alternator will be mounted as a whole on a heavy-duty fabricated steel base frame, complete with anti-vibration mounting pads for fixing between base frames.

DAY FUEL TANK

Base frame mounted fuel tank is provided with the generator set and is complete with all essential accessories comprising: filler, breather, feed and return lines, dial type contents gauge, bund sensor.

FUSIBLE LINK

In the event of fire in the canopy, this will melt and shut the fire valve to close the supply of fuel to the engine.

CANOPY

Metal soundproofed canopy with IP45 protection made using 2.5mm phosphate sheet steel, primer and polyurethane powder paint in RAL9016 (traffic white – other RAL colours available for additional cost) and oven dried at 200°C with a thickness of 100 microns with sound insulation to achieve acoustic pressure 69dba @ 7m in open field conditions with non contributory background noise. Due to proposed location, the canopy will be provided with a front-mounted discharge grille to facilitate configuration with any ventilation system.

CABLE LINK BOX

Complete with the following features:

- Enclosure painted to match the canopy colour
- Fully rated copper bars fitted for ease of SWA cable termination
- Pre-installed internal conduits/cabling and draw lines between the set mounted 4-pole MCCB and the cable link box

FLUIDS

We include first fills of lubricating oil and antifreeze mixture. Diesel fuel will be not supplied unless otherwise agreed and must be in place prior to any commissioning of the sets.

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140kVA GENERATOR PARTICULAR SPECIFICATIONS – BAUDOUIN ENGINE

GENERATOR

Model	PTBS150ST
Prime rating	140kVA / 112kW
Standby rating	150kVA / 120kW

ENGINE

Manufacturer	BAUDOUIN
Model	6M11G150/5
Governor	Electronic
Speed	1500rpm
No. of cylinders	6L
Compression ratio	18 : 1

FUEL AND OIL

100% load - runtime (consumption)	14.1 hours (30.2lph)
75% load - runtime (consumption)	18.5 hours (23.0lph)
Fuel tank capacity	425litres
Oil Sump	19 litres

ALTERNATOR

Manufacturer	Stamford
Model	UCI274E

PHYSICAL DATA

Configuration	Enclosed
Dimensions	3410L x 1162W x 1902H mm
Weight	2100kg (dry) / 2500kg (wet)

Ratings

RPM	Gross Engine Output		
	COP kWm	PRP kWm	ESP kWm
1500	117	128	140

Basic data

Engine model 6M11G150/5
N° of Cylinders / Valves ..... 6 / 12
Cylinders arrangement ..... In line
Bore x Stroke (mm) ..... 105 x 130
Displacement (L) 6.75
Thermodynamic Cycle ..... Diesel 4 stroke
Cooling System ..... Liquid (water + 50% antifreeze)
Injection System ..... Direct
Fuel System ..... Mechanical Pump
Aspiration ..... Turbocharged and Aftercooled
Compression ratio ..... 18 : 1
Flywheel housing ..... SAE 3
Flywheel ..... 11.5"
N° of teeth on flywheel ring gear 145
Inertia of flywheel (kg/m²) 1.76
Inertia of crankshaft (kg/m²) 0.22
Emission standard ..... N/A
Overall Dimensions with radiator (Length x Width x Height) (mm) ..... 1726 x 856 x 1146
Engine dry weight (kg) 710
Engine wet weight (includes oil, coolant) (kg) 746

Air intake system

Air intake temperature rise (°C) ..... ≤ 5
Air intake restriction clean filter (mBar) ..... ≤ 35
Air intake restriction dirty filter (mBar) ..... ≤ 60
Recommended air flow @ PRP (m³/min) 8.28
Recommended air flow @ ESP (m³/min) 8.76
Min. diameter of intake pipe (mm) 65

Intercooling system

Intercooler heat dissipating capacity @ PRP (kJ/s) 12.4
Intercooler heat dissipating capacity @ ESP (kJ/s) 14.5
Max. intake temperature @ 25°C ambient temperature (°C) 55
Max. difference between intake temperature and ambient temperature (°C) ..... ≤ 30
Max. intake pressure drop of intercooler (mBar) 120

Cooling system

System designed for ambient temperature up to (°C) 50
Min. inside diameter of coolant outlet pipe (mm) 42
Coolant capacity of radiator and pipes (L) 9
Coolant alarm (shutdown) temperature (°C) 105
Thermostat opening temperature / full open temperature (°C) ..... 76 / 90
Min. pressure in cooling system (Bar) 0.15
Coolant capacity of the engine (L) 8

Exhaust system

Max. exhaust back pressure (mBar) 60
Max. exhaust temperature before turbocharger (°C) ..... ≤ 700
Max. exhaust temperature after turbocharger (°C) ..... ≤ 550
Exhaust flow @ PRP (m³/min) 21.8
Exhaust flow @ ESP (m³/min) 23.65
Min. diameter of exhaust pipe (mm) 80
Max. bending moment of exhaust gas exit flange (Nm) 10

Lubrication system

Oil capacity Low / High (L) ..... 15 / 17
Oil pressure in normal condition idle speed (Bar) ..... ≥ 1.2
Oil pressure in normal condition at 1500 Rpm (Bar) ..... 3 - 6
Lowest oil pressure alarm (shutdown) (Bar) 1
Max. oil temperature (°C) 105
Oil flow (L/min) 47
Oil fuel consumption ratio based on engine fuel consumption data ..... ≤ 0.2 %
Total system capacity (including filters) (L) 19

Noise

Diesel engine noise (Acoustic power level) (dB(A)) 108.7

Fuel system

Governor ..... Electronic
Max. restriction at fuel pump inlet (Bar) 0.5
Max. fuel return restriction (Bar) 0.5
Max. fuel inlet temperature (°C) 70
Fuel supply flow (L/hr) 92
Min. pressure of fuel pump (Bar) 1.3
Min. diameter of inlet pipe (mm) 12
Min. diameter of return pipe (mm) 12

Electrical system

Electrical system voltage (negative to ground) (Vdc) ..... 24 / 12 from Feb. 2019
Starter power (kW) ..... 6 for 24 Vdc / 4 for 12 Vdc
Battery charger current (A) 80
Max. electric resistance of starting circuit (Ω) 0.004
Min. sectional area of wire (mm²) 50
Min. cold start temperature without auxiliary starting device (°C) ..... - 10
Min. cold start temperature with auxiliary starting device (°C) ..... - 30

Heat balance test data (with ambient temperature 28 °C)

Total heat dissipation @ ESP (kJ/s) 206

Performance data

Mean Piston Speed (m/s) 6.5

BMEP (Bar) 16.59

Fan absorbed power (kW) 3.9

Fuel consumption

Rating	gr/kWh	L/hr
100% ESP	198.7	33.4
100% PRP	198.5	30.4
75% PRP	201.4	23.1
50% PRP	207.2	15.9
25% PRP	236.6	9.1
	Fuel consumption tolerance + 3 %	

Ratings definitions

Emergency Standby Power (ESP)
Emergency Standby Power is the maximum power available for a varying load for the duration of a main power network failure. The average load factor over 24 hours of operation should not exceed 70% of the engine's ESP power rating. Typical operational hours of the engine is 200 hours per year, with a maximum usage of 500 hours per year. This includes an annual maximum of 25 hours per year at the ESP power rating. No overload capability is allowed. The engine is not to be used for sustained utility paralleling applications.

Prime Power (PRP)
Prime Power is the maximum power available for unlimited hours of usage in a variable load application. The average load factor should not exceed 70% of the engine's PRP power rating during any 24 hour period. An overload capability of 10% is available, however, this is limited to 1 hour within every 12 hour period.

Continuous Power (COP)
Continuous Power is the maximum power available for an unlimited period of use at a constant load factor. No overload capability is allowed.

1) All ratings are based on operating conditions under ISO 8528-1, ISO 3046, DIN6271. Performance tolerance of ±5%.
2) Test conditions : 100 kPa, 25°C air inlet temperature, relative humidity of 30%, with fuel density 0.84 kg/L. Derating may be required for conditions outside these; please contact the factory for details.
3) Power output curves are based on the engine operating with fuel system, water pump and lubricating oil pump; not included are battery charging alternator, fan and optional equipment.

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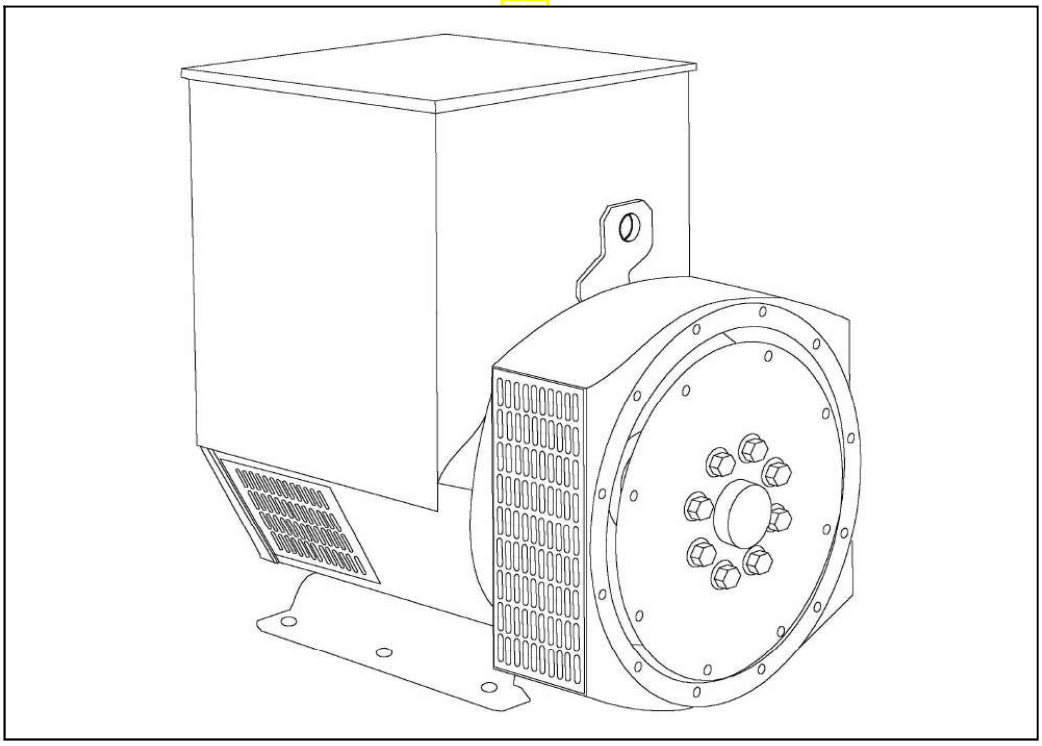
UCI274E - Winding 311

Technical Data Sheet



SPECIFICATIONS & OPTIONS

STANDARDS

Stamford industrial generators meet the requirements of BS EN 60034 and the relevant section of other international standards such as BS5000, VDE 0530, NEMA MG1-32, IEC34, CSA C22.2-100, AS1359.
Other standards and certifications can be considered on request.

VOLTAGE REGULATORS

SX460 AVR - STANDARD

With this self excited control system the main stator supplies power via the Automatic Voltage Regulator (AVR) to the exciter stator. The high efficiency semiconductors of the AVR ensure positive build-up from initial low levels of residual voltage.
The exciter rotor output is fed to the main rotor through a three phase full wave bridge rectifier. This rectifier is protected by a surge suppressor against surges caused, for example, by short circuit.

AS440 AVR

With this self-excited system the main stator provides power via the AVR to the exciter stator. The high efficiency semi-conductors of the AVR ensure positive build-up from initial low levels of residual voltage.
The exciter rotor output is fed to the main rotor through a three-phase full-wave bridge rectifier. The rectifier is protected by a surge suppressor against surges caused, for example, by short circuit or out-of-phase paralleling.
The AS440 will support a range of electronic accessories, including a 'droop' Current Transformer (CT) to permit parallel operation with other ac generators.

MX341 AVR

This sophisticated AVR is incorporated into the Stamford Permanent Magnet Generator (PMG) control system.
The PMG provides power via the AVR to the main exciter, giving a source of constant excitation power independent of generator output. The main exciter output is then fed to the main rotor, through a full wave bridge, protected by a surge suppressor. The AVR has in-built protection against sustained over-excitation, caused by internal or external faults. This de-excites the machine after a minimum of 5 seconds.
An engine relief load acceptance feature can enable full load to be applied to the generator in a single step.
If three-phase sensing is required with the PMG system the MX321 AVR must be used.
We recommend three-phase sensing for applications with greatly unbalanced or highly non-linear loads.

MX321 AVR

The most sophisticated of all our AVRs combines all the features of the MX341 with, additionally, three-phase rms sensing, for improved regulation and performance.
Over voltage protection is built-in and short circuit current level adjustments is an optional facility.

WINDINGS & ELECTRICAL PERFORMANCE

All generator stators are wound to 2/3 pitch. This eliminates triplen (3rd, 9th, 15th …) harmonics on the voltage waveform and is found to be the optimum design for trouble-free supply of non-linear loads. The 2/3 pitch design avoids excessive neutral currents sometimes seen with higher winding pitches, when in parallel with the mains. A fully connected damper winding reduces oscillations during paralleling. This winding, with the 2/3 pitch and carefully selected pole and tooth designs, ensures very low waveform distortion.

TERMINALS & TERMINAL BOX

Standard generators are 3-phase reconnectable with 12 ends brought out to the terminals, which are mounted on a cover at the non-drive end of the generator. A sheet steel terminal box contains the AVR and provides ample space for the customers' wiring and gland arrangements. It has removable panels for easy access.

SHAFT & KEYS

All generator rotors are dynamically balanced to better than BS6861:Part 1 Grade 2.5 for minimum vibration in operation.
Two bearing generators are balanced with a half key.

INSULATION/IMPREGNATION

The insulation system is class 'H'.
All wound components are impregnated with materials and processes designed specifically to provide the high build required for static windings and the high mechanical strength required for rotating components.

QUALITY ASSURANCE

Generators are manufactured using production procedures having a quality assurance level to BS EN ISO 9001.

The stated voltage regulation may not be maintained in the presence of certain radio transmitted signals. Any change in performance will fall within the limits of Criteria 'B' of EN 61000-6-2:2001. At no time will the steady-state voltage regulation exceed 2%.

DE RATES

All values tabulated on page 8 are subject to the following reductions

5% when air inlet filters are fitted.
3% for every 500 metres by which the operating altitude exceeds 1000 metres above mean sea level.
3% for every 5°C by which the operational ambient temperature exceeds 40°C.
Note: Requirement for operating in an ambient exceeding 60°C must be referred to the factory.

NB Continuous development of our products entitles us to change specification details without notice, therefore they must not be regarded as binding.

Front cover drawing typical of product range.

UCI274E

STAMFORD

WINDING 311

CONTROL SYSTEM	SEPARATELY EXCITED BY P.M.G.		
A.V.R.	MX321	MX341	
VOLTAGE REGULATION	± 0.5 %	± 1.0 %	With 4% ENGINE GOVERNING
SUSTAINED SHORT CIRCUIT	REFER TO SHORT CIRCUIT DECREMENT CURVES (page 7)		

CONTROL SYSTEM	SELF EXCITED		
A.V.R.	SX460	AS440	
VOLTAGE REGULATION	± 1.0 %	± 1.0 %	With 4% ENGINE GOVERNING
SUSTAINED SHORT CIRCUIT	SERIES 4 CONTROL DOES NOT SUSTAIN A SHORT CIRCUIT CURRENT		

INSULATION SYSTEM	CLASS H						
PROTECTION	IP23						
RATED POWER FACTOR	0.8						
STATOR WINDING	DOUBLE LAYER CONCENTRIC						
WINDING PITCH	TWO THIRDS						
WINDING LEADS	12						
STATOR WDG. RESISTANCE	0.0317 Ohms PER PHASE AT 22°C SERIES STAR CONNECTED						
ROTOR WDG. RESISTANCE	1.34 Ohms at 22°C						
EXCITER STATOR RESISTANCE	20 Ohms at 22°C						
EXCITER ROTOR RESISTANCE	0.091 Ohms PER PHASE AT 22°C						
R.F.I. SUPPRESSION	BS EN 61000-6-2 & BS EN 61000-6-4,VDE 0875G, VDE 0875N. refer to factory for others						
WAVEFORM DISTORTION	NO LOAD < 1.5% NON-DISTORTING BALANCED LINEAR LOAD < 5.0%						
MAXIMUM OVERSPEED	2250 Rev/Min						
BEARING DRIVE END	BALL. 6315-2RS (ISO)						
BEARING NON-DRIVE END	BALL. 6310-2RS (ISO)						
	1 BEARING				2 BEARING			
WEIGHT COMP. GENERATOR	492 kg				511 kg			
WEIGHT WOUND STATOR	180 kg				180 kg			
WEIGHT WOUND ROTOR	167.51 kg				156.55 kg			
WR² INERTIA	1.3271 kgm^2				1.2765 kgm^2			
SHIPPING WEIGHTS in a crate	525 kg				539 kg			
PACKING CRATE SIZE	123 x 67 x 103(cm)				123 x 67 x 103(cm)			
	50 Hz				60 Hz			
TELEPHONE INTERFERENCE	THF<2%				TIF<50			
COOLING AIR	0.514 m³/sec 1090 cfm				0.617 m³/sec 1308 cfm			
VOLTAGE SERIES STAR	380/220	400/231	415/240	440/254	416/240	440/254	460/266	480/277
VOLTAGE PARALLEL STAR	190/110	200/115	208/120	220/127	208/120	220/127	230/133	240/138
VOLTAGE SERIES DELTA	220/110	230/115	240/120	254/127	240/120	254/127	266/133	277/138
kVA BASE RATING FOR REACTANCE VALUES	140	140	140	N/A	160	167.5	167.5	178.8
Xd DIR. AXIS SYNCHRONOUS	2.34	2.11	1.96	-	2.68	2.51	2.29	2.25
X'd DIR. AXIS TRANSIENT	0.21	0.19	0.18	-	0.25	0.23	0.21	0.21
X"d DIR. AXIS SUBTRANSIENT	0.14	0.13	0.12	-	0.17	0.16	0.15	0.14
Xq QUAD. AXIS REACTANCE	1.53	1.38	1.28	-	1.74	1.63	1.49	1.46
X"q QUAD. AXIS SUBTRANSIENT	0.18	0.16	0.15	-	0.22	0.21	0.19	0.18
X_L LEAKAGE REACTANCE	0.08	0.08	0.07	-	0.09	0.08	0.08	0.08
X_2 NEGATIVE SEQUENCE	0.16	0.14	0.13	-	0.19	0.18	0.16	0.16
X_0 ZERO SEQUENCE	0.10	0.09	0.08	-	0.11	0.10	0.09	0.09
REACTANCES ARE SATURATED	VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED							
T'd TRANSIENT TIME CONST.	0.032 s							
T"d SUB-TRANSTIME CONST.	0.01 s							
T'do O.C. FIELD TIME CONST.	0.85 s							
Ta ARMATURE TIME CONST.	0.007 s							
SHORT CIRCUIT RATIO	1/Xd							

50 Hz

UCI274E

Winding 311

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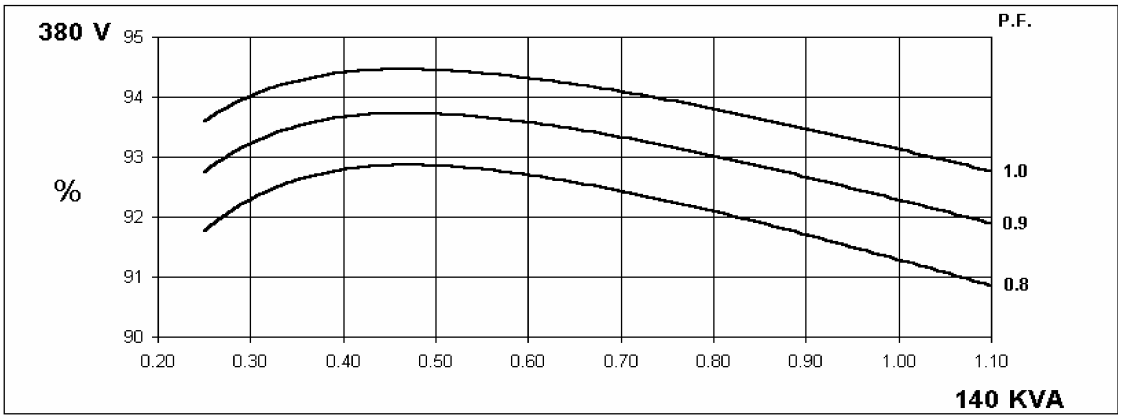
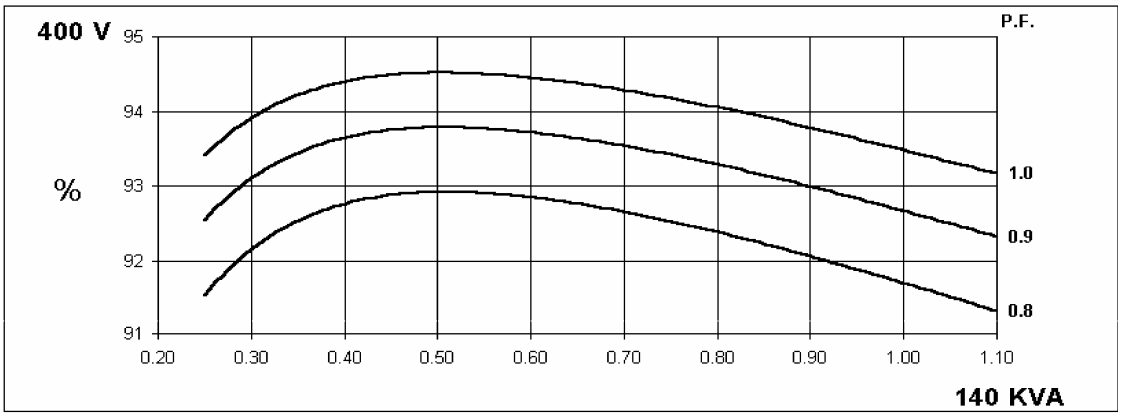
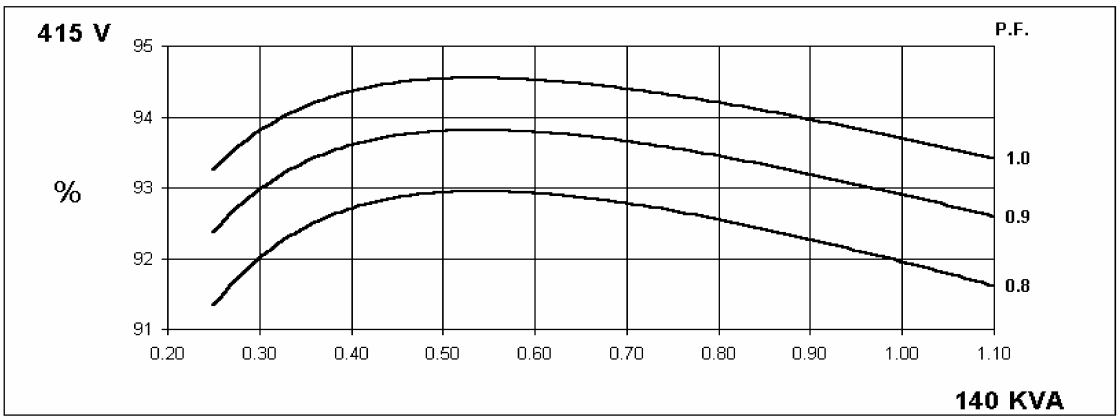
THREE PHASE EFFICIENCY CURVES







60 Hz

UCI274E

Winding 311

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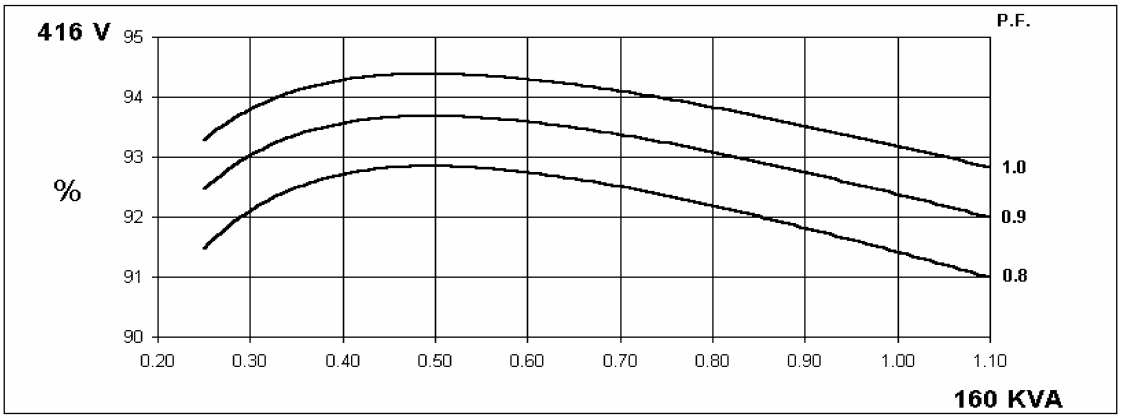
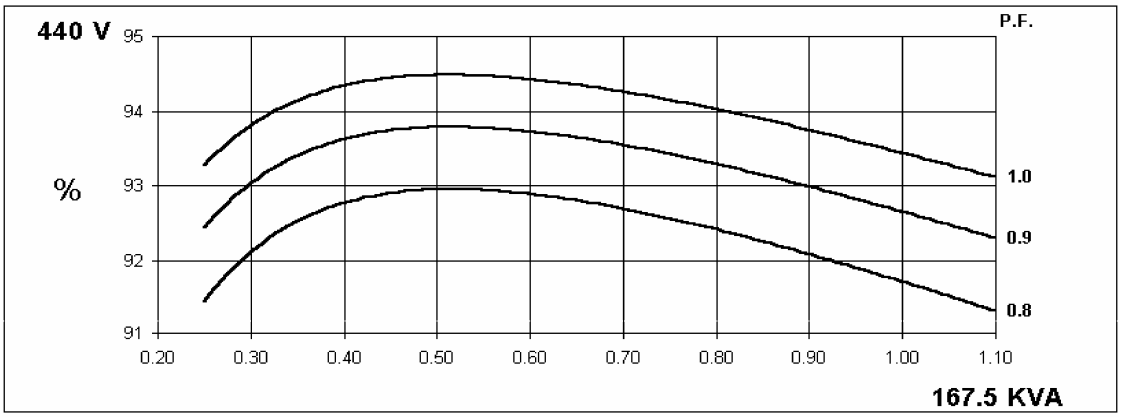
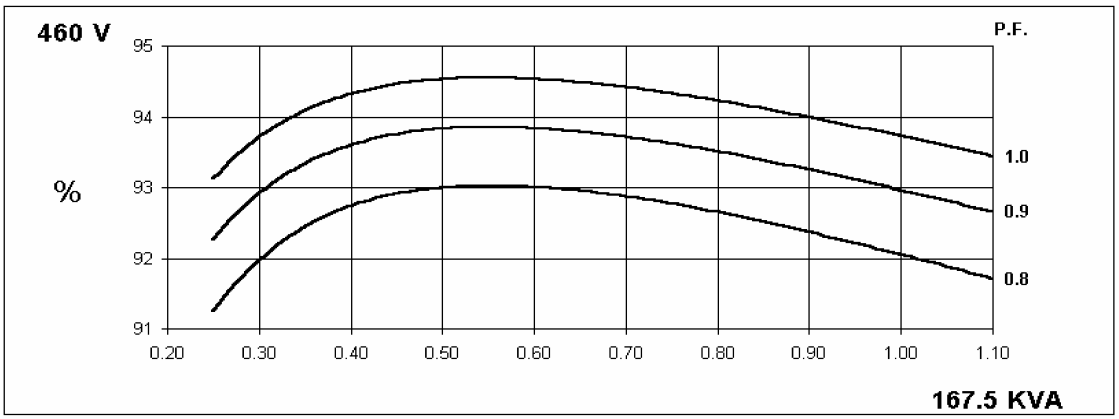
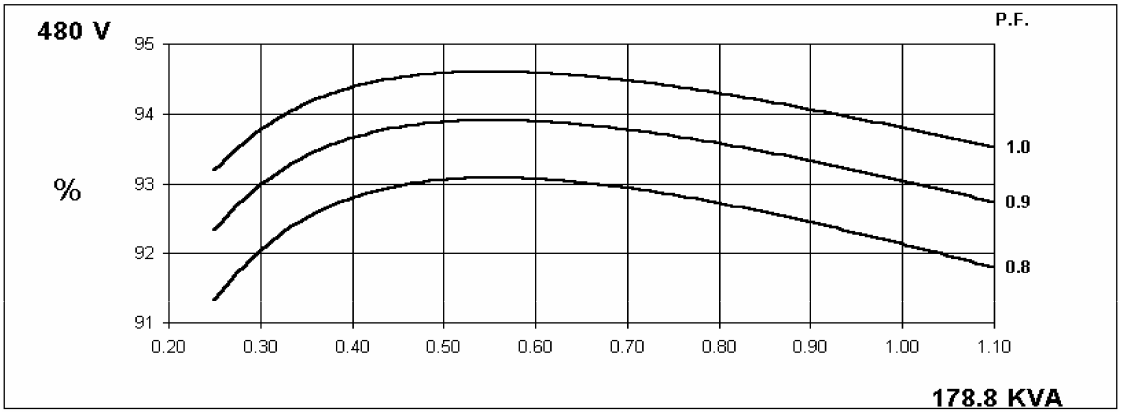
THREE PHASE EFFICIENCY CURVES









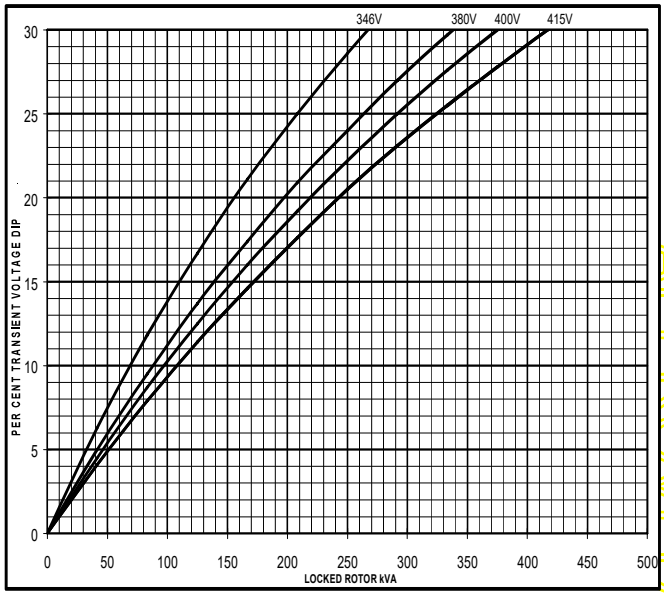
UCI274E

Winding 311

Locked Rotor Motor Starting Curve

50 Hz

MX



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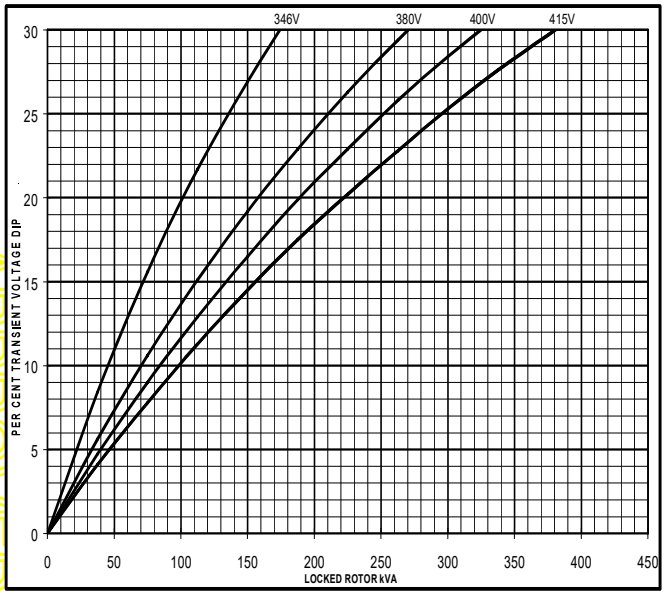
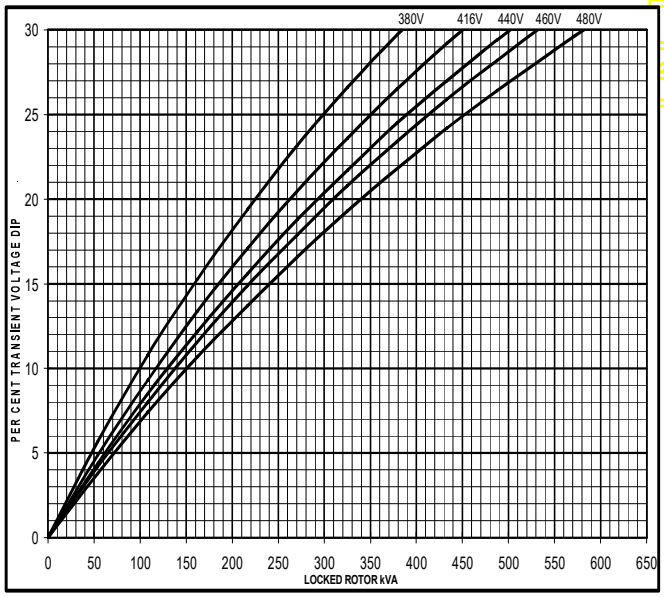


60 Hz

MX



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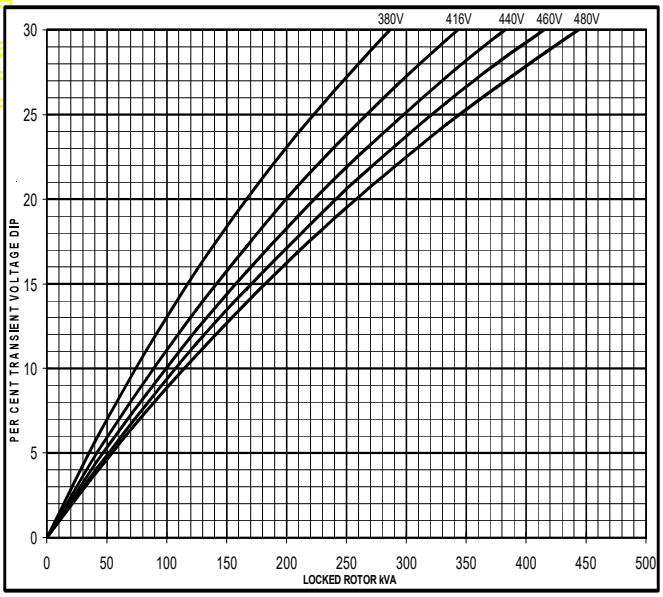
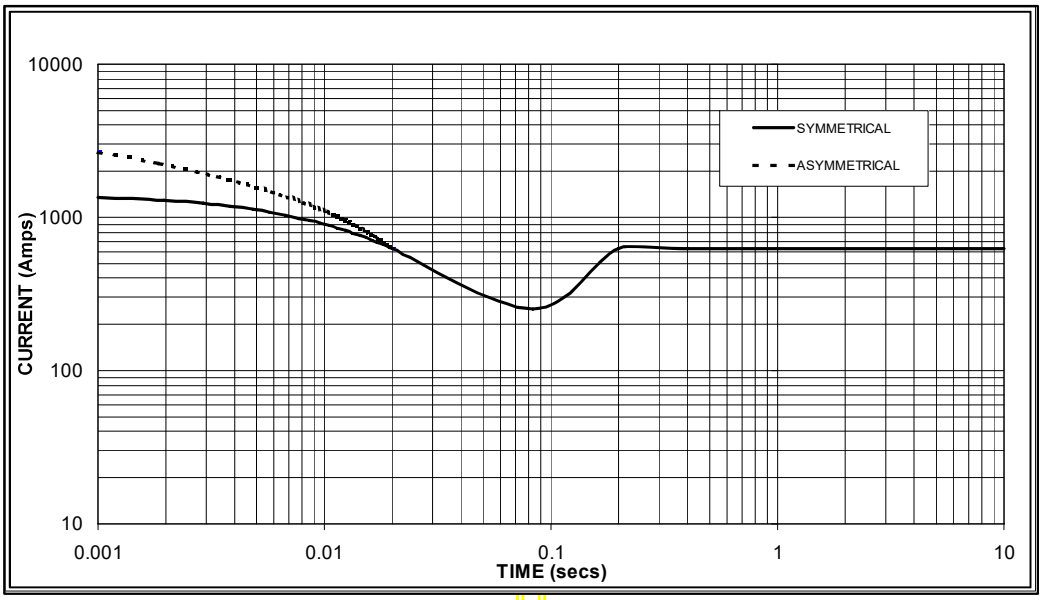


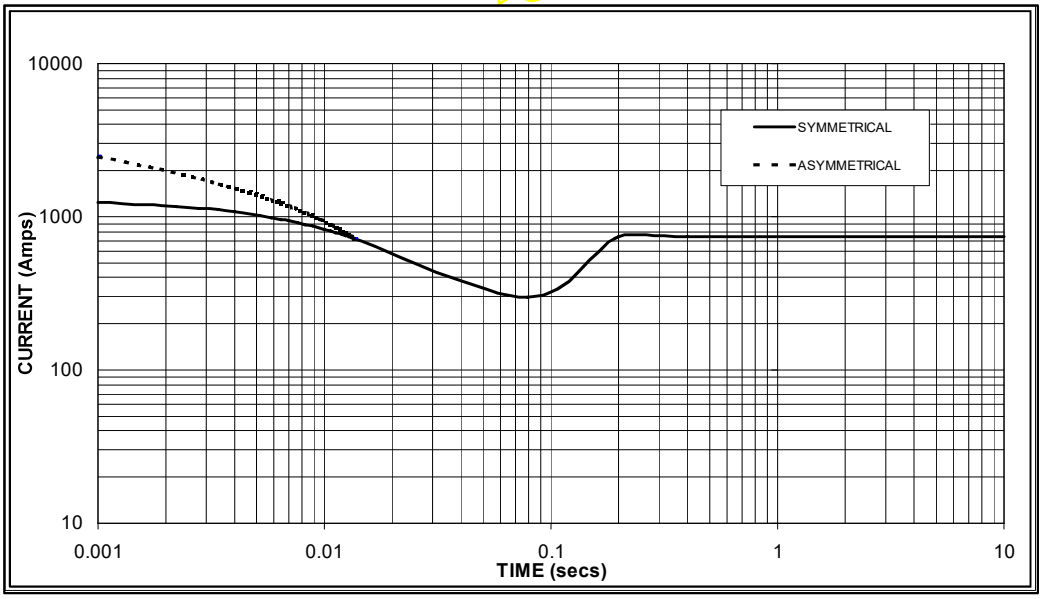
Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed Based on star (wye) connection.

50 Hz



Sustained Short Circuit = 630 Amps

60 Hz



Sustained Short Circuit = 740 Amps

Note 1

The following multiplication factors should be used to adjust the values from curve between time 0.001 seconds and the minimum current point in respect of nominal operating voltage :

50Hz		60Hz	
Voltage	Factor	Voltage	Factor
380v	X 1.00	416v	X 1.00
400v	X 1.07	440v	X 1.06
415v	X 1.12	460v	X 1.12
		480v	X 1.17

The sustained current value is constant irrespective of voltage level

Note 2

The following multiplication factor should be used to convert the values calculated in accordance with NOTE 1 to those applicable to the various types of short circuit :

	3-phase	2-phase L-L	1-phase L-N
Instantaneous	x 1.00	x 0.87	x 1.30
Minimum	x 1.00	x 1.80	x 3.20
Sustained	x 1.00	x 1.50	x 2.50
Max. sustained duration	10 sec.	5 sec.	2 sec.

All other times are unchanged

Note 3

Curves are drawn for Star (Wye) connected machines. For other connection the following multipliers should be applied to current values as shown :

Parallel Star = Curve current value X 2

Series Delta = Curve current value X 1.732

UCI274E

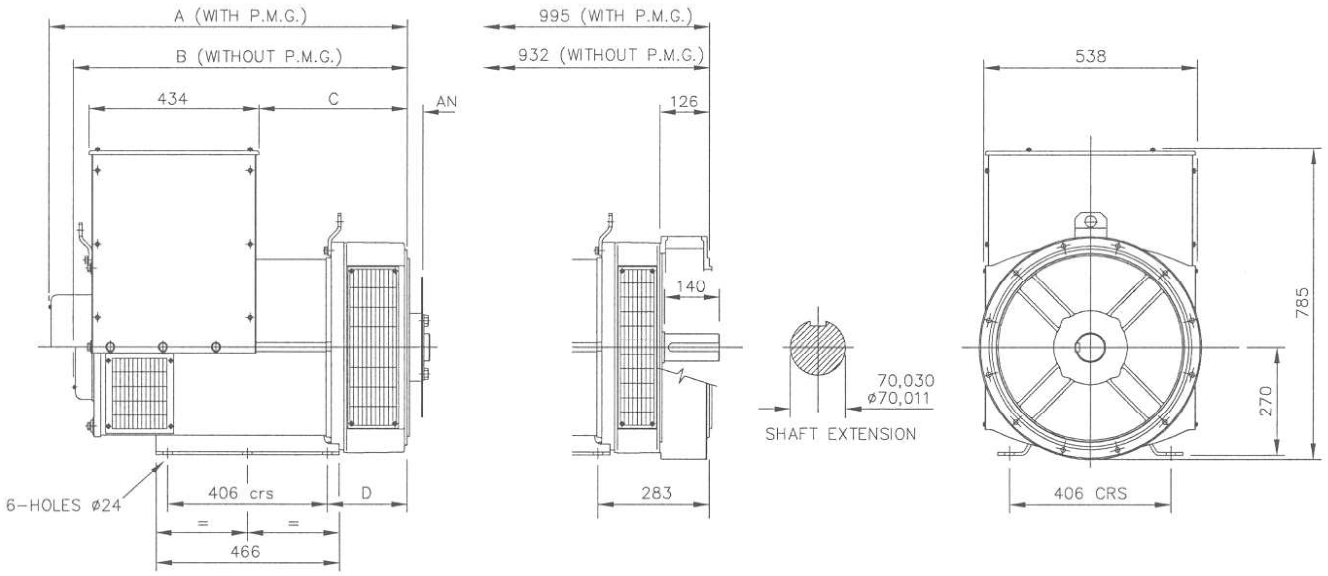
STAMFORD

Winding 311 / 0.8 Power Factor

RATINGS

	Class - Temp Rise	Cont. F - 105/40°C				Cont. H - 125/40°C				Standby - 150/40°C				Standby - 163/27°C			
50 Hz	Series Star (V)	380	400	415	440	380	400	415	440	380	400	415	440	380	400	415	440
	Parallel Star (V)	190	200	208	220	190	200	208	220	190	200	208	220	190	200	208	220
	Series Delta (V)	220	230	240	254	220	230	240	254	220	230	240	254	220	230	240	254
	kVA	125.0	125.0	125.0	N/A	140.0	140.0	140.0	N/A	145.0	145.0	145.0	N/A	150.0	150.0	150.0	N/A
	kW	100.0	100.0	100.0	N/A	112.0	112.0	112.0	N/A	116.0	116.0	116.0	N/A	120.0	120.0	120.0	N/A
	Efficiency (%)	91.7	92.1	92.3	N/A	91.3	91.7	92.0	N/A	91.1	91.6	91.8	N/A	91.0	91.4	91.7	N/A
	kW Input	109.1	108.6	108.3	N/A	122.7	122.1	121.7	N/A	127.3	126.6	126.4	N/A	131.9	131.3	130.9	N/A
60 Hz	Series Star (V)	416	440	460	480	416	440	460	480	416	440	460	480	416	440	460	480
	Parallel Star (V)	208	220	230	240	208	220	230	240	208	220	230	240	208	220	230	240
	Series Delta (V)	240	254	266	277	240	254	266	277	240	254	266	277	240	254	266	277
	kVA	140.0	143.8	143.8	160.0	160.0	167.5	167.5	178.8	170.0	175.0	175.0	187.5	175.0	181.3	181.3	193.8
	kW	112.0	115.0	115.0	128.0	128.0	134.0	134.0	143.0	136.0	140.0	140.0	150.0	140.0	145.0	145.0	155.0
	Efficiency (%)	91.9	92.2	92.5	92.5	91.4	91.7	92.1	92.1	91.2	91.5	91.9	92.0	91.0	91.4	91.8	91.9
	kW Input	121.9	124.8	124.4	138.4	140.0	146.1	145.5	155.3	149.1	153.0	152.3	163.0	153.8	158.7	158.0	168.7

DIMENSIONS



SINGLE BEARING ADAPTORS				
ADAPTOR	A	B	C	D
SAE 1	928,3	865,3	389,3	216,3
SAE 2	914	851	375	202
SAE 3	914	851	375	202

COUPLING DISCS	
DISC	AN
SAE 10	53,98
SAE 11,5	39,68
SAE 14	25,40

APPROVED DOCUMENT

STAMFORD

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www.cumminsgeneratortechnologies.com

UC274E-311-TD-EN-SG-A

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T: +44 (0) 1489 560 700
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GENERATOR CONTROL MODULE

Vibration isolated DSE7320 control panel with USB, RS232 and RS485 ports – data sheet attached.

INDICATION:

- Generator RPM/Frequency (Hz)
- Generator AC Voltage Line-Neutral
- Generator AC Voltage Line-Line
- Oil Pressure
- Coolant Temperature
- Fuel Level (%)
- Engine Hours Run
- DC Battery Voltage
- AC Line Current
- Total VA and KW
- AC Phase Angle
- Mains Frequency (Hz)
- Mains AC Voltage Line-Neutral
- Mains AC Voltage Line-Line

WARNINGS:

- Battery Charge Fail
- Battery Low Voltage
- Battery High Voltage
- Fail to Stop

ANALOGUE PRE-ALARMS:

- Low Oil Pressure
- High Engine Temperature
- Overspeed
- Under speed
- Generator High / Low Frequency
- Generator High / Low Voltage
- Generator High Current

SHUTDOWNS:

- Fail to Start
- Emergency Stop
- Low Oil Pressure
- High Engine Temperature
- Overspeed and Underspeed
- Generator High / Low Frequency
- Generator High / Low Voltage
- Auxiliary Input (shutdown)
- Loss of Speed Signal

DSEGenset®

DSE7310/20 MKII

AUTO START & AUTO MAINS FAILURE CONTROL MODULES

KEY FEATURES

- Configurable power-up mode
- MPU fail delay
- Enhanced graphical user interface
- Drag & drop advanced PLC editor
- MSC ID within PLC GenComm override
- 4-Line back-lit LCD text display
- Multiple Display Languages
- Five key menu navigation
- LCD alarm indication
- Heated display option available
- Customisable power-up text and images
- DSENet expansion compatibility
- Data logging facility
- Internal PLC editor
- Protections disable feature
- Fully configurable via PC using USB, RS232 & RS485 communication
- Front panel configuration with PIN protection
- Power save mode
- 3 phase generator sensing and protection
- 3 phase mains (utility) sensing and protection (DSE7320 MKII only)
- Automatic load transfer control (DSE7320 MKII only)
- Generator current and power monitoring (kW, kvar, kVA, pf)
- Mains current and power monitoring (kW, kvar, kVA, pf) (DSE7320 MKII only)
- kW and kvar overload and reverse power alarms
- Over current protection
- Unbalanced load protection
- Independent earth fault protection
- Breaker control via fascia buttons
- Fuel and start outputs configurable when using CAN
- 6 configurable DC outputs
- 2 configurable volt-free relay outputs
- 6 configurable analogue/digital inputs
- Support for 0 V to 10 V & 4 mA to 20 mA sensors
- 8 configurable digital inputs
- Configurable 5 stage dummy load and load shedding outputs
- CAN, MPU and alternator frequency speed sensing in one variant
- Real time clock
- Manual and automatic fuel pump control
- Engine pre-heat and post-heat functions
- Engine run-time scheduler
- Engine idle control for starting & stopping
- Fuel usage monitor and low fuel level alarms
- Simultaneous use of RS232 and RS485 communication ports
- True dual mutual standby using RS232 or RS485 for accurate engine hours balancing.
- MODBUS RTU support with configurable MODBUS pages.
- Advanced SMS messaging (additional external modem required)
- Start & stop capability via SMS messaging
- 3 configurable maintenance alarms
- Compatible with a wide range of CAN engines, including tier 4 engine support
- Uses DSE Configuration Suite PC Software for simplified configuration
- Licence-free PC software
- IP65 rating (with supplied gasket) offers increased resistance to water ingress
- Modules can be integrated into building management systems (BMS) using MODBUS RTU

KEY BENEFITS

- Automatically transfers between mains (utility) and generator (DSE7320 MKII only) for convenience.
- Hours counter provides accurate information for monitoring and maintenance periods
- User-friendly set-up and button layout for ease of use
- Multiple parameters are monitored & displayed simultaneously for full visibility
- The module can be configured to suit a wide range of applications for user flexibility
- PLC editor allows user configurable functions to meet user specific application requirements.

SPECIFICATIONS

DC SUPPLY

CONTINUOUS VOLTAGE RATING
8 V to 35 V Continuous
5 V for upto 1 minute

CRANKING DROPOUTS
Able to survive 0 V for 100 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. LEDs and backlight will not be maintained during cranking.

MAXIMUM OPERATING CURRENT
510 mA at 12 V, 240 mA at 24 V

MAXIMUM STANDBY CURRENT
330 mA at 12 V, 160 mA at 24 V

CHARGE FAIL/EXCITATION RANGE
0 V to 35 V

GENERATOR & MAINS (UTILITY)

VOLTAGE RANGE
15 V to 415 V AC (Ph to N)
26 V to 719 V AC (Ph to Ph)

FREQUENCY RANGE
3.5 Hz to 75 Hz

MAGNETIC PICKUP

VOLTAGE RANGE
+/- 0.5 V to 70 V

FREQUENCY RANGE
10,000 Hz (max)

INPUTS

DIGITAL INPUTS A TO H
Negative switching

ANALOGUE INPUTS A & F
Configurable as:
Negative switching digital input
0 V to 10 V sensor
4 mA to 20 mA sensor
Resistive sensor

ANALOGUE INPUTS B, C, D & E
Configurable as:
Negative switching digital input
Resistive sensor

OUTPUTS

OUTPUT A & B (FUEL & 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

DIMENSIONS

OVERALL
245 mm x 184 mm x 51 mm
9.6” x 7.2” x 2.0”

PANEL CUT-OUT
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

HEATED DISPLAY VARIANT
-40 °C to +70 °C
-40 °F to +158 °F

RELATED MATERIALS

TITLE	PART NO.
DSE7310 MKII & DSE7320 MKII Installation Instructions	053-181
DSE7310 MKII & DSE7320 MKII Operator Manual	057-253
DSE7310 MKII & DSE7320 MKII Configuration Suite PC Manual	057-243

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Registered in England & Wales No.01319649
VAT No.316923457

055-203/12/20 (2)

DSEGenset®

DSE7310/20 MKII

AUTO START & AUTO MAINS FAILURE CONTROL MODULES

The DSE7310 MKII is an Auto Start Control Module and the DSE7320 MKII is an Auto Mains (Utility) Failure Control Module suitable for a wide variety of single, diesel or gas, gen-set applications.

Monitoring an extensive number of engine parameters, the modules will display warnings, shutdown and engine status information on the back-lit LCD screen, illuminated LEDs, remote PC and via SMS text alerts (with external modem).

The DSE7320 MKII will also monitor the mains (utility) supply. The modules include USB, RS232 and RS485 ports as well as dedicated DSENet® terminals for system expansion.

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

The extensive list of features includes enhanced event and performance monitoring, remote communications & PLC functionality. Dual mutual standby is now available on both the DSE7310 MKII & DSE7320 MKII using RS232 or RS485 communications. This provides for a simpler and more convenient installation with more advanced features such as true engine hours balancing.

The modules can be easily configured using the DSE Configuration Suite PC 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

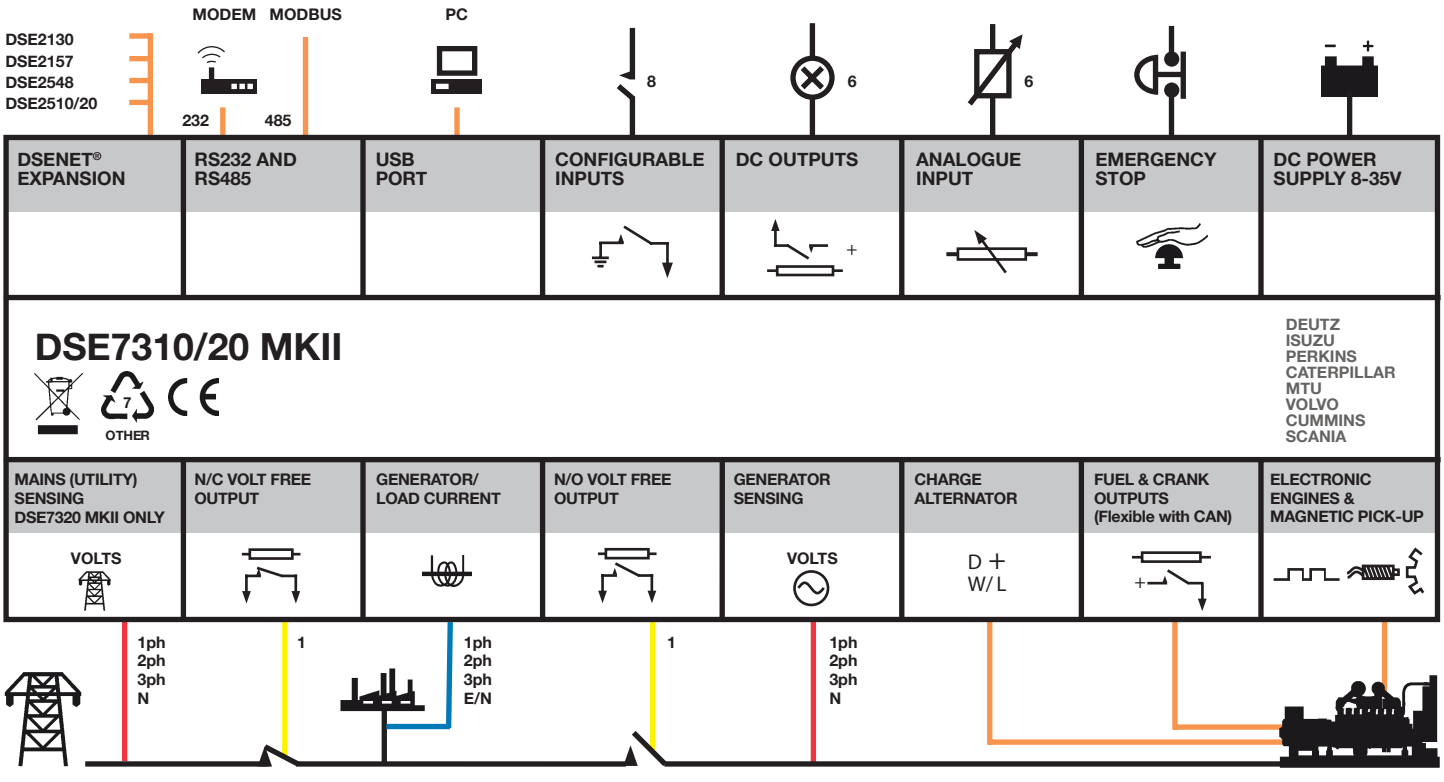
VIBRATION
BS EN 60068-2-6
Ten sweeps in each of three major axes
5 Hz to 8 Hz at +/-7.5 mm,
8 Hz to 500 Hz at 2 gn

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



LISTED

DSEGenset

DSE2157
DSENET® OUTPUT EXPANSION MODULE

The DSE2157 is an output relay expansion module for use with DSENet® compatible control modules. The DSE2157 has been designed to extend a host module's output capabilities.

A maximum of 10 DSE2157's can be connected to an individual module at any one time. All outputs are configurable via the host controller.

The additional output capabilities of the DSE2157 give OEMs the flexibility to meet increasingly complex industry specifications. The module incorporates 'DIN' rail and chassis mountings allowing convenient fixing into a panel.

The module will work up to 1 KM (0.6miles) from the host control module.

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

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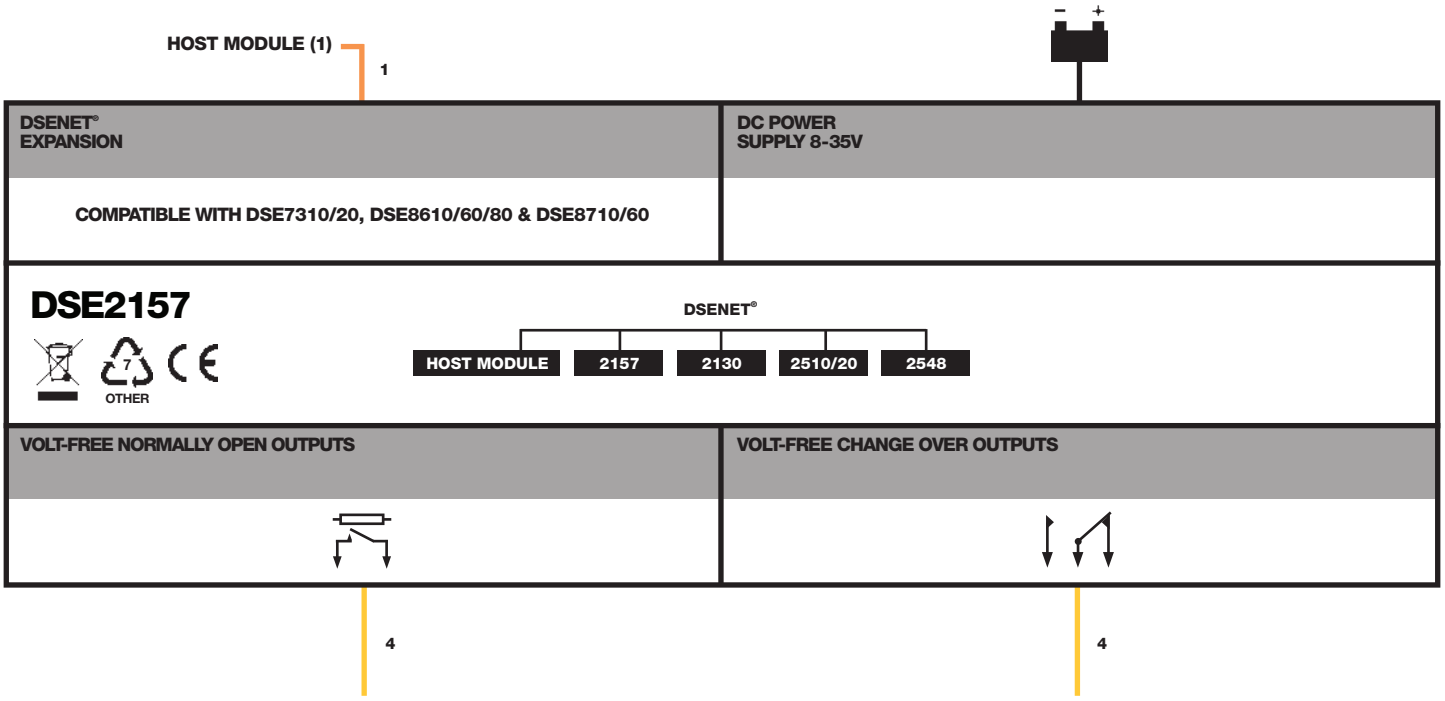
Db Damp Heat Cyclic 20/55 °C
@ 95% RH 48 Hours
BS EN 60068-2-78
Cab Damp Heat Static 40 °C
@ 93% RH 48 Hours

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

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

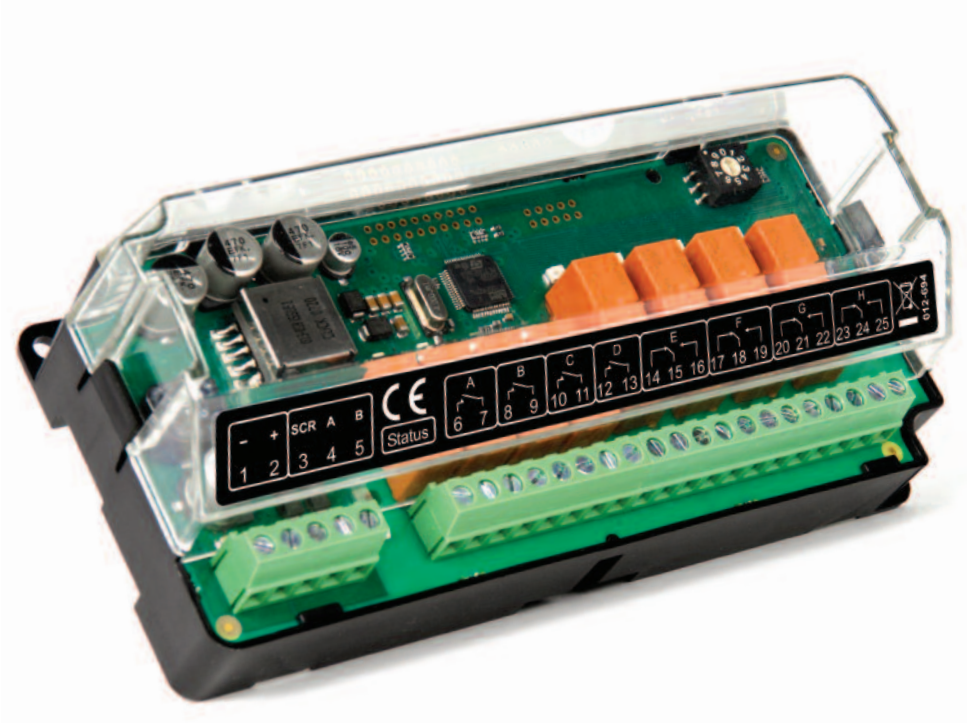


ISSUE 3

DSEGenset

DSE

DSE2157
DSENET® OUTPUT EXPANSION MODULE



KEY FEATURES

- Power On/Link Lost LED ID SWITCH
- 10 expansion modules can be connected to 1 host controller at a time
- 8 configurable relay contacts with LED indicators:
  - 4 Normally Open (N/O)
  - 4 Change Over (C/O)
- Terminal strip connection for quick and easy set-up

ID SWITCH

The rotary ID switch is used to select the address of the DSE2157 expansion module, as the host control module is capable of giving instructions to a number of DSE2157 expansion modules at the same time.

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. LEDs and backlight will not be maintained during cranking.

MAXIMUM OPERATING CURRENT
325 mA at 12 V, 152 mA at 24 V

MAXIMUM STANDBY CURRENT
70 mA at 12 V, 32 mA at 24 V

AUXILIARY RELAY CONTACTS
2 Amp DC rated voltage free

DIMENSIONS

OVERALL
165 mm x 76 mm x 49 mm
6.5” x 3” x 1.9”

RELATED MATERIALS

TITLE	PART NO’S
DSE2157 Installation Instructions	053-034
DSE2157 Operator Manual	057-083

DEEP SEA ELECTRONICS PLC UK
Highfield House, Hunmanby Industrial Estate, Hunmanby YO14 0PH
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EMAIL sales@deepseaplc.com **WEBSITE** www.deepseaplc.com

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EMAIL sales@deepseausa.com **WEBSITE** www.deepseausa.com

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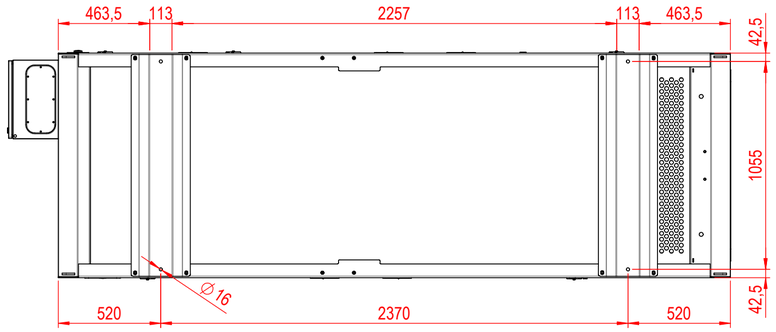
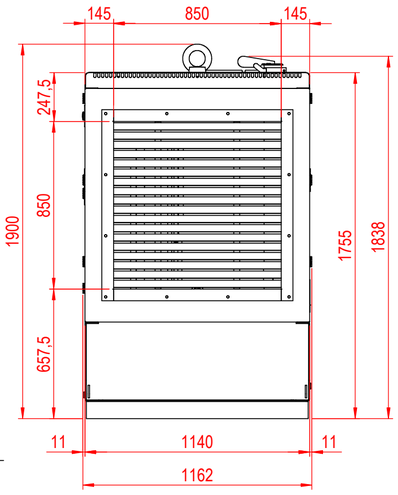
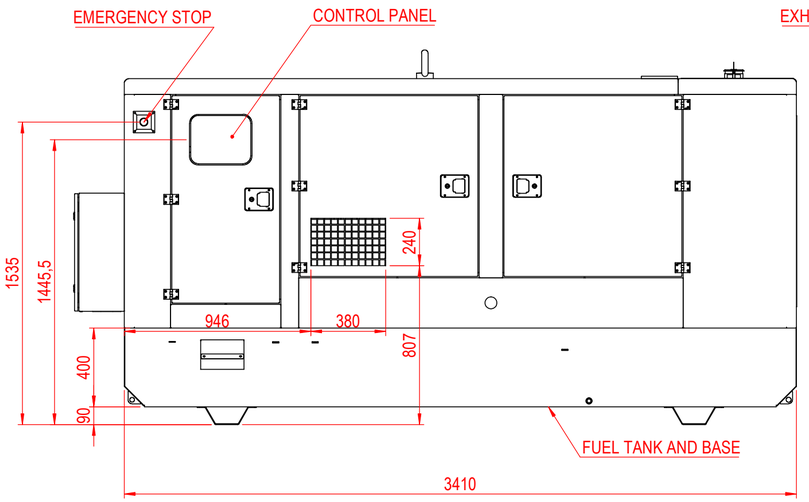
VAT No.316923457

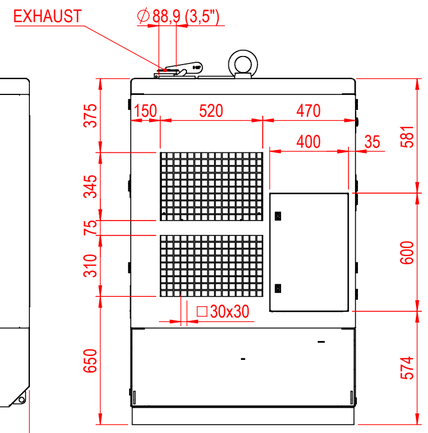
055-061/10/10 (3)

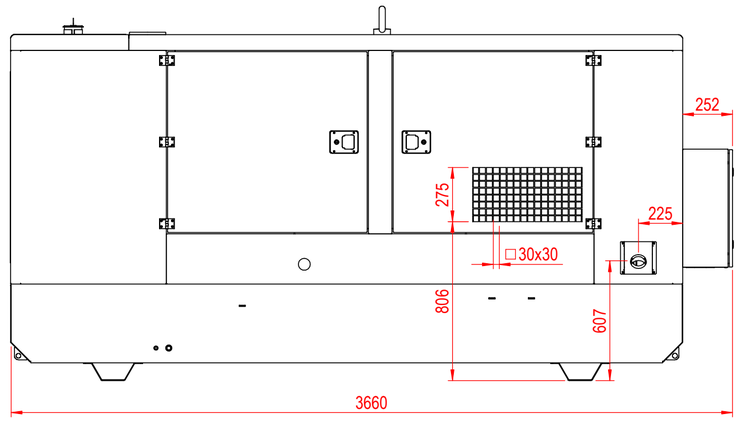
MODIFICACIÓN:
Modification:

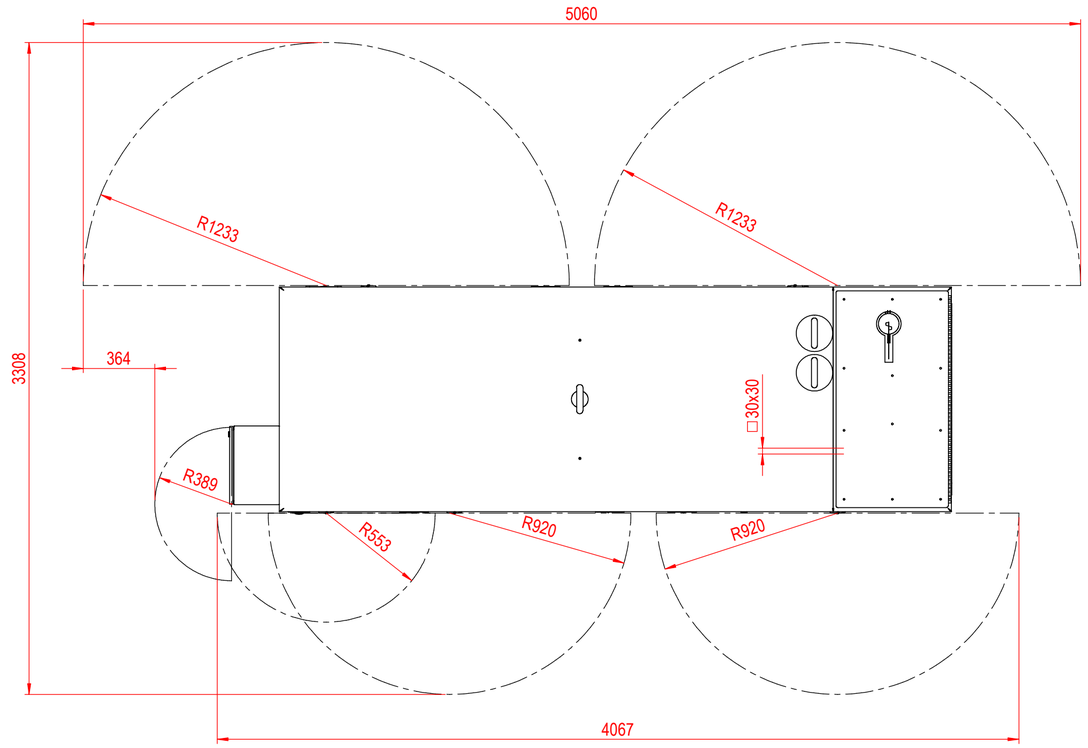


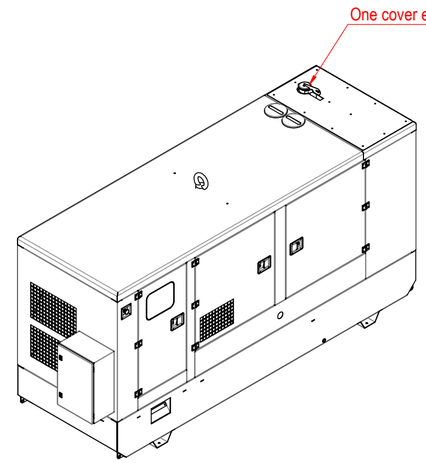


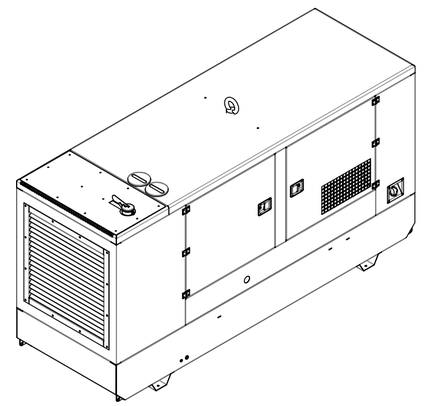












Measures in mm

DIBUJADO POR: Drawn by:	DMOROS	FECHA: Date:	31/07/2020		NORMAS ISO 2768-c
APROBADO POR: Approved by:		FECHA: Date:	-		
MODIFICADO POR: Modified by:		FECHA: Date:			A2

DESCRIPCIÓN: Description:

GENSET DK (UK + FRONT GRILL)

PLANO: Drawing:

DGIS 170-200-220
DGPS 165-200-220

ESPESOR: Thickness:	MATERIAL: Material:	VERSIÓN: Version:	ESCALA: Scale:
TRATAMIENTO/COLOR: Treatment/Color:		PESO: Weight:	HOJA: Sheet: 1/1

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E: sales@powertecnique.com **W:** www.powertecnique.com

EXHAUST FLUE SPECIFICATION

SUMMARY

To supply, deliver and install **1 No 150 mm I/D 250 mm O/D Dinak GE50+ Exhaust System** from the exit of the silencer through to termination. In addition to the list below, we have allowed for an adaptor, short and adjustable lengths, standard brackets and supports.

ROUTE DESCRIPTION

Nominal length: 10 metres
Terminal: open
Drain point: at lowest point (drainage pipework by others)

EXHAUST SUPPORT

Vertical sections will be supported to the riser wall using standard Dinak GE50+ support system.

TECHNICAL SPECIFICATIONS

Dinak GE50+ is a twin wall generator exhaust system manufactured to conform to BS EN 1856-1 with an AISI 316L stainless steel inner and an AISI 304 stainless steel outer. The system is insulated with 50mm thick high density Rockwool insulation. The system is designed to operate to high temperature (T600) and to high pressures under 5000Pa, (European Standard Designation H1). Components assembled by means of pushing one section onto the existing, pushing into position and securing using sealing band and locking band. Expansion is absorbed on the inner skin with additional external compensators built into each metre section.

INCLUSIONS

Design of exhaust system based upon the appliance data supplied and the route advised.
Installation of the exhaust system(s) in one continuous visit.
All standard Dinak GE50+ Generator Exhaust flue brackets and supports, including minor support components such as Unistrut channel, threaded studding and fixings.
Site survey
Working drawings in 2D CAD format.
Standard 3 metre aluminium scaffold tower.
Delivery to site on standard delivery.

EXCLUSIONS

Internal and external builder's works
Out of hours and weekend works
Leakage test to DW144 Class C to 1500Pa (unless requested on original order)
Special sized flashings
Holes through roofs, weathering of flashings, roof work, lightning protection
Firestop arrangement between walls and floors
Drainage pipework from drainage points in the system
Compliance with specified noise criteria
Exhaust from engine bellows to primary silencer and between silencers

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EXCLUSIONS (continued)

Anti-implosion/explosion relief sections
Protection of product until project completion once installed
Test points
FORS Delivery to site. Standard delivery included
Painting of exhaust system
Cranage/ lifting equipment
Materials suitable for coastal areas where atmospheres may contain high levels of corrosive elements

PLEASE NOTE:

- If installed in a riser, this will require ventilation to prevent build-up of heat from the flue
- The discharge height of all exhaust systems must be approved by the relevant Local Authority planning office as required under the Clean Air Act. Power Tecnique is not responsible for obtaining this approval.

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ADDITIONAL ITEMS AND SERVICES INCLUDED

DELIVERY, OFFLOAD, AND POSITIONING

Delivery and offload outside the plantroom by hiab (non-FORS registered), with positioning by skate. Road management if required and suitability of road surfaces for vehicle movement and outrigger placement to be undertaken by others.

MARSHALLING BOX

Provided to convert multiple cables from ATS to 2-wire cable to be connected to generator. Price includes deliver by courier with others responsible for installation prior to Power Tecnique attendance to commission the generator.

FUEL TO FILL TANKS BEFORE AFTER COMMISSIONING, TOP UP AFTER

Price to fill fuel tank is based on the following:

- provision of **white** diesel - red diesel may be offered following receipt of written confirmation from the HMRC that the site is exempt from paying fuel tax duty
- assumes filling is done during same visit to commission the generator, and prior to commissioning, with easy access for delivery of fuel by our commissioning engineer – if additional personnel or specialist handling equipment is required to bring fuel to the generator, our offer will be revised accordingly
- we allow for two hours running during commissioning and topping up after. If we are not supplying fuel, sufficient fuel prior to commissioning will need to be supplied by others
- due to the volatility of the fuel market, we reserve the right to revise pricing in accordance with concurrent fuel pricing at the time of order and on instruction to proceed with fuelling

COMMISSIONING AND LOAD BANK TESTING

Commissioning assumes site load will be available and is based on undertaking the following:

- Carry out manufacturers pre-commissioning checks
- Bleed the fuel system where required
- Connect starter batteries where required
- Test start generator
- Run generator on the available site load
- Generating set testing in accordance with our standard commissioning procedures
- Load bank testing for 4 hours in accordance with the specification. Please note that this is offered using a resistive load bank with 25m of cable and assumes a suitable cable route to an external location is available. The load bank will be delivered by flatbed trailer (non-FORS registered), with offload and positioning if required by others. Road management if required and suitability of road surfaces for vehicle movement to be undertaken by others. We allow for the load bank to remain on site for up to 5 hours, with longer duration subject to additional days hire.
- Handover test certificates

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ADDITIONAL OPTIONS

VENTILATION SYSTEM

Excluded from our scope of works as in the remit of others.

FLUE LEAKAGE TEST

We offer two rates for a flue leakage test, with cost dependant on whether it is undertaken during the same visit as flue installation, or as a separate visit.

MAINTENANCE CONTRACT

Includes 2 x PPM visits p.a., next day response to site for emergency call out (labour and travel chargeable), consumables chargeable – other service plans are available on request

ADDITIONAL VISITS

Should additional visits for induction, personnel training, or integrated system testing be required the engineers day rate will be applicable. The cost is based upon supply of engineer only and does not include for additional hire of specialist test equipment such as a load bank. This day rate will also be charged if they are delays on site or aborted visits as labour costs within this quotation are based on continuous work with free access to required areas.

Generator Warranty Statement

Our Commitment to Quality

Customer care and satisfaction is paramount to Powertecnique. Our standard warranty periods and terms are amongst the best in the industry. However standard warranty has some limitations if your power back-up is critical and response times essential. A specific Maintenance Contract will provide you with total peace of mind and documented response times.

Generator Standard Warranty

Warranty terms for all standby operation generators are one calendar year from the commissioning date or up to 500 hours run time, whichever is sooner. All Volvo and MTU engines are covered by 2 years or 1000 hours of operation, whichever is sooner.

Powertecnique undertakes to remedy any operating fault resulting from a defect in design, materials or workmanship (including assembly if this operation is entrusted to them) within the limit of the provisions below.

In order to be covered by the warranty, the end user must ensure that the equipment is operated and maintained according to the manufacturer's guidelines. The equipment must be properly maintained by Powertecnique or a Powertecnique approved/ accredited service partner. The user must keep up-to-date a maintenance book in which he enters the date, content and results of tests, visual inspections, routine maintenance work and maintenance work together with any comments and findings concerning any operating anomalies.

Faults must be reported in writing to Powertecnique in a timely manner and repairs can only be carried out by Powertecnique or a company approved by Powertecnique.

The decision to accept or deny a warranty belongs to Powertecnique. In the event of a breakdown of the engine or alternator the warranty will be granted by the supplier of the said component according to the warranty terms of this component. Powertecnique reserves the right to recover the failed element. In this event all expenses derived from this recovery will be payable by the customer.

The warranty of a repair made during the warranty period will end at the time that the warranty for the generator unit expires.

Generator Warranty Validation

In order for the equipment warranty to be valid the equipment must have been commissioned by a Powertecnique approved Commissioning Engineer (for relevant equipment only) and the equipment must be registered with Powertecnique within 30 days of delivery/commissioning. Failure to register your equipment in this timeframe may invalidate your warranty.

Conditions of Warranty

The warranty covers only the initial user and cannot be transferred to a third party without the prior agreement of Powertecnique.

The warranty does not cover breakdowns due to the coupling of the electric generator unit to other devices not installed or supplied by Powertecnique. Breakdowns and damage caused by prolonged or incorrect storage are also excluded. Please refer to the Users Manual with respect to this clause.

Any warranty is also excluded for incidents due to unforeseeable circumstances or cases of force majeure as well as for any replacements or repairs which may result from normal wear and tear of the material, from damage or from accidents arising out of negligence, lack of supervision or of maintenance and from defective use of this material.

The warranty of the generator set will only cover the necessary replacement parts and labour for repairing the unit by personnel authorised by Powertecnique. All travel, mileage and other expenses derived from a repair to the unit under warranty are excluded from warranty coverage, therefore in no event will Powertecnique pay for the same and such items must be reimbursed to Powertecnique.

Should no fault be found or damage to the generator be from misuse or operator error then all repair and recovery costs will be charged to the user.

Powertecnique reserves the right to exchange your generator for a suitable replacement should your equipment be deemed to be beyond economical repair.

Service & Maintenance Contracts

Powertecnique's annual Service and Maintenance contracts are tailored to suit your specific requirements. Offering you a guaranteed response time from fully qualified engineers, 24 hours a day, seven days a week, every day of the year.

PowerVue

PowerVue is a complete UPS and generator remote monitoring system. This service is an add on feature that can be included with any service plan offered by Powertecnique. Please contact your customer service representative for more information and a product demonstration.

Please contact your Service Sales Representative for detailed pricing of the above.

Powertecnique's liability is strictly limited to the obligations defined above and it is an express agreement that Powertecnique shall not be liable for any compensation for any direct or indirect damage, even in the event of a claim whose initial cause is damage covered under the terms of this warranty.

Power Tecnique Limited trading as "Powertecnique" – Standard Terms & Conditions

GENERAL

These Conditions relate primarily to material supply contracts supplied by Power Tecnique Limited trading as "Powertecnique" (herein after called "the Seller"). Where site work or maintenance work is involved the Seller's supplementary terms and conditions relating to the relevant work also apply. These are available from the Seller upon request.

1.1 All quotations are made and all orders are accepted subject to the following conditions. All other terms and conditions or warranties whatsoever are excluded from the contract or any variation thereof (with the exception of Appendix A) unless expressly accepted by the Seller in writing.

1.2 Quotations shall be made available for acceptance for a maximum period of 30 days from the date thereof and may be withdrawn by the Seller within any such period by written or oral notice, except where acceptance takes place before the end of this period.

1.3 If any statement or representation has been made to the Buyer by the Seller its servants or agents upon which the Buyer relies other than in documents enclosed with the Seller's quotation or acknowledgment of order then the Buyer must set out that statement or representation in a document to be attached to or endorsed on the order and in any such case the Seller may confirm reject or clarify the point and submit a new quotation.

DELIVERY

2.1 Time for delivery is given as accurately as possible but is not guaranteed. The Buyer shall have no right to damages or to cancel the order for failure for any cause to meet the delivery time stated.

2.2 The date of delivery shall in every case be dependent upon prompt receipt of all necessary information final instructions or approvals from the Buyer. Alterations by the Buyer in design specifications or quantities required may result in delay in delivery.

2.3 Failure by the Buyer to take delivery of or to make payment in respect of any one or more instalments of Goods delivered here under shall entitle the Seller to treat the whole contract as repudiated by the Buyer.

2.4 The Seller will endeavour to comply with reasonable requests by the Buyer for postponement of delivery but shall be under no obligation to do so. Where delivery is postponed otherwise than due to default by the Seller the Buyer shall pay all costs and expenses including a reasonable charge for storage and transportation occasioned thereby and payment for the goods shall be made in accordance with these conditions.

2.5 Any packaging supplied by the Seller unless otherwise expressly agreed is intended only to provide adequate protection throughout normal conditions of transit of usual duration.

2.6 The Seller shall not be responsible for unloading or any damage thereby occasioned.

RISK

3.1 Risk shall pass to the Buyer so that the Buyer is responsible for all loss, damage or deterioration of the goods as follows;

3.1.1 If the Seller delivers the Goods by its own transport or in accordance with a specific contractual obligation arranges transport for the Goods at the time when the Goods or at a relevant part thereof arrive at the place of delivery, or

3.1.2 in all other circumstances at the time when the Goods or a consignment or other part thereof leave the premises of the Seller.

TITLE

4.1 Title to the Goods or any relevant part thereof shall only pass to the Buyer upon the happening of any one of the following events;

4.1.1 The Buyer has paid to the Seller all sums due and payable by it to the Seller under this contract and all other prior contracts between the Seller and the Buyer, or when the Seller serves on the Buyer notice in writing specifying that title in the goods or such thereof has passed.

4.2 The Seller may recover goods in respect of which title has not been passed to the Buyer at any time and the Buyer hereby licences the Seller its officers, employees and agents to enter upon any premises of the Buyer for the purpose either of satisfying itself that the Goods have been stored separately from other Goods and that they are clearly identifiable as belonging to the Seller in accordance with condition 4.3 or of recovering any Goods in respect of which property has not been passed to the Buyer.

4.3 Until title to the goods has passed to the Buyer pursuant to the terms hereof it shall possess the goods as a bailee of the Seller on the terms of the contract. If the Seller so requires the Buyer shall store the Goods separately from other Goods and shall ensure that they are clearly identifiable as belonging to the Seller.

CANCELLATION

5.0 Cancellation will only be agreed to by the Seller on condition that all costs and expenses incurred by the Seller up to the time of cancellation and all loss of profits and other loss or damage resulting to the Seller by reason of such cancellation will be paid forthwith by the Buyer to the Seller.

5.1 In the event that Buyer postpones, delays or cancel the provision of services or shipment of goods, Buyer shall pay Seller the following abortive visit / cancellation charges;

More than 72 working hours before the planned works are due to begin	0%	No Charge
Less than 72 working hours before the planned works are due to begin	25%	Of all charges associated with the cancelled visit
Less than 48 working hours before the planned works are due to begin	50%	Of all charges associated with the cancelled visit
Less than 24 working hours before the planned works are due to begin	100%	Of all charges associated with the cancelled visit

5.2 Notwithstanding the foregoing Seller reserves the right to recover from Buyer all reasonable and documented costs and damages incurred by Seller as a result of such postponement, delay or cancellation, including but not limited to all storage costs and other additional expenses resulting therefrom and a reasonable allowance for overheads and profit (including but not limited to loss of prospective profits and overheads).

PRICES

6.1 All prices are unless otherwise stated quoted net ex works exclusive of V.A.T. and are subject to fluctuation in the event of any increase in the cost of labour or national awards or increases in the costs of materials and overheads. Any increase in such costs during the period of the contract will be added to the quoted price.

6.2 In the event of any alteration being requested by the Buyer and agreed by the Seller in design or specification the Seller shall be entitled to make an adjustment of the contract price corresponding to such alteration.

6.3 The cost of carriage and packaging shall unless otherwise stated or agreed by the Seller be charged extra and is not refundable.

TERMS OF PAYMENT

7.1 Unless otherwise agreed with the Seller in writing, payment shall be made strictly 30 days from the date of Invoice. The Seller shall be entitled to submit its Invoice with its delivery address note or at any time after dispatch of the Goods save that where the delivery has been postponed at the request of or by the default of the Buyer then the Seller may submit its invoice at any time after the Goods are ready for delivery or would have been ready in the ordinary course but for the request or default as aforesaid.

7.2 Where goods are delivered by instalments the Seller may invoice each instalment separately and the Buyer shall pay such invoices in accordance with these conditions.

7.3 No disputes arising under the contract or delays beyond the reasonable control of the Seller shall interfere with prompt payment in full by the Buyer.

7.4 In the event of default in payment by the Buyer the Seller shall be entitled without prejudice to any other right or remedy to suspend all further deliveries on any other contract or contracts between the Seller and Buyer without notice and to charge interest on any amount outstanding at the rate of 8% above NatWest Bank base rate per month from the time payment was due. In addition the Buyer agrees to meet the Companies legal, professional and debt collection fees, costs and disbursements that the Company may incur in order to obtain payment of all and any sums arising out of the sale.

SHORTAGES AND DEFECTS APPARENT ON INSPECTION

8.1 The Buyer shall have no claim for shortages or defects apparent unless:-

8.1.2 The Buyer inspects the Goods within three working days of arrival at its premises or other agreed destination and:

8.1.2 a written complaint is made to the Seller within seven (7) days of receipt of the Goods or such shorter period as the carriers conditions (if applicable) require specifying the shortage or defect and:

8.1.3. The Seller is given an opportunity to inspect the Goods and investigate any complaint before any use of or alteration is made of or to the goods or the goods are interfered with.

8.2 If a complaint is not made to the Seller as herein provided then the Goods shall be deemed to be in all respects in accordance with the contract and the Buyer shall be bound to pay for the same accordingly.

DEFECTS NOT APPARENT UPON INSPECTION

Where the seller is instructed to install and commission equipment on the customers site any defects that occur within 12 months following the commissioning will be covered under the installation maintenance period, subject to the following clauses;

9.1 The Buyer shall have no claim in respect of defects not apparent upon visual inspection at the time of delivery unless:-

9.1.1 a written complaint is sent to the Seller as soon as reasonably practicable after the defect is discovered and no use is made of the Goods thereafter and no alteration made thereto or interference made therewith before the Seller is given an opportunity to inspect the Goods in accordance with this Condition and

9.1.2 The complaint is sent within twelve (12) months of the date of delivery of the Goods or in the case of an item not manufactured by the Seller within the guarantee period specified by the manufacturer of such item.

9.2 The Buyer shall not be entitled to any claim in respect of any repairs or alterations undertaken by the Buyer without the prior specific written consent of the Seller nor in respect of any defect arising by reason of fair wear and tear or damage due to misuse.

9.3 The Seller shall not be liable for loss or damage suffered by reason of use of the Goods after the Buyer becomes aware of a defect or after circumstances which should reasonably have indicated to the Buyer the existence of a defect.

9.4 The Seller may within 15 days of receiving such a written complaint (or 28 days where the Goods are situated outside the United Kingdom) inspect the goods and the Buyer if so required by the Seller shall take all steps necessary to enable the Seller to do so.

GUARANTEE

10.1 Save as otherwise provided in the other conditions of these conditions sections 12-15 of the Sale of Goods Act 1979 are to be implied into this contract.

10.2 The Seller accepts no responsibility for failure of the Goods to attain performance figures unless the Seller has given specific written assurance in the quotation or in a separate document issued subsequently.

10.3 In the event of the conditions of the Goods being such as might or would (subject to these conditions) entitle the Buyer to claim damages or to repudiate the contract the Buyer shall not then do so but shall first ask the Seller to repair or supply satisfactory substitute goods and the Seller shall thereupon be entitled at it's option to repair or take back the defective goods and to supply satisfactory substitute goods free of costs and within a reasonable time. If the Seller does so repair the goods or supply satisfactory substitute Goods the Buyer shall be bound to accept such repaired or substituted Goods and the loss or damage whatsoever arising from the initial delivery of the defective goods or from the delay before the defective Goods are repaired or the substitute Goods are delivered.

10.4. In no event shall the Buyer be entitled to reject the Goods on the basis of any defect of failure which is so slight that it would be unreasonable for the Buyer to reject them.

10.5. In the case of Goods not manufactured by the Seller the Seller gives no assurance or guarantee whatsoever that the sale or use of the Goods will no infringe patent copyright or other industrial property rights of any person firm or Seller.

LIABILITY

11.0 Save where the Seller is shown to have failed to exercise reasonable care in the supply of the Goods and such failure results in death or personal injury the Seller shall not be liable in respect of claims arising by reason of death or personal injury. Further under no circumstances whatsoever shall the Seller be liable for consequential loss (including removal or rectification work required in connection with installation of repaired or substitute Goods) of profits or of damage to property.

CONFIDENTIAL INFORMATION

12.0 All drawings documents confidential records computer software and other information supplied by the Seller are supplied on the express understanding that copyright is reserved to the Seller and the Buyer will not without the written consent of the Seller either give away loan exhibit or sell such drawings documents records software or other information or extracts therefrom or copies thereof or use them in any way except in connections with the Goods in respect of which they are issued.

BUYER DRAWINGS

13.1 The Buyer shall be solely responsible for ensuring that all drawings information advice and recommendations given to the Seller either directly or indirectly by the Buyer or by the Buyers agent's servants consultants or advisers are accurate correct and suitable. Examination or consideration by the Seller of such drawings information advice or recommendations shall in no way limit the Buyers responsibility hereunder unless the Seller specifically agrees in writing to accept responsibility.

13.2 The Buyer shall Indemnify the Seller from and against all actions claims costs and proceedings which arise due to the manufacture of Goods to the drawings or specifications of the Buyer where such drawings or specifications are at fault or where it is alleged that they involve an infringement of a patent copyright registered design or design copyright or other exclusive right.

DATA, TECHNICAL INFORMATION AND DRAWINGS

14.1 Illustrations performance details examples of instalments method of assembly and all other technical data in the advertising sale and technical literature issue by the Seller are based on experience and upon trials under test conditions and are provided

for general guidance only. No such information shall form part of the contract unless the Buyer shall have complied with conditions 1.3 hereof relating to statements and representations.

14.2 All specifications drawings and particulars of weights and dimensions included or referred to in the Seller's tender are approximate only.

TESTS

15.0 If tests are required in the presence of representatives of the Buyer these will be carried out at the Seller's premises unless otherwise mutually agreed. An extra charge will be made by the Seller for which the Buyer shall be responsible and the Buyer will also bear the costs of sending its representatives to the tests. If there is a delay of more than 7 days on the part of the Buyer in attending tests after having being noted by the Seller that it is ready for the test to proceed, the tests will be done in the absence of the Buyers' representatives.

HEALTH SAFETY AND CONSUMER PROTECTION

16.1 The attention of the Buyer is drawn to the Seller's product catalogues which contain important information relevant to the safe installation and use of the Goods and to the Health and Safety at Work etc. Act 1974.

16.2 In circumstances where the Seller supplies parts or products to the Buyer for incorporation with or use ancillary to any composite products to be produced manufactured processed or supplied by the Buyer then:

16.2.1 the Buyer shall forthwith on demand produce for inspection by the Seller copies of all written instructions and warnings to be supplied by the Buyer in relation to the said composite provided nevertheless that such inspection or right to inspect shall not of itself constitute acceptance or approval on the part of the Seller of such instructions information of warnings and

16.2.2 The Buyer shall indemnify reimburse and compensate the Seller for all losses and damages (including costs expenses and charges for legal actions in which the Seller may be involved) that the Seller may incur in the event that any claim or claims are made against the Seller pursuant to the Consumer Protection Act 1987 ("The Act") relating to the said composite products of the Buyer in circumstances in which the part or product supplied by the Seller was either (i) not the defective part of the said Composite product or (ii) was only rendered the defective part or became a defective product by reason of actions or omissions of the Buyer or (iii) was only rendered the defective part or became a defective product by reason of instructions or warnings given by the Buyer or other supplier of the said composite product or products or (iv) was supplied by the Seller in accordance with specification and / or design either stipulated or approved by the Buyer.

16.3 For the purpose of this condition the word "defective" shall be interpreted in accordance with the definition contained in the Act.

16.4 The Buyer hereby acknowledges that it is under a duty to pass on to its Buyers (where appropriate) all instructions information and warnings supplied to it by the Seller with the Goods.

16.5 The seller is not responsible for the testing, handling or removal of asbestos if discovered during project implementation.

INSOLVENCY ADMINISTRATIVE RECEIVER

17.0 If the Buyer shall become bankrupt or insolvent or compound with its creditors or in the event of a resolution being passed or proceedings commenced for the liquidation of the Buyer (other than for a voluntary winding up for the purpose of reconstruction or amalgamation) or if an administrative receiver is appointed of all or any part of its assets or undertaking or if a petition shall be presented to the Court for the appointment of an administrator in relation to the Buyer the Seller shall be entitled to cancel the contract in whole or in part by notice in writing without prejudice to any right or remedy accrued or accruing to the Seller.

FORCE MAJEURE

18.0 Neither party shall be under any liability for delay loss or damage caused wholly or in any part by act of God government restriction condition or control or by reason of any act done or not done pursuant to a trade dispute whether such dispute involves its employees or not or by reason of any other act matter or thing beyond its reasonable control including failure by the other party to carry out the provisions of these conditions.

LEGAL

19.1 The contract shall be governed and interpreted exclusively according to the law of England.

19.2 In the event of the Seller wishing to pursue legal proceedings against the Buyer relating to this contract the Seller shall be entitled either to institute arbitration proceedings in accordance with condition *19.4* or to bring an action in the English Courts.

19.3 Unless otherwise mutually agreed in writing, the English courts will have exclusive jurisdiction in all proceedings brought by the Buyer against the Seller relating to this contract provided that once the Seller has indicated to the Buyer its intentions to refer a dispute to arbitration all set-offs counterclaims or other cross claims of the Buyer relating to that dispute shall also be referred to arbitration.

19.4 Any dispute arising under or in connection with this contract shall be referred to arbitration by a single arbitrator appointed by agreement or (in default) nominated on the application of either party by the President for the time being of the Institution of Electrical Engineers. The provisions of the Arbitration Act 1950 or any statutory modification or re-enactment thereof for the time being in force shall apply to such arbitration.

COMPUTER SOFTWARE WARRANTIES

20.1 The Seller warrants that the diskette on which the Software is supplied will be free from defects in materials and workmanship under normal use for a period of 90 days after the date of original purchase ('the Warranty Period'). If a defect in the diskette shall occur during the Warranty Period it may be returned with proof of purchase to the Seller who will replace it free of charge.

20.2 The Seller warrants that the Software will perform substantially in accordance with its accompanying documentation (provided that the Software is properly used on the computer and with the operating system for which it was designed) and that the documentation correctly describes the operation of the Software in all material respects. If the Seller is notified of significant errors during the Warranty Period it will correct any such demonstrable errors in the Software or its documentation within a reasonable time or (at its option) provide or authorise a refund (against return of the Software and its documentation).

20.3 The Seller does not warrant that the Software will meet your requirements or that the operation of the Software will be uninterrupted or error-free or that defects in the Software will be corrected. You shall load and use the Software at your own risk and in no event will the Seller be liable to you for any loss or damage of any kind (except personal injury or death resulting from the Sellers negligence) including lost profits or other consequential loss arising from your use of or inability to use the Software or from deficiencies in it whether cause by negligence or otherwise except as expressly provided herein. In no event shall the Seller's liability exceed the amount paid by you for the Software.