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April 22, 2010

Customer: Bi-Pure Water Inc

Project: Government of Nunavut, Water Systems Upgrade, Taloyoak NU

Product: Frontier Built JDS40 - 44kW Diesel Generator

Quote No: QC-6226-2

Generator Bill Of Material

- John Deere 4045DF Diesel powered engine
- Stamford UCI224F alternator rated 45KW @ 125C rise at 240 volt , single phase
- 40C Rated Unit mounted radiator C/W pusher fan and Guards
- Diesel fuel system, C/W flexible fuel lines
- Silex 4" Critical Grade Silencer, Shipped Loose
- Silex Flexible exhaust connector, shipped loose
- 12 volt starting system
- Controls Inc GenMaster Plus Digital autostart control panel
- Generator Run Relay
- Common Failure Relay
- Oil drain valve
- Battery cables
- Battery rack
- Battery
- Kohler 10Amp, 120V Battery Charger C/W alarm board, Shipped loose
- 1000W, 120V Block Heater
- 175Amp Square D Model JDS36175 Molded case circuit breaker
- Steel channel skid base
- CSA Certified
- Owners manual, 1 copy
- 1 year/ 2000 hour warranty

Content:

Engine: Built in US

Generator End: Built in Mexico

Control panel: Built in US

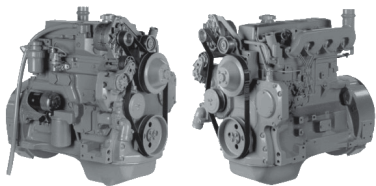
Misc supply: Canadian

Assembled in Canada

PowerTech

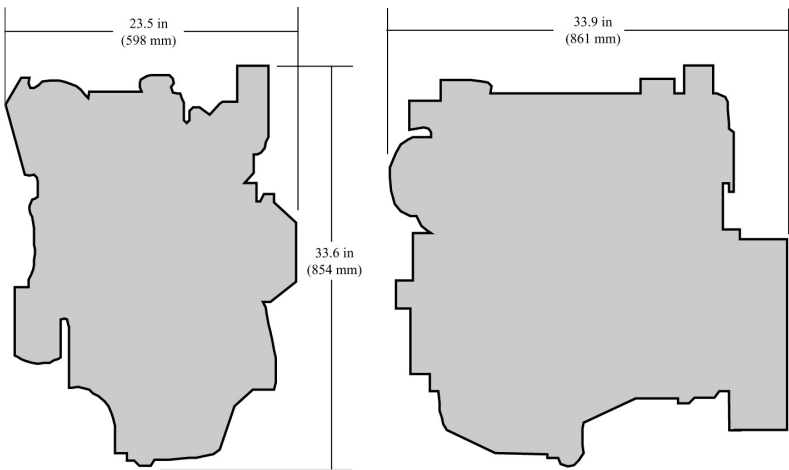
4045D Diesel Engine

Generator Drive Engine Specifications



4045D shown

Dimensions



Certifications

CARB
EPA Tier 1

General data

Model	4045DF150
Number of cylinders	4
Displacement - L (cu in)	4.5 (275)
Bore and Stroke-- mm (in)	106 x 127 (4.17 x 5.00)
Compression Ratio	17.6:1
Engine Type	In-line, 4-Cycle

Aspiration	Naturally aspirated
Length - mm (in)	861 (33.9)
Width - mm (in)	598 (23.5)
Height-- mm (in)	854 (33.6)
Weight, dry-- kg (lb)	387 (853)

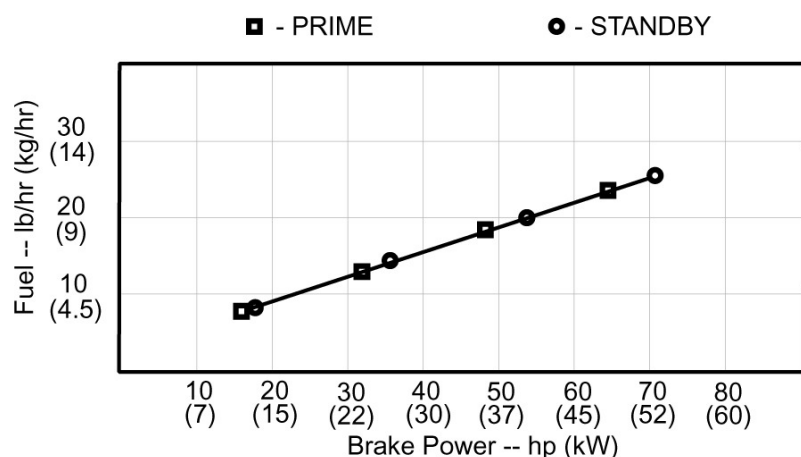
Performance data

Prime power at 60 Hz (1800 rpm)	48 kW (64 hp)
Standby power at 60 Hz (1800 rpm)	53 kW (71 hp)

The prime power gen-set engine rating is the nominal power an engine is capable of delivering with a variable load for an unlimited number of hours per year with normal maintenance intervals observed. This rating incorporates a 10% overload capability which is available for up to 2 hours at a time. Operating time between 100% and 110% of the prime power rating is not to exceed 8% of the total engine operating time. This rating conforms to ISO 8528-1 "prime power (PRP)". The permissible average power for the prime or PRP rating is not to exceed 70% of rated prime power when calculated per ISO 8528-1.

The standby gen-set engine rating is the nominal engine power available at varying load factors for up to 200 hours per year with normal maintenance intervals observed. No overload capability is available for this rating. This rating conforms to ISO 8528-1 "Emergency Standby Power (ESP)". The permissible average power for the standby or ESP rating is calculated per ISO 8528-1.

Performance curve



Performance data

Hz (rpm)	Generator efficiency %	Rated fan power		Power factor	Calculated generator set output			
		kW	hp		Prime		Standby	
					kWe	kVa	kWe	kVa
60 (1800)	88-92	2.6	3.5	0.8	40-42	50-52	44-46	55-58

Features and benefits

Dynamically Balanced Crankshaft

- Induction-hardened journals for long hours of reliable service
- Robust design to drive machinery from the front of the crankshaft
- Supported by five main bearings

Forged-steel Connecting Rods

- 45-degree connecting rod/cap-joint design allows the use of large connecting rod bearings for increased durability

Replaceable Wet-type Cylinder Liners

- Provide excellent heat dissipation
- Precision machined for long life
- Rebuild to original specifications

Smooth Operation

- Smooth vibration with full length engine balancers

Easy to Apply, Easy to Install

- Front and rear engine mounting pads on the side of the block facilitates installation
- Either side service for filters and service points
- All connection points in common locations make it easy to install or package

Compact Size

- Short length is ideal for both skid and packaged installations

World-class performance

- Excellent fuel economy and low oil consumption

Fuel System Controls

- Proven and Reliable Mechanical Governor
- 3-5% Droop Governing
- 12V or 24V Electric Shutoff

Emissions

- CARB & EPA Certified

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3801 W. Ridgeway Ave.
PO Box 5100
Waterloo, IA 50704-5100
Phone: 1-800-533-6446
Fax: 319.292.5075

John Deere Power Systems
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45401 Fleury les Aubrais Cedex
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Fax: 33.2.38.82.60.00

*All values at rated speed and power with standard options unless otherwise noted.
Specifications and design subject to change without notice.*



ENGINE PERFORMANCE CURVE

Rating: Gross Power
Application: Generator
1800 RPM (60 Hz)

POWERTECH 4.5L Engine
Model: **4045DF150**

64 hp (48 kW) Prime
71 hp (53 kW) Standby

[Option 1603 / 1673 / 1674]*

Nominal Engine Power @ 1800 RPM

Prime		Standby	
HP	kW	HP	kW
64	48	71	53

Generator Efficiency %	Fan Power		Power Factor	Prime Rating		Standby Rating ¹		4 sec Standby Block Load Capability
	hp	kW		kW	kVA	kW	kVA	
88-92	3.5	2.6	0.8	40-42	50-52	44-46	55-58	100%*

Note 1: Based on nominal engine power.*

Air Intake Restriction 12 in.H₂O (3 kPa)
Exhaust Back Pressure 30 in.H₂O (7.5 kPa)

Gross power guaranteed within + or - 5% at SAE J1995 and ISO 3046 conditions:

77 °F (25 °C) air inlet temperature
29.31 in.Hg (99 kPa) barometer
104 °F (40 °C) fuel inlet temperature
0.853 fuel specific gravity @ 60 °F (15.5 °C)

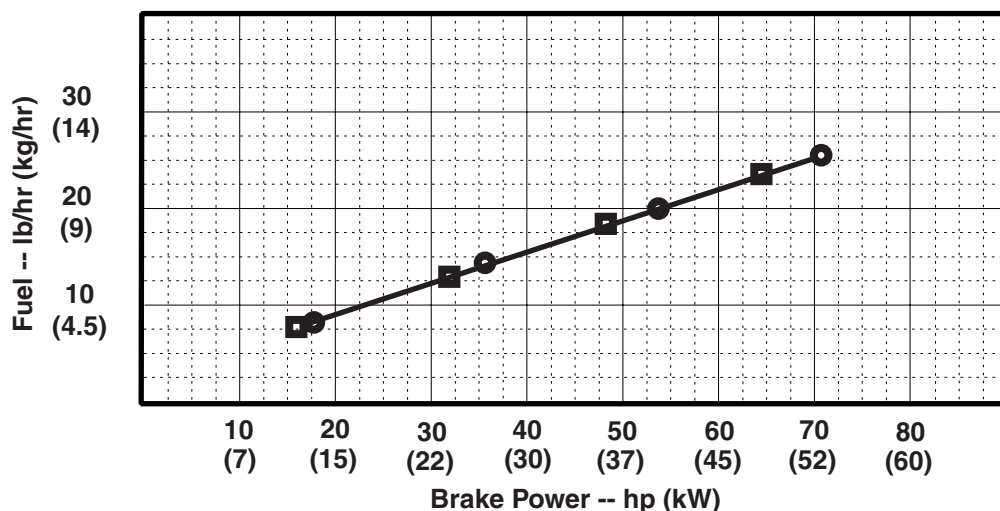
Conversion factors:

Power: kW = hp x 0.746
Fuel: 1 gal = 7.1 lb, 1 L = 0.85 kg
Torque: N•m = lb-ft x 1.356

All values are from currently available data and are subject to change without notice.

■ - PRIME

● - STANDBY



Notes:

All OEM Gen Set Engine Applications must be pre-screened for torsional vibration compatibility with the respective alternator end hardware.

*OEM Engine Application Engineering will perform this computer-based analysis work upon request. **

Emission Certifications:

Certified by:

CARB; EPA

Ref: Engine Emission Label

Kevin J. Bailey
31 May 1999

* Revised Data

Curve 4045DF180071 Sheet 1 of 2
June 1999

Engine Specification Data

General Data

Model	4045DF150
Number of Cylinders	4
Bore and Stroke--in.(mm).....	4.19 x5 (106 x 127)
Displacement--in. ³ (L)	276 (4.5)
Compression Ratio	17.6:1
Valves per Cylinder--Intake/Exhaust	1/1
Firing Order	1-3-4-2
Combustion System	Direct Injection
Engine Type	In-line, 4-Cycle
Aspiration	Natural
Engine Crankcase Vent System	Open
Maximum Crankcase Pressure--in.H ₂ O (kPa)	2 (0.5)

Physical Data

Length--in.(mm)	33.9 (861)
Width--in.(mm)	23.5 (598)
Height--in.(mm)	33.6 (854)
Weight, dry--lb (kg).....	851 (387)
(Includes flywheel housing, flywheel & electrics)	
Center of Gravity Location	
From Rear Face of Block (X-axis)--in.(mm).....	9.3 (235)
Right of Crankshaft (Y-axis)--in.(mm)	0.3 (7)
Above Crankshaft (Z-axis)--in.(mm)	5.7 (144)
Max. Allow. Static Bending Moment at Rear	
Face of Flywhl Hsg w/ 5-G Load--lb-ft (N•m)	600 (814)
Thrust Bearing Load Limit (Forward)	
Continuous--lb (N)	500 (2224)
Intermittent--lb (N).....	900 (4003)

Electrical System

Recommended Battery Capacity (CCA)	
12 Volt System--amp	640
24 Volt System--amp	570
Maximum Allowable Starting Circuit Resistance	
12 Volt System--Ohm.....	0.0012
24 Volt System--Ohm.....	0.002
Starter Rolling Current--12 Volt System	
At 32 °F (0 °C)--amp	780
At -22 °F (-30 °C)--amp	1000
Starter Rolling Current--24 Volt System	
At 32 °F (0 °C)--amp	600
At -22 °F (-30 °C)--amp	700

Air System

Prime Standby

Maximum Allowable Temp Rise--Ambient Air to	
Engine Inlet--°F (°C)	15 (8)
Maximum Air Intake Restriction	
Dirty Air Cleaner--in.H ₂ O (kPa)	25 (6.25) ... 25 (6.25)
Clean Air Cleaner--in.H ₂ O (kPa)	12 (3)
Engine Air Flow--ft ³ /min (m ³ /min)	107 (3) ... 117 (3.3)
Intake Manifold Pressure--psi (kPa)	Ambient ... Ambient
Recm'd Intake Pipe Dia--in.(mm).....	3 (76.2) 3 (76.2)

Exhaust System

Prime Standby

Exhaust Flow--ft ³ /min (m ³ /min).....	318 (9)
Exhaust Temperature--°F (°C)	1060 (571) 1103 (595)
Max. Allow. Back Press.--in.H ₂ O (kPa).30 (7.5)	30 (7.5)
Recm'd Exhaust Pipe Dia--in.(mm) ...	2.5 (63.5) .. 2.5 (63.5)

Cooling System

Prime Standby

Eng. Heat Rejection--BTU/min (kW) ..	1649 (29) .. 1820 (32)
Coolant Flow--gal/min (L/min).....	38 (144) 38 (144)
Thermostat Start to Open--°F (°C)	180 (82) 180 (82)
Thermostat Fully Open--°F (°C).....	202 (94) 202 (94)
Maximum Water Pump	
Inlet Restriction--in.H ₂ O (kPa)	27 (7)
Engine Coolant Capacity--qt (L)	9(8.5)
Recm'd Pressure Cap--psi (kPa)	10 (69)
Maximum Top Tank Temp--°F (°C)	221 (105) .. 221 (105)
Min. Coolant Fill Rate--gal/min (L/min) ...	3 (11)
Min. Air-to-Boil Temperature--°F (°C) ..	117 (47) 117 (47)

Fuel System

Prime Standby

Fuel Injection Pump	Stanadyne Stanadyne
Governor Regulation.....	5 %
Governor Type	MechanicalMechanical
Fuel Consumption--lb/hr (kg/hr).....	23.5(10.7) . 25.7(11.7)
Total Fuel Flow--lb/hr (kg/hr).....	212 (96) 212 (96)
Maximum Fuel Transfer Pump Suction--	
ft (m) fuel.....	3 (0.9)
Fuel Filter Micron Size @ 98 % Efficiency	8

Lubrication System

Prime Standby

Oil Pressure at Rated Speed--psi (kPa)50 (345) ...	50 (345)
Oil Pressure at Low Idle--psi (kPa)	15 (105) 15 (105)
In Pan Oil Temperature--°F (°C)	240 (115) .. 240 (115)
Oil Pan Capacity, High--qt (L)	8 (7.5)
Oil Pan Capacity, Low--qt (L)	7 (6.5)
Total Engine Oil Capacity	
With Filters--qt (L).....	9 (8.5)
Engine Angularity Limits (Continuous)	
Any Direction--degrees.....	20

Performance Data

Prime Standby

Rated Power--hp (kW)	64 (48)
Rated Speed--rpm	1800
Low Idle Speed--rpm	1400*
BMEP--psi (kPa)	103 (707) .. 113 (781)
Friction Power @ Rated Speed--hp (kW)17 (13).....	17 (13)
Altitude Capability--ft (m)	5000 (1525) 5000 (1525)
Ratio--Air : Fuel.....	19.5:1
Noise--dB(A) @ 1 m	94

Fuel Consumption -- lb/hr (kg/h)

Prime Standby

25 % Power	7.7 (3.5)
50 % Power	13 (5.9) 14.3(6.5)
75 % Power	18.3 (8.3)
100 % Power	23.5 (10.7) ... 25.7 (11.7)

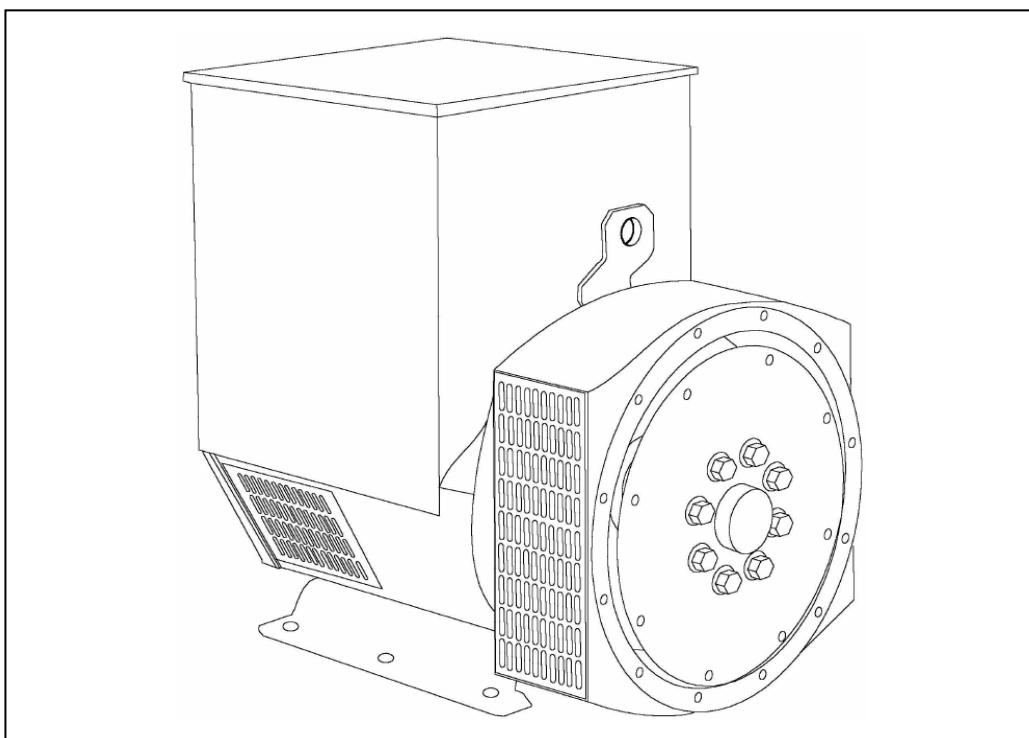
All values at rated speed and power with standard options unless otherwise noted.

* Revised Data

Curve 4045DF180071..... Sheet 2 of 2
June 1999

STAMFORD[®]

UCI224F - Technical Data Sheet



UCI224F

SPECIFICATIONS & OPTIONS

STAMFORD

STANDARDS

Newage 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%.

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.

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	0.065 Ohms PER PHASE AT 22°C SERIES STAR CONNECTED							
ROTOR WDG. RESISTANCE	0.83 Ohms at 22°C							
EXCITER STATOR RESISTANCE	20 Ohms at 22°C							
EXCITER ROTOR RESISTANCE	0.078 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. 6312-2RS (ISO)							
BEARING NON-DRIVE END	BALL. 6309-2RS (ISO)							
	1 BEARING				2 BEARING			
WEIGHT COMP. GENERATOR	337 kg				350 kg			
WEIGHT WOUND STATOR	120 kg				120 kg			
WEIGHT WOUND ROTOR	110.69 kg				102.32 kg			
WR ² INERTIA	0.6071 kgm ²				0.5754 kgm ²			
SHIPPING WEIGHTS in a crate	360 kg				371 kg			
PACKING CRATE SIZE	105 x 57 x 96(cm)				105 x 57 x 96(cm)			
	50 Hz				60 Hz			
TELEPHONE INTERFERENCE	THF<2%				TIF<50			
COOLING AIR	0.216 m ³ /sec 458 cfm				0.281 m ³ /sec 595 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	72.5	72.5	72.5	70	83.8	87.5	87.5	93.8
X _d DIR. AXIS SYNCHRONOUS	2.29	2.07	1.92	1.65	2.52	2.35	2.15	2.12
X' _d DIR. AXIS TRANSIENT	0.18	0.16	0.15	0.13	0.21	0.20	0.18	0.18
X'' _d DIR. AXIS SUBTRANSIENT	0.12	0.11	0.10	0.09	0.14	0.13	0.12	0.12
X _q QUAD. AXIS REACTANCE	1.05	0.95	0.88	0.76	1.16	1.08	0.99	0.98
X'' _q QUAD. AXIS SUBTRANSIENT	0.16	0.14	0.13	0.11	0.13	0.12	0.11	0.11
X _L LEAKAGE REACTANCE	0.07	0.06	0.06	0.05	0.08	0.07	0.07	0.07
X ₂ NEGATIVE SEQUENCE	0.14	0.13	0.12	0.10	0.13	0.12	0.11	0.11
X ₀ ZERO SEQUENCE	0.11	0.10	0.09	0.08	0.10	0.09	0.09	0.08
REACTANCES ARE SATURATED VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED								
T' _d TRANSIENT TIME CONST.	0.03 s							
T'' _d SUB-TRANSTIME CONST.	0.008 s							
T' _{do} O.C. FIELD TIME CONST.	0.75 s							
T _a ARMATURE TIME CONST.	0.0065 s							
SHORT CIRCUIT RATIO	1/X _d							

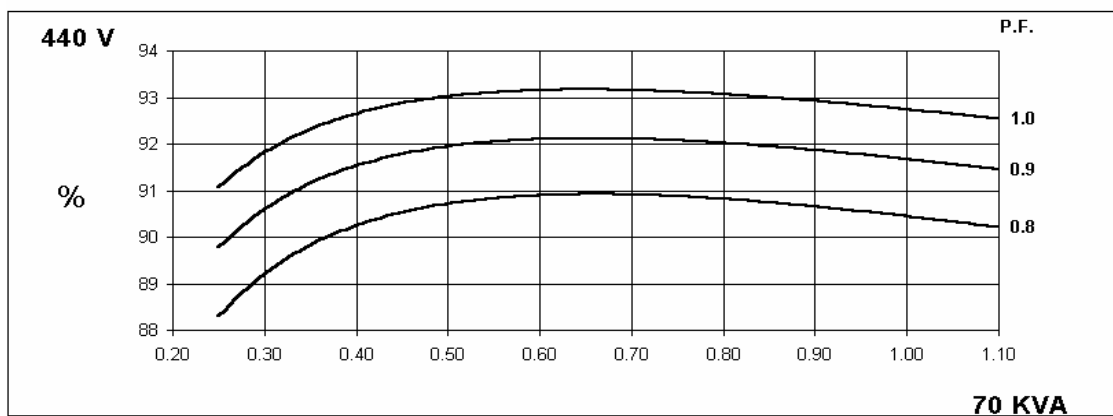
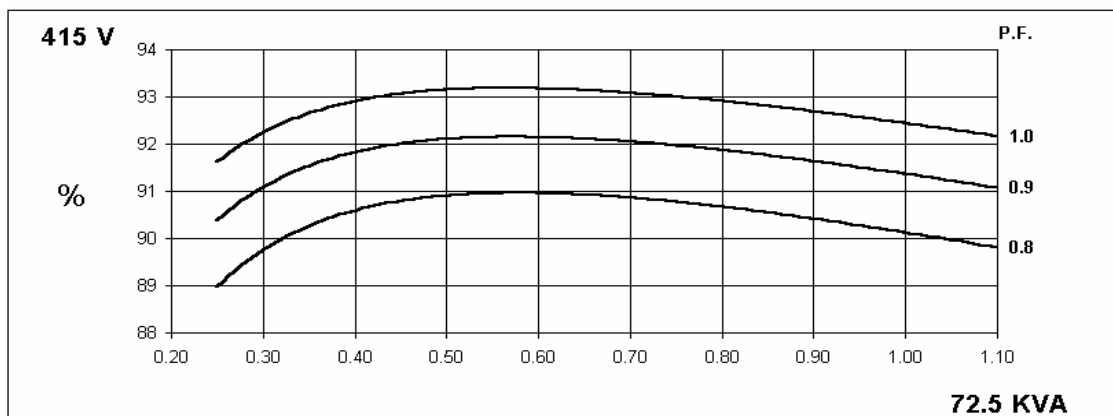
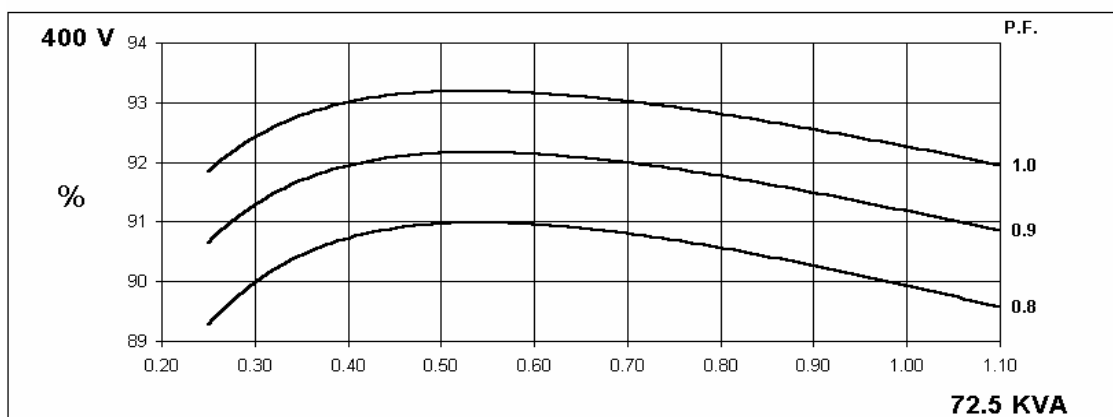
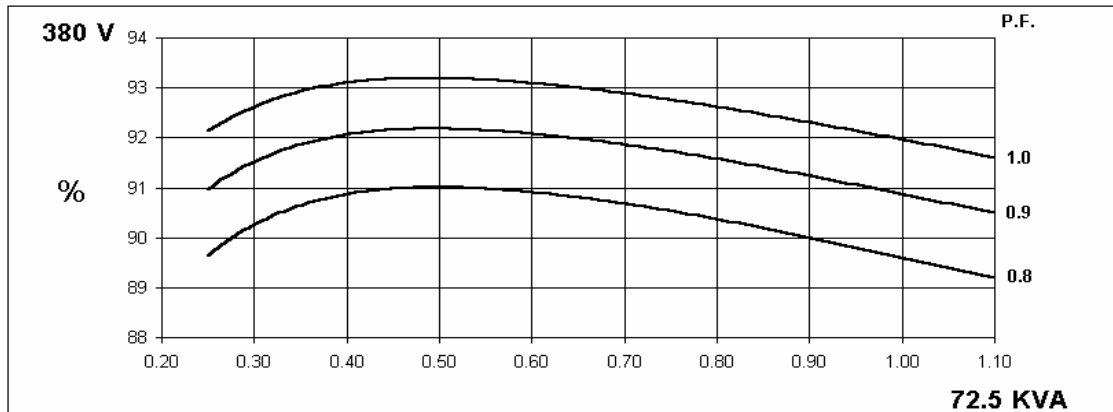
**50
Hz**

UCI224F

Winding 311

STAMFORD

THREE PHASE EFFICIENCY CURVES



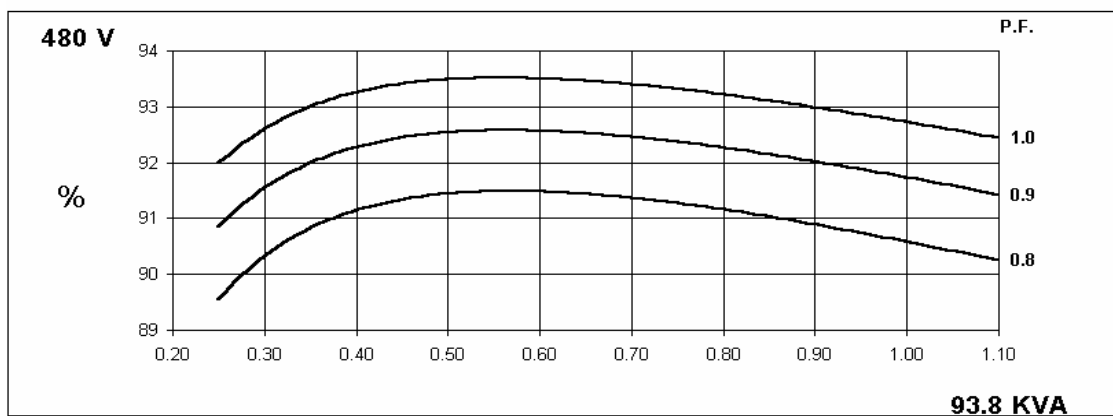
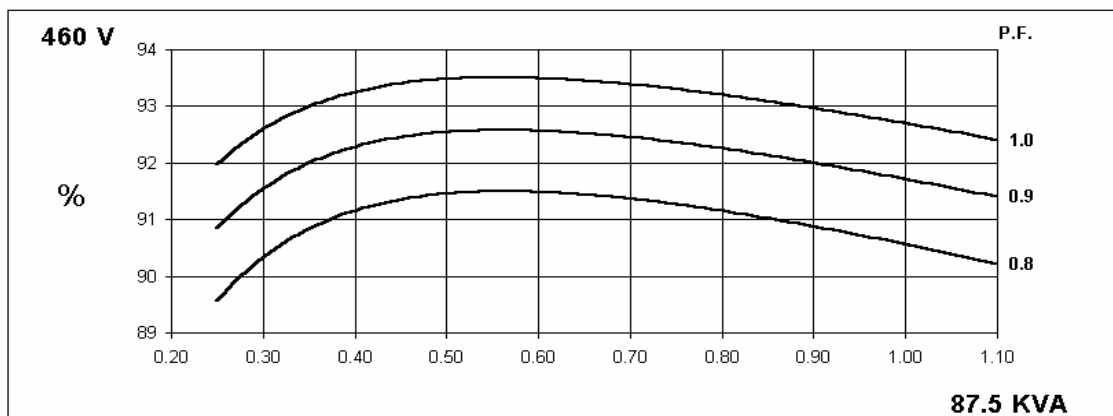
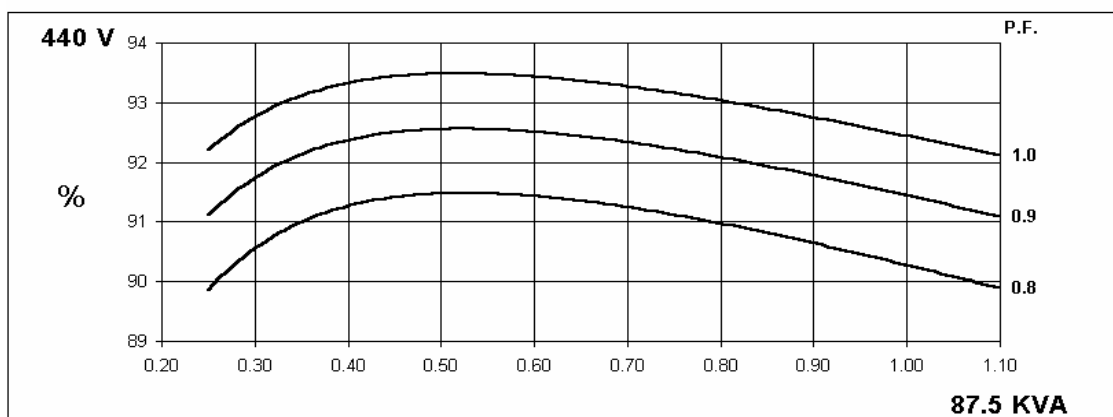
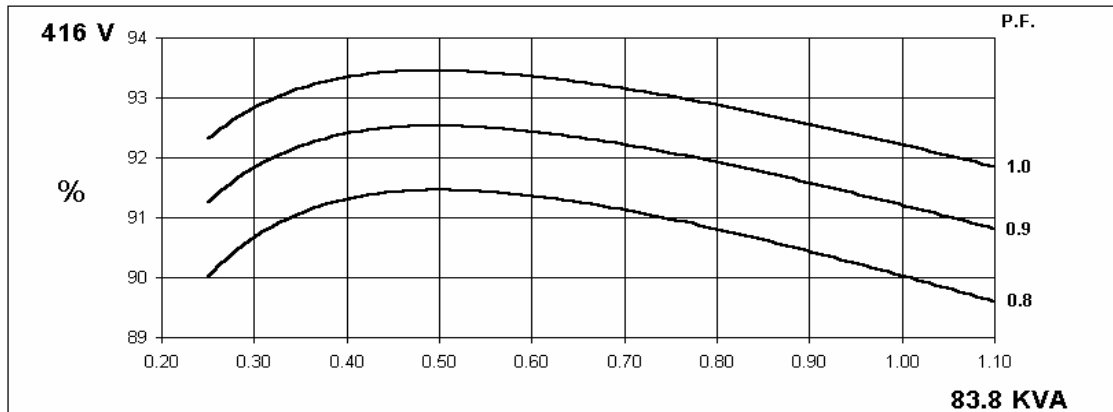
**60
Hz**

UCI224F

Winding 311

STAMFORD

THREE PHASE EFFICIENCY CURVES

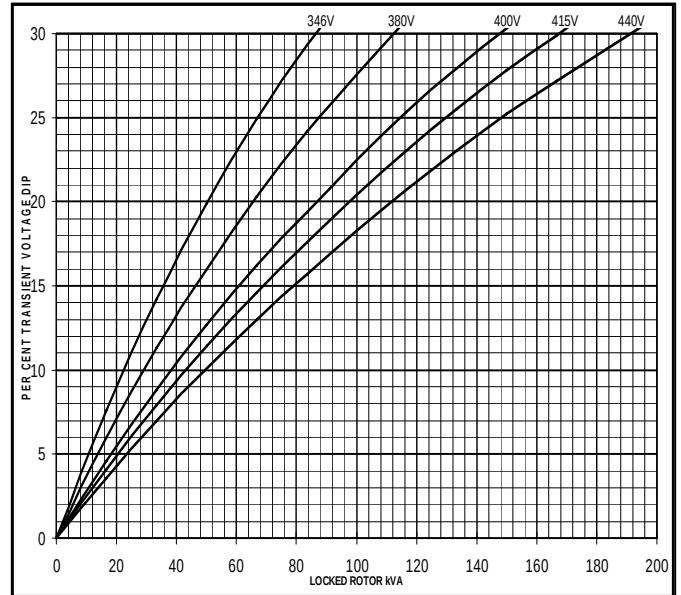
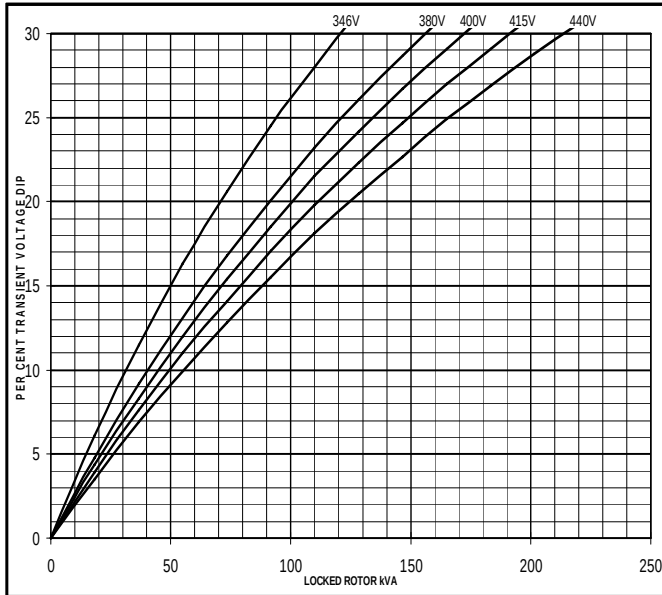


Locked Rotor Motor Starting Curve

50
Hz

MX

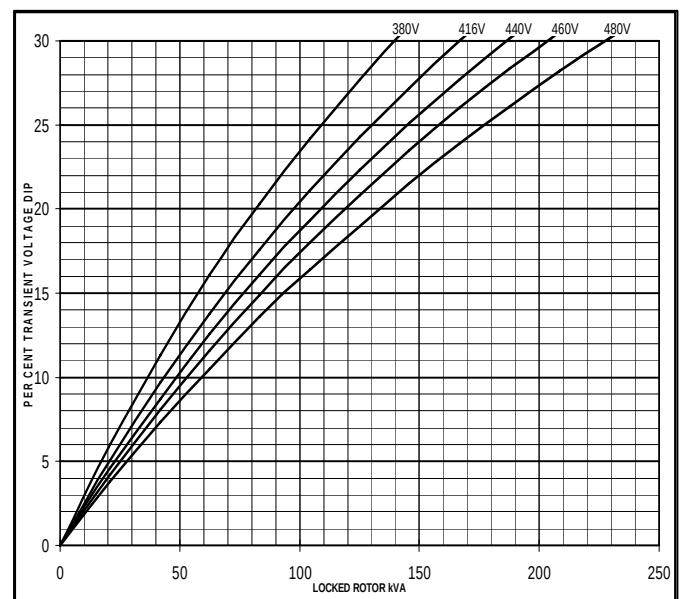
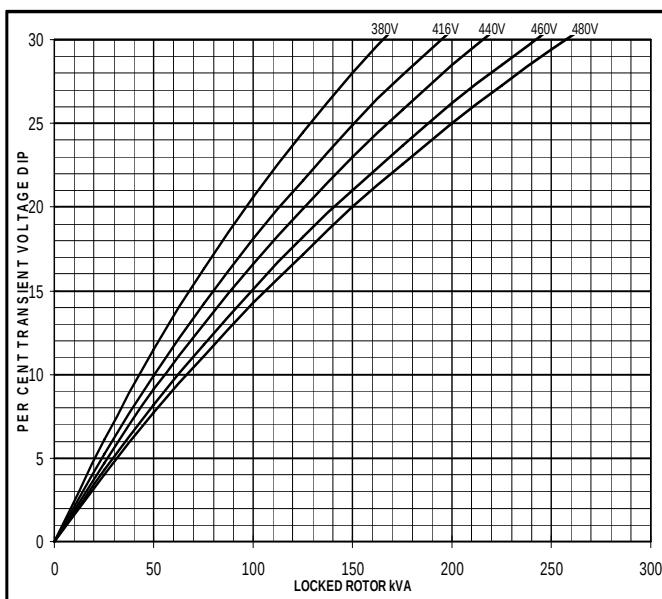
SX



60
Hz

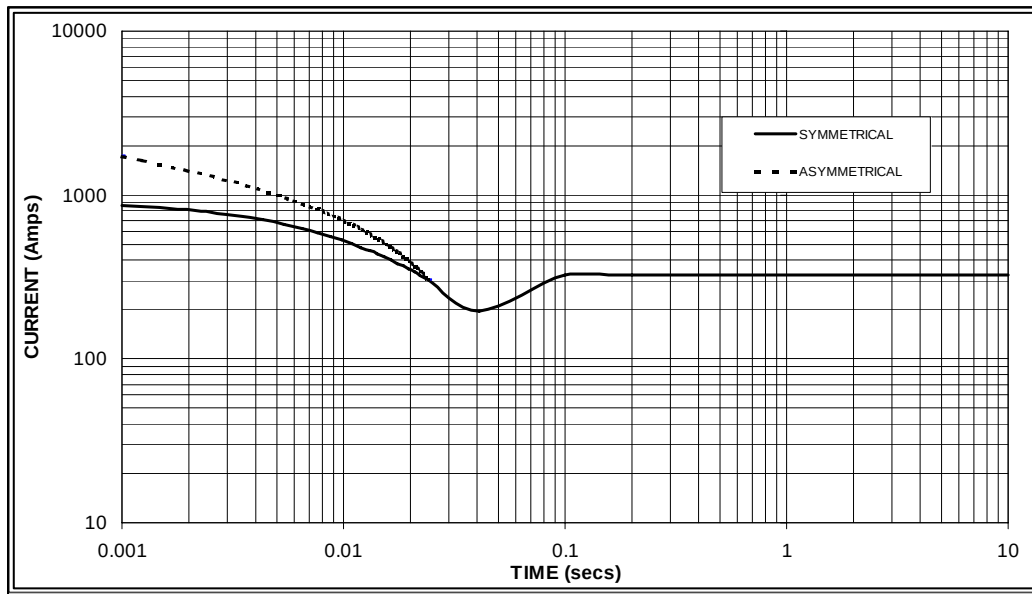
MX

SX



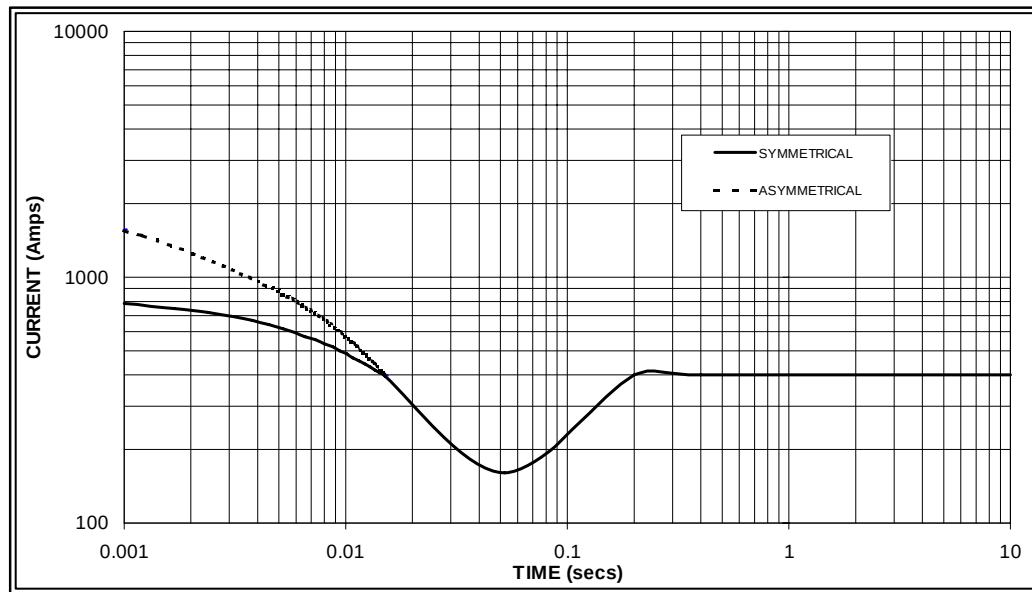
**Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed
Based on star (wye) connection.**

**50
Hz**



Sustained Short Circuit = 325 Amps

**60
Hz**



Sustained Short Circuit = 400 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
440v	X 1.18	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

Engine Specification Data

General Data

Model	4045DF150
Number of Cylinders	4
Bore and Stroke--in.(mm).....	4.19 x5 (106 x 127)
Displacement--in. ³ (L)	276 (4.5)
Compression Ratio	17.6:1
Valves per Cylinder--Intake/Exhaust	1/1
Firing Order	1-3-4-2
Combustion System	Direct Injection
Engine Type	In-line, 4-Cycle
Aspiration	Natural
Engine Crankcase Vent System	Open
Maximum Crankcase Pressure--in.H ₂ O (kPa)	2 (0.5)

Physical Data

Length--in.(mm)	33.9 (861)
Width--in.(mm)	23.5 (598)
Height--in.(mm)	33.6 (854)
Weight, dry--lb (kg).....	851 (387)
(Includes flywheel housing, flywheel & electrics)	
Center of Gravity Location	
From Rear Face of Block (X-axis)--in.(mm).....	9.3 (235)
Right of Crankshaft (Y-axis)--in.(mm)	0.3 (7)
Above Crankshaft (Z-axis)--in.(mm)	5.7 (144)
Max. Allow. Static Bending Moment at Rear	
Face of Flywhl Hsg w/ 5-G Load--lb-ft (N•m)	600 (814)
Thrust Bearing Load Limit (Forward)	
Continuous--lb (N)	500 (2224)
Intermittent--lb (N).....	900 (4003)

Electrical System

Recommended Battery Capacity (CCA)	
12 Volt System--amp	640
24 Volt System--amp	570
Maximum Allowable Starting Circuit Resistance	
12 Volt System--Ohm.....	0.0012
24 Volt System--Ohm.....	0.002
Starter Rolling Current--12 Volt System	
At 32 °F (0 °C)--amp	780
At -22 °F (-30 °C)--amp	1000
Starter Rolling Current--24 Volt System	
At 32 °F (0 °C)--amp	600
At -22 °F (-30 °C)--amp	700

Air System

Prime Standby

Maximum Allowable Temp Rise--Ambient Air to	
Engine Inlet--°F (°C)	15 (8)
Maximum Air Intake Restriction	
Dirty Air Cleaner--in.H ₂ O (kPa)	25 (6.25) ... 25 (6.25)
Clean Air Cleaner--in.H ₂ O (kPa)	12 (3)
Engine Air Flow--ft ³ /min (m ³ /min)	107 (3) ... 117 (3.3)
Intake Manifold Pressure--psi (kPa)	Ambient ... Ambient
Recm'd Intake Pipe Dia--in.(mm).....	3 (76.2) 3 (76.2)

Exhaust System

Prime Standby

Exhaust Flow--ft ³ /min (m ³ /min).....	318 (9)
Exhaust Temperature--°F (°C)	1060 (571) 1103 (595)
Max. Allow. Back Press.--in.H ₂ O (kPa).30 (7.5)	30 (7.5)
Recm'd Exhaust Pipe Dia--in.(mm) ...	2.5 (63.5) .. 2.5 (63.5)

Cooling System

Prime Standby

Eng. Heat Rejection--BTU/min (kW) ..	1649 (29) .. 1820 (32)
Coolant Flow--gal/min (L/min).....	38 (144) 38 (144)
Thermostat Start to Open--°F (°C)	180 (82) 180 (82)
Thermostat Fully Open--°F (°C).....	202 (94) 202 (94)
Maximum Water Pump	
Inlet Restriction--in.H ₂ O (kPa)	27 (7)
Engine Coolant Capacity--qt (L)	9(8.5)
Recm'd Pressure Cap--psi (kPa)	10 (69)
Maximum Top Tank Temp--°F (°C)	221 (105) .. 221 (105)
Min. Coolant Fill Rate--gal/min (L/min)	3 (11)
Min. Air-to-Boil Temperature--°F (°C) ..	117 (47) 117 (47)

Fuel System

Prime Standby

Fuel Injection Pump	Stanadyne Stanadyne
Governor Regulation.....	5 %
Governor Type	Mechanical Mechanical
Fuel Consumption--lb/hr (kg/hr).....	23.5(10.7) . 25.7(11.7)
Total Fuel Flow--lb/hr (kg/hr).....	212 (96) 212 (96)
Maximum Fuel Transfer Pump Suction--	
ft (m) fuel.....	3 (0.9)
Fuel Filter Micron Size @ 98 % Efficiency	8

Lubrication System

Prime Standby

Oil Pressure at Rated Speed--psi (kPa)50 (345) ...	50 (345)
Oil Pressure at Low Idle--psi (kPa)	15 (105) 15 (105)
In Pan Oil Temperature--°F (°C)	240 (115) .. 240 (115)
Oil Pan Capacity, High--qt (L)	8 (7.5)
Oil Pan Capacity, Low--qt (L)	7 (6.5)
Total Engine Oil Capacity	
With Filters--qt (L).....	9 (8.5)
Engine Angularity Limits (Continuous)	
Any Direction--degrees.....	20

Performance Data

Prime Standby

Rated Power--hp (kW)	64 (48)
Rated Speed--rpm	1800
Low Idle Speed--rpm	1400*
BMEP--psi (kPa)	103 (707) .. 113 (781)
Friction Power @ Rated Speed--hp (kW)17 (13).....	17 (13)
Altitude Capability--ft (m)	5000 (1525) 5000 (1525)
Ratio--Air : Fuel.....	19.5:1
Noise--dB(A) @ 1 m	94

Fuel Consumption -- lb/hr (kg/h)

Prime Standby

25 % Power	7.7 (3.5)
50 % Power	13 (5.9) 14.3(6.5)
75 % Power	18.3 (8.3)
100 % Power	23.5 (10.7) ... 25.7 (11.7)

All values at rated speed and power with standard options unless otherwise noted.

* Revised Data

Curve 4045DF180071..... Sheet 2 of 2
June 1999

Silencers - Cylindrical

Silencer Selection

Call Sillex for immediate assistance in selecting the appropriate silencer that best suits your application's acoustical and backpressure requirements or consult the silencer selection guide in our catalogue. You can also use Sillex's exclusive Silencer Sizing and Selection Program "Sillex Digital Engineer" found on the Company's secure website at www.sillex.com.

Application & Performance

The Critical Grade series are reactive silencers with good acoustical performance. All of the silencers are manufactured from light to heavy gauge steel and finished with high temperature paint. A drain is included as a standard component on the silencer.

Dimensions

Model	A	B In(mm)	C In(mm)	D In(mm)	F** In(mm)	G In(mm)	H In(mm)	Wgt. Lb(kg)
JB-1.5	1.5	9 (229)	24 (610)	30 (762)	4.0 (102)	7.5 (191)	27 (686)	21 (10)
JB-2	2	9 (229)	24 (610)	30 (762)	4.5 (114)	7.5 (191)	27 (686)	22 (10)
JB-2.5	2.5	10 (254)	28 (711)	34 (864)	5.0 (127)	8.0 (203)	31 (787)	31 (14)
JB-3	3	12 (305)	32 (813)	38 (660)	5.5 (140)	9.0 (229)	35 (889)	44 (20)
JB-3.5	3.5	14 (356)	36 (914)	42 (1067)	6.0 (152)	10.0 (254)	39 (991)	63 (29)
JB-4	4	14 (356)	40 (1016)	48 (1219)	6.0 (152)	11.0 (279)	44 (1118)	77 (35)
JB-5	5	16 (406)	49 (1245)	57 (1448)	7.0 (178)	12.0 (305)	53 (1346)	103 (47)
JB-6	6	18 (457)	55 (1397)	63 (1600)	8.0 (203)	13.0 (330)	59 (1499)	130 (59)
JB-8	8	22 (559)	68 (1727)	76 (1930)	9.5 (241)	15.0 (381)	72 (1829)	204 (93)
JB-10	10	26 (660)	81 (2057)	89 (2261)	11.5 (292)	17.0 (432)	85 (2159)	401 (182)
JB-12	12	30 (762)	94 (2388)	102 (2591)	13.0 (330)	19.0 (483)	98 (2489)	535 (243)
JB-14	14	36 (914)	99 (2515)	109 (2769)	15.5 (394)	23.0 (584)	104 (2642)	684 (310)
JB-16	16	40 (1016)	109 (2769)	119 (3023)	16.5 (419)	25.0 (635)	114 (2896)	1114 (505)
JB-18	18	45 (1143)	117 (2972)	127 (3226)	18.0 (457)	27.5 (699)	122 (3099)	1579 (716)
JB-20	20	50 (1270)	127 (3226)	137 (3480)	20.5 (521)	30.0 (762)	132 (3353)	2189 (993)
JB-22	22	54 (1372)	139 (3531)	149 (3785)	22.5 (572)	32.0 (813)	144 (3658)	2538 (1151)
JB-24	24	60 (1524)	152 (3861)	162 (4115)	24.0 (610)	35.0 (889)	157 (3988)	3116 (1413)
JB-26	26	64 (1626)	173 (4394)	183 (4648)	25.5 (648)	37.0 (940)	178 (4521)	3778 (1714)
JB-28	28	68 (1727)	190 (4826)	200 (5080)	26.5 (673)	39.0 (991)	195 (4953)	4342 (1970)
JB-30	30	72 (1829)	206 (5232)	216 (5486)	28.0 (711)	41.0 (1041)	211 (5359)	4946 (2244)

**For F dimension other than that specified, please contact Sillex.

Available in sizes up to 60" inlet

Options

- Aluminized steel, 304L or 316L stainless steel, Corten Steel
- Dual inlet or Custom inlet/outlet configurations
- Thermal insulation blankets to suit all configurations
- Mounting brackets, gussets and lifting lugs

Metric dimensions rounded to nearest mm.

Dimensions and weights are nominal and may vary slightly in production models.

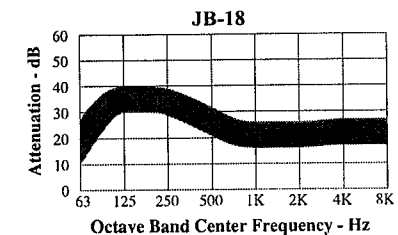
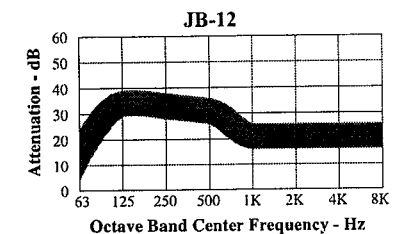
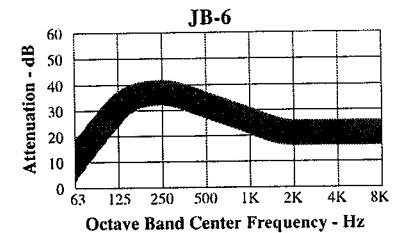
Sillex Innovations Inc.
Phone 905 612 4000
Fax 905 612 8999
www.sillex.com

The inlet and outlet on silencers up to 3½" are Sch. 40 NPT pipe. On silencers 4" and larger the inlet and discharge are flanged, manufactured from minimum ½" thick plate and drilled to ANSI class 150.

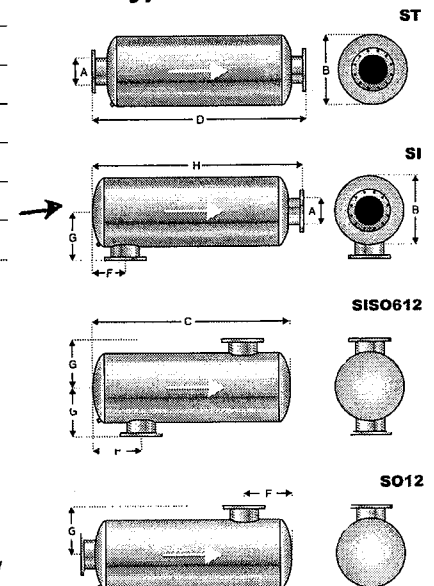
JB Series 25 - 32 dBA

Critical Grade

Typical Attenuation Curve



Typical Orientations



800 387 7818

Flexible Connectors

Look to Silex for standard and customized flexible connectors to cover all your needs.

Most engine installations require that all piping to and from the engine be supplied with flexible connectors to absorb the vibration. Manufactured from T321 stainless steel convoluted metal hose and your choice of connection ends, Silex flexible connectors maintain the life expectancy of your exhaust system and your equipment. For connectors that compensate for thermal growth or allow motion, please refer to our expansion joint page.

Features and Benefits

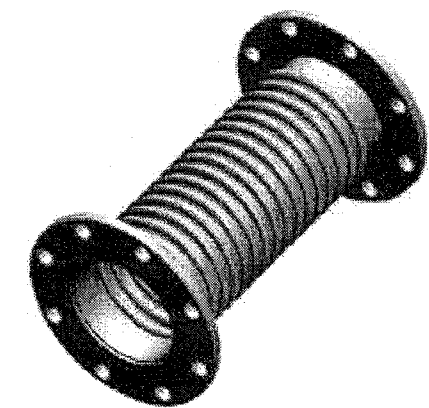
Silex offers both standard and custom connection ends to suit your specific application.

Engine specific flexible connectors are available for most OEMs including Caterpillar, Cummins, Kohler, Detroit Diesel, Mitsubishi, Generac.

Flexible connectors available with different size connector ends in an effort to eliminate the need for expanders when accommodating larger piping

Various lengths available to suit different applications. Standard length recommended by Silex is 18" OAL.

The result? The right flexible connector for your specific application. Tell us what you need and we can design a connector to fit. That's the Silex advantage.



Flexible Connectors

Features

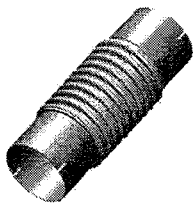
- T321 Stainless steel annular corrugated hose
- Braided hose also available for higher pressure ratings
- Various connector ends available to suit specific application
- Sizes 1 1/2" & up
- Designed up to 1500 degrees F for flexes up to 6".
Designed up to 1200 degrees F for flexes 8" and up.
- Stainless steel connector ends available upon request.

Benefits

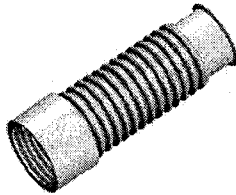
- Leakproof and pressure tight
- Vibration Control
- Can resolve misalignment problems if sized correctly.

Flex Connector Types

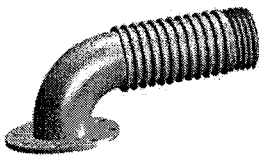
Here are a few examples of flex connectors manufactured by Silex



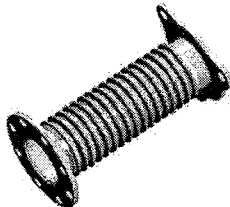
ID Slipon x ID Slipon (OO)



Flared Tube x Female Coupling (CJ)



Male NPT x Elbow 90 degree
w/Flange (NB)



ANSI Flange x OEM Specific
Flange (FF)

Connector Ends

- ANSI Flange 125/150#
- Male NPT
- Female Coupling (FNPT)
- Sch 40 Pipe
- I.D. Slipon
- O.D. Tubing
- OEM Specific Flanges/connectors
- Elbows
- Custom flanges

Call Us

For more information on our flex connectors - as well as our complete line of exhaust products, simply give us a call.



Silex Innovations Inc.
6659 Ordan Drive, Mississauga
Ontario L5T 1K6

Phone 905 612 4000

Fax 905 612 8999

Email info@silex.com

Web www.silex.com

800 387 7818

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Printed in Canada

Connectors

Flexible Connector

**OEM Specific -
Kohler**

Description

Most engine installations require that all piping to and from the engine be supplied with flexible connectors to absorb the vibration. Manufactured from T321 stainless steel convoluted metal hose and your choice of connection ends, Silex flexible connectors maintain the life expectancy of your exhaust system and your equipment.

Selection Guide

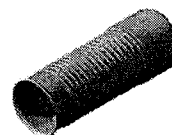
Contact a Silex sales representative for information on selecting the appropriate components to suit your specific application.

INNOVATIONS INC.

Flared Tube x Female NPT (CJ)

Engine	Generator	Part No.	Flared Tube Inlet	Female NPT Outlet	Wgt
3029TF150	20/ 30/ 40REOZJB	CJ-2.5-18-515*	2.50 (65)	2.5 (65)	4 (2)
3029DF120	20ROZJB	CJ-2.5-18-509	2.43 (62)	2.0 (51)	4 (2)
4045DF150/4039D	20REOZJ/ 20ROZJ/ 30REOZJ/ 30ROZJ	CJ-2.5-18-510	2.43 (62)	2.5 (65)	4 (2)
→ 4045DF150	40REOZJ	CJ-2.5-18-511	2.43 (62)	3.0 (76)	4 (2)
4045TF150/ 4039T	50REOZJB/ 50REOZJ/ 60REOZJB/ 60REOZJ/ 60ROZJ	CJ-4-18-513	3.86 (98)	3.0 (76)	5 (2)
4045TF150/ 6059T	80REOZJB/ 80ROZJ	CJ-4-18-514	3.86 (98)	3.5 (89)	6 (3)

*Complete with 90 degree elbow



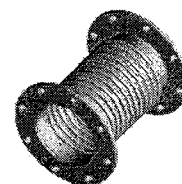
Flared Tube x ANSI Flange (FJ)

Engine	Generator	Part No.	Flared Tube Inlet	ANSI Flange Outlet	Wgt
6068TF150/ 6059T/ 6068TF250/ 6067T	80REOZJ/ 100REOZJ/ 100ROZJ/ 125ROZJ	FJ-4-18-518	3.86 (98)	4 (102)	11 (5)
6081TF001/ 6081AF001	135ROZJ/ 150ROZJ	FJ-4-18-519	3.86 (98)	5 (127)	13 (6)
6081AF001	180ROZJ/ 180REOZJB/ 200REOZJB/ 230REOZJB	FJ-4-18-520	3.86 (98)	6 (152)	15 (7)



Mitsubishi Flange x ANSI Floating Flange (FF)

Engine	Generator	Part No.	Mitsubishi Flange Inlet	ANSI Flange Outlet	Wgt
S6R-PTA	600ROZM	FF-8-18-600	8.11 (206)	10 (254)	44 (20)
S12H-PTA	900ROZM	FF-8-18-601	8.11 (206)	12 (305)	58 (26)
S12H-PTA	1000ROZM	FF-8-18-602	8.11 (206)	14 (356)	69 (31)



Standard length 18". Other lengths available upon request.

Finish high temperature black paint

ANSI Floating Flange, drilled to suit ANSI #150

Custom flex connectors available. Contact Silex for details.

Flex is not designed to absorb pipe growth.

Dimensions in Inches. Metric dimensions rounded to nearest mm. Weights in Lbs and Kgs.

Dimensions and weights are nominal and may vary slightly in production models.

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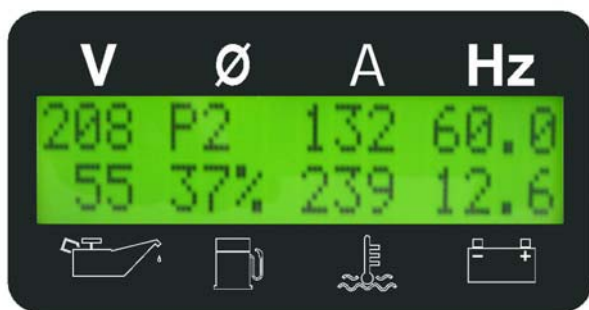
800 387 7818

DESCRIPTION

The GenMaster Plus™ series is a microprocessor-based digital generator controller providing complete monitoring, control, and protection for mechanical engines. The large, backlit display provides complete, easy-to-read engine and generator information on a full-time basis. The flexible product platform allows for customer specific features and functions. For 12 and 24VDC applications. Manual & auto start.

DISPLAY

Large 1"H x 4"W backlit display with ½" characters.



ALARMS & SHUTDOWNS

Engine and generator protection provided with easy-to-read display messages and indication lamps (red and yellow) for alarm and shutdown conditions. Standard shutdowns for low oil pressure, high engine temperature and over speed are complimented with other available shutdowns for emergency stop, low water level, low oil level and low fuel level.



ENCLOSURE

The standard enclosure is a 10"H x 14"W x 10" D powder coated steel enclosure. Other enclosure options are available.

SWITCHES

Three toggle switches are standard for Auto/Off/Run, Scroll Lock/Running Time and Speed Select (Run/Idle). Four membrane switch buttons are provided for accessing information and unit configuration. Additional options are available such as emergency stop or other customer specific buttons.

ACCESSORIES

For a complete installation, engine harnesses, extension harnesses and other accessories such as current transformers are available. In addition, components such as relays, fuses, connectors and communication modules can be installed at the factory per customer request.



SPECIFICATIONS

GENERAL

OPERATING VOLTAGE.....	7.5VDC to 36 VDC
MAXIMUM POWER CONSUMPTION.....	200mA
OPERATING TEMPERATURE.....	-20°C to +70°C
STORAGE TEMPERATURE.....	-30°C to +80°C
HUMIDITY.....	95% Non-condensing
REVERSE POLARITY PROTECTION.....	Yes
TRANSIENT VOLTAGE SUPPRESSION.....	Yes
DISPLAY.....	LCD, 1"H X 4"W, 2 lines x 16 characters/line
ENCLOSURE.....	Powder Coated Steel
OVERLAY/INTERFACE.....	Autotex Polyester
PANEL FUSE.....	10A
APPROX. WEIGHT.....	14.5 lbs
APPROX. DIMENSIONS.....	10"H x 14"W x 10"D

MECHANICAL ENGINE INPUTS

TEMPERATURE INPUT.....	Stewart Warner Scale 0-1000 Ohms
OIL PRESSURE INPUT.....	Stewart Warner Scale 33-240 Ohms
FUEL LEVEL INPUT.....	Stewart Warner Scale 33-240 Ohms
SPEED SENSOR INPUT.....	Magnetic Pickup or Alternator Tach Output

GENERATOR INPUTS

VOLTAGE INPUTS.....	(3) 0-600VAC
CURRENT TRANSFORMER INPUTS.....	(3) 5A
FREQUENCY INPUT.....	50Hz or 60Hz

DIGITAL INPUTS

EMERGENCY STOP (Normally Open).....	1
DIGITAL INPUTS (Normally Open).....	3
(Low Water Level, Low Oil Level, Low Fuel Level – Modified per customer request)	

OUTPUTS

RUN OUTPUT.....	10A Relay
CRANK OUTPUT.....	10A Relay
PRE ALARM OUTPUT.....	10A Relay
ALARM OUTPUT.....	10A Relay
REMOTE ANNUNCIATION COM PORT.....	Serial RS485

Extreme Cold Weather Option

OPERATING TEMPERATURE.....	-45°C to +85°C
STORAGE TEMPERATURE.....	-55°C to +95°C

OPTIONS

- Remote annunciator with duplicate display and start/stop
- Digital or analog inputs configured per customer request
- Interconnectivity to external communication systems & modules
- Extreme cold weather option

Powerpact J-frame Circuit Breakers
250 Ampere Frame at 240, 480 and 600 Vac, 3Ø
150–250 Amperes

Curve No. 50-8 Let-Through I^2t
and 50-9 Peak Let-Through Current I_p

