MID FLORIDA DIESEL

2215 HIGHWAY 60 EAST
BARTOW, FL. 33830
(863) 519-0107 FAX (863) 519-0109
WWW.MIDFLORIDADIESEL.COM

Bill of Material
For
Florida Sheriff Association
Item #127 - 500KW GENERATOR PACKAGE

Blue Star Power Systems MODEL: (Qty. - 1) VD500-01

GENERATOR: 500 kW, 625 kVA
VOLTAGE: 480 volt Three-Phase
Engine Model: Volvo TAD1641GE 500kW Standby Power Rating at 1800 RPM

Selected Model Features Included:

Isochronous Governor + / - .25%
UL2200
EPA Tier II Certified
130 Degree Temperature Rise

Voltage: 480/277V 3 PH

Gen Model: Marathon 572RSL4027 12 Lead Wired 480V 3 Phase High Wye 130°C Rise Over 27°C Ambient
Voltage Regulator: Marathon DVR2000E+ Digital Voltage Regulator with PMG Excitation

Control Panel: Blue Star DGC-2020 Microprocessor Based Gen-Set Controller
Mounted Facing Left from Generator End (Unless Specified Otherwise)
Standard Features: Low Oil Pressure, High Coolant Temp, Overspeed, Overcrank Shutdowns
Emergency Stop Pushbutton, Audible Alarm Buzzer with Silencing Switch
Optional Features Include: Generator Protection (Undervoltage, Overvoltage, Underfrequency, Overfrequency, Overcurrent)

Enclosure: Level 2 (Weather Proof Enclosure with Foam) Powder Coated .090 Aluminum
Rugged and Durable 150 MPH Wind Rated Enclosure
Pitched Roof for Increased Structural Integrity and Improved Watershed
Punched Intake with Baffle and Punched Exhaust Openings
Keyed Alike Lockable Doors with Draw Down Latches and Stainless Steel Component Hinges
Additional 1.5” Thick Polydamp Type D Acoustical Foam (PAF)
Structural Steel Base with Mounting and Lifting Holes
Includes Pad Type Vibration Mounts to Isolate Unit from Mounting Surface
Sound Attenuation Foam: Sound Attenuation Installed in Enclosure

Enclosure Options:
-Cooling: Unit Mounted Radiator (50°C Ambient)
-Coolant Drain Extension: Plumbed to Bulkhead Fitting in Base

-Oil Drain Extension: Plumbed to Bulkhead Fitting in Base

Mainline Breaker: 800 Amp 3 Pole 600 Volt Breaker Mounted & Wired in a NEMA 1 Enclosure

Jacket Water Heater: Engine Block Heater 5000W 240VAC Rated for -20°F
Heater Installed with Isolation Valves and Wired to Terminal

Air Cleaner: Dry Single Stage

Air Restrictor Indicator: Installed in Air Filtration System

Silencer: Critical Grade Compact (CPJ Series) Silencer Mounted to Engine

Battery: 24 Volt System with Rack and Cables

Battery Charger: 24 Volt 5 Amp Mounted and Wired to Terminal

Fuel Tank: 24 Hour / 900 Gallon UL 142 Listed Sub-Base Fuel Tank with Stub-up Area
Double Wall Construction with Secondary Containment Standard
Includes: Supply & Return Connections, Fuel Level Gauge, Fuel Leak Switch and Fill & Vent Plumbing

Factory Test: Standard Commercial Testing Includes:
Verification of Alarm Shutdowns, Voltage Settings, Block Loading to Rated kWe and PF

Owner's Manual: Print Copy (Qty 1) **Standard**
Warranty: 2 Year / 2000 Hour Limited

MISCELLANEOUS:

Certified Factory Test
Test Acceptance Run by Factory Trained Representative (Start Up)

BLUE STAR
Power Systems Inc.

Engineering Submittal

8/25-2020

Project Title	FSA-500KW Standby Spec# 117
Quote Number:	0023581-0
Model:	VD500-01

Mid Florida Diesel
Joe Antonini
2215 Hwy 60 East
Bartow FL 33830
Office: 863-519-0107
Cell: 863-944-0400
Email: joe@midfloridadiesel.com

BLUE STAR
Power Systems Inc.

Table of Contents

BLUE STAR
Power Systems Inc.

Quote Date:	**8/28/2019 0023581-0**
Quote Number:	**FSA-500KW Standby Spec# 117**
Project Title:	**Mid Florida Diesel**
Prepared for	

Unit Model	**VD500-01**	**Standby / Prime**	**Emergency Stationary Standby**
kWe Rating	**500 kWe**	**UL 2200 Listed**	**Yes**
Fuel	**Diesel**	**CSA Approved**	**Yes**
EPA	**Tier 2**	**Paint Color**	**White**

Engine Model:	Volvo TAD1641GE 500kW Standby Power Rating at 1800 RPM Governor - Electronic Isochronous
Voltage:	240/120V 3 PH
Gen Model:	Marathon 572RSL4029 12 Lead Wired 240V 3 Phase Delta 130°C Rise Over 27°C Ambient
Voltage Regulator:	Marathon DVR2000E+ Digital Voltage Regulator with PMG Excitation
Control Panel:	Blue Star DGC-2020 Microprocessor Based Gen-Set Controller Mounted Facing Left from Generator End (Unless Specified Otherwise) Standard Features: Low Oil Pressure, High Coolant Temp, Overspeed, Overcrank Shutdowns Emergency Stop Pushbutton, Audible Alarm Buzzer with Silencing Switch Optional Features Include: Generator Protection (Undervoltage, Overvoltage, Underfrequency, Overfrequency, Overcurrent)
Unit Color:	White
Enclosure:	Level 2 (Weather Proof Enclosure with Foam) Powder Coated .090 Aluminum Rugged and Durable 150 MPH Wind Rated Enclosure Pitched Roof for Increased Structural Integrity and Improved Watershed Punched Intake with Baffle and Punched Exhaust Openings Keyed Alike Lockable Doors with Draw Down Latches and Stainless Steel Component Hinges Additional 1.5” Thick Polydamp Type D Acoustical Foam (PAF) Structural Steel Base with Mounting and Lifting Holes Includes Pad Type Vibration Mounts to Isolate Unit from Mounting Surface
Sound Attenuation Foam:	Sound Attenuation Installed in Enclosure
Enclosure Options:	
Cooling:	Unit Mounted Radiator (50°C Ambient)
Coolant Drain Extension:	Plumbed to Bulkhead Fitting in Base
Oil Drain Extension:	Plumbed to Bulkhead Fitting in Base
Mainline Breaker:	1500 Amp 100% Rated 3 Pole 600 Volt Breaker Mounted & Wired in a NEMA 1 Enclosure
Jacket Water Heater:	Engine Block Heater 5000W 240VAC Rated for -20°F Heater Installed with Isolation Valves and Wired to Terminal
Air Cleaner:	Dry Single Stage
Air Restrictor Indicator:	Installed in Air Filtration System
Silencer:	Critical Grade Compact (CPJ Series) Silencer Mounted to Engine
Battery:	24 Volt System with Rack and Cables
Battery Charger:	24 Volt 5 Amp Mounted and Wired to Terminal

Fuel Tank:	24 Hour / 900 Gallon UL 142 Listed Sub-Base Fuel Tank with Stub-up Area Double Wall Construction with Secondary Containment Standard Includes: Supply & Return Connections, Fuel Level Gauge, Fuel Leak Switch and Fill & Vent Plumbing
Factory Test:	Standard Commercial Testing Includes: Verification of Alarm Shutdowns, Voltage Settings, Block Loading to Rated kWe and PF
Owner's Manual:	Print Copy (Qty 1) **Standard**
Warranty:	2 Year / 2000 Hour Limited

Notes:

Fl. Derm-Includes the cost for a Alarm Panel

BLUE STAR
Power Systems Inc.

Diesel Product Line

208-600 Volt

VD500-01

60 Hz / 1800 RPM

500 kWe / 460 kWe

Standby / Prime

Ratings

	208V	240V	480V	600V
Phase	3	3	3	3
PF	0.8	0.8	0.8	0.8
Hz	60	60	60	60
Generator Model	572RSL4029	572RSL4029	572RSL4027	572RSL4270
Connection	12 LEAD WYE	12 LEAD DELTA	12 LEAD WYE	4 LEAD WYE
Standby				
kWe	500	500	500	500
AMPS	1737	1505	753	602
Temp Rise	130˚C / 27˚C	130˚C / 27˚C	130˚C / 27˚C	130˚C / 27˚C
Prime [Only Available For Mobile Applications]				
kWe	460	460	460	460
AMPS	1598	1385	692	554
Temp Rise	105˚C / 40˚C	105˚C / 40˚C	105˚C / 40˚C	105˚C / 40˚C

Standard Equipment

Engine
- Radiator Cooled Unit Mounted (55˚C)
- Blower Fan & Fan Drive
- Starter & Alternator
- Oil Pump & Filter
- Oil Drain Extension w/Valve
- Governor - Electronic Isochronous
- 24V Battery System & Cables
- Air Cleaner (Dry Single Stage)
- Flexible Fuel Connector
- EPA Certified Tier 2

Listing Certifications
- UL 2200 Listed
- cUL Listed
- CSA Certified
- Seismic Certified to IBC 2012

Generator
- Brushless Single Bearing
- Automatic Voltage Regulator
- ± .25% Voltage Regulation
- 4 Pole, Rotating Field
- 130˚C Standby Temperature Rise
- 105˚C Prime Temperature Rise
- 100% of Rated Load - One Step
- 5% Maximum Harmonic Content
- NEMA MG 1, IEEE and ANSI Standards Compliance for Temperature Rise

Additional
- Microprocessor Based Digital Control
- Interface Connection Box
- Control Panel Mounted in NEMA 12 Enclosure
- Base - Structural Steel
- Main Line Circuit Breaker Mounted & Wired
- Critical Grade Silencer Mounted
- Battery Charger 24V 5 Amp
- Jacket Water Heater -20˚F 5000W 240V w/Isolation Valves
- Vibration Isolation Mounts Pad Type
- Radiator Duct Flange (OPU Only)
- Single Source Supplier
- 2YR / 2000HR Standby Warranty
- 1YR / 1500HR Prime Warranty
- Standard Colors - White / Tan / Gray

Diesel Product Line

500 kWe / 460 kWe

BLUE STAR Power Systems Inc.

Application Data

Engine			
Manufacturer:	Volvo Penta	Displacement - Cu. In. (lit):	984 (16.1)
Model:	TAD1641GE	Bore - in. (cm) x Stroke - in. (cm):	5.70 (14.4) x 6.50 (16.5)
Type:	4-Cycle	Compression Ratio:	16.5:1
Aspiration:	Turbo Charged, CAC	Rated RPM:	1800
Cylinder Arrangement:	6 Cylinder Inline	Max HP Stby (kWm):	768 (573)

Exhaust System	Standby	Prime
Gas Temp. (Stack): °F (°C)	893 (478)	817 (436)
Gas Volume at Stack Temp: CFM (m³/min)	3,899 (110)	3,553 (101)
Maximum Allowable Exhaust Restriction: in. H_2O (kPa)	40.2 (10.0)	40.2 (10.0)
Cooling System		
Ambient Capacity of Radiator: °F (°C)	131 (55.0)	131 (55.0)
Maximum Allowable Static Pressure on Rad. Exhaust: in. H_2O (kPa)	0.50 (0.12)	0.50 (0.12)
Water Pump Flow Rate: GPM (lit/min)	122 (462)	122 (462)
Heat Rejection to Coolant: BTUM (kW)	13,137 (230)	12,056 (211)
Heat Rejection to CAC: BTUM (kW)	7,109 (125)	6,483 (114)
Heat Radiated to Ambient: BTUM (kW)	3,700 (64.8)	3,404 (59.6)
Air Requirements		
Aspirating: CFM (m³/min)	1,617 (45.8)	1,554 (44.0)
Air Flow Required for Rad. Cooled Unit: CFM (m³/min)	21,120 (598)	21,120 (598)
Air Flow Required for Heat Exchanger/Rem. Rad. CFM (m³/min)	Consult Factory For Remote Cooled Applications	
Fuel Consumption		
At 100% of Power Rating: gal/hr (lit/hr)	36.8 (139.3)	32.2 (121.9)
At 75% of Power Rating: gal/hr (lit/hr)	26.8 (101.4)	23.7 (89.6)
At 50% of Power Rating: gal/hr (lit/hr)	18.0 (68.1)	16.0 (60.6)
Fluids Capacity		
Total Oil System: gal (lit)	12.7 (48.1)	12.7 (48.1)
Engine Jacket Water Capacity: gal (lit)	8.70 (33.0)	8.70 (33.0)
System Coolant Capacity: gal (lit)	16.0 (60.6)	16.0 (60.6)

Deration Factors

Rated Power is available up to 4,920 ft (1,500 m) at ambient temperatures to 122˚F (50˚C).
Consult factory for site conditions above these parameters.

Diesel Product Line

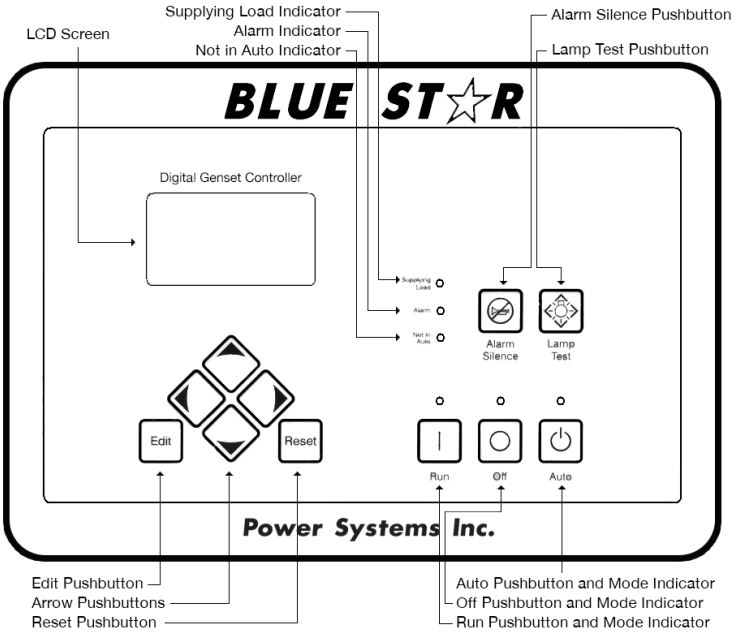
500 kWe / 460 kWe

BLUE STAR Power Systems Inc.

DGC-2020 Control Panel

Standard Features

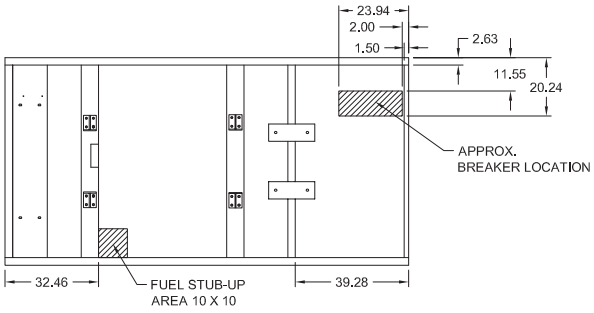
- Digital Metering
- Engine Parameters
- Generator Protection Functions
- Engine Protection
- CAN Bus ECU Communications
- Windows-Based Software
- Multilingual Capability
- Remote Communications to RDP-110 Remote Annunciator
- 16 Programmable Contact Inputs
- Up to 15 Contact Outputs (7 standard)
- UL Recognized, CSA Certified, CE Approved
- Event Recording
- IP 54 Front Panel Rating with Integrated Gasket
- NFPA 110 Level 1 Compatible

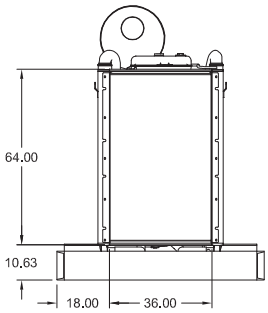


Weights / Dimensions / Sound Data

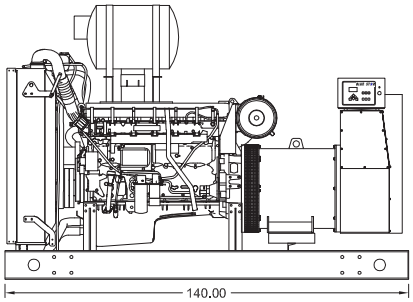
	L x W x H	Weight lbs
OPU	140 x 72 x 98 in	9,425
Level 1	180 x 72 x 103 in	11,075
Level 2	180 x 72 x 103 in	11,175
Level 3	225 x 72 x 103 in	11,575

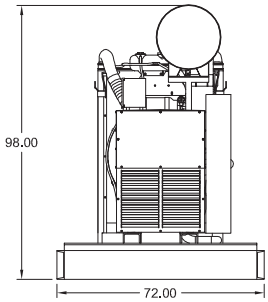
Please allow 6-12 inches for height of exhaust stack.





	No Load	Full Load
OPU	91 dBA	94 dBA
Level 1	86 dBA	89 dBA
Level 2	81 dBA	83 dBA
Level 3	73 dBA	75 dBA





Drawings based on standard open power 480 volt standby generator. Lengths may vary with other voltages. Subject to change without notice.
Sound data as measured at 23 feet (7 meters) in accordance with ISO 8528-10 at standby rating.

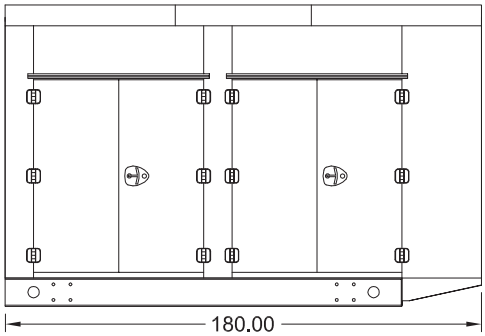
Diesel Product Line

500 kWe / 460 kWe

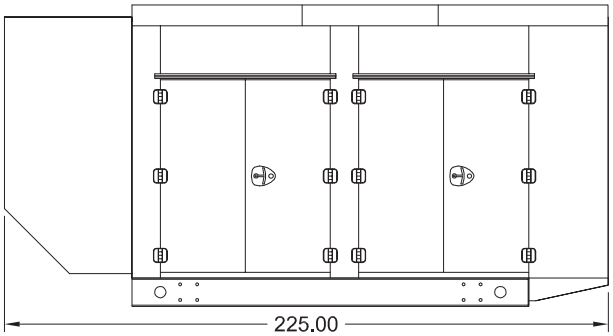
BLUE STAR Power Systems Inc.

Enclosures

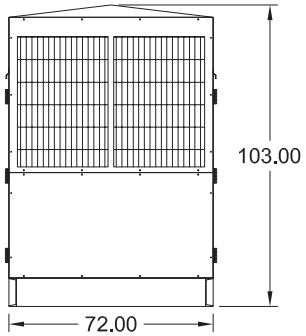
Level 1 & 2 | Side View (Weather Proof)



Level 3 | Side View (Sound Attenuated)

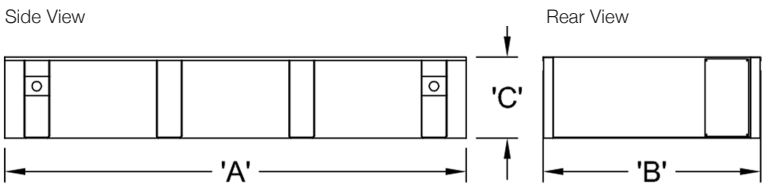


Level 1, 2 & 3 | Intake View



All enclosures are 150 MPH Wind Rated.
Level 2 & 3 enclosures include sound attenuation foam.
Level 3 enclosure includes frontal sound & exhaust hood.
*Enclosure height does not include exhaust stack.

Double Wall UL 142 Listed Fuel Tanks



	24 Hour 900 Gallon	48 Hour 1800 Gallon	72 Hour 2700 Gallon
A	140.00	216.00	312.00
B	72.00	72.00	72.00
C	32.00	36.00	36.00

All specification sheet dimensions are represented in inches.
All enclosures and fuel tanks are based on the standard standby unit configuration. Any deviation can change dimensions.
Materials and specifications subject to change without notice.

American Owned

American Made

Distributed By:

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Lake Crystal, Minnesota 56055
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General

In-line four stroke diesel engine with direct injection. Rotation direction, anti-clockwise viewed towards flywheel.
Turbocharged

Number of cylinders			6
Displacement, total		litre in^3	16,12 983,7
Firing order			1-5-3-6-2-4
Bore		mm in	144 5,67
Stroke		mm in	165 6,50
Compression ratio			16,5:1
Dry weight	Engine only, excluding cooling system	kg lb	1480 3263
	GenPac	kg lb	1910 4211
Wet weight	Engine only, excluding cooling system	kg lb	1550 3417
	GenPac	kg lb	2020 4453

Performance		**r/min**	**1500**	**1800**
Prime Power	without fan	kW hp	441 600	504 685
	with fan	kW hp	430 585	485 660
Standby Power	without fan	kW hp	484 658	565 768
	with fan	kW hp	473 643	546 743
Torque at:	Prime Power	Nm lbft	2807 2071	2674 1972
	Standby Power	Nm lbft	3081 2272	2997 2211
Mean piston speed		m/s ft/sec	8,3 27,1	9,9 32,6
Effective mean pressure at:	Prime Power	MPa psi	2,2 317	2,1 302
Effective mean pressure at:	Standby Power	MPa psi	2,4 348	2,3 339
Max combustion pressure at:	Prime Power	MPa psi	16,4 2379	17,1 2480
Max combustion pressure at:	Standby Power	MPa psi	17,5 2538	18,2 2640
Total mass moment of inertia, J (mR2)		kgm^2 $lbft^2$	4,20 99,7	
Degree of irregularity at:	Prime Power		1:50	1:88
Friction Power		kW hp	36 48,96	53 72,08

Derating

The engine may be operated up to 1500 m altitude without derating .
For operation at higher altitudes the power will be derated according to the graph below.
There is no derating for ambient temperature or humidity.

Engine noise emission

Test Standards: ISO 3744-1981 (E) sound power (with fan & radiator, without intake and exhaust noise)

Tolerans ± 0.75 dB(A)		**r/min**	**1500**	**1800**
Measured sound power Lw	No load	dB(A)	113,1	116,9
	Prime Power	dB(A)	116,9	119
	Standby Power	dB(A)	116,9	119,4
Calculated sound pressure Lp at 1 m	No load	dB(A)	101,1	104,9
	Prime Power	dB(A)	104,9	107
	Standby Power	dB(A)	104,9	107,4

Unsilenced exhaust noise

Data calculated as sound pressure Lp. (Without fan & radiator)

Assumed microphone distance 1 m	**r/min**	**1500**	**1800**
Prime Power	dB(A)	115	119
Standby Power	dB(A)	116	120

Test conditions for load acceptance data

Warm engine.	Generator	Modell	Type of AVR
	Stamford	HCI 544 E1	SX 440

Load acceptance performance can vary due to actual alternator inertia, voltage regulator, type of load and local ambient conditions. UFRO: STD-setting 47 / 57 Hz.

Single step load performance at 1500 rpm

Load (%)	Speed diff (%)		Recovery time (s)		Remaining load	Speed diff (%)		Recovery time (s)	
	Prime	Standby	Prime	Standby	(%)	Prime	Standby	Prime	Standby
0-20	2,4	2,6	1,3	1,2	20-100	24,1	28,9	4,7	7,8
0-40	4,0	4,1	1,3	1,3	40-100	12,6	14,2	3,4	4,5
0-54		10,0		2,5	54-100		8,3		3,0
0-59	10,0		2,5		59-100	7,5		2,8	
0-60	11,0	15,3	2,6	3,0	60-100	6,0	6,4	1,7	2,0
0-80	19,3	28,7	3,2	4,6	80-100	2,3	2,2	1,3	2,0
0-100	36,6	42,8	5,3	7,3					
100-0	9,3	10,3	2,5	2,5					

Single step load performance at 1800 rpm

Load (%)	Speed diff %		Recovery time (s)		Remaining load	Speed diff (%)		Recovery time (s)	
	Prime	Standby	Prime	Standby	(%)	Prime	Standby	Prime	Standby
0-20	1,5	1,7	1,3	1,4	20-100	11,3	10,9	3,5	3,5
0-40	2,8	3,1	1,7	1,6	40-100	4,7	6,0	1,9	3,0
0-60	5,7	7,2	2,3	2,2	60-100	2,7	2,9	1,8	3,0
0-67		10,0		2,9	67-100		7,7		2,9
0-76	10,0		2,9		76-100	2,0		1,5	
0-80	11,0	15,3	2,9	3,7	80-100	1,6	1,7	1,3	1,4
0-100	19,7	23,7	4,0	4,0					
100-0	5,5	6,6	1,0	1,3					

Cold start performance			**r/min**	**1500**	**1800**
Time from start to stay within 0.5% of no load speed at ambient temperature:	°C	20	s	6,5	8,4
		5	s	6,7	8,7
		-15*	s	7,3	9,8
Time from start to stay within 0.8% of no load speed at ambient temperature:	°C	20	s	5,6	7,5
		5	s	6,2	8,2
		-15*	s	6,7	9,2

* With manifold heater kW engaged, lubrication oil 10W/30, block heater and MK1 fuel.

Usage of manifold heater:	Time preheating, minutes	Time postheating, minutes
	0,5	1,7

Ambient temp. °C	Block heater type and Make	Power kW	Engaged hours	Cooling water temp engine block, °C
-15	External Volvo	2	12	17

Lubrication system			**r/min**	**1500**	**1800**
Lubricating oil consumption	Prime Power		liter/h	0,10	0,11
			US gal/h	0,026	0,029
	Standby Power		liter/h	0,10	0,12
			US gal/h	0,026	0,032
Oil system capacity including filters			liter	48	
			US gal	12,7	
Oil sump capacity:		max	liter	42	
			US gal	11,1	
		min	liter	32	
			US gal	8,5	
Oil change intervals/specifications:	VDS-2*		h	600	
	VDS, ACEA, E3*		h	400	
	ACEA E2, API CD, CF, CF-4, CG-4*		h	200	
Engine angularity limits:		front up	°	30	
		front down	°	30	
		side tilt	°	30	
Oil pressure at rated speed			kPa	300 - 650	
			psi	44 - 94	
Lubrication oil temperature in oil sump:		max	°C	130	
			°F	266	
Oil filter micron size			mm	0,040	

* See also general section in the sales guide

Fuel system		**r/min**	**1500**	**1800**
Prime Power	25%	g/kWh	216	228
Specific fuel consumption at:		lb/hph	0,350	0,369
	50%	g/kWh	199	204
		lb/hph	0,322	0,331
	75%	g/kWh	196	202
		lb/hph	0,318	0,328
	100%	g/kWh	199	206
		lb/hph	0,322	0,334
Standby Power	25%	g/kWh	217	233
Specific fuel consumption at:		lb/hph	0,351	0,377
	50%	g/kWh	197	205
		lb/hph	0,320	0,332
	75%	g/kWh	196	203
		lb/hph	0,318	0,330
	100%	g/kWh	200	210
		lb/hph	0,324	0,340

Fuel system	r/min	1500	1800
Fuel to conform to	ASTM-D975-No1 and 2-D JIS KK 2204, EN 590		
System return flow	liter/h	25	
	US gal/h	6,6	
System supply flow at rated speed	liter/h	170	190
	US gal/h	45	50
Fuel supply line max restriction	kPa	10	
	psi	1	
Fuel supply line max pressure, engine stopped	kPa	0,0	
	psi	0,0	
Fuel return line max restriction	kPa	20,0	
	psi	2,9	
Maximum allowable inlet fuel temp	°C	60	
	°F	140	
Prefilter / Water separator	mm	0,010	
Governor type/make, standard	Volvo / EMS 2		
Injection pump type/make	Delphi / E1		

Intake and exhaust system			r/min	1500	1800
Air consumption at:	Prime Power	25°C	m^3/min	35,5	44
		77°F	cfm	1254	1554
	Standby Power	25°C	m^3/min	38	45,8
		77°F	cfm	1342	1617
Air intake restriction, clean filter(s)			kPa	1,2	2
			in wc	4,8	8,0
Max allowable air intake restriction			kPa	5	5
			in wc	20,1	20,1
Air filter type			Single stage paper cartridge		
Air filter cleaning efficiency			%	99,85	
Heat rejection to exhaust at:		Prime Power	kW	326	373
			BTU/min	18539	21212
		Standby Power	kW	356	442
			BTU/min	20245	25136
Exhaust gas temperature after turbine at:		Prime Power	°C	443	436
			°F	829	817
		Standby Power	°C	455	479
			°F	851	893
Max allowable back pressure in exhaust line			kPa	10	10
			In wc	40,2	40,2
Exhaust gas flow at:		Prime Power	m^3/min	85,0	100,6
			cfm	3002	3553
		Standby Power	m^3/min	92,0	110,4
			cfm	3249	3899

Cooling system		r/min	1500	1800
Heat rejection radiation from engine at:	Prime Power	kW	18	22
		BTU/min	1024	1251
	Standby Power	kW	20	24
		BTU/min	1137	1365
Heat rejection to coolant at:	Prime Power	kW	170	212
		BTU/min	9668	12056
	Standby Power	kW	184	231
		BTU/min	10464	13137
Radiator cooling system type			Closed circuit	
Standard radiator core area		m²	1,32	
		foot²	14,21	
Standard radiator core thickness		mm	52	
		in	2,05	
Fan diameter		mm	890	
		in	35,04	
Fan power consumption		kW	11	19
		hp	15	26
Fan drive ratio			1,04 : 1	
Coolant capacity,	engine	liter	33	
		US gal	8,72	
	Engine + std radiator with hoses	liter	60	
		US gal	15,85	
Coolant pump		drive/ratio	Belt / 1,85:1	
Coolant flow with standard system		l/s	6,4	7,7
		US gal/s	1,69	2,04
Minimum coolant flow		l/s	6,4	7,7
		US gal/s	1,69	2,04
Maximum external coolant system restriction, including piping		kPa	40	60
		in wc	161	241
Thermostat	start to open	°C	86	
		°F	187	
	fully open	°C	96	
		°F	205	
Maximum static pressure head (expansion tank height + pressure cap setting)		kPa	100	
		in wc	402	
Minimum static pressure head (expansion tank height + pressure cap setting)		kPa	70	
		in wc	281	
Standard pressure cap setting		kPa	75	
		in wc	301	
Maximum top tank temperature		°C	103	
		°F	217	
Draw down capacity	4% of total cooling system capacity			

Intercooler system		r/min	1500	1800
Cooling power	Prime Power	kW	91	127
		BTU/min	5175	7222
	Standby Power	kW	110	147
		BTU/min	6256	8360
Combustion air inlet temp. (Charge air temp after turbo compressor)	Prime Power	°C	184	210
		°F	363	410
	Standby Power	°C	202	230
		°F	396	446
Max allowable Comb. Air temp after CAC at 25 degree ambient. (Charge air temp after intercooler)	Standby Power	°C	45	45
		°F	113	113
Maximum pressure droop over intercooler, incl. piping		kPa	10	18
		psi	1,5	2,6
Boost pressure		kPa	240	252
		psi	34,8	36,5
Standard intercooler core area		m²	1,3	
		foot²	13,99	
Standard intercooler core thickness		mm	68	
		in	2,68	

Cooling performance, STD cooling package with 890mm fan

Cooling air flow and external restriction at different radiator air temperatures based on 103°C TTT and 40% antifreeze (radiator and cooling fan, see optional equipment)

Engine speed rpm	Air on temp °C	PRIME POWER		STANDBY POWER	
		Air mass flow kg/s	External restriction Pa	Air mass flow kg/s	External restriction Pa
1500	40	5,1	966	5,6	876
	45	5,7	866	6,2	780
	50	6,4	769	7,0	708
	55	7,3	710	8,0	650
	60	8,5	595	9,4	285
	62			10,1	0
	65	10,1	0		
1800	40	6,0	1473	6,9	1286
	45	6,7	1339	7,7	1156
	50	7,6	1195	8,7	1059
	55	8,7	1085	10,0	918
	60	10,1	928	11,7	203
	61			12,4	0
	65	12,4	0		

Cooling performance, HD cooling package with 750mm fan

Cooling air flow and external restriction at different radiator air temperatures based on 103°C TTT and 40% antifreeze (radiator and cooling fan, see optional equipment)

Engine speed rpm	External restriction Pa	PRIME POWER		STANDBY POWER	
		Air mass flow kg/s	Air on temp C°	Air mass flow kg/s	Air on temp C°
1500	0		71		68
	100		68		65
	200		66		62
	300		62		59
	400		60		55
1800	0		68		64
	100		66		62
	200		65		60
	300		64		59
	400		62		57

Engine management system

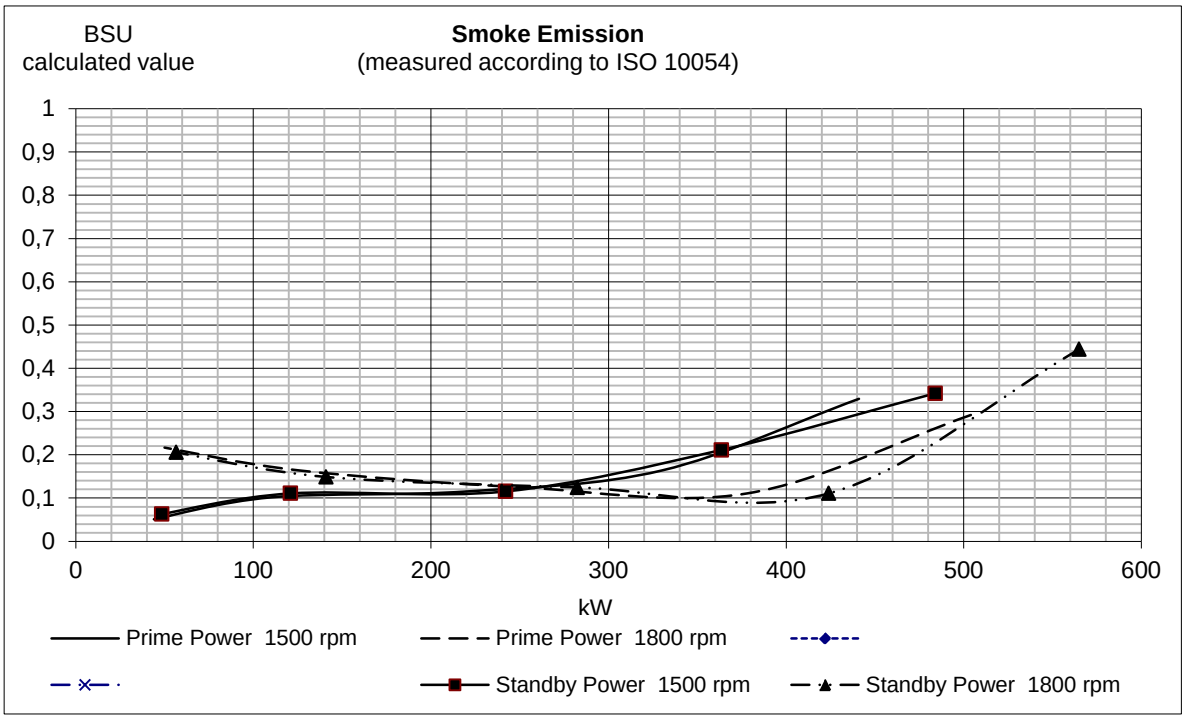
Functionallity		Alternatives	Default setting
Governor mode		Isochronous/droop	Isochronous
Governor droop		0-8%	4%
Dual speed		1500/1800	According to customer
Low Idle speed select		600-1200	900
Stop function		Energized to Run / Stop	Energized to stop
Lamp test		On / Off	On
Pre-heat on ignition		On / Off	Off
Governor characteristic			
Gain			
Stability			

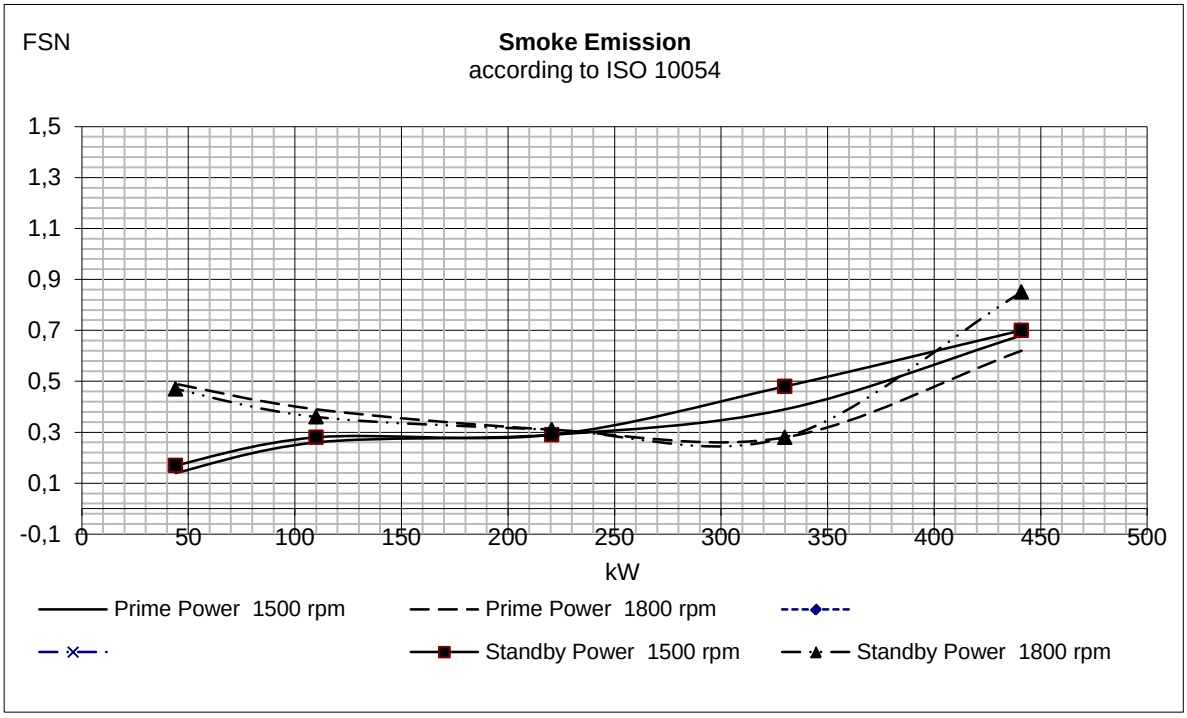
Engine protection	Alarm		Engine protection	
Parameter	Selectable span	Default setting	Protection at	Protective action
Oil temperature C	120 - 130	125	Setting +5	Shut down / off *
Oil pressure kPa				
Low idle 900rpm	-	190	Default -30	Shut down / off *
1500 rpm	-	250	::	::
1800 rpm	-	300	::	::
Oil level	-	Min level	-	-
Piston cooling pressure kPa				
>1000rpm	-	150	150	Shut down / off *
Coolant temp	95 - 101	98	Setting +5	Shut down / off *
Coolant level	-	On	Low level	Shut down / off *
Fuel feed pressure kPa				
Low idle 900rpm	-	150	-	-
> 1400 rpm	-	300	-	-
Water in fuel	-	High level	-	-
Crank case pressure kPa	-	-	-	Shut down
Air filter diff pressure kPa	-	5,0	-	-
Altitude, above sea m	-	-	>1500	Automatic derating,
Charge air temp after cac	-	80	+5	Shut down
Charge air pressure kPa	-	290	300	Shut down
Overspeed	100 - 120% of rated	120% / off *	Alarm level	Shut down / on
Low voltage V	-	25,5	-	-

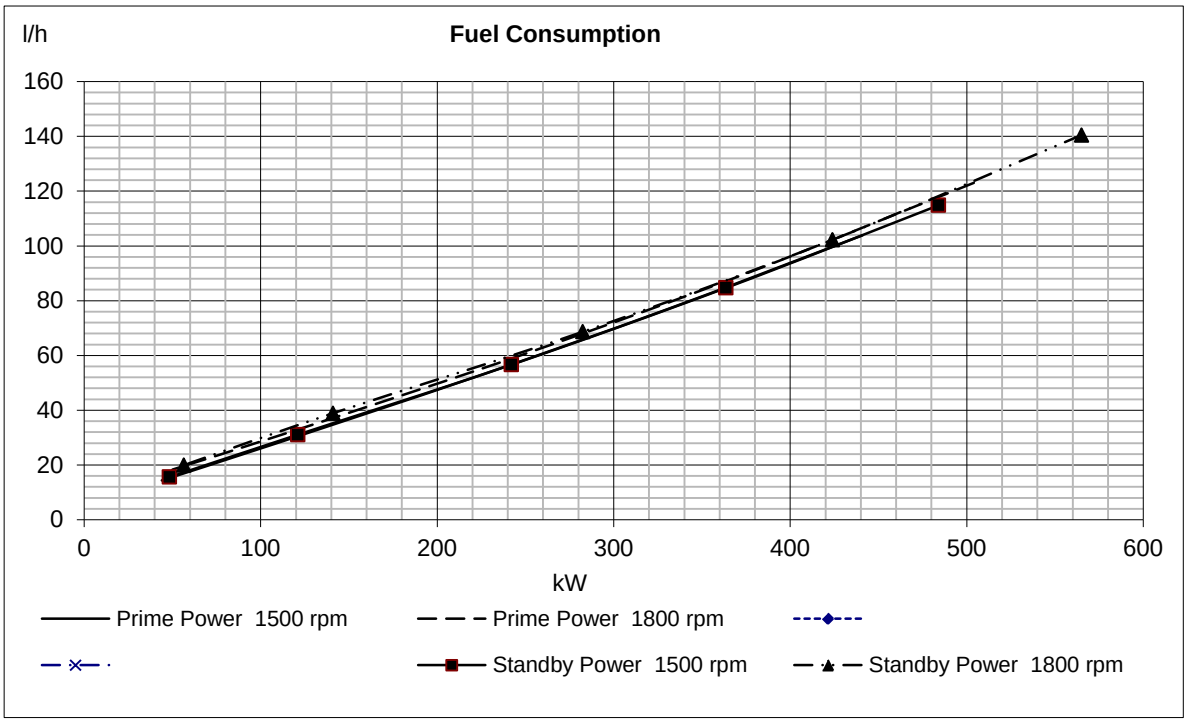
*Off means no shutdown , alarm only.

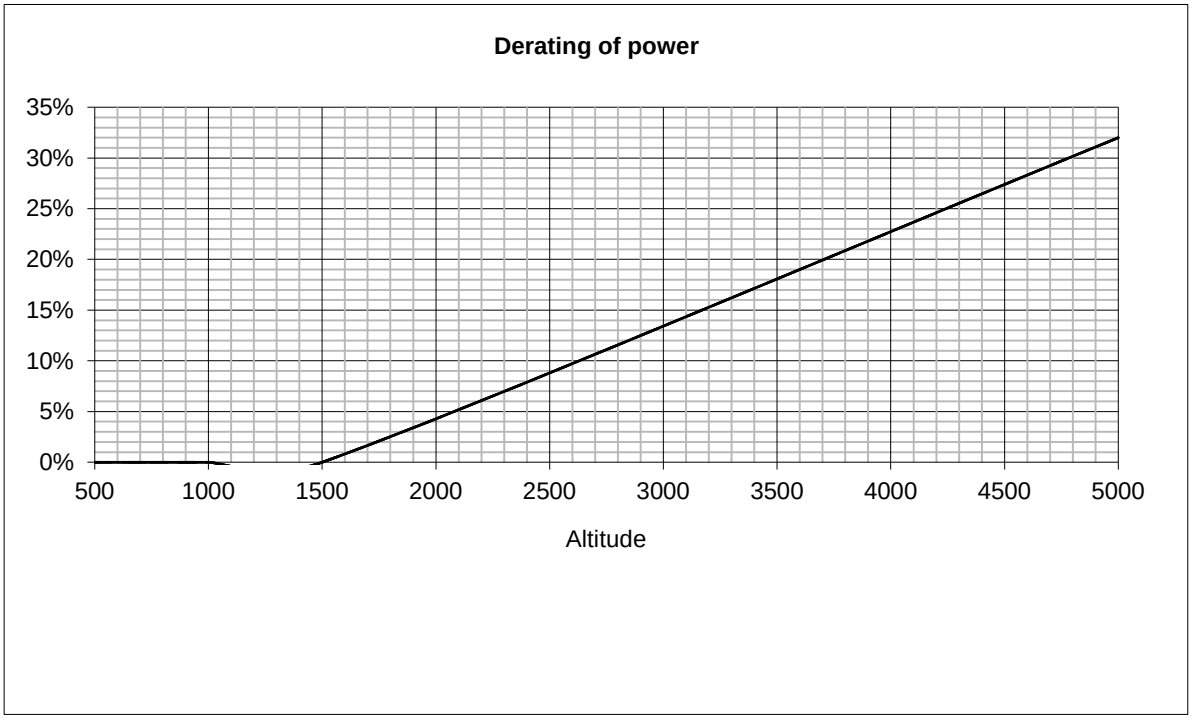
Electrical system		r/min	1500	1800
Voltage and type			24V / insulated from earth	
Alternator:	make/output	Amp	Bosch / 80	
	tacho output	Hz/alt. Rev	6	
	drive ratio		3,9 : 1	
Starter motor		make	Melco	
		type	105P70	
		kW	7,0	
Starter motor solenoid,	pull current	Amp	-	
	hold current	Amp	2,3	
Number of teeth on:	flywheel		153	
	starter motor		12	
Inrush current at +20°C		Amp	700	
Cranking current at +20°C		Amp	280	
Crank engine speed at 20°C		rpm	150	
Starter motor battery capacity:	max	Ah	2 x 225	
	min at +5°C	Ah		
Inlet manifold heater (at 20 V)		kW	4,0	
Power relay for the manifold heater		Amp	1	

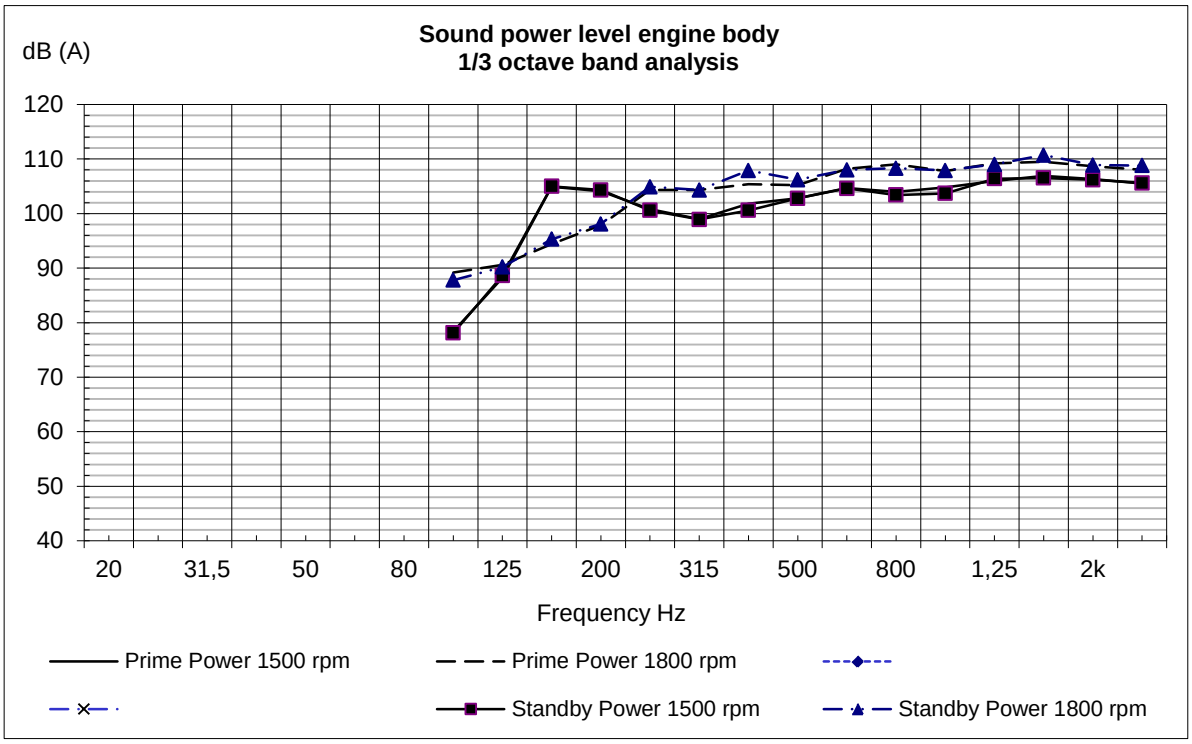
Power take off		r/min	1500	1800
Front end in line with crank shaft max:		Nm lbft	-	
Front end belt pulley load. Direction of load viewed from flywheel side:	max left	kW hp	-	-
	max down	kW hp	-	-
	max right	kW hp	-	-
Timing gear at compressor PTO max:		Nm lbft	160 118	
Speed ratio direction of rotation viewed from flywheel side		1,31:1 / anti-clockwise		
Timing gear at servo pump PTO max:		Nm lbft	100 74	
Max allowed bending moment in flywheel housing		Nm lbft	15000 11063	
Max. rear main bearing load		N lbf	5000 1124,0	

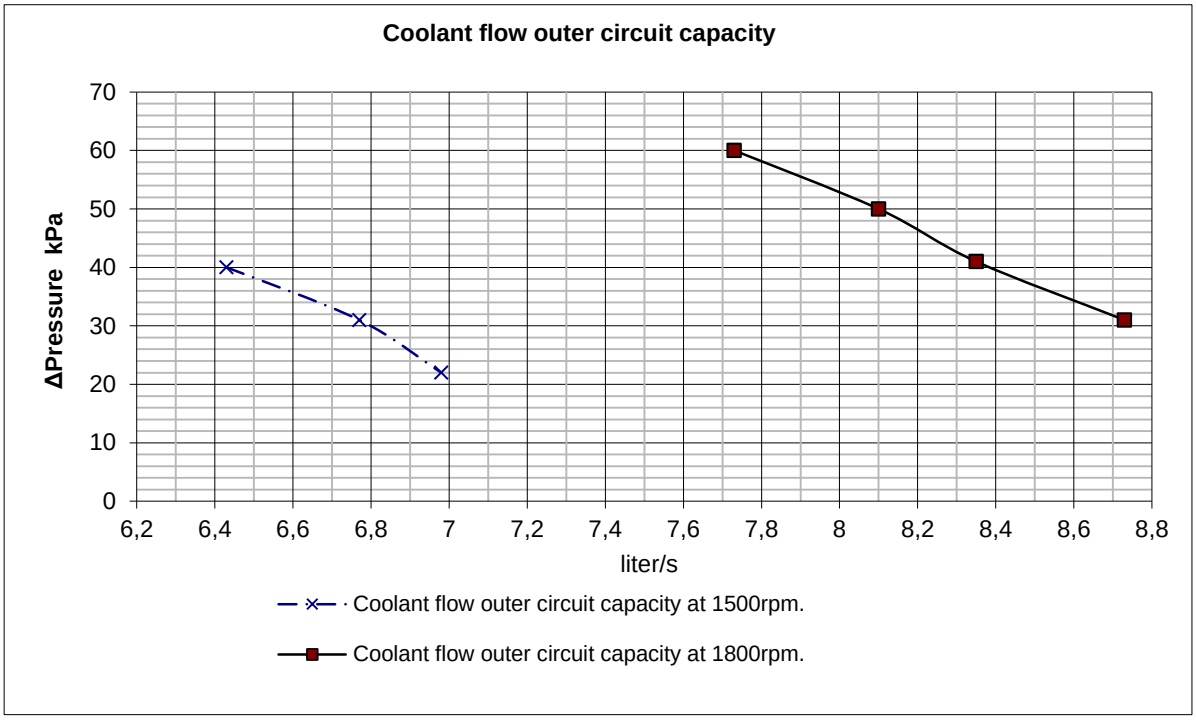

BSU
calculated value
Smoke Emission
(measured according to ISO 10054)
1
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
0
100
200
300
400
500
600
kW
Prime Power 1500 rpm
Prime Power 1800 rpm
Standby Power 1500 rpm
Standby Power 1800 rpm

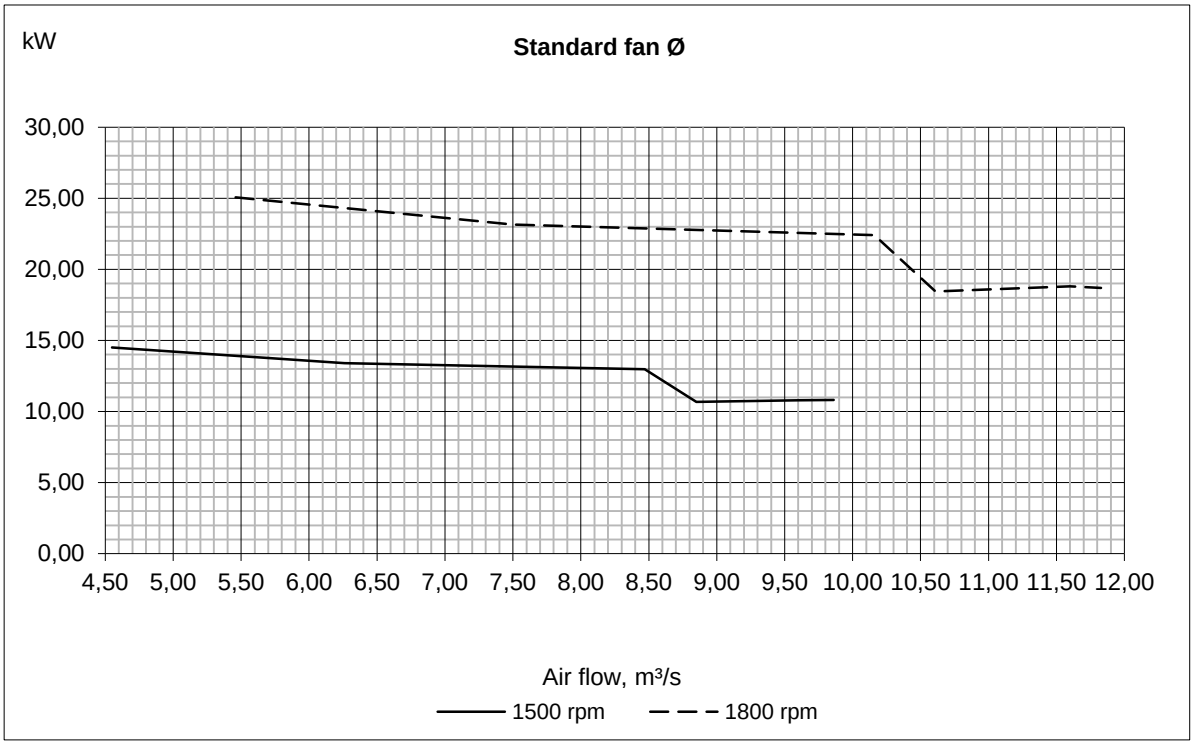

FSN
Smoke Emission
according to ISO 10054
1,5
1,3
1,1
0,9
0,7
0,5
0,3
0,1
-0,1
0
50
100
150
200
250
300
350
400
450
500
kW
Prime Power 1500 rpm
Prime Power 1800 rpm
Standby Power 1500 rpm
Standby Power 1800 rpm

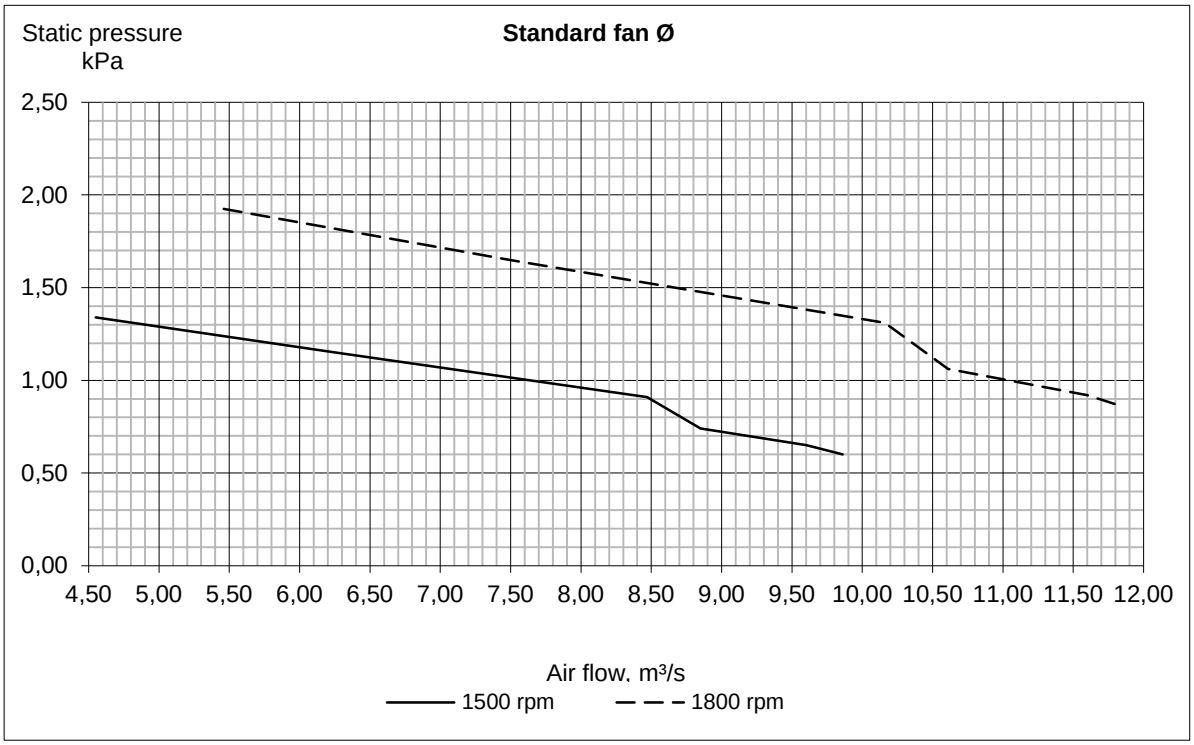

l/h
Fuel Consumption
160
140
120
100
80
60
40
20
0
0
100
200
300
400
500
600
kW
Prime Power 1500 rpm
Prime Power 1800 rpm
Standby Power 1500 rpm
Standby Power 1800 rpm


Derating of power
35%
30%
25%
20%
15%
10%
5%
0%
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
Altitude


Sound power level engine body
1/3 octave band analysis
dB (A)
120
110
100
90
80
70
60
50
40
20
31,5
50
80
125
200
315
500
800
1,25
2k
Frequency Hz
Prime Power 1500 rpm
Prime Power 1800 rpm
Standby Power 1500 rpm
Standby Power 1800 rpm


Coolant flow outer circuit capacity
ΔPressure kPa
70
60
50
40
30
20
10
0
6,2
6,4
6,6
6,8
7
7,2
7,4
7,6
7,8
8
8,2
8,4
8,6
8,8
liter/s
Coolant flow outer circuit capacity at 1500rpm.
Coolant flow outer circuit capacity at 1800rpm.


kW
Standard fan Ø
30,00
25,00
20,00
15,00
10,00
5,00
0,00
4,50 5,00 5,50 6,00 6,50 7,00 7,50 8,00 8,50 9,00 9,50 10,00 10,50 11,00 11,50 12,00
Air flow, m³/s
1500 rpm
1800 rpm


Static pressure
kPa
Standard fan Ø
2,50
2,00
1,50
1,00
0,50
0,00
4,50 5,00 5,50 6,00 6,50 7,00 7,50 8,00 8,50 9,00 9,50 10,00 10,50 11,00 11,50 12,00
Air flow, m³/s
1500 rpm
1800 rpm

Industrial Generators

BLUE STAR Power Systems Inc.

Blue Star Power Systems, Inc. utilizes the highest quality generators available. Our industrial generators provide consistent performance, quality design, and great durability required for long life and versatility. Generators used by Blue Star Power Systems, Inc. are UL and CSA Listed (unless specified otherwise), which guarantees that each one meets the rigorous demands of industrial power generation and will provide safe and effective service for the life of the generator. Blue Star Power Systems, Inc. generators range from 20 kWe through 2000 kWe.

Standard Features

- **Enhanced Ventilation**
  Created by a high-efficiency fan that optimizes internal airflow patterns, maximizes heat transfer, and minimizes hot spot differentials for extended winding life.
- **Fully Guarded**
  For operator safety and generator protection. No rotating or electrically energized parts are exposed. All openings are covered by louvers or screens.
- **Large Conduit Box**
  Provides ample space for easy connections and allows load line access from all sides, top, or bottom.
- **Design Specs and Agency Approvals**
  All Blue Star Power Systems, Inc. generators are UL and CSA Listed (unless specified otherwise) and meet NEMA MG1-22, BS5000, CSA C22.2, IEC 34-1 and VDE 0530 requirements.
- **Class H Insulation System**
  Utilizes an unsaturated polyester varnish for optimal insulation life and superior moisture protection.
- **Optimized Windings**
  Provide low reactances and exceptional motor starting capability. The stator windings utilize a 2/3 pitch to minimize harmonic distortion and facilitate parallel operation.
- **Permanent Magnet Generator (optional)**
  Ensures 300% short circuit current during fault conditions and provides the regulator with input power isolated from load distortion.
- **Shielded Heavy-Duty Bearing**
  Resists contamination and gives a minimum B-10 life of 40,000 hours.
- **Automatic Voltage Regulator**
  Provides accurate 1% regulation, under-speed protection, stability adjustment to optimize transient performance, and EMI filtering to commercial standards. Fully encapsulated for rugged durability in virtually any environment.

DVR2000E+
Digital Voltage Regulator

BLUE STAR Power Systems Inc.

Advanced Features

- **CAN Bus Communication -** Allows for the integration of the DVR2000E+ as a node on a CAN Network for the purpose of controlling or monitoring regulator performance
- **True RMS Single and Three Phase Voltage Sensing -** Connect in the sensing mode required per the application. Sense 100 to 600 Volts ±10% at 50 or 60 Hz
- **True Three Phase Power Monitoring -** Additional CT inputs monitor current on all three phases if required
- **Generator Soft Start -** Controlled increase to rated voltage limits overshoot during voltage build-up in AVR regulation modes if required
- **Frame Specific PID Selection -** Regulator tuned to specific frame size and gain settings
- **Four Digit HMI Display -** Clearly displayed whether changing settings or monitoring regulator status
- **Expandable Platform -** Features include shunt power capability and RTD monitoring through expansion modules

Specifications

- **Voltage Regulation** – 0.25% over the entire load range at rated power factor and constant generator frequency
- **Output Power** – 75VDC, 3.0ADC continuous rating and 150VDC, 7.5ADC forcing capability for one minute
- **Exciter Field DC Resistance** – 18 to 25Ω range
- **Voltage Adjustment** – Minimum of ±10% of nominal voltage range. Remote adjustment can be made from up to 150 feet from voltage regulator
- **Input Power** – 180 to 240VAC, 250 to 300 Hz PMG power supply
- **Operating Temperature** – From -40°C to +70°C (-40°F to +158°F)
- **Storage Temperature** – From -40°C to +85°C (-40°F to +185°F)
- **Ingress Protection** – IP52 (front side mounted in conduit box); IP10 (rear side with protective cover)
- **Shock** – 20g in 3 perpendicular planes
- **Vibration** – 1 G at 5 to 26 Hz; 0.050” double amplitude (27 to 52 Hz); 7g at 53 to 500 Hz
- **Weight** – 3 lb. (1361g)
- **Humidity Testing** – Per MIL-STD-705B, Method 711-D
- **Salt Fog Testing** – Per MIL-STD- 810E
- **CAN Protocol** – SAE J1939
- **Regulator Sensing** – 100 to 600VAC, 50/60 Hz, 1-phase/3-phase
- **EMI Compatibility**
  Immunity - Meets EN 61000-6-2: 2005 Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments
  Emission - Meets EN 61000-6-4: 2007 Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments
- **EMI Compatibility Tests**
  Immunity - Electrostatic Discharge (ESD): IEC 61000-4-2 | Radiated RF: IEC 61000-4-3 | Electrical Fast Transient (EFT) / Burst: IEC 61000-4-4 Conducted RF: IEC 61000-4-6 | Power Frequency and Magnetic Field: IEC 61000-4-8
  Emission - Radiated RF: EN 61000-6-4: 2007, 30 MHz to 1000 MHz

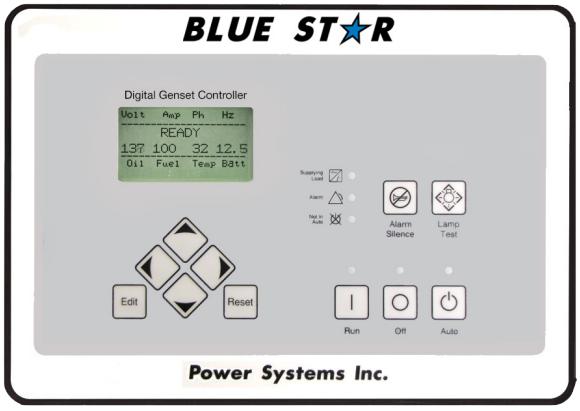
This regulator meets MIL-STD-461C, Part 9 for radiated and conducted emissions and radiated susceptibility when mounted in the generator conduit box.

Blue Star Power Systems, Inc. | 52146 Ember Road, Lake Crystal, Minnesota 56055 | Phone + 1 507 726 2508 | bluestarps.com

DGC-2020 Gen-Set Controller

BLUE STAR Power Systems Inc.

Blue Star Power Systems, Inc's Digital Gen-Set Controller (DGC-2020) is a highly advanced integrated gen-set control system. The DGC-2020 is perfectly focused, combining rugged construction and microprocessor technology to offer a product that will hold up to almost any environment and flexible enough to meet your application's needs. This device provides gen-set control, transfer switch control, metering, protection and programmable logic in a simple, easy to use, reliable, rugged, and cost effective package.



Highlights

- UL Recognized, CSA & CE approved
- Microprocessor based
- Complete system metering
- Remote communication options
- Rugged encapsulated construction

Standard Features

- Generator Metering
- Engine Metering
- Gen-set Control
- Engine Protection:
  - Oil Pressure
  - Engine Temperature
  - Overspeed
  - Overcrank
- BESTCOMS Plus:
  - Programming and Setup Software
  - Intuitive and Powerful
  - Remote Control and Monitoring
  - Programmable Logic
  - USB Communications
- SAE J1939 Engine ECU Communications (Where Applicable)
- Extremely Rugged, Fully Encapsulated Design
- 16 Programmable Inputs
- 7 Contact Outputs: (3) 30ADC and (4) Programmable 2ADC Rated Contacts
- Wide Ambient Temperature Range
- UL Recognized, CSA Certified, CE Approved
- HALT (Highly Accelerated Life Test) Tested
- IP54 Front Panel Rating with Integrated Gasket
- NFPA110 Level One Compliant
- Real Time Clock with Battery Backup and Event Log
- Emergency Stop Pushbutton
- Current Sensing: 5A CT inputs
- Generator Frequency: 50/60 Hz
- LCD Display Heater to -40˚F
- Event Recording (up to 99 occurrences)

Standard Gen-Set Monitoring

- Generator parameters: voltage, current, frequency, real power (Watts), apparent power (VA), and power factor
- Engine parameters: oil pressure, coolant temperature, RPM, battery voltage, fuel level, engine runtime, and various J1939 supported parameters where applicable

Standard Engine Control Functions

Cranking Control

- Cyclic or Continuous (Fully Programmable)

Successful Start Counter

- Counts and Records Successful Engine Starts

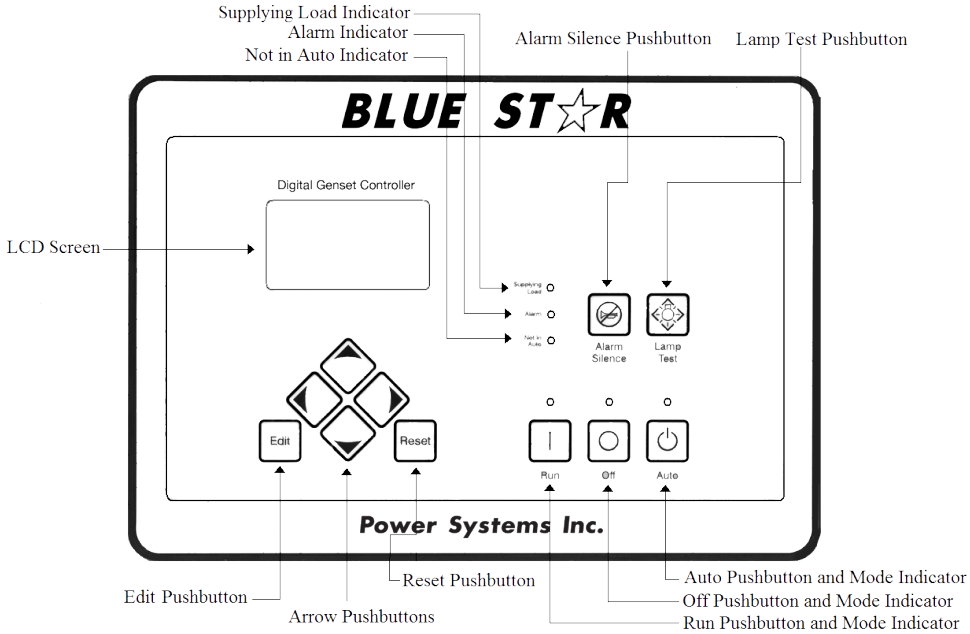
Timers

- Engine Cooldown Timer (Specify)
- Engine Maintenance Interval Timer (Specify)
- Pre-Alarm Time Delays for Weak/Low Battery Voltage
- Alarm Time Delay for Overspeed
- Alarm Time Delay for Sender Failure
- Arming Time Delays After Crank Disconnect:
  - Low Oil Pressure
  - High Coolant Temperature
  - Pre-Crank Delay
- Continuous/Cyclic Cranking Timing Sequence

DGC-2020 Gen-Set Controller

Front Panel LED Indicators:

- Run: Green – Indicates controller is in the RUN mode
- Off: Red – Indicates controller is in the OFF mode
- Auto: Green – Indicates unit is in the AUTO mode
- Not in Auto: Red – Indicates DGC-2020 is not in AUTO mode
- Supplying Load: Green – Indicates system is supplying current to a connected load
- Alarm: Red – Indicates an alarm situation by continuous illumination
  A pre-alarm will flash



Standard Engine Protection Functions

Pre-Alarms (Warnings)

- Low Oil Pressure
- High Coolant Temperature
- Low Coolant Temperature
- Battery Overcharge (High Voltage)
- Weak Battery (Low Voltage)
- Battery Charger Failure
- Engine Sender Unit Failure
- Engine kWe Overload
- Maintenance Interval Timer
- Low Fuel Level
- Fuel Leak Detect

Alarms (Shutdowns)

- Low Oil Pressure
- High Coolant Temperature
- Overspeed
- Overcrank
- Fuel Sender Failure

- All alarms and pre-alarms can be configured via the BESTCOMSPlus PC software or the front panel.

Optional Features

- Generator Protection
  - 27(2), 32, 40Q, 51(2), 59(2), 81O, 81U
- Enhanced Generator Protection - 51 and 47
- Selection of Integrating Reset or Instantaneous Reset Characteristics for Overcurrent Protection
- Remote Communication to RDP-110 / NFPA-110 Compliant Remote Annunciator
- Additional (8) Programmable 2ADC Contacts
- Remote Dial-out and Dial-in Capability with Modem
- Modbus Communications with RS-485
- Expandable I/O Capability via J1939 CANBUS
- Automatic Transfer Switch Control
- Remote Emergency Stop
- Multilingual Capability
- High Fuel Level Pre-Alarm
- Critical Low Fuel Level Alarm
- Analog Meters

Generator Protection

- Undervoltage (27)
- Overvoltage (59)
- Underfrequency (81U)
- Overfrequency (81O)
- Overcurrent (51)
- Phase Imbalance (57)
- Reverse Power (32)
- Loss of Excitation (400)
- Phase Imbalance (47)
- Generator Overcurrent (51)

All generator protection features are programmable as alarms or pre-alarms.

Contact Outputs

For those applications where more output contacts are needed, the DGC-2020 can be adapted to include 8 additional 2ADC rated dry contact outputs. These are real contacts and not the solid-state type that require additional external circuitry to properly operate. These contacts are fully programmable via the easy-to-use BESTCOMSPlus PC software and can be assigned to numerous user-defined functions.

DC Voltage Panel Mounted Modem

The DGC-2020 can provide long distance communication by adding a modem. When a modem is used, the user can access the DGC-2020 from virtually anywhere via a dedicated telephone line. The user can monitor and control the gen-set as if standing right in front of it. The DGC-2020 can also dial out for pre-programmed circumstances to alert the user of selected situations.

RS-485 Communication

When the RS-485 option is selected, the user can send and receive information from the DGC-2020 via the RS-485 communications port and Modbus protocol. This feature allows the DGC-2020 to be fully integrated into the building management system. Please see the instruction manual for the Modbus register list.

Enhanced Generator Protection

In addition to the standard generator protection (27, 59, 81O, 81U) the DGC-2020 can be equipped with a more sophisticated generator protection system. This option provides an overcurrent element (51) with 17 selectable time current characteristic curves and a voltage phase balance protection function.

Transfer Switch Control (Mains Failure)

The DGC-2020 monitors utility (mains) and determines if it is providing power that is suitable for the loads. If the utility supply goes outside of predetermined levels, the generator is started and the utility is disconnected from the load and the generator is connected. When the utility returns to acceptable levels for a sufficient time, the generator is disconnected and the utility is reconnected to the load. It also includes appropriate adjustable timers or time delays for establishing stable utility operation.

Contact Expansion Module (CEM)

The CEM add-on module increases the contact input and contact output capability adding 10 contact inputs and 24 form C contact outputs. This module communicates to the DGC-2020 via SAE J1939 CANBUS and allows the user to program the functionality of these inputs and outputs in the BESTCOMS programmable logic program. The user can add labels for the inputs and outputs that appear on BESTCOMS front panel, and in the programmable logic. All the functionality can be assigned to these inputs and outputs as if they were an integrated part of the DGC-2020. The CEM-2020 module has all of the environmental ratings, like the DGC-2020, including a model for UL Class1 Div2 applications (consult price list for part number). The output ratings of the form C contacts are: (12 contacts) 10A @ 30VDC and (12 contacts) 2A @ 30VDC. The 2A rated contacts are gold flash contacts for low current circuits. The CEM-2020 terminals accept a maximum wire size of 12 AWG while the chassis ground requires 12 AWG wire. The CEM-2020 provides the user with the flexibility to use the same model DGC-2020 gen-set controller for simple applications or more complicated applications that require contact functionality or duplication of contacts for remote annunciation. Flexibility is one of the benefits of the DGC-2020, and this add-on module enhances that benefit even further.

ModBus TCP/RTU (NetBiter RTU-TCP Gateway)

NetBiter® RTU-TCP Gateway connects the fully enhanced DGC-2020 with Ethernet and mobile networks. The gateway acts as a transparent bridge translating DGC-2020 Modbus registers allowing control systems, such as PLCs, SCADA, etc. to communicate over Ethernet. One gateway is required per generator allowing multiple generator sets to be accessed and monitored simultaneously. Note: This option does not interface with BESTCOMSPlus software. Features include: connectivity between serial Modbus devices and the Modbus TCP; RS-232, RS-485 and RS-422 connectivity; Ethernet and mobile network connectivity; 10/100 Mbit/s Ethernet; web-based configuration; DIN rail mounting; and network and serial status indicators.

Load Share Module 2020 (LSM-2020)

The LSM is an easy to connect and use add-on module for the DGC-2020 to allow the DGC-2020 to control the kW load sharing of multiple generator sets. The LSM-2020 is remotely mounted and communicates to the DGC-2020 via J1939 CANbus communications.

Gen-Set Enclosures

Blue Star Power Systems, Inc. gen-set enclosures are specifically designed for optimal protection against the elements. They are designed to protect the entire system from even the most extreme environments, and to reduce sound levels to most specified requirements. Blue Star Power Systems, Inc's vast flexibility allows the design of standard enclosures to meet most specifications or requirements. All standard enclosure models are constructed of 14 gauge steel and feature a pitched roof for increased structural integrity and superior watershed. All enclosures feature a rugged UL listed hammer powder coat finish as standard for a long lasting and durable finish in standard white, tan or gray. Custom colors are available as specified.

Enclosure Design Features

- UL 2200 & CSA Listed as standard
- All enclosures are 150 MPH wind rated
- Lockable gasketed doors with draw down latches and Stainless Steel component hinges
- All Stainless Steel fasteners
- UL & CSA listed extreme-wear hammer powder coat finish
- Pitched roof for high structural integrity and superior watershed
- Above-door drip guards
- Optimal airflow means no cooling system de-rates on most models
- Internally mounted exhaust silencers standard up to 600 kWe
- Sound attenuation options
- Stainless Steel and Aluminum enclosure options

Level 1

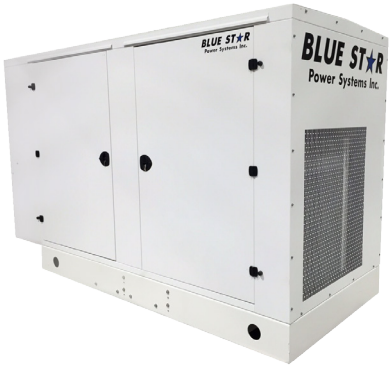
Weather Proof Enclosure

Blue Star Power Systems, Inc. Level 1 enclosures have the rugged construction and weather proof protection required for most outdoor environments. These enclosures will effectively protect the gen-set through high wind (150 MPH), rain, snow, and other extreme weather conditions. Weather proof enclosures feature standard hinged lockable doors, a pitched roof to prevent water accumulation and improved structural integrity. The enclosure is painted with extreme-wear UL and CSA listed hammer powder coat finish.

Level 2

Weather Proof Enclosure with Foam

Blue Star Power Systems, Inc. Level 2 enclosures include all of the same great features of the Level 1 enclosures. With the addition of high performance 1.5" Type D Sound Attenuating Foam, our Level 2 Enclosures offer an even lower dBA rating with the same great weather proof protection.



Level 3

Sound Attenuated Enclosure

Blue Star Power Systems, Inc. Level 3 enclosures feature the same great weather proof protection and standard features as the Level 1 & 2 enclosure models, but with a greater emphasis on reducing sound levels. Standard Level 3 features include the same high performance 1.5" type D sound attenuating foam, and the addition of a separate frontal exhaust sound chamber and dual rear air intake to ensure that your system runs exceptionally quiet. These features make this enclosure among the best in the industry for noise reduction and quality.

Sound Attenuation Foam

BLUE STAR Power Systems Inc.

Polydamp® Type D Acoustical Foam, (PAF) is an acoustical grade, open cell, flexible ether based urethane foam designed to give maximum sound absorption for a given thickness. It has excellent resistance to heat, moisture and chemicals. All applications use 1.5" foam as standard.

Foam Characteristics

Sound Absorption: Nominal values of random incidence sound absorption coefficient per ASTM C384-77 for Plain/Tuffylm

	Frequency (Hz)					
Foam Thickness	**125**	**250**	**500**	**1000**	**2000**	**4000**
(1.5 in) 38.1 mm	15/20	27/49	60/96	77/93	90/82	98/67
(2.0 in) 50.8 mm	20/30	40/66	90/98	100/96	96/85	100/75

	Test Standard	U.S. Standard
Density, Nominal: (lb/ft3-kg/m3)	ASTM-D-3574-91	1.85
Tensile Strength: (PSI-KPa)	ASTM-D-3574-91	12
Elongation, %	ASTM-D-3574-91	120
Tear Resistance: (lb/in - N/M)	ASTM-D-3574-91	1.3
IFD: (PSI - KN/M2)	ASTM-D-3574-91	30
Compression Set (50%): %	ASTM-D-3574-91	10
Air Permeability (Tested at 1" thickness): (Rayles/M)	ASTM C-522	
Thermal Conductivity		
(BTU/hr. ft2, °F/in.)	ASTM C-177	0.25

Service Temperature	
Continuous	-45°F (-43°C) TO 212°F (100°C)
Intermittent	250°F (121°C)
Flame Resistance	
UL94	HF-1
FAR.853(B)	PASS
SAEJ-369(B)	PASS
MVSS-302	PASS
DIN	PASS

Humidity Resistance

Excellent; no significant decrease in tensile strength or elongation after 5 hrs. of steam autoclave at 250°F (121°C) per ASTM D3574-86, Test J.

Chemical Resistance

Excellent - no significant change in strength after 4 weeks immersion in common solvents, alkalies, acids, and water.

Estimated Service Life:

Min. 10 years at 80F (27°C) and 95% R.H.

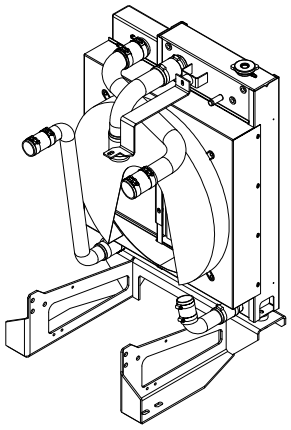
Adhesive Characteristics

P4 is a high performance unsupported acrylic pressure sensitive adhesive exhibiting aggressive tack, high peel and shear, and good heat resistance. In addition, it has good chemical and plasticizer resistance as well as excellent long term aging and the ability to withstand environmental extremes.

Adhesive Thickness (Nominal)	0.004"
Color of Adhesive	Water Clear
Release Liner	76 lb Polycoated bleached kraft paper
Service Temperature	-40°F +200°F

Radiators

Blue Star Power Systems, Inc. radiators offer a variety of styles and configurations including radiator and charged air assemblies, radiator and aftercooler assemblies with durable core construction. Our radiators are compact and efficient meeting the most stringent enclosure footprint requirements. All radiators are sized for 50˚C (122˚F) ambient. The single-source design ensures a perfect match with your genset package.



Radiator Features

Standard Radiator Package

- Engine-specific tank design with variant coolant connection locations and sizes (dependant on engine size)
- Complete cooling package with mounting foot and plumbing kit
- All steel construction of top and bottom tanks
- Dual Core designs -
    - Jacket Water / Charged Air Circuit
    - Jacket Water / After Cooler Circuit
- Individual radiators designed to meet manufacturer's specific requirements
- Top tank has built in expansion capacity - no need for an external recover tank
- Full or partial deration system built into the top tank
- Standard cooling package includes fan shroud & fan guard
- Corrosion preventive options:
    - Hot dipped galvanizing on all steel parts or stainless steel
    - Epoxy coated cores

Fan-On Radiator Design

- Engine-specific tank design with variant coolant connection locations and sizes (dependant on engine size)
- Rigid built construction for fan support
- High speed bearings within pillow blocks
- Dual Core designs with variable jacket water / after cooler circuit designs
- All steel construction of top and bottom tanks
- Individual radiators designed to meet manufacturer's specific requirements

CB / CL Series Engine Block Heaters

BLUE STAR Power Systems Inc.

Features

- Constant circulation of coolant through the engine achieves even heat distribution
- One-piece, heavy-duty, pressure die-cast aluminum tank with a bolt-on flange element assembly
- Fixed thermostat ON: 100˚F, OFF: 120˚F (optional temp ranges available)
- All parts replaceable - easy to service
- CSA and cULus approved
- Classified weather tight
- Models available for Class I, Group D (Hazardous Locations) applications
- Various voltages and 3 phase units available

- **Easy Starts**
- Saves warm-up time
- Saves fuel
- Prolongs battery life
- Protects the Environment
- Reduces “white smoke” upon start-up
- Engine is ready for full power operation
- Reduces noise pollution

- **Reduces Engine Wear**
- 90% of engine wear is due to low jacket water temp upon start-up
- Stops destructive condensation
- Extends engine life

Specifications

Part Number	Volts	Watts	Phase	Amps
10591	120	2500	1	20.8
11376	208	2500	1	12.0
10592	240	2500	1	10.4
14208	480	2500	1	5.2
11136	120	3000	1	25.0
11137	208	3000	1	14.4
10593	240	3000	1	12.5
11138	480	3000	1	6.3
11139	208	4000	1	19.2
10594	240	4000	1	16.7
11140	480	4000	1	8.3
11141	208	5000	1	24.0
10595	240	5000	1	20.8
11142	480	5000	1	10.4

CPJ Series Critical Grade Silencers

BLUE STAR Power Systems Inc.

Blue Star Power Systems, Inc's "CPJ" Series is the accumulation of research and development offering a compact silencer without compromising performance. It incorporates a unique combination of resonator chambers, acoustically packed internal components and diffusers to achieve a stunning level of performance for its size. All CPJ series silencers are critical grade silencers and are packed with insulation to greatly reduce radiated noise and exterior shell temperature.

Standard Construction Features

- Available in sizes from 2 inch to 12 inch
- Multitude of inlet/outlet design styles to meet almost any requirement
- Packed with fiberglass insulation to reduce shell temperature and noise levels
- Fully welded double shell carbon steel weldment construction, corrosive resistant
- High density fiberglass acoustic blanket good to 1500°F, wrapped with 304 Stainless Steel wire mesh cloth and encased in a carbon steel perforated facing
- Black phenolic resin based finish paint

Optional Construction Features and Accessories

- Stainless Steel construction
- Aluminum construction
- Aluminized Steel construction
- Vertical mounting legs
- Round mounting bands
- Horizontal mounting saddles
- Horizontal and vertical shell lugs
- Special finish per specification
- Air leak test
- ASME code construction
- Oversized flanges
- Acoustic shell lagging
- High temperature acoustic pack material
- Contact factory for additional features to meet your requirements

Model #	Part #	Inlet Size	Outlet Size	Flanged Connection	WT (lbs)
CPJS-02	10660	2.0" ID	2.0" OD	No	12
CPJS-25	10661	2.5" ID	2.5" OD	No	18
CPJS-03	10662	3.0" ID	3.0" OD	No	20
CPJS-35	10663	3.5" ID	3.5" OD	No	30
CPJS-04	10664	4.0" ID	4.0" OD	No	31
CPJS-05	10665	5.0" ID	5.0" OD	No	50
CPJS-06	10666	6.0" ID	6.0" OD	Yes	50
CPJS-08	10667	8.0" ID	8.0" OD	Yes	120
CPJS-10	10668	10.0" ID	10.0" OD	Yes	180

Industrial Gen-Set Batteries

BLUE STAR Power Systems Inc.

Engine Starting Batteries

Built to Handle Extreme Conditions

Blistering heat and bitter cold are ruthless battery killers. That's why Blue Star Power Systems, Inc. utilizes the Exide pioneered climatized battery. Designed to offer you long-life and high-performance starting power that will get your gen-set running even under extreme conditions. Blue Star Power Systems, Inc.'s "all-climate" Exide batteries stand up to the harshest temperatures and are available in sizes and configurations to fit almost any application.

Standard Features

- Unique Manifold Vent - Virtually eliminates corrosion by venting gases away from terminals and cables
- Exclusive TRP™ Construction – Rib reinforced TRP™ container significantly improves the vibration and impact resistance
- Armored Plate Cell Bonding - Vibration is the number one killer of commercial batteries. To solve this problem, the cells of every Exide battery are bonded
- Polyethylene Enveloped Separator Design – Super tough polyethylene material reduces electrical resistance and provides higher cranking performance
- Center Lug Design - Suppresses the vibration inherent in traditional construction for improved performance (where applicable)
- TTP™ - Through-the-Partition inter-cell connectors create a shorter current path to deliver more power to the terminals
- Heavy Duty Cases - Reinforced polyethylene or hard rubber cases stand up to the demands of standby gen-sets
- Convenient Lifting Slots - a handle is built in the top of the battery for easy carrying and transportation
- Protective Bottom Design - Waffled bottom design provides protection against nuts, bolts, or stones that might become lodged under the battery
- Computer Designed Radical Grids - An improved state-of-the-art design which adds power and resists vibration
- Threaded Accessory Ports - Features a sealed "O" ring that does not work loose during severe service (78DT only)

Specifications

				Dimensions (Inches)			
BCI Group Size	Part Number	CCA at 0˚F	CCA at 32˚F	Length	Width	Height	Weight (lbs.)
78DT	78DT-72	850	1000	10-3/16	6-13/16	8-1/8	54
4D	COM-4D-P	1000	1200	19-9/16	8-5/16	10	95
8D	COM-8D-P	1155	1380	20-7/8	11	10	117

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BC2405A Series Battery Chargers

BLUE STAR Power Systems Inc.

The BC2405A charger is built to stand up to the punishing power generation environment. It is engineered to exacting performance specifications, including cULus listing for an extra margin of safety.

Features

- Automatic 24V 5A, 2-Stage charge rate
- UL 1236 listed
- Watertight, shock proof and corrosion proof
- LED status indicators
- Reverse polarity protected
- Short circuit protected
- EMI/RFI Shielded

Specifications

Specifications	
Output Voltage:	24VDC
Input Rating	
Input Voltage Range:	100 - 130VAC
Input Current Rating:	3.0A maximum
Float - Maintenance Stage	
Float Voltage:	27.1VDC
Float Current:	0.1A
LED Status:	Green LED On
Full Load - Bulk Stage	
Full Load Voltage:	24.0 - 27.1VDC
Full Load Current:	0.1 - 5.0A
LED Status:	Red LED On

Reverse Polarity Protection	
Available as Standard:	Yes
Short Circuit / Overload Protection	
Maximum Short Circuit Current:	8A (typical)
Current Limit:	7A (+/- 10%)
Operating Temperature Range	
Minimum Temperature:	-40˚ C
Maximum Temperature:	50˚ C
Agency Certification	
This product is listed under UL 1236 for battery chargers.	
Warranty	
Warranty Period:	1 Year
Weight:	4.5 Pounds

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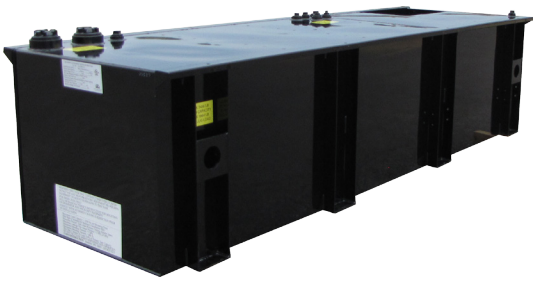
Sub-Base Fuel Tanks

Blue Star Power Systems, Inc. sub-base fuel tanks are listed and manufactured under UL 142 & ULC-S601 standards for steel above ground tanks, which guarantees that every fuel tank meets the structural and mechanical integrity requirements for mounting a generator set directly on top of the tank. This provides a convenient, efficient, and safe way to store fuel for your gen-set.



Sub-Base Fuel Tank Standard Features

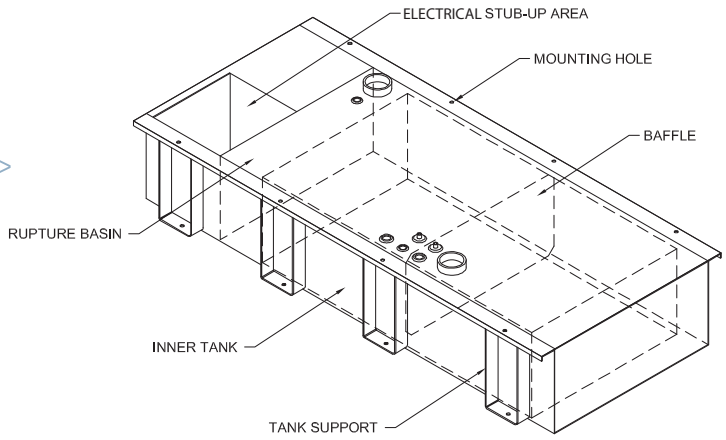
- Double walled secondary containment UL 142 & ULC-S601 Listed
- Electrical stub-up openings are standard to provide generator set wiring provisions through the base tank
- Heavy gauge steel construction
- Durable two part catalyzed epoxy finish paint
- Standard fittings: fuel supply with check valve (sized per unit), fuel return (sized per unit), 2” NPT for normal vent, 2” - 6” NPT for emergency vent (sized per unit), 2” NPT for manual fill, 1 1/2” NPT for fuel level gauge, and 3/8” NPT basin drain (plugged). Removable 1/2” supply dip tube standard (size may vary with gen-set model). 1 1/2” NPT for leak detection
- Interior tank baffle: Separates cold engine supply fuel from hot returning fuel
- Direct reading fuel level gauge
- Low fuel level and fuel leak alarms

Design Options

- High and critical low fuel level shutdowns or alarms
- Full pumping control systems for a true day tank system with a full array of electrical options
- Additional Tank Fittings
- Custom Fuel Tank Designs (sizes and shapes)
- Fuel Heater
- Fill / Spill Containment

Blue Star Power Systems, Inc. offers two distinctive types of double wall sub-base fuel tanks, those with an electrical stub up area (standard) and those without. Each type can be customized to any specification to meet your specific requirements.

UL 142 & ULC-S601 double wall secondary containment sub-base fuel tank with stub-up.



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Engine Generator Set Two (2) Year 2000 Hour Standby Limited Warranty

BLUE STAR Power Systems Inc.

Your Blue Star Power Systems Inc. product has been designed and manufactured with care by people with many years of experience. Blue Star Power Systems Inc. warrants to its Buyer that the product is free from defects in materials and/or workmanship for the period of time outlined below. If the product should prove defective within the time period outlined below, it will be repaired, adjusted or replaced at the option of Blue Star Power Systems Inc., provided that the product, upon inspection by Blue Star Power Systems Inc., has been properly installed, maintained and operated in accordance with Blue Star Power Systems Inc.'s Installation and Operating Manuals. This limited warranty is not valid or enforceable unless: (1) all supporting maintenance records are kept on file with the end user and made available upon request from factory, and (2) the generator set is routinely exercised in accordance with operating instructions. This warranty does not apply to malfunctions caused by physical damage, misuse, improper installation, repair or service by unauthorized persons, or normal wear and tear. The warranty is not assignable.

Blue Star Power Systems Inc. product warranty period: Engine generator set: Parts and Labor for two (2) years from the date of factory invoice or 2000 hours (whichever occurs first). Accessories (installed on the engine generator set or shipped loose): Parts and Labor for one (1) year from the date of factory invoice or 2000 hours (whichever occurs first). Transfer Switches: If purchased with a generator set (same order number): Parts and Labor for two (2) years from the date of factory invoice or 2000 hours (whichever occurs first).

The start of the warranty period can be adjusted to the date of unit start-up (limited to 180 days from invoice date) provided that the following information is provided to Blue Star Power Systems Inc. at the time of start-up. The warranty will not be effective unless a copy of the Blue Star Power Systems Inc. start-up validation checklist is properly and completely filled out and returned to Blue Star Power Systems Inc. within 30 days of start-up. Additionally, the engine manufacturer's engine registration form must be completed and returned to the engine manufacturer as stated in the instructions with the registration form.

To obtain warranty service: Contact your nearest Blue Star Power Systems Inc. Service Representative. For assistance in locating your nearest authorized service representative, contact Blue Star Power Systems Inc., Attention: Service Department (see contact information below).

Warranty service may be performed by authorized Blue Star Power Systems Inc. service providers only. Service work performed by unauthorized persons will void all warranties.

Blue Star Power Systems Inc. shall not be liable for any claim in amount greater than the purchase price of the product. In no event shall Blue Star Power Systems Inc. be held liable for any special, indirect, consequential or liquidated damages.

Blue Star Power Systems Inc. shall not be liable for any claim that requires replacement of engine, part, or component of the gen-set that is no longer manufactured or available. Additionally, Blue Star Power Systems Inc. will not be liable for any engine replacement that may require emissions tier level change.

THERE ARE NO EXPRESS WARRANTIES OTHER THAN THOSE DESCRIBED HEREIN. THERE ARE NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, OR OTHERWISE CREATED UNDER THE UNIFORM COMMERCIAL CODE, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY, OR WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE.

The following items and/or circumstances are excluded from this limited warranty:

- Engine starting batteries: The battery manufacturers' warranty applies. Consult your local battery supplier for warranty service.
- Fuel system and/or governing system adjustments performed during or after start-up.
- Normal maintenance items: Consumable items such as belts, filters and hoses.
- Adjustments and tune–ups performed during start-up or thereafter.
- Loose connections (electrical and mechanical) not found during start-up.
- All fluid level related items including low coolant not found during start-up or checked during regular maintenance intervals.
- Equipment modifications made without the written consent of Blue Star Power Systems Inc. will void all warranties.
- Shipping damage of any type. All equipment is shipped F.O.B. factory and risk of loss transfers to the carrier once loaded for shipment. It is the responsibility of the receiving party to sign for the receipt of, and note any shipping damage to the equipment. Freight damage claim filing is the responsibility of the receiving party. In the rare event that damage occurs during shipment, Blue Star Power Systems Inc. will not warrant any damage to the unit resulting from shrink wrap.
- Any special access fees, requirements or after hours scheduling to gain access to the equipment for warranty service purposes.
- Buyer requested rental generators used while warranty work is being performed.
- Damages caused by acts of nature, such as lightning, wind, flood, or earthquake.
- Any damage due to situations beyond the control of the manufacturing and/or workmanship of the product.
- Use of non-protected steel enclosure within 10 miles of the coast.
- Improper installation or operation as outlined in the Installation and Operation Manuals.
- Misapplication of the equipment such as usage outside the original design parameters as stated on the nameplate of the equipment.
- Equipment purchased at the standby rating that is being used in a prime power application(s).
- Diesel engine "Wet Stacking" due to lightly loaded diesel engines.
- All travel labor and mileage on portable equipment must be approved before any work is performed.

Terms of warranty shall be deemed made and executed in Lake Crystal, Blue Earth County, Minnesota. Venue for all legal proceedings shall be in Blue Earth County, Minnesota.