

# PROPOSAL

Presented To:

**ABA Express**

for

**Deutz TBD620V12 Diesel  
Power Module**

*Prepared By*



Proposal No. 709-2865

October 30, 2009

**This document is privileged and contains confidential information intended for use only by  
ABA Express.**

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## **1.0 Introduction**

ProEnergy Services (“ProEnergy”) is pleased to provide this proposal to ABA Express (“ABA”) for four (4) 1.5 MW Deutz TBD620V21 Diesel Power Modules.

The RS1500DD ISO Containerized Power Generation Module will meet your power generation needs. Each unit is a factory assembled and tested package. The prime mover is a Deutz Corporation diesel engine, model TBD620V12 running at 1800 RPM. The generator is manufactured by Marathon Electric and is model 743RSL4050. The rated output of the RS1500DD is 1500 kWe standby, 1390 kWe prime and 1320 kWe continuous.

## **2.0 Gas Turbine Generator Set Scope of Supply**

We are offering four (4) refurbished 1.5 MW Deutz TBD620V12 Diesel Power Modules which includes the following scope of supply:

### **2.1 Standard Features**

- Rated output 1500 kW Standby of 1350 kW Continuous.
- ISO Standard 40' High Cube container
- Isochronous, parallel load sharing or parallel baseload operation
- Critical-grade exhaust silencer
- Fuel Cooler
- Remote connections for Day Tanks
- Waste Oil sump pump, 24VDC
- Engine-mounted Battery charging alternator and 24VDC, 10amp static battery charger
- Low fuel level alarm
- Large-capacity, on-board fuel system (UL listed)
- High ambient, heavy-duty cooling system with modulating capacity control system
- Sound-attenuating acoustic insulation with perforated metal sheathing
- Duplex fuel filtration with water separator
- Sealed, maintenance-free 8D batteries with battery disconnect switch
- Lockable access doors
- Oversized power connection with lockable hinged cover and easily accessible customer interfaces
- Full service history and manuals

### **2.2 General Arrangement**

- A. The basic unit includes the engine, generator and fuel tank mounted to the deck, which occupies the majority of the container’s interior (refer to the attached General Arrangement Drawing). The switchgear cabinet is adjacent to the generator and is coupled to the generator terminal box by buss way. The exhaust silencers are situated above the engine. Service items such as filters and batteries are located on either end of the engine and are accessible through the double doors in both sides of the container. The unit is self-contained and designed to be transported over the road on a standard two-axle ISO container chassis. The completed unit’s maximum gross weight is 50,500 pounds, inclusive of coolant, oil and 200 gallons of fuel (without trailer). Loading will not exceed 17,000 pounds per axle based on a 2-axle trailer weight of 10,000 pounds

- B. External connections are provided for normal servicing of the generator set. These connections include fuel transfer ports, engine oil drain and radiator coolant drain. The secondary containment area drain can be used for normal “make ready” cleanup or in the unlikely event of an engine oil, fuel or coolant rupture. The external fuel connection can be utilized to transfer fuel from a bulk fuel storage tank. All drains have plugs installed with the exception of the rainwater drain.
- C. The power rating is applicable to heavy-duty Diesel generator sets and is based on ISO 8528 rating methods. Ratings and emissions compliance are optimized for 1800 RPM (60 Hz.) operation.

### 2.3 Engine

- A. The heavy-duty diesel engine is model TBD620V12, manufactured by Deutz Corporation. It is turbocharged and intercooled, operates on the four-stroke cycle, and is in a 90o vee configuration. The TBD620V12 is EPA certified at 1800 RPM and TA LUFT/2 approved for 1500 RPM operation.
- B. All fluids are pumped by engine driven pumps. This includes the fuel system, lube oil system, jacket cooling system and a separate charge air cooling system.
- C. The lube oil system includes a gear type lube oil pump, oil cooler, spin-on oil filters and a centrifugal type filter. A 24 VDC waste oil sump pump is installed to assist with routine oil change maintenance.
- D. A Racor Turbine Series fuel filter is installed on the engine. The Racor filter incorporates centrifugal separation along with a pleated media filter to remove water and solids. The Racor duplex filters are installed in parallel so they can be serviced while the generator set is online. A 24 VDC fuel priming pump assists with initial start up after the container is moved.
- E. The Woodward PRO-ACT II electronic governor provides engine speed control. It provides steady state frequency regulation better than  $\pm 0.5\%$ .
- F. The starting system consists of two 8D lead acid batteries supplying 24 VDC to the engine mounted starter. The heavy-duty, maintenance-free batteries will be in polyethylene battery boxes. The electric system has a master battery disconnect switch in the negative circuit. A 10 amp, float type battery charger is installed in the container and requires 120 VAC customer furnished power in the standby mode. An engine-mounted, battery-charging alternator maintains the charge on the batteries while the engine is running.
- G. The air intake system is fitted with dry type air filters with replaceable paper elements and restriction indicators. Combustion air for the engine is drawn into the container through fixed louvers and then through the heavy-duty air cleaners.
- H. A gauge panel is installed with mechanical gauges for oil pressure, water temperature, and fuel pressure.
- I. An automatic lube oil level regulating system is installed. The system has a 20-gallon rectangular tank to allow oil make-up while the engine is running.
- J. Dual 4000-watt jacket water heaters will be mounted on the engine block to maintain the engine in a warm, ready to start state. The water will circulate by convection to maintain the appropriate temperature while the engine is not running. The heaters are equipped with isolation valves and operate on 208VAC customer supplied power.
- K. The exhaust system consists of a stainless steel flexible exhaust connection mounted on the turbocharger outlet. This connects to the critical grade exhaust silencer, which provides typical sound attenuation of 25 to 30 dB(A). The outlet of the silencer is protected from debris or rain with a weighted rain cap.

## 2.4 Generator

- A. The MAGNAMAX generator is manufactured by Marathon Electric Manufacturing Corporation and is a single bearing design. The generator meets NEMA MG 1, parts 16 and 22, in design, performance and factory test procedures. The generator is rated 1500 kW, 1875 kVA standby and 1430 kW, 1788 kVA prime, 60 hertz, 1800 RPM, 3 phase, and 0.8 lagging power factor. The voltage will be 480 volt, but the units are capable of running at 380 VAC, 50 Hz or 480 VAC, 60 Hz.
- B. The generator is equipped with a permanent magnet generator excitation system. Both the PMG and the rotating brushless exciter will be mounted outboard of the bearing. The system shall supply a minimum short circuit support current of 300% of the rating for 10 seconds. The exciter uses a three-phase full wave rectifier assembly.
- C. The stator shall be a 2/3-pitch design to eliminate the third harmonic. The stator and rotor shall be insulated with NEMA Class H or better, synthetic, non-hygroscopic materials. The generator temperature rise will be 130 degrees C over a 40 degree C ambient at the standby rating.
- D. Voltage regulation shall be ¼% from no load to full load and 5% frequency variation. Regulator drift shall be less than ½% per 40 degree C ambient temperature change.
- E. The programmable digital voltage regulator, Marathon model DVR2000C, is located in the control cabinet.
- F. Strip heaters are installed to minimize condensation forming in the generator. These are supplied with 120 VAC power.

## 2.5 Assembly

- A. The generator is direct coupled to the engine flywheel housing and driven through a flex plate attached to the engine flywheel. The engine/generator assembly is mounted on the container floor with vibration isolators sized for the weight and duty.

## 2.6 Cooling System

- A. The cooling system consists of two radiator cores located in the container walls. One core serves the engine cooling water circuit and the other the charge air-cooling circuit. Hydraulic motors drive the two (2) high capacity fans. The variable speed fans are thermostatically controlled.
- B. Air is drawn through fixed louvers in the sides of the container and through the radiator cores and exhausted through fixed guards. The radiated heat of the engine-generator compartment does not heat the cooling air. Additional outside air is drawn through louvered openings at the engine end of the container to provide airflow across the engine generator set. The fans are of sufficient capacity to accommodate volume requirements of the radiator cores, the generator and switchgear as well as to dissipate the engine's radiated heat.
- C. Radiator drain lines have accessible valves. Radiator fill port and sight glass are accessible through and located near the rear cargo doors.
- D. The cooling system is designed to provide the rated heat rejection for prime power operation at 113°F ambient, and for standby power operation at 109°F.

## 2.7 Controls

- A. The Generator Control Panel is designed in accordance with NEMA and ANSI standards. The enclosure is freestanding and made of aluminum/steel construction. Each unit has the following standard features:
  - a. Basler DGC2000 controller
  - b. A Basler GPR generator protection relay with switches and controls.
  - c. On-board synchronization and load sharing capability.
  - d. Synchroscope and sync lights
  - e. Master circuit breaker open/closed indicator lamps and operating switch.
- B. The Woodward Governor Company synchronizing and load sharing modules offer a reliable and proven paralleling system working with the Woodward PRO-ACT II electronic governor. The Woodward AGLC allows the system to achieve preset baseload settings, automatically or manually while in the utility mode. The Woodward SPMA acts as a synchronizer for paralleling with an existing grid, utility, or other units. The Woodward Load Sharing Module provides for multiple generator sets to be paralleled and share load.

## 2.8 Breaker, Power and other Connections

- A. The 2500-ampere circuit breaker is a GE Power Break II with an interrupting capacity of 150,000 symmetrical amperes. The main breaker is an electrically operated, stored energy unit equipped for synchronizing and remote operation. The main circuit breaker is fixed in the freestanding generator control cabinet. The breaker cabinet door has lock-out/tag-out provisions.
- B. The electrical connections between the generator and the breaker are oversized bus bars on each phase. The minimum spread between buss bars is 6" for ample spacing. The bus bars continue from the breaker and terminate in the power connection box on the outside of the container. This box is used to house the connection to the customer's power cables.
- C. Customer interface connections are located in a separate section of the power connection box and include power, paralleling, and control signals. Control circuit breakers are included as needed. The customer's power cables are connected to the bus bars by standard lugs. The access door installed on the exterior side of the container for the cables is capable of being locked with the customer's power cables installed for added safety.
- D. A separate power supply is required to maintain the generator set in the standby mode when the engine is not running. Off-line power, 110/208 VAC via standard, twist-lock receptacle for supply of engine heater, generator strip heaters, battery charger, internal AC lighting, and convenience receptacles must be supplied when the generator set is in the standby mode.
- E. Control signals for paralleling RS1500DD units with other power systems can be accessed via heavy-duty industrial DIN-rail terminal strips mounted in the power connection box.
- F. Control signals for the remote start/stop and status monitoring of the unit can be accessed via heavy-duty industrial DIN-rail terminal strips. All customer control inputs are dry contacts. All customer status outputs are dry normally open contacts. These signals include:
  - a. Remote Start/Stop input (maintained contact)
  - b. Remote Start input (momentary contact)
  - c. Remote Stop input (momentary contact)
  - d. Engine Running/Stopped status dry contact output
  - e. Low Fuel Level status dry contact output
  - f. Remote breaker trip input.

- g. Remote emergency stop input
  - h. Breaker closed, dry contact.
  - i. Breaker tripped, dry contact.
  - j. Summary alarm, dry contact.
  - k. Low battery voltage, dry contact.
  - l. Low oil pressure pre alarm, dry contact.
  - m. High coolant temperature, dry contact.
- G. Grounding and bonding pads are located on the container chassis in two (2) locations, one below the power connection box and another diagonally near the rear side of the container. Full current grounds are provided from the generator set to the container chassis. Bonding straps are installed from the power connection box, control cabinet, fuel tank and engine skid to the container chassis.

## 2.9 ISO Container

- A. The container housing the engine-generator set is custom-built for the application and is fabricated to ISO specifications for an ocean going shipping container. It is fabricated from heavy gauge corrugated steel and hollow section to provide a rigid support for the entire generator set. The container is manufactured in accordance with Lloyds of London certification, or equal, and it has a CSC nameplate to signify meeting three-high ocean shipping standards. Since the container meets ocean shipping standards, it has ISO corner castings for twist lock fastening and overhead lifting, and nothing protrudes beyond the corner castings.
- B. The container engine compartment includes multiple access doors for operator safety with internal release hardware to open door even if padlocked from outside. There are standard container lockable doors on the rear of the container. All doors provide full height access with positive closing/locking mechanisms and heavy-duty hinges.
- C. The acoustic treatment is designed to meet a mean average ambient noise rating of 74 dB(A) at 7 meters. The acoustic attenuation is comprised of an acoustic infill of resin bonded mineral fiber of suitable density and thickness. The attenuation lining is non-hygroscopic, non-carcinogenic, noncombustible, and compliant with BS476.4 standard. The walls and roof are lined with the acoustic insulation that is retained by aluminum perforated metal.
- D. Air inlet silencers with suitable corrosion-resistant fixed blade weather louvers cover the openings for compartment ventilation, radiators, and combustion air intakes. The aluminum louvers are mounted to the container with a gasket to prevent corrosion caused by galvanic reaction.
- E. The container includes a seal-welded floor to provide environmental spill containment of up to 110% of the total fluids (fuel, engine coolant, lube oil, and hydraulic fluid). The seal-welded bottom is treated with spray-in type resilient coating to prevent leakage of fluids from the container at every possible point. Containment area drain plugs are included. The container is designed so that there is no inherent entry of rainwater into the fluid containment area.
- F. A connection box is provided for customer power connections located at the generator end of the container adjacent to the circuit breaker. The hinged door over the connection box is secured with a locking device.
- G. Internal lighting consists of fluorescent fixtures, powered by 120VAC shore power and by 24VDC battery power via a timer-controlled switch. Switch boxes for the lights and 120V GFI receptacles are located adjacent to each door.



- H. The exhaust outlet from the internally mounted exhaust silencer consists of rain caps to prevent rainwater from entering the piping while the engine is not running. The rain caps are mounted flush with the top of the container. The rain caps are oriented so that exhaust is deflected toward radiator fans to blow it away from the combustion air intakes.
- I. One portable personnel ladder is included with the optional trailer for container access. There are attachment points for the ladder located below each of the seven (7) access doors.
- J. The container dimensions are standard ISO 40 foot length, width, and “high cube” height. The exterior dimensions are:
  - a. Length: 480 inches (40 ft)
  - b. Width: 96 inches (8 ft 0 in)
  - c. Height: 114 inches (9 ft 6 in)

#### 2.10 Finish Coatings

- A. The painting system is applied in accordance with standard paint specification. This includes all carbon steel parts being commercially sandblasted clean prior to coating.
- B. The container interior and exterior is primed per manufacturer's recommendation. A finish coat is then applied. The container bottom is protected with ten (10) to fifteen (15) mils of a heavy duty sealing coating.
- C. The engine and generator are coated gray, (RAL 7015), controls are white, accessories and components are finished to the manufacturer's standard.
- D. Items fabricated are finished to standard coating and finishing specification.
- E. Finishing materials are applied in accordance with the manufacturer's recommendations and conform to local environmental regulations with regard to OSHA requirements and VOC emissions at the time of application.
- F. Owner furnished logo decals or sign placards are applied as required.

#### 2.11 Fuel Tank

- A. The unit is provided with a steel, UL-listed, 1100 useable gallon fuel tank. The tank is sized to achieve 8 hours of operating time at prime rating prior to re-filling. To facilitate easy filling, a 1" fill port shall be provided and terminated on the outside wall of the container.
- B. The penetrations from the tank exterior into the fuel tank are through the tank top and they are fully within the spill containment area. All fittings are NPT standard. The tank includes a slanted 4-inch fill neck with removable screen located within the 2-inch containment basin on top of the tank for overflow spill protection, and has an adjacent fuel level gauge.
- C. The fuel tank vent is routed to the outside of the container and incorporates a check valve. The fuel tank 6" emergency pressure/vacuum vent is located on top of the tank and is within the spill containment area.
- D. The fuel supply line to the engine terminates 1" above the tank bottom, and has a check valve. The fuel returns into a separate baffled section of the tank and terminates 1" above the tank bottom. A pick up port is provided for transferring fuel out of the tank.
- E. There are 6-inch clean out ports located at the top of each baffled section of the fuel tank.



### 3.0 Pricing

Pricing references the scope of equipment and service work described in this proposal:

- Four (4) Deutz TBD620V12 Diesel Power Module

Equipment is subject to prior sale until down payment is received.

#### 3.1 Equipment Pricing

- \$350,000 USD Each
- \$1,400,000 USD Total

#### 3.2 Payment

This proposal and pricing is based upon receipt of the progress payments shown below:

- Down Payment: 10% to initiate procurement for refurbishment and to take the units off the market. **Non-refundable**
- Balance: upon notice of readiness to ship.

Name: ProEnergy Services LLC

Bank: US Bank

Routing # 081000210

Account # 152305958703

Swift Code: USBKUS 44IMT (that is an “i” not a 1)

#### 3.3 Taxes, Duties and Fees

No sales or use taxes have been included in this quotation. The prices quoted exclude any federal, state or local taxes or fees which may be associated with the export, import or purchase of equipment and/or services.

### 4.0 Schedule

ProEnergy expects to prepare the equipment for shipment Ex-works within ninety (90) days after receipt of down payment.

### 5.0 Terms & Conditions

This proposal shall be valid for thirty (30) days; provided, however, the obligation to treat this proposal as confidential, and that it cannot be shared with any third party without the prior written consent of ProEnergy shall survive.

ProEnergy and ABA Express will negotiate in good faith to establish general terms and conditions that are usual and customary of the sale of used equipment.

## **6.0     Site Services**

ProEnergy would be pleased to also provide a proposal for the installation, startup and commissioning of the facility. This would include providing construction supervision as well as startup engineers for all equipment provided.

ProEnergy can also provide an experienced service representative to assist the operating personnel during the first two (2) months after the equipment goes online.

## **7.0     Follow Up**

Please contact the following person at ProEnergy for information regarding this proposal:

Omar Petit, Regional Sales Manager	or	Joaquin Mavares
<a href="mailto:opetit@proenergyservices.com">opetit@proenergyservices.com</a>		<a href="mailto:jmavares@proenergyservices.com">jmavares@proenergyservices.com</a>
Office: 660.829.5100		Office: 660.829.5100
Cell: 660.281.8588		Cell: 713.992.1790
Fax: 660.829.1160		Fax: 660.829.1160

**Attachment A**  
**Deutz TBD620V12 Specifications**

## Specifications

## Model RS1500D Power Generation Module

### Complete Unit

Manufacturer ..... Stewart & Stevenson  
Houston, Texas

### Engine

Manufacturer ..... Deutz ..... DDC  
Type ..... Diesel, 4-cycle ..... Diesel, 4-Cycle  
Model ..... TBD620 ..... Series 4000  
Number of Cylinders ..... V-12 ..... V-12  
Bore ..... 6.7 inches (170mm) ..... 6.5 inches (165mm)  
Stroke ..... 7.7 inches (195mm) ..... 7.5 inches (190mm)  
Displacement ..... 53.1 liters ..... 48.75 liters  
Speed(Rated) ..... 1800 rpm ..... 1800 rpm  
Governor ..... Woodward ProAct II ..... DDEC  
Starting Motor ..... 24VDC ..... 24VDC  
Alternator ..... 24VDC, 55A, belt-driven ..... 24VDC, 55A, belt-driven

### Generator

Manufacturer ..... Marathon  
Type ..... Brushless, single bearing  
Model ..... Magnamax 743RSL4050  
Insulation ..... NEMA Class H  
Temperature Rise (standby) ..... 130°C  
Temperature Rise (prime) ..... 105°C  
Exciter ..... PMG  
Voltage Regulator ..... Digital DVR2000C

### Engine Controls

Digital Engine/Generator Controller ..... Basler DGC2000  
Protection for ..... Low Oil Pressure  
High Coolant Temperature  
Engine Overspeed  
Large Backlit LCD Display ..... English or Metric Values  
UL Recognized ..... CSA Certified

### Generator Controls

Automatic Synchronizing module ..... Woodward SPM-A  
Load Sharing module ..... Woodward LSM  
Load Control module ..... Woodward AGLC  
Generator Circuit Breaker ..... General Electric Power Break II  
Generator Protective Relay ..... Basler BE3-GPR  
Three-phase RMS sensing ..... Microprocessor-based  
Wide trip range and reset adjustments ..... UL and CSA Certified

### Weights and Dimensions

Length ..... 40 feet  
Width ..... 8 feet  
Height ..... 9.5 feet  
Weight ..... 47,500 lbs(dry) / 50,500 lbs(transport)  
Fuel Tank Capacity ..... 1250 gallons

Specifications are subject to change without notice or obligation for continuous improvement.

### Instrumentation

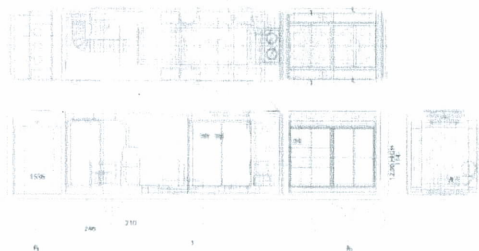
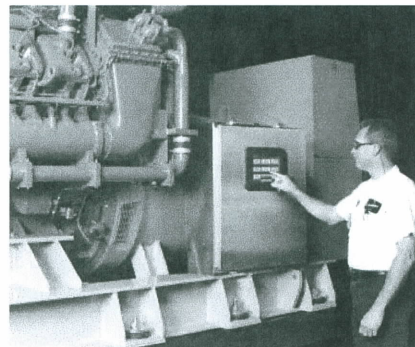
AC Voltmeter (3-phase)  
AC Ammeter (3-phase)  
AC Frequency Meter  
Synchronization Scope and  
Lights  
Engine Speed  
Engine Oil Pressure  
Engine Coolant Temperature  
Main Breaker Status Lights

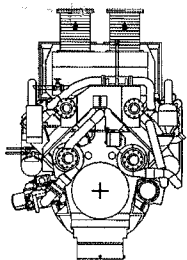
### Remote Capabilities

Remote Start/Stop input  
Remote Breaker Trip input  
Remote Emergency Stop input  
Remote Status Outputs  
(7 functions)  
Communications Port

### Options

ISO trailer chassis  
Cable storage boxes  
Extended Warranty  
Preventive Maintenance  
Agreement

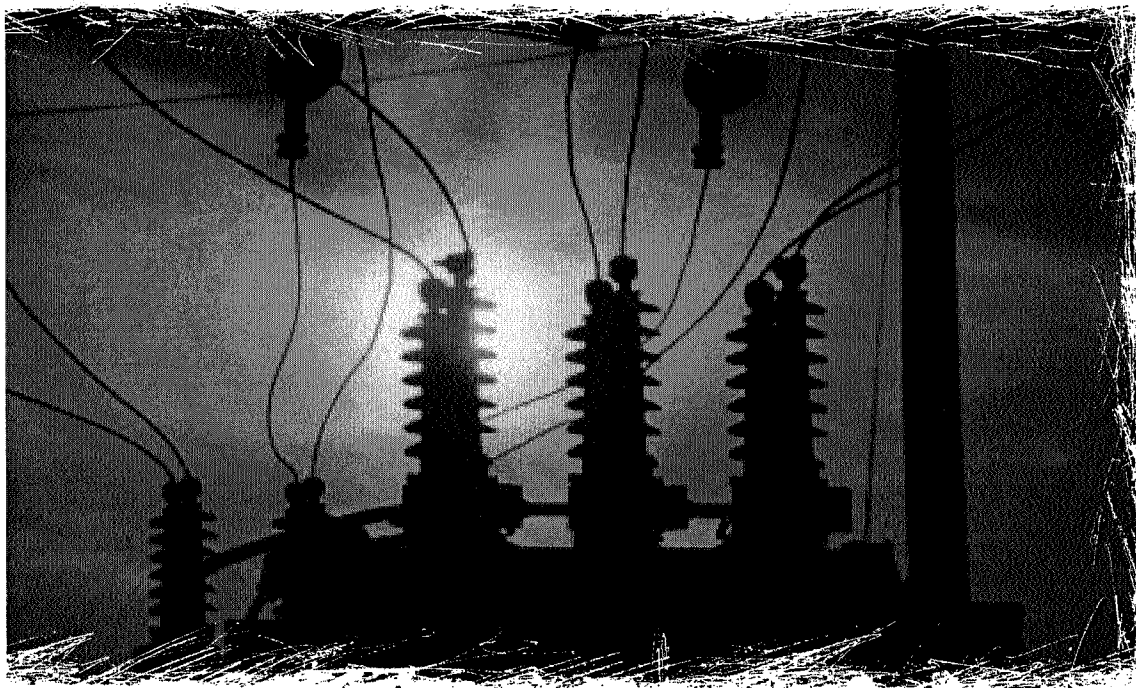




# TBD 620. The Gen engine.



1045-2510 kVA at 1500/1800 min<sup>-1</sup>



## These are the characteristics of the TBD 620:

Modern 8-, 12- and 16-cylinder 90°V-engines.

Turbocharging and charge air cooling.

Exhaust ducting via single-line PEARL® system (Pulse Energy Advanced Recovery Line).

Single cylinder heads with four-valve technology.

Electronic governor included in standard scope of supply.

Swirl optimized for high and low load with HALLO® swirl system (High and Low Load Swirl).

Application-specific cooling system.

Crankshaft with bolted counterweights and external torsional vibration damper.

Compact dimensions.

## Your benefits:

- ▶ High compression ratio and high ignition pressure ensure thanks to HALLO® swirl an extremely low fuel consumption. PEARL® guarantees low heat losses.
- ▶ High reliability and a long life of all components further enhance operating economy. Maintenance work is only required after long intervals and can be performed quickly and easily without extended downtimes.
- ▶ Compact dimensions offer optimum prerequisites for low installation costs.
- ▶ The engines are environmentally compatible and laid out for maximized operating economy. They fulfill easily the stringent exhaust emission regulations of TA-Luft 2000.

## ► Technical data

Engine type		TBD 620 V8		TBD 620 V12		TBD 620 V16	
Speed	min <sup>-1</sup>	1500	1800	1500	1800	1500	1800
Frequency	Hz	50	60	50	60	50	60

Engine/ genset ratings <sup>1)</sup>		TBD 620 V8		TBD 620 V12		TBD 620 V16	
Continuous power, ICN (COP) <sup>2)</sup>	kW	880	960	1320	1440	1760	1920
Prime power, ICN (PRP) <sup>3)</sup>	kW	922	1008	1384	1512	1844	2016
Limited-time running power, IFN (LTP) <sup>4)</sup>	kW	968	1056	1452	1584	1936	2112
Typical generator power output (COP) <sup>5)</sup>	kVA	1045	1140	1568	1710	2090	2280
Typical generator power output (PRP) <sup>5)</sup>	kVA	1095	1197	1645	1795	2190	2394
Typical generator power output (LTP) <sup>5)</sup>	kVA	1150	1255	1725	1880	2300	2510

Basic engine data		TBD 620 V8		TBD 620 V12		TBD 620 V16	
Inertia moment J							
– Engine without flywheel	kg/m <sup>2</sup>	6.2	6.2	10.75	10.75	7.42	7.42
– Flywheel	kg/m <sup>2</sup>	9.5	9.5	4.9	4.9	9.4	9.4
Weight, engine w/o cooling system	kg	3500	3500	4900	4900	6600	6600

Governing		TBD 620 V8		TBD 620 V12		TBD 620 V16	
Governor electronic		Woodward PRO ACT II		Woodward PRO ACT II		Woodward PRO ACT II	
– Speed droop (static, option)	%	adjustable ≤ 5%		adjustable ≤ 5%		adjustable ≤ 5%	
Control quality <sup>6)</sup>		G2	G2	G2	G2	G2	G2

Load acceptance <sup>7)</sup>		TBD 620 V8		TBD 620 V12		TBD 620 V16	
Recovery time	approx. sec.	2,2	1,2	2	1,2	2,2	1,1
Speed drop	approx. %	9	5	8	4	8	4
Inertia moment generator	kg/m <sup>2</sup>	18.7	18.7	35	35	65	65

Fuel system		TBD 620 V8		TBD 620 V12		TBD 620 V16	
Spec. fuel consumption at COP <sup>8)</sup>							
100 % load	g/kWh	193	199	193	199	194	200
75 % load	g/kWh	194	200	193	200	194	202
50 % load	g/kWh	199	204	199	206	200	208

Cooling system/cooling capacity		TBD 620 V8		TBD 620 V12		TBD 620 V16	
Cooling water volume engine	l	70	70	100	100	140	140
Cooling air flow rate	m <sup>3</sup> /h	86 832	77 160	127 180	124 420	155 520	136 857
Heat in engine cooling water	kW	232	288	414	432	498	602
Heat in charge air cooler	kW	176	213	264	320	352	427
Circulating water flow rate (Δt 10 K)	m <sup>3</sup> /h	46	55	54	59	46	56
Permissible resistance at Δt 10 K	bar	1	1,35	0,9	1,3	0,9	1,3
Circulating water flow rate	m <sup>3</sup> /h	27	31	39	47	39	47
Permissible resistance for cooler and water pipes outside the engine	bar	0.85	1.24	1.3	1.9	1.3	1.9
Max. cooling water temperature							
– Engine outlet	°C	82	82	82	82	82	82
– (Alarm)	°C	85	85	85	85	85	85
Heat radiation	kW	50	57	76	85	101	114

## ► Technical data

Engine type	TBD 620V8		TBD 620V12		TBD 620V16	
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Speed	min <sup>-1</sup>	1500	1800	1500	1800	1800
Frequency	Hz	50	60	50	60	60

### Lubrication system

Lube oil consumption at full load	g/kWh	1.0+0.3	1.0+0.3	1.0+0.3	1.0+0.3	1.0+0.3
Lube oil specification		API class CD or CE or CF4 and CCMC class D4/D5 (SHPD oil)				
Lube oil volume	l	70	110	110	150	150
- Oil pan top	l	95	95	150	200	200
- Oil pan bottom	l	90	90	90	90	90
Oil temperature max.	°C	2/3	2/3	4/3	4/3	4/3
Full-flow filter	pcs./l	2	2	2	2	2
Min. oil pressure (shutdown)	bar	2	2	2	2	2

### Combustion air system

Combustion air flow rate (COP)	m <sup>3</sup> /h	4435	4896	6920	7531	8870
Max. vacuum (filter clean)	mbar	20	25	20	25	25

### Exhaust system

Exhaust mass flow rate at full load (COP)	kg/h	5245	5789	8210	8943	10490
Exhaust temperature at full load and 25°C ambient temperature	°C	480	530	420	450	480
Max. permissible exhaust backpressure	mbar	20	25	20	25	25
Exhaust flange	mm	1x250	1x250	2x250	2x250	2x250
TA-Luft (4000)	mg/hm <sup>3</sup>	4000	-	4000	4000	4000

### Engine electrics

Electrical equipment:		9	9	9	9	15
- Starter motor	kW	55/28	55/28	55/28	55/28	55/28
- Alternator	A/V	300	300	400	400	475
- Battery (min. capacity)	Ah	3	3	6	6	6
- Coolant preheating unit	W	24	24	24	24	24
- Voltage	V	24	24	24	24	24

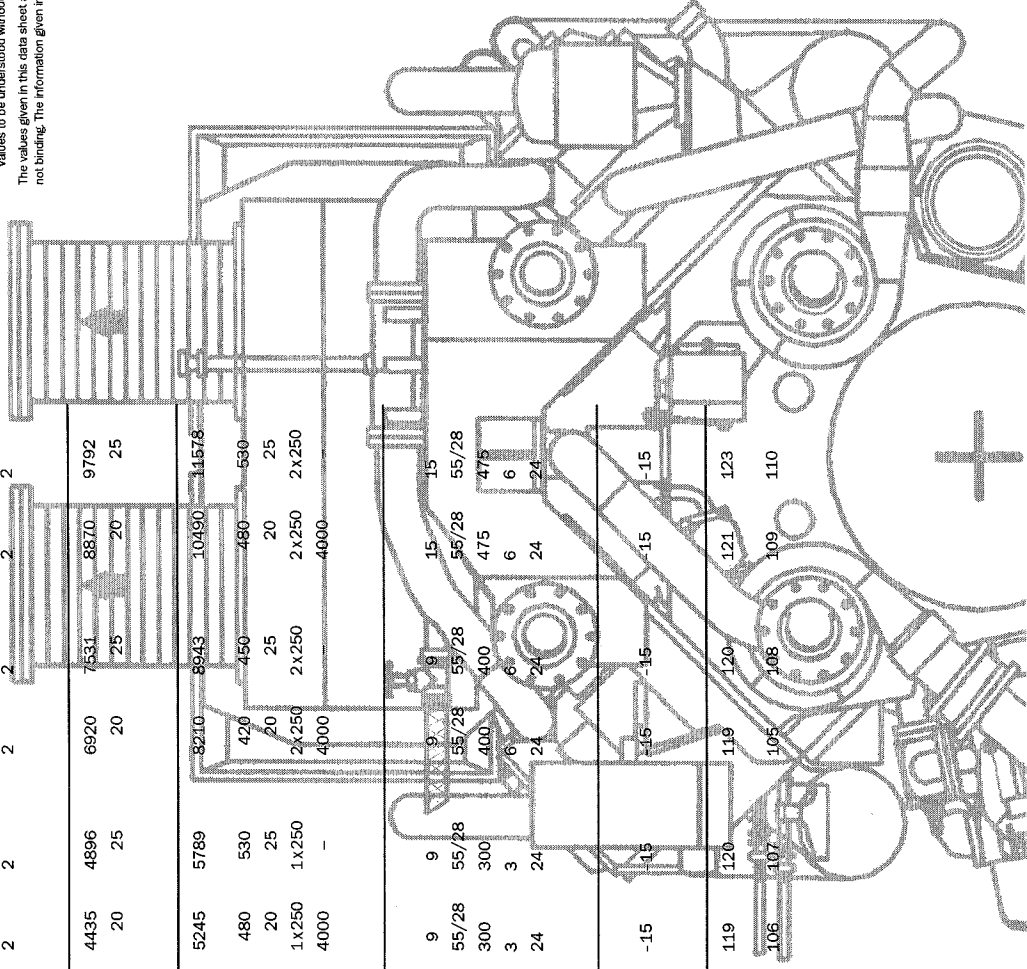
### Cold-start capability

Cold-start limit temperature:	°C	-15	-15	-15	-15	-15
- without starting aid						

### Noise emissions<sup>a)</sup>

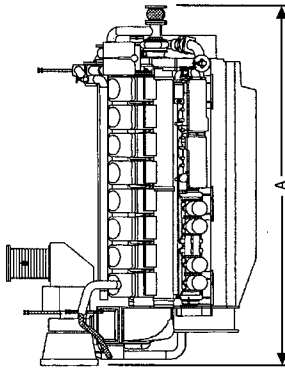
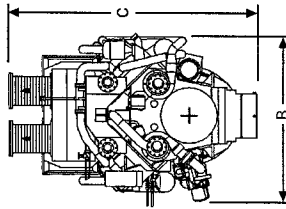
Sound power level	dB(A)/1pW	119	120	119	120	121
Sound pressure level at full load, 1 m distance	dB(A)	106	107	105	108	109
						110

- 1) Power reduction caused by altitude and temperature without deduction of fan power consumption.  
For details refer to DEUTZ.
- 2) Net continuous power 100% available at flywheel, no time limitation, plus 10% extra power for governing purposes.
- 3) Prime power 100%, average power output 80% within 24 hours, plus 5% extra power for governing purposes.
- 4) Limited time running power 100% which must be available 500 hours/year (thereof max. 300 hours/year continuously, no overload permissible; the required extra power for governing purposes must be taken into account however).  
Taking into account typical generator efficiency, power factor cos (φ) = 0.8, generator efficiency: 0.95.  
Performance acc. to ISO 8528.
- 5) Load application from 0 to 50% of the rated power starting from the idling speed of 1560 or 1872 min<sup>-1</sup> (speed drop 4%).
- 6) For fuel specification see operation manual.
- 7) Cumulative noise level weighted according to dB (A) with a tolerance of +/- 1.5 dB (A).  
Values to be understood without cooling system.  
The values given in this data sheet are for information purposes only and not binding. The information given in the offer is decisive.





## ► Dimensions



Engine type	A	B	C
TBD 620 V8	mm	1950	2035
TBD 620 V12	mm	2700	2180
TBD 620 V16	mm	3200	2180

## ► Standard Specification

Standard engine:..... Basic parts  
Cooling systems:..... Dual-circuit cooling system  
(air-to-water charge air cooling),  
with LT thermostat loose,  
mechanical engine cooling water pump,  
mechanical pump for charge  
air cooler coolant,  
cooling water preheating unit, loose.  
Exhaust system:..... Exhaust manifolds and elbow,  
two exhaust turbochargers  
(with V8: one turbocharger),  
insulated exhaust pipes.  
Filters:..... Plate-type air cleaner with paper element,  
fuel twin filter, lube oil single filter.  
Governor:..... Electronic governor.  
Flywheel:..... Flywheel with 18" connection.  
With 21" connection for V16.  
Adapter housing:..... SAE O housing.  
Engine electrics:..... Starter motor 24 V, 9 kW (with V16: 15 kW),  
analog sensor for cooling water and  
charge air temperature, lube oil and  
crankcase overpressure, electr. priming  
pump set, solenoid shutdown, wiring to  
engine switchbox.  
Miscellaneous:..... Painting in diamond grey,  
operation manual,  
spare parts catalogue.

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