

## TECHNICAL SPECIFICATION

Date: 07.08.2006  
Rev.16.01.2008 by U.S. (A)  
Rev.05.03.2008 by G.S. (B)

**YARD** : Jiangnan SY  
**OWNER** : BCH-Befrachtungskontor Hamburg GmbH & Co.KG  
**FLAG STATE** : Liberia or Marshall Islands  
**TYPE OF SHIP** : 5100 TEU CV  
**Yard Project NO:** H2431/32/33  
**LIAG PROJECT NO:** 05-1623 GL  
**LIAG ORDER NO** : 180048 0000ff-180050 0000 before 19974000 **but check (same small additions)**

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1 Nos. CLASSIFIED LIAG/MAN EMERGENCY MARINE DIESELGENERATING SET (S)  
Classification: Germanischer Lloyd on behalf of CCS

**Set Rating** : 240 kW, 300 kVA at p.f 0,8  
**Voltage** : 3 x 450 Volt  
**Frequency** : 60 Hz  
**Speed** : 1800 rpm

**Attention: the connection diameter of flanges and the distance between flanges is according to JIS standard.**

### Reference Data for Rating and Consumption Details:

45°C. ambient air temperature at 1000 mbar and 60% relative air humidity. The diesel engines can adopt/manage to the total connected statutory load (sudden applied load) in the initiated stage as per Classification rules, however the statutory load (sudden applied load) must not exceed 70% of max. engine power.

Cooling System for the Set : Radiator cooler and pusher fan for max. 50°C. ambient temperature.

Starting System for the Set: MAIN : Electric 24V, 2-pole

EMERGENCY: Manual, hydraulic type,  
Bryce Berger

Construction of the Set : The diesel engine, MAN type D 2866 LXE 20 and the alternator, Leroy Somer type LSAM 46.2 L9 are flanged together and connected through a flexible coupling in order to avoid dangerous tensional vibrations. The vibration calculations will be made from LIAG/MAN.

The diesel engine and the alternator are mounted on a common marine bed frame, manufactured of electro welded steel profiles and also mounted on vibration dampers, which are mounted between the set and the bed frame.

### Cooling System for the set:

Fan-cooled radiator for 50°C. cooling ambient temperature with flange connection for air duct, finger protection guard for fan, piping, flexible connections and all other mounting materials are delivered and fitted to the set.

The fan is a pressure type.

### Diesel Engine Data:

MAN water-cooled, four-stroke diesel engine, turbo charged, inter cooled, counter-clockwise rotation seen from the flywheel.

**Engine Type** : MAN D 2866 LXE 20  
**ISO-rating acc. to IXCN** : 313 kW at 1800 rpm  
**Derating for fan** : 18 kW  
**Overload** : 10% for 1 hour within 12 hours acc. to IXCN  
**Number of Cylinders** : 6  
**Arrangement of Cylinders:** In line.  
**Bore/Stroke** : 128/155 mm  
**Piston displacement** : 11,967 liters.

The fuel consumption stated below refers to a net calorific value of 42,000 kJ/kg (10,000 kcal/kg) for fuel acc. to DIN 51601-BS MA class M1 or B1-ISO 8217 DMX+DMA:

At 100% load: 208 g/kWh  
At 75% load: 205 g/kWh  
At 50% load: 209 g/kWh

The consumption is given with 5% tolerance.

The lube oil consumption per engine running hour is approx. < 325 g, excl. oil changes.

Air for combustion : 1.600 m<sup>3</sup>/h  
Exhaust gas heat : 285 kW  
Exhaust gas temp. : 470 °C  
Exhaust gas mass flow : 1.920 kg/h  
Exhaust gas volume flow : 4.090 m<sup>3</sup>/h  
Exhaust gas back pressure, max : 60 hPa  
Jacket water heat, non-cooled  
Exhaust manifold : 125 kW  
Minimum cool. water circulation : 25.200 l/h  
Cooling air for fan cooler : 24.500 m<sup>3</sup>/h

**All engines related data are fuel optimised, as emergency does not require NOx certificates according to "ANNEX VI, Regulation 13(1)(b)(i)"**

### Engine Equipment:

- Basis engine
- Air filter, marine type
- Full-flow lube oil filter with drip tray
- Lube oil cooler
- Freshwater cooling pump with thermostats
- Duplex change-over fuel oil filter with drip tray
- Fuel oil pressure gauge, mounted on the engine (according rules of GL)
- Flameproof flexible fuel oil hoses

- Flywheel and -housing
- Fuel injection pump with fuel lift pump and pre-filter
- Mechanical governor for constant speed
- Turbocharger air-cooled and isolated
- Intercooler
- Exhaust manifold(s) air-cooled, isolated and sheet plate covered
- Lube oil sump for inclination up to 12,5 deg. forward / 22,5 deg. at the side
- Hand pump for lube oil draining
- Electric starter, 24V 2-pole, marine version
- Emergency starter, manual, hydraulic type, operating unit installed on right side (seen from "engine-side" of the set)
- Flexible coupling between diesel engine and alternator
- Stop solenoid 24V
- Cooling water pre-heater 1 kW / 230V, with thermostat
- Double fuel oil pipes with alarm sensor

**Alternator Data:**

**Make** : Leroy Somer, type LSAM 46.2 L9  
**Rating max.:** 240 kWe, 300 kVA p.f. 0,8 (A)  
**Voltage** : 3 x 450 Volt  
**Frequency** : 60 Hz  
**Speed** : 1800 rpm

**Insulation Stator/Rotor:** H/H, temp. rise F  
**Enclosure** : IP 23

The alternator is a 2-bearings, brush less, self-exciting, self-regulating with revolving field, in-ventilated, drip-proof design and with damper windings included.

The voltage regulation is maintained within limits of +/- 1% from no load to full load at any power factor between 0,8 and 1,0.

**Alternator Equipment:**

- Anti-condensation heater(s) AC 230V
- Cable glands for out connection to be provided by maker, mounted on left side (seen from "engine-side" of the set).  
The size of the cable glands will be confirmed by the yard during approval period.

**Instrument Panel and automatic start-/stop and shut down equipment:**

Is flexible mounted on the set on right side (seen from "engine-side" of the set), and contains the following:

- Cooling water temperature gauge
- Lube oil pressure gauge
- Cooling water pressure gauge (B)
- Lube oil temperature gauge (B)
- Tachometer
- Hour counter

Starting device with 3 automatic start attempts in case of mains failure  
Indication lamps for alarms and shut-down, mentioned above  
Alarm reset push button  
Prepared for acoustic alarm  
Buzzer and buzzer reset  
Selector switch OFF/AUTOMATIC/MANUAL  
Start push button  
Stop push button  
Lamp for set in operation  
Indication lamp for start failure  
Automatic, delayed stop after mains have returned

Free terminals for remote indication:

- control voltage failure
- alarms activated (common)
- shut-down activated (common)
- set in operation
- start failure
- remote start/stop
- engine ready (automatic)

All being completely wired to the engine.

Enclosure IP 44

#### **Alarm Equipment:**

The set is equipped with alarm sensors for following failures:

- Low lube oil pressure 1,5 bar
- High lube oil temperature 120 °C
- High cooling water temperature 93 °C
- Leak in fuel oil pipes
- Low cooling water pressure 0,2 bar
- Low cooling water level MAN
- Control voltage failure
- Over-speed (shut down only)

All sensors are connected the engine instrument panel

#### **Shut-down equipment:**

The set is equipped with sensors for automatic shut-down at following failures:

Over-speed

The sensors are connected to the engine instrument panel.

### **Signs:**

All signs on the set will be in English and Chinese.  
All sensors will be equipped with a name plate, indicating the set point and function in English and Chinese.

### **Painting:**

The set will be painted in **Munsell notation: 7,5 BG 7/2**, unless others is specified.

The panel will be painted in a gray color **RAL 7035**.

### **Equipment mounted on the set:**

- 1 Set starting batteries (80 Ah) installed in a box according the rules
- 1 PCS battery Charger (24V DC) with alarm.
- 1 PCS battery switch

### **Equipment delivered loose with the set (per set):**

- 1 PCS silencer ND 200 **uninsulated** with spark arrester, flanges, counter-flanges and mounting kits, noise reduction 20 dB.  
**Insulation has to be done by the yard after installation.**
- 1 PCS flexible exhaust expansion joint(s) with flanges, counter flanges and mounting kits. Welded
- 1 PCS potentiometer for alternator
- 1 PCS flexible duct for connection

### **Spare parts and tools (per ship):**

- 1 Set of spare parts for the engine according to enclosed list.
- 1 Set of special tools for the engine according to enclosed list.
- 1 Set of spare parts for the alternator according to enclosed set.

### **Final Documentation (per ship):**

- 3 Sets of spare parts books for the engine in 5 languages
- 3 Sets of operation instruction books for the engine in English.
- 3 Sets of installation, service and maintenance manuals for the alternator in English
- 3 Sets of Technical data's, descriptions, service instructions and drawings for the delivered equipment in English.
- 4 PCS Final documentation on CD ROM

### **Additional Drawing Documentation:**

- 4 Sets Approval Drawings total for all ships have to be delivered within 21 working days ex works after LIAG received firm order for the sets.
- 1 Set Approval drawings must be returned to LIAG with the shipyards/owners comments latest 21 working days after yard/owner received the approval drawing, for secure of correctness.

4 Sets Working Drawing for all ships have to be send 21 working days after LIAG received the approved drawing from shipyard.

**Certificates and Test run:**

The complete set will be delivered with certificates from GL on behalf of CCS.

The equipment will be tested according to classification rules in our workshop in Germany in the presence of the classification society. Together with the set will be send the test report from Lindenberg, the test report of the engine and the test report of the alternator. The certificates will be delivered later on with special express courier.

**Warranty:**

12 months after starting up on board the ship, max. 18 months after delivery from LIAG, whichever come first.

Uwe Schmidt  
**Lindenberg-Anlagen GmbH**

**RECOMMENDED**

**Maintenance Spare Parts for the Emergency Generating Set**

Diesel Engine Maintenance Spare Parts

<b>Qty.</b>	<b>Description:</b>
2	Cylinder head gaskets individual cylinders
1	Cylinder head cover gaskets for one engine
1	Nozzle with needle
1	Seal ring for nozzle
2	Fuel filter elements (spin-on type)
2	Lube oil filter elements with gaskets

Alternator Maintenance Spare Parts

<b>Qty.</b>	<b>Description:</b>
1	Ball bearing drive end
1	Ball bearing non drive end

Tools for the Diesel Engine

<b>Qty.</b>	<b>Description:</b>
1	Turning gear
1	Tapped key for injection nozzle
1	Hammer for injection nozzle
1	Ratchet key for tuning gear and tapped key