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Document Title:
Technical Submittal - Mechanical Drawing and Data Sheet

Project: LHR 21

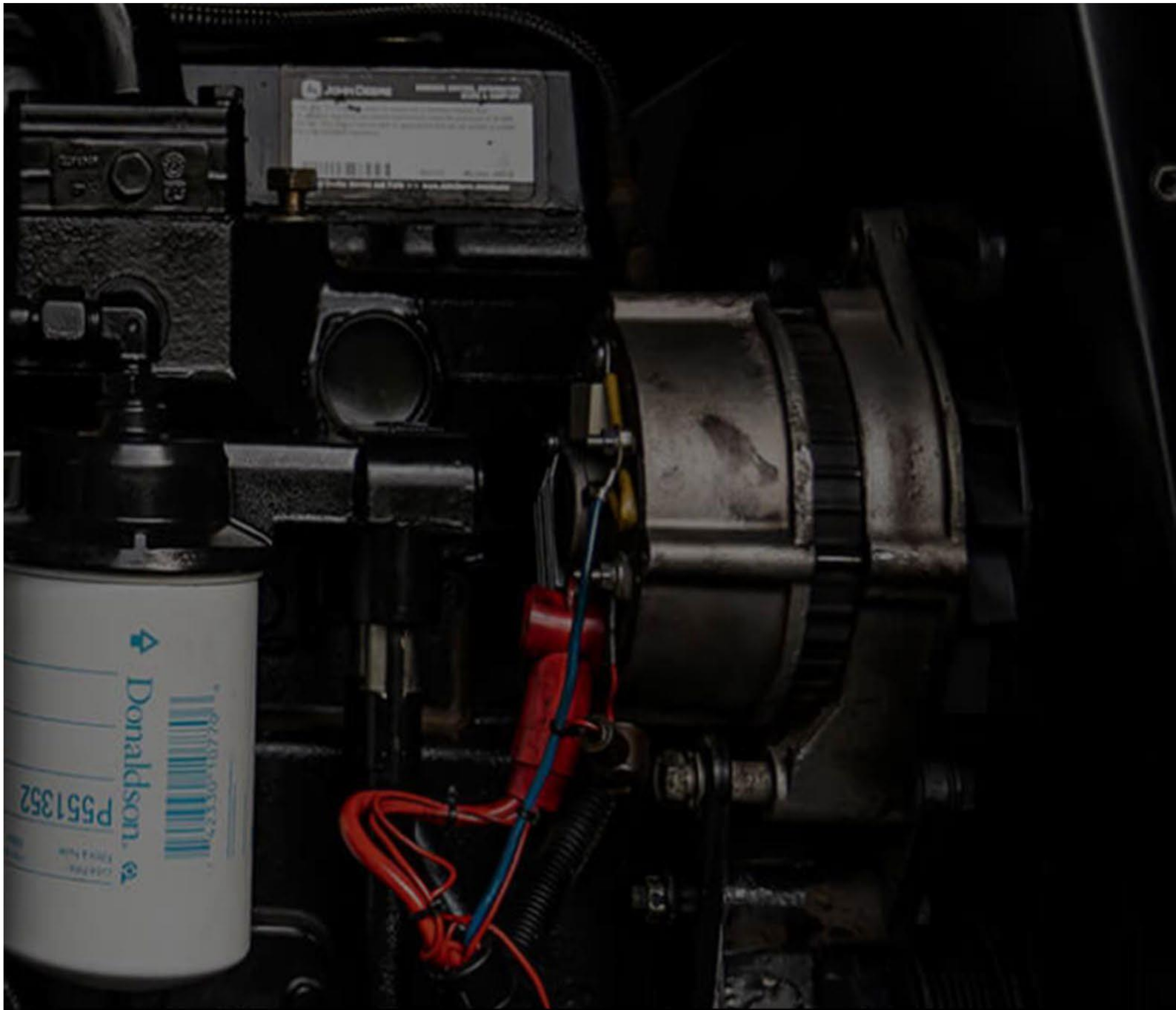
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Status: S4 Suitable For Stage Approval

WB Power Services Ltd |
Generator Sales, Hire,
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WBPS



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REV	Status	Author	Date	Notes
P01	S4 – Suitable For Stage Approval	Martin Parker	20-09-2023	Technical Submittal – Mechanical Drawing and Data Sheet



Comments Response

GENERATOR TECHNICAL SPECIFICATION
AVI43402 - VDC - LHR21



GENERAL SPECIFICATION

Generator Set Power Rating (DCP*) (kVA)	3250
Engine	Kohler KD83V16-5CES
Alternator	Leroy Somer LSA 54 M90
Net Apparent/Active Power on Site Conditions (^)	3250 kVA / 2600 kWe DCP ISO8528-1
Rated Voltage (V)	400/230
Rated Current (A)	4869
Rated Frequency (Hz)	50
Rated Power Factor	0.8
Control Panel	AMP802
Circuit Breaker	Not included
Cooling System	Mechanical radiator
Daily Tank	Not included
Performance Class	ISO8528-G3
One step load acceptance (Out of ISO criteria)	100%

**(DCP) = Data centre mission Critical - Data centre power is defined as being the maximum power which a generating set is capable of delivering while supplying a variable or continuous electrical load and during unlimited run hours.*

(^) subject to site installation constraints

DIMENSIONS

Length (mm)	
Width (mm)	
Height (mm)	Refer to drawing AVI43402-01-000101
Dry Weight (kg)	

SITE CLIMATIC CONDITIONS

Outside Minimum Temperature (°C)	-15
Outside Maximum Temperature (°C)	+44
Altitude (m)	<1000

COLOUR

Engine	Black
Alternator	RAL 1014 Ivory
Control Panel	RAL 7035 Light grey

Reference Conditions: 25°C Air Inlet Temperature, 40°C Fuel Inlet Temperature, 100 kPa Barometric Pressure; 10.7 g/kg of dry air Humidity. Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit; Fuel density at 0.85 kg/L. Data was taken from a single engine test according to the test methods, fuel specification and reference conditions stated above and is subjected to instrumentation and engine-to-engine variability. Test conducted with alternate test methods, instrumentation, fuel or reference conditions can yield different results. Data and specifications subject to change without notice.



Industrial Diesel Generator Set – KD3500-E

50 Hz - Emission Optimized – EPA Tier 2 Compliant

Engine & Cooling System Specification

General

Engine brand	KOHLER KD Series
Engine ref.	KD83V16-5CES
Air inlet system	Turbo
Fuel	Diesel Fuel/HVO
Emission level	Emission optimization - EPA Tier 2 Compliant
Cylinder configuration	V
Number of cylinders	16
Displacement (l)	82.74
Bore (mm) * Stroke (mm)	175 * 215
Compression ratio	16 : 1
Speed 50Hz (RPM)	1500
Maximum stand-by power at rated RPM (kW)	3007
Piston type & material	Forged Steel
Charge Air coolant	Water/Air
Frequency regulation, steady state (%)	+/- 0.25%
Injection Type	Direct
Governor type	Electronic
Air cleaner type, models	Dry

Fuel system

Maximum fuel pump flow (l/h)	1070
Max head on fuel return line (m fuel)	3.50
Maximum allowed inlet fuel temperature (°C)	70

Consumption with cooling system

Fuel consumption @ ESP 100% Max Power (l/h)	707.50
Fuel consumption @ ESP 75% Max Power (l/h)	559.80
Fuel consumption @ ESP 50% Max Power (l/h)	394.40

Consumption with cooling system

	ESP
Consumption @ 100% load (g/kW.h)	200
Consumption @ 75% load (g/kW.h)	211
Consumption @ 50% load (g/kW.h)	223

Starting system

Dual redundant	
Battery charging alternator	1
Electric starter (24 Vdc)	2
Starting batteries (24 Vdc) (4 x 50 Ah Optima)	2 sets
Battery isolator switch	1 per battery set

Lubrication System

Oil system capacity including filters (l)	560
Min. oil pressure (bar)	3.70
Oil capacity between dipstick marks (l)	83
Oil sump capacity (l)	460
Oil consumption 100% ESP 50Hz (l/h)	1.42

Air Intake system

Max. intake restriction (mm H2O)	510
Combustion air flow (l/s)	3720.58

Exhaust system

	ESP
Exhaust gas flow (L/s)	10266
Exhaust gas temperature @ ESP (°C)	510
Heat rejection to exhaust (kW)	2090
Max. exhaust back pressure (mm H2O)	867

Cooling system

Dual circuit radiator	
Fan driven by engine	
Radiator & engine capacity (l)	1225
Fan power 50Hz (kW)	88
Fan air flow w/o restriction (m3/s)	45.6
Available restriction on air flow (Pa)	300
Ambient temperature design (°C)	40
Type of coolant	GENCOOL
Radiated heat to ambient (kW)	140
Heat rejection to coolant HT (kW)	1100
Heat rejection to coolant LT (kW)	820
HT circuit flow rate (l/min)	1980
LT circuit flow rate (l/min)	620
Coolant capacity HT, engine only (l)	270
Coolant capacity LT, engine only (l)	105
Outlet coolant temperature (°C)	85
Max coolant temperature w/o derating (°C)	100
Max. pressure at inlet of HT water pump (mbar)	2500
Thermostat begin of opening HT (°C)	71
Thermostat begin of opening LT (°C)	45
Thermostat end of opening HT (°C)	81
Thermostat end of opening LT (°C)	57
Expansion tanks – radiator mounted	2
HT Standard pressure cap setting (kPa)	100
LT Standard pressure cap setting (kPa)	100

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50 Hz - Emission Optimized – EPA Tier 2 Compliant

Additional engine features

- Air filter (x4)
- Engine water pre-heater (9 kW)
- Engine water circulation pump (150 W)
- Pre-lubrication pump (24V dc)
- Primary fuel filter/water separator
- Fuel return cooler (24 Vdc)
- Oil drain pump (manual) – engine mounted
- Vibration isolation mounts (x12)
- Exhaust bellows (x4)
- Exhaust manifold (4x DN175 inlet / 1x DN500 outlet)

Noise spectrum

ENGINE SOUND KD83V16	Fr (Hz)		Unité	63	125
	Sound power	Rought spectrum	dB	118.8	126.7
		dBA weighting	dB	-26.2	-16.1
		dBA weighted spectrum	dBA	92.6	110.6
MECH RAD	Fr (Hz)		Unité	63	125
	Sound power	dBA weighted spectrum	dBA	88	99.7
ENGINE + MECH RAD	Sound power	dBA weighted spectrum	dBA	93.9	110.9

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Emissions

Reference Conditions: 25°C Air Inlet Temperature, 40°C Fuel Inlet Temperature, 100 kPa Barometric Pressure; 10.7 g/kg of dry air Humidity. Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit; Fuel density at 0.85 kg/L.

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KD3500

50 Hz. Diesel Generator Set EMISSION OPTIMIZED DATA SHEET TIER 2 COMPLIANT

ENGINE INFORMATION

Model:	KD83V16	Bore:	175 mm (6.89 in.)
Type:	4-Cycle, 16-V Cylinder	Stroke:	215 mm (8.46 in.)
Aspiration:	Turbocharged, Intercooled	Displacement:	83 L (5048 cu. in.)
Compression ratio:	16:0:1		
Emission Control Device:	Direct Diesel Injection, Engine Control Module, Turbocharger, Charge Air Cooler		

EXHAUST EMISSION DATA:

EPA D2 Cycle 5-mode weighted

HC	0.45 g/kWh
NO _x (Oxides of Nitrogen as NO ₂)	5.88 g/kWh
CO (Carbon Monoxide)	1.05 g/kWh
PM (Particular Matter)	0.08 g/kWh

EMISSION DATA

Cycle point	100% ESP	100% PRP	75% ESP	75% PRP	50% PRP					
Power [kW]	3007	2734	2255	2051	1367					
Speed [rpm]	1500	1500	1500	1500	1500					
NO _x [g/kWh]	9.3	7.8	6.0	5.9	5.2					
CO [g/kWh]	0.2	0.2	0.3	0.4	1.3					
HC [g/kWh]	0.29	0.31	0.34	0.35	0.45					
PM [g/kWh]	0.01	0.01	0.02	0.02	0.07					
	@ 5% O ₂	@ 15% O ₂	@ 5% O ₂	@ 15% O ₂	@ 5% O ₂	@ 15% O ₂	@ 5% O ₂	@ 15% O ₂	@ 5% O ₂	@ 15% O ₂
HC [mg/Nm ³]	98	37	102	38	109	41	113	42	134	50
NO _x [mg/Nm ³]	3174	1190	2610	979	1920	720	1873	702	1538	577
CO [mg/Nm ³]	79	30	82	31	105	39	120	45	382	143
PM [mg/Nm ³]	2	1	2	1	7	3	6	2	21	8

TEST METHODS AND CONDITIONS

Test Methods:

Steady-State emissions recorded per ISO8178-1 during operation at rated engine speed (+/-2%) and stated constant load (+/2%) with engine temperatures, pressures and emission rated stabilized.

Fuel Specification:

EN590 Diesel Fuel

Reference Conditions:

25°C (77 °F) Air Inlet Temperature, 40°C (104 °F) Fuel Inlet Temperature, 100 kPa (29.53 in Hg) Barometric Pressure; 10.7 g/kg (75 grains H₂O/lb) of dry air Humidity. Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit.

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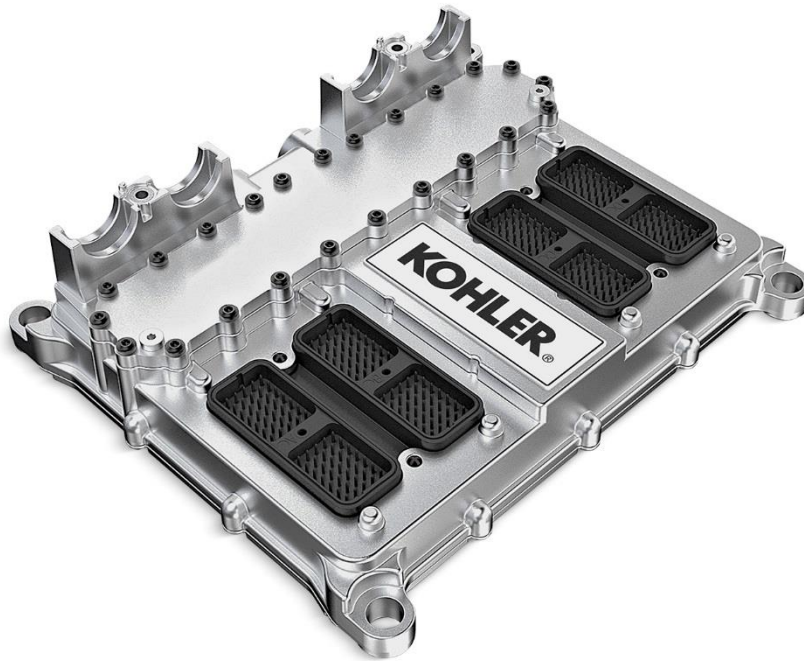


Industrial Diesel Generator Set – KD3500-E
50 Hz - Emission Optimized – EPA Tier 2 Compliant

Engine ECU

Reference Conditions: 25°C Air Inlet Temperature, 40°C Fuel Inlet Temperature, 100 kPa Barometric Pressure; 10.7 g/kg of dry air Humidity. Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit; Fuel density at 0.85 kg/L.

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Uncompromisingly robust: The ECU2-HD, ensures optimal control of the injection system for reliable engine operation. It performs reliably even under challenging environmental conditions, which is underlined by a **IP6K9K rating** with connected cable harness.

It masters extreme operating temperatures **from -40°C up to +125°C**.

Thus, the control units also qualify for safe operation in restricted space with low airflow and strong heat generation, thanks to fuel or liquid cooling. They are suitable for direct mount on the engine. Standardized communication interfaces allow easy integration.

The control unit is suitable for diesel engines with up to 12 cylinders. As a cascaded solution, it controls up to 20 cylinders.

The ECU2-HD matches perfectly to the **KOHLER Engine Common Rail System**. The control unit fulfills the functional safety requirements of function chains according to international safety standards. Due to the **integrated self-diagnosis**, the ECU2-HD checks itself, which facilitates maintenance. Integrated fuel cooling ensures safe and reliable operation of the ECU2-HD, even in case of strong heat generation.

FEATURES

- Combined control of engine and exhaust gas treatment
- 12 power outputs for injector activation
- Control of up to 20 cylinders in cascaded use
- Suitable for direct mount on the engine
- High functionality of self-diagnostic for a safe operation
- Standardized communication interfaces: J1939, UDS
- Functional safety according to EN ISO 13849
- Temperature range from -40°C to +125°C
- Robust and reliable in harsh conditions
- Platform for EU Stage IV / V, Euro V / VI and EPA Tier 4f

TECHNICAL DATA

Microcontroller	Freescale SPC56xx Family
Frequency	256 MHz
Memory	4 MB Flash 256 kB RAM internal 4 MB RAM external (optional) 128 kB EEPROM external
Digital inputs	10 x configurable logic levels
Analogue inputs	2 x configurable 0–5 V / 0–25 mA 17 x 0–5 V 14 x 0–33 V
Resistance inputs	19 x resistance 0–50 kΩ
Frequency inputs	2 x Hall speed sensor 8 x universal freefrequency measurement range 0.5 Hz to 10 kHz
Constant voltage outputs	12 x 5 V 2 x 12 V 11 x UBATT
PWM outputs	10 x half bridge configuration with current measurement
Digital outputs	12 x high-side 8 x low-side
Controlled analogue outputs	1
Power outputs for injectors	12 x split into four stages
Communication interfaces	4 x CAN according to ISO 11898-2, thereof one galvanically isolated
Plug	DEUTSCH DRC 280 Pins (4 x 70)
Dimensions	334 x 296 x 85.9 mm (without strain relief clamp)
Weight	5.4 kg
Housing	Die-cast aluminium
Rated voltage	+24 V
Operating temperature	-40 °C to +80 °C with air cooling -40 °C to max. +125 °C with fuel cooling
Flammability	UL 94 V-0
IP rating	IP6K9K with and without connected cable harness



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Optima red top battery

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OPTIMATM

BATTERIES

THE ULTIMATE POWER SOURCETM



**AGRICULTURE · CONSTRUCTION
EQUIPMENT · GENERATORS ·
EMERGENCY VEHICLES ·
CLEANING**

OPTIMA[®] YELLOWTOP[®]

DUAL PURPOSE BATTERY (STARTING & SEMI TRACTION)



**UP TO 3 TIMES
QUICKER RECHARGING**



**OVER 15 TIMES MORE
VIBRATION RESISTANCE**

OPTIMA YELLOWTOP is made to install and forget. No matter the conditions, be it dampness, heat, dirt or exposure to extremes in vibration or regular discharge, it is guaranteed to deliver uninterrupted power throughout the entire discharge cycle. The ability to hold a higher voltage during the discharge cycle makes it possible to utilize more of the stored power in the OPTIMA, compared to ordinary batteries. All of these benefits are due to OPTIMA's SPIRALCELL TECHNOLOGY[®], which combines the advantages of a starting battery with those of a deep cycle battery. The YELLOWTOP handles many discharges as well as re-charges without losing significant capacity and is also ideal for seasonal use because of its very low self-discharge rate.

OPTIMA® REDTOP®

STARTER BATTERY*



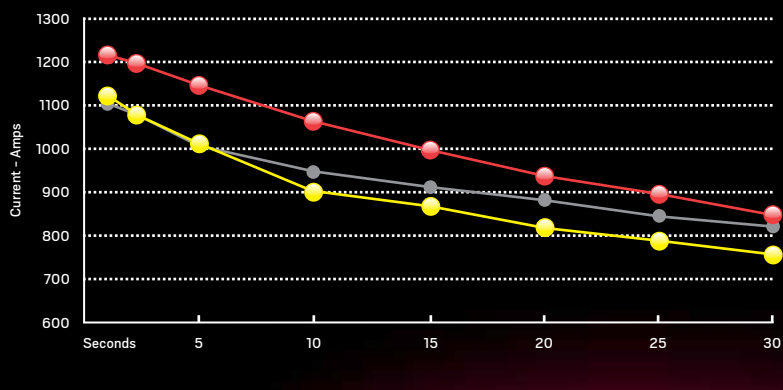
**100 % SPILL-PROOF AND
MAINTENANCE FREE**



**STARTING POWER EQUIVALENT TO BATTERIES
2 – 3 TIMES OPTIMA'S SIZE AND WEIGHT**

For agricultural use, where machinery is used seasonally, the OPTIMA REDTOP shows its outstanding starting capacity. Even if the battery has been left out in the tractor or harvester over the winter, the REDTOP will provide starting power the first time.* The key to the REDTOP's remarkable starting power is OPTIMA's SPIRALCELL TECHNOLOGY®. This makes it possible to start heavy diesel engines with a battery, as compact as an ordinary automobile battery, which can be mounted in areas with very little space. This powerful package also shows unparalleled resistance to vibration, knocks and bumps. The REDTOP's robust, leak free construction stands up to the toughest conditions, without power interruption.

*The battery should be disconnected during extended periods of non-use.



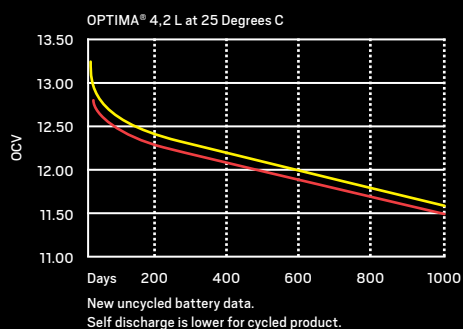
MORE STARTING POWER

OPTIMA® batteries deliver a higher level of power to the starter in the critical first 10 seconds of the vehicle starting cycle.

- OPTIMA® REDTOP®
- OPTIMA® YELLOWTOP®
- Traditional battery

SHAKE IT UP!

Damage from vibration is a leading cause of battery failure. OPTIMA batteries have over 15 times more vibration resistance than traditional batteries due to patented SPIRALCELL TECHNOLOGY®.

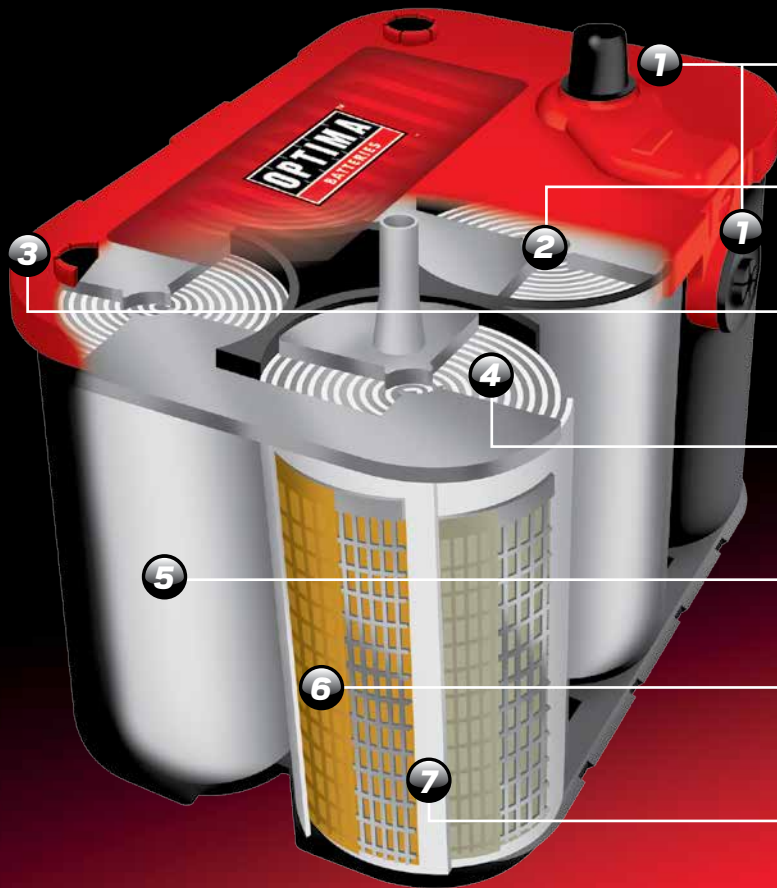


LONG SHELF LIFE

OPTIMA batteries are ideal for vehicles that are used seasonally because of their low self-discharge rate. All batteries that sit unused for extended periods of time will begin to lose charge. But OPTIMA batteries retain a significantly greater amount of power, enough to start large vehicles like tractors, harvesters and recreational vehicles even after a long winter of no use.

- OPTIMA® REDTOP® 4,2
- OPTIMA® YELLOWTOP® 4,2

THE SPIRALCELL TECHNOLOGY®



1 Corrosion resistant terminals

2 Solid moulded cell connections for increased durability

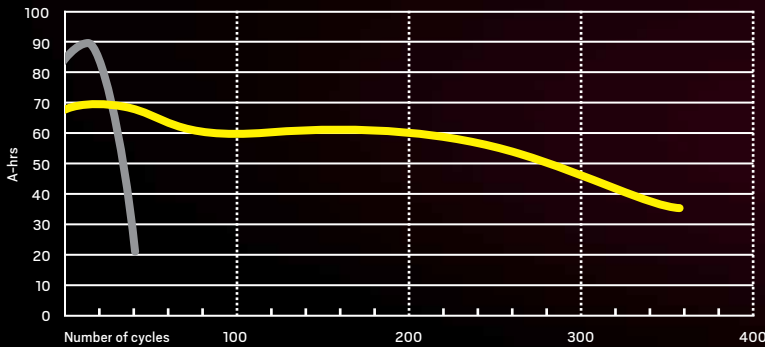
3 Self sealing safety valves

4 Rugged SPIRALCELL construction provides maximum vibration resistance and extends product life

5 Impact resistant polypropylene case

6 High purity lead grids for long life

7 Absorbent glass mat separator holds electrolyte like a sponge to eliminate acid spilling

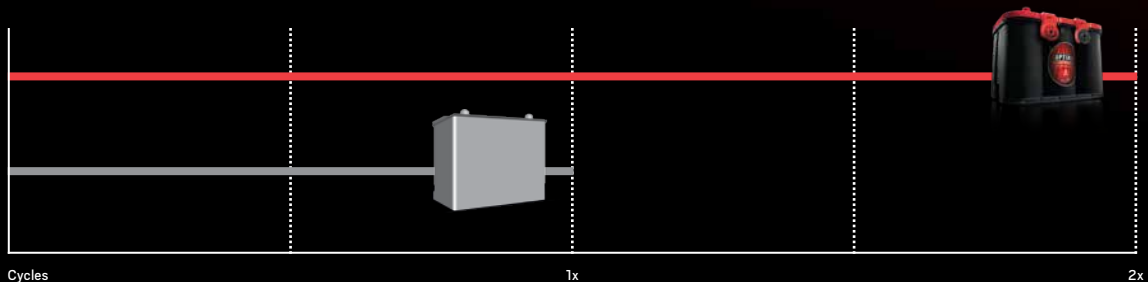


REPETITIVE RESERVE CAPACITY

OPTIMA® batteries have the ability to withstand significantly more discharge/recharge cycles and still accept a high percentage of the original full capacity.

● OPTIMA® YELLOWTOP® 75 Ah/C20

● Traditional battery 98 Ah/C20



UP TO 2 TIMES LONGER LIFE*

Damage from heat is the leading cause of battery failure. Even in high heat environments, OPTIMA batteries can outlast traditional batteries by up to 2 times.

*When compared to traditional batteries

SPECIFICATIONS

OPTIMA® YELLOWTOP®

	YTS 5,5 (BCI D31A)	YTR 5,0 (BCI D27F)	YTS 4,2 (BCI D34)	YTU 4,2 (BCI D34/78)	YTR 3,7 (BCI D35)	YTS 2,7 (BCI D51)	YTS 2,7J (DS46B24R)	YTR 2,7 (BCI D51R)	YTR 2,7J (BCI D51R)	YTS 2,1 (6 VOLT)
Part Number	851 187 000 888 2	837 327 000 888 2	812 254 000 888 2	814 254 000 888 2	840 222 000 888 2	871 176 000 888 2	870 176 000 888 2	873 176 000 888 2	872 176 000 888 2	818 356 000 888 2
Length base: mm	317	300	245	245	229	228	228	228	228	253
Length top cover: mm	325	309	254	254	237	237	237	237	237	254
Height not including terminals: mm	218	200	173	173	168	201	201	201	201	176
Height including terminals: mm	238	219	200	200	197	227	227	227	227	203
Width base: mm	158	169	172	172	172	121	121	121	121	83
Width top cover: mm	165	172	175	175	171	129	129	129	129	90
Nominal Voltage: V	12	12	12	12	12	12	12	12	12	6
Cold Cranking Amps: (EN) CCA	975	845	765	765	660	460	460	460	460	765
Capacity: (EN) Ah	75	66	55	55	48	38	38	38	38	55
Reserve Capacity: (BCI) Min	155	140	120	120	98	66	66	66	66	120
Weight: kg	26.5	20.6	19.5	19.9	16.6	11.8	11.8	11.8	11.8	9.5

OPTIMA® REDTOP®

	RTC 4,2 (BCI 34C)	RTS 4,2 (BCI 34)	RTR 4,2 (BCI 34R)	RTU 4,2 (BCI 34/78)	RTF 4,2 (BCI 78)	RTS 3,7 (BCI 25)	RTR 3,7 (BCI 35)	RTU 3,7 (BCI 75/25)	RTS 2,1 (6 VOLT)
Part Number	801 287 000 888 2	802 250 000 888 2	803 251 000 888 2	804 250 000 888 2	878 209 000 888 2	820 255 000 888 2	835 255 000 888 2	822 255 000 888 2	810 355 000 888 2
Length base: mm	245	245	255	245	245	229	229	229	255
Length top cover: mm	254	254	254	254	254	237	237	237	252
Height not including terminals: mm	184	173	173	173	184	168	168	168	185
Height including terminals: mm	200	200	200	200	184	197	197	197	206
Width base: mm	172	172	172	172	172	172	172	172	83
Width top cover: mm	175	175	175	175	185	171	171	171	90
Nominal Voltage: V	12	12	12	12	12	12	12	12	6
Cold Cranking Amps: (EN) CCA	815	815	815	815	815	730	730	730	815
Capacity: (EN) Ah	50	50	50	50	50	44	44	44	50
Reserve Capacity: (BCI) Min	100	100	100	100	100	90	90	90	110
Weight: kg	17.2	17.2	17.2	17.6	17.5	14.4	14.4	15	8.3

CHARGING INFORMATION

ALTERNATOR 13.8 to 15.0 volts

BATTERY CHARGER (Constant Voltage) 13.8 to 15.0 volts, 10 amps, 12 – 15 hours approximate

FLOAT CHARGE 13.2 to 13.8 volts, 1 amp maximum current

RAPID RECHARGE (Constant Voltage Charger)

Maximum voltage 15.6 volts. No current limit as long as temperature remains below 50 °C. Charge until current drops below 1 amp.

RECHARGE TIME (Example assuming 100% discharge – 10.5 volts)

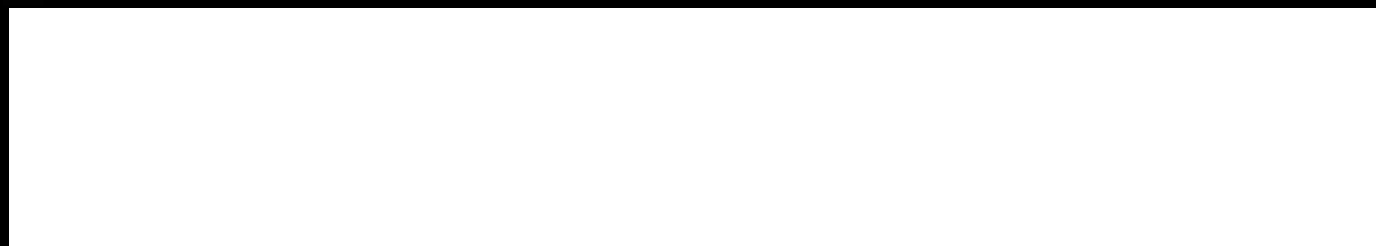
AMPERAGE	APROX. TIME TO 90% CHARGE	
	4,2	5,5
100 amps	35 minutes	52 minutes
50 amps	75 minutes	112 minutes
25 amps	140 minutes	210 minutes

Recharge time will vary according to temperature and charger characteristics. When using Constant Voltage chargers, current will taper down as the battery becomes recharged. When current drops below 1 amp, the battery will be close to a full state of charge.

CYCLIC APPLICATION OR STRING SERIES APPLICATIONS Constant Voltage with Constant Current finish (CC/CV): 14.7 volts, temperature < 50 °C, no current limits. When current falls below 1 amp, finish with 3 amps constant current for 1 hour for type 5,5 and 2 amps for all other types.

(All charge recommendations assume an average room temperature of 25 °C.)

Your authorised dealer / distributor



www.optimabatteries.com

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OPTIMA® RedTop S 4,2 & R 4,2



Battery Model: RT S 4,2
Part Number: 802 250 000 888 2
Nominal Voltage: 12 volts
NSN: 6140 01 457 5296
Description: High power, sealed lead acid, engine starting battery



Battery Model: RT R 4,2
Part Number: 803 251 000 888 2
Nominal Voltage: 12 volts
NSN: 6140 01 475 9357
Description: High power, sealed lead acid, engine starting battery

Physical Characteristics:

Plate Design: High purity lead-tin alloy. Wound cell configuration utilizing proprietary *SPIRALCELL*® technology.
Electrolyte: Sulfuric acid, H₂SO₄
Case: Polypropylene
Color: Case: Dark Gray
Cover: "OPTIMA" Red
Group Size: BCI: 34

	Standard	Metric
Length:	10"	254 mm
Width:	6.875"	175 mm
Height:	7.813"	200 mm (height at the top of the terminals)
Weight:	37.9 lb.	17.2 kg

Terminal Configuration: SAE / BCI automotive.

Performance Data:

Open Circuit Voltage (fully charged): 12.8 volts
Internal Resistance (fully charged): 0.0030 ohms
Capacity: 50 Ah (C/20)
Reserve Capacity: BCI: 100 minutes
(25 amp discharge, 80°F (26.7°C), to 10.5 volts cut-off)

Power:

CCA (EN -18°C): 815 amps
MCA (BCI 0°C): 1000 amps

OPTIMA® RedTop S 4,2 & R 4,2

Recommended Charging:

The following charging methods are recommended to ensure a long battery life:
(Always use a voltage regulated charger with voltage limits set as described below.)

Model: RT S 4,2 & RT R 4,2

These batteries are designed for engine starting applications. They are not recommended or warranted for use in deep cycle applications.

Recommended Charging Information:

Alternator:	13.3 to 15.0 volts; no amperage limit
Battery Charger:	13.8 to 15.0 volts; 10 amps maximum; 6-12 hours approximate
Float Charge:	13.2 to 13.8 volts; 1 amp maximum current (indefinite time at lower voltages)
Rapid Recharge: (Constant voltage charger)	Maximum voltage 15.6 volts. No current limit as long as battery temperature remains below 50°C (125°F). Charge until current drops below 1 amp. All limits must be strictly adhered to.

Recharge Time: (example assuming 100% discharge – 10.5 volts)

Current	Approx. time to 90% charge
100 amps	35 minutes
50 amps	75 minutes
25 amps	140 minutes

Recharge time will vary according to temperature and charger characteristics. When using Constant Voltage chargers, amperage will taper down as the battery becomes recharged. When amperage drops below 1 amp, the battery will be close to a full state charge.

(All charge recommendations assume an average room temperature of 25°C, 77°F)

Always wear safety glasses when working with batteries.

Always use a voltage regulated battery charger with limits set to the above ratings. Overcharging can cause the safety valves to open and battery gases to escape, causing premature end of life. These gases are flammable! You cannot replace water in sealed batteries that have been overcharged. Any battery that becomes very hot while charging should be disconnected immediately.

Not fully charging a battery can result in poor performance and a reduction in capacity.

Shipping and Transportation Information:

OPTIMA batteries can be shipped by AIR. The battery is nonspillable and is tested according to ICAO Technical Instructions DOC. 9284-AN/905 to meet the requirements of Packing Instructions No. 806 and is classified as non-regulated by IATA Special Provision A-48 and A-67 for UN2800. Terminals must be protected from short circuit.

OPTIMA® RedTop S 4,2 & R 4,2

Manufacturing Location:

OPTIMA Batteries
17500 East 22nd Avenue
Aurora, CO 80011
United States of America
Phone: 303-340-7400
Fax: 303-340-7474

BCI = Battery Council International

OPTIMA Batteries
Product Specifications: Models RT S 4,2 & RT R 4,2
June 2005

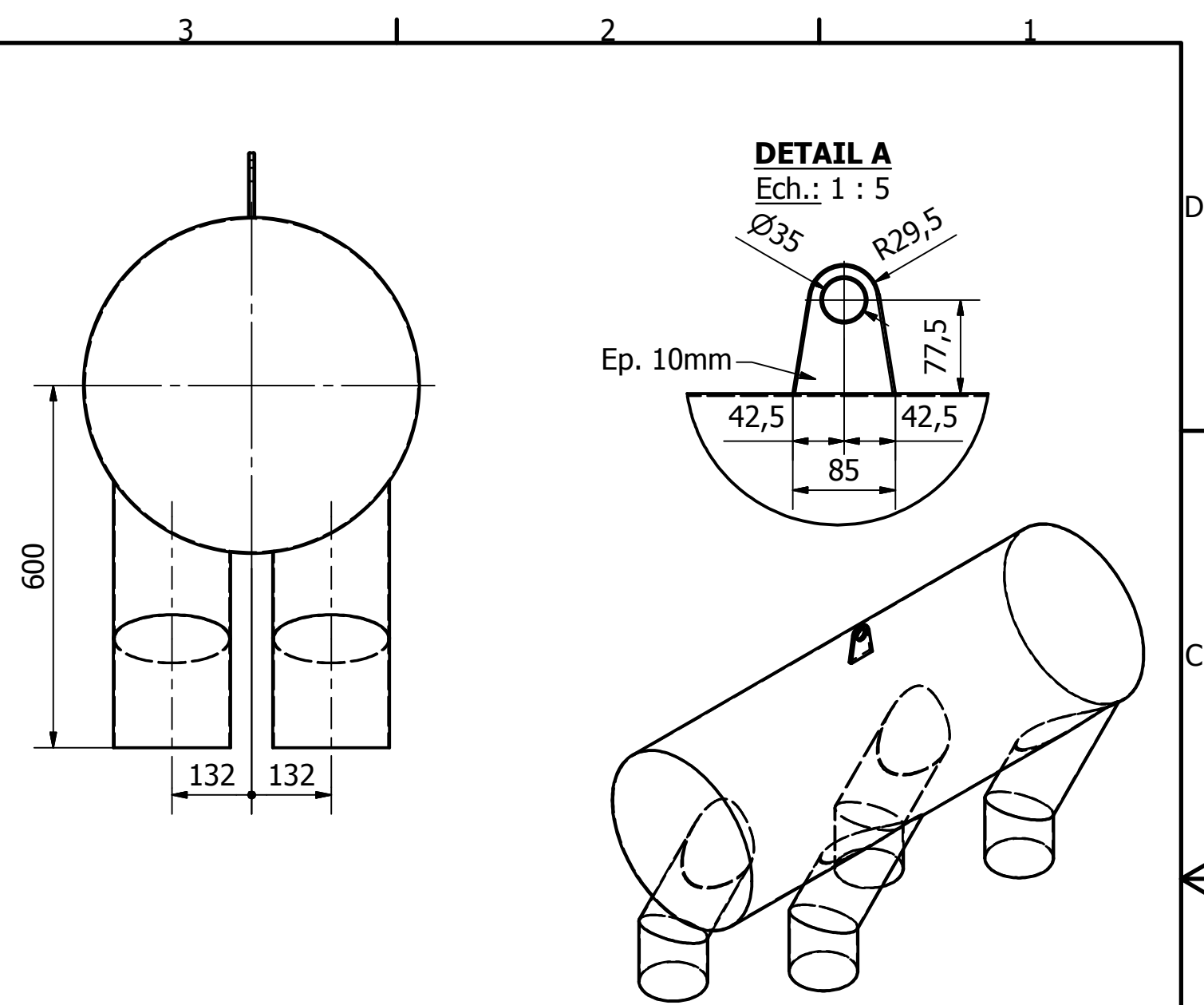
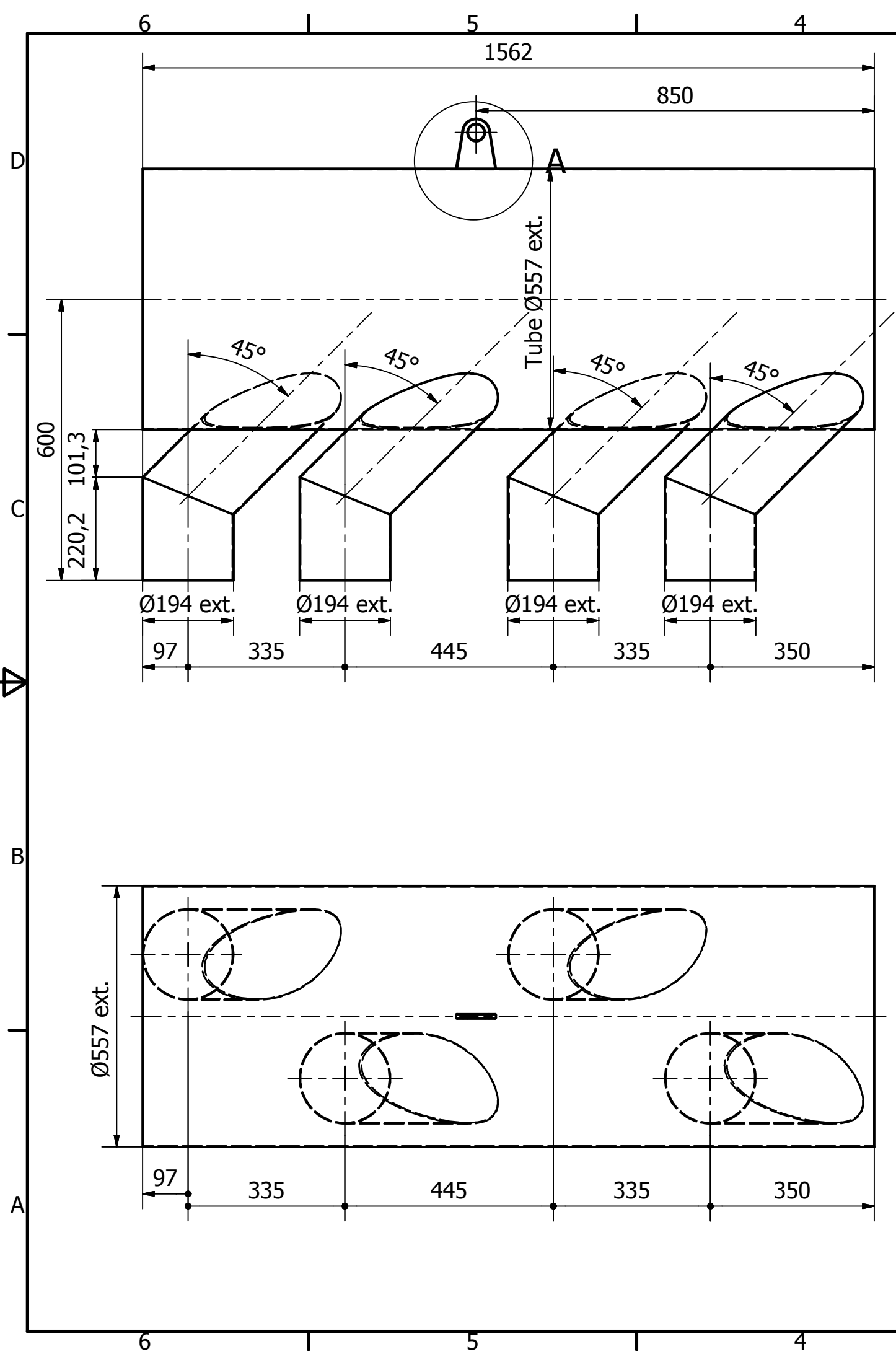


Industrial Diesel Generator Set – KD3500-E
50 Hz - Emission Optimized – EPA Tier 2 Compliant

Exhaust manifold

Reference Conditions: 25°C Air Inlet Temperature, 40°C Fuel Inlet Temperature, 100 kPa Barometric Pressure; 10.7 g/kg of dry air Humidity. Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit; Fuel density at 0.85 kg/L.

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NOTA :
 Ep. Toile / Th. Sheet : 2mm
 Matière / Material : Acier S235JR / Steel S235JR
 Revêtement / Coating : Peinture Noire Haute Température 600°C / Black painting High Temperature 600°C

D	AJOUT DES DESCRIPTIONS EN ANGLAIS	11/07/18	HILLION R.		
C	AJOUT REVETEMENT PEINTURE	26/06/18	HILLION R.		
B	MODIFICATION DU DIAMETRE DE SORTIE COLLECTEUR	22/12/17	HILLION R.		
A	CREATION DU DOCUMENT	01/12/17	HILLION R.		
REV	DESCRIPTION	DATE	VISA	DATE VER.	VISA

MOTEUR : _____ FORMAT : A3 ECHELLE : 1:10

DESIGNATION: COLLECTEUR HORIZONTAL E: 4xDN175 - S: 1xDN550
 Plan de détails

SDMO 35900071513 FOLIO : 1 / 1

12 bis, rue de la Villeneuve - CS92848 - 29228 BREST - Tel: 02.98.41.41.41 - Telex: 940757F - Telecopie: 02.98.41.63.07
 CE PLAN EST LA PROPRIETE DE LA SOCIETE; IL NE PEUT ETRE REPRODUIT, UTILISE OU COMMUNIQUE SANS SON AUTORISATION



Industrial Diesel Generator Set – KD3500-E
50 Hz - Emission Optimized – EPA Tier 2 Compliant

Alternator Specification

Reference Conditions: 25°C Air Inlet Temperature, 40°C Fuel Inlet Temperature, 100 kPa Barometric Pressure; 10.7 g/kg of dry air Humidity. Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit; Fuel density at 0.85 kg/L.

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ALTERNATOR TECHNICAL DESCRIPTION
LSA 54 M90 / 4p

LS Reference: **D220812 JLB 01** 1

Date: 12/08/2022 V6.06 - 04/2021 1
1
Moteurs Leroy-Somer prenom.nom@mail.nidec.com 1
Electric Power Generation +33 (0)2 38 60 42 xx 1
1 rue de la Buelle - 45800 Saint Jean de Braye - France pn 1

Main data M 1

Generator type: **LSA 54 M90 / 4p** 1
Power: 3,500 kVA 2,800 kWe 2,902 kWm 1
Voltage: 400 V Star serial 1
Rated voltage range: +5/-5% 1
Power factor - Lagging: 0.8 1
Frequency: 50 Hz 1
Speed: 1,500 rpm 1
Nominal current: 5,052 A 1
Winding type: p2/3 1
Classes (Insulation / Temperature Rise): H / H 1
Ambient temperature: 44 °C 1
Altitude: 100 m 1

Installation IEC Quantity 1 1

Client: Kohler SDMO 1
Prime mover: Reciprocating engine 1
Manufacturer: KOHLER 1
Type: KD83 1
Duty: Base Rating 1

Mechanical construction IM1301 1

Type of construction: Single bearing 1
Mounting arrangement: Horizontal Axis 1
Direction of rotation: Clockwise (seen when facing the drive end - DE) 1
Bearing type: Anti-friction 1
Bearing Lubrication: Regreasable 1
Bearing insulation: Not insulated 1
Flector type: SAE 21 1
Balancing - Class (ISO 1940/1): Without key - G2,5 (std) 1
Flange: SAE 00 1
Shaft height: 500 mm 1
Width: 1,150 mm 1

Additional specificities 1

Stabilized Runaway speed: 1,800 rpm - 2 min. 1

Cooling Method IC01 1

Degree of protection: IP23 1
Coolant: Air / Temperature: 44 °C 1
Air quality: Clean 1
Ventilation (internal): Self-ventilated 1
Filters: Without 1
Ducting for air inlet: No 1
Ducting for air outlet: No 1

ALTERNATOR TECHNICAL DESCRIPTION
LSA 54 M90 / 4p

LS Reference: D220812 JLB 01 1

Connection, Excitation & Regulation

Parallel operation:	Island mode (0F) - no //CT	1
Excitation:	Self-excited - Brushless - Type: AREP + PMI	1
Sustained 3-phase Isc:	> 3 x FLC for 10s.	1
AVR type:	Leroy Somer - D550 - Digital	1
AVR location:	In terminal box	1
Alternator Voltage sensing:	In terminal box	1

Terminal box

Power connection:	4 connectors (brought out neutral)	1
Main terminal box location:	1 terminal box on the top	1
Line side outlet:	Left hand side (seen when facing the drive end - D)	1
Gland plate:	Non magnetic, Undrilled	1
	-	1

Protection and measurement accessories

Temperature detection

Stator windings:	6 x 3-wire PT100 RTDs	1
Guide bearing - NDE:	1 x 3-wire PT100 RTD	1

Anti-condensation heating

Voltage: 230 V - 1Ph / Power: 500 W 1

Various items

220812EN02_B

Paint:	C3M-P - Polyurethane - RAL 1014	1
Documentation:	PDF manual	1
Documentation Language:	English	1

Controls

QUAL/INES/006 001	Measurement of winding resistance	1
QUAL/INES/006 021	Insulation check on sensors (when fitted)	1
QUAL/INES/006 002	Voltage balance and phase order check	1
QUAL/INES/006 007	Overspeed test (according to test bench limitation)	1
QUAL/INES/006 009	High potential test	1
QUAL/INES/006 010	Insulation resistance measurement	1

ALTERNATOR ELECTRICAL DATA
LSA 54 M90 / 4P

LS Reference: D220812 JLB 01

Date: 12/08/2022

V6.06 - 04/2021

Main data: M

Power:	3,500 kVA	2,800 kW _e	2,902 kW _m	1
Voltage:	400 V	Frequency:	50 Hz	1
Rated voltage range:	+5% / -5%	Speed:	1500 rpm	1
Power factor - Lagging:	0.8			1
Nominal current:	5,052 A	Phases	3	1
Insulation / Temperature rise:	H / H	Connexion	Star serial	1
Cooling:	IC01	Winding type:	p2/3	1
		Winding:	- 6 Wires	1
Ambient temperature:	44 °C			1
Altitude:	100 m	Overspeed (rpm)	1800	1
Duty: Base Rating		Total Harmonic Distortion (THD) <	3,5%	1

Efficiency (Base 2800 kW_e) IEC

	25%	50%	75%	100%	110%	
Power factor - Lagging: 0,8	94.02	96.13	96.52	96.50	96.43	1
Power factor - Lagging: 1	94.42	96.70	97.26	97.40	97.40	1

Reactances (%) - (Base 3500 kVA)

Unitary impedance (1 per unit) = 0,045714 ohms

		Unsaturated		Saturated			
		Direct axis	Quadrature axis	Direct axis	Quadrature axis		
Synchronous reactance	X _d	268	238	X _q	137	121	1
Transient reactance	X' _d	25.3	21.5	X' _q	137	121	1
Subtransient reactance	X'' _d	12.0	10.2	X'' _q	11.5	9.8	1
Negative sequence reactance	X ₂	11.7	10.0				
X ₀	2.3	Zero sequence reactance					1
X _l	6.0	Stator leakage reactance					
X _r	20.9	Rotor leakage reactance					
Kc	0.42	Short-circuit ratio					1

Time constants (s)

	Direct axis		Quadrature axis		
Open circuit transient time constant	T' _{do}	3.38	T' _{qo}	NA	1
Short-circuit transient time constant	T' _d	0.320	T' _q	NA	1
Open circuit subtransient time constant	T'' _{do}	0.049	T'' _{qo}	0.246	1
Subtransient time constant	T'' _d	0.023	T'' _q	0.021	1
T _a	0.032	Armature time constant			1

Resistances (%)

R _a	1.2	Armature resistance	R ₀	0.8	Zero sequence resistance	1
X/R	8.7	X/R ratio (without unit)	R ₂	2.3	Negative sequence resistance	

Voltage accuracy: 0,25%

Maximum inrush current for a voltage dip of 15%: 2708 kVA

when starting an AC motor having a starting power factor between 0 and 0.4

Rating is provided for the specified temperature rise, by resistance measurement according to IEC60034-1

According to: I.E.C. 60034.1 - 60034.2 - NEMA MG 1-32

Products and materials shown in this catalogue may, at any time, be modified in order to follow the latest technological developments.

#REF!

ALTERNATOR MAIN CURVES
LSA 54 M90 / 4P

LS Reference: D220812 JLB 01

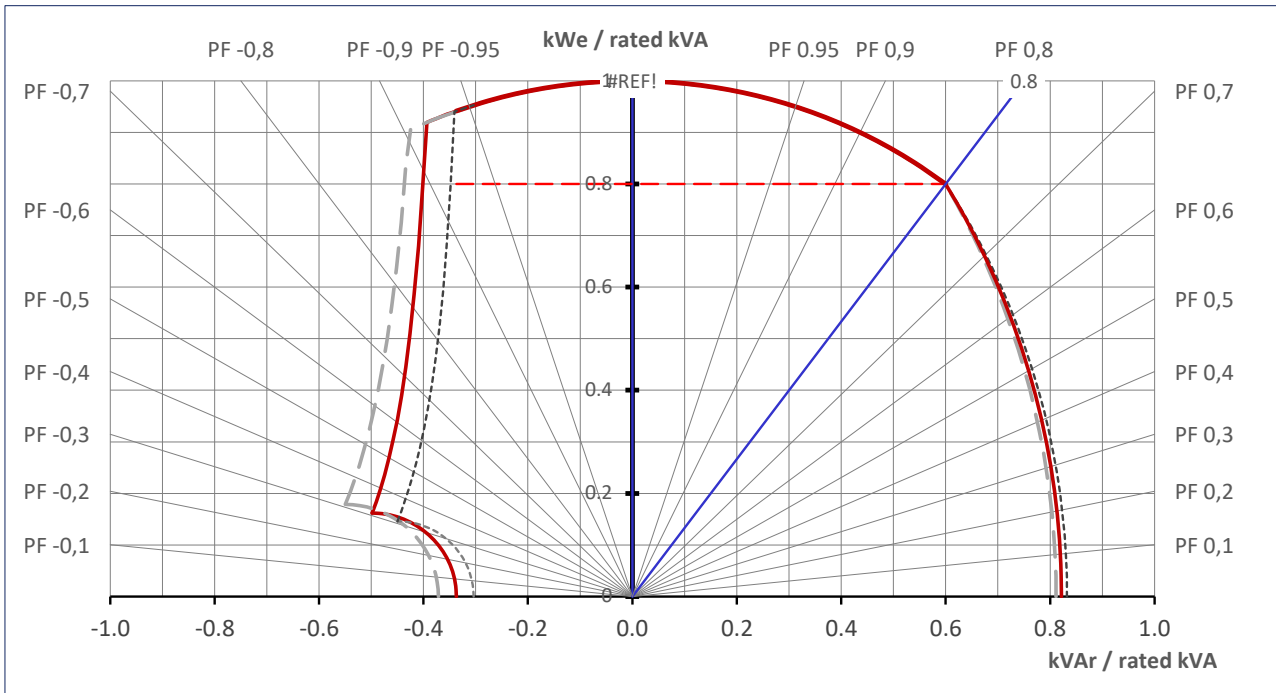
Date: 12/08/2022

3500kVA - 400V - 50 Hz

V6.06 - 04/2021

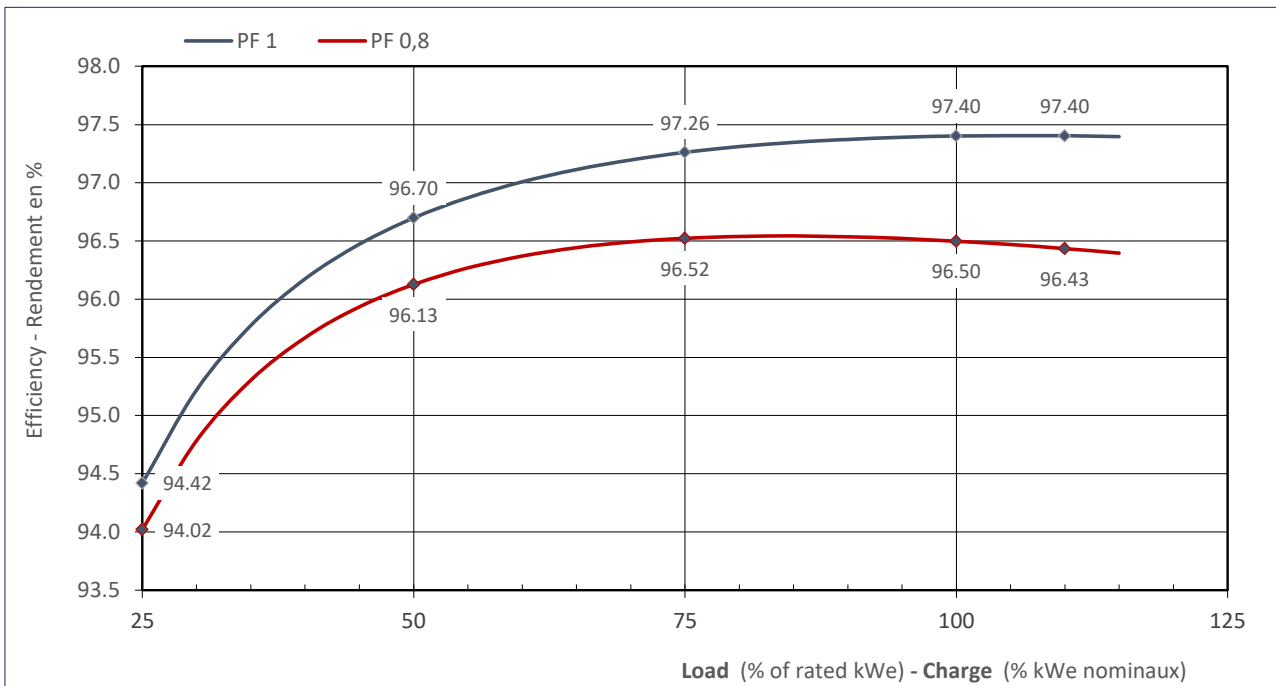
Capability Curve

---	Umax	+ 5%	420	V
—	Un		400	V
- - -	Umin	- 5%	380	V



Efficiency Curves

According to: IEC

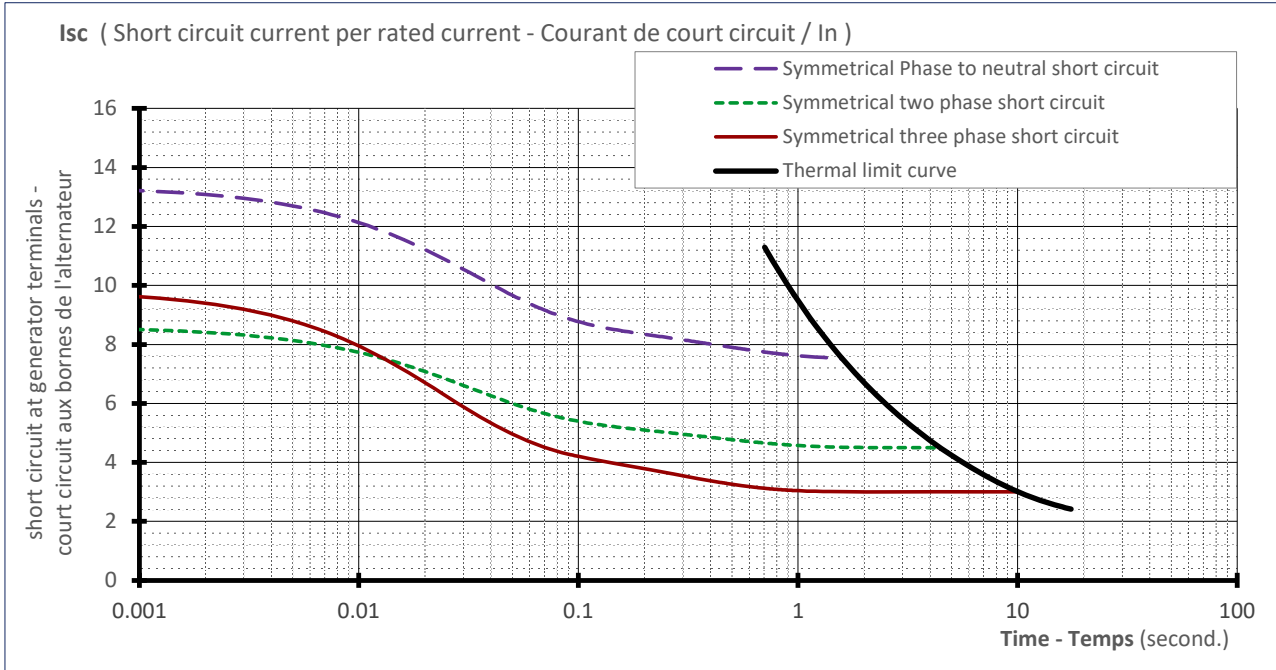


ALTERNATOR MAIN CURVES
LSA 54 M90 / 4P

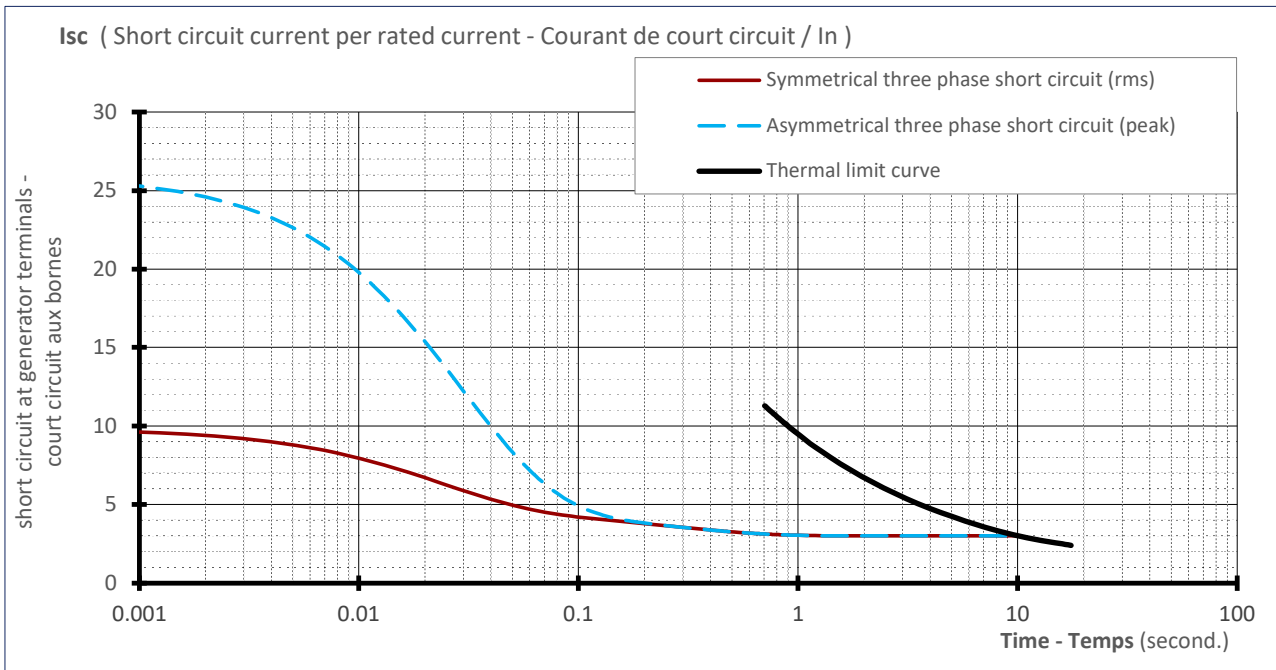
LS Reference: D220812 JLB 01

Stator Current decrement curves

Symmetrical phase to neutral short-circ		initial	66,774	A	13,2 x In	
Symmetrical two phase short-circuit		max	42,982	A	8,5 x In	In = 5052 A
Symmetrical three phase short-circuit		value	48,588	A	9,6 x In	
Thermal Limit						



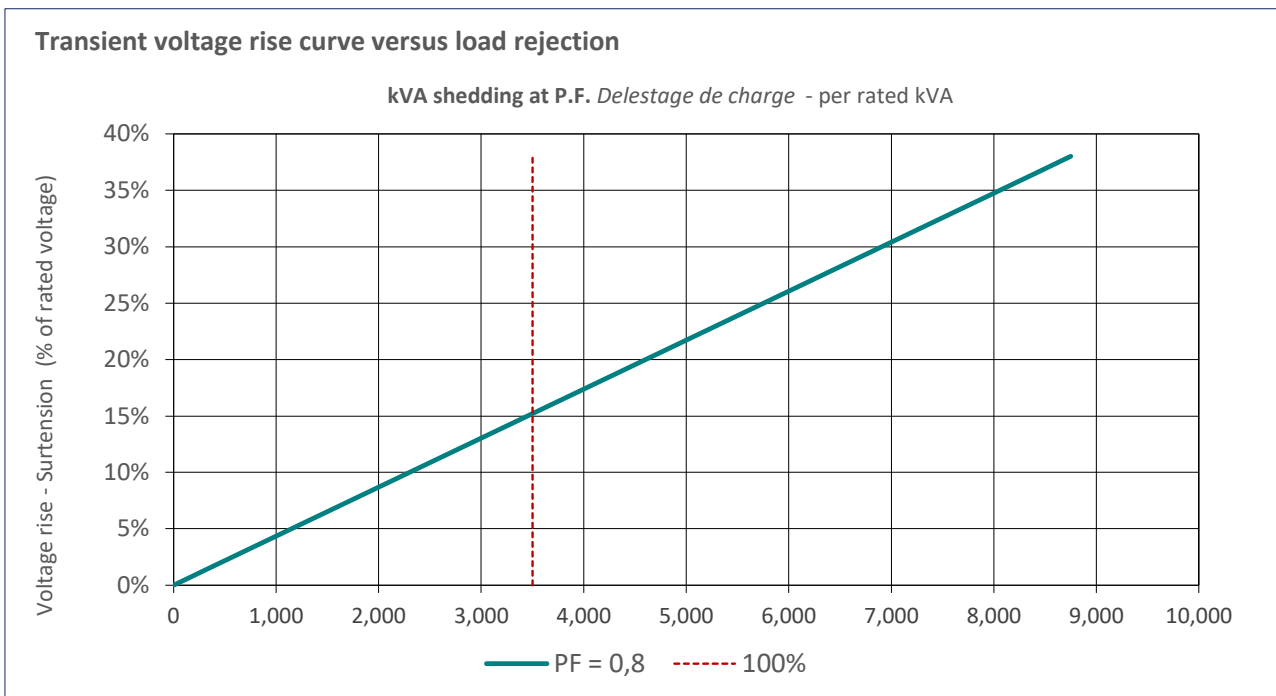
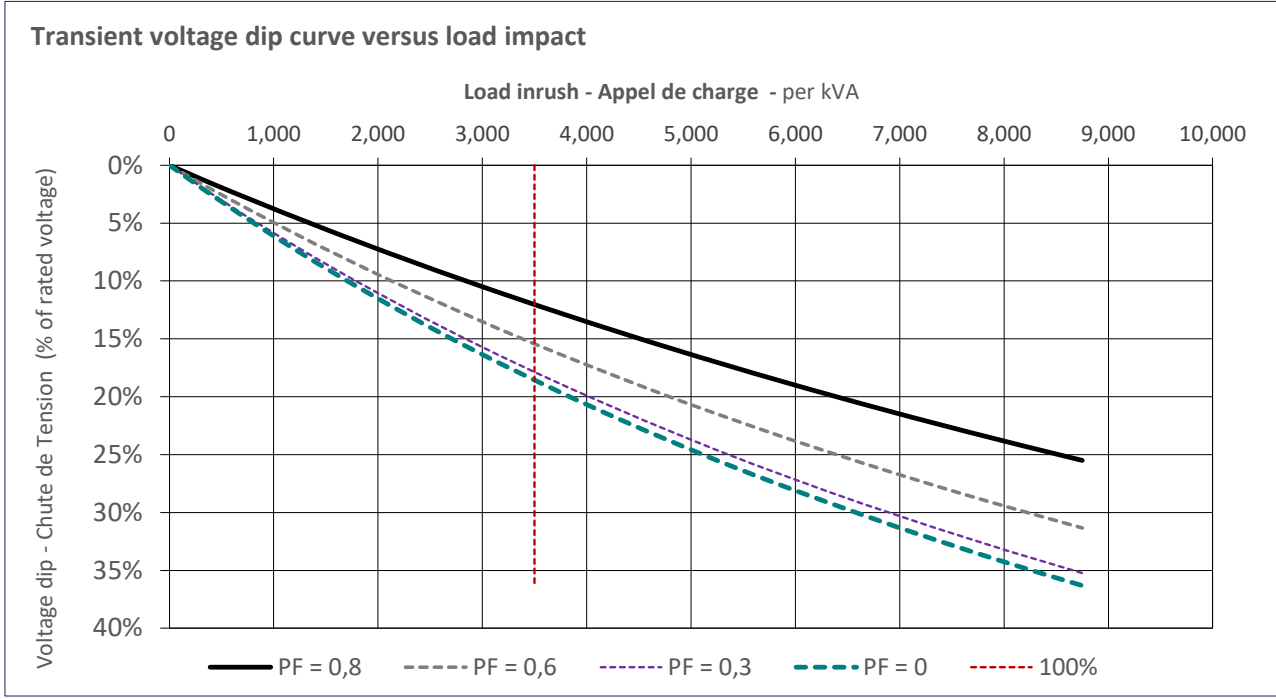
Asymmetrical three phase short-circuit		IP	126,747	A	25,1 x In
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ALTERNATOR MAIN CURVES
LSA 54 M90 / 4P

LS Reference: D220812 JLB 01

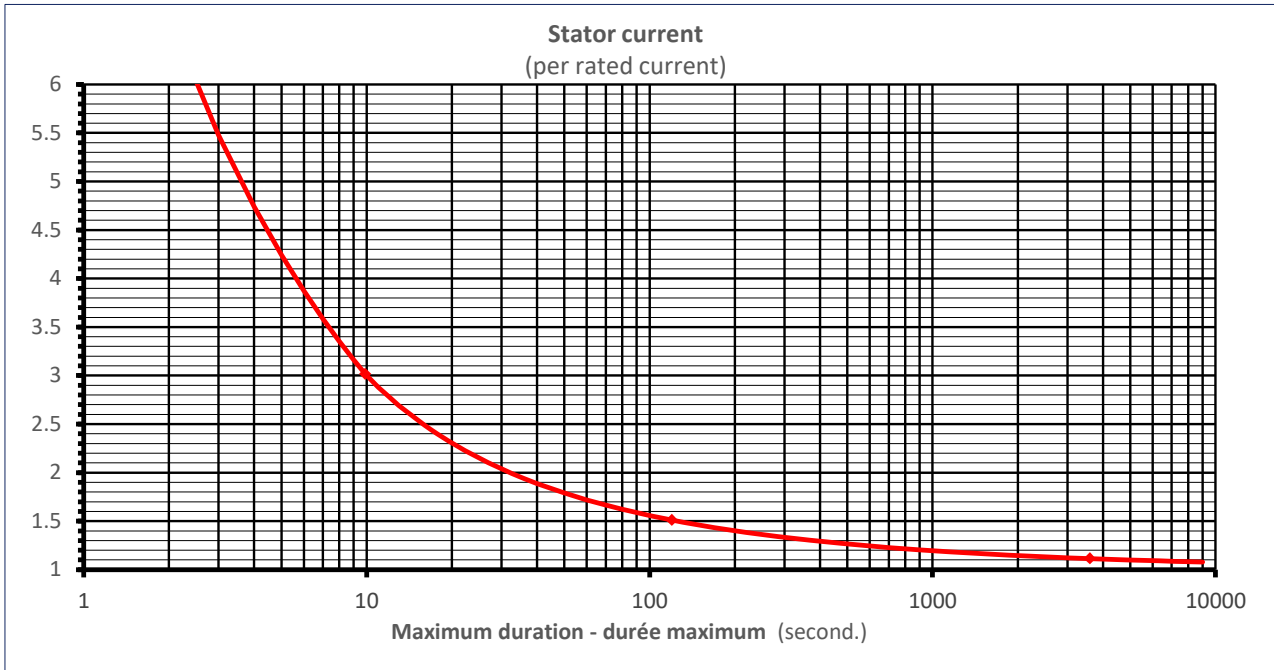
Transient Voltage Variation



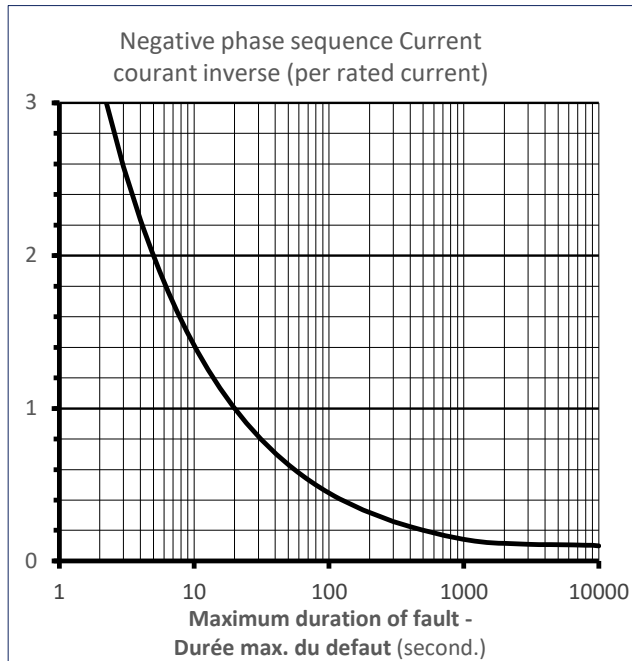
ALTERNATOR MAIN CURVES
LSA 54 M90 / 4P

LS Reference: D220812 JLB 01

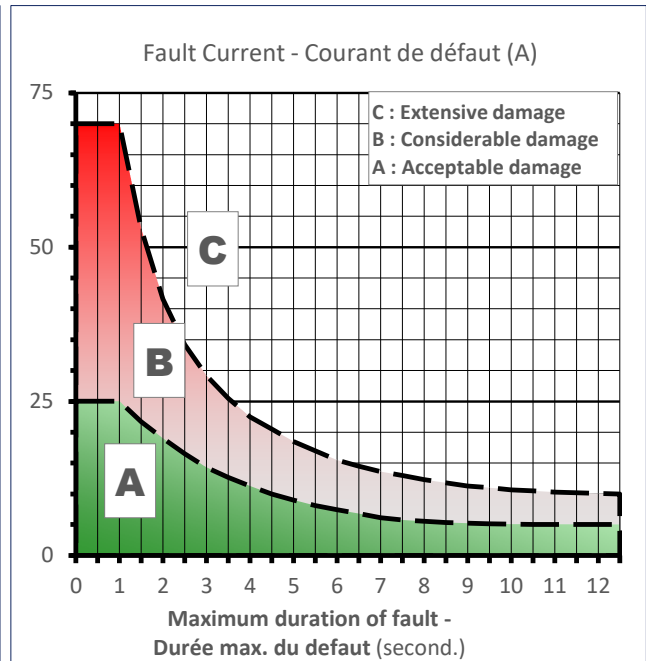
Thermal Damage Curve



Unbalance Load Curve



Stator Earth Fault Current





Industrial Diesel Generator Set – KD3500-E
50 Hz - Emission Optimized – EPA Tier 2 Compliant

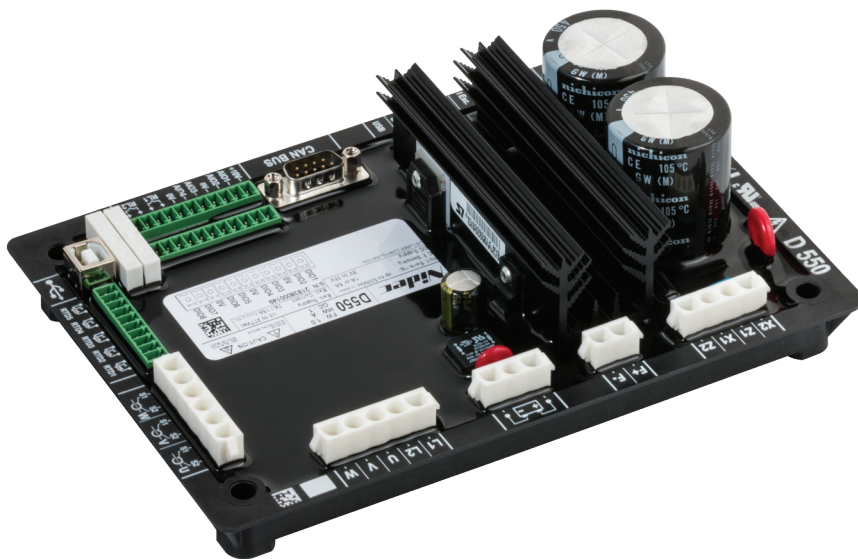
D550 digital AVR

Reference Conditions: 25°C Air Inlet Temperature, 40°C Fuel Inlet Temperature, 100 kPa Barometric Pressure; 10.7 g/kg of dry air Humidity. Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit; Fuel density at 0.85 kg/L.

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D550 DIGITAL AVR

FOR ALTERNATORS WITH SHUNT, AREP OR PMG EXCITATION



The D550 is a digital automatic voltage regulator (AVR) for alternators with rated field current up to 8 A at 55°C.

It offers a vast array of regulation modes suitable for all power generation applications, including grid-connected configurations.

The D550 also integrates a visual interface through the EasyReg Advanced software, which allows the user to read the configuration values and parameters. It can also be configured directly via USB without external power supply.

The D550 also includes several protections and functions to keep the alternator running in full safe operation, in particular settings to comply with public network connection instructions (grid code).

The communication port is CANJ1939 compatible.

DATASHEET

KEY FEATURES

- **Regulation modes**
 - Voltage regulation accuracy: $\pm 0.25\%$
 - Field current (manual mode)
 - Generator power factor
 - Grid power factor
 - Generator kVAr
- **Regulation features**
 - Voltage equalization
 - Droop management
 - Cross current compensation
 - Soft start
 - Load Acceptance Module (L.A.M.) function to assist during heavy load application events
 - Negative field forcing
- **kW, kVAr, kVA & PF calculation**
- **Protections & Limitations**
 - Under and over field current limitation
 - Loss of field sensing
 - Generator under/over voltage
 - Loss of sensing
 - V/Hz regulation mode
 - Diode fault monitor
- **Data logger (option)**
- **Synchronization monitoring**
- **Events log**

ELECTRIC FEATURES

- **Generator voltage measurement**
 - 3-phase, 2-phase
 - Range: 0-230-530 VAC
 - Consumption: < 2 VA
- **Grid voltage measurement**
 - 2-phase
 - Range: 0-230-530 VAC
 - Consumption: < 2 VA
- **Generator current measurement**
 - 1 or 3-phase
 - Secondary range: 1 or 5 A
 - Consumption: < 2 VA
- **AC supply input**
 - PMG, AREP, SHUNT
 - Range: 50-277 VAC
- **Excitation**
 - Rated field current (continuous):
7 A at 70°C
8 A at 55°C
 - Field forcing current (10s max):
15 A at 70°C
 - Recommended field resistance:
> 4 ohms
- **Auxiliary supply: 8-35 VDC**
 - Consumption: < 1 A
- **Frequency range: 30-400 Hz**
- **Storage temperature: -55°C +85°C**
- **Operating temperature: -40°C +70°C**

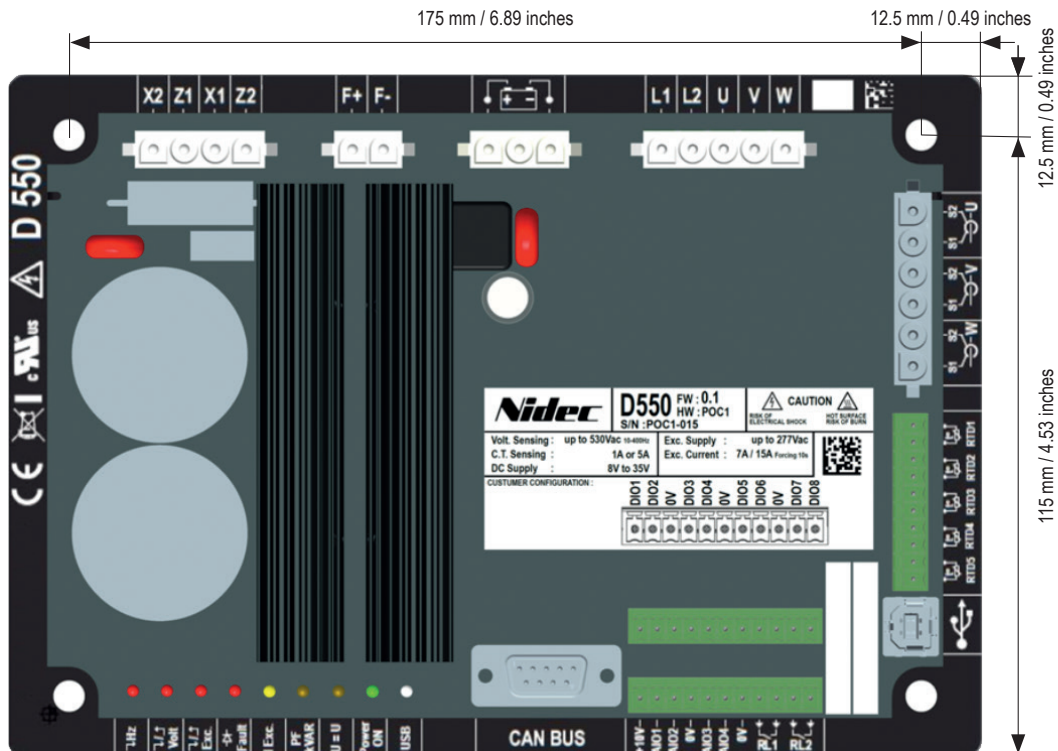
INPUTS / OUTPUTS

- **8 programmable digital inputs & outputs**
 - Output specification: 150 mA - 30 VDC
- **4 programmable analog inputs & outputs**
 - 4-20 mA / ± 10 V / 0-10 V / potentiometer (1 k Ω)
- **2 relay outputs**
 - Specifications: 125 VAC - 5 A
- **5 temperature sensings**
 - Type: Pt100/CTP
 - Programmable threshold

COMMUNICATION & SETTINGS

- Software configuration (PC tool)
- USB port (self powered)
- CAN J1939 and Proprietary (Leroy-Somer protocol)

DIMENSIONS



Same footprint as Leroy-Somer D510C



Industrial Diesel Generator Set – **KD3500-E** 50 Hz - Emission Optimized – EPA Tier 2 Compliant

Control Panel Specification

Reference Conditions: 25°C Air Inlet Temperature, 40°C Fuel Inlet Temperature, 100 kPa Barometric Pressure; 10.7 g/kg of dry air Humidity. Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit; Fuel density at 0.85 kg/L.

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AMP802 Generator Set Control

OVERVIEW

The APM802 enables user-friendly, ergonomic and autonomous operation of generator sets and power plants.

- 12-inch colour touch screen
- Navigation system
- 100% usable without the need for an external computer
- Languages: French, English, Spanish, Portuguese, German, Dutch, Russian
- The APM802 manages:
 - Control of the genset and/or the power plant in both manual and automatic mode, as well as tests off load or on load.
 - Mechanical and electrical measurement displays
 - Status and time-stamped event displays (up to 1000 events)
 - Adjustment of parameters accessible to the customer (timers, etc.)
- The APM802 comes with built-in:
 - Software, accessible from an external computer, a tablet or smartphone, used for modifying certain parameters and displaying the APM802 data.
 - Configuration of site specific functions
- The APM802 is designed for operation under the following conditions:
 - Operating temperature - 20°C to + 60°C
 - Humidity: 93% at 40°C
- The APM802 is protected:
 - Protection index on front: IP65
 - Electronics protected against dust and humidity with tropicalised varnish



Embedded cabinet APM802 on genset.

ERGONOMIC

Designed for user-friendliness and convenience. The user is guided through how to operate the product according to their access level, making it easy to get started and reducing the risk of errors.



USER PROFILES



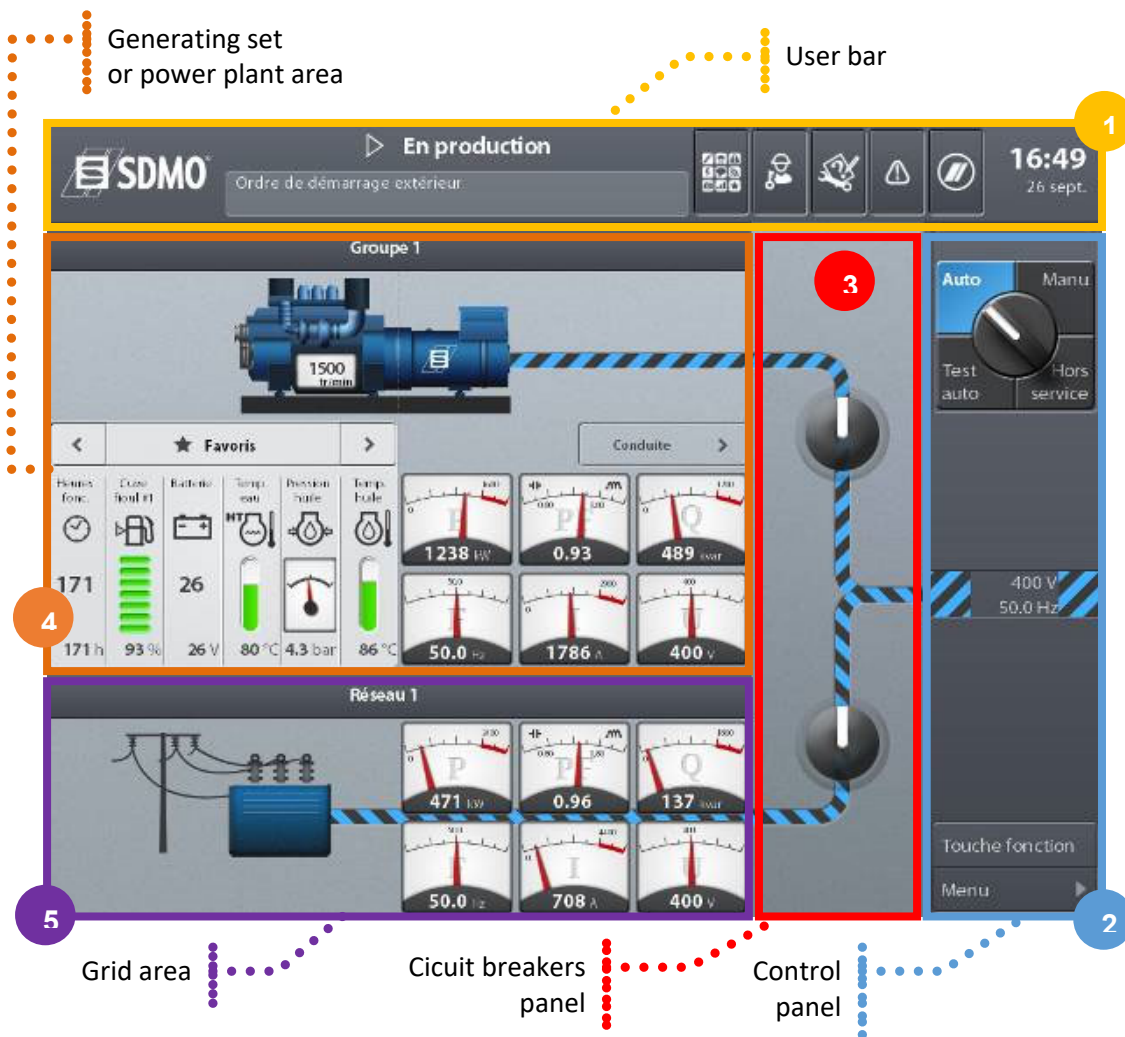
PROFILE	USER	OPERATOR*	SPECIALIST*
ACCESS	System monitoring	Trained in power plant operation	Trained by SDMO and approved partner
		End customer or maintenance company	
		Maintenance of wearing parts	Start-up, assistance, programming

*Profiles can be accessed using a password

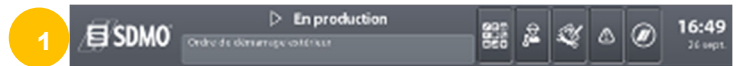
OPERATION

Whatever the HMI configuration, the "operation" screen is always divided into 5 very distinct parts.

The example below shows a "single generator set with grid" configuration.



User bar



The user bar is divided into 3 parts or screen areas:

- Generator set, power plant and grid status messages
 - Generator set status
 - Time delay countdowns
 - Event displays, e.g.: external starting order, etc.
- Area with 5 keys:
 - Direct access to "User applications"
 - Identification for a password protected "Operator" access level
 - Access to maintenance functions
 - Access to all events, alarms and faults time-stamped for consultation, analysis and processing:
 - Oil pressure
 - Engine coolant temperature
 - Overspeed
 - Fail to start
 - Alternator protection triggered
 - Emergency stop triggered
 - Back to "Operation" screen
- Date and time display

Control panel

The control panel is divided into 5 parts or screen areas:

- Control and operation mode area: Auto, Manual, Auto test & Out of service
- Voltage and frequency indication during use
- Function key:
 - Access specific commands, if programmed
- Menu key:
 - Access the settings required for any aspect of generator set or power plant operation.
 - Complete display of all mechanical and electrical measurements (generator sets, power plant and grids)
 - Display of the history of all the electrical and mechanical values
 - Energy meters:
 - One active energy meter
 - One reactive energy meter
 - Counters:
 - A generator set operating hours meter
 - A generator set starting sequence meter
 - Run diagnostics on the status of any logic input and input, analog input or system input.
 - Complete system configuration (application, regulation, protection)
 - Description of complete system architecture



Circuit breaker panel

- Representation area of part of the electrical installation located downstream of the generator set, power plant and grid transformer.

3



Generator set area

- Generator set number or power plant name indicated in the title bar:
- Generator set Start/Stop button present in Manual mode
- Alternator connection display – live and on load protection.
- Mechanical values display
- Electrical values display

Genset mechanical values examples:

- Engine speed
- Oil pressure
- Coolant temperature
- Starting battery voltage

Generator set or power plant electrical values examples:

- 3 line-to-neutral voltages
- 3 line-to-line voltages
- 3 phase currents
- Alternator frequency
- Active power per phase and overall active power
- Reactive power per phase and overall reactive power
- Power factor (Cos phi) per phase and average power factor
- Voltage, frequency and phase differences for synchronisation

4



Grid area

- Grid number indicated in title bar
- Grid connection display – live and on load protection.
- Electrical values display

Grid electrical values

- 3 line-to-neutral voltages
- 3 line-to-line voltages
- 3 phase currents
- Alternator frequency
- Active power per phase and overall active power
- Reactive power per phase and overall reactive power
- Power factor (Cos phi) per phase and average power factor

5



EQUIPMENT

Front Panel

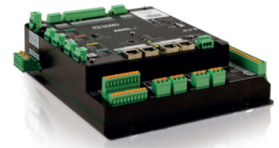
HMI (Human Machine Interface)

- Selecting the various modes:
 - Manual
 - Auto
 - Auto test
 - Test off load
 - Test on load
 - End test
 - Out of service
- Controlling the power supply devices (if motorised):
 - Closing the generator set power supply device
 - Opening the generator set power supply device
 - Closing the grid power supply device
 - Opening the grid power supply device
- Stopping sound alarm
- Acknowledging faults
- Programming via touch screen, for:
 - Adjusting the parameters
 - Programming additional functions
 - Settings accessible via touch screen
- 1x emergency stop” push-button with a protective cover



Inside the Cabinet

- Base module which manages the generator set
- Main functions of base module:
 - execute the automatic function via integrated and application software
 - manage the system communications
 - manage the external communications (Modbus, Web)
 - manage and save the operating configuration
 - save up to 1000 time-stamped events (statuses, alarms, faults)
 - provides and checks stabilised power supply to the HMI
- Base module: Inputs and outputs
 - 1x pick-up analog input (speed detection)
 - 2x battery current analog inputs
 - 1x 24 VDC power supply inputs
 - 4x resistive inputs
 - 3x analog inputs, 1 of which isolated
 - 18x digital inputs
 - 1x 24 VDC HMI power supply output
 - 2x analog outputs, 1 of which isolated
 - 18x relay outputs
- Base module: Communication ports
 - 4x CAN buses, of which 1 bus isolated
 - 2x system Ethernet ports (intercommunication connection)
 - 1x Ethernet port for user (e.g.: Connection for supervision)
 - 1x HMI Ethernet port
 - 1x isolated RS 485 serial link (e.g.: Connection for supervision)



Regulation module

- Main functions of regulation module:
 - manages electrical measurements
 - manages speed and voltage regulation
 - manages synchronisation, coupling and distribution
 - manages power setpoints
 - manages generator set, power plant and grid protection
 - connection with the base module via CAN bus port
- Synchronisation and coupling:
 - frequency regulation (with centring in isolated operation)
 - voltage regulation (with centring in isolated operation)
 - power factor regulation
 - active power regulation
 - reactive power regulation
 - analog distribution of P and Q
 - digital distribution of P and Q
 - droop (Hz/V)
- Grid detection:
 - Three-phase power cut detection
 - rotating magnetic field checking
- Protection:
 - (ANSI 49) thermal image
 - (ANSI 50) alternator overload
 - (ANSI 32PQ) Maximum reactive power
 - (ANSI 32PH) Maximum active power
 - (ANSI 32PL) Minimum active power
 - (ANSI 32RP) Active power reverse
 - (ANSI 32RQ) Reactive power reverse or excitation loss
 - (ANSI 78) Vector jump
 - (ANSI 81R) DF / DT
 - (ANSI 27) Minimum voltage
 - (ANSI 59) Maximum voltage
 - (ANSI 81L) Minimum frequency
 - (ANSI 81H) Maximum frequency
 - (ANSI 68L/H) Power supply voltage min/max checking



I/O module

- 8x digital inputs
- 4x digital inputs





Price* : 606.11 GBP



Main

Range	Spacial
Product name	Spacial SM
Product or component type	Compact enclosure
Application	Multi-purpose
Installation accessory type	Floor-standing
Device composition	1 blocking system for left door 1 body 1 cable gland plate 1 mounting plate 1 locking system with handle for door 4 mounting plate bracket 2 door
Removable parts	Door fixed by screws for hinge Mounting plate bracket fixed by screws Mounting plate fixed by screws for mounting plate bracket
Enclosure nominal height	1600 mm
Enclosure nominal width	1000 mm
Enclosure nominal depth	300 mm

Complementary

Number of doors	2 on front
Door opening side	Left 120 ° Right 120 °
Door type	Plain
Lock type	4 points lock, handle with 5 mm double bar insert
Body type	Single piece body with welded rear panel Front part forming a rigid frame with welded corners
Mounting plate description	Plain
Type of gland plate	Standard

Disclaimer: This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications

Cable entry	1 entry
Material	Galvanised steel for mounting plate Sheet steel for body Sheet steel for door Zamak for hinge
Surface finish	Epoxy-polyester powder
Colour	Enclosure : grey RAL 7035 Handle : black RAL 9005
Accessibility for operation	Front

Environment

Standards	IEC 62208
Product certifications	BV DNV UL
IP degree of protection	IP55 conforming to IEC 60529
IK degree of protection	IK10 conforming to IEC 62262

Offer Sustainability

Sustainable offer status	Green Premium product
RoHS (date code: YYWW)	Compliant - since 0940 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACH	Reference not containing SVHC above the threshold Reference not containing SVHC above the threshold
Product environmental profile	Available Product Environmental Profile
Product end of life instructions	Need no specific recycling operations

Contractual warranty

Warranty period	18 months
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Industrial Diesel Generator Set – KD3500-E
50 Hz - Emission Optimized – EPA Tier 2 Compliant

Battery charger

Reference Conditions: 25°C Air Inlet Temperature, 40°C Fuel Inlet Temperature, 100 kPa Barometric Pressure; 10.7 g/kg of dry air Humidity. Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit; Fuel density at 0.85 kg/L.

Data was taken from a single engine test according to the test methods, fuel specification and reference conditions stated above and is subjected to instrumentation and engine-to-engine variability. Test conducted with alternate test methods, instrumentation, fuel or reference conditions can yield different results. Data and specifications subject to change without notice.

Technical specifications sheet

SDMO

Battery charger

BC 2024

BATTERY CHARGER SINGLE PHASE

BC 2024



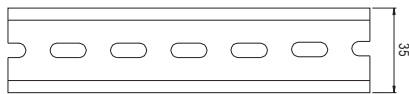
Features:

- Protections: Short circuit/ Overload/ Over voltage/ Over temperature
- Boost mode
- Cooling by free air convection
- Can be installed on DIN rail TS-35/7.5 or TS-35/15
- Fault relay contact
- 100% full load burn-in test
- 3 years warranty

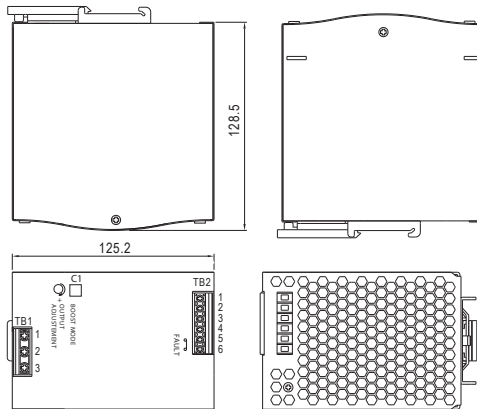
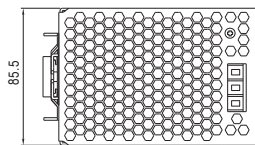
OUTPUT	DC VOLTAGE	24 V
	RATED CURRENT	20 A
	CURRENT RANGE	0 ~ 20 A
	RATED POWER	480 W
	RIPPLE & NOISE (max.)	100mVp-p
	VOLTAGE ADJ. RANGE	24 ~ 28 V
	LINE REGULATION	(+/-) 0.5%
	LOAD REGULATION	(+/-) 1%
	SETUP, RISE TIME	800ms, 150ms/400V _{AC} , 2000ms, 150ms/230V _{AC} at full load
	HOLD UP TIME (typ.)	18ms / 400V _{AC} 16ms / 230V _{AC} at full load
⚠ INFORMATION	Please adjust output voltage required with the potentiometer according to the battery charger type before the commissioning	
INPUT	VOLTAGE RANGE	180 ~ 550V _{AC} 254 ~ 780V _{DC}
	FREQUENCY RANGE	47 ~ 63Hz
	EFFICIENCY (typ.)	92%
	AC CURRENT (typ.)	1.6A/400V _{AC} 4A/230V _{AC}
	INRUSH CURRENT (typ.)	Cold start 50A
	LEAKAGE CURRENT	<3.5mA / 530V _{AC}
PROTECTION	OVERLOAD	105 ~ 130% rated output power Protection type : Constant current limiting, unit will shut down after 3 sec. , auto-recovery after 1 minute if the fault condition is removed
	OVER VOLTAGE	29 ~ 33V Protection type : Shut down o/p voltage, auto-recovery after 1 minute if the fault condition is removed
	OVER TEMPERATURE	95°C (+/-)5°C (TSW) Protection type : shut down o/p voltage, recovers automatically after temperatures goes down
FONCTION	FAULT RELAY CONTACT	60V _{DC} /0.3A, 30V _{DC} /1A, 30V _{AC} /0.5A resistive load Contact open = DC OK / Contact closed = DC NOK
	BOOST MODE	Contact closed = boost mode Boost voltage =+4% above floating voltage
ENVIRONMENT	WORKING TEMP.	(-)30 ~ (+)70°C (refer to ouput load derating curve)
	WORKING HUMIDITY	20 ~ 95% RH non condensing
	STORAGE TEMP, HUMIDITY	(-)40 ~ (+)85°C, 10 ~ 95% RH
	TEMP. COEFFICIENT	(+/-)0.03%/°C (0 ~ 50°C)
	VIBRATION	Components: 10 ~ 500Hz, 2G 10min./1cycle, period for 60min. each along X, Y, Z axes ; Mounting : Compliance to IEC60068-2-6
SAFETY & EMC	SAFETY STANDARDS	UL508 approved, IEC60950-1 CB approved by SIQ, design refer to GL
	WITHSTAND VOLTAGE	I/P-O/P:3KV _{AC} I/P-FG:2KV _{AC} O/P-FG:0.5KV _{AC} O/P-DC OK:0.5KV _{AC}
	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG:100M Ohm / 500V _{DC} / 25°C / 70% RH
	EMI CONDUCTION & RADIATION	Compliance to EN55022 (CISPR22), EN61204-3 Class B, EN61000-3-2,-3
	EMS IMMUNITY	Compliance to EN61000-4-2,3,4,5,6,8,11, EN55024, EN61000-6-2 (EN50082-2), EN61204-3, heavy industry level, criteria A
OTHERS	MTBF	112.8K hrs min. MIL-HDBK-217F (25°C)
	DIMENSION	85.5 x 125.2 x 128.5mm (W x H x D)
	PACKING	1.7Kg; 8pcs/14.6Kg/0.9CUFT
NOTES	All parameters NOT specially mentioned are measured at 400V _{AC} input, rated load and 25°C of ambient temperature.	
	Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair wire terminated with a 0.1uf & 47uf parallel capacitor.	
	The power supply is considered a component wich will be installed into a final equipment. The final equipment must be re-confirmed that it still meets EMC directives	
	Length of set up time is measured at cold first start. Turning ON/OFF the power supply very quick may lead to increase of the set up time.	

BATTERY CHARGER SINGLE PHASE BC 2024

Mechanical specification Unit: mm



ADMISSIBLE DIN-RAIL: TS35/7.5 OR TS35/15



Terminal Pin No. Assignment (TB1)

Pin No.	Assignment
1	FG ⊕
2	AC/L2
3	AC/L1

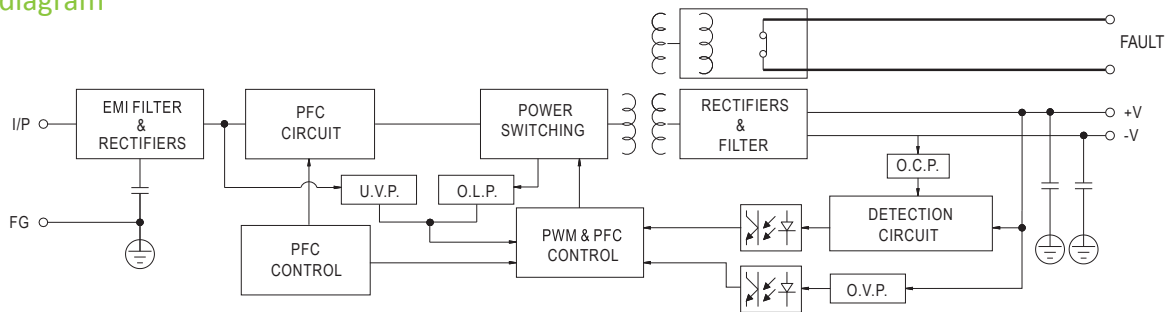
Terminal Pin No. Assignment (TB2)

Pin No.	Assignment
1,2	DC OUTPUT +V
3,4	DC OUTPUT -V
5,6	Relay Contact

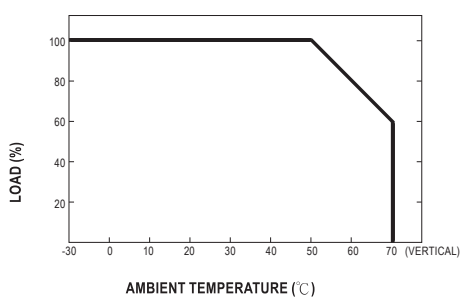
Front panel connector (C1)

Close	Boost mode
Open	Floating mode

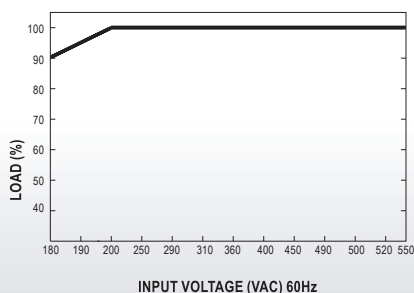
Block diagram



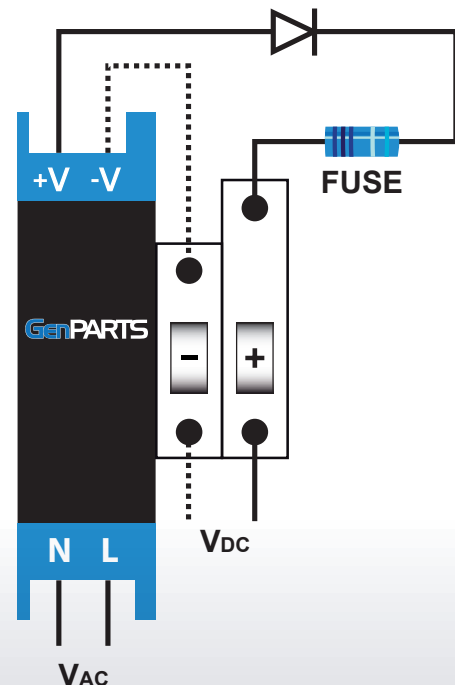
Derating curve



Output derating VS Input voltage (V_{AC})



Battery connection



ENGINE DATASHEET



KOHLER®

Engine ref. : KD83V16-5CES

General technical data

Cylinder configuration	V
Number of cylinders	16
Emission level	Emission optimization - EPA Tier 2 Compliant
Dual Frequency	Yes
Speed 50Hz (RPM)	1500
Speed (RPM)	1800
Displacement (l)	82.74
Bore (mm)	175
Stroke (mm)	215
Compression ratio	16 : 1
Engine Firing Order	A1-B7-A2-B5-A4-B3-A6-B1-A8-B2-A7-B4-A5-B6-A3-B8
Air inlet system	Turbo
Fuel	Diesel Fuel/HVO

Performance

	RPM	1500	1800
Maximum stand-by power at rated RPM (kW)		3007	3490
PRP Power (kW)		2734	3172
Pistons speed (m/s)		10.75	12.90
BMEP @ ESP (bar) / BMEP @ ESP 60Hz (bar)		29.10	28.10
Friction Power Loss (kW)		240	354
Max Combustion Pressure (Mpa)		240	

Electrical system

Governor type	Electronic
ECU type	KODEC
Frequency regulation, no-load to full-load	
Frequency regulation, steady state (%)	+/- 0.25%
No. of teeth on ring gear	182
Idle speed (RPM)	650
Battery voltages (V)	24
Charging alternator (V/Ah)	24 / 28 / 140
Starter characteristics (V/kW)	2 * (24 / 9)

Dimensions and weight

Length (mm)	3240
Width (mm)	1777
Height (mm)	2125
Dry weight (kg)	11300

ENGINE DATASHEET



KOHLER®

Engine ref. : KD83V16-5CES

Wet weight (kg)	12157
Center of Gravity from Rear Face of Block (mm)	-1200

Construction / Material

Main Bearing Type	Half shell bearing
Cylinder Head Material	Cast Iron
Crankshaft Material	Forged Steel
Intake and Exhaust Valve Material	Forged Steel
Piston type & material	Forged Steel
Exhaust manifold type	Dry

Installation

Maximum Bending Moment at Rear Face of Block (RFOB) (Nm)	
Maximum Rear Bearing Load (N)	
Maximal engine inclination, longitudinal front up/down (degree)	10
Maximal engine inclination, lateral (degree)	15
SAE Flywheel housing	00
SAE Flywheel	21
Inertia (kg.m ²)	42.10

Fuel system

	RPM	1500	1800
Maximum fuel pump flow (l/h)		1070	
Max. restriction at fuel pump (m)			3.50
Max head on fuel return line (m)			3.50
Maximum allowed inlet fuel temperature (°C)			70
Primary fuel filter rating (micron)			5
Fuel Prefilter / Water Separator Micron Size			10
Fuel Inlet Minimum recommended size (mm)			33.70
Fuel Outlet Minimum recommended size (mm)			33.70

Fuel consumption (Specific fuel consumption +5% ; ISO3046-1 ; 42.7 MJ/kg)

	RPM	1500	1800
Specific consumption @ 25% of PRP Power (g/kW.h)		262	
Specific consumption @ 50% of PRP Power (g/kW.h)		226	
Specific consumption @ 75% of PRP Power (g/kW.h)		211	
Specific consumption @ PRP Max Power (g/kW.h)		204	
Specific consumption @ 25% of ESP Power (g/kW.h)		257	253
Specific consumption 50% of ESP Power (g/kW.h)		223	
Specific consumption @ 75% of ESP Power (g/kW.h)		211	199
Specific consumption @ ESP Max Power (g/kW.h)		200	198

ENGINE DATASHEET



KOHLER®

Engine ref. : KD83V16-5CES

Lubrication system

	RPM	1500	1800
Oil consumption 100% ESP 50Hz (l/h)		1.42	1.42
Oil system capacity including filters (l)		560	
Oil sump capacity (l)		460	
Oil capacity between dipstick marks Max-Min (l)		83	
Min. oil pressure (bar)		3.70	
Oil Pressure at rated speed (bar)		4.50	
Max. oil pressure (bar)			
Oil temperature maximum (°C at 25°C ambient)		100	
Oil filter micron size		10	
Oil Filter Quantity and type		Spin On / 8	
Oil cooler		Plate Exchanger	

Air intake system

	RPM	1500	1800
Combustion air flow (l/s)		3720.58	4027.66
Max. intake restriction (mm H2O)		510	
Maximum air filter temp without derating (°C)		65	

Exhaust system

	RPM	1500	1800
Heat rejection to exhaust (kW)		2090	1950
Max. exhaust back pressure (mm H2O)		867	
Exhaust gas temperature @ ESP (°C)		510	400
Exhaust gas flow @ ESP (l/s)		10266	9523

Cooling system

	RPM	1500	1800
Radiated heat to ambient (kW)		140	140
Heat rejection to coolant HT (kW)		1100	1110
HT circuit flow rate (l/min)		1980	2480
Heat rejection to coolant LT (kW)		820	860
LT circuit flow rate (l/min)		620	810
Temperature of inlet to LT engine water circuit (°C)		55	
Outlet coolant temperature (°C)		85	
Maximum Coolant temp without derating (°C)		100	
Max coolant temperature, Shutdown (°C)		105	
Coolant capacity HT, engine only (l)		270	
Restriction pressure drop off engine – HT circuit (mbar)		700	
Minimal pressure before HT pump (mbar)		400	

ENGINE DATASHEET



KOHLER®

Engine ref. : KD83V16-5CES

Max. pressure at inlet of HT water pump (mbar)	2500
Thermostat begin of opening HT (°C)	71
Thermostat end of opening HT (°C)	81
HT Standard pressure cap setting (kPa)	100
Coolant capacity LT, engine only (l)	105
Restriction pressure drop off engine – LT circuit (mbar)	700
Minimal pressure before LT pump (mbar)	400
Max. pressure at inlet of LT water pump (mbar)	2500
Thermostat begin of opening LT (°C)	45
Thermostat end of opening LT (°C)	57
LT Standard pressure cap setting (kPa)	100
Water Pump Type	Vane Wheel pump

Charge air cooling system



KD3500

50 Hz. Diesel Generator Set EMISSION OPTIMIZED DATA SHEET TIER 2 COMPLIANT

ENGINE INFORMATION

Model:	KD83V16	Bore:	175 mm (6.89 in.)
Type:	4-Cycle, 16-V Cylinder	Stroke:	215 mm (8.46 in.)
Aspiration:	Turbocharged, Intercooled	Displacement:	83 L (5048 cu. in.)
Compression ratio:	16:0:1		
Emission Control Device:	Direct Diesel Injection, Engine Control Module, Turbocharger, Charge Air Cooler		

EXHAUST EMISSION DATA:

EPA D2 Cycle 5-mode weighted

HC	0.45 g/kWh
NO _x (Oxides of Nitrogen as NO ₂)	5.88 g/kWh
CO (Carbon Monoxide)	1.05 g/kWh
PM (Particular Matter)	0.08 g/kWh

EMISSION DATA

Cycle point	100% ESP	100% PRP	75% ESP	75% PRP	50% PRP					
Power [kW]	3007	2734	2255	2051	1367					
Speed [rpm]	1500	1500	1500	1500	1500					
NO _x [g/kWh]	9.3	7.8	6.0	5.9	5.2					
CO [g/kWh]	0.2	0.2	0.3	0.4	1.3					
HC [g/kWh]	0.29	0.31	0.34	0.35	0.45					
PM [g/kWh]	0.01	0.01	0.02	0.02	0.07					
	@ 5% O ₂	@ 15% O ₂	@ 5% O ₂	@ 15% O ₂	@ 5% O ₂	@ 15% O ₂	@ 5% O ₂	@ 15% O ₂	@ 5% O ₂	@ 15% O ₂
HC [mg/Nm ³]	98	37	102	38	109	41	113	42	134	50
NO _x [mg/Nm ³]	3174	1190	2610	979	1920	720	1873	702	1538	577
CO [mg/Nm ³]	79	30	82	31	105	39	120	45	382	143
PM [mg/Nm ³]	2	1	2	1	7	3	6	2	21	8

TEST METHODS AND CONDITIONS

Test Methods:

Steady-State emissions recorded per ISO8178-1 during operation at rated engine speed (+/-2%) and stated constant load (+/2%) with engine temperatures, pressures and emission rated stabilized.

Fuel Specification:

EN590 Diesel Fuel

Reference Conditions:

25°C (77 °F) Air Inlet Temperature, 40°C (104 °F) Fuel Inlet Temperature, 100 kPa (29.53 in Hg) Barometric Pressure; 10.7 g/kg (75 grains H₂O/lb) of dry air Humidity. Intake Restriction set to maximum allowable limit for clean filter; Exhaust Back pressure set to maximum allowable limit.

Data was taken from a single engine test according to the test methods, fuel specification and reference conditions stated above and is subjected to instrumentation and engine-to-engine variability. Test conducted with alternate test methods, instrumentation, fuel or reference conditions can yield different results.

Data and specifications subject to change without notice.

Noise Spectrum – KD83V16 + Mechanical Radiator:

ENGINE SOUND KD83V16	Fr (Hz)		Unit	63	125	250	500	1000	2000	4000	8000	GLOBAL
	Sound power	Rought spectrum	dB	118.8	126.7	125	118.6	117.3	116.5	114.1	115.1	130.4
		dBA weighting	dB	-26.2	-16.1	-8.6	-3.2	0.0	1.2	1.0	-1.1	/
		dBA weighted spectrum	dBA	92.6	110.6	116.4	115.4	117.3	117.7	115.1	114.0	124.2
MECH WHEEL	Fr (Hz)		Unit	63	125	250	500	1000	2000	4000	8000	GLOBAL
	Sound power	dBA weighted spectrum	dBA	88	99.7	107.2	112.3	114.3	111.5	108.7	103.3	118.7
ENGINE + MECH RAD	Sound power	dBA weighted spectrum	dBA	93.9	110.9	116.9	117.1	119.1	118.6	116.0	114.4	125.2

ALTERNATOR TECHNICAL DESCRIPTION
LSA 54 M90 / 4p

LS Reference: D220812 JLB 01 1

Date: 12/08/2022 V6.06 - 04/2021 1

Moteurs Leroy-Somer prenom.nom@mail.nidec.com 1
Electric Power Generation +33 (0)2 38 60 42 xx 1
1 rue de la Burelle - 45800 Saint Jean de Braye - France pn

Main data M 1

Generator type:	LSA 54 M90 / 4p			1
Power:	3,500	kVA	2,800 kWe	2,902 kWm
Voltage:	400	V	Star serial	1
Rated voltage range:	+5/-5%			1
Power factor - Lagging:	0.8			1
Frequency:	50	Hz		1
Speed:	1,500	rpm		1
Nominal current:	5,052	A		1
Winding type:	p2/3			1
Classes (Insulation / Temperature Rise):	H / H			1
Ambient temperature:	44	°C		1
Altitude:	100	m		1

Installation IEC Quantity 1 1

Client:	Kohler SDMO	1
Prime mover:	Reciprocating engine	1
Manufacturer:	KOHLER	1
Type:	KD83	1
Duty:	Base Rating	1

Mechanical construction IM1301 1

Type of construction:	Single bearing		1
Mounting arrangement:	Horizontal Axis		1
Direction of rotation:	Clockwise (seen when facing the drive end - DE)		1
Bearing type:	Anti-friction		1
Bearing Lubrication:	Regreasable		1
Bearing insulation:	Not insulated		1
Flector type:	SAE 21		1
Balancing - Class (ISO 1940/1):	Without key - G2,5 (std)		1
Flange:	SAE 00		1
Shaft height:	500	mm	1
Width:	1,150	mm	1

Additional specificities 1

Stabilized Runaway speed:	1,800	rpm - 2 min.	1
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Cooling Method IC01 1

Degree of protection:	IP23		1
Coolant:	Air / Temperature: 44 °C		1
Air quality:	Clean		1
Ventilation (internal):	Self-ventilated		1
Filters:	Without		1
Ducting for air inlet:	No		1
Ducting for air outlet:	No		1

ALTERNATOR TECHNICAL DESCRIPTION
LSA 54 M90 / 4p

LS Reference: D220812 JLB 01 1

Connection, Excitation & Regulation

Parallel operation:	Island mode (0F) - no //CT	1
Excitation:	Self-excited - Brushless - Type: AREP + PMI	1
Sustained 3-phase Isc:	> 3 x FLC for 10s.	1
AVR type:	Leroy Somer - D550 - Digital	1
AVR location:	In terminal box	1
Alternator Voltage sensing:	In terminal box	1

Terminal box

Power connection:	4 connectors (brought out neutral)	1
Main terminal box location:	1 terminal box on the top	1
Line side outlet:	Left hand side (seen when facing the drive end - D)	1
Gland plate:	Non magnetic, Undrilled	1
	-	1

Protection and measurement accessories

Temperature detection

Stator windings:	6 x 3-wire PT100 RTDs	1
Guide bearing - NDE:	1 x 3-wire PT100 RTD	1

Anti-condensation heating

Voltage: 230 V - 1Ph / Power: 500 W 1

Various items

220812EN02_B

Paint:	C3M-P - Polyurethane - RAL 1014	1
Documentation:	PDF manual	1
Documentation Language:	English	1

Controls

QUAL/INES/006 001	Measurement of winding resistance	1
QUAL/INES/006 021	Insulation check on sensors (when fitted)	1
QUAL/INES/006 002	Voltage balance and phase order check	1
QUAL/INES/006 007	Overspeed test (according to test bench limitation)	1
QUAL/INES/006 009	High potential test	1
QUAL/INES/006 010	Insulation resistance measurement	1

ALTERNATOR ELECTRICAL DATA
LSA 54 M90 / 4P

LS Reference: D220812 JLB 01

Date: 12/08/2022

V6.06 - 04/2021

Main data: **M**

Power:	3,500 kVA	2,800 kW _e	2,902 kW _m	1
Voltage:	400 V	Frequency:	50 Hz	1
Rated voltage range:	+5% / -5%	Speed:	1500 rpm	1
Power factor - Lagging:	0.8	Phases	3	1
Nominal current:	5,052 A	Connexion	Star serial	1
Insulation / Temperature rise:	H / H	Winding type:	p2/3	1
Cooling:	IC01	Winding:	- 6 Wires	1
Ambient temperature:	44 °C	Overspeed (rpm)	1800	1
Altitude:	100 m	Total Harmonic Distortion (THD) < 3,5%		1
Duty: Base Rating				

Efficiency (Base 2800 kW_e) **IEC**

	25%	50%	75%	100%	110%	
Power factor - Lagging: 0,8	94.02	96.13	96.52	96.50	96.43	1
Power factor - Lagging: 1	94.42	96.70	97.26	97.40	97.40	1

Reactances (%) - (Base 3500 kVA)

Unitary impedance (1 per unit) = 0,045714 ohms

		Unsaturated		Saturated		
	Direct axis					Quadrature axis
Synchronous reactance	X _d	268	238	X _q	137	121
Transient reactance	X' _d	25.3	21.5	X' _q	137	121
Subtransient reactance	X'' _d	12.0	10.2	X'' _q	11.5	9.8
Negative sequence reactance	X ₂	11.7	10.0			

X ₀	2.3	Zero sequence reactance	1
X _l	6.0	Stator leakage reactance	
X _r	20.9	Rotor leakage reactance	
K_c	0.42	Short-circuit ratio	1

Time constants (s)

		Direct axis		Quadrature axis	
Open circuit transient time constant	T' _{do}	3.38		T' _{qo}	NA
Short-circuit transient time constant	T' _d	0.320		T' _q	NA
Open circuit subtransient time constant	T'' _{do}	0.049		T'' _{qo}	0.246
Subtransient time constant	T'' _d	0.023		T'' _q	0.021

T _a	0.032	Armature time constant	1
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Resistances (%)

R _a	1.2	Armature resistance	R ₀	0.8	Zero sequence resistance	1
X/R	8.7	X/R ratio (without unit)	R ₂	2.3	Negative sequence resistance	

Voltage accuracy: 0,25%

Maximum inrush current for a voltage dip of 15%: 2708 kVA

when starting an AC motor having a starting power factor between 0 and 0.4

Rating is provided for the specified temperature rise, by resistance measurement according to IEC60034-1

According to: I.E.C. 60034.1 - 60034.2 - NEMA MG 1-32

Products and materials shown in this catalogue may, at any time, be modified in order to follow the latest technological developments.

#REF!

ALTERNATOR MAIN CURVES
LSA 54 M90 / 4P

LS Reference: D220812 JLB 01

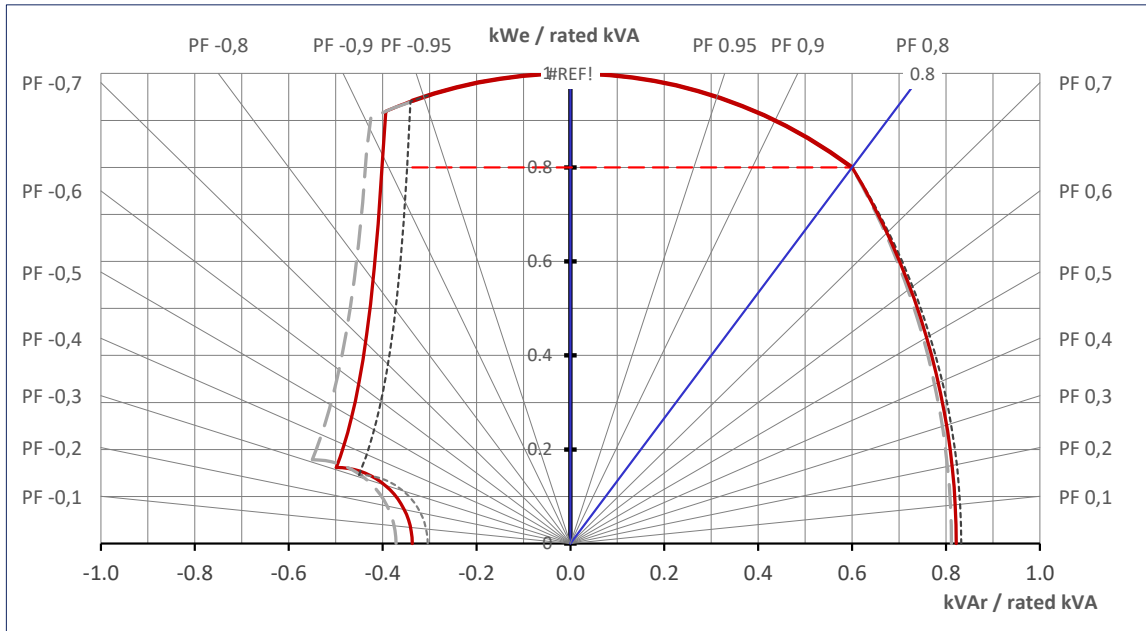
Date: 12/08/2022

3500kVA - 400V - 50 Hz

V6.06 - 04/2021

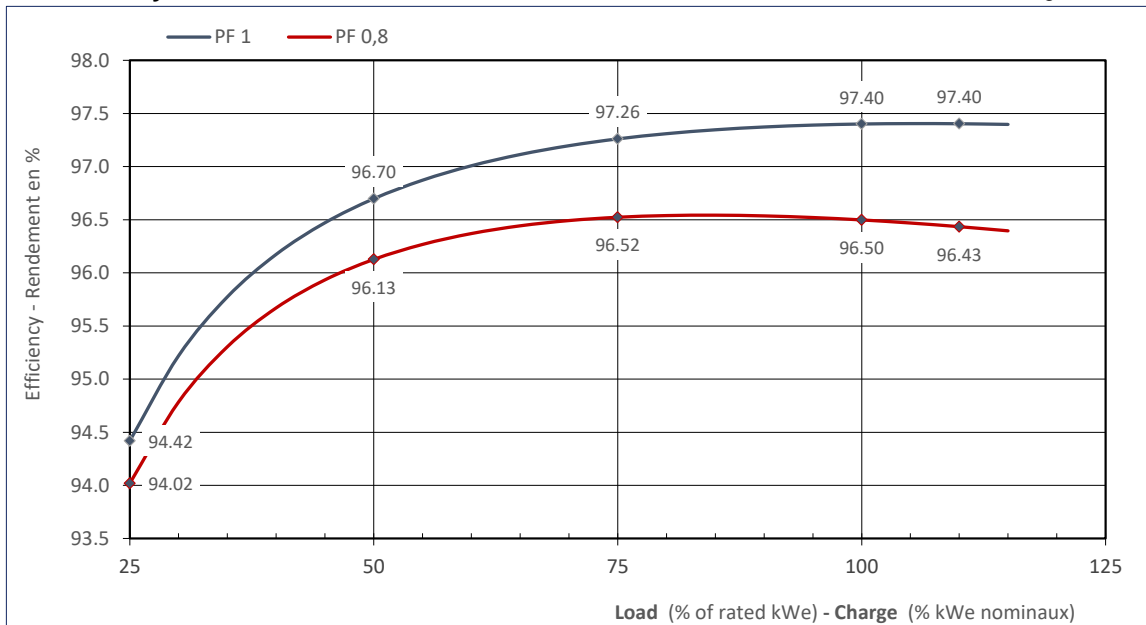
Capability Curve

---	Umax	+ 5%	420	V
---	Un		400	V
---	Umin	- 5%	380	V



Efficiency Curves

According to: IEC

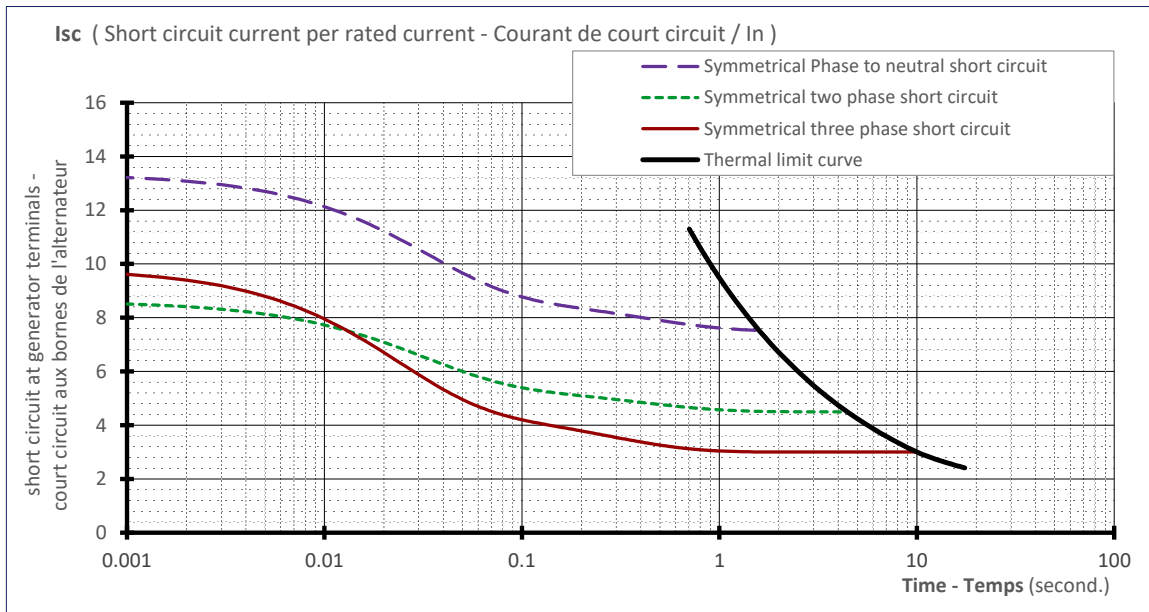


ALTERNATOR MAIN CURVES
LSA 54 M90 / 4P

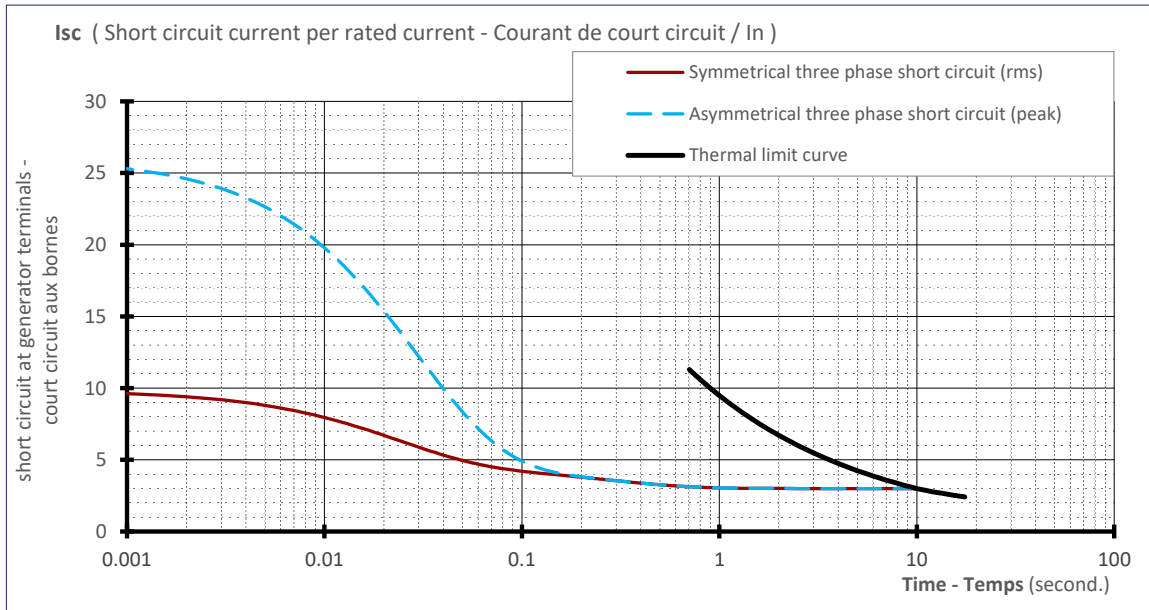
LS Reference: D220812 JLB 01

Stator Current decrement curves

Symmetrical phase to neutral short-circuit	—	initial	66,774	A	13,2 x In	
Symmetrical two phase short-circuit	- - -	max	42,982	A	8,5 x In	In = 5052 A
Symmetrical three phase short-circuit	—	value	48,588	A	9,6 x In	
Thermal Limit	—					



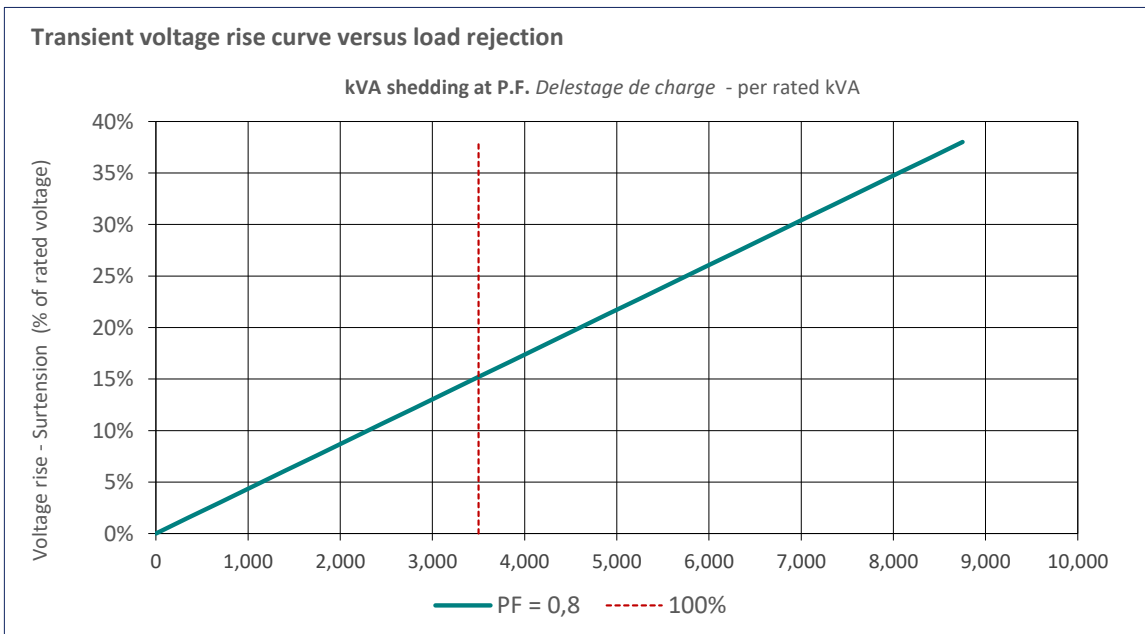
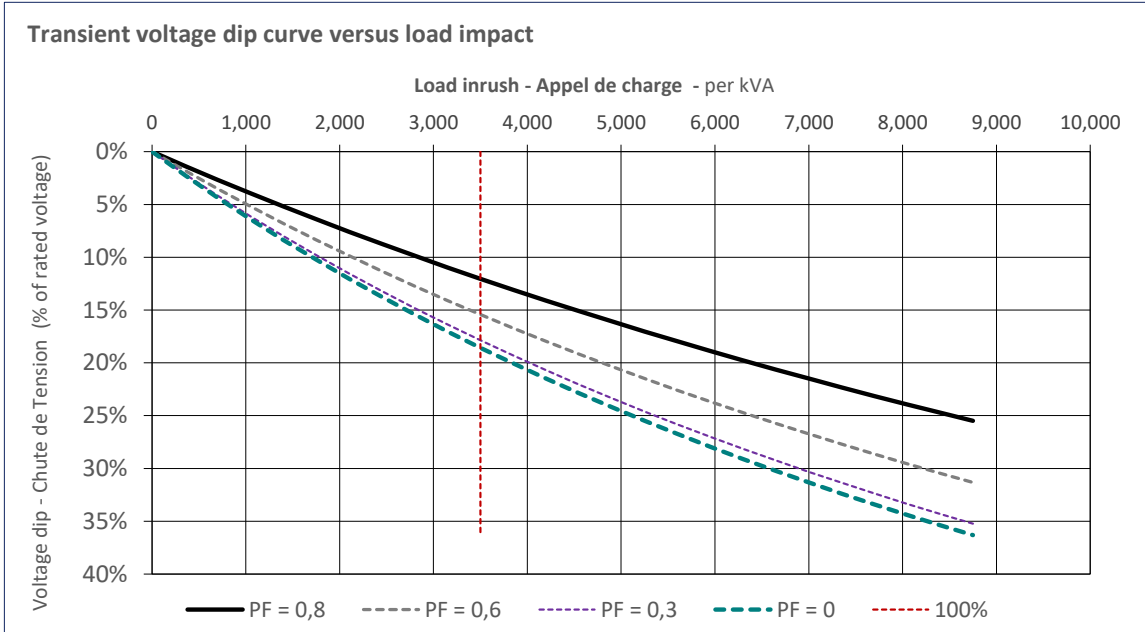
Asymmetrical three phase short-circuit — IP 126,747 A 25,1 x In



ALTERNATOR MAIN CURVES
LSA 54 M90 / 4P

LS Reference: D220812 JLB 01

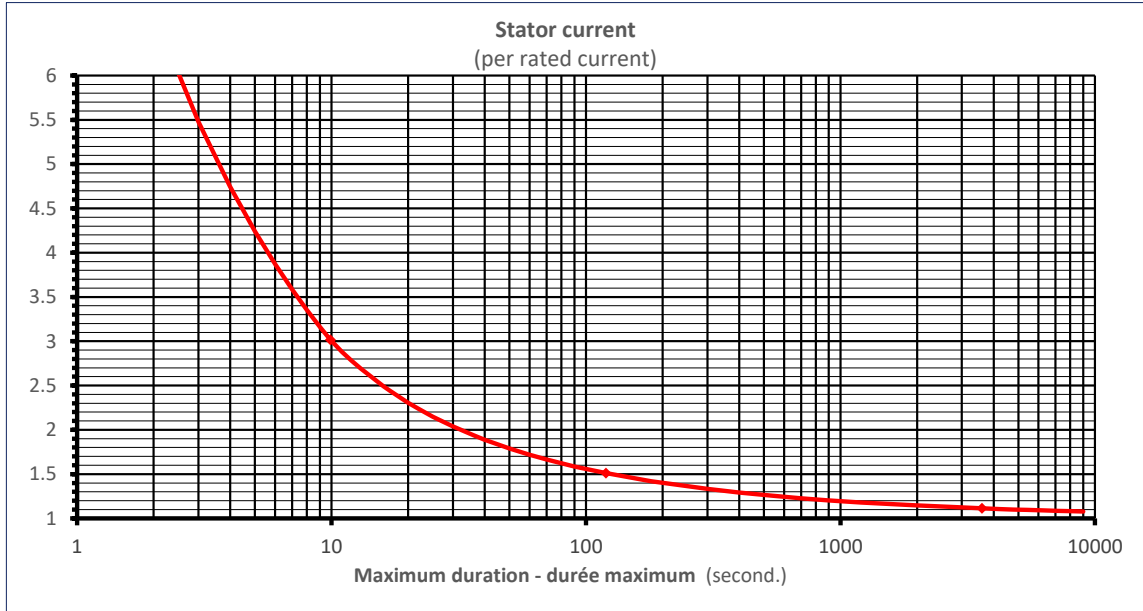
Transient Voltage Variation



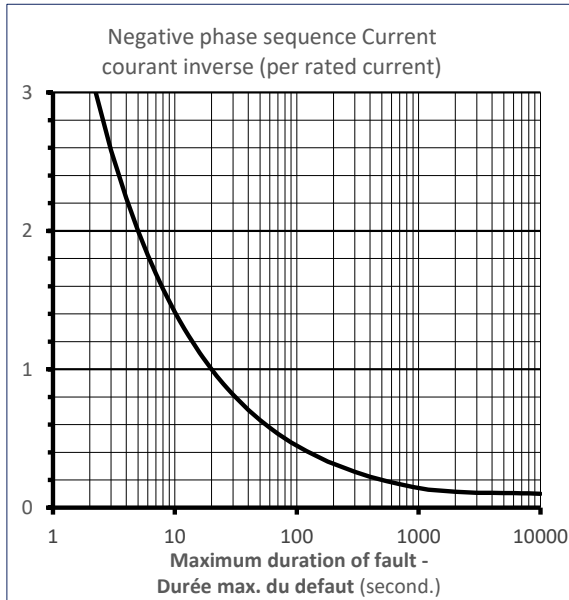
ALTERNATOR MAIN CURVES
LSA 54 M90 / 4P

LS Reference: D220812 JLB 01

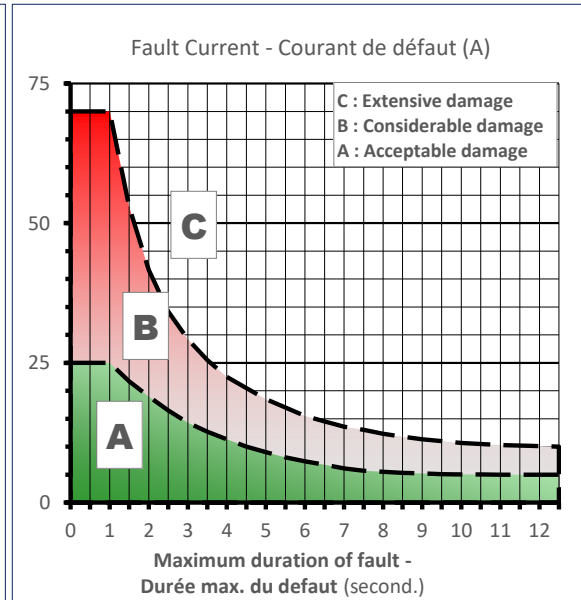
Thermal Damage Curve



Unbalance Load Curve



Stator Earth Fault Current





Derating calculation note

KD3500-E

REF				
REV	DATE	DESCRIPTION	WRITTER	SOFTWARE VERSION
A	25/10/22	FIRST ISSUE	FOLGOAS	

Genset features ISO conditions	RANGE	K175	/	TEMPERATURE	25	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE / READINESS	KD3500-E	O	PRP	3182	kVA
	VOLTAGE	400/230		ESP / DCP	3500	kVA
	ENGINE	KD83V16-5CES		PRP	2546	kWe
	STANDARD ALTERNATOR	LSA532M12	KH07830TO4D	ESP / DCP	2800	kWe
OVERSIZED ALTERNATOR	/	/	COOLING	AERO	A	

Genset features on site conditions	RANGE	K175	/	TEMPERATURE	44	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE	KD3500-E	/	HUMIDITY	75	%
	ENGINE	KD83V16-5CES	3 °C	COOLING	RAD-STD-KD3500-E	/
	ΔT AIR FILTER	LS	/	VERSION	OPEN	/
	Manufacturer	KH09	/	NET GENSET PRP POWER	2530 / 3160	kWe / kVA (cosφ=0.8)
	Range	KH09260TO4D	LSA54M90	NET GENSET ESP - DCP* POWER	2790 / 3490 - 2790 / 3490	kWe / kVA (cosφ=0.8)
	Reference	400/230	/	WEAK COMPONENT PRP/ESP/DCP	ENGINE/ENGINE/ENGINE	/
	Voltage	S	/	DERATING ON SITE/ISO PRP/ESP/DCP	99 % / 100 % / 100 %	/
	Winding					



Derating calculation note

KD3500-E

REF				
REV	DATE	DESCRIPTION	WRITTER	SOFTWARE VERSION
A	25/10/22	FIRST ISSUE	FOLGOAS	

Genset features ISO conditions	RANGE	K175	/	TEMPERATURE	25	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE / READINESS	KD3500-E	O	PRP	3182	kVA
	VOLTAGE	400/230		ESP / DCP	3500	kVA
	ENGINE	KD83V16-5CES		PRP	2546	kWe
	STANDARD ALTERNATOR	LSA532M12	KH07830TO4D	ESP / DCP	2800	kWe
OVERSIZED ALTERNATOR	/	/	COOLING	AERO	A	

Genset features on site conditions	RANGE	K175	/	TEMPERATURE	44	°C	
	FREQUENCY	50	Hz	ALTITUDE	1000	masl	
	TYPE	KD3500-E	/	HUMIDITY	75	%	
	ENGINE	ΔT AIR FILTER	KD83V16-5CES	3 °C	COOLING	RAD-STD-KD3500-E	/
		Manufacturer	LS	/	VERSION	OPEN	/
		Range	KH09	/	NET GENSET PRP POWER	2320 / 2900	kWe / kVA (cosφ=0.8)
		Reference	KH09260TO4D	LSA54M90	NET GENSET ESP - DCP* POWER	2560 / 3200 - 2560 / 3200	kWe / kVA (cosφ=0.8)
		Voltage	400/230	/	WEAK COMPONENT PRP/ESP/DCP	ENGINE/ENGINE/ENGINE	/
		Winding	S	/	DERATING ON SITE/ISO PRP/ESP/DCP	91 % / 91 % / 91 %	/



Derating calculation note

KD3500-E

REF				
REV	DATE	DESCRIPTION	WRITTER	SOFTWARE VERSION
A	25/10/22	FIRST ISSUE	FOLGOAS	

Genset features ISO conditions	RANGE	K175	/	TEMPERATURE	25	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE / READINESS	KD3500-E	O	PRP	3182	kVA
	VOLTAGE	400/230		ESP / DCP	3500	kVA
	ENGINE	KD83V16-5CES		PRP	2546	kWe
	STANDARD ALTERNATOR	LSA532M12	KH07830TO4D	ESP / DCP	2800	kWe
OVERSIZED ALTERNATOR	/	/	COOLING	AERO	A	

Genset features on site conditions	RANGE	K175	/	TEMPERATURE	45	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE	KD3500-E	/	HUMIDITY	75	%
	ENGINE	KD83V16-5CES	3 °C	COOLING	RAD-STD-KD3500-E	/
	ΔT AIR FILTER	LS	/	VERSION	OPEN	/
	Manufacturer	KH09	/	NET GENSET PRP POWER	2500 / 3120	kWe / kVA (cosφ=0.8)
	Range	KH09260TO4D	LSA54M90	NET GENSET ESP - DCP* POWER	2760 / 3450 - 2760 / 3450	kWe / kVA (cosφ=0.8)
	Reference	400/230	/	WEAK COMPONENT PRP/ESP/DCP	ENGINE/ENGINE/ENGINE	/
	Voltage	S	/	DERATING ON SITE/ISO PRP/ESP/DCP	98 % / 99 % / 99 %	/
	Winding					



Derating calculation note

KD3500-E

REF				
REV	DATE	DESCRIPTION	WRITTER	SOFTWARE VERSION
A	25/10/22	FIRST ISSUE	FOLGOAS	

Genset features ISO conditions	RANGE	K175	/	TEMPERATURE	25	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE / READINESS	KD3500-E	O	PRP	3182	kVA
	VOLTAGE	400/230		ESP / DCP	3500	kVA
	ENGINE	KD83V16-5CES		PRP	2546	kWe
	STANDARD ALTERNATOR	LSA532M12	KH07830TO4D	ESP / DCP	2800	kWe
OVERSIZED ALTERNATOR	/	/	COOLING	AERO	A	

Genset features on site conditions	RANGE	K175	/	TEMPERATURE	45	°C	
	FREQUENCY	50	Hz	ALTITUDE	1000	masl	
	TYPE	KD3500-E	/	HUMIDITY	75	%	
	ENGINE	ΔT AIR FILTER	KD83V16-5CES	3 °C	COOLING	RAD-STD-KD3500-E	/
		Manufacturer	LS	/	VERSION	OPEN	/
		Range	KH09	/	NET GENSET PRP POWER	2290 / 2860	kWe / kVA (cosφ=0.8)
		Reference	KH09260TO4D	LSA54M90	NET GENSET ESP - DCP* POWER	2520 / 3150 - 2520 / 3150	kWe / kVA (cosφ=0.8)
		Voltage	400/230	/	WEAK COMPONENT PRP/ESP/DCP	ENGINE/ENGINE/ENGINE	/
		Winding	S	/	DERATING ON SITE/ISO PRP/ESP/DCP	90 % / 90 % / 90 %	/



Derating calculation note

KD3500-E

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A	25/10/22	FIRST ISSUE	FOLGOAS	

Genset features ISO conditions	RANGE	K175	/	TEMPERATURE	25	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE / READINESS	KD3500-E	O	PRP	3182	kVA
	VOLTAGE	400/230		ESP / DCP	3500	kVA
	ENGINE	KD83V16-5CES		PRP	2546	kWe
	STANDARD ALTERNATOR	LSA532M12	KH07830TO4D	ESP / DCP	2800	kWe
OVERSIZED ALTERNATOR	/	/	COOLING	AERO	A	

Genset features on site conditions	RANGE	K175	/	TEMPERATURE	46	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE	KD3500-E	/	HUMIDITY	75	%
	ENGINE	KD83V16-5CES	3 °C	COOLING	RAD-STD-KD3500-E	/
	ΔT AIR FILTER	LS	/	VERSION	OPEN	/
	Manufacturer	KH09	/	NET GENSET PRP POWER	2470 / 3090	kWe / kVA (cosφ=0.8)
	Range	KH09260TO4D	LSA54M90	NET GENSET ESP - DCP* POWER	2720 / 3400 - 2720 / 3400	kWe / kVA (cosφ=0.8)
	Reference	400/230	/	WEAK COMPONENT PRP/ESP/DCP	ENGINE/ENGINE/ENGINE	/
	Voltage	S	/	DERATING ON SITE/ISO PRP/ESP/DCP	97 % / 97 % / 97 %	/
	Winding					
	RNATEURH/H Cl					



Derating calculation note

KD3500-E

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REV	DATE	DESCRIPTION	WRITTER	SOFTWARE VERSION
A	25/10/22	FIRST ISSUE	FOLGOAS	

Genset features ISO conditions	RANGE	K175	/	TEMPERATURE	25	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE / READINESS	KD3500-E	O	PRP	3182	kVA
	VOLTAGE	400/230		ESP / DCP	3500	kVA
	ENGINE	KD83V16-5CES		PRP	2546	kWe
	STANDARD ALTERNATOR	LSA532M12	KH07830TO4D	ESP / DCP	2800	kWe
OVERSIZED ALTERNATOR	/	/	COOLING	AERO	A	

Genset features on site conditions	RANGE	K175	/	TEMPERATURE	46	°C	
	FREQUENCY	50	Hz	ALTITUDE	1000	masl	
	TYPE	KD3500-E	/	HUMIDITY	75	%	
	ENGINE	ΔT AIR FILTER	KD83V16-5CES	3 °C	COOLING	RAD-STD-KD3500-E	/
		Manufacturer	LS	/	VERSION	OPEN	/
		Range	KH09	/	NET GENSET PRP POWER	2250 / 2810	kWe / kVA (cosφ=0.8)
		Reference	KH09260TO4D	LSA54M90	NET GENSET ESP - DCP* POWER	2480 / 3100 - 2480 / 3100	kWe / kVA (cosφ=0.8)
		Voltage	400/230	/	WEAK COMPONENT PRP/ESP/DCP	ENGINE/ENGINE/ENGINE	/
		Winding	S	/	DERATING ON SITE/ISO PRP/ESP/DCP	88 % / 89 % / 89 %	/



Derating calculation note

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Genset features ISO conditions	RANGE	K175	/	TEMPERATURE	25	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE / READINESS	KD3500-E	O	PRP	3182	kVA
	VOLTAGE	400/230		ESP / DCP	3500	kVA
	ENGINE	KD83V16-5CES		PRP	2546	kWe
	STANDARD ALTERNATOR	LSA532M12	KH07830TO4D	ESP / DCP	2800	kWe
OVERSIZED ALTERNATOR	/	/	COOLING	AERO	A	

Genset features on site conditions	RANGE	K175	/	TEMPERATURE	47	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE	KD3500-E	/	HUMIDITY	75	%
	ENGINE	KD83V16-5CES	3 °C	COOLING	RAD-STD-KD3500-E	/
	ΔT AIR FILTER	LS	/	VERSION	OPEN	/
	Manufacturer	KH09	/	NET GENSET PRP POWER	2440 / 3050	kWe / kVA (cosφ=0.8)
	Range	KH09260TO4D	LSA54M90	NET GENSET ESP - DCP* POWER	2690 / 3360 - 2690 / 3360	kWe / kVA (cosφ=0.8)
	Reference	400/230	/	WEAK COMPONENT PRP/ESP/DCP	ENGINE/ENGINE/ENGINE	/
	Voltage	S	/	DERATING ON SITE/ISO PRP/ESP/DCP	96 % / 96 % / 96 %	/
	Winding					



Derating calculation note

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A	25/10/22	FIRST ISSUE	FOLGOAS	

Genset features ISO conditions	RANGE	K175	/	TEMPERATURE	25	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE / READINESS	KD3500-E	O	PRP	3182	kVA
	VOLTAGE	400/230		ESP / DCP	3500	kVA
	ENGINE	KD83V16-5CES		PRP	2546	kWe
	STANDARD ALTERNATOR	LSA532M12	KH07830TO4D	ESP / DCP	2800	kWe
OVERSIZED ALTERNATOR	/	/	COOLING	AERO	A	

Genset features on site conditions	RANGE	K175	/	TEMPERATURE	47	°C
	FREQUENCY	50	Hz	ALTITUDE	1000	masl
	TYPE	KD3500-E	/	HUMIDITY	75	%
	ENGINE	KD83V16-5CES	3 °C	COOLING	RAD-STD-KD3500-E	/
	ΔT AIR FILTER	LS	/	VERSION	OPEN	/
	Manufacturer	KH09	/	NET GENSET PRP POWER	2220 / 2780	kWe / kVA (cosφ=0.8)
	Range	KH09260TO4D	LSA54M90	NET GENSET ESP - DCP* POWER	2440 / 3050 - 2440 / 3050	kWe / kVA (cosφ=0.8)
	Reference	400/230	/	WEAK COMPONENT PRP/ESP/DCP	ENGINE/ENGINE/ENGINE	/
	Voltage	S	/	DERATING ON SITE/ISO PRP/ESP/DCP	87 % / 87 % / 87 %	/
	Winding					



Derating calculation note

KD3500-E

REF				
REV	DATE	DESCRIPTION	WRITTER	SOFTWARE VERSION
A	25/10/22	FIRST ISSUE	FOLGOAS	

Genset features ISO conditions	RANGE	K175	/	TEMPERATURE	25	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE / READINESS	KD3500-E	O	PRP	3182	kVA
	VOLTAGE	400/230		ESP / DCP	3500	kVA
	ENGINE	KD83V16-5CES		PRP	2546	kWe
	STANDARD ALTERNATOR	LSA532M12	KH07830TO4D	ESP / DCP	2800	kWe
OVERSIZED ALTERNATOR	/	/	COOLING	AERO	A	

Genset features on site conditions	RANGE	K175	/	TEMPERATURE	48	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE	KD3500-E	/	HUMIDITY	75	%
	ENGINE	KD83V16-5CES	3 °C	COOLING	RAD-STD-KD3500-E	/
	ΔT AIR FILTER	LS	/	VERSION	OPEN	/
	Manufacturer	KH09	/	NET GENSET PRP POWER	2420 / 3020	kWe / kVA (cosφ=0.8)
	Range	KH09260TO4D	LSA54M90	NET GENSET ESP - DCP* POWER	2670 / 3340 - 2670 / 3340	kWe / kVA (cosφ=0.8)
	Reference	400/230	/	WEAK COMPONENT PRP/ESP/DCP	ENGINE/ENGINE/ENGINE	/
	Voltage	S	/	DERATING ON SITE/ISO PRP/ESP/DCP	95 % / 95 % / 95 %	/
	Winding					



Derating calculation note

KD3500-E

REF				
REV	DATE	DESCRIPTION	WRITTER	SOFTWARE VERSION
A	25/10/22	FIRST ISSUE	FOLGOAS	

Genset features ISO conditions	RANGE	K175	/	TEMPERATURE	25	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE / READINESS	KD3500-E	O	PRP	3182	kVA
	VOLTAGE	400/230		ESP / DCP	3500	kVA
	ENGINE	KD83V16-5CES		PRP	2546	kWe
	STANDARD ALTERNATOR	LSA532M12	KH07830TO4D	ESP / DCP	2800	kWe
OVERSIZED ALTERNATOR	/	/	COOLING	AERO	A	

Genset features on site conditions	RANGE	K175	/	TEMPERATURE	48	°C
	FREQUENCY	50	Hz	ALTITUDE	1000	masl
	TYPE	KD3500-E	/	HUMIDITY	75	%
	ENGINE	KD83V16-5CES	3 °C	COOLING	RAD-STD-KD3500-E	/
	ΔT AIR FILTER	LS	/	VERSION	OPEN	/
	Manufacturer	KH09	/	NET GENSET PRP POWER	2200 / 2750	kWe / kVA (cosφ=0.8)
	Range	KH09260TO4D	LSA54M90	NET GENSET ESP - DCP* POWER	2430 / 3040 - 2430 / 3040	kWe / kVA (cosφ=0.8)
	Reference	400/230	/	WEAK COMPONENT PRP/ESP/DCP	ENGINE/ENGINE/ENGINE	/
	Voltage	S	/	DERATING ON SITE/ISO PRP/ESP/DCP	86 % / 87 % / 87 %	/
	Winding					



Derating calculation note

KD3500-E

REF				
REV	DATE	DESCRIPTION	WRITTER	SOFTWARE VERSION
A	25/10/22	FIRST ISSUE	FOLGOAS	

Genset features ISO conditions	RANGE	K175	/	TEMPERATURE	25	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE / READINESS	KD3500-E	O	PRP	3182	kVA
	VOLTAGE	400/230		ESP / DCP	3500	kVA
	ENGINE	KD83V16-5CES		PRP	2546	kWe
	STANDARD ALTERNATOR	LSA532M12	KH07830TO4D	ESP / DCP	2800	kWe
OVERSIZED ALTERNATOR	/	/	COOLING	AERO	A	

Genset features on site conditions	RANGE	K175	/	TEMPERATURE	49	°C	
	FREQUENCY	50	Hz	ALTITUDE	100	masl	
	TYPE	KD3500-E	/	HUMIDITY	75	%	
	ENGINE	ΔT AIR FILTER	KD83V16-5CES	3 °C	COOLING	RAD-STD-KD3500-E	/
		Manufacturer	LS	/	VERSION	OPEN	/
		Range	KH09	/	NET GENSET PRP POWER	2410 / 3010	kWe / kVA (cosφ=0.8)
		Reference	KH09260TO4D	LSA54M90	NET GENSET ESP - DCP* POWER	2650 / 3310 - 2650 / 3310	kWe / kVA (cosφ=0.8)
		Voltage	400/230	/	WEAK COMPONENT PRP/ESP/DCP	ENGINE/ENGINE/ENGINE	/
		Winding	S	/	DERATING ON SITE/ISO PRP/ESP/DCP	95 % / 95 % / 95 %	/



Derating calculation note

KD3500-E

REF				
REV	DATE	DESCRIPTION	WRITTER	SOFTWARE VERSION
A	25/10/22	FIRST ISSUE	FOLGOAS	

Genset features ISO conditions	RANGE	K175	/	TEMPERATURE	25	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE / READINESS	KD3500-E	O	PRP	3182	kVA
	VOLTAGE	400/230		ESP / DCP	3500	kVA
	ENGINE	KD83V16-5CES		PRP	2546	kWe
	STANDARD ALTERNATOR	LSA532M12	KH07830TO4D	ESP / DCP	2800	kWe
OVERSIZED ALTERNATOR	/	/	COOLING	AERO	A	

Genset features on site conditions	RANGE	K175	/	TEMPERATURE	49	°C
	FREQUENCY	50	Hz	ALTITUDE	1000	masl
	TYPE	KD3500-E	/	HUMIDITY	75	%
	ENGINE	KD83V16-5CES	3 °C	COOLING	RAD-STD-KD3500-E	/
	ΔT AIR FILTER	LS	/	VERSION	OPEN	/
	Manufacturer	KH09	/	NET GENSET PRP POWER	2180 / 2720	kWe / kVA (cosφ=0.8)
	Range	KH09260TO4D	LSA54M90	NET GENSET ESP - DCP* POWER	2410 / 3010 - 2410 / 3010	kWe / kVA (cosφ=0.8)
	Reference	400/230	/	WEAK COMPONENT PRP/ESP/DCP	ENGINE/ENGINE/ENGINE	/
	Voltage	S	/	DERATING ON SITE/ISO PRP/ESP/DCP	86 % / 86 % / 86 %	/
	Winding					



Derating calculation note

KD3500-E

REF				
REV	DATE	DESCRIPTION	WRITTER	SOFTWARE VERSION
A	25/10/22	FIRST ISSUE	FOLGOAS	

Genset features ISO conditions	RANGE	K175	/	TEMPERATURE	25	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE / READINESS	KD3500-E	O	PRP	3182	kVA
	VOLTAGE	400/230		ESP / DCP	3500	kVA
	ENGINE	KD83V16-5CES		PRP	2546	kWe
	STANDARD ALTERNATOR	LSA532M12	KH07830TO4D	ESP / DCP	2800	kWe
OVERSIZED ALTERNATOR	/	/	COOLING	AERO	A	

Genset features on site conditions	RANGE	K175	/	TEMPERATURE	50	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE	KD3500-E	/	HUMIDITY	75	%
	ENGINE	KD83V16-5CES	3 °C	COOLING	RAD-STD-KD3500-E	/
	ΔT AIR FILTER	LS	/	VERSION	OPEN	/
	Manufacturer	KH09	/	NET GENSET PRP POWER	2390 / 2990	kWe / kVA (cosφ=0.8)
	Range	KH09260TO4D	LSA54M90	NET GENSET ESP - DCP* POWER	2630 / 3290 - 2630 / 3290	kWe / kVA (cosφ=0.8)
	Reference	400/230	/	WEAK COMPONENT PRP/ESP/DCP	ENGINE/ENGINE/ENGINE	/
	Voltage	S	/	DERATING ON SITE/ISO PRP/ESP/DCP	94 % / 94 % / 94 %	/
	Winding					



Derating calculation note

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REF				
REV	DATE	DESCRIPTION	WRITTER	SOFTWARE VERSION
A	25/10/22	FIRST ISSUE	FOLGOAS	

Genset features ISO conditions	RANGE	K175	/	TEMPERATURE	25	°C
	FREQUENCY	50	Hz	ALTITUDE	100	masl
	TYPE / READINESS	KD3500-E	O	PRP	3182	kVA
	VOLTAGE	400/230		ESP / DCP	3500	kVA
	ENGINE	KD83V16-5CES		PRP	2546	kWe
	STANDARD ALTERNATOR	LSA532M12	KH07830TO4D	ESP / DCP	2800	kWe
OVERSIZED ALTERNATOR	/	/	COOLING	AERO	A	

Genset features on site conditions	RANGE	K175	/	TEMPERATURE	50	°C
	FREQUENCY	50	Hz	ALTITUDE	1000	masl
	TYPE	KD3500-E	/	HUMIDITY	75	%
	ENGINE	KD83V16-5CES	3 °C	COOLING	RAD-STD-KD3500-E	/
	ΔT AIR FILTER	LS	/	VERSION	OPEN	/
	Manufacturer	KH09	/	NET GENSET PRP POWER	2170 / 2710	kWe / kVA (cosφ=0.8)
	Range	KH09260TO4D	LSA54M90	NET GENSET ESP - DCP* POWER	2390 / 2990 - 2390 / 2990	kWe / kVA (cosφ=0.8)
	Reference	400/230	/	WEAK COMPONENT PRP/ESP/DCP	ENGINE/ENGINE/ENGINE	/
	Voltage	S	/	DERATING ON SITE/ISO PRP/ESP/DCP	85 % / 85 % / 85 %	/
	Winding					