# GILLETTE GENERATORS

## LIQUID COOLED DIESEL ENGINE GENERATOR SET

**60 HZ MODEL**

# T4D-2000

| Model | HZ | STANDBY 130°C RISE | PRIME 105°C RISE |
|---|---|---|---|
| **T4D-2000-60 HERTZ** | 60 | 200 | 200 |

All generator sets are USA prototype built and thoroughly tested. Production models are USA factory built and 100% load tested.

**UL2200, UL1446, UL508, UL142, UL498**

**NFPA 110, 99, 70, 37**
All generator sets meet NFPA-110 Level 1, when equipped with the necessary accessories and installed per NFPA standards.

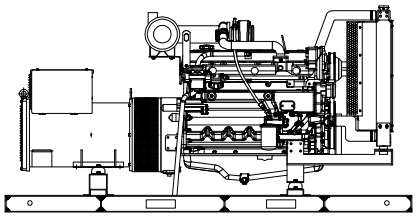
**NEC 700, 701, 702, 708**

**NEMA ICS10, MG1, ICS6, AB1**

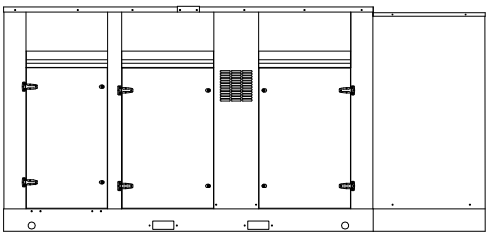
**ANSI C62.41, 27, 59, 32, 480, 40Q, 81U, 360-05**

**ASCE 7-05 & 7-10**
All generator sets meet 180 MPH rating.

**EPA 40CFR Part 60, 89, 1039, 1048, 1054, 1065, 1068**



**"OPEN" GEN-SET**
There is no enclosure, so gen-set must be placed within a weather protected area, un-inhabited by humans or animals, with proper ventilation. Silencer not supplied, as installation requirements are not known. However, this item is available as optional equipment.



**"LEVEL 2" HOUSED GEN-SET**
Full aluminum weather protection and superior sound attenuation for specific low noise applications. Critical grade muffler is standard.

## GENERATOR RATINGS

| GENERATOR MODEL | VOLTAGE | | PH | HZ | 130°C RISE STANDBY RATING | | 105°C RISE PRIME RATING | |
|---|---|---|---|---|---|---|---|---|
| | L-N | L-L | | | KW/KVA | AMP | KW/KVA | AMP |
| T4D-2000-3-2 | 120 | 208 | 3 | 60 | 200/250 | 694 | 200/250 | 694 |
| T4D-2000-3-3 | 120 | 240 | 3 | 60 | 200/250 | 602 | 200/250 | 602 |
| T4D-2000-3-4 | 277 | 480 | 3 | 60 | 200/250 | 301 | 200/250 | 301 |
| T4D-2000-3-5 | 127 | 220 | 3 | 60 | 200/250 | 656 | 200/250 | 656 |
| T4D-2000-3-16 | 346 | 600 | 3 | 60 | 200/250 | 240 | 200/250 | 240 |

RATINGS: All three phase gen-sets are 12 lead windings, rated at .8 power factor. 130° C "STANDBY RATINGS" are strictly for gen-sets that are used for back-up emergency power to a failed normal utility power source. This standby rating allows varying loads, with no overload capability, for the entire duration of utility power outage. 105° C "PRIME RATINGS" are strictly for gen-sets that provide the prime source of electric power, where normal utility power is unavailable or unreliable. A 10% overload is allowed for a total of 1 hour, within every 12 hours of operation, on every PRIME RATED systems. All gen-set power ratings are based on temperature rise measured by resistance method as defined by MIL-STD 705C and IEEE STD 115, METHOD 6.4.4. All generators have class H (180°C) insulation system on both rotor and stator windings. All factory tests and KW/KVA charts shown above are based 130°C (standby), and 105°C (prime) R/R winding temperature, within a maximum 40°C ambient condition. Generators operated at standby power ratings must not exceed the temperature rise limitation for class H insulation system, as specified in NEMA MG1-22.40. Specifications & ratings are subject to change without prior notice.

# APPLICATION & ENGINEERING DATA FOR MODEL T4D-2000-60 HZ

## GENERATOR SPECIFICATIONS

Manufacturer ..... Stamford Generators
Model & Type ..... HCI434D-311, 4 Pole, 12 Lead, Three Phase
..... HCI434D-17, 4 Pole, 12 Lead, 600V, Three Phase
Exciter ..... Brushless, shunt excited
Voltage Regulator ..... Solid State, HZ/Volts
Voltage Regulation ..... ½%, No load to full load
Frequency ..... 60 HZ
Frequency Regulation ..... ± ½% (1/2 cycle, no load to full load)
Unbalanced Load Capability ..... 100% of standby amps
One Step Load Acceptance ..... 100% of nameplate rating
Total Stator and Load Insulation ..... Class H, 180°C
Temperature Rise ..... 105°C R/R, prime rating @ 40°C amb.
3 Ø Motor Starting @ 30% Voltage Dip (208-240V) ... 1500 kVA
3 Ø Motor Starting @ 30% Voltage Dip (480V-600V) 2300 kVA
Bearing ..... 1, Pre-lubed and sealed
Coupling ..... Direct flexible disc.
Total Harmonic Distortion ..... Max 3½% (MIL-STD705B)
Telephone Interference Factor ..... Max 50 (NEMA MG1-22)
Deviation Factor ..... Max 5% (MIL-STD 405B)
Alternator ..... Self ventilating and drip-proof
Ltd. Warranty Period ..... 24 Months from start-up date or
..... 1000 hours use, first to occur.

## GENERATOR FEATURES

- World Renown Stamford Electric Generator having UL-1446 certification.
- Full generator protection with **Basler DGC-2020** controller, having UL-508 certification.
- Automatic voltage regulator with over-excitation, under-frequency compensation, under-speed protection, and EMI filtering. Entire solid-state board is encapsulated for moisture protection.
- Generator power ratings are based on temperature rise, measured by resistance method, as defined in MIL-STD 705C and IEEE STD 115, Method 6.4.4.
- Power ratings will not exceed temperature rise limitation for class H insulation as per NEMA MG1-22.40.
- Insulation resistance to ground, exceeds 1.5 meg-ohm.
- Stator receives 2000 V. hi-potential test on main windings, and rotor windings receive a 1500 V. hi-potential test, as per MIL-STD 705B.
- Full amortisseur windings with UL-1446 certification.
- Complete engine-generator torsional acceptance, confirmed during initial prototype testing.
- Full load testing on all engine-generator sets, before shipping.

# ENGINE SPECIFICATIONS AND APPLICATIONS DATA

## ENGINE

Manufacturer ..... VOLVO-PENTA
Model and Type ..... TAD1170VE, 4 cycle, liquid Cooled
Aspiration ..... Turbo After Cooler, Air to Air
Charged Air Cooled System ..... Air to Air
Cylinder Arrangement ..... 6 Cylinders, In-Line
Displacement Cu. In. (Liters) ..... 661 (10.8)
Bore & Stroke in (Cm) ..... 4.84 x 5.98 (12.3 x 15.2)
Compression Ratio ..... 17.0:1
Main Bearings ..... Tin Overlay with Babbit Backing
Cylinder Head ..... Cast Iron with overhead Cam
Pistons ..... Aluminum Alloy with Graphite Coating
Crankshaft ..... Induction Hardened, Heat Treated Forged
Valves ..... Heat Treated and Hardened Exhaust Valve
Governor ..... Electronic, EMS 2.2
Frequency Regulation ..... ± 1/4%
Air Cleaner ..... Dry, Replaceable Cartridge
Engine Speed ..... 1800 rpm
Max Power, bhp (kwm) Standby ..... ..... 320 (235)
BMEP: psi (MPa) Standby ..... ..... 331 (2.3)
Ltd. Warranty Period ..... 2 Year or 1000 hrs, first to occur

## FUEL SYSTEM

Type ..... Diesel Fuel Oil (ASTM No. 2-D)
Combustion System ..... Direct Injection
Fuel Injection Pump ..... Electronic, Delphi E3
24 VDC Coolant heaters ..... Optional Equipment
Fuel Filter ..... ..... Yes with Water Separator

## FUEL CONSUMPTION

| GAL/HR (LITER/HR) | STANDBY | PRIME |
|---|---|---|
| 100% LOAD | 14.9 (56.4) | 14.9 (56.4) |
| 75% LOAD | 11.6 (44.0) | 11.6 (44.0) |
| 50% LOAD | 8.29 (31.4) | 8.3 (34.8) |
| DEF Consumption is 6% of fuel consumption | | |

## OIL SYSTEM

Type ..... Full Pressure
Oil Pan Cap. W/ filter qt. (L) ..... 39 (37)
Oil Filter ..... 3, Replaceable Cartridge type

## ELECTRICAL SYSTEM

Ignition System ..... Electronic
Eng. Alternator/Starter: 24 VDC, negative ground, 110 amp/hr.

Recommended battery to -18°C (0° F): ....(2) 12 VDC, BCI# 31, Max. Dimensions: 14"lg x 6 3/4" wi x 10" hi, with standard round posts. Min output 1000 CCA. Battery tray (max. dim. at 15"lg x 7"wi). This model has (2) battery trays, (2) hold down straps, (2) sets of battery cables, and (1) battery charger. Installation of (2) 12VDC starting batteries connected in series for 24VDC output is required, with possible higher AMP/HR rating, as described above, if the normal environment temperature averages -13° F (-25°C) or cooler.

## CERTIFICATIONS

All engines are EPA emissions certified. All non-emergency stationary diesel engines are Tier IV Final compliant.

# APPLICATION & ENGINEERING DATA FOR MODEL T4D-2000-60 HZ

## COOLING SYSTEM

Type of System ..... Air to Air, Charged Air Cooler
Coolant Pump .....Pre-lubricated, self-sealing
Cooling Fan Type .....Pusher
Fan Diameter inches (cm).....35.1 (89)
Fan drive ratio..... 1.04:1
Ambient Capacity of Radiator °F (°C).....131 (55)
Engine Jacket Coolant Capacity gal. (L).....4.50 (17)
Radiator Coolant Capacity gal. (L) .....10.2 (39)
Water Pump Capacity gpm (L/min)..... ..... 96 (372)
Heat Reject Coolant: Btu/min ..... ..... ….6,824
Air to Air Heat Reject, BTU/min. ..... ..... ….2,843
Heat Radiated to Ambient, BTU/min ..... ..... ….2,419
Low Radiator Coolant Level Shutdown……..Standard
Note: Coolant temp. shut-down switch setting at 228°F (109°C) with 50/50 (water/antifreeze) mix.

## COOLING AIR REQUIREMENTS

Combustion Air cfm ($m^3$/min) ..... .....745 (21.1)
Max Air Intake Restrictions:
Clean Air Cleaner, KPA (psi) ..... .....5 (1.5)
Radiator Cooling Air, SCFM ($m^3$/min)……....16,725 (480)

## EXHAUST SYSTEM

Exhaust Outlet Size.....6"
Max. Back Pressure in KPA (in. H2O).....7 (28)
Exhaust Flow, at rated KW, CFM (m3/min)..... 1564 (44.3)
Exhaust Temp, (Stack) °F (ºC) ..... .....775 (413)

## SOUND LEVELS MEASURED IN dB(A)

| | Open Set | Level 2 Encl. |
|---|---|---|
| Level 2, SCR/Residential Silencer | 98 | 83 |

Note: Open sets (no enclosure) have installed selective catalytic reduction/residential silencer system. Level 2 enclosure has installed selective catalytic reduction/residential silencer. Sound tests are averaged from several test points and taken at 23 ft. (7 m) from source of noise at normal operation.

## DERATE GENERATOR FOR ALTITUDE

3% per 1000 ft. (305m) above 3000 ft. (914m) from sea level

## DERATE GENERATOR FOR TEMPERATURE

2% per 10°F (5.6°C) above 104°F (40°C)

## DIMENSIONS AND WEIGHTS

| | Open Set | Level 2 Enclosure |
|---|---|---|
| Length in (cm) | 172 (437) | 172 (437) |
| Width in (cm) | 52 (132) | 52 (132) |
| Height in (cm) | 75 (190) | 80 (203) |
| Net Weight lbs (kg) | 5777 (2620) | 7547 (3424) |
| Ship Weight lbs (kg) | 6052 (2745) | 7892 (3580) |

# BASLER DGC-2020 DIGITAL MICROPROCESSOR CONTROLLER

**Basler DGC-2020**

The "**2020**" controller is a highly advanced integrated gen-set control system for single gen-set applications. This controller includes a backlit LCD display which continuously displays the status of the engine and generator at all times.

Basler "**DGC-2020"** includes: Generator metering (including three phase) • Engine – Generator protections including IEEE-[27] under voltage, [32] power, [40] loss of excitation, [59] over voltage, [81] over and under frequency, Exercise timer • SAE J1939 engine ECU communications • Expansion capabilities for both inputs and outputs with expansion • Remote communications through RS-485 to Basler's RDP110 remote Display panel • (16) programmable contact inputs • (15) programmable contact outputs- (3) for up to 30AmpDC and (12) for up to 2 Amp DC • Illuminated Text Display • Front panel menu scroll buttons • Front panel operation mode buttons for STOP, RUN and AUTO • Alarm Silence and Lamp Test buttons

This controller includes expansion features including, RS485 (using MODBUS), direct USB connection with PC, expansion optioned using BESTCOMSPlus for remote annunciation and remote relay interfacing for a distance of up to 3300FT. The controller software is freely downloadable from the internet and allows monitoring with direct USB cable, LAN, or by internet via the built in web interface.

Further expansion is available by adding the optional RDP-110 remote display panel module. This featured device will allow Four programmable LEDs (2) alarms and (2) pre-alarms • (17) alarms and pre-alarms displayed from Basler controller • audible alarm horn • lamp test and alarm silence buttons • RD100 local power supply inputs of either 12vdc or 24vdc • connects through Basler controller through RS-485 communications protocol • conduit box included for (2) mounting configurations- either surface mount or semi-flush mounting.

# STANDARD FEATURES FOR MODEL T4D-2000-60 HZ

## STANDARD FEATURES

**CONTROL PANEL:**

Basler DGC-2020 digital microprocessor with logic allows programming in the field. Controller has:

- STOP-MANUAL-AUTO modes and automatic engine shutdowns, signaled by full text LCD indicators:
- Low oil pressure
- High engine temp
- Low Radiator Level
- Three auxiliary alarms
- Battery fail alarm
- Engine fail to start
- Engine over speed
- Engine under speed
- Over & under voltage

Also included is tamper-proof engine hour meter

**ENGINE:**

Fuel filter • Full flow Oil filter • Air filter • Fuel pump • Oil pump • Solenoid type starter motor • Hi-temp radiator • Jacket water pump • Thermostat • Pusher fan and guard • Exhaust manifold • Electronic Governor • 24 VDC battery charging alternator • Flexible fuel and exhaust connectors • Vibration isolators • Open coolant recovery system with 50/50 water to anti-freeze mixture • flexible oil & radiator hose • Shut-down sensors for low oil pressure, high coolant temp., low coolant level, high ambient temp.

Design & specifications subject to change without prior notice. Dimensions shown are approximate. Contact Gillette for certified drawings. DO NOT USE DIMENSIONS FOR INSTALLATION PURPOSES.

**AC GENERATOR SYSTEM:**

AC generator • Shunt excited • Brushless design • Circuit Breaker installed and wired to gen-set • Direct connection to engine with flex disc • Class H, 180°C insulation • Self ventilated • Drip proof construction • UL Certified

**VOLTAGE REGULATOR:**

1% Voltage regulation • EMI filter • Under-speed protection • Over-excitation protection • total encapsulation

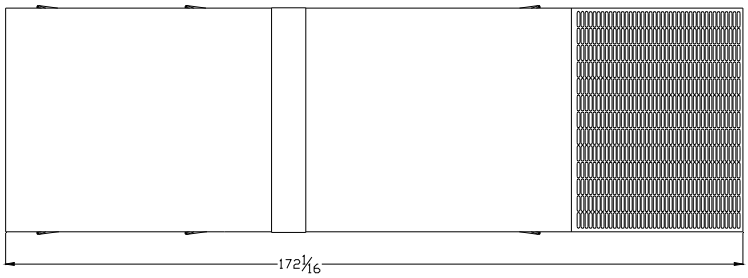
**DC ELECTRICAL SYSTEM:**

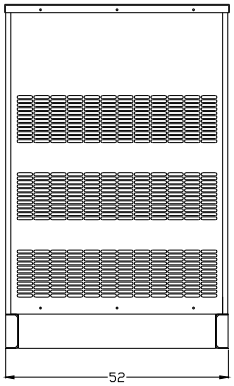
Battery trays • Battery cables • Battery hold down straps • 3-stage battery charger with float, absorption, & bulk automatic charge stages

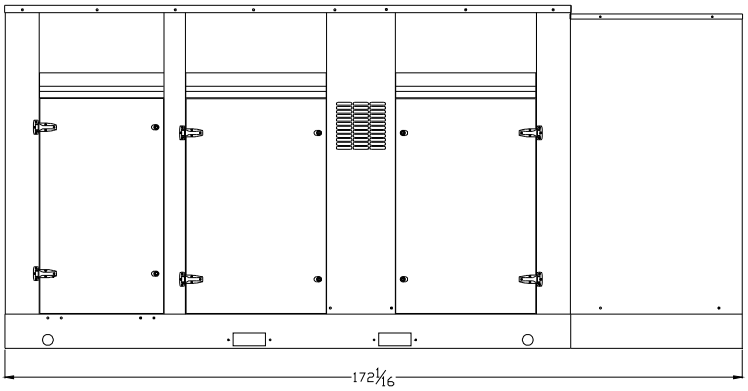
**WEATHER / SOUNDPROOF ALUMINUM HOUSING:**

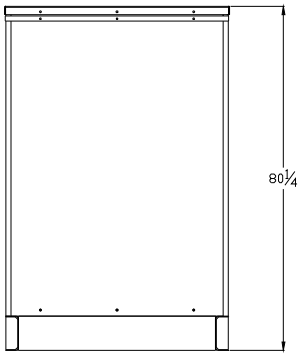
Corrosion Resistant Protection consisting of:

- (9) Heated and Agitated Wash Stages
- Zinc Phosphate Etching-Coating Stage
- Final Baked on Enamel Powder Coat
- 18/8 Stainless Steel Hardware



## Important

This Technical Data Sheet and the corresponding Installation Instructions provide important information to ensure the installed engine will operate according to the design specification in the Volvo Penta application for certification.

Requirements marked with ⚠ are considered as critical for exhaust emissions compliance according to the design specification in the Volvo Penta application for certification.

Failing to follow and meet these instructions and requirements when installing a certified engine in a piece of nonroad equipment for use in the United States violates U.S. federal law (40 CFR 1068.105(b)), subject to fines or other penalities as described in the Clean Air Act.

## General

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

| | | | |
|---|---|---|---|
| Number of cylinders | | | 6 |
| Displacement, total | | liters<br>$in^3$ | 10,84<br>661 |
| Firing order | | | 1-5-3-6-2-4 |
| Bore | | mm<br>in | 123<br>4,84 |
| Stroke | | mm<br>in | 152<br>5,98 |
| Compression ratio | | | 17,0:1 |
| Wet weight | Engine only (Estimated)<br>(excl after treatment comp.) | kg<br>lb | 1072<br>2363 |
| | Power pac | kg<br>lb | 1351<br>2978 |

| **Performance** | | | | **rpm** | **1400** | **1800** | **2000** | **2100** |
|---|---|---|---|---|---|---|---|---|
| ICFN Power 235 kW | | without fan | | kW<br>hp | 227<br>309 | 235<br>320 | 235<br>320 | 235<br>320 |
| | | with fan<br>890 mm | | kW<br>hp | 219<br>298 | 217<br>295 | 211<br>287 | 207<br>282 |
| Torque at: | | ICFN Power 235 kW | | Nm<br>lbf ft | 1548<br>1142 | 1247<br>919 | 1122<br>828 | 1069<br>788 |
| Max torque at engine speed | | rpm | 1260 rpm | Nm<br>lbf ft | 1550<br>1143 | | | |
| Power tolerance | | | | % | ±2 | | | |
| Mean piston speed | | | | m/s<br>ft/sec | 7,1<br>23,3 | 9,1<br>29,9 | 10,1<br>33,2 | 10,6<br>34,9 |
| Effective mean pressure at: | | ICFN Power 235 kW | | MPa<br>psi | 1,80<br>260 | 1,45<br>210 | 1,30<br>189 | 1,24<br>180 |
| Max combustion pressure at: | | ICFN Power 235 kW | | MPa<br>psi | 15<br>2175 | 13<br>1885 | 13<br>1885 | 12<br>1740 |
| Total mass moment of inertia, J ($mR^2$)<br>(not including flywheel) | | | | $kgm^2$<br>$lbft^2$ | 1,034<br>24,5 | | | |
| Friction Power | | | | kW<br>hp | 20<br>27 | 29<br>39 | 36<br>49 | 49<br>67 |
| **Derating see Technical Diagrams** | | | | | | | | |

| Engine brake performance (only engines with VCB) | | rpm | 1200 | 1500 | 1900 | 2200 |
|---|---|---|---|---|---|---|
| Brake power: | without fan | kW | 70 | 120 | 170 | 185 |
| | | hp | 95 | 163 | 231 | 252 |
| Brake torque: | without fan | Nm | 557 | 764 | 854 | 803 |
| | | lbf ft | 411 | 563 | 630 | 592 |
| Engine speed range for VCB activation: | | rpm | 1000-2200 | | | |
| Min engine speed with VCB still active: | | rpm | 900 | | | |
| Min oil temperature for VCB activation: | | °C | 55 | | | |

**Cold start performance**

| | | | | |
|---|---|---|---|---|
| *Cold start limit temperature | without starting aid | °C<br>°F | -15<br>5 | |
| | with manifold heater 3 kW | °C<br>°F | -25<br>-13 | |
| | with manifold heater 3 kW and block heater | °C<br>°F | -35<br>-31 | |
| *Specify oil and fuel quality | T>-15°C Oil VDS3 or VDS4 15W/40<br>T<-15°C Oil VDS3 or VDS4 5W/40 | | | |
| Heater type | Make | Power kW | Engaged hours (-30°C) | Cooling water temp engine block |
| Self circulating | Volvo | 1,2 | 12 | -1°C<br>30°F |

* See also general section in the sales guide

**Lubrication system**

| | | | | |
|---|---|---|---|---|
| Lubricating oil consumption (average) | | | Vol% | 0,05 |
| Oil system capacity including filters | | | liter<br>US gal | 37<br>9,77 |
| Oil pan capacity: (both variants) | | Max | liter<br>US gal | 32<br>8,45 |
| | | Min | liter<br>US gal | 27<br>7,00 |
| Oil change intervals/specifications | VDS3 | | h | 1000 |
| | VDS4 | | h | 1000 |
| Engine angularity limits: | | front up | ° | 30 |
| | | front down | ° | 30 |
| | | side tilt | ° | 30 |
| Oil pressure at rated speed | | | kPa<br>psi | 350 - 600<br>51 - 87 |
| Lubrication oil temperature in sump: | | max | °C<br>°F | 130<br>266 |
| Oil filter filtration efficiency (in accordance with ISO 4548-12) | | 99% | µ | 38 |
| | | 50% | µ | 14 |

**Fuel system**

| | | | |
|---|---|---|---|
| System supply flow at max. Speed | | liter/h<br>US gal/h | 108<br>28,5 |
| Fuel supply line max. restriction<br>(measured at fuel inlet connection) | | kPa<br>psi | 20<br>2,9 |
| Fuel supply line max. pressure, during engine stand still<br>(measured at fuel inlet connection and high tank/low tank positions) | | kPa<br>psi | 165<br>23,9 |
| Fuel supply line min. pressure, during engine stand still<br>(measured at fuel inlet connection and high tank/low tank positions) | | kPa<br>psi | -125<br>-18,1 |
| System return flow at max. Speed | | liter/h<br>US gal/h | 30,0<br>7,9 |
| Fuel return line max. restriction<br>(measured at fuel return connection) | | kPa<br>psi | 20<br>2,9 |
| Max. allowable inlet fuel temp<br>(Measured at fuel inlet connection) | | °C<br>°F | 60<br>140 |
| Prefilter / Water separator micron size | | µ | 10 |
| Fuel filter filtration efficiency | 75% | µ | 4 |
| Governor type/make, standard | | Volvo/EMS2.3 | |
| Injection pump type/make | | | |
| Specific UREA consumption in Nonroad Transient Cycle (NRTC) | | Vol% | 5,0 |
| Fuel to conform to | | | Fuel equal to or better than EN590:2009 or ASTM D975-09 and Max sulphur 15ppm |

| **Intake and exhaust system** | | **rpm** | **1400** | **1800** | **2000** | **2100** |
|---|---|---|---|---|---|---|
| Charge air consumption at:<br>(+25°C and 100kPa) | ICFN Power 235 kW | m³/min<br>cfm | 17,2<br>607 | 21,1<br>745 | 22<br>777 | 22,8<br>805 |
| ⚠<br>**See front page for important information**<br>Max allowable air intake restriction including piping | | kPa<br>psi | 6<br>0,9 | | | |
| Heat rejection to exhaust at: | ICFN Power 235 kW | kW<br>BTU/min | 157<br>8928 | 193<br>10976 | 210<br>11942 | 218<br>12397 |
| Exhaust gas temperature after turbine at: | ICFN Power 235 kW | °C<br>°F | 411<br>772 | 413<br>775 | 430<br>806 | 430<br>806 |
| ⚠<br>**See front page for important information**<br>Max allowable back pressure in exhaust line (after turbine)<br>Pipe dimension Ø: 125 mm | | kPa<br>psi | 15<br>2,2 | 17<br>2,5 | 17<br>2,5 | 17<br>2,5 |
| ⚠<br>**See front page for important information**<br>Max allowable temperature drop between turbine and SCR muffler inlet. | | Δ°C<br>Δ°F | 10<br>18 | 10<br>18 | 10<br>18 | 10<br>18 |
| SCR muffler pressure drop<br>(at exhaust gas flow and exhaust temp given) | | kPa<br>psi | 11<br>1,6 | 10<br>1,5 | 10<br>1,5 | 9<br>1,3 |
| Pre-catalyst pressure drop | | kPa<br>psi | N/A | N/A | N/A | N/A |
| Exhaust gas flow at:<br>(temp and pressure after turbine at the corresponding power setting) | ICFN Power 235 kW | m³/min<br>cfm | 36,7<br>1296 | 44,3<br>1564 | 47,3<br>1670 | 49,2<br>1737 |

| Cooling system | | | rpm | 1400 | 1800 | 2000 | 2100 |
|---|---|---|---|---|---|---|---|
| Heat rejection radiation from engine at: | | ICFN Power 235 kW | kW | 6 | 7 | 7 | 7 |
| | | | BTU/min | 341 | 398 | 398 | 398 |
| Heat rejection to coolant at: | | ICFN Power 235 kW | kW | 105 | 120 | 132 | 138 |
| | | | BTU/min | 5971 | 6824 | 7507 | 7848 |
| Coolant | | | Yellow Volvo Coolant Solution (VCS) | | | | |
| Radiator cooling system type | | | | Closed circuit | | | |
| Standard radiator core area | | ICFN Power 235 kW | m² | 0,8 | | | |
| | | | foot² | 8,61 | | | |
| Fan diameter | 890mm | | mm | 890 | | | |
| | | | in | 35,04 | | | |
| Fan power consumption | 890mm | | kW | 8,0 | 18,0 | 24,0 | 28,0 |
| | | | hp | 11 | 24 | 33 | 38 |
| Fan drive ratio | fan Ø890 | | | 1,01:1 ccw | | | |
| Coolant capacity: | engine | | liter | 17 | | | |
| | | | US gal | 4,5 | | | |
| | std. 0,8m² radiator with hoses | | liter | 21 | | | |
| | | | US gal | 5,5 | | | |
| Coolant pump | | | drive/ratio | belt/1,41:1 cw | | | |
| Coolant flow with standard system | | | l/s | 4,8 | 6,2 | 6,8 | 7,1 |
| | | | US gal/s | 1,3 | 1,6 | 1,8 | 1,9 |
| Minimum coolant flow | | | l/s | 1,9 | 2,3 | 2,6 | 2,5 |
| | | | US gal/s | 0,5 | 0,6 | 0,7 | 0,7 |
| Maximum outer circuit restriction incl. piping | | | kPa | 55,0 | | | |
| | | | psi | 8,0 | | | |
| Thermostat: | | start to open | °C | 82 | | | |
| | | | °F | 180 | | | |
| | | fully open | °C | 92 | | | |
| | | | °F | 198 | | | |
| Maximum static pressure head (expansion tank height + pressure cap setting) | | | kPa | 100 | | | |
| | | | psi | 14,5 | | | |
| Minimum static pressure head (expansion tank height + pressure cap setting) | | | kPa | 70 | | | |
| | | | psi | 10,2 | | | |
| Standard pressure cap setting | | | kPa | 75 | | | |
| | | | psi | 10,9 | | | |
| Maximum top tank temperature | | | °C | 107 | | | |
| | | | °F | 225 | | | |
| Recommended Draw down capacity. The difference between min coolant level in the expansion tank and the lowest level where the engine's coolant system still are functioning | | | liter | 2 | | | |
| | | | US gal | 0,5 | | | |

| Charge air cooler system | | rpm | 1400 | 1800 | 2000 | 2100 |
|---|---|---|---|---|---|---|
| Heat rejection to charge air cooler | ICFN Power 235 kW | kW | 41 | 50 | 52 | 55 |
| | | BTU/min | 2332 | 2843 | 2957 | 3128 |
| Charge air mass flow | ICFN Power 235 kW | kg/s | 0,34 | 0,42 | 0,44 | 0,46 |
| | ICFN Power 235 kW | | | | | |
| Charge air inlet temp. | | °C | 161 | 166 | 167 | 169 |
| (Charge air temp after turbo compressor) | | °F | 322 | 331 | 333 | 336 |
| ⚠ **See front page for important information** | | | | | | |
| Max allowable Charge air outlet temp. | | °C | 43 | 48 | 49 | 50 |
| (Charge air temp after charge air cooler) | | °F | 109 | 118 | 120 | 122 |
| ⚠ **See front page for important information** | | | | | | |
| Maximum pressure drop over charge air cooler incl. piping | | kPa | 12 | | | |
| | | psi | 1,74 | | | |
| Charge air pressure | | kPa | 180 | 182 | 180 | 175 |
| (After charge air cooler) | | psi | 26,11 | 26,40 | 26,11 | 25,38 |
| Standard charge air cooler core area | | m² | 0,8 | | | |
| | | foot² | 8,61 | | | |

**Cooling performance: 0,8 m² radiator and 890 fan**

Cooling air flow and maximum additional external restriction at different radiator air temperatures based on 107°C TTT and 40% coolant. Valid at 1 atm.

| Engine speed | Engine power | Air on temp | | Air flow | | External restriction | |
|---|---|---|---|---|---|---|---|
| | kW | | | | | | |
| rpm | hp | °C | °F | $m^3/s$ | $ft^3/s$ | Pa | psi |
| 2100 | 235 | | | | | | |
| (fix 1,01) | | 75 | 167 | 8,5 | 300,2 | 0 | 0,000 |
| | | 73 | 163 | 8 | 282,5 | 100 | 0,015 |
| | | 70 | 158 | 7,5 | 264,9 | 200 | 0,029 |

**Engine management system**

| Functionality | Alternatives | | | Default setting |
|---|---|---|---|---|
| Governor mode | Droop | Isochronous | | Isochronous |
| Governor droop | 10 | 127 | Nm/rpm | |
| Governor response | Adjustable PI constants | | | |
| Idle speed | 600 | 900 | rpm | 700 |
| Preheating function | Ignition | Request | Request + temp | If preheat is available, preheat will be active at ignition on if temp low or demanded by driver. |
| Ignition off stops engine | Yes | No | | No |

| Engine sensors and switch settings | | | | | Engine protection action | |
|---|---|---|---|---|---|---|
| Parameter | | Unit | Warning setting (Yellow) | Alarm setting | Default | Optional (Module or |
| Oil temp | | °C | 125 | 130 | Derate | Shut down. |
| Oil pressure | Low idle | kPa | 80 | 55,0 | Shut down | Shut down. |
| | Rated speed | kPa | 300 | 275 | Shut down | Shut down. |
| Oil level | | | Low level | N/A | Fault code only | Fault code only |
| Piston cooling pressure >1000 rpm | | kPa | Not avaliable on this engine | | | |
| Coolant temp | | °C | 105 | 107 | Derate | Shut down. |
| Coolant level | | | N/A | Low level | Derate | Shut down. |
| Fuel feed pressure | Low idle | kPa | See Fuel pressure limits | N/A | Fault code only | Fault code only |
| | Rated speed | | | N/A | Fault code only | Fault code only |
| Water in fuel | | | Alarm when closed | N/A | Fault code only | Fault code only |
| EGR temp | | °C | N/A | N/A | N/A | N/A |
| Air filter pressure drop | | kPa | 5 | N/A | Fault code only | Fault code only |
| Altitude, above sea | | m | N/A | N/A | Automatic derating, see section derating | Automatic derating, see section derating |
| Crank case pressure | | | N/A | Alarm at | Shut down | Shut down. |
| Charge air temp | | °C | 120 | 125 | Derate | Shut down. |
| Charge air pressure | | kPa | See Charge air pressure limits | | Derate | Shut down. |
| SCR temp | | °C | N/A | N/A | Automatic derating | Automatic derating |
| Engine overspeed | | rpm | 2400 | N/A | Fault code only | Fault code only |

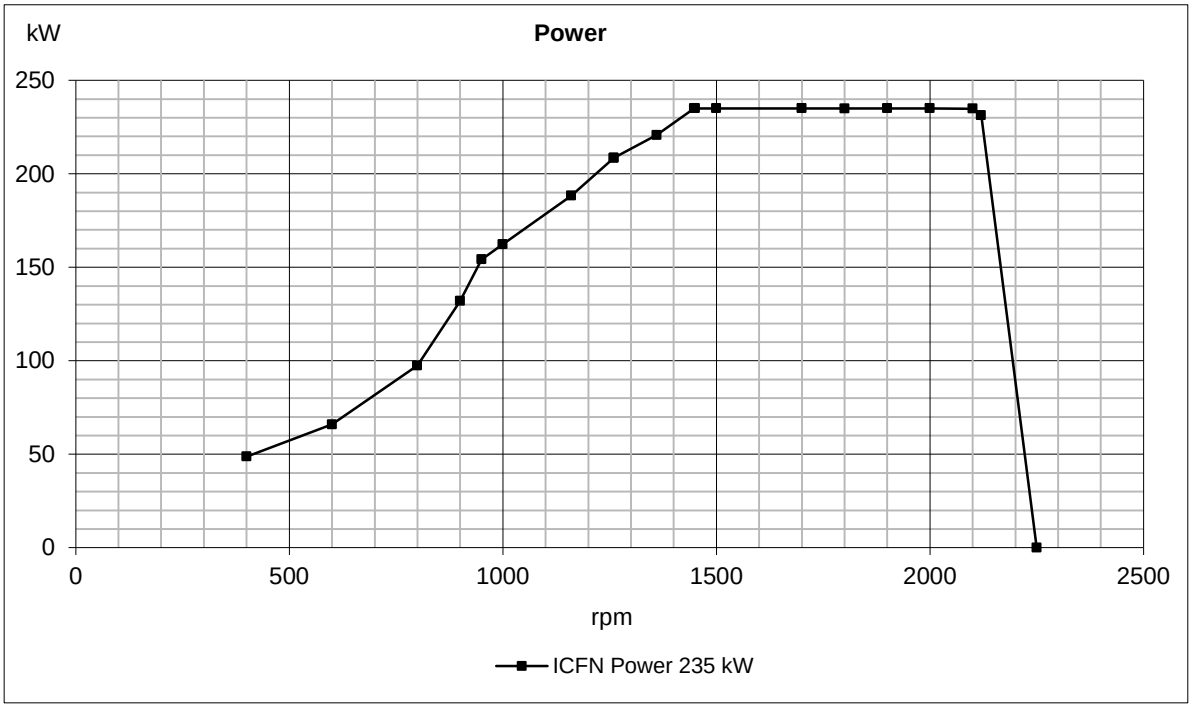
| Derate parameters | Derated 0% to engine protection map | Derated 100% to engine protection map | Forced idle after 5 sec | Forced shut down after 0 sec |
|---|---|---|---|---|
| Oil temp | 130°C | 132°C | N/A | N/A |
| Coolant temp | 107°C | 108°C | N/A | N/A |
| Charge air temp | 125°C | 126°C | N/A | N/A |
| EGR temp | N/A | N/A | N/A | N/A |
| Low oil pressure | See Oil pressure limits | | N/A | At alarm |
| Charge air pressure | See Charge air pressure limits | | N/A | N/A |

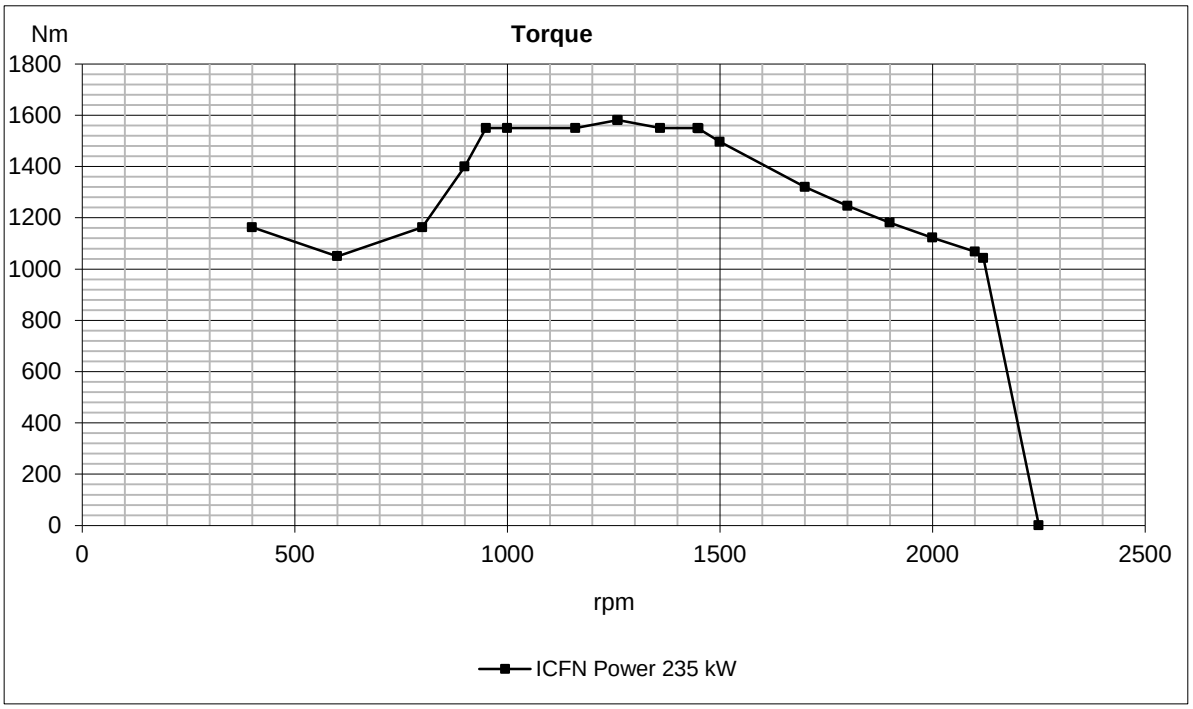
**Electrical system**

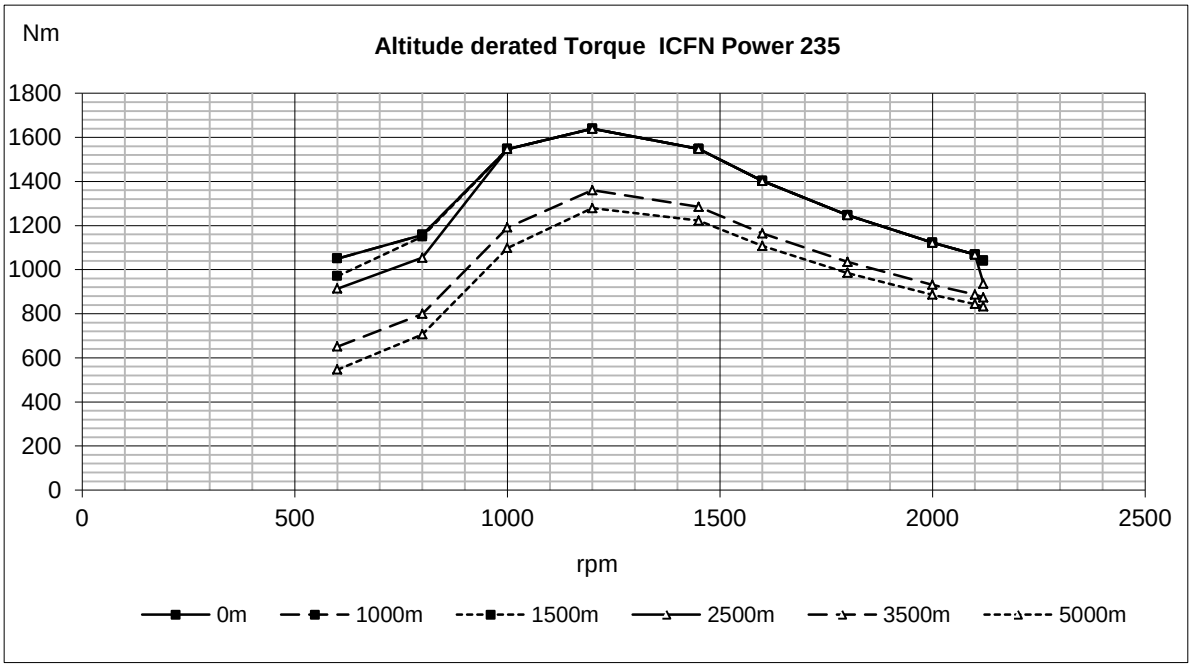
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Voltage and type | | | | | 24V | | |
| Alternator: | output | A | | | 110/150 | | |
| | tacho output | Hz/alternator rev. | | | 6 | | |
| | drive ratio | | | | 5,25 | | |
| Starter motor: | type | | | | 90P55 / (105P70 ISS för start/stop) | | |
| | output | kW<br>hp | | | 5,5 / (7,0) | | |
| Number of teeth on: | flywheel | | | | 153 | | |
| | starter motor | | | | 11 | | |
| Inlet manifold heater (at 20 V) | | kW | | | 3 | | |
| Power relay for the manifold heater | | A | | | 1 | | |
| Max wiring resistance main circuit | | mΩ | | | 3 | | |
| | | | | | | | |
| **Conditions:** | **Temperature** | **°C** | | **25** | **0** | **-15** | |
| (4 mΩ main circuit resistance@ | **Battery** | **Ah / CCA** | | **140/800** | **140/800** | **145 / 1050** | |
| Crank speed | | rpm | | 165 | 150 | 100 | |
| Crank current | | A | | 240 | 310 | 370 | |
| Starter input power during crank | | kW | | 5 | 6,1 | 6,3 | |
| Battery power during crank | | kW | | 5,3 | 6,5 | 6,8 | |
| Min battery @ 0°C | | Ah / CCA | | 140/800 | | | |

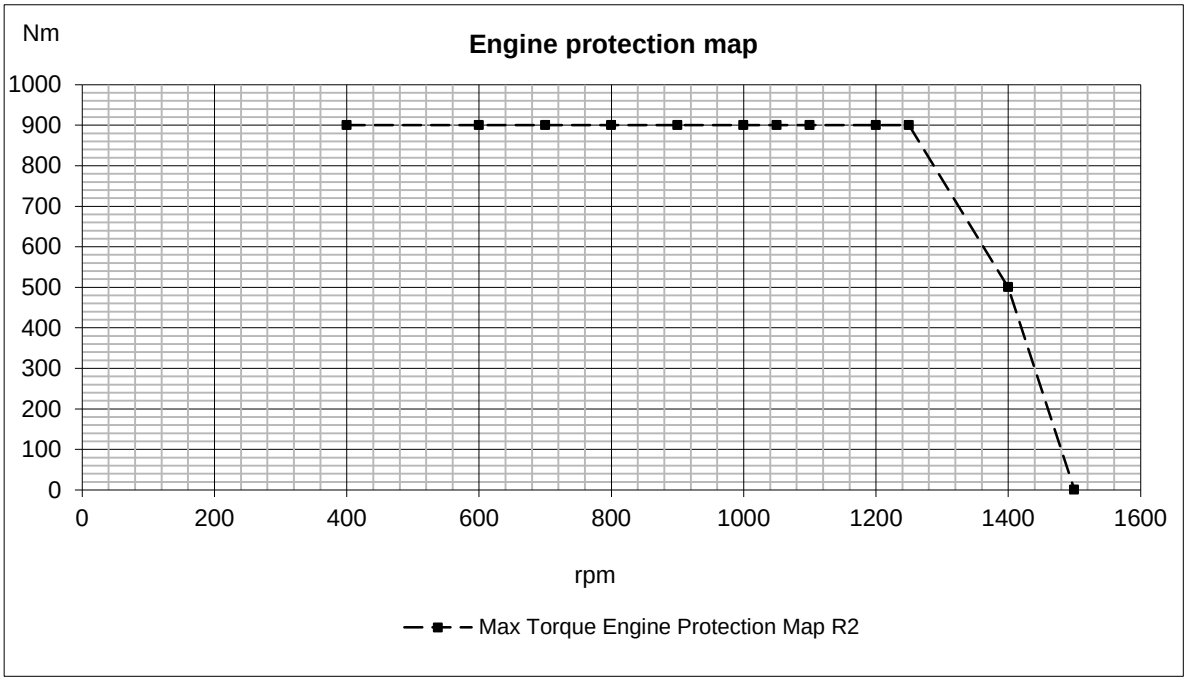
| **Power take off** | | **rpm** | **1400** | **1800** | **2000** | **2100** |
|---|---|---|---|---|---|---|
| Front end in line with crank shaft max:* | | Nm | 1490 | 1210 | 1110 | 1060 |
| (with a total added mass moment of inertia, J (mR2)≤0,05 kgm²) | | lbf ft | 1099 | 892 | 819 | 782 |
| Front end belt pulley load. Direction of load viewed from flywheel side. | max side | kW | 13 | 19 | 21 | 22 |
| | | hp | 18 | 26 | 29 | 30 |
| Pulley diameter 201mm and position 190mm from main bearing 1 | max down | kW | 13 | 19 | 21 | 22 |
| | | hp | 18 | 26 | 29 | 30 |
| | max up | kW | 38 | 52 | 58 | 61 |
| | | hp | 52 | 71 | 79 | 83 |
| Maximum torque on timing gear at rear PTO : ***** | | Nm | 650 | | | |
| | | lbf ft | 479 | | | |
| Speed ratio direction of rotation viewed from flywheel side | | | 1,08:1/ ccw | | | |
| Timing gear at compressor PTO max:***** | | Nm | 310 | | | |
| | | lbf ft | 229 | | | |
| Speed ratio direction of rotation viewed from flywheel side | | | 1,29:1 / ccw | | | |
| Max allowed bending moment in flywheel housing | | Nm | 7000 | | | |
| | | lbf ft | 5163 | | | |
| Max. rear main bearing load | | N | 3000 | | | |
| | | lbf | 674,4 | | | |

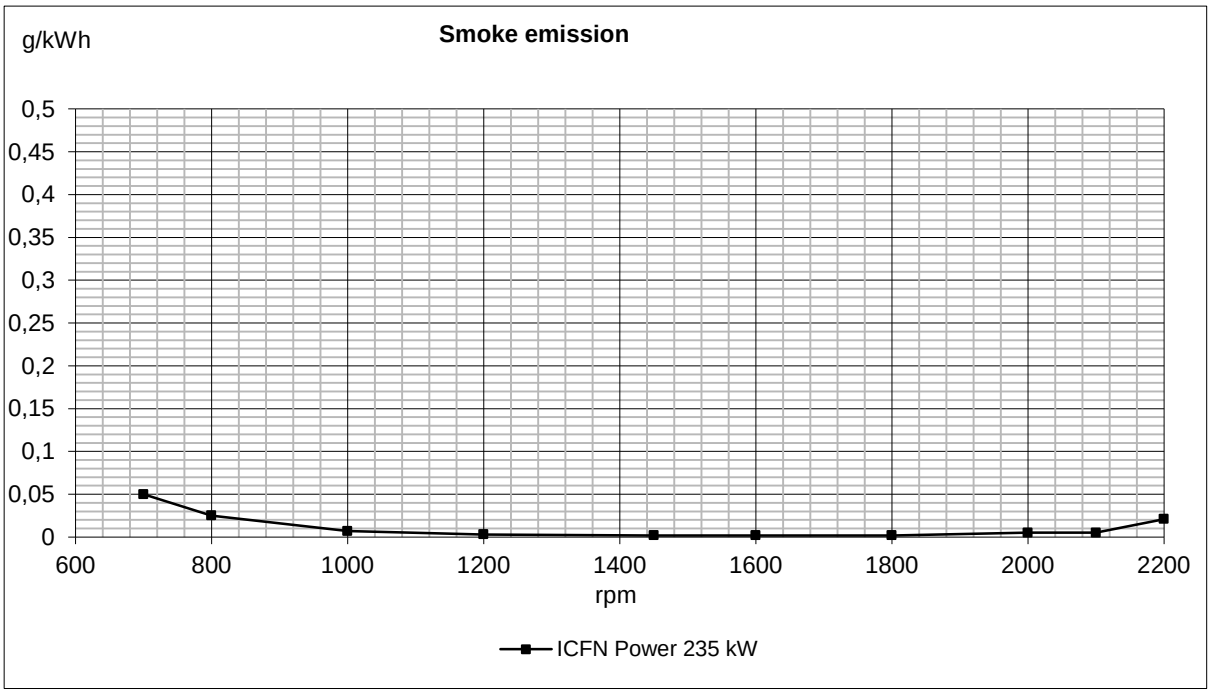
**** Maximum allowed torque at individual PTO´s.***
***If more then one PTO output is used simultaniusly, calculations needs to be performed to determine available maximum. Available torque depends on application inertia.***

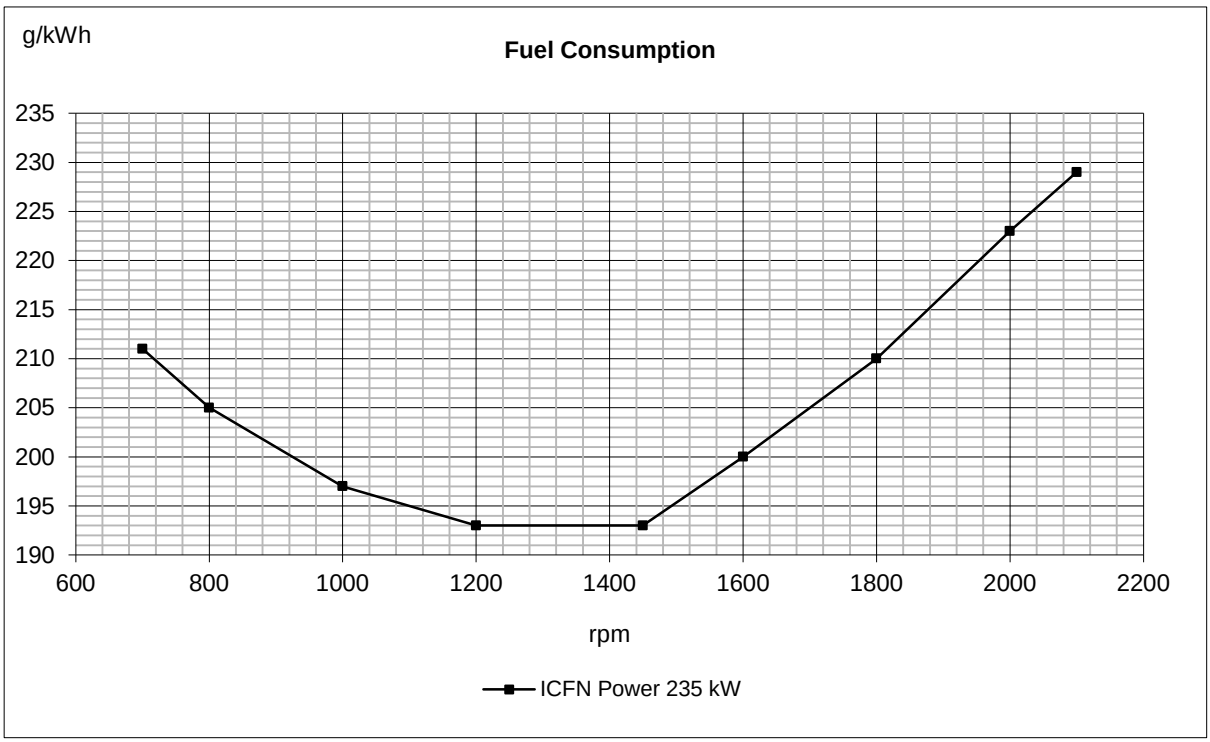

kW
Power
250
200
150
100
50
0
0
500
1000
1500
2000
2500
rpm
ICFN Power 235 kW

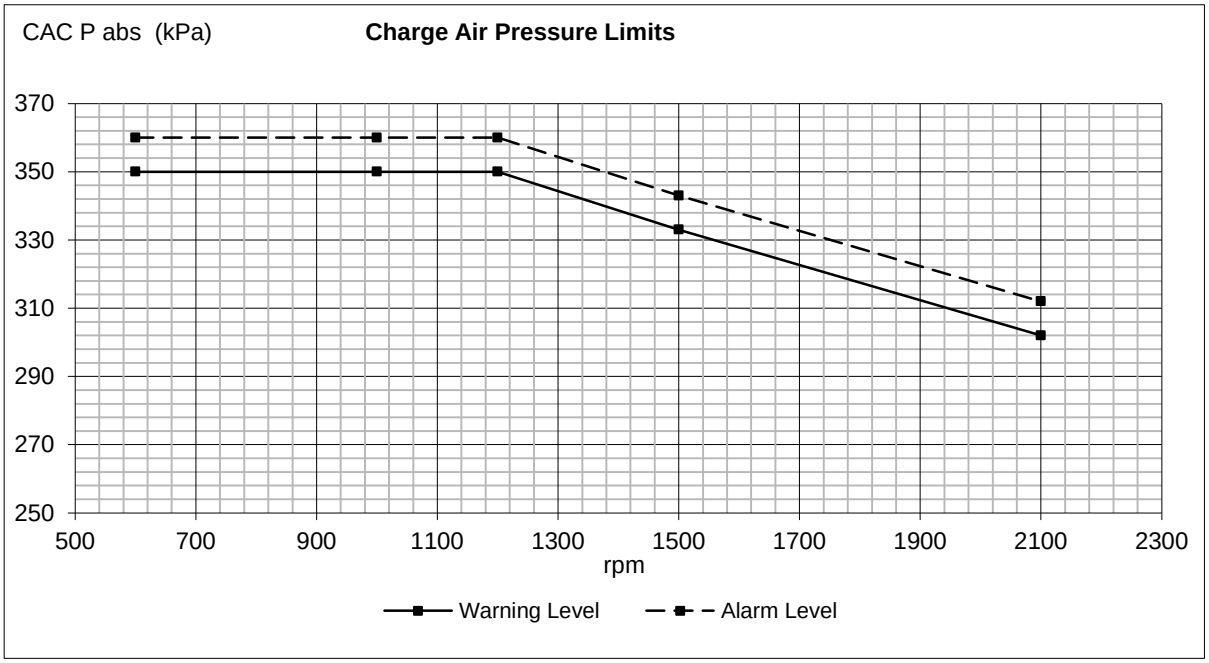

Nm
Torque
1800
1600
1400
1200
1000
800
600
400
200
0
0
500
1000
1500
2000
2500
rpm
ICFN Power 235 kW

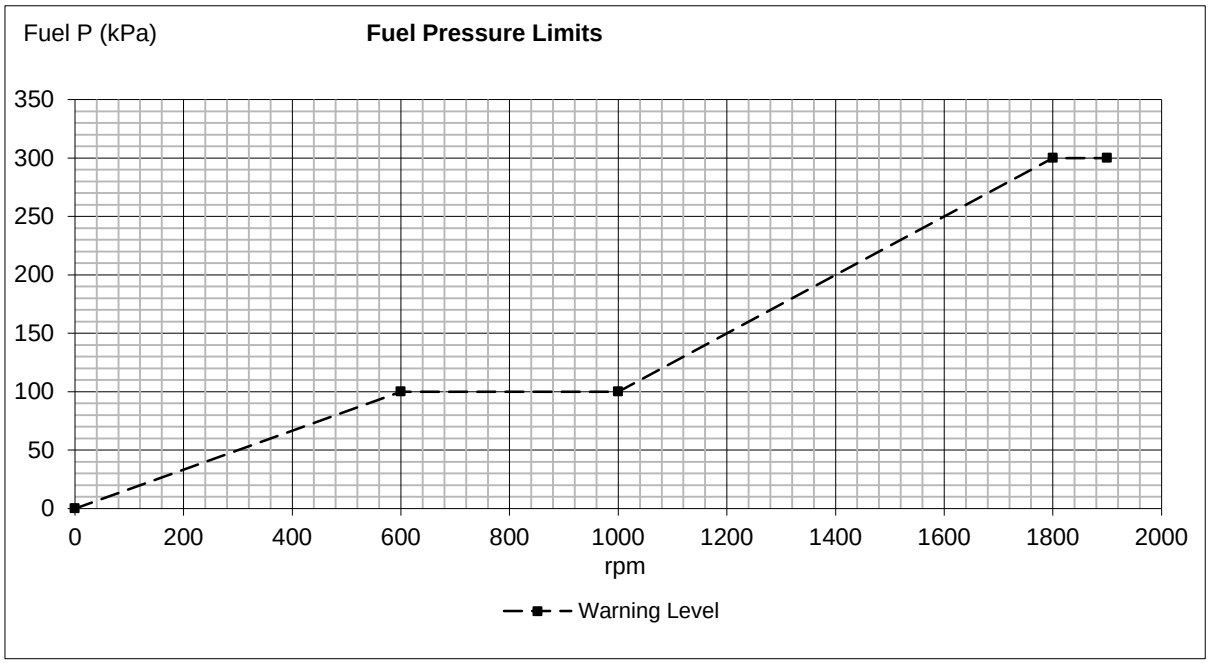

Nm
Altitude derated Torque ICFN Power 235
1800
1600
1400
1200
1000
800
600
400
200
0
0
500
1000
1500
2000
2500
rpm
0m
1000m
1500m
2500m
3500m
5000m

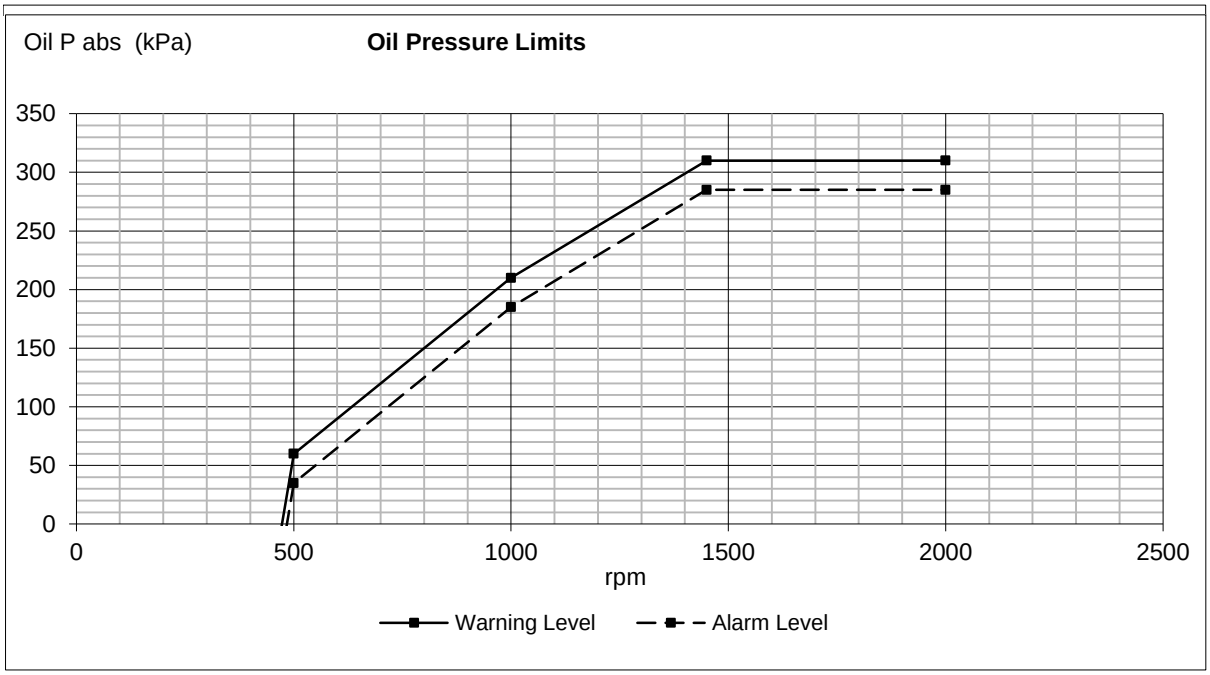

Nm
Engine protection map
1000
900
800
700
600
500
400
300
200
100
0
0
200
400
600
800
1000
1200
1400
1600
rpm
Max Torque Engine Protection Map R2

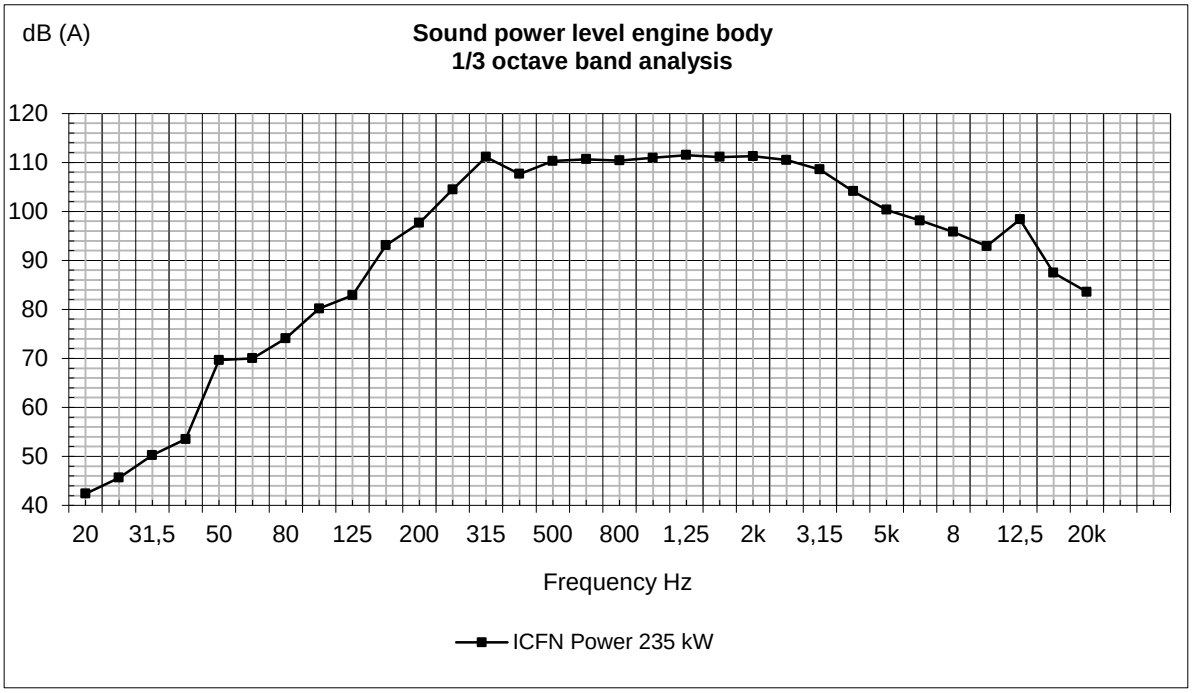

Smoke emission
g/kWh
0,5
0,45
0,4
0,35
0,3
0,25
0,2
0,15
0,1
0,05
0
600
800
1000
1200
1400
1600
1800
2000
2200
rpm
ICFN Power 235 kW

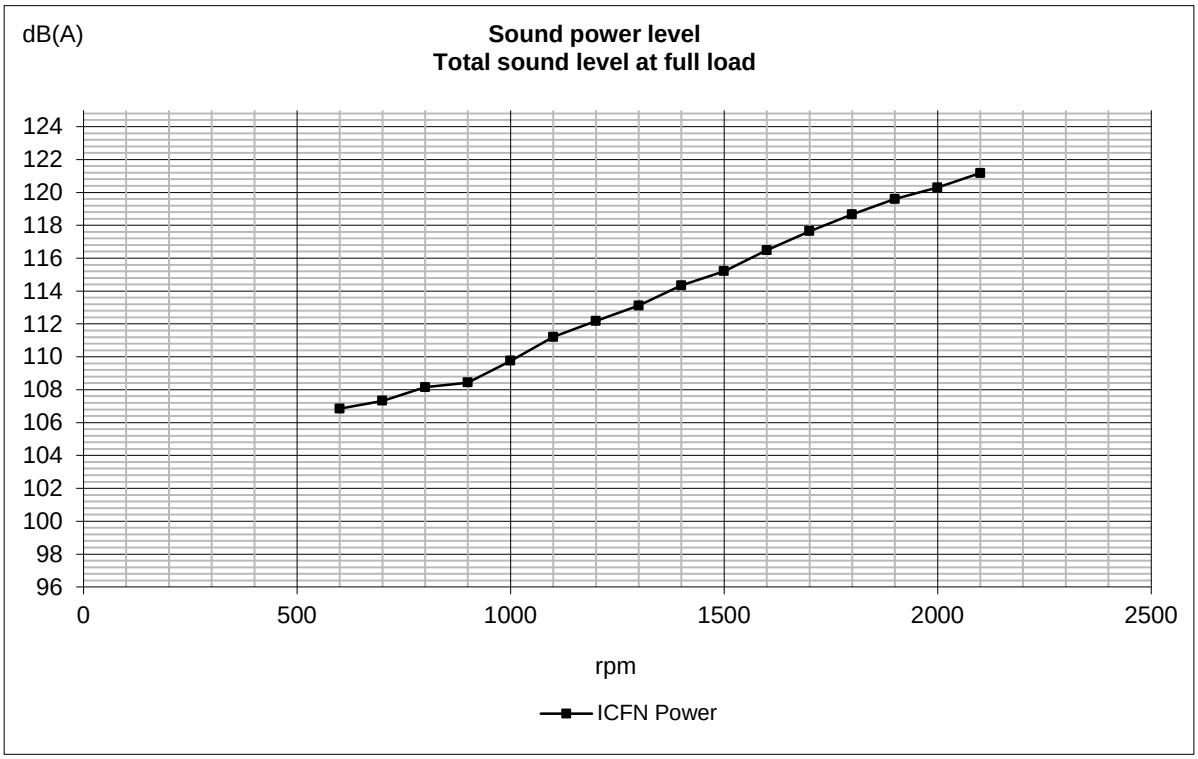

g/kWh
Fuel Consumption
235
230
225
220
215
210
205
200
195
190
600
800
1000
1200
1400
1600
1800
2000
2200
rpm
ICFN Power 235 kW

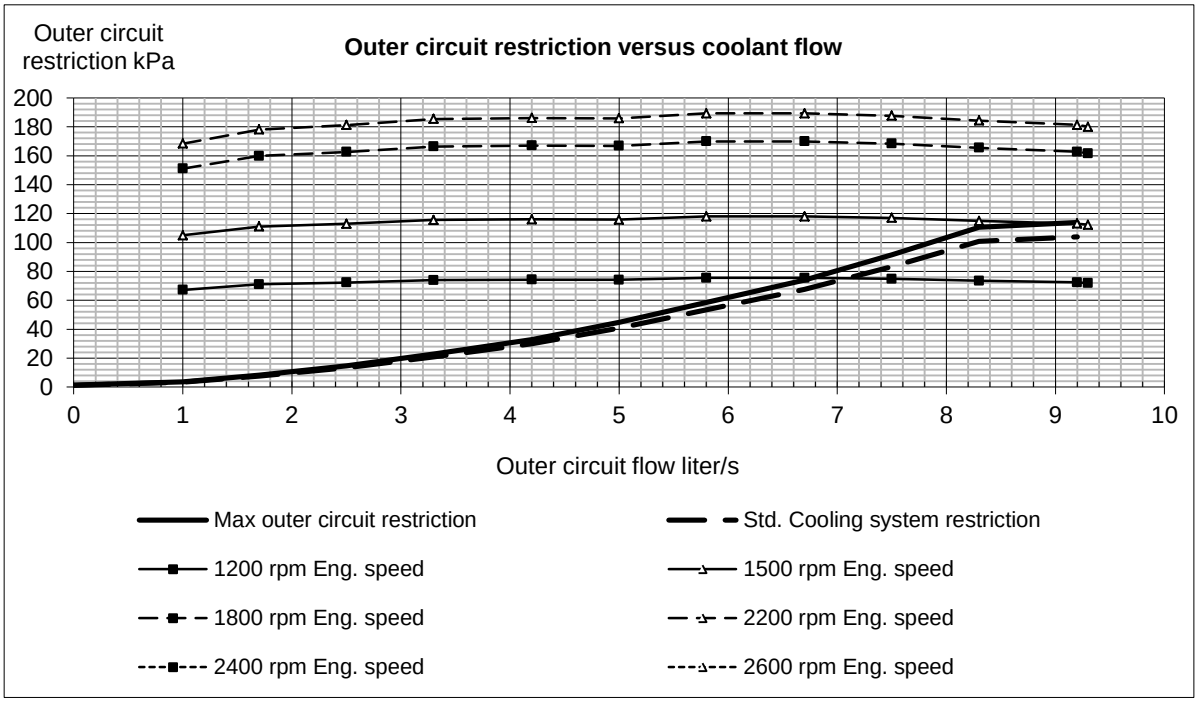

CAC P abs (kPa)
Charge Air Pressure Limits
370
350
330
310
290
270
250
500
700
900
1100
1300
1500
1700
1900
2100
2300
rpm
Warning Level
Alarm Level

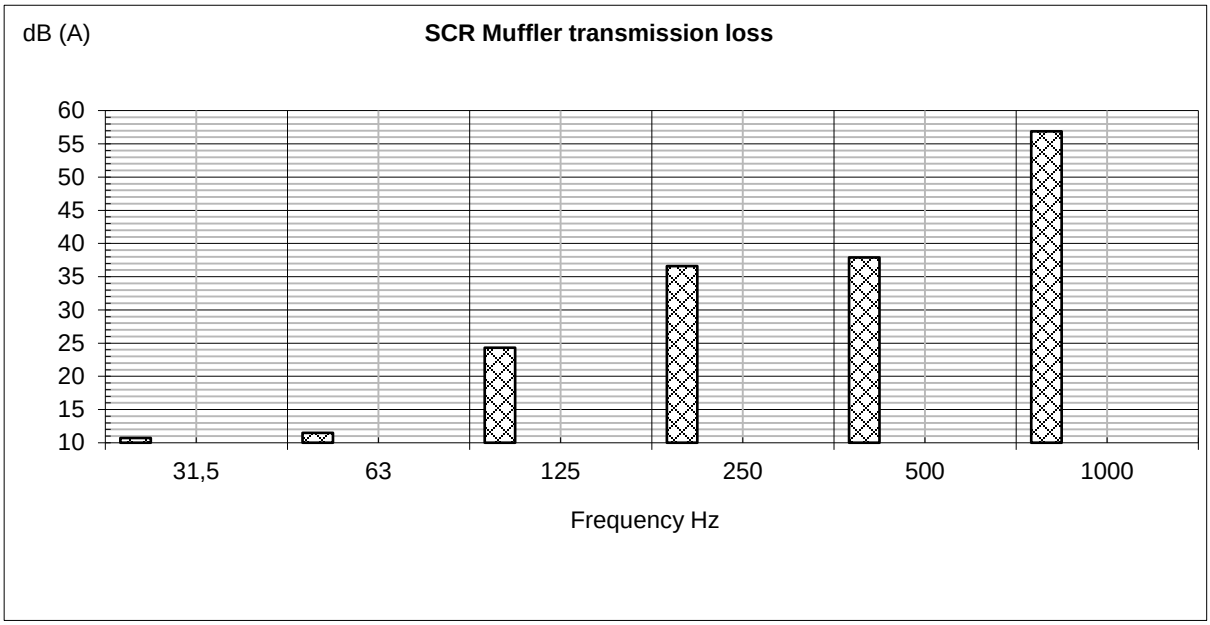

Fuel P (kPa)
Fuel Pressure Limits
350
300
250
200
150
100
50
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
rpm
Warning Level

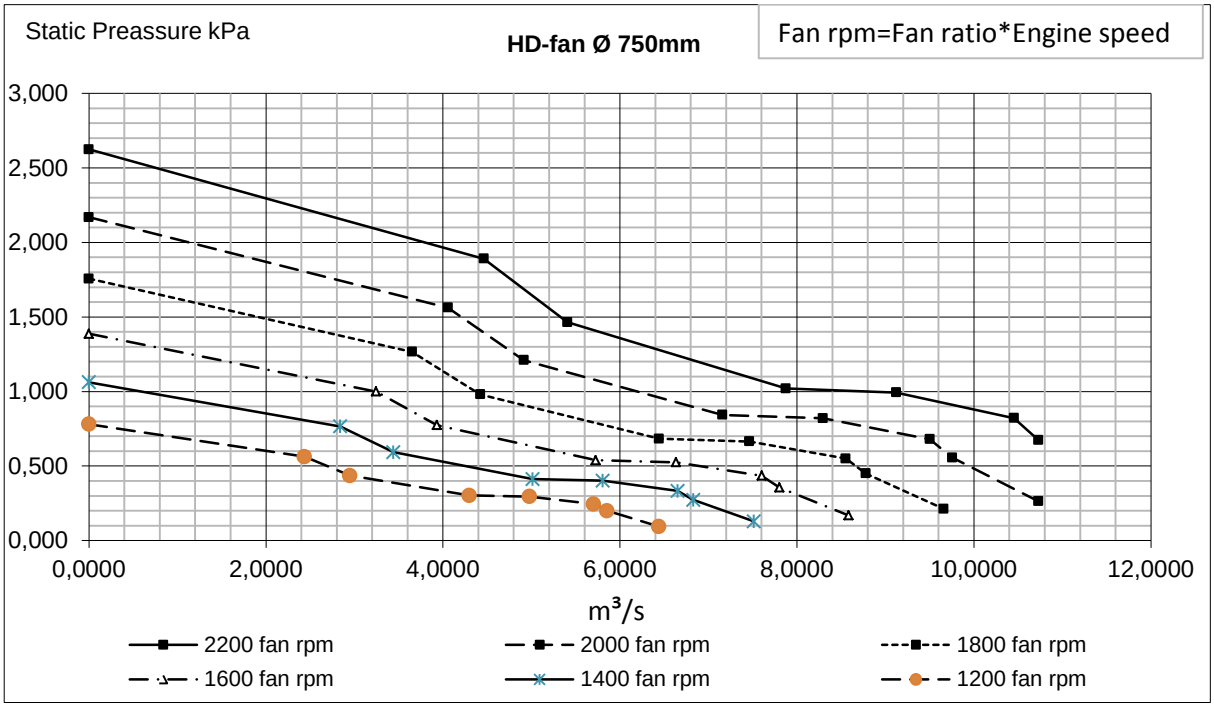

Oil P abs (kPa)
Oil Pressure Limits
350
300
250
200
150
100
50
0
0
500
1000
1500
2000
2500
rpm
Warning Level
Alarm Level

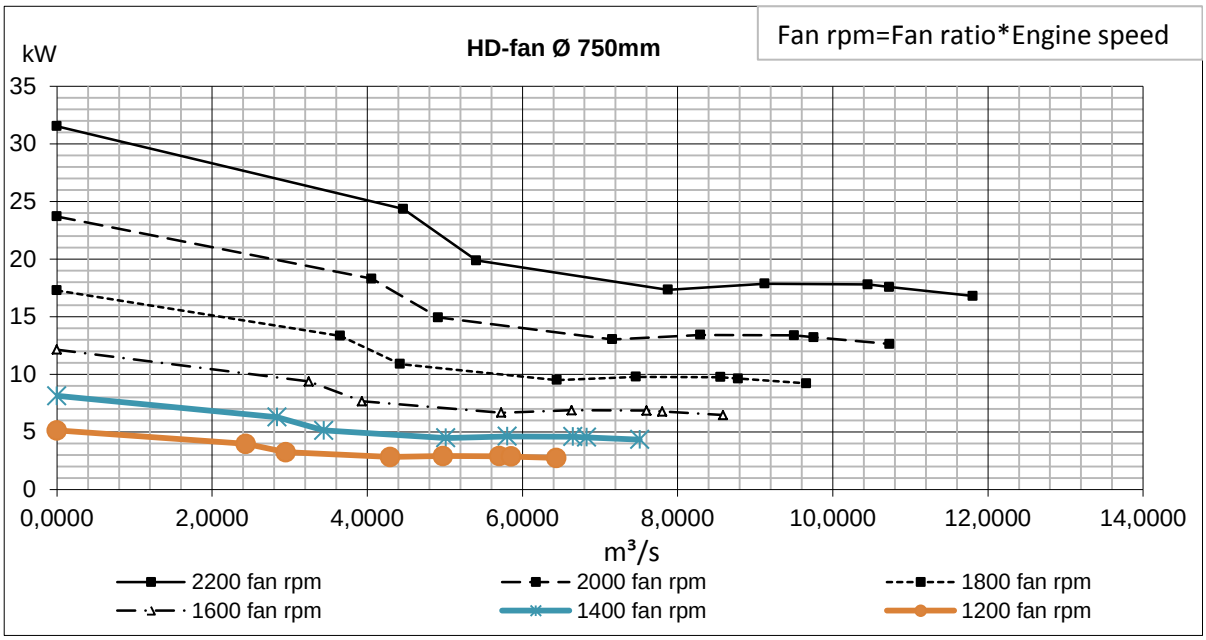

dB (A)
Sound power level engine body
1/3 octave band analysis
120
110
100
90
80
70
60
50
40
20
31,5
50
80
125
200
315
500
800
1,25
2k
3,15
5k
8
12,5
20k
Frequency Hz
ICFN Power 235 kW

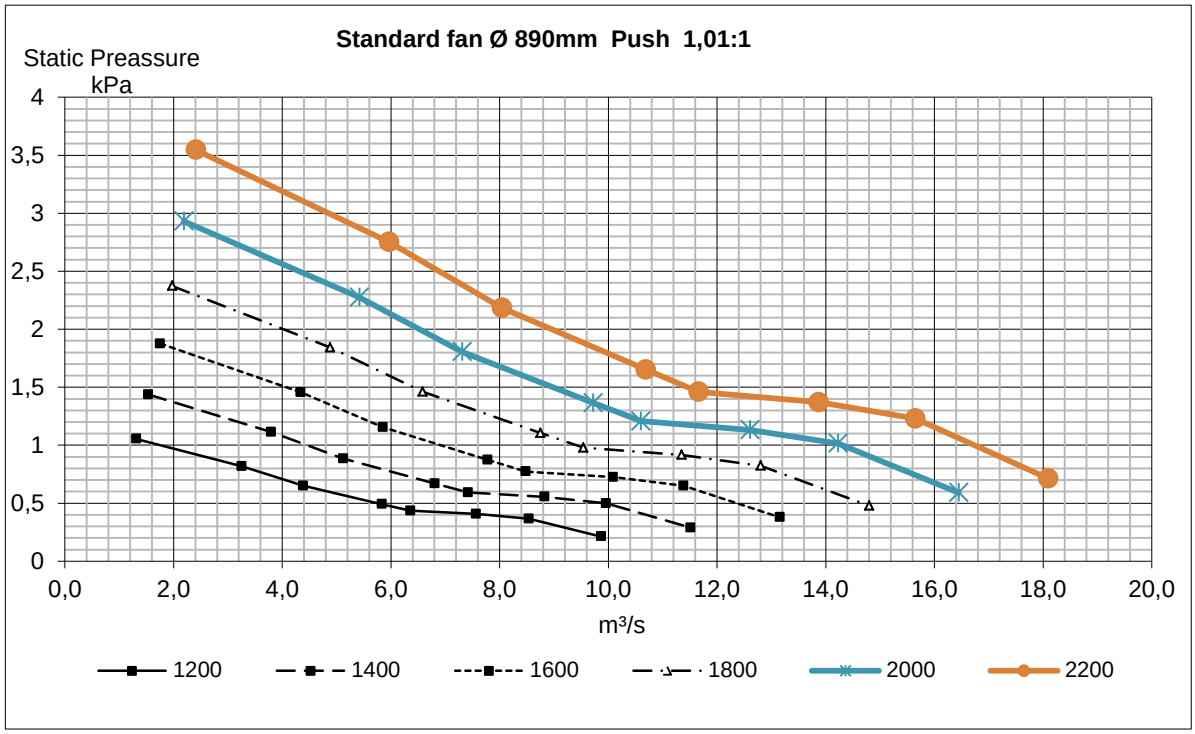

dB(A)
Sound power level
Total sound level at full load
124
122
120
118
116
114
112
110
108
106
104
102
100
98
96
0
500
1000
1500
2000
2500
rpm
ICFN Power

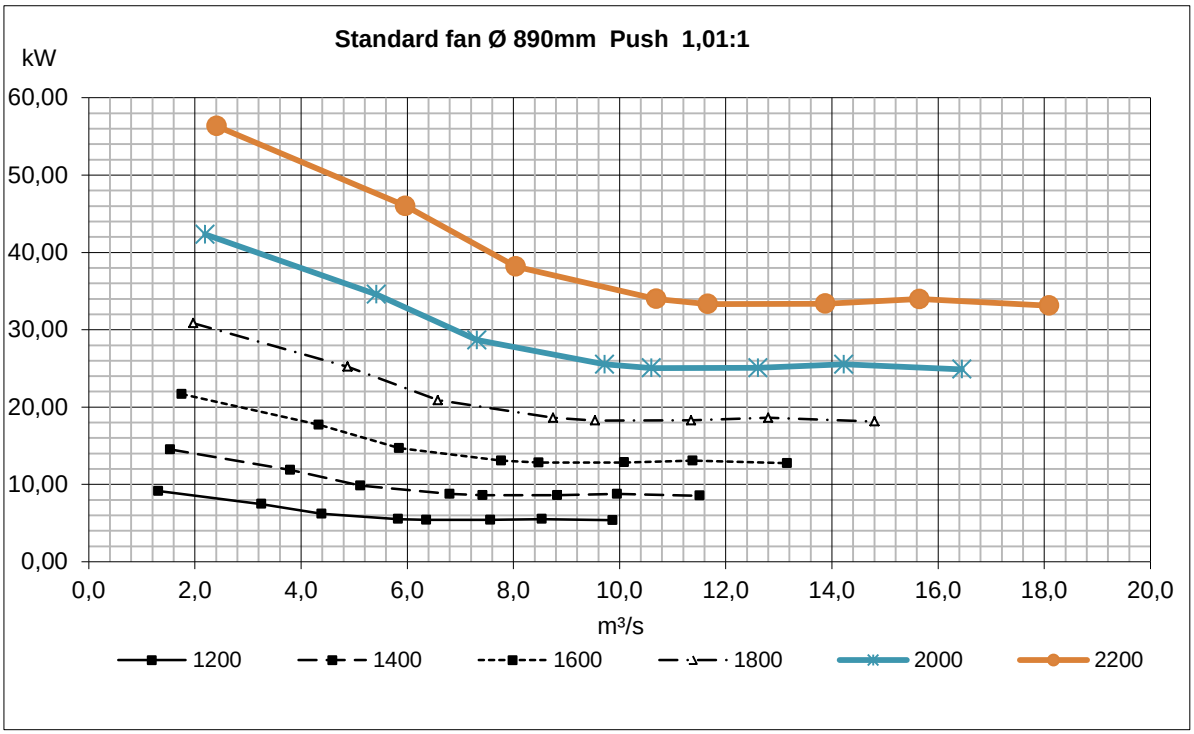

Outer circuit restriction kPa
Outer circuit restriction versus coolant flow
200
180
160
140
120
100
80
60
40
20
0
0
1
2
3
4
5
6
7
8
9
10
Outer circuit flow liter/s
Max outer circuit restriction
Std. Cooling system restriction
1200 rpm Eng. speed
1500 rpm Eng. speed
1800 rpm Eng. speed
2200 rpm Eng. speed
2400 rpm Eng. speed
2600 rpm Eng. speed


dB (A)
SCR Muffler transmission loss
60
55
50
45
40
35
30
25
20
15
10
31,5
63
125
250
500
1000
Frequency Hz

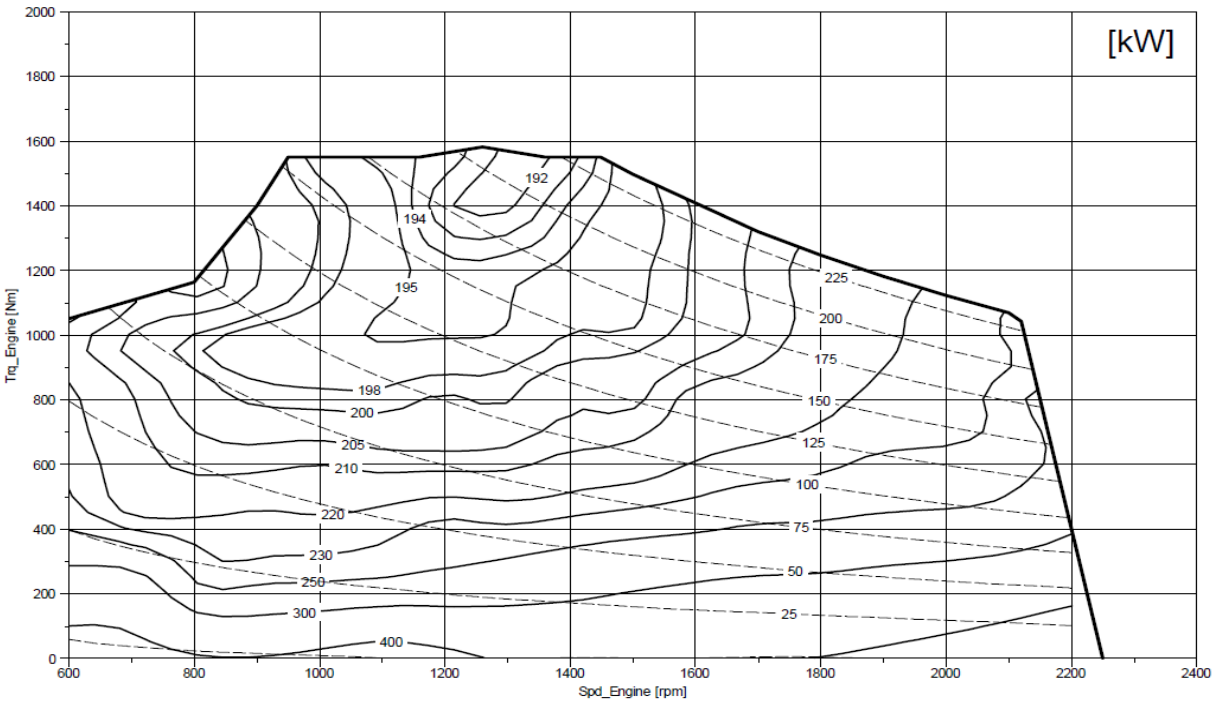

Static Preassure kPa
HD-fan Ø 750mm
Fan rpm=Fan ratio*Engine speed
3,000
2,500
2,000
1,500
1,000
0,500
0,000
0,0000
2,0000
4,0000
6,0000
8,0000
10,0000
12,0000
m³/s
2200 fan rpm
2000 fan rpm
1800 fan rpm
1600 fan rpm
1400 fan rpm
1200 fan rpm


kW
HD-fan Ø 750mm
Fan rpm=Fan ratio*Engine speed
35
30
25
20
15
10
5
0
0,0000
2,0000
4,0000
6,0000
8,0000
10,0000
12,0000
14,0000
m³/s
2200 fan rpm
2000 fan rpm
1800 fan rpm
1600 fan rpm
1400 fan rpm
1200 fan rpm

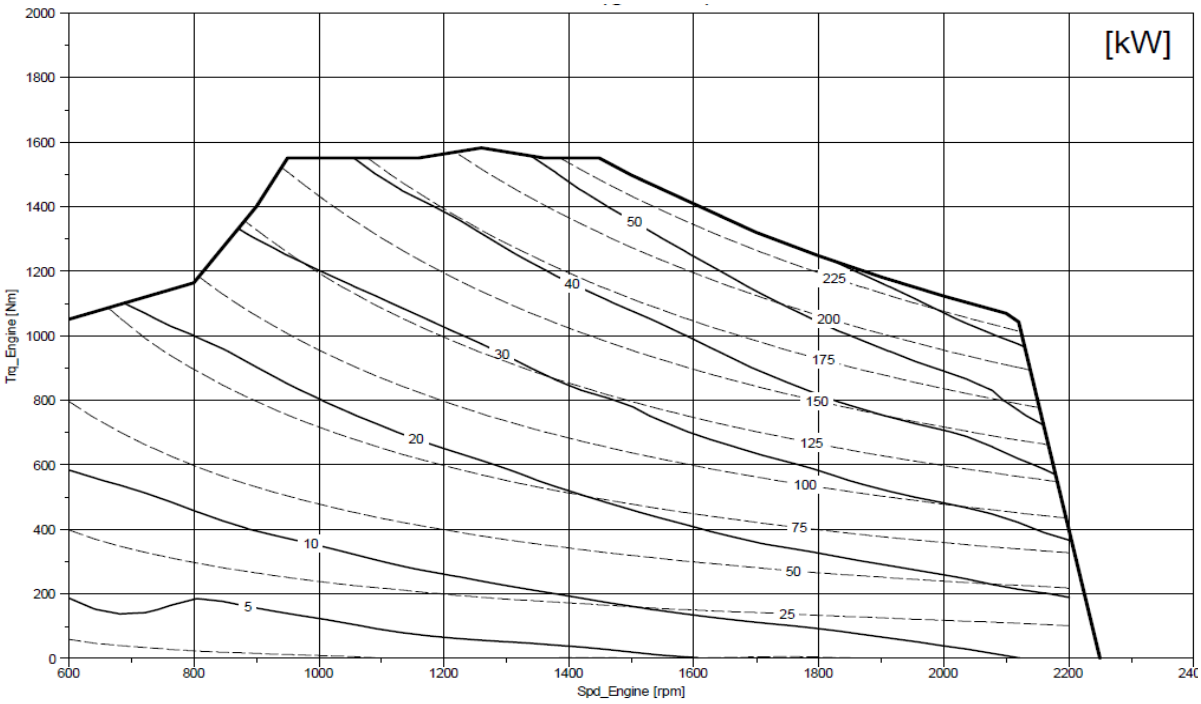

Standard fan Ø 890mm Push 1,01:1
Static Preassure
kPa
4
3,5
3
2,5
2
1,5
1
0,5
0
0,0
2,0
4,0
6,0
8,0
10,0
12,0
14,0
16,0
18,0
20,0
m³/s
1200
1400
1600
1800
2000
2200


Standard fan Ø 890mm Push 1,01:1
kW
60,00
50,00
40,00
30,00
20,00
10,00
0,00
0,0
2,0
4,0
6,0
8,0
10,0
12,0
14,0
16,0
18,0
20,0
m³/s
1200
1400
1600
1800
2000
2200

BSFC [g/kWh]




Fuel consumption [l/h]

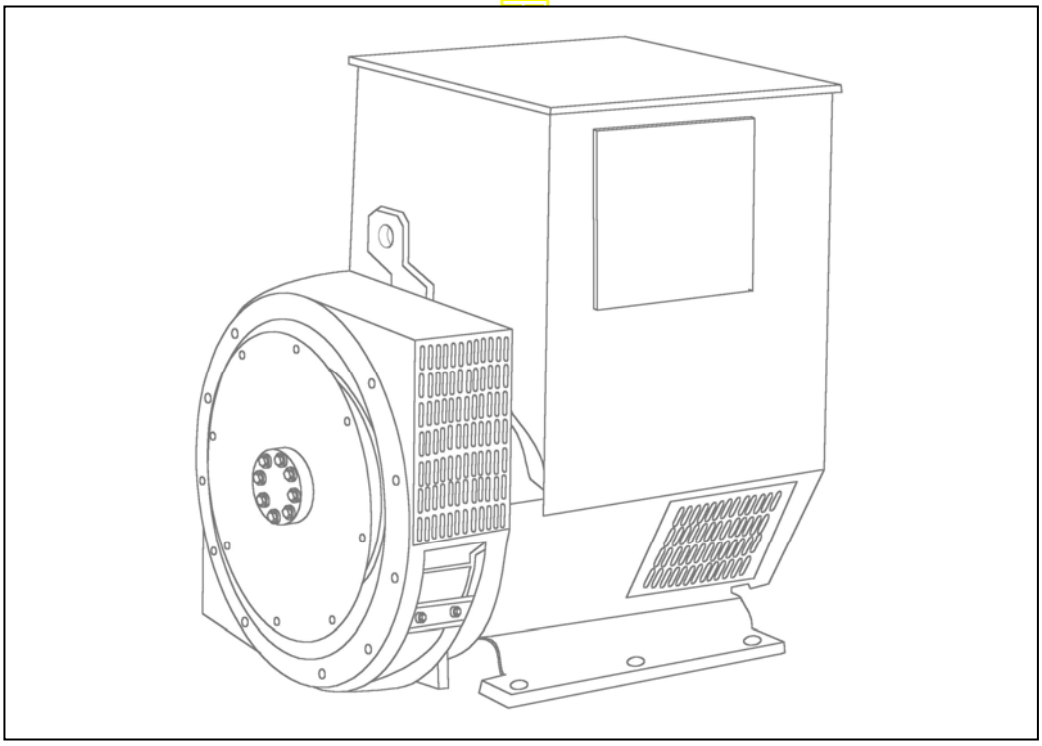


STAMFORD®

# **UCDI274J** - Winding 311

## Technical Data Sheet





# SPECIFICATIONS & OPTIONS

## STANDARDS

Stamford industrial generators meet the requirements of BS EN 60034 and the relevant section of other international standards such as BS5000, VDE 0530, NEMA MG1-32, IEC34, CSA C22.2-100, AS1359.
Other standards and certifications can be considered on request.

## VOLTAGE REGULATORS

### SX460 AVR - STANDARD

With this self excited control system the main stator supplies power via the Automatic Voltage Regulator (AVR) to the exciter stator. The high efficiency semiconductors of the AVR ensure positive build-up from initial low levels of residual voltage.
The exciter rotor output is fed to the main rotor through a three phase full wave bridge rectifier. This rectifier is protected by a surge suppressor against surges caused, for example, by short circuit.

### AS440 AVR

With this self-excited system the main stator provides power via the AVR to the exciter stator. The high efficiency semi-conductors of the AVR ensure positive build-up from initial low levels of residual voltage.
The exciter rotor output is fed to the main rotor through a three-phase full-wave bridge rectifier. The rectifier is protected by a surge suppressor against surges caused, for example, by short circuit or out-of-phase paralleling.
The AS440 will support a range of electronic accessories, including a 'droop' Current Transformer (CT) to permit parallel operation with other ac generators.

### MX341 AVR

This sophisticated AVR is incorporated into the Stamford Permanent Magnet Generator (PMG) control system.
The PMG provides power via the AVR to the main exciter, giving a source of constant excitation power independent of generator output. The main exciter output is then fed to the main rotor, through a full wave bridge, protected by a surge suppressor. The AVR has in-built protection against sustained over-excitation, caused by internal or external faults. This de-excites the machine after a minimum of 5 seconds.
An engine relief load acceptance feature can enable full load to be applied to the generator in a single step.
If three-phase sensing is required with the PMG system the MX321 AVR must be used.
We recommend three-phase sensing for applications with greatly unbalanced or highly non-linear loads.

### MX321 AVR

The most sophisticated of all our AVRs combines all the features of the MX341 with, additionally, three-phase rms sensing, for improved regulation and performance.
Over voltage protection is built-in and short circuit current level adjustments is an optional facility.



## WINDINGS & ELECTRICAL PERFORMANCE

All generator stators are wound to 2/3 pitch. This eliminates triplen (3rd, 9th, 15th …) harmonics on the voltage waveform and is found to be the optimum design for trouble-free supply of non-linear loads. The 2/3 pitch design avoids excessive neutral currents sometimes seen with higher winding pitches, when in parallel with the mains. A fully connected damper winding reduces oscillations during paralleling. This winding, with the 2/3 pitch and carefully selected pole and tooth designs, ensures very low waveform distortion.

## TERMINALS & TERMINAL BOX

Standard generators are 3-phase reconnectable with 12 ends brought out to the terminals, which are mounted on a cover at the non-drive end of the generator. A sheet steel terminal box contains the AVR and provides ample space for the customers' wiring and gland arrangements. It has removable panels for easy access.

## SHAFT & KEYS

All generator rotors are dynamically balanced to better than BS6861:Part 1 Grade 2.5 for minimum vibration in operation.

## INSULATION/IMPREGNATION

The insulation system is class 'H'.
All wound components are impregnated with materials and processes designed specifically to provide the high build required for static windings and the high mechanical strength required for rotating components.

## QUALITY ASSURANCE

Generators are manufactured using production procedures having a quality assurance level to BS EN ISO 9001.

The stated voltage regulation may not be maintained in the presence of certain radio transmitted signals. Any change in performance will fall within the limits of Criteria 'B' of EN 61000-6-2:2001. At no time will the steady-state voltage regulation exceed 2%.

## DE RATES

All values tabulated on page 8 are subject to the following reductions

5% when air inlet filters are fitted.
3% for every 500 metres by which the operating altitude exceeds 1000 metres above mean sea level.
3% for every 5°C by which the operational ambient temperature exceeds 40°C.
Note: Requirement for operating in an ambient exceeding 60°C must be referred to the factory.

*NB Continuous development of our products entitles us to change specification details without notice, therefore they must not be regarded as binding.*

*Front cover drawing typical of product range.*

## WINDING 311

| | | | |
|---|---|---|---|
| CONTROL SYSTEM SER.3 | SEPARATELY EXCITED BY P.M.G. | | |
| A.V.R. | MX321 | MX341 | |
| VOLTAGE REGULATION | ± 0.5 % | ± 1.0 % | With 4% ENGINE GOVERNING |
| SUSTAINED SHORT CIRCUIT | REFER TO SHORT CIRCUIT DECREMENT CURVES (page 7) | | |

| | | | |
|---|---|---|---|
| CONTROL SYSTEM SER.4 | SELF EXCITED | | |
| A.V.R. | SX460 | AS440 | |
| VOLTAGE REGULATION | ± 1.0 % | ± 1.0 % | With 4% ENGINE GOVERNING |
| SUSTAINED SHORT CIRCUIT | SERIES 4 CONTROL DOES NOT SUSTAIN A SHORT CIRCUIT CURRENT | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| INSULATION SYSTEM | CLASS H | | | | | | |
| PROTECTION | IP23 | | | | | | |
| RATED POWER FACTOR | 0.8 | | | | | | |
| STATOR WINDING | DOUBLE LAYER CONCENTRIC | | | | | | |
| WINDING PITCH | TWO THIRDS | | | | | | |
| WINDING LEADS | 12 | | | | | | |
| STATOR WDG. RESISTANCE | 0.0126 Ohms PER PHASE AT 22°C SERIES STAR CONNECTED | | | | | | |
| ROTOR WDG. RESISTANCE | 2.08 Ohms at 22°C | | | | | | |
| EXCITER STATOR RESISTANCE | 20 Ohms at 22°C | | | | | | |
| EXCITER ROTOR RESISTANCE | 0.091 Ohms PER PHASE AT 22°C | | | | | | |
| R.F.I. SUPPRESSION | BS EN 61000-6-2 & BS EN 61000-6-4,VDE 0875G, VDE 0875N. refer to factory for others | | | | | | |
| WAVEFORM DISTORTION | NO LOAD < 1.5% NON-DISTORTING BALANCED LINEAR LOAD < 5.0% | | | | | | |
| MAXIMUM OVERSPEED | 2250 Rev/Min | | | | | | |
| BEARING NON-DRIVE END | BALL. 6310-2RS (ISO) | | | | | | |
| WEIGHT COMP. GENERATOR | 727 kg | | | | | | |
| WEIGHT WOUND STATOR | 304 kg | | | | | | |
| WEIGHT WOUND ROTOR | 271.9 kg | | | | | | |
| WR² INERTIA | 2.3744 kgm$^2$ | | | | | | |
| SHIPPING WEIGHTS in a crate | 740 kg | | | | | | |
| PACKING CRATE SIZE | 123 x 67 x 103 (cm) | | | | | | |
| | 50 Hz | | | | 60 Hz | | | |
| TELEPHONE INTERFERENCE | THF<2% | | | | TIF<50 | | | |
| COOLING AIR | 0.58 m³/sec 1230 cfm | | | | 0.69 m³/sec 1463 cfm | | | |
| VOLTAGE SERIES STAR | 380/220 | 400/231 | 415/240 | 440/254 | 416/240 | 440/254 | 460/266 | 480/277 |
| VOLTAGE PARALLEL STAR | 190/110 | 200/115 | 208/120 | 220/127 | 208/120 | 220/127 | 230/133 | 240/138 |
| VOLTAGE SERIES DELTA | 220/110 | 230/115 | 240/120 | 254/127 | 240/120 | 254/127 | 266/133 | 277/138 |
| kVA BASE RATING FOR REACTANCE VALUES | 230 | 230 | 230 | N/A | 269 | 281 | 294 | 300 |
| Xd DIR. AXIS SYNCHRONOUS | 1.939 | 1.750 | 1.626 | - | 2.651 | 2.475 | 2.370 | 2.221 |
| X'd DIR. AXIS TRANSIENT | 0.103 | 0.093 | 0.086 | - | 0.164 | 0.153 | 0.147 | 0.137 |
| X"d DIR. AXIS SUBTRANSIENT | 0.070 | 0.064 | 0.059 | - | 0.096 | 0.090 | 0.086 | 0.080 |
| Xq QUAD. AXIS REACTANCE | 0.886 | 0.800 | 0.743 | - | 1.206 | 1.126 | 1.078 | 1.010 |
| X"q QUAD. AXIS SUBTRANSIENT | 0.163 | 0.147 | 0.137 | - | 0.138 | 0.129 | 0.123 | 0.116 |
| $X_L$ LEAKAGE REACTANCE | 0.062 | 0.056 | 0.052 | - | 0.081 | 0.076 | 0.072 | 0.068 |
| $X_2$ NEGATIVE SEQUENCE | 0.117 | 0.105 | 0.098 | - | 0.117 | 0.109 | 0.105 | 0.098 |
| $X_0$ ZERO SEQUENCE | 0.044 | 0.040 | 0.037 | - | 0.048 | 0.045 | 0.043 | 0.040 |
| REACTANCES ARE SATURATED | VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED | | | | | | | |
| T'd TRANSIENT TIME CONST. | 0.045 s | | | | | | | |
| T"d SUB-TRANSTIME CONST. | 0.015 s | | | | | | | |
| T'do O.C. FIELD TIME CONST. | 1.27 s | | | | | | | |
| Ta ARMATURE TIME CONST. | 0.03 s | | | | | | | |
| SHORT CIRCUIT RATIO | 1/Xd | | | | | | | |

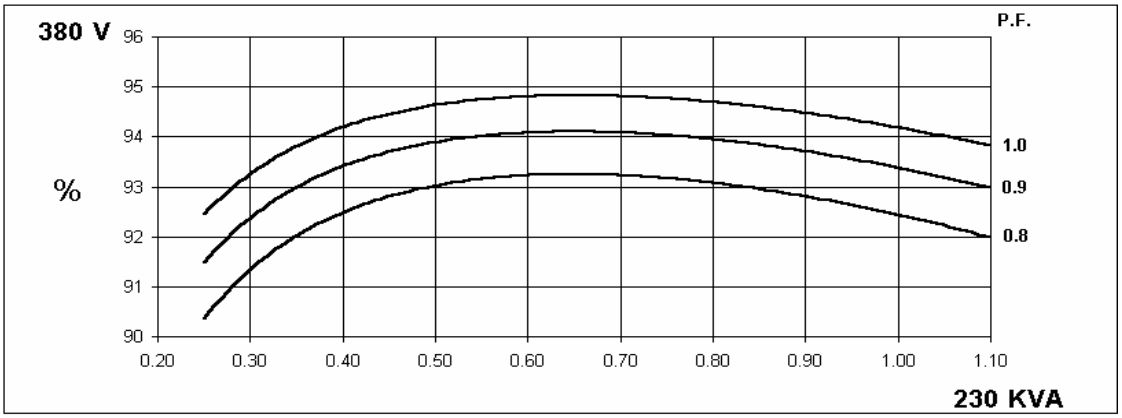
50 Hz

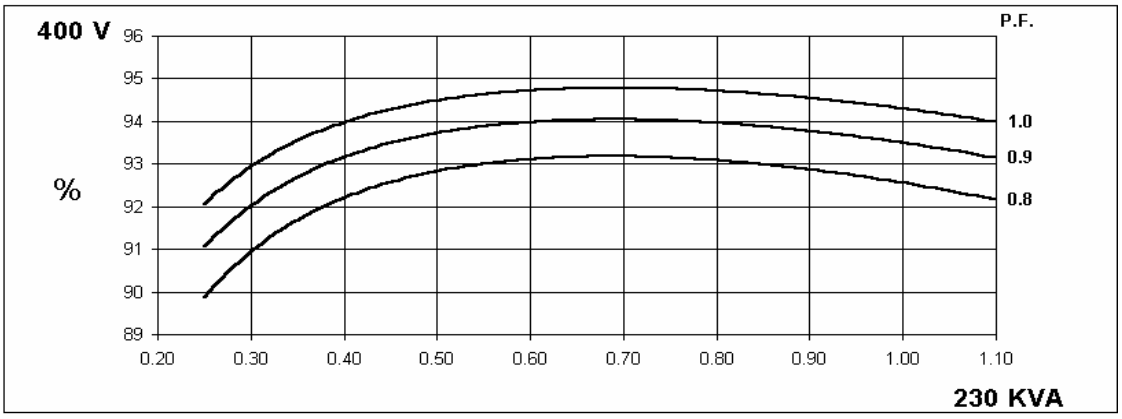
# UCDI274J

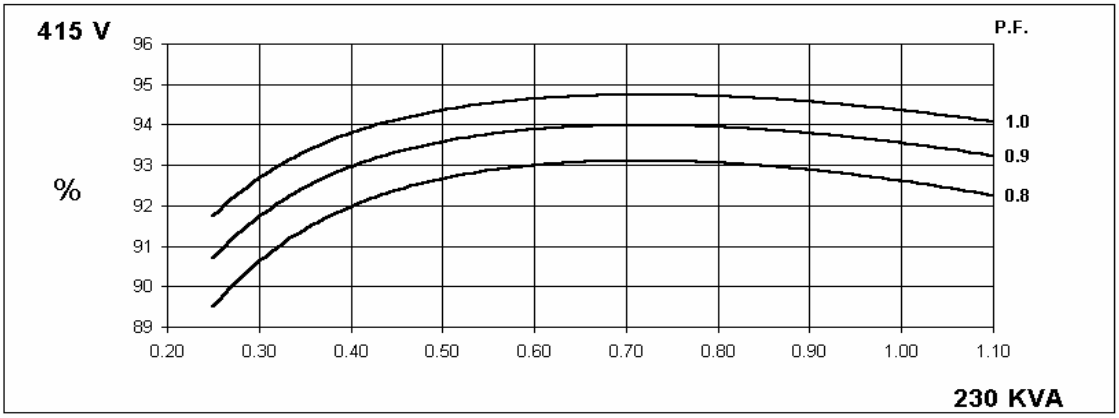
**Winding 311**

STAMFORD

## THREE PHASE EFFICIENCY CURVES



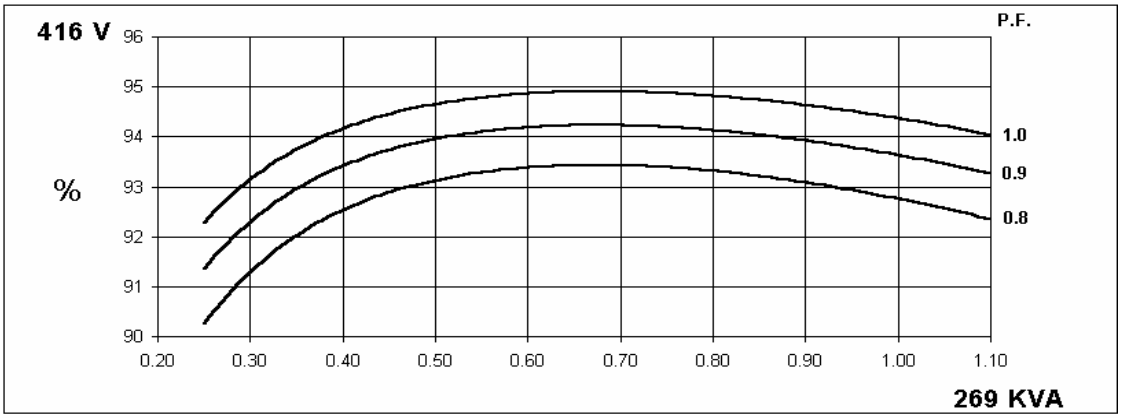
60 Hz

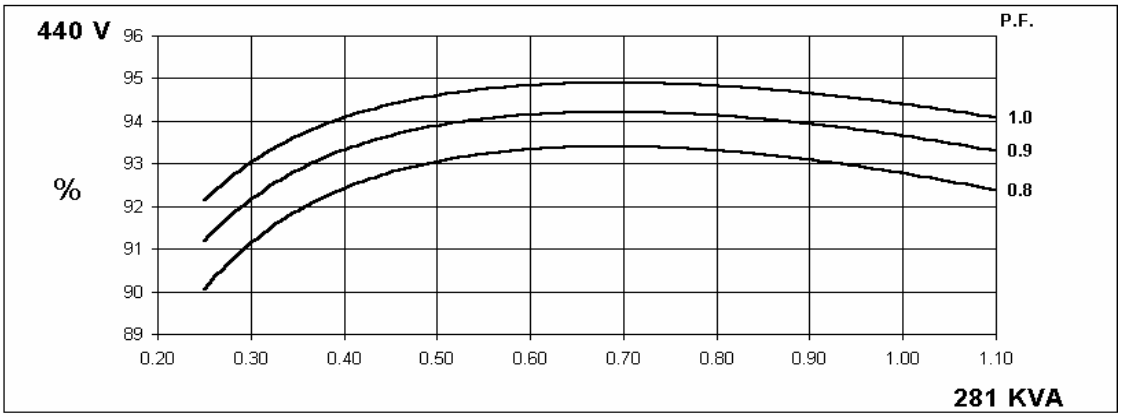
# UCDI274J

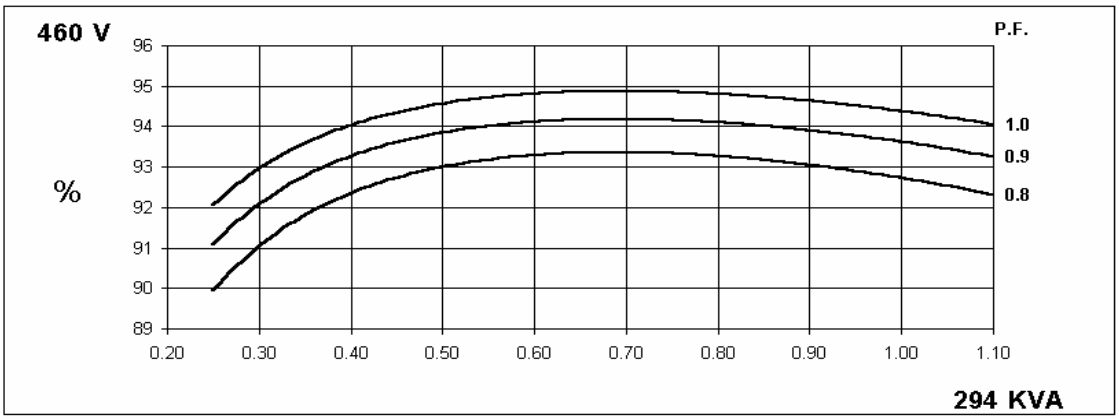
**Winding 311**

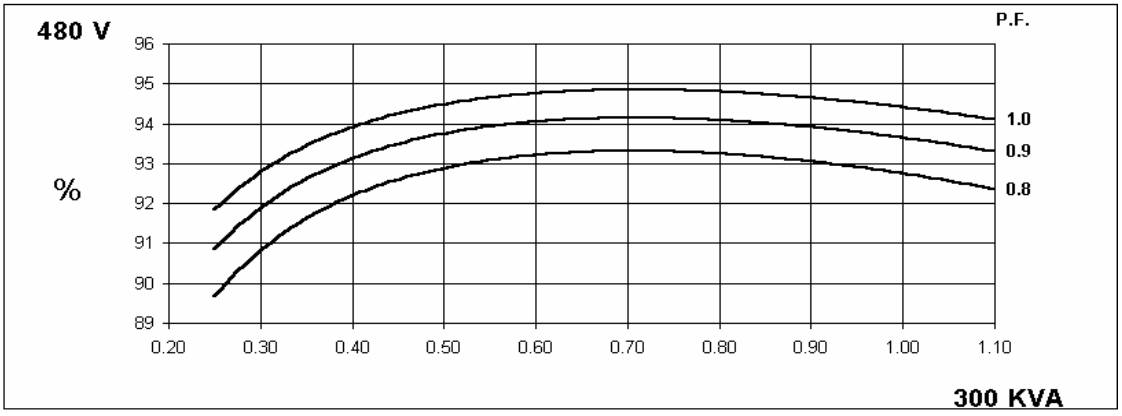
STAMFORD

## THREE PHASE EFFICIENCY CURVES



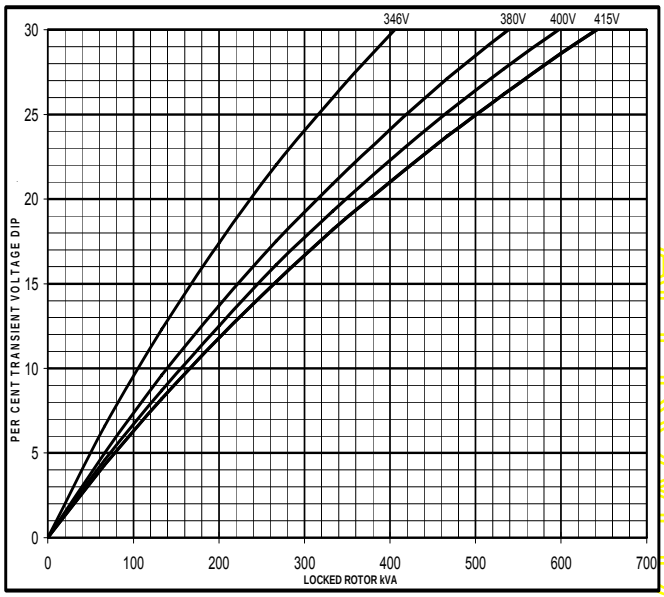
# UCDI274J

**Winding 311**

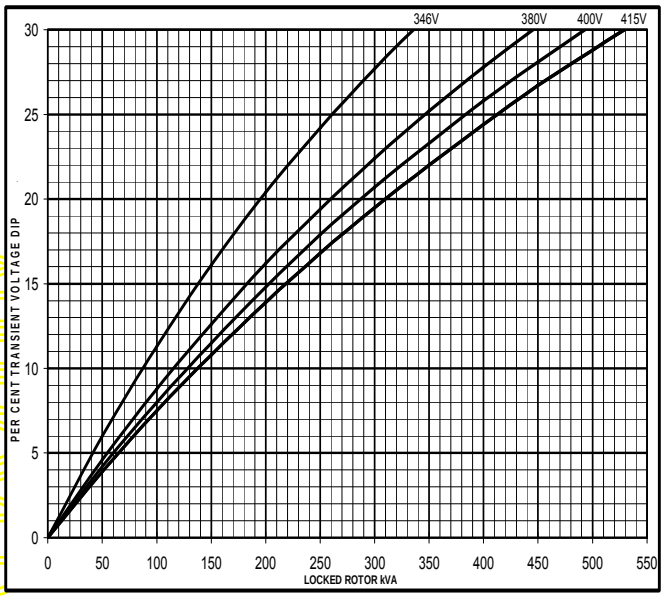
## Locked Rotor Motor Starting Curve

**50 Hz**

**MX**



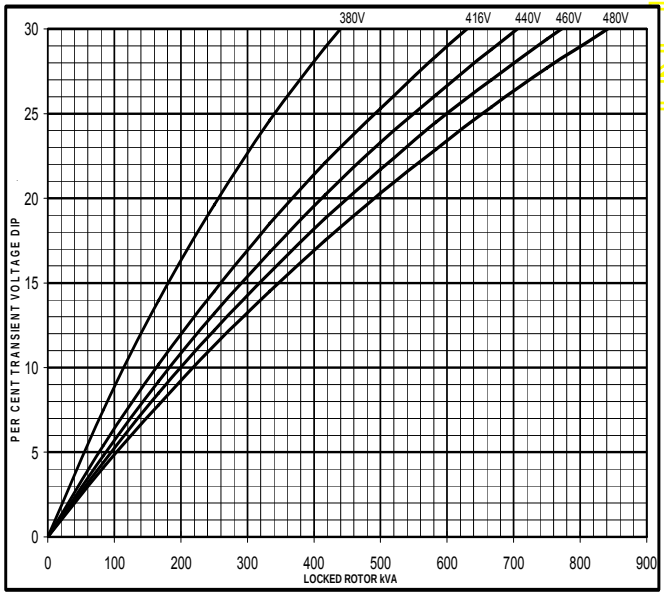

**SX**



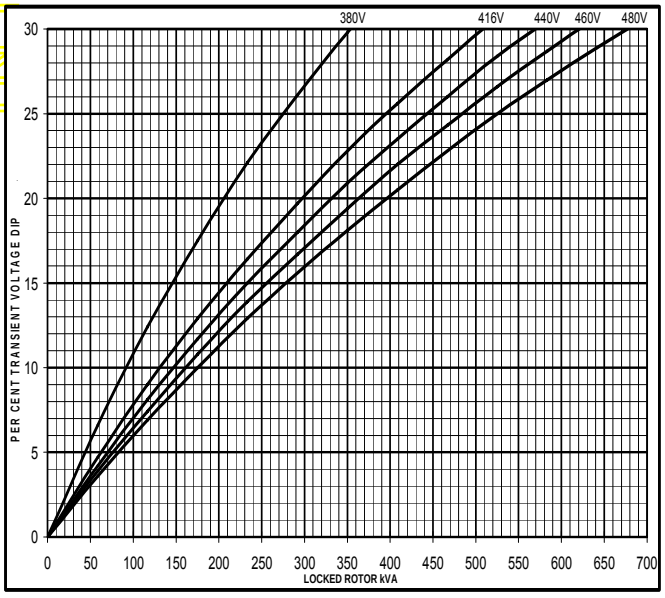



**60 Hz**

**MX**

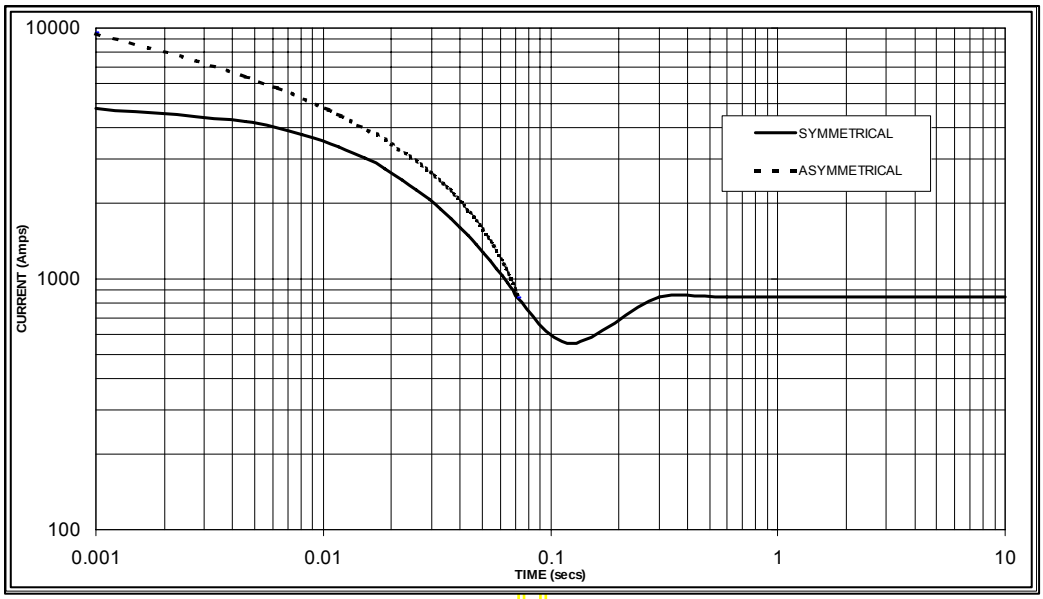



**SX**



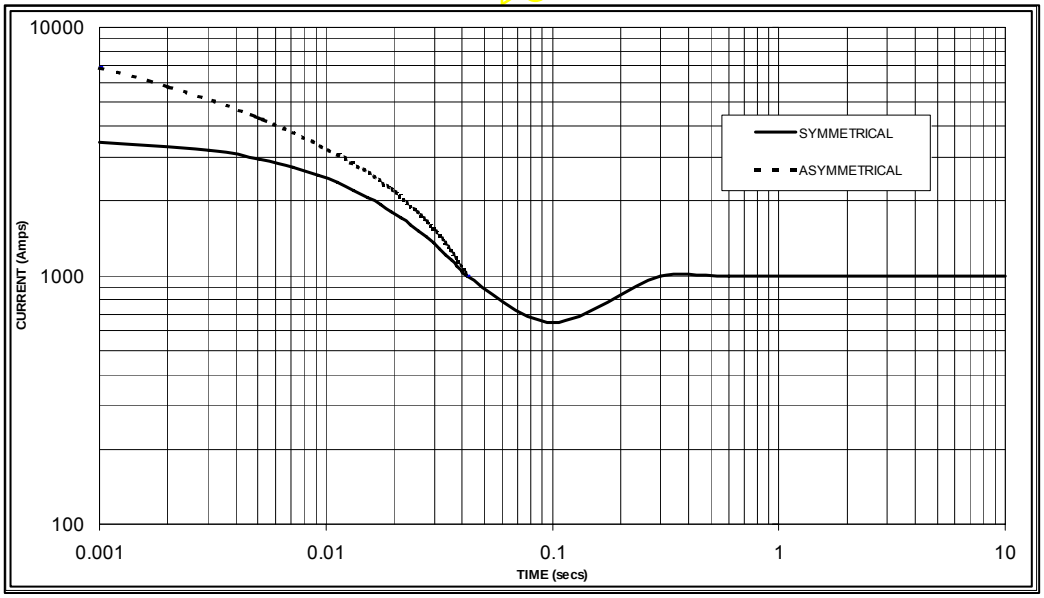
## Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed Based on star (wye) connection.

50 Hz




Sustained Short Circuit = 850 Amps

60 Hz




Sustained Short Circuit = 1,000 Amps

**Note 1**

The following multiplication factors should be used to adjust the values from curve between time 0.001 seconds and the minimum current point in respect of nominal operating voltage :

| 50Hz | | 60Hz | |
|---|---|---|---|
| Voltage | Factor | Voltage | Factor |
| 380v | X 1.00 | 416v | X 1.00 |
| 400v | X 1.05 | 440v | X 1.07 |
| 415v | X 1.10 | 460v | X 1.12 |
| | | 480v | X 1.16 |

The sustained current value is constant irrespective of voltage level

**Note 2**

The following multiplication factor should be used to convert the values calculated in accordance with NOTE 1 to those applicable to the various types of short circuit :

| | 3-phase | 2-phase L-L | 1-phase L-N |
|---|---|---|---|
| Instantaneous | x 1.00 | x 0.87 | x 1.30 |
| Minimum | x 1.00 | x 1.80 | x 3.20 |
| Sustained | x 1.00 | x 1.50 | x 2.50 |
| Max. sustained duration | 10 sec. | 5 sec. | 2 sec. |

All other times are unchanged

**Note 3**

Curves are drawn for Star (Wye) connected machines. For other connection the following multipliers should be applied to current values as shown :

Parallel Star = Curve current value X 2

Series Delta = Curve current value X 1.732

# UCDI274J

STAMFORD

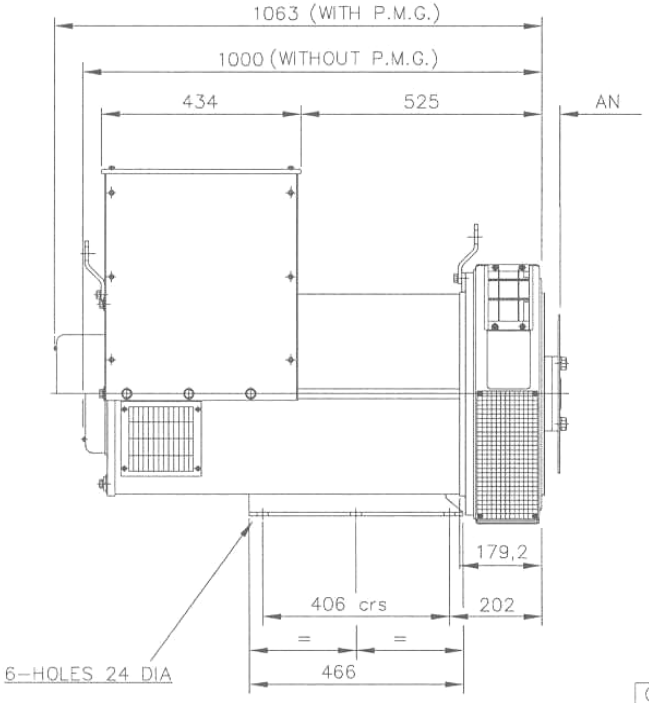
## Winding 311 / 0.8 Power Factor

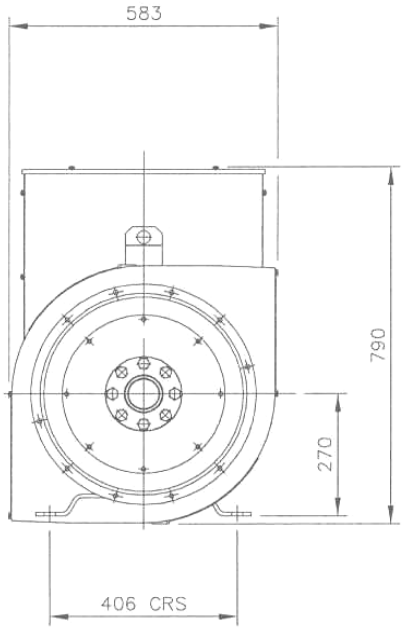
### RATINGS

| | Class - Temp Rise | Cont. F - 105/40°C | | | | Cont. H - 125/40°C | | | | Standby - 150/40°C | | | | Standby - 163/27°C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **50** Hz | Series Star (V) | 380 | 400 | 415 | 440 | 380 | 400 | 415 | 440 | 380 | 400 | 415 | 440 | 380 | 400 | 415 | 440 |
| | Parallel Star (V) | 190 | 200 | 208 | 220 | 190 | 200 | 208 | 220 | 190 | 200 | 208 | 220 | 190 | 200 | 208 | 220 |
| | Series Delta (V) | 220 | 230 | 240 | 254 | 220 | 230 | 240 | 254 | 220 | 230 | 240 | 254 | 220 | 230 | 240 | 254 |
| | kVA | 210 | 210 | 210 | N/A | 230 | 230 | 230 | N/A | 250 | 250 | 250 | N/A | 260 | 260 | 260 | N/A |
| | kW | 168 | 168 | 168 | N/A | 184 | 184 | 184 | N/A | 200 | 200 | 200 | N/A | 208 | 208 | 208 | N/A |
| | Efficiency (%) | 92.8 | 92.8 | 92.9 | N/A | 92.4 | 92.6 | 92.6 | N/A | 92.1 | 92.2 | 92.3 | N/A | 91.8 | 92.0 | 92.1 | N/A |
| | kW Input | 181.0 | 181.0 | 180.8 | N/A | 199.1 | 198.7 | 198.7 | N/A | 217.2 | 216.9 | 216.7 | N/A | 226.6 | 226.1 | 225.8 | N/A |
| **60** Hz | Series Star (V) | 416 | 440 | 460 | 480 | 416 | 440 | 460 | 480 | 416 | 440 | 460 | 480 | 416 | 440 | 460 | 480 |
| | Parallel Star (V) | 208 | 220 | 230 | 240 | 208 | 220 | 230 | 240 | 208 | 220 | 230 | 240 | 208 | 220 | 230 | 240 |
| | Series Delta (V) | 240 | 254 | 266 | 277 | 240 | 254 | 266 | 277 | 240 | 254 | 266 | 277 | 240 | 254 | 266 | 277 |
| | kVA | 250 | 264 | 275 | 275 | 269 | 281 | 294 | 300 | 288 | 300 | 313 | 319 | 294 | 306 | 319 | 325 |
| | kW | 200.0 | 211.2 | 220.0 | 220.0 | 215.2 | 224.8 | 235.2 | 240.0 | 230.4 | 240.0 | 250.4 | 255.2 | 235.2 | 244.8 | 255.2 | 260.0 |
| | Efficiency (%) | 93.0 | 93.0 | 93.0 | 93.0 | 92.8 | 92.8 | 92.7 | 92.8 | 92.5 | 92.5 | 92.5 | 92.5 | 92.4 | 92.4 | 92.4 | 92.4 |
| | kW Input | 215.1 | 227.1 | 236.6 | 236.6 | 231.9 | 242.2 | 253.7 | 258.6 | 249.1 | 259.5 | 270.7 | 275.9 | 254.5 | 264.9 | 276.2 | 281.4 |



### DIMENSIONS




| COUPLING DISC | AN |
|---|---|
| SAE 11,5 | 39,68 |
| SAE14 | 25,4 |

APPROVED DOCUMENT

STAMFORD

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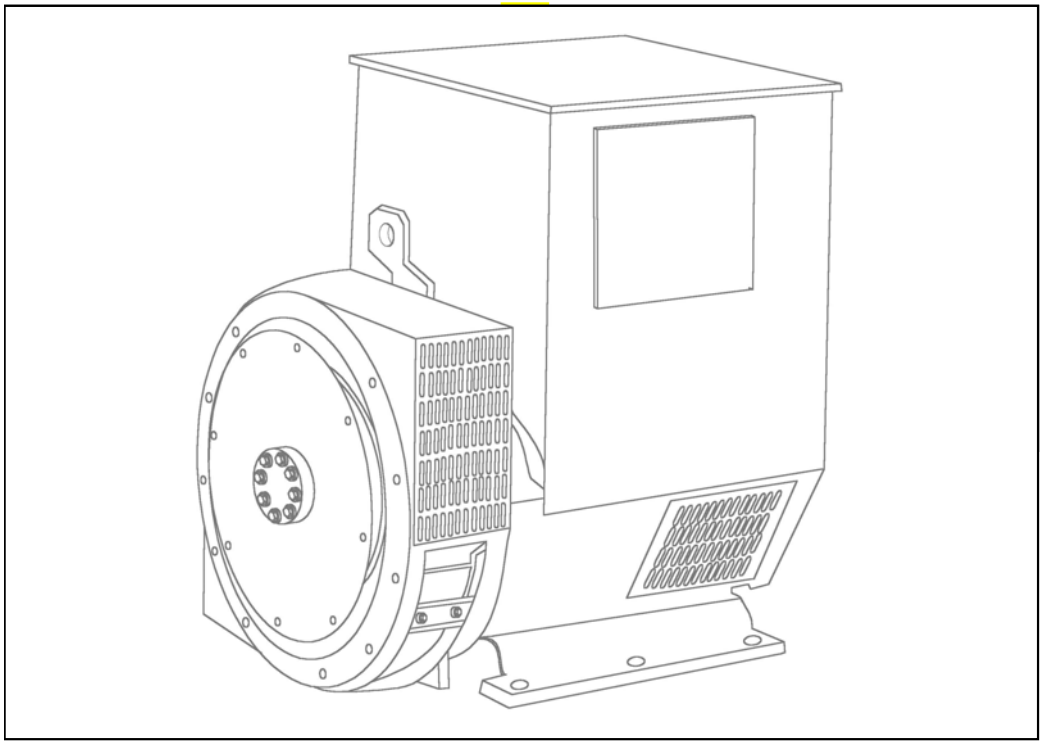
UCD274J-311-TD-EN-SG-A

STAMFORD®

# **UCDI274J** - Winding 17

## Technical Data Sheet



# SPECIFICATIONS & OPTIONS

## STANDARDS

Stamford industrial generators meet the requirements of BS EN 60034 and the relevant section of other international standards such as BS5000, VDE 0530, NEMA MG1-32, IEC34, CSA C22.2-100, AS1359.
Other standards and certifications can be considered on request.

## VOLTAGE REGULATORS

### SX460 AVR - STANDARD

With this self excited control system the main stator supplies power via the Automatic Voltage Regulator (AVR) to the exciter stator. The high efficiency semiconductors of the AVR ensure positive build-up from initial low levels of residual voltage.
The exciter rotor output is fed to the main rotor through a three phase full wave bridge rectifier. This rectifier is protected by a surge suppressor against surges caused, for example, by short circuit.

### AS440 AVR

With this self-excited system the main stator provides power via the AVR to the exciter stator. The high efficiency semi-conductors of the AVR ensure positive build-up from initial low levels of residual voltage.
The exciter rotor output is fed to the main rotor through a three-phase full-wave bridge rectifier. The rectifier is protected by a surge suppressor against surges caused, for example, by short circuit or out-of-phase paralleling.
The AS440 will support a range of electronic accessories, including a 'droop' Current Transformer (CT) to permit parallel operation with other ac generators.

### MX341 AVR

This sophisticated AVR is incorporated into the Stamford Permanent Magnet Generator (PMG) control system.
The PMG provides power via the AVR to the main exciter, giving a source of constant excitation power independent of generator output. The main exciter output is then fed to the main rotor, through a full wave bridge, protected by a surge suppressor. The AVR has in-built protection against sustained over-excitation, caused by internal or external faults. This de-excites the machine after a minimum of 5 seconds.
An engine relief load acceptance feature can enable full load to be applied to the generator in a single step.
If three-phase sensing is required with the PMG system the MX321 AVR must be used.
We recommend three-phase sensing for applications with greatly unbalanced or highly non-linear loads.

### MX321 AVR

The most sophisticated of all our AVRs combines all the features of the MX341 with, additionally, three-phase rms sensing, for improved regulation and performance.
Over voltage protection is built-in and short circuit current level adjustments is an optional facility.



## WINDINGS & ELECTRICAL PERFORMANCE

All generator stators are wound to 2/3 pitch. This eliminates triplen (3rd, 9th, 15th …) harmonics on the voltage waveform and is found to be the optimum design for trouble-free supply of non-linear loads. The 2/3 pitch design avoids excessive neutral currents sometimes seen with higher winding pitches, when in parallel with the mains. A fully connected damper winding reduces oscillations during paralleling. This winding, with the 2/3 pitch and carefully selected pole and tooth designs, ensures very low waveform distortion.

## TERMINALS & TERMINAL BOX

Standard generators are 3-phase reconnectable with 12 ends brought out to the terminals, which are mounted on a cover at the non-drive end of the generator. A sheet steel terminal box contains the AVR and provides ample space for the customers' wiring and gland arrangements. It has removable panels for easy access.

## SHAFT & KEYS

All generator rotors are dynamically balanced to better than BS6861:Part 1 Grade 2.5 for minimum vibration in operation.

## INSULATION/IMPREGNATION

The insulation system is class 'H'.
All wound components are impregnated with materials and processes designed specifically to provide the high build required for static windings and the high mechanical strength required for rotating components.

## QUALITY ASSURANCE

Generators are manufactured using production procedures having a quality assurance level to BS EN ISO 9001.

The stated voltage regulation may not be maintained in the presence of certain radio transmitted signals. Any change in performance will fall within the limits of Criteria 'B' of EN 61000-6-2:2001. At no time will the steady-state voltage regulation exceed 2%.

## DE RATES

All values tabulated on page 6 are subject to the following reductions

5% when air inlet filters are fitted.
3% for every 500 metres by which the operating altitude exceeds 1000 metres above mean sea level.
3% for every 5 C by which the operational ambient temperature exceeds 40 C.
Note: Requirement for operating in an ambient exceeding 60 C must be referred to the factory.

*NB Continuous development of our products entitles us to change specification details without notice, therefore they must not be regarded as binding.*

*Front cover drawing typical of product range.*

# UCDI274J

STAMFORD

## WINDING 17

| | | | |
|---|---|---|---|
| CONTROL SYSTEM | SEPARATELY EXCITED BY P.M.G. | | |
| A.V.R. | MX321 | MX341 | |
| VOLTAGE REGULATION | ± 0.5 % | ± 1.0 % | With 4% ENGINE GOVERNING |
| SUSTAINED SHORT CIRCUIT | REFER TO SHORT CIRCUIT DECREMENT CURVES (page 5) | | |

| | | | |
|---|---|---|---|
| CONTROL SYSTEM | SELF EXCITED | | |
| A.V.R. | SX460 | AS440 | |
| VOLTAGE REGULATION | ± 1.5 % | ± 1.0 % | With 4% ENGINE GOVERNING |
| SUSTAINED SHORT CIRCUIT | SERIES 4 CONTROL DOES NOT SUSTAIN A SHORT CIRCUIT CURRENT | | |

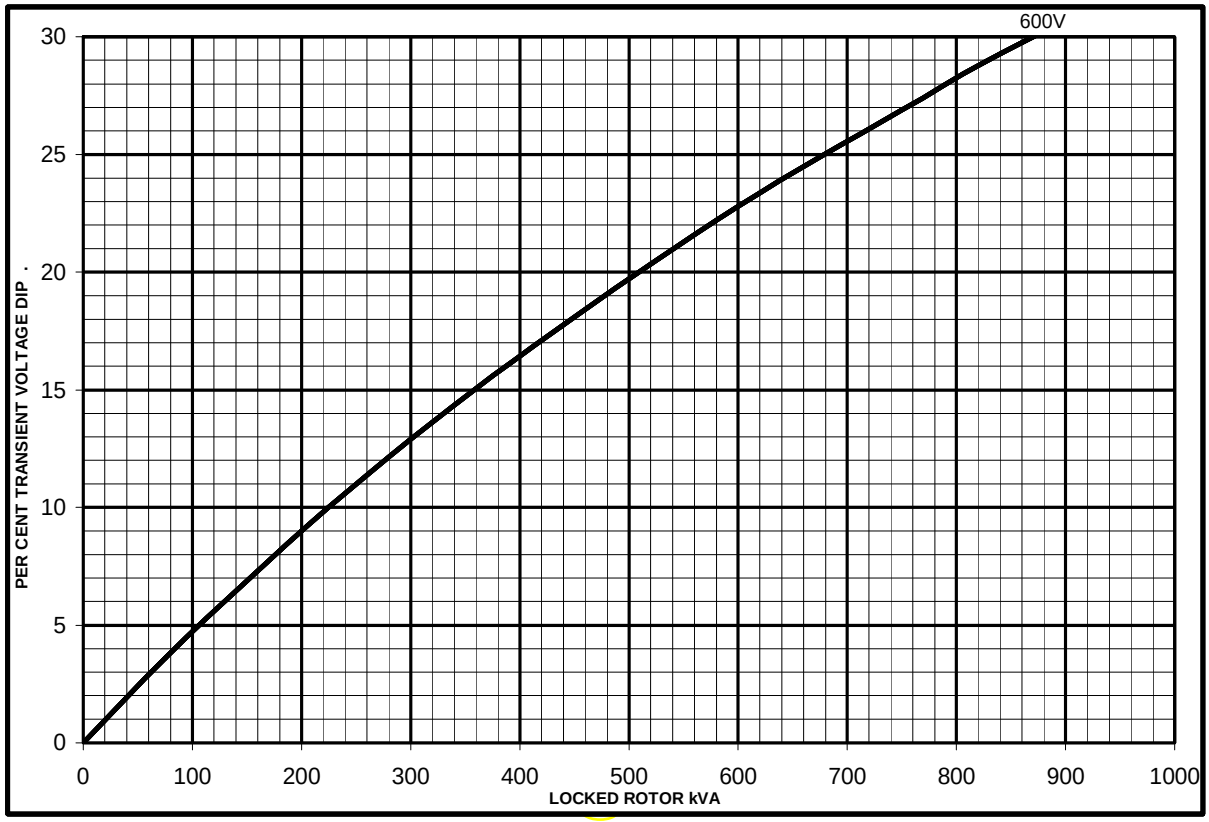
| | | |
|---|---|---|
| INSULATION SYSTEM | CLASS H | |
| PROTECTION | IP23 | |
| RATED POWER FACTOR | 0.8 | |
| STATOR WINDING | DOUBLE LAYER CONCENTRIC | |
| WINDING PITCH | TWO THIRDS | |
| WINDING LEADS | 12 | |
| STATOR WDG. RESISTANCE | 0.017 Ohms PER PHASE AT 22°C SERIES STAR CONNECTED | |
| ROTOR WDG. RESISTANCE | 2.08 Ohms at 22°C | |
| EXCITER STATOR RESISTANCE | 20 Ohms at 22°C | |
| EXCITER ROTOR RESISTANCE | 0.091 Ohms PER PHASE AT 22°C | |
| R.F.I. SUPPRESSION | BS EN 61000-6-2 & BS EN 61000-6-4,VDE 0875G, VDE 0875N. refer to factory for others | |
| WAVEFORM DISTORTION | NO LOAD < 1.5% NON-DISTORTING BALANCED LINEAR LOAD < 5.0% | |
| MAXIMUM OVERSPEED | 2250 Rev/Min | |
| BEARING NON-DRIVE END | BALL. 6310-2RS (ISO) | |
| | 1 BEARING | |
| WEIGHT COMP. GENERATOR | 727 kg | |
| WEIGHT WOUND STATOR | 304 kg | |
| WEIGHT WOUND ROTOR | 271.9 kg | |
| $WR^2$ INERTIA | 2.3744 $kgm^2$ | |
| SHIPPING WEIGHTS in a crate | 740 kg | |
| PACKING CRATE SIZE | 123 x 67 x 103(cm) | |
| TELEPHONE INTERFERENCE | THF<2% | TIF<50 |
| COOLING AIR | 0.69 $m^3$/sec 1463 cfm | |
| VOLTAGE SERIES STAR | 600V | |
| VOLTAGE PARALLEL STAR | 300V | |
| VOLTAGE SERIES DELTA | 346V | |
| kVA BASE RATING FOR REACTANCE VALUES | 305 | |
| Xd DIR. AXIS SYNCHRONOUS | 2.01 | |
| X'd DIR. AXIS TRANSIENT | 0.12 | |
| X"d DIR. AXIS SUBTRANSIENT | 0.07 | |
| Xq QUAD. AXIS REACTANCE | 0.92 | |
| X"q QUAD. AXIS SUBTRANSIENT | 0.11 | |
| $X_L$ LEAKAGE REACTANCE | 0.06 | |
| $X_2$ NEGATIVE SEQUENCE | 0.09 | |
| $X_0$ ZERO SEQUENCE | 0.04 | |
| REACTANCES ARE SATURATED | VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED | |
| T'd TRANSIENT TIME CONST. | 0.045s | |
| T"d SUB-TRANSTIME CONST. | 0.015s | |
| T'do O.C. FIELD TIME CONST. | 1.27s | |
| Ta ARMATURE TIME CONST. | 0.03s | |
| SHORT CIRCUIT RATIO | 1/Xd | |

# UCDI274J

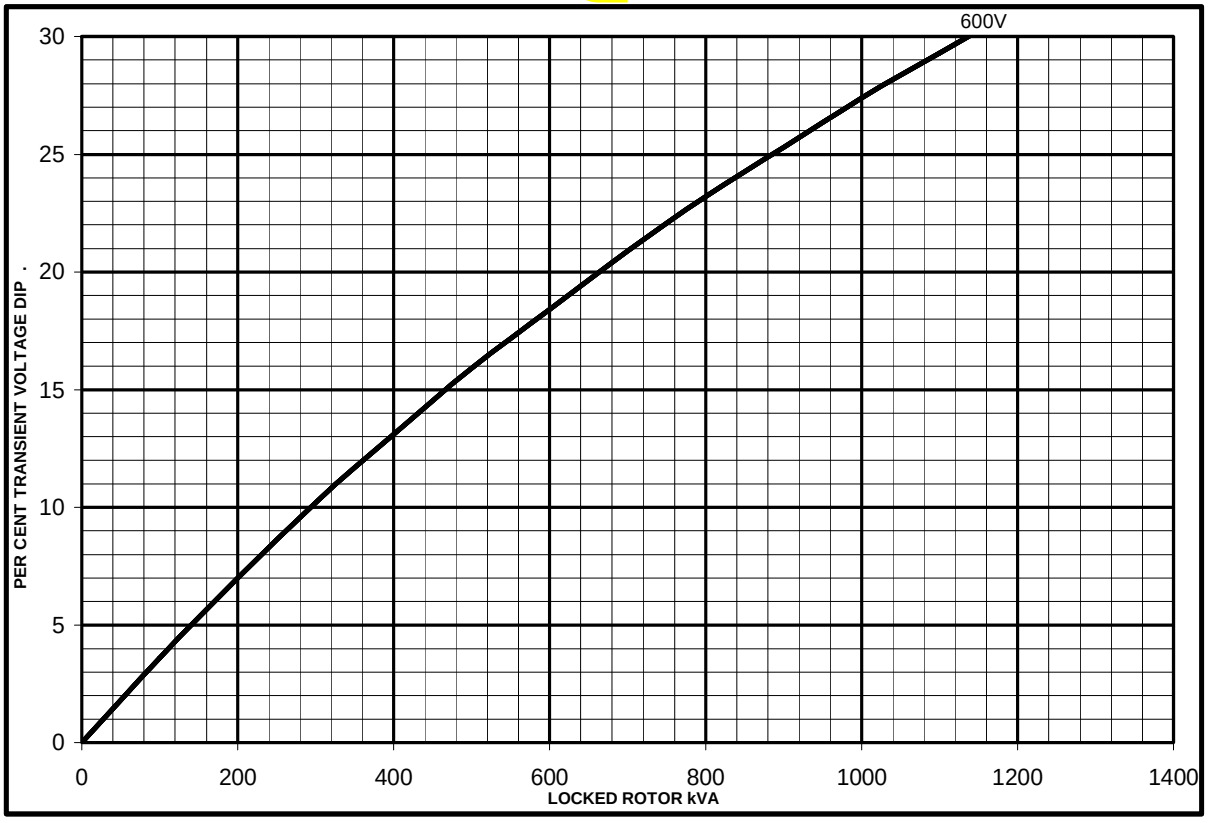
**Winding 17**

SX

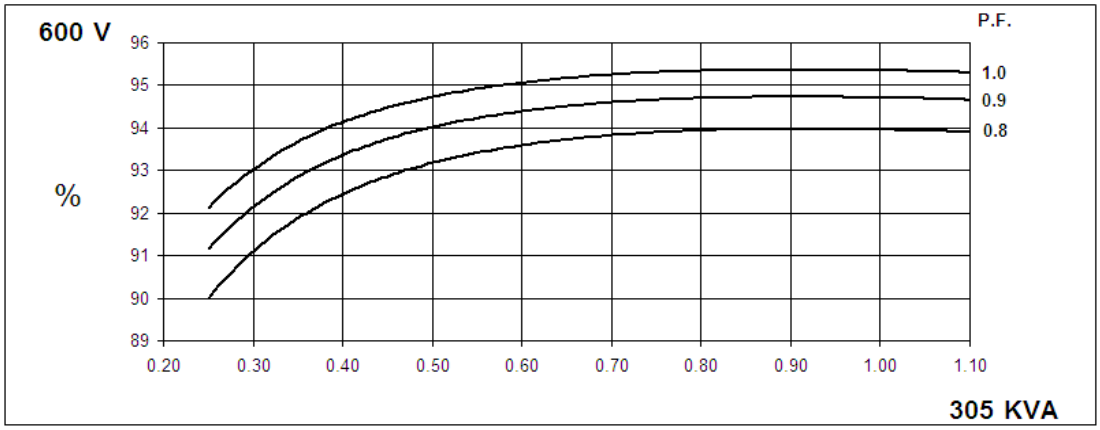
## Locked Rotor Motor Starting Curves




MX

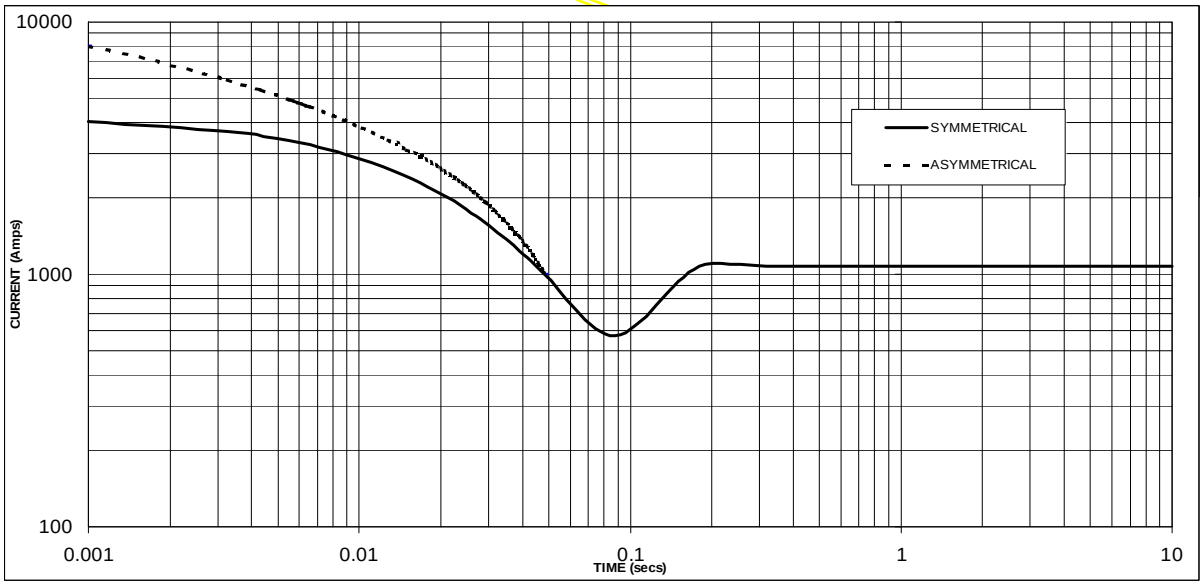


## THREE PHASE EFFICIENCY CURVES






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




Sustained Short Circuit = 1075 Amps

**Note**
The following multiplication factor should be used to convert the values from curve for the various types of short circuit :

| | 3-phase | 2-phase L-L | 1-phase L-N |
|---|---|---|---|
| Instantaneous | x 1.00 | x 0.87 | x 1.30 |
| Minimum | x 1.00 | x 1.80 | x 3.20 |
| Sustained | x 1.00 | x 1.50 | x 2.50 |
| Max. sustained duration | 10 sec. | 5 sec. | 2 sec. |

All other times are unchanged

# UCDI274J

**Winding 17 / 0.8 Power Factor**

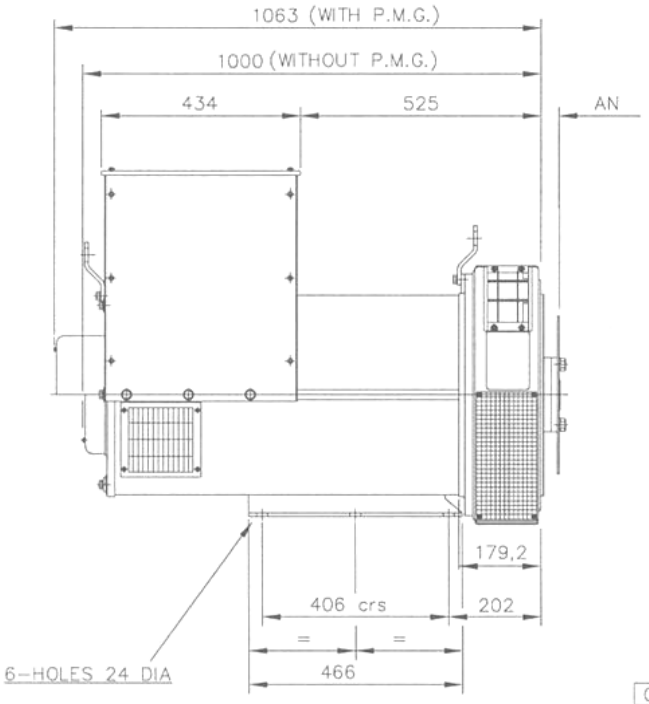
## 60Hz

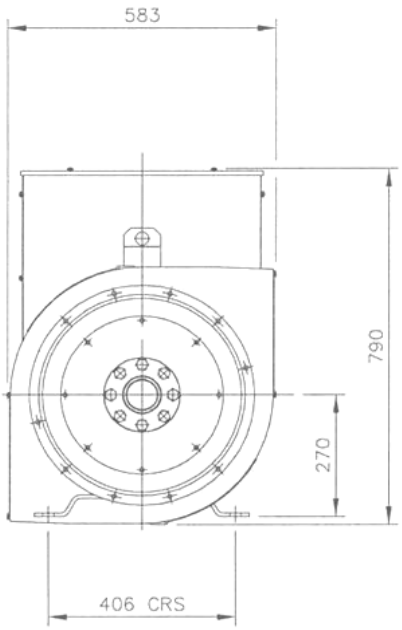
## RATINGS

| Class - Temp Rise | Cont. F - 105/40°C | Cont. H - 125/40°C | Standby - 150/40°C | Standby - 163/27°C |
|---|---|---|---|---|
| Series Star (V) | 600 | 600 | 600 | 600 |
| Parallel Star (V) | 300 | 300 | 300 | 300 |
| Series Delta (V) | 346 | 346 | 346 | 346 |
| kVA | 281.0 | 305.0 | 328.0 | 334.0 |
| kW | 224.8 | 244.0 | 262.4 | 267.2 |
| Efficiency (%) | 94.0 | 94.0 | 93.9 | 93.9 |
| kW Input | 239.2 | 259.7 | 279.4 | 284.6 |



## DIMENSIONS




| COUPLING DISC | AN |
|---|---|
| SAE 11,5 | 39,68 |
| SAE14 | 25,4 |

APPROVED DOCUMENT

STAMFORD

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www.cumminsgeneratortechnologies.com

# DGC-2020 Digital Genset Controller

A highly advanced integrated genset control system, this device provides genset control, transfer switch control, metering, protection, and programmable logic in a simple, easy-to-use, reliable, rugged, and cost effective package.

## Features

- Generator metering (includes three-phase mains)
- Engine and generator protection: 27, 32R, 40Q, 59, 81O/U
- Optional enhanced generator protection: 47, 51, 78, and 81ROCOF
- Load sharing and generator sequencing (via LSM-2020 Load Share Module)
- Var sharing over Ethernet (via LSM-2020)
- BESTCOMS*Plus*® Software
  - Programming and setup
  - Intuitive and powerful
  - Remote control and monitoring
  - Programmable logic
  - USB communications
- Automatic transfer switch control
- Automatic synchronizer (optional)
- Exercise timer
- SAE J1939 engine ECU communications
- Automatic generator configuration detection
- Expandable functionality via add-on modules
  - LSM-2020 Load Share Module
  - CEM-2020 Contact Expansion Module
  - AEM-2020 Analog Expansion Module
- Multilingual capability
- Remote communications to Basler's RDP-110 (remote display panel)
- Sixteen programmable contact inputs
- Up to 15 contact outputs: 3 contacts rated for 30 Adc and up to 12 programmable contacts rated for 2 Adc

**Visit www.basler.com for additional information.**

## Benefits

- Provides integrated engine-genset control, protection, and metering in a single package.
- The Offline Simulator, provided in BESTlogic™*Plus*, helps test and troubleshoot logic without the need for expensive hardware.
- Flexible programmable logic and programmable I/O make it easy to expand the DGC-2020's inputs and outputs with the CEM-2020 (Contact Expansion Module) and the AEM-2020 (Analog Expansion Module). This saves time and money by eliminating unnecessary external PLCs and control relaying.

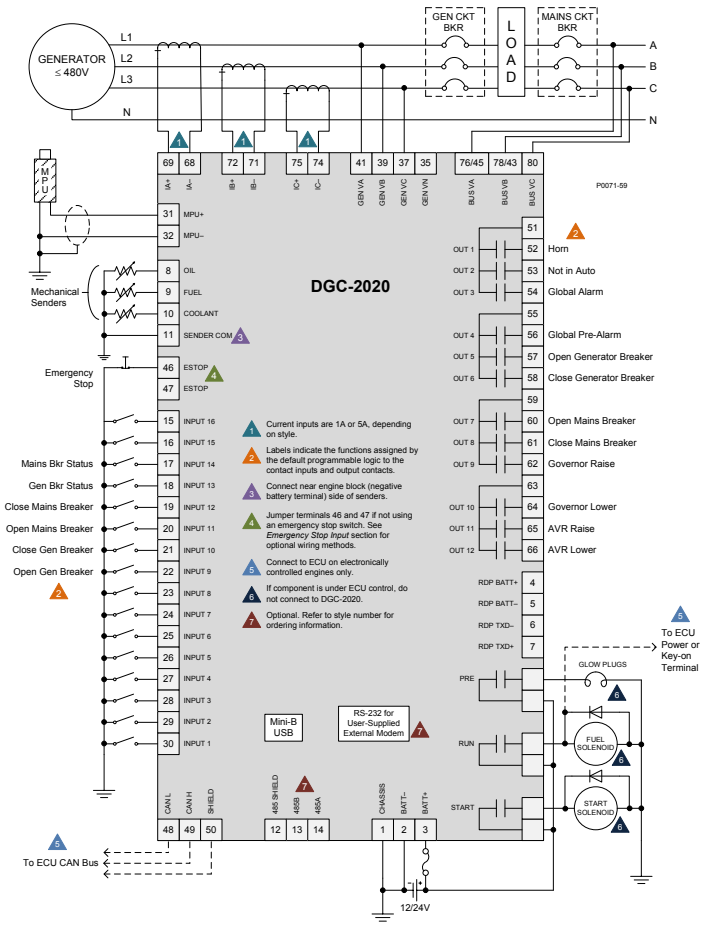



*Figure 1 - DGC-2020 Connection Diagram for a Typical Application*

# DGC-2020 Digital Genset Controller

## Specifications

### Power Supply

| | |
|---|---|
| Nominal: | 12 or 24 Vdc |
| Range: | 6 to 32 Vdc |
| Battery Ride Through: | Starting at 10 Vdc, withstands cranking ride-through down to 0 V for 50 ms |

### Power Consumption

| | |
|---|---|
| Sleep Mode: | 5 W |
| Normal Operational Mode: | 7.9 W |
| Maximum: | 14.2 W |

### Current Sensing

| | |
|---|---|
| 1 A Sensing: | 0.02 to 1.0 Aac, continuous<br>2 Aac for 1 second |
| 5 A Sensing: | 0.1 to 5.0 Aac, continuous<br>10 Aac for 1 second |
| Burden: | 1 VA |

### Voltage Sensing

| | |
|---|---|
| Range: | 12 to 576 Vrms L-L |
| Frequency Range: | 10 to 72 Hz for 50/60 Hz style,<br>10 to 480 Hz for 400 Hz style |
| Burden: | 1 VA |
| One-second Rating: | 720 Vrms |

### Contact Sensing

| | |
|---|---|
| Contact Inputs (16): | Accepts normally open (N.O.), Dry Contacts, programmable |
| Emergency Stop: | Normally closed (N.C.), Dry Contact |

### Engine Speed Sensing

| | |
|---|---|
| Magnetic Pickup: | |
| Voltage Range: | 6 to 70 Vpp |
| Frequency Range: | 32 to 10,000 Hz |
| Generator Frequency: | |
| Generator Voltage Range: | 12 to 576 Vrms |
| Via ECU over J1939 | |

### Resistive Senders

| | |
|---|---|
| Fuel Level Sender: | 0 to 250 Ω nominal |
| Coolant Temp Sender: | 10 to 2,750 Ω nominal |
| Oil Pressure Sender: | 0 to 250 Ω nominal |

### Output Contacts

| | |
|---|---|
| Fuel Solenoid, Engine Crank, Pre-Start Relays Rating: | 30 Adc at 28 Vdc-make, break, and carry |
| Programmable Relays: | Up to 12 |
| Rating: | 2 Adc at 28 Vdc-make, break, and carry |

### Protection

| | |
|---|---|
| Generator: | 27, 32R, 40Q, 59, 81O/U (standard)<br>47, 51, 78, 81 ROCOF (optional) |
| Engine: | Oil pressure, coolant temperature, overcrank, ECU-specific elements, and diagnostic reporting. |

### Agency Approvals

CSA certified, NFPA compliant, CE compliant, UL recognized (Hazardous Location certification available upon request), EAC certified

### Communication

| | |
|---|---|
| USB Port: | USB 2.0, Mini-B jack |
| RS-485 (optional): | 9600 baud, 8 data bits, no parity |
| RDP-110 (optional): | 4,000 ft (1,219 m) max wire length, 20 AWG (0.52 mm²) min wire size |
| Modem (optional): | DB-9 connector (male) |
| CAN bus: | 250 kb/s communication rate, 1.5 to 3 Vdc differential bus |

### Environmental

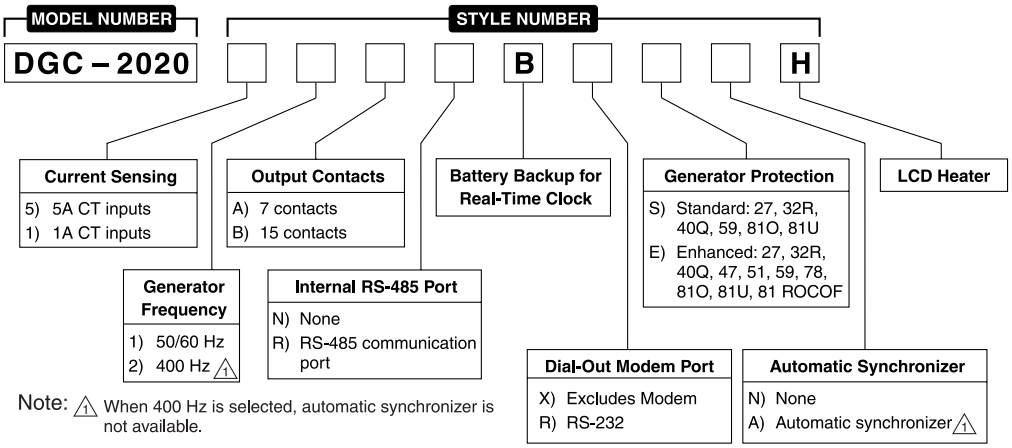
| | |
|---|---|
| Operating Temp: | -40°C to 70°C (-40°F to 158°F) |
| Storage Temp: | -40°C to 85°C (-40°F to 185°F) |
| Humidity: | IEC 68-2-38 |
| Salt Fog: | ASTM B 17-73, IEC 68-2-11 |
| Ingress Protection: | IEC IP54 for front panel |
| Shock: | 15 G in three perpendicular planes |
| Vibration: | |
| 5 to 29 Hz: | 1.5 G peak |
| 29 to 52 Hz: | 0.036″ (0.914 mm) double amplitude |
| 52 to 500 Hz: | 5 G peak |

### Physical

| | |
|---|---|
| Weight: | 4.4 lb (2 kg) |
| Dimensions (WxHxD): | 11.77 x 8.27 x 2.69 inches (299 x 210 x 69 mm) |

**For complete specifications, download the instruction manual at www.basler.com.**

## Style Chart




Note: 1 When 400 Hz is selected, automatic synchronizer is not available.

## Related Products

- BE1-11*g* Generator Protection System
  - A complete generator protection system.
- DECS-250 Digital Excitation Control System
  - Total control in a compact package provides precise voltage, var and power factor regulation, exceptional system response, and generator protection.

## Accessories

- AEM-2020 Analog Expansion Module
  - Easily increases the functionality by seamlessly adding analog inputs and outputs.
- CEM-2020, CEM-2020H Contact Expansion Module
  - Each module adds 10 inputs and up to 24 outputs that are easily programmed through BESTCOMS*Plus*® for easy integration into the system.
- LSM-2020 Load Share Module
  - The simple-to-use LSM-2020 easily adds paralleling capabilities with little effort and expense.
- RDP-110 Remote Display Panel
  - Provides remote alarm and pre-alarm indication and annunciation of system status, easily meeting the annunciation requirements of NFPA-110 applications.


ISO 9001-2008
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# Tmax-Molded Case Circuit Breakers

## T4 250A Frame

**AC Circuit Breakers and Switches**

**DC Circuit Breakers and Switches**

**3 and 4 Pole**

**Motor Circuit Protectors**

**Higher Performances in Less Space**

**Field Installable Accessories and Trip Units**


**Dimensions** 3P Fixed Version 8.07H x 4.13W x 4.07D

### Compliance with Standards

| |
|---|
| UL 489 |
| CSA C22.2 No.5.1 |
| IEC 60947-2 |
| Standards |
| EC directive: |
| – “Low Voltage Directives” (LVD) no. 73/23 EEC |
| – “Electromagnetic Compatibility Directive” (EMC) no.89/336 EEC |

The ABB Quality System complies with the international ISO 9001 - 2000 Standard (model for quality assurance in design, development, construction, and installation and service) and with the equivalent European EN ISO 9001 and Italian UNI EN ISO 9001 Standards

| Interrupting ratings (RMS sym. kAmps) | | T4 | | | | |
|---|---|---|---|---|---|---|
| Continuous Current Rating | | 250A | | | | |
| Number of Poles | | 3-4 | | | | |
| | | **N** | **S** | **H** | **L** | **V** |
| AC | | | | | | |
| 240V | | 65 | 100 | 150 | 200 | 200 |
| 480V | | 25 | 35 | 65 | 100 | 150 |
| 600V | | 18 | 25 | 35 | 65 | 100 |
| DC* | | | | | | |
| 500V | 2 poles in series | 25 | 35 | 50 | 65 | 100 |
| 600V | 3 poles in series | 16 | 25 | 35 | 50 | 65 |

*Thermo Magnetic Trip Only

## Company Quality Systems and Environmental Systems

The new Tmax series has a hologram on the front, obtained using special anti-imitation techniques, which guarantees the quality and that the circuit breaker is an original ABB product.

Attention to protection of the environment and to health and safety in the work place is another priority commitment for ABB and, as confirmation of this, the company environmental management system has been certified by RINA in 1997, in conformity with the international ISO 14001 Standard. This certification has been integrated in 1999 with the Management System for Health and Safety in the workplace, according to OHSAS 18001 (British Standards), obtaining one of the first certification of integrated management System, QES (Quality, Environment, Safety) issued by RINA. ABB - the first industry in the electromechanical section in Italy to obtain this recognition - thanks to a revision of the production process with an eye to ecology has been able to reduce the consumption of raw materials and waste from processing by 20%. ABB's commitment to safeguarding the environment is also shown in a concrete way by the Life Cycle Assessments of its products carried out directly by the ABB Research and Development in collaboration with the ABB Research Center. Selection of materials, processes and packing materials is made optimizing the true environmental impact of the product, also foreseeing the possibility of its being recycled.

## Mounting

Fixed
Plug-in
Drawout

## Connections

Busbar connection or compression lugs
Pressure-type terminals for bare cables
Rear connections

## Trip Unit

TMF thermo magnetic trip units, with fixed thermal and magnetic threshold (I3 = 10 x In);

TMD (up to 50 A) thermo magnetic trip units with adjustable thermal threshold (I1 = 0.7…1 x In) and fixed magnetic threshold (I3 = 10 x In).

TMA thermo magnetic trip units, with adjustable thermal threshold (I1 = 0.7…1 x In) and adjustable magnetic threshold (I3 = 5…10 x In).

PR221DS, PR222DS/P and PR222DS/PD-A electronic trip unit

| | |
|---|---|
| **Weight (lbs)** | 6.18 |

## Auxiliary Devices for Indication and Control

- Auxiliary contacts - AUX
- Undervoltage release - UVR
- Shunt trip - SOR
- Terminal covers
- Front for lever operating mechanism - FLD
- Direct rotary handle - RHD
- Stored energy motor operator - MOE
- Key lock - KLF
- Early auxiliary contact - AUE
- Transmitted rotary handle - RHE
- Front terminal for copper cable - FC Cu
- Front extended terminal - EF
- Front terminal for copper-aluminum - FC CuAl
- Front extended spread terminal – ES
- Distribution lugs
- Rear orientated terminal - R
- Phase separators
- Residual current release (IEC Only)

Publication LV038
No. 1SXU 210 038 D0201
Printed in USA, November, 2005

**ABB Inc.**

1206 Hatton Road
Wichita Falls, TX 76302
For more information and
the location of your local
field office please go to
www.abb-control.com

# Tmax-Molded Case Circuit Breakers

## T5 400A and 600A Frame

**AC Circuit Breakers and Switches**

**DC Circuit Breakers and Switches** (400A Only)

**3 and 4 Pole**

**Motor Circuit Protectors**

**Higher Performances in Less Space**

**Field Installable Accessories and Trip Units**

**Dimensions** 3P Fixed Version 8.07H x 5.51W x 4.07D

### Compliance with Standards

| |
|---|
| UL 489 |
| CSA C22.2 No.5.1 |
| IEC 60947-2 |
| Standards |
| EC directive: |
| – “Low Voltage Directives” (LVD) no. 73/23 EEC |
| – “Electromagnetic Compatibility Directive” (EMC) no.89/336 EEC |

The ABB Quality System complies with the international ISO 9001 - 2000 Standard (model for quality assurance in design, development, construction, and installation and service) and with the equivalent European EN ISO 9001 and Italian UNI EN ISO 9001 Standards

| Interrupting ratings (RMS sym. kAmps) | | T5 | | | | |
|---|---|---|---|---|---|---|
| Continuous Current Rating | | 400-600A | | | | |
| Number of Poles | | 3-4 | | | | |
| | | **N** | **S** | **H** | **L** | **V** |
| AC | | | | | | |
| 240V | | 65 | 100 | 150 | 200 | 200 |
| 480V | | 25 | 35 | 65 | 100 | 150 |
| 600V | | 18 | 25 | 35 | 65 | 100 |
| DC* ( 400 A only ) | | | | | | |
| 500V | 2 poles in series | 25 | 35 | 50 | 65 | 100 |
| 600V | 3 poles in series | 16 | 25 | 35 | 50 | 65 |

*Thermo Magnetic Trip Only

## Company Quality Systems and Environmental Systems

The new Tmax series has a hologram on the front, obtained using special anti-imitation techniques, which guarantees the quality and that the circuit breaker is an original ABB product.

Attention to protection of the environment and to health and safety in the work place is another priority commitment for ABB and, as confirmation of this, the company environmental management system has been certified by RINA in 1997, in conformity with the international ISO 14001 Standard. This certification has been integrated in 1999 with the Management System for Health and Safety in the workplace, according to OHSAS 18001 (British Standards), obtaining one of the first certification of integrated management System, QES (Quality, Environment, Safety) issued by RINA. ABB - the first industry in the electromechanical section in Italy to obtain this recognition - thanks to a revision of the production process with an eye to ecology has been able to reduce the consumption of raw materials and waste from processing by 20%. ABB's commitment to safeguarding the environment is also shown in a concrete way by the Life Cycle Assessments of its products carried out directly by the ABB Research and Development in collaboration with the ABB Research Center. Selection of materials, processes and packing materials is made optimizing the true environmental impact of the product, also foreseeing the possibility of its being recycled.

## Mounting

Fixed
Plug-in
Drawout

## Connections

Busbar connection or compression lugs
Pressure-type terminals for bare cables
Rear connections

## Trip Unit

TMA thermo magnetic trip units, with adjustable thermal threshold (I1 = 0.7…1 x In) and adjustable magnetic threshold (I3 = 5…10 x In).

PR221DS, PR222DS/P and PR222DS/PD-A electronic trip unit

| | |
|---|---|
| **Weight (lbs)** | 8.55 |

## Auxiliary Devices for Indication and Control

- Auxiliary contacts - AUX
- Undervoltage release - UVR
- Shunt trip - SOR
- Terminal covers
- Front for lever operating mechanism - FLD
- Direct rotary handle - RHD
- Stored energy motor operator - MOE
- Key lock - KLF
- Early auxiliary contact - AUE
- Transmitted rotary handle - RHE
- Front terminal for copper cable - FC Cu
- Front extended terminal - EF
- Front terminal for copper-aluminum - FC CuAl
- Front extended spread terminal – ES
- Distribution lugs
- Rear orientated terminal - R
- Phase separators
- Residual current release (IEC Only)

Publication LV039
No. 1SXU 210 039 D0201
Printed in USA, November, 2005

**ABB Inc.**

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Wichita Falls, TX 76302
For more information and
the location of your local
field office please go to
www.abb-control.com

# Tmax-Molded Case Circuit Breakers

## T6 800A Frame

**AC Circuit Breakers and Switches**

**DC Circuit Breakers and Switches**

**3 and 4 Pole**

**Motor Circuit Protectors**

**Higher Performances in Less Space**

**Field Installable Accessories and Trip Units**

| | | |
|---|---|---|
| **Dimensions** | 3P Fixed Version | 10.55H x 8.26W x 4.07D |
| **Weight** | 20.9 (lbs) | |

### Compliance with Standards

| |
|---|
| UL 489 |
| CSA C22.2 No.5.1 |
| IEC 60947-2 |
| Standards |
| EC directive: |
| – "Low Voltage Directives" (LVD) no. 73/23 EEC |
| – "Electromagnetic Compatibility Directive" (EMC) no.89/336 EEC |

The ABB Quality System complies with the international ISO 9001 - 2000 Standard (model for quality assurance in design, development, construction, and installation and service) and with the equivalent European EN ISO 9001 and Italian UNI EN ISO 9001 Standards

| Interrupting ratings (RMS sym. kAmps) | | T6 | | | |
|---|---|---|---|---|---|
| Continuous Current Rating | | 800 | | | |
| Number of Poles | | 3-4 | | | |
| | | **N** | **S** | **H** | **L** |
| AC | | | | | |
| 240V | | 65 | 100 | 200 | 200 |
| 480V | | 35 | 50 | 65 | 100 |
| 600V | | 20 | 25 | 35 | 42 |
| DC* | | | | | |
| 500V | 2 poles in series | 35 | 35 | 50 | 65 |
| 600V | 3 poles in series | 20 | 20 | 35 | 50 |

*Thermal Magnetic Trip Only

## Company Quality Systems and Environmental Systems

The new Tmax series has a hologram on the front, obtained using special anti-imitation techniques, which guarantees the quality and that the circuit breaker is an original ABB product.

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## Mounting

Fixed
Drawout

## Connections

Busbar connection or compression lugs
Pressure-type terminals for bare cables
Rear connections

## Trip Unit

TMA thermal magnetic trip units, with adjustable thermal threshold (I1 = 0.7…1 x In) and adjustable magnetic threshold (I3 = 5…10 x In).

PR221DS, PR222DS/P, and PR222DS/PD-A electronic trip unit

## Auxiliary Devices for Indication and Control

- Auxiliary contacts - AUX
- Undervoltage release - UVR
- Shunt trip - SOR
- Terminal covers
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- Direct rotary handle - RHD
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- Key lock - KLF
- Early auxiliary contact - AUE
- Transmitted rotary handle - RHE
- Front extended terminal - EF
- Front terminal for copper-aluminum - FC CuAl
- Front extended spread terminal – ES
- Rear orientated terminal - R
- Phase separators
- Residual current relay (IEC Only)

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Printed in USA, April, 2008

**ABB Inc.**

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Wichita Falls, TX 76302
For more information and
the location of your local
field office please go to
www.abb-control.com

# Digital Linear Chargers

## Specifications

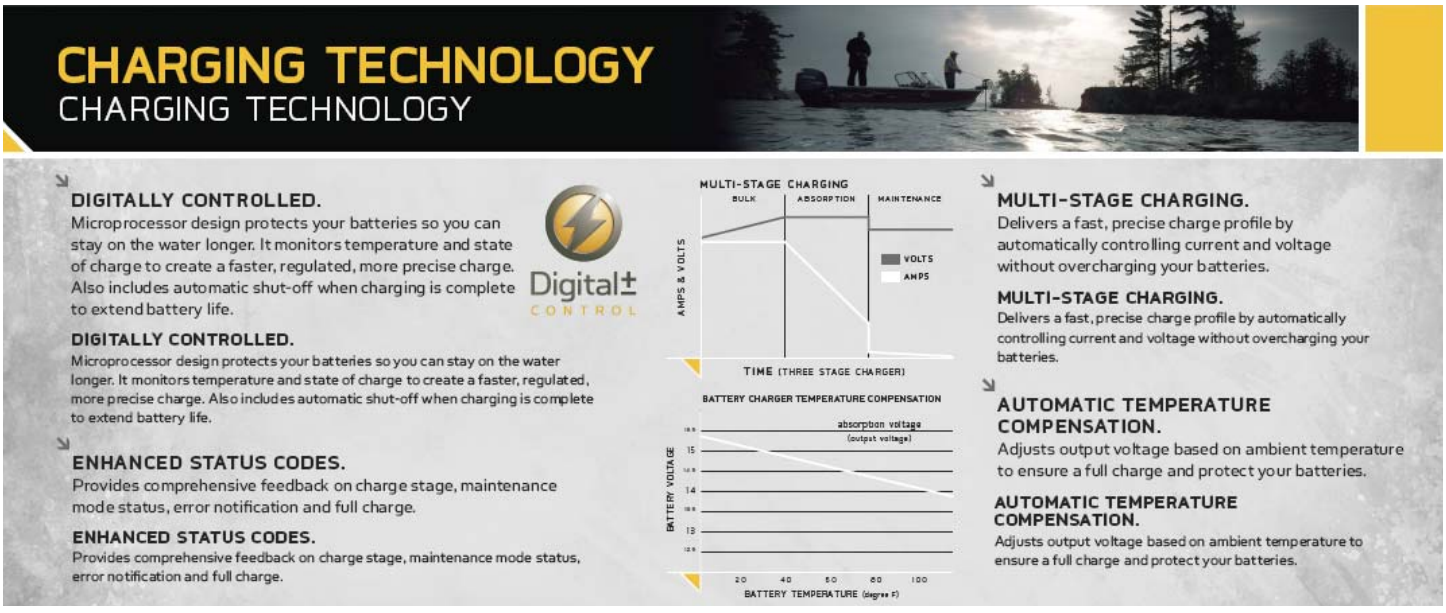
- Waterproof, shock-and vibration-resistant aluminum construction
- Saltwater tested and fully corrosion-resistant
- Short circuit, reverse polarity, and ignition protected
- For use with 12V/6 cell batteries that are flooded/wet cell, maintenance free or starved electrolyte (AGM) only
- FCC compliant
- UL listed to marine standard 1236
- 3 year warranty
- Replaces all existing current on-board chargers (excluding portables)
- No Price Increase
- Availability: November 2010


| DIGITAL LINEAR ON-BOARD CHARGERS | |
|---|---|
| PRODUCT CODE | PRODUCT DESCRIPTION |
| 1821065 | MK 106D (1 bank x 6 amps) |
| 1821105 | MK-110D (1 bank x 10 amps) |
| 1822105 | MK-210D (2 bank x 5 amps) |
| 1823155 | MK-315D (3 bank x 5 amps) |
| 1822205 | MK-220D (2 bank x 10 amps) |
| 1823305 | MK-330D (3 bank x 10 amps) |
| 1824405 | MK-440D (4 bank x 10 amps) |
| 1822305 | MK-230D (2 bank x 15 amps) |
| 1823455 | MK-345D (3 bank x 15 amps) |
| 1824605 | MK-460D (4 bank x 15 amps) |

# Digital Linear Chargers

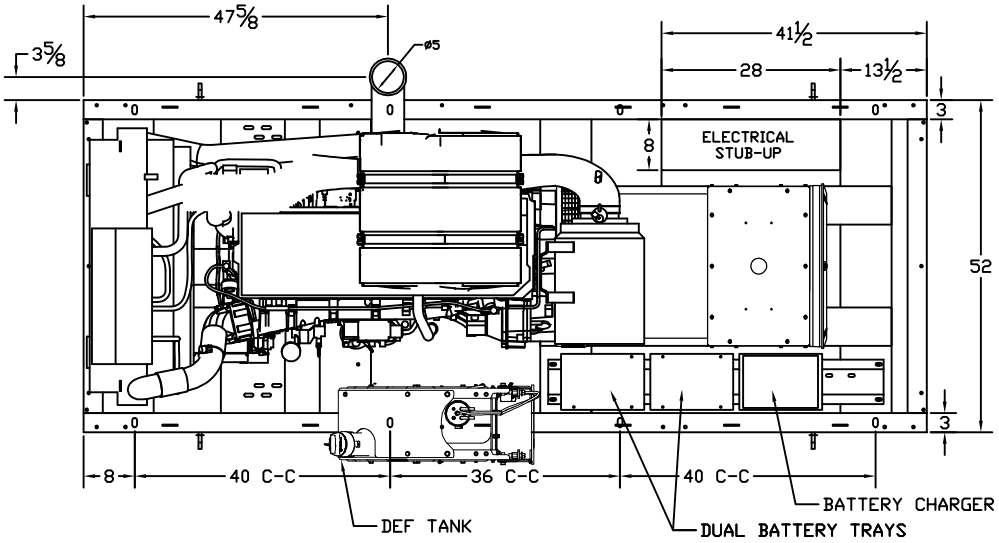
## Specifications (cont.)

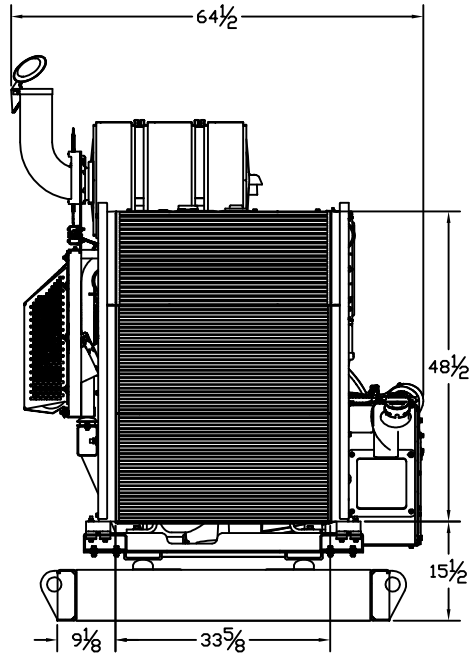
- New 4-color package design

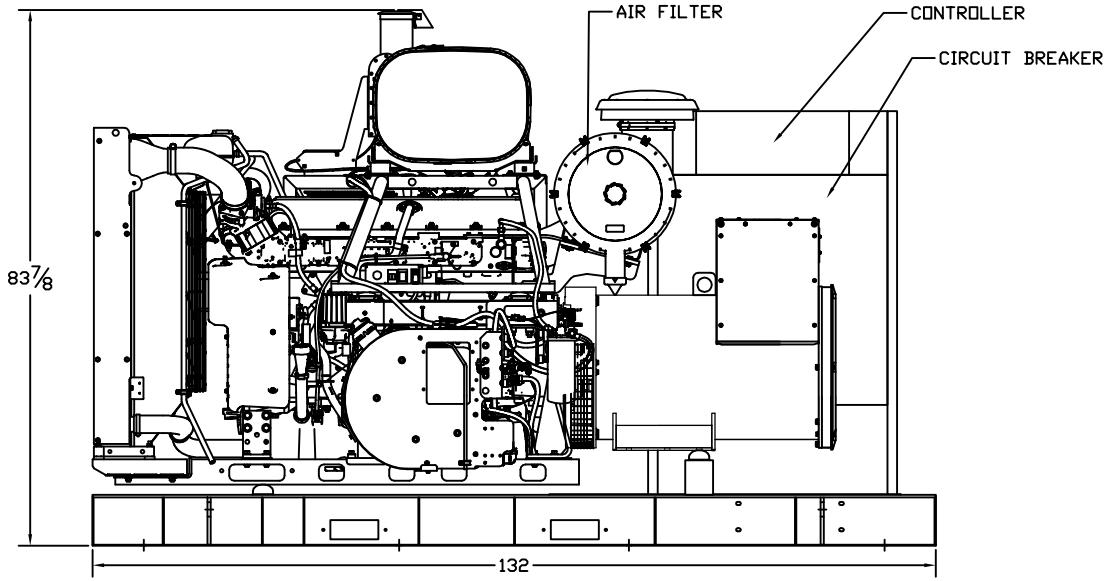
# OUTLINE DIMENSIONS FOR T4D-2000 OPEN

## TOP VIEW




## RADIATOR END VIEW

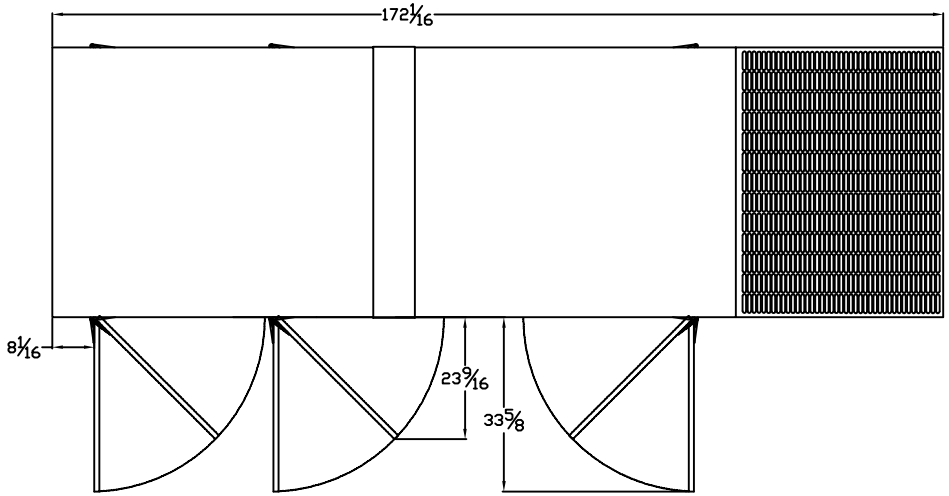



## RIGHT SIDE VIEW

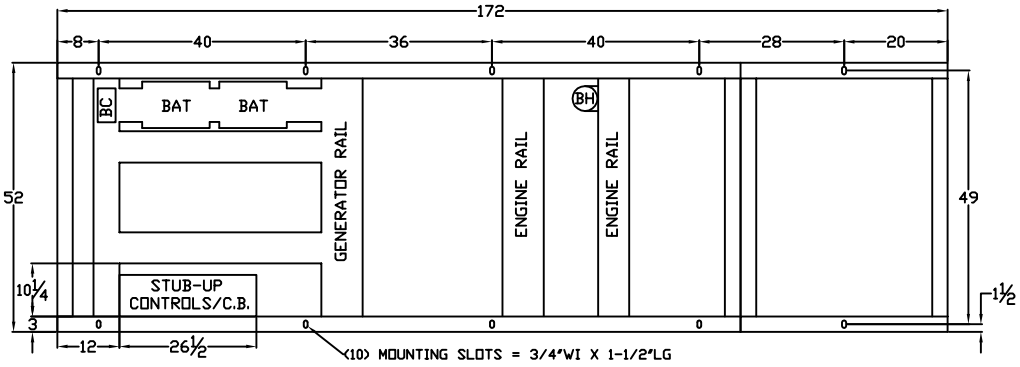
# OUTLINE DIMENSIONS FOR T4D 200 KW LEVEL 2 ENCLOSURE
## (HINGED DOORS)

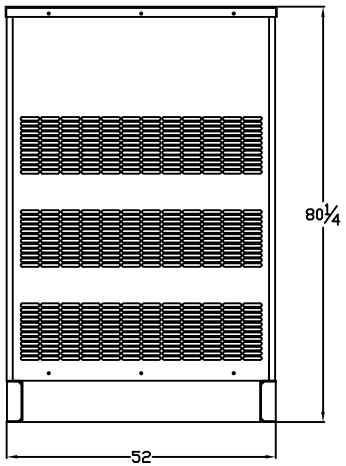
### TOP VIEW

(GEN-SET HAS (6) DOORS, (3) SHOWN OPEN ARE TYPICAL FOR BOTH SIDES)

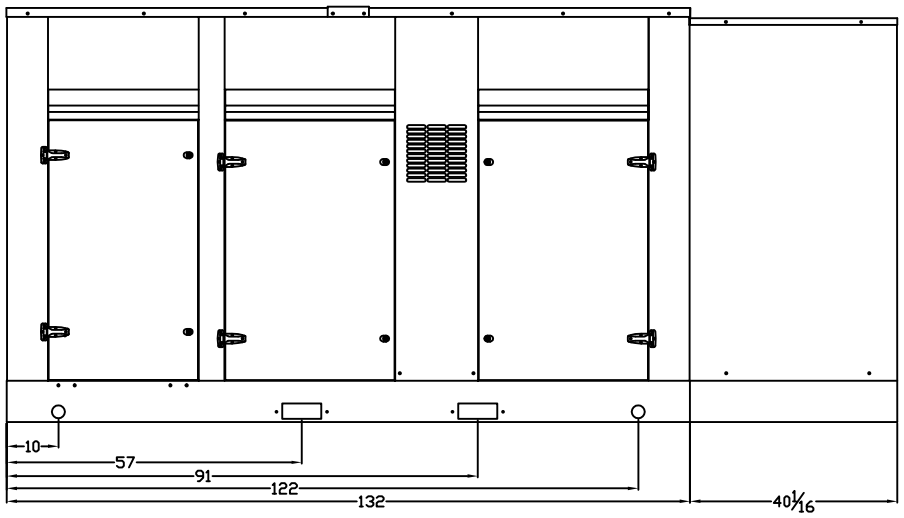



### FRAME VIEW

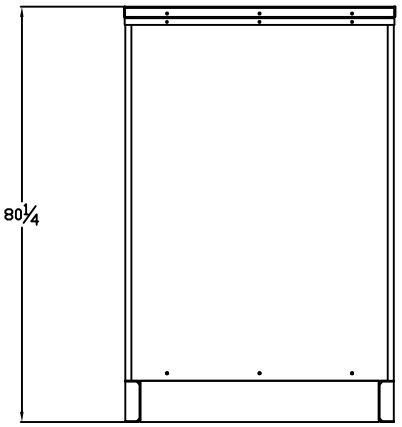



### GENERATOR END VIEW




### SIDE VIEW




### RADIATOR END VIEW