Technical Data Sheet

HCI634H - Winding 311 and 312
STANDARDS

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

VOLTAGE REGULATORS

MX321 AVR - STANDARD

This sophisticated Automatic Voltage Regulator (AVR) is incorporated into the Stamford Permanent Magnet Generator (PMG) system and is fitted as standard to generators of this type. 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. 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 feature a main stator with either 6 ends (Winding 312) or 12 ends (Winding 311) brought out to the terminals, which are mounted on the frame 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. Two bearing generators are balanced with a half key.

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.
10% when IP44 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.
## Control System
SEPARATELY EXCITED BY P.M.G.

### A.V.R.
MX321

### Voltage Regulation
± 0.5 % With 4% ENGINE GOVERNING

### Sustained Short Circuit
REFER TO SHORT CIRCUIT DECREMENT CURVES (page 7)

### Insulation System
CLASS H

### Protection
IP23

### Rated Power Factor
0.8

### Stator Winding
DOUBLE LAYER LAP

### Winding Pitch
TWO THIRDS

### Winding Leads
6 (Wdg 312) or 12 (Wdg 311)

### Stator Wdg. Resistance
0.003 Ohms PER PHASE AT 22°C STAR CONNECTED

### Rotor Wdg. Resistance
1.88 Ohms at 22°C

### Exciter Stator Resistance
17 Ohms at 22°C

### Exciter Rotor Resistance
0.079 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 Drive End
BALL 6224 (ISO)

### Bearing Non-Drive End
BALL 6317 (ISO)

### Weight Comp. Generator
1 BEARING
2117 kg

### Weight Wound Stator
1010 kg

### Weight Wound Rotor
866 kg

### Wr² Inertia
20.0438 kgm²

### Shipping Weights in a crate
2173kg

### Packing Crate Size
183 x 92 x 140(cm)

### Telephone Interference
THF < 2%

### Cooling Air
50 Hz

### Voltage Star
380/220

### Voltage Parallel Star (*)
190/110

### Voltage Delta
220

### KVA Base Rating for Reactance Values
910

### Xd Dir. Axis Synchronous
2.99

### X'd Dir. Axis Transient
0.25

### X"d Dir. Axis Subtransient
0.18

### Xq Quad. Axis Reactance
1.77

### X'q Quad. Axis Subtransient
0.19

### Xl Leakage Reactance
0.09

### Xs Negative Sequence
0.20

### Xo Zero Sequence
0.03

### Reactances Are Saturated Values Are Per Unit at Rating and Voltage Indicated

<table>
<thead>
<tr>
<th>Reactance</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>T'd Transient Time Const.</td>
<td>0.185</td>
</tr>
<tr>
<td>T'd Sub-Trans Time Const.</td>
<td>0.025</td>
</tr>
<tr>
<td>T'd O.C. Field Time Const.</td>
<td>2.44</td>
</tr>
<tr>
<td>Ta Armature Time Const.</td>
<td>0.04</td>
</tr>
<tr>
<td>Short Circuit Ratio</td>
<td>1/Xd</td>
</tr>
</tbody>
</table>

(*) Parallel Star connection only available with Wdg 311
Three Phase Efficiency Curves

**HCl634H**

Winding 311 and 312

Three Phase Efficiency Curves

- **380 V**
  - 97%
  - 96%
  - 95%
  - 94%

- **400 V**
  - 97%
  - 96%
  - 95%
  - 94%

- **415 V**
  - 97%
  - 96%
  - 95%
  - 94%

- **440 V**
  - 97%
  - 96%
  - 95%
  - 94%

**50 Hz**

- 910 KVA
- 940 KVA
- 910 KVA
- 875 KVA
60 Hz

HCI634H
WINDING 311 and 312
THREE PHASE EFFICIENCY CURVES

60 Hz

1025 KVA

1063 KVA

1075 KVA

1125 KVA
Locked Rotor Motor Starting Curve

50 Hz

60 Hz
HCl634H

WINDING 311 and 312

Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed

Based on star (wye) connection.

Sustained Short Circuit = 3,300 Amps

50 Hz

Sustained Short Circuit = 4,000 Amps

60 Hz

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:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Factor</th>
<th>Voltage</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>380v</td>
<td>x 1.00</td>
<td>416v</td>
<td>x 1.00</td>
</tr>
<tr>
<td>400v</td>
<td>x 1.07</td>
<td>440v</td>
<td>x 1.06</td>
</tr>
<tr>
<td>415v</td>
<td>x 1.12</td>
<td>480v</td>
<td>x 1.12</td>
</tr>
<tr>
<td>440v</td>
<td>x 1.18</td>
<td>480v</td>
<td>x 1.17</td>
</tr>
</tbody>
</table>

Note 3
Curves are drawn for Star (Wye) connected machines.
For Delta connection multiply the Curve current value by 1.732

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:

<table>
<thead>
<tr>
<th>50Hz</th>
<th>60Hz</th>
<th>3-phase</th>
<th>2-phase L-L</th>
<th>1-phase L-N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instantaneous</td>
<td>x 1.00</td>
<td>x 0.87</td>
<td>x 1.30</td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>x 1.00</td>
<td>x 1.80</td>
<td>x 3.20</td>
<td></td>
</tr>
<tr>
<td>Sustained</td>
<td>x 1.00</td>
<td>x 1.50</td>
<td>x 2.50</td>
<td></td>
</tr>
<tr>
<td>Max. sustained duration</td>
<td>10 sec.</td>
<td>5 sec.</td>
<td>2 sec.</td>
<td></td>
</tr>
</tbody>
</table>

All other times are unchanged

The sustained current value is constant irrespective of voltage level.
<table>
<thead>
<tr>
<th></th>
<th>50 Hz</th>
<th>60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class - Temp Rise</td>
<td>RATINGS</td>
</tr>
<tr>
<td></td>
<td>Star (V)</td>
<td>Cont. F - 105/40°C</td>
</tr>
<tr>
<td></td>
<td>380 400 415 440</td>
<td>380 400 415 440</td>
</tr>
<tr>
<td></td>
<td>Parallel Star (V)</td>
<td>180 200 208 220</td>
</tr>
<tr>
<td></td>
<td>Delta (V)</td>
<td>220 230 240 254</td>
</tr>
<tr>
<td></td>
<td></td>
<td>kW 664 688 664 640</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Efficiency (%) 95.2 95.3 95.4 95.6</td>
</tr>
<tr>
<td></td>
<td>kW Input 697 722 696 669</td>
<td>kW Input 767 792 765 734</td>
</tr>
<tr>
<td></td>
<td></td>
<td>kW 664 688 664 640</td>
</tr>
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</table>

* Parallel Star only available with Wdg 311

**DIMENSIONS**

![Diagram](attachment:image1.png)

<table>
<thead>
<tr>
<th></th>
<th>SAE</th>
<th>AN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>15.87</td>
<td>0</td>
</tr>
</tbody>
</table>

**HCI634H**

Winding 311 and 312  0.8 Power Factor

**STAMFORD**