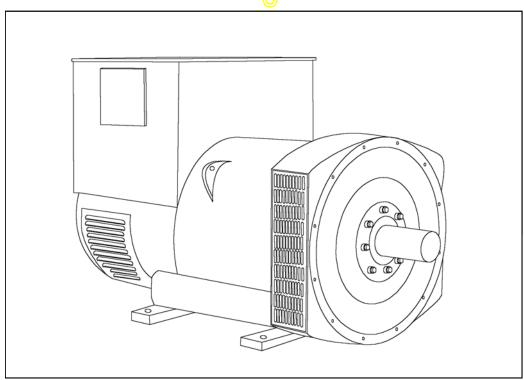
# STAMFORD

# HCI434E/444E - Winding 311 Single Phase

Technical Data Sheet



# STAMFORD

# HCI434E/444E

# **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.

# MX321 AVR

The most sophisticated of all our AVRs combines all the features of the MX341 with, additionally, over voltage protection built-in and short circuit current level adjustments as 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 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. 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.

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.

# **STAMFORD**

# HCI434E/444E

# WINDING 311 Single Phase

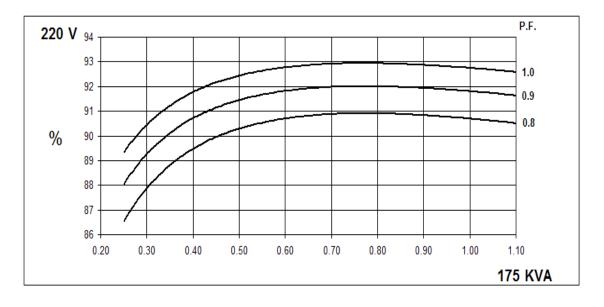
| A.V.R. MX341 MX321   | CONTROL SYSTEM              | SEPARATELY                                       | EXCITED BY P M                  | G              |                      |                  |      |  |  |  |  |
|--|-----------------------------|--|---------------------------------|----------------|----------------------|------------------|------|--|--|--|--|
| SUSTAINED SHORT CIRCUIT   REFER TO SHORT CIRCUIT DECREMENT CURVES (page 7)   |                             | SEPARATELY EXCITED BY P.M.G.  MX341 MX321        |                                 |                |                      |                  |      |  |  |  |  |
| SUSTAINED SHORT CIRCUIT  REFER TO SHORT CIRCUIT DECREMENT CURVES (page 7)  AV.R. A5440  VOLTAGE REQUIATION   |                             |  |                                 |                |                      |                  |      |  |  |  |  |
| SELF EXCITED   |                             |  |                                 |                |                      |                  |      |  |  |  |  |
| A.V.R. AS440  VOLTAGE REGULATION ± 1.0% With 4% ENGINE GOVERNING  SUSTAINED SHORT CIRCUIT  WILL NOT SUSTAIN A SHORT CIRCUIT  WILL NOT SUSTAIN A SHORT CIRCUIT  INSULATION SYSTEM  PROTECTION  P23  RATED POWER FACTOR  0.8  STATOR WINDING  DOUBLE LAYER LAP  WINDING PITCH  WINDING PITCH  WINDING PITCH  WINDING STATOR WINDING  ROTOR WOR, RESISTANCE  ROTOR WOR, RESISTANCE  ROTOR WOR, RESISTANCE  EXCITER ROTOR RESISTANCE  EXCITER ROTOR RESISTANCE  RECITER ROTOR RO | SUSTAINED SHORT CIRCUIT     | REFER TO SHORT CIRCUIT DECREMENT CURVES (page 7) |                                 |                |                      |                  |      |  |  |  |  |
| \$\text{VICTAGE REGULATION}  | CONTROL SYSTEM              | SELF EXCITED                                     | )                               |                |                      |                  |      |  |  |  |  |
| SUSTAINED SHORT CIRCUIT   WILL NOT SUSTAIN A SHORT CIRCUIT   | A.V.R.                      | AS440  |                                 |                |                      |                  |      |  |  |  |  |
| INSULATION SYSTEM PROTECTION IP23  RATED POWER FACTOR 0.8  STATOR WINDING DOUBLE LAYER LAP  WINDING PITCH TWO THIRDS  WINDING BEACH WINDING BEADS 12  STATOR WIDG, RESISTANCE 0.006 Ohms AT 22°C DOUBLE DELTA CONNECTED  ROTOR WIDG, RESISTANCE 1.19 Ohms at 22°C  EXCITER STATOR RESISTANCE 1.19 Ohms at 22°C  EXCITER STATOR RESISTANCE 1.19 Ohms at 22°C  EXCITER ROTOR RESISTANCE 0.068 Ohms PER PHASE AT 22°C  EXCITER STATOR RESISTANCE 1.19 Ohms at 22°C  EXCITER STATOR RESISTANCE 1.10 Ohms at 22°C  EXCITER STATOR OHMS AT 22°C  1.10 Ohms at 22°C  1 | VOLTAGE REGULATION          | ± 1.0 % With 4% ENGINE GOVERNING                 |                                 |                |                      |                  |      |  |  |  |  |
| NSULATION SYSTEM   | SUSTAINED SHORT CIRCUIT     |  |                                 |                |                      |                  |      |  |  |  |  |
| RATED POWER FACTOR  8.0 8  STATOR WINDING  DOUBLE LAYER LAP  WINDING PITCH  TWO THIRDS  WINDING LEADS  12  STATOR WDG, RESISTANCE  ROTOR WDG, RESISTANCE  EXCITER STATOR RESISTANCE  EXCITER STATOR RESISTANCE  EXCITER ROTOR RESISTANCE  10.06 No. 10.06 No.06 No.06  EXCITER STATE ROTOR RESISTANCE  EXCITER ROTOR RESISTANCE  10.018 s  EXCITER STATE ROTOR RESISTANCE  10.008 s  EXCITER STATE ROTOR RESISTANCE  10.008 s  EXCITER STATE ROTOR RESISTANCE  |                             | 1  |                                 |                |                      |                  |      |  |  |  |  |
| RATED POWER FACTOR   0.8   | INSULATION SYSTEM           |  |                                 |                |                      |                  |      |  |  |  |  |
| STATOR WINDING   | PROTECTION                  |  | IP23                            |                |                      |                  |      |  |  |  |  |
| WINDING PITCH TWO THIRDS  WINDING LEADS 12  STATOR WDG. RESISTANCE 0.006 Ohms AT 22°C DOUBLE DELTA CONNECTED  ROTOR WDG. RESISTANCE 1.19 Ohms at 22°C  EXCITER STATOR RESISTANCE 18 Ohms at 22°C  EXCITER ROTOR RESISTANCE 2.00.88 Ohms PER PHASE AT 22°C  EXCITER ROTOR RESISTANCE 3.00.88 Ohms PER PHASE AT 22°C  EXCITER ROTOR RESISTANCE 3.00.88 Ohms PER PHASE AT 22°C  EXCITER ROTOR RESISTANCE 3.00.88 Ohms PER PHASE AT 22°C  EXCITER ROTOR RESISTANCE 3.00.88 Ohms PER PHASE AT 22°C  EXCITER ROTOR RESISTANCE 3.00.80 Ohms PER PHASE AT 22°C  EXCITER ROTOR RESISTANCE 3.00.80 Ohms PER PHASE AT 22°C  EXCITER ROTOR RESISTANCE 3.00.80 Ohms PER PHASE AT 22°C  EXCITER ROTOR RESISTANCE 3.00 Ohms at 22°C  EXCITER ROTOR MASE AT 22°C  IN EXCITER STATE IN THIS CANNOL OHMS AT 22°C  EXCITER ROTOR MASE AT 22°C  IN EXCITER STATE IN THIS CANNOL OHMS AND   | RATED POWER FACTOR          |  |                                 | 0              | .8                   |                  |      |  |  |  |  |
| 12   | STATOR WINDING              |  |                                 | DOUBLE L       | AYER LAP             |                  |      |  |  |  |  |
| STATOR WDG. RESISTANCE  ROTOR WDG. RESISTANCE  ROTOR WDG. RESISTANCE  1.19 Ohms at 22°C   | WINDING PITCH               |  |                                 | TWOT           | HIRDS                |                  |      |  |  |  |  |
| 1.19 Ohms at 22°C  | WINDING LEADS               |  | 50                              | 1              | 2                    |                  |      |  |  |  |  |
| EXCITER STATOR RESISTANCE  EXCITER ROTOR RESISTANCE  BS EN 61000-6-2 & 8 5 EN 61000-6-4 \ VDE 0875G, \ VDE 0875N. refer to factory for others  WAVEFORM DISTORTION  NO LÓAD: 1.5% NON-DISTORTING LINEAR LOAD < 5.0%  MAXIMUM OVERSPEED  EXEMPRESSION  BEARING DRIVE END  BEARING DRIVE END  BEARING RON-DRIVE END  BEARING NON-DRIVE END  BEARING NON-DRIVE END  BEARING OND-DRIVE END  BEARING WEIGHT WOUND STATOR  WEIGHT WOUND STATOR  470 kg  WEIGHT WOUND ROTOR  WEIGHT WOUND ROTOR  WEIGHT WOUND ROTOR  400 kg  377 kg  WEIGHTS in a crate  1095 kg  1100 kg  PACKING CRATE SIZE  155 x 87 x 107(cm)  155 x 87 x 107(cm)  50 Hz  TELEPHONE INTERFERENCE  COOLING AIR  0.8 m³/sec 1700 cfm  0.99 m³/sec 2100 cfm  VOLTAGE DOUBLE DELTA  20/110  20/115  210 110  115  120  VOLTAGE PARALLEL DELTA  110  115  120  110  115  120  110  115  120  110  11  | STATOR WDG. RESISTANCE      |  | 0.00 <mark>6 Q</mark> hi        | ms AT 22°C DOL | JBLE DELTA CON       | NNECTED          |      |  |  |  |  |
| EXCITER STATOR RESISTANCE  EXCITER ROTOR RESISTANCE  EXCITER ROTOR RESISTANCE  EXCITER ROTOR RESISTANCE  BS EN 61000-6-2 & BS EN 61000-6-4. VDE 0875G. VDE 0875N. refer to factory for others  WAVEFORM DISTORTION  NO LÓAD 1.5% NON-DISTORTING LINEAR LOAD < 5.0%  WANTENDRY STATE  | ROTOR WDG. RESISTANCE       |  |                                 | 1.19 Ohm       | s at 22°C            |                  |      |  |  |  |  |
| R.F.I. SUPPRESSION  BS EN 61000-6-2 & BS EN 61000-6-4, VDE 08750, VDE 0875N. refer to factory for others  WAVEFORM DISTORTION  NO LOAD 1.5% NON-DISTORTING LINEAR LOAD < 5.0%  MAXIMUM OVERSPEED  2250 Rev/Min  BEARING DRIVE END  BALL. 6317 (ISO)  BEARING NON-DRIVE END  BALL. 6317 (ISO)  BEARING NON-DRIVE END  BALL. 6314 (ISO)  1 BEARING  WEIGHT COMP. GENERATOR  1024 Mg  WEIGHT WOUND STATOR  470 kg  WEIGHT WOUND STATOR  470 kg  WRIGHT WOUND ROTOR  400 kg  WRIGHT WOUND ROTOR  4.6331 kgm²  1100 kg  PACKING CRATE SIZE  155 x 87 x 107(cm)  155 x 87 x 107(cm)  TIF-50  COOLING AIR  0.8 m³/sec 1700 cfm  0.99 m³/sec 2100 cfm  VOLTAGE DOUBLE DELTA  220/110  230/115  240/120  220/110  230/115  240/120  VALUES  VALUES  VALUES  VALUES  VALUES  VALUES  VA DIR. AXIS SYNCHRONOUS  2.24  2.05  1.88  2.85  2.75  2.59  Xd DIR. AXIS SYNCHRONOUS  2.24  2.05  1.88  2.85  2.75  2.59  Xd DIR. AXIS SYNCHRONOUS  2.24  2.05  1.88  2.85  2.75  2.59  Xd DIR. AXIS SYNCHRONOUS  2.24  2.05  1.81  2.20  1.20  1.21  1.21  1.20  1.20  1.21  1.21  1.20  1.20  1.21  1.21  1.20  1.20  1.21  1.21  1.21  1.21  1.22  1.23  1.24  1.25  1 | EXCITER STATOR RESISTANCE   | <u> </u>   |                                 |                |                      |                  |      |  |  |  |  |
| R.F.I. SUPPRESSION  BS EN 61000-6-2 & BS EN 61000-6-4, VDE 08750, VDE 0875N. refer to factory for others  WAVEFORM DISTORTION  NO LOAD 1.5% NON-DISTORTING LINEAR LOAD < 5.0%  MAXIMUM OVERSPEED  2250 Rev/Min  BEARING DRIVE END  BALL. 6317 (ISO)  BEARING NON-DRIVE END  BALL. 6317 (ISO)  BEARING NON-DRIVE END  BALL. 6314 (ISO)  1 BEARING  WEIGHT COMP. GENERATOR  1024 Mg  WEIGHT WOUND STATOR  470 kg  WEIGHT WOUND STATOR  470 kg  WRIGHT WOUND ROTOR  400 kg  WRIGHT WOUND ROTOR  4.6331 kgm²  1100 kg  PACKING CRATE SIZE  155 x 87 x 107(cm)  155 x 87 x 107(cm)  TIF-50  COOLING AIR  0.8 m³/sec 1700 cfm  0.99 m³/sec 2100 cfm  VOLTAGE DOUBLE DELTA  220/110  230/115  240/120  220/110  230/115  240/120  VALUES  VALUES  VALUES  VALUES  VALUES  VALUES  VA DIR. AXIS SYNCHRONOUS  2.24  2.05  1.88  2.85  2.75  2.59  Xd DIR. AXIS SYNCHRONOUS  2.24  2.05  1.88  2.85  2.75  2.59  Xd DIR. AXIS SYNCHRONOUS  2.24  2.05  1.88  2.85  2.75  2.59  Xd DIR. AXIS SYNCHRONOUS  2.24  2.05  1.81  2.20  1.20  1.21  1.21  1.20  1.20  1.21  1.21  1.20  1.20  1.21  1.21  1.20  1.20  1.21  1.21  1.21  1.21  1.22  1.23  1.24  1.25  1 | EXCITER ROTOR RESISTANCE    |  |                                 |                |                      |                  |      |  |  |  |  |
| WAVEFORM DISTORTION   NO LOAD   1.5%   NON-DISTORTING LINEAR LOAD < 5.0%   MAXIMUM OVERSPEED   2250 Rev/Min  |                             | BS EN 61   |                                 |                |                      |                  |      |  |  |  |  |
| MAXIMUM OVERSPEED   2250 Rev/Min   BALL. 6317 (ISO)  |                             | 202.101  |                                 |                |                      |                  |      |  |  |  |  |
| BEARING DRIVE END  BEARING NON-DRIVE END  BEARING  BEARING  WEIGHT COMP. GENERATOR  WEIGHT WOUND STATOR  WEIGHT WOUND STATOR  WEIGHT WOUND ROTOR  WEIGHT WOUND ROTOR  WEIGHT WOUND ROTOR  WEIGHT WOUND STATOR  ### WEIGHT WOUND ROTOR  ### ### WEIGHTS in a crate  ### ### ### ### ### ### ### ### ### #   |                             | 0 0 0  |                                 |                |                      |                  |      |  |  |  |  |
| BEARING NON-DRIVE END  1 BEARING  |                             |  |                                 |                |                      |                  |      |  |  |  |  |
| BEARING   2 BEARING   1030 kg   1030 kg   1030 kg   1030 kg   470 kg   470 kg   470 kg   470 kg   377 kg   44343 kgm²   1100 kg   377 kg   1100 kg   1100 kg   1100 kg   1100 kg   1100 kg   1100 kg   155 x 87 x 107(cm)   155 x    |                             | ` ´  |                                 |                |                      |                  |      |  |  |  |  |
| WEIGHT COMP. GENERATOR   | BEARING NON-DRIVE END       | <u> </u>   |                                 |                |                      |                  |      |  |  |  |  |
| WEIGHT WOUND STATOR  | WEIGHT COMP. OF MEDITOR     |  |                                 |                |                      |                  |      |  |  |  |  |
| WEIGHT WOUND ROTOR   |                             |  |                                 |                |                      |                  |      |  |  |  |  |
| WR² INERTIA         4.6331 kgm²         4.4343 kgm²           SHIPPING WEIGHTS in a crate         1095 kg         1100 kg           PACKING CRATE SIZE         155 x 87 x 107(cm)         155 x 87 x 107(cm)           ELEPHONE INTERFERENCE         THF-2%         60 Hz           COOLING AIR         0.8 m³/sec 1700 cfm         0.99 m³/sec 2100 cfm           VOLTAGE DOUBLE DELTA         220/110         230/115         240/120         220/110         230/115         240/120           VOLTAGE PARALLEL DELTA         110         115         120         110         115         120           VOLTAGE PARALLEL DELTA         110         115         120         110         115         120           VOLTAGE PARALLEL DELTA         110         115         120         110         115         120           VOLTAGE PARALLEL DELTA         110         115         120         110         115         120           VOLTAGE PARALLEL DELTA         110         115         120         110         115         120           VALUES         175         175         175         185         195         200           VAD JAMA JAS SYNCHRONOUS </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>  |                             |  |                                 |                |                      |                  |      |  |  |  |  |
| SHIPPING WEIGHTS in a crate  |                             |  |                                 |                |                      |                  |      |  |  |  |  |
| PACKING CRATE SIZE  155 x 87 x 107(cm)  155 x 87 x 107(cm)  50 Hz  60 Hz  TIF<50  COOLING AIR  0.8 m³/sec 1700 cfm  0.99 m³/sec 2100 cfm  VOLTAGE DOUBLE DELTA  220/110  230/115  240/120  220/110  230/115  120  110  115  120  110  115  120  120  | SHIPPING WEIGHTS in a crate |  |                                 |                |                      |                  |      |  |  |  |  |
| TELEPHONE INTERFERENCE  COOLING AIR  0.8 m³/sec 1700 cfm  0.99 m³/sec 2100 cfm  VOLTAGE DOUBLE DELTA  220/110  230/115  240/120  220/110  230/115  240/120  VOLTAGE PARALLEL DELTA  110  115  120  110  115  120  XVA BASE RATING FOR REACTANCE  175  175  175  175  185  195  200  XVA DIR. AXIS SYNCHRONOUS  2.24  2.05  1.88  2.85  2.75  2.59  XVA DIR. AXIS TRANSIENT  0.15  0.14  0.13  0.17  0.17  0.16  XVA DIR. AXIS SUBTRANSIENT  0.11  0.10  0.09  0.12  0.12  0.11  XQ QUAD. AXIS REACTANCE  1.92  1.76  1.61  2.40  2.31  2.18  XVa QUAD. AXIS SUBTRANSIENT  0.27  0.24  0.22  0.34  0.32  0.31  XL LEAKAGE REACTANCE  0.05  0.05  0.05  0.05  0.07  0.06  0.06  X2 NEGATIVE SEQUENCE  0.18  0.19  VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED  Tid TRANSIENT TIME CONST.  0.019 s  Tido O.C. FIELD TIME CONST.  1.7 s  Ta ARMATURE TIME CONST.  0.018 s  | PACKING CRATE SIZE          |  |                                 | n)             | 1                    | 55 x 87 x 107(cn | n)   |  |  |  |  |
| COOLING AIR         0.8 m³/sec 1700 cfm         0.99 m³/sec 2100 cfm           VOLTAGE DOUBLE DELTA         220/110         230/115         240/120         220/110         230/115         240/120           VOLTAGE PARALLEL DELTA         110         115         120         110         115         120           KVA BASE RATING FOR REACTANCE VALUES         175         175         175         185         195         200           Xd DIR. AXIS SYNCHRONOUS         2.24         2.05         1.88         2.85         2.75         2.59           X'd DIR. AXIS TRANSIENT         0.15         0.14         0.13         0.17         0.17         0.16           X''d DIR. AXIS SUBTRANSIENT         0.11         0.10         0.09         0.12         0.12         0.11           X''q QUAD. AXIS REACTANCE         1.92         1.76         1.61         2.40         2.31         2.18           X''q QUAD. AXIS SUBTRANSIENT         0.27         0.24         0.22         0.34         0.32         0.31           X''q QUAD. AXIS SUBTRANSIENT         0.27         0.24         0.22         0.34         0.32         0.31           XLEAKAGE REACTANCE         0.05         0.05         0.05         0.05         0.07   |                             |  | 50 Hz                           |                |                      |                  |      |  |  |  |  |
| VOLTAGE DOUBLE DELTA         220/110         230/115         240/120         220/110         230/115         240/120           VOLTAGE PARALLEL DELTA         110         115         120         110         115         120           kVA BASE RATING FOR REACTANCE VALUES         175         175         175         185         195         200           Xd DIR. AXIS SYNCHRONOUS         2.24         2.05         1.88         2.85         2.75         2.59           X'd DIR. AXIS TRANSIENT         0.15         0.14         0.13         0.17         0.17         0.16           X"d DIR. AXIS SUBTRANSIENT         0.11         0.10         0.09         0.12         0.12         0.11           X'q QUAD. AXIS REACTANCE         1.92         1.76         1.61         2.40         2.31         2.18           X"q QUAD. AXIS SUBTRANSIENT         0.27         0.24         0.22         0.34         0.32         0.31           XL LEAKAGE REACTANCE         0.05         0.05         0.05         0.05         0.07         0.06         0.06           X2 NEGATIVE SEQUENCE         0.18         0.16         0.15         0.23         0.22         0.21           X0 ZERO SEQUENCE         0.07         0.07 <td>TELEPHONE INTERFERENCE</td> <td></td> <td>THF&lt;2%</td> <td></td> <td colspan="5"></td>   | TELEPHONE INTERFERENCE      |  | THF<2%                          |                |                      |                  |      |  |  |  |  |
| VOLTAGE PARALLEL DELTA         110         115         120         110         115         120           kVA BASE RATING FOR REACTANCE VALUES         175         175         175         185         195         200           Xd DIR. AXIS SYNCHRONOUS         2.24         2.05         1.88         2.85         2.75         2.59           X'd DIR. AXIS TRANSIENT         0.15         0.14         0.13         0.17         0.17         0.16           X'd DIR. AXIS SUBTRANSIENT         0.11         0.10         0.09         0.12         0.12         0.11           X'q QUAD. AXIS REACTANCE         1.92         1.76         1.61         2.40         2.31         2.18           X''q QUAD. AXIS SUBTRANSIENT         0.27         0.24         0.22         0.34         0.32         0.31           X'L LEAKAGE REACTANCE         0.05         0.05         0.05         0.07         0.06         0.06           X2 NEGATIVE SEQUENCE         0.18         0.16         0.15         0.23         0.22         0.21           X₀ ZERO SEQUENCE         0.07         0.07         0.06         0.08         0.08         0.08           T'd TRANSIENT TIME CONST.         0.019 s         0.019 s         0.019 s <td></td> <td>С</td> <td>0.8 m³/sec 170<mark>0</mark> c</td> <td>fm</td> <td colspan="5">0.99 m³/sec 2100 cfm</td>   |                             | С  | 0.8 m³/sec 170 <mark>0</mark> c | fm             | 0.99 m³/sec 2100 cfm |                  |      |  |  |  |  |
| KVA BASE RATING FOR REACTANCE VALUES         175         175         185         195         200           Xd DIR. AXIS SYNCHRONOUS         2.24         2.05         1.88         2.85         2.75         2.59           X'd DIR. AXIS TRANSIENT         0.15         0.14         0.13         0.17         0.17         0.16           X"d DIR. AXIS SUBTRANSIENT         0.11         0.10         0.09         0.12         0.12         0.11           X'q QUAD. AXIS REACTANCE         1.92         1.76         1.61         2.40         2.31         2.18           X"q QUAD. AXIS SUBTRANSIENT         0.27         0.24         0.22         0.34         0.32         0.31           XL LEAKAGE REACTANCE         0.05         0.05         0.05         0.05         0.07         0.06         0.06           X2 NEGATIVE SEQUENCE         0.18         0.16         0.15         0.23         0.22         0.21           X0 ZERO SEQUENCE         0.07         0.07         0.06         0.08         0.08         0.08           T'd TRANSIENT TIME CONST.         0.019 s         0.019 s         0.019 s         0.019 s         0.019 s           T'do O.C. FIELD TIME CONST.         0.018 s         0.018 s         0.018 s </td <td>VOLTAGE DOUBLE DELTA</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>   | VOLTAGE DOUBLE DELTA        |  |                                 |                |                      |                  |      |  |  |  |  |
| VALUES         1/5         1/5         175         185         195         200           Xd DIR. AXIS SYNCHRONOUS         2.24         2.05         1.88         2.85         2.75         2.59           X'd DIR. AXIS TRANSIENT         0.15         0.14         0.13         0.17         0.17         0.16           X"d DIR. AXIS SUBTRANSIENT         0.11         0.10         0.09         0.12         0.12         0.11           Xq QUAD. AXIS REACTANCE         1.92         1.76         1.61         2.40         2.31         2.18           X"q QUAD. AXIS SUBTRANSIENT         0.27         0.24         0.22         0.34         0.32         0.31           XL LEAKAGE REACTANCE         0.05         0.05         0.05         0.07         0.06         0.06           X2 NEGATIVE SEQUENCE         0.18         0.16         0.15         0.23         0.22         0.21           Xo ZERO SEQUENCE         0.07         0.07         0.06         0.08         0.08         0.08           T'd TRANSIENT TIME CONST.         0.08 s         0.09 s  |                             | 110  | 115                             | 120            | 110                  | 115              | 120  |  |  |  |  |
| Xd DIR. AXIS SYNCHRONOUS       2.24       2.05       1.88       2.85       2.75       2.59         X'd DIR. AXIS TRANSIENT       0.15       0.14       0.13       0.17       0.17       0.16         X"d DIR. AXIS SUBTRANSIENT       0.11       0.10       0.09       0.12       0.12       0.11         Xq QUAD. AXIS REACTANCE       1.92       1.76       1.61       2.40       2.31       2.18         X"q QUAD. AXIS SUBTRANSIENT       0.27       0.24       0.22       0.34       0.32       0.31         XL LEAKAGE REACTANCE       0.05       0.05       0.05       0.07       0.06       0.06         X2 NEGATIVE SEQUENCE       0.18       0.16       0.15       0.23       0.22       0.21         X0 ZERO SEQUENCE       0.07       0.07       0.06       0.08       0.08       0.08         REACTANCES ARE SATURATED       VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED         T'd T'd SUB-TRANSTIME CONST.       0.019 s         T'do O.C. FIELD TIME CONST.       1.7 s         Ta ARMATURE TIME CONST.       0.018 s   |                             | 175  | 175                             | 175            | 185                  | 195              | 200  |  |  |  |  |
| X"d DIR. AXIS SUBTRANSIENT       0.11       0.10       0.09       0.12       0.12       0.11         Xq QUAD. AXIS REACTANCE       1.92       1.76       1.61       2.40       2.31       2.18         X"q QUAD. AXIS SUBTRANSIENT       0.27       0.24       0.22       0.34       0.32       0.31         XL LEAKAGE REACTANCE       0.05       0.05       0.05       0.07       0.06       0.06         X2 NEGATIVE SEQUENCE       0.18       0.16       0.15       0.23       0.22       0.21         X0 ZERO SEQUENCE       0.07       0.07       0.06       0.08       0.08       0.08         REACTANCES ARE SATURATED       VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED         T'd TRANSIENT TIME CONST.       0.08 s         T'd SUB-TRANSTIME CONST.       0.019 s         T'do O.C. FIELD TIME CONST.       1.7 s         Ta ARMATURE TIME CONST.       0.018 s   |                             | 2.24   | 2.05                            | 1.88           | 2.85                 | 2.75             | 2.59 |  |  |  |  |
| Xq QUAD. AXIS REACTANCE       1.92       1.76       1.61       2.40       2.31       2.18         X"q QUAD. AXIS SUBTRANSIENT       0.27       0.24       0.22       0.34       0.32       0.31         XL LEAKAGE REACTANCE       0.05       0.05       0.05       0.07       0.06       0.06         X2 NEGATIVE SEQUENCE       0.18       0.16       0.15       0.23       0.22       0.21         X0 ZERO SEQUENCE       0.07       0.07       0.06       0.08       0.08       0.08         REACTANCES ARE SATURATED       VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED         T'd TRANSIENT TIME CONST.       0.08 s       0.09 s         T'd SUB-TRANSTIME CONST.       0.019 s         T'do O.C. FIELD TIME CONST.       1.7 s         Ta ARMATURE TIME CONST.       0.018 s   | X'd DIR. AXIS TRANSIENT     | 0.15   | 0.14                            | 0.13           | 0.17                 | 0.17             | 0.16 |  |  |  |  |
| X"q QUAD. AXIS SUBTRANSIENT       0.27       0.24       0.22       0.34       0.32       0.31         XL LEAKAGE REACTANCE       0.05       0.05       0.05       0.07       0.06       0.06         X2 NEGATIVE SEQUENCE       0.18       0.16       0.15       0.23       0.22       0.21         X0 ZERO SEQUENCE       0.07       0.07       0.06       0.08       0.08       0.08         REACTANCES ARE SATURATED       VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED         T'd TRANSIENT TIME CONST.       0.08 s         T'd SUB-TRANSTIME CONST.       0.019 s         T'do O.C. FIELD TIME CONST.       1.7 s         Ta ARMATURE TIME CONST.       0.018 s  | X"d DIR. AXIS SUBTRANSIENT  | 0.11   | 0.10                            | 0.09           | 0.12                 | 0.12             | 0.11 |  |  |  |  |
| XL LEAKAGE REACTANCE         0.05         0.05         0.05         0.07         0.06         0.06           X2 NEGATIVE SEQUENCE         0.18         0.16         0.15         0.23         0.22         0.21           X0 ZERO SEQUENCE         0.07         0.07         0.06         0.08         0.08         0.08           REACTANCES ARE SATURATED         VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED           T'd TRANSIENT TIME CONST.         0.08 s         0.019 s           T'd SUB-TRANSTIME CONST.         0.019 s         0.019 s           T'do O.C. FIELD TIME CONST.         1.7 s         0.018 s  | Xq QUAD. AXIS REACTANCE     | 1.92   | 1.76                            | 1.61           | 2.40                 | 2.31             | 2.18 |  |  |  |  |
| X2 NEGATIVE SEQUENCE       0.18       0.16       0.15       0.23       0.22       0.21         X0 ZERO SEQUENCE       0.07       0.07       0.06       0.08       0.08       0.08         REACTANCES ARE SATURATED       VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED         T'd TRANSIENT TIME CONST.       0.08 s         T'd SUB-TRANSTIME CONST.       0.019 s         T'do O.C. FIELD TIME CONST.       1.7 s         Ta ARMATURE TIME CONST.       0.018 s   | X"q QUAD. AXIS SUBTRANSIENT | 0.27   | 0.24                            | 0.22           | 0.34                 | 0.32             | 0.31 |  |  |  |  |
| X0 ZERO SEQUENCE         0.07         0.07         0.06         0.08         0.08         0.08           REACTANCES ARE SATURATED         VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED           T'd TRANSIENT TIME CONST.         0.08 s           T''d SUB-TRANSTIME CONST.         0.019 s           T'do O.C. FIELD TIME CONST.         1.7 s           Ta ARMATURE TIME CONST.         0.018 s   | XL LEAKAGE REACTANCE        | 0.05   | 0.05                            | 0.05           | 0.07                 | 0.06             | 0.06 |  |  |  |  |
| REACTANCES ARE SATURATED  T'd TRANSIENT TIME CONST.  T'd SUB-TRANSTIME CONST.  T'd O.C. FIELD TIME CONST.  Ta ARMATURE TIME CONST.  VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED  0.08 s  0.019 s  1.7 s  0.018 s   | X2 NEGATIVE SEQUENCE        | 0.18   | 0.16                            | 0.15           | 0.23                 | 0.22             | 0.21 |  |  |  |  |
| T'd TRANSIENT TIME CONST.       0.08 s         T''d SUB-TRANSTIME CONST.       0.019 s         T'do O.C. FIELD TIME CONST.       1.7 s         Ta ARMATURE TIME CONST.       0.018 s   |                             | 0.07 0.07 0.06 0.08 0.08 0.08                    |                                 |                |                      |                  |      |  |  |  |  |
| T'd SUB-TRANSTIME CONST.       0.019 s         T'do O.C. FIELD TIME CONST.       1.7 s         Ta ARMATURE TIME CONST.       0.018 s   |                             |  |                                 |                |                      |                  |      |  |  |  |  |
| T'do O.C. FIELD TIME CONST. 1.7 s Ta ARMATURE TIME CONST. 0.018 s  |                             |  |                                 |                |                      |                  |      |  |  |  |  |
| Ta ARMATURE TIME CONST. 0.018 s  |                             |  |                                 |                |                      |                  |      |  |  |  |  |
| SHORT CIRCUIT RATIO 1/Xd   | Ta ARMATURE TIME CONST.     |  |                                 |                |                      |                  |      |  |  |  |  |
|  | SHORT CIRCUIT RATIO         | 1/Xd   |                                 |                |                      |                  |      |  |  |  |  |

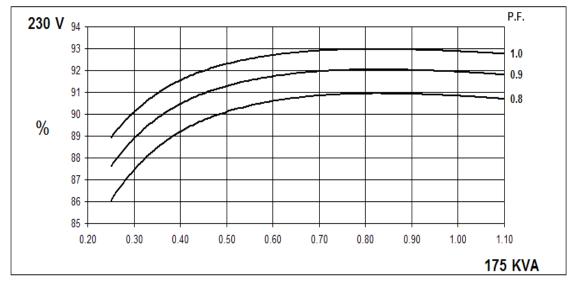


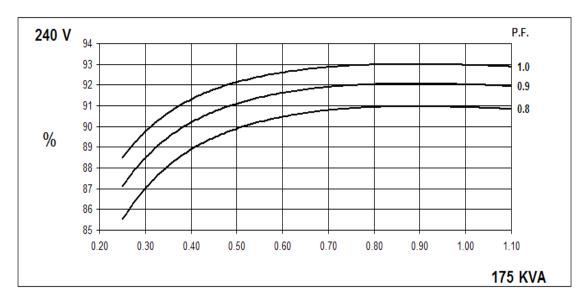
# 50 Hz

# **HCI434E/444E**Winding 311 Single Phase

# SINGLE PHASE EFFICIENCY CURVES





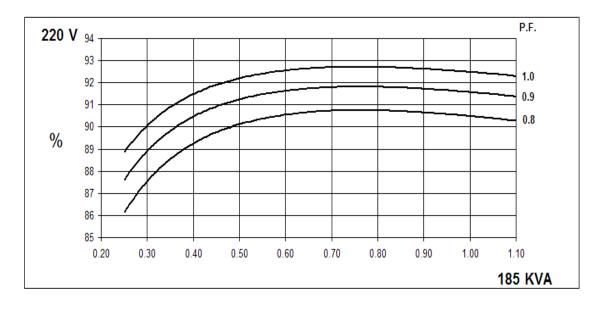


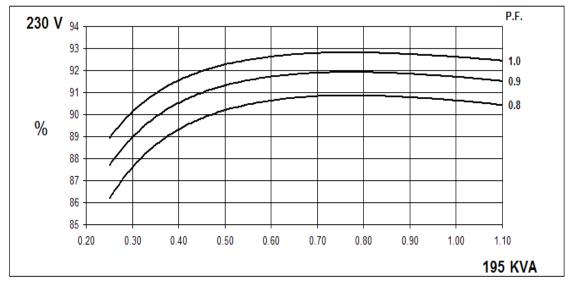


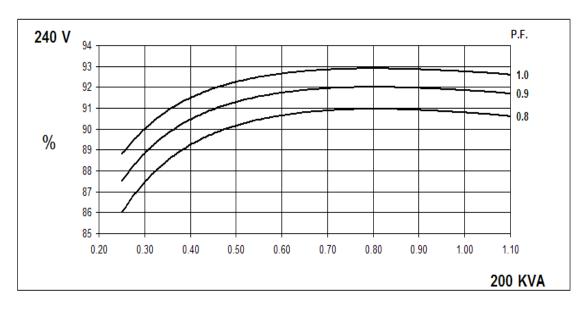
# 60 Hz

# **HCI434E/444E**Winding 311 Single Phase

# SINGLE PHASE EFFICIENCY CURVES





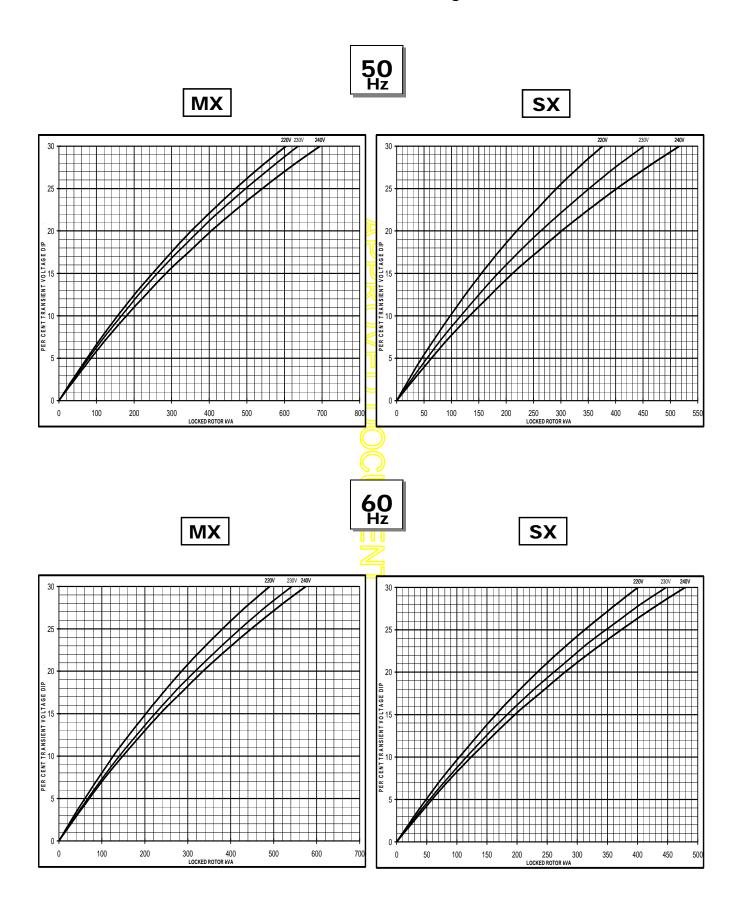




# HCI434E/444E

# Winding 311 Single Phase

# **Locked Rotor Motor Starting Curve**



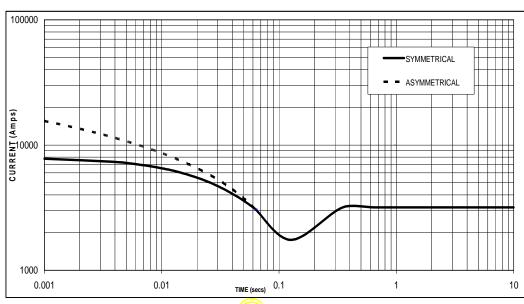
# HCI434E

**STAMFORD** 

# **Winding 311 Single Phase**

Single Phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed Based on Double Delta connection.

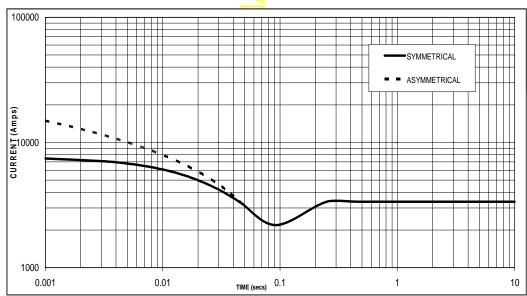
50 H<sub>7</sub>



Sustained Short Circuit = 3181 Amps



60 Hz



Sustained Short Circuit = 3364 Amps

# Note

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 :

| Voltage | Factor |
|---------|--------|
| 220V    | X 1.00 |
| 230V    | X 1.05 |
| 240V    | X 1.09 |

The sustained current value is constant irrespective of voltage level



# HCI434E/444E

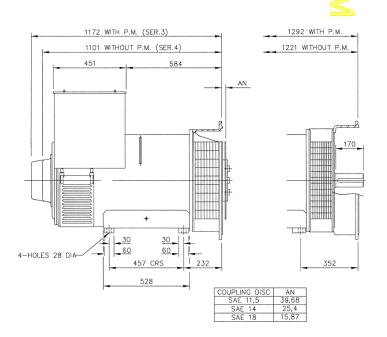
# Winding 311 Single Phase

# **RATINGS**

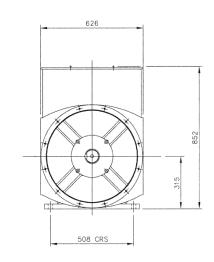
|    | Class - Temp Rise  | Cont. F - 105/40°C<br><b>0.8pf</b> |      |      | Cont. | Cont. H - 125/40°C<br><b>0.8pf</b> |      |      | Cont. F - 105/40°C<br>1.0pf |      |      | Cont. H - 125/40°C<br>1.0pf |      |  |
|----|--------------------|------------------------------------|------|------|-------|------------------------------------|------|------|-----------------------------|------|------|-----------------------------|------|--|
| 50 | Double Delta (V)   | 220                                | 230  | 240  | 220   | 230                                | 240  | 220  | 230                         | 240  | 220  | 230                         | 240  |  |
|    | Parallel Delta (V) | 110                                | 115  | 120  | 110   | 115                                | 120  | 110  | 115                         | 120  | 110  | 115                         | 120  |  |
|    | kVA                | 160                                | 160  | 160  | 175   | 175                                | 175  | 160  | 160                         | 160  | 175  | 175                         | 175  |  |
|    | kW                 | 128                                | 128  | 128  | 140   | 140                                | 140  | 160  | 160                         | 160  | 175  | 175                         | 175  |  |
|    | Efficiency (%)     | 90.8                               | 90.9 | 90.0 | 90.7  | 90.8                               | 90.9 | 92.8 | 92.9                        | 93.0 | 92.7 | 92.9                        | 93.0 |  |
|    | kW Input           | 141                                | 141  | 141  | 154   | 154                                | 154  | 172  | 172                         | 172  | 189  | 188                         | 188  |  |

|    | Class - Temp Rise  | Cont. F - 105/40°C<br><b>0.8pf</b> |      |      | Cont. H - 125          | Cont. F - 105/40°C<br><b>1.0pf</b> |      |      | Cont. H - 125/40°C<br>1.0pf |      |      |      |
|----|--------------------|------------------------------------|------|------|------------------------|------------------------------------|------|------|-----------------------------|------|------|------|
| 60 | Double Delta (V)   | 220                                | 230  | 240  | 220 230                | 240                                | 220  | 230  | 240                         | 220  | 230  | 240  |
|    | Parallel Delta (V) | 110                                | 115  | 120  | 110 115                | 120                                | 110  | 115  | 120                         | 110  | 115  | 120  |
|    | kVA                | 165                                | 180  | 185  | 185 <mark>∏</mark> 195 | 200                                | 165  | 180  | 185                         | 185  | 195  | 200  |
|    | kW                 | 132                                | 144  | 148  | 148 156                | 160                                | 165  | 180  | 185                         | 185  | 195  | 200  |
|    | Efficiency (%)     | 90.7                               | 90.7 | 90.9 | 90.590.6               | 90.8                               | 92.6 | 92.7 | 92.8                        | 92.5 | 92.6 | 92.7 |
|    | kW Input           | 146                                | 159  | 163  | 1640172                | 176                                | 178  | 194  | 199                         | 200  | 211  | 216  |

# DIMENSIONS







# APPROVED DOCUMENT

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