

**FRAME**

**3004E**

**WINDING**

**6**



**MODELS** LL 3014E / LL3024E / LL3034E

REF: F3004EW6-0 DEC 2012

**WINDING DETAILS**

|             |   |                  |     |
|-------------|---|------------------|-----|
| Code        | 6 | Insulation class | H   |
| Phase       | 3 | Leads            | 12  |
| Pole number | 4 | Pitch            | 2/3 |

**MECHANICAL DETAILS**

|                     |                             |
|---------------------|-----------------------------|
| Standard protection | IP23                        |
| Overspeed           | rpm 2250                    |
| Air flow 50Hz/60Hz  | m <sup>3</sup> /s 0.37/0.44 |

**EXCITATION DETAILS**

|                                 |              |                 |
|---------------------------------|--------------|-----------------|
| Excitation system               | <b>SHUNT</b> | <b>AREP/PMG</b> |
| AVR model                       | R250         | R438            |
| Sustained short-circuit current | -            | 300%            |
| Steady state voltage regulation | +/-0.5%      | +/-0.5%         |

**WAVEFORM**

*Line voltage on no load or balanced linear rated load*

|                                       |      |
|---------------------------------------|------|
| Total harmonic content THC            | <2%  |
| Telephone influence factor TIF (NEMA) | <50% |
| Telephone harmonic factor THF (IEC)   | <2%  |

**LINE VOLTAGE**

*No overvoltage tolerance for 440V 50Hz excitation level*

| Frequency / speed | 50Hz / 1500rpm |     |     |     |     | 60Hz / 1800rpm |     |     |     |     |     |
|-------------------|----------------|-----|-----|-----|-----|----------------|-----|-----|-----|-----|-----|
|                   | V              | 380 | 400 | 415 | 440 | 380            | 400 | 416 | 440 | 460 | 480 |
| Series star       | V              | 380 | 400 | 415 | 440 | 380            | 400 | 416 | 440 | 460 | 480 |
| Series delta      | V              | 220 | 230 | 240 |     | 220            | 230 | 240 |     |     |     |
| Parallel star     | V              |     | 200 | 208 | 220 |                | 200 | 208 | 220 | 230 | 240 |

**RATING**

*Power factor 0.8, Altitude <=1000m*

| Class           | Rating | kVA | 130.0 | 135.0 | 130.0 | 125.0 | 136.0 | 142.0 | 146.0 | 155.0 | 162.0 | 169.0 |
|-----------------|--------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Class H rise BR | 125/40 | kVA | 130.0 | 135.0 | 130.0 | 125.0 | 136.0 | 142.0 | 146.0 | 155.0 | 162.0 | 169.0 |
|                 |        | kW  | 104.0 | 108.0 | 104.0 | 100.0 | 108.8 | 113.6 | 116.8 | 124.0 | 129.6 | 135.2 |
| Class H rise PR | 150/40 | kVA | 137.8 | 143.1 | 137.8 | 132.5 | 144.2 | 150.5 | 154.8 | 164.3 | 171.7 | 179.1 |
|                 |        | kW  | 110.2 | 114.5 | 110.2 | 106.0 | 115.4 | 120.4 | 123.8 | 131.4 | 137.4 | 143.3 |
| Class H rise PR | 163/27 | kVA | 144.0 | 150.0 | 144.0 | 137.0 | 150.0 | 156.0 | 162.0 | 172.0 | 178.0 | 187.0 |
|                 |        | kW  | 115.2 | 120.0 | 115.2 | 109.6 | 120.0 | 124.8 | 129.6 | 137.6 | 142.4 | 149.6 |
| Class F rise BR | 105/40 | kVA | 115.0 | 122.0 | 115.0 | 113.8 | 122.0 | 129.2 | 132.0 | 139.0 | 147.4 | 152.0 |
|                 |        | kW  | 92.0  | 97.6  | 92.0  | 91.0  | 97.6  | 103.4 | 105.6 | 111.2 | 117.9 | 121.6 |

**EFFICIENCIES**

*Power factor 0.8*

| Efficiency | Class      | % | 90.7 | 91.0 | 91.4 | 91.6 | 90.1 | 90.4 | 90.7 | 91.0 | 91.2 | 91.3 |
|------------|------------|---|------|------|------|------|------|------|------|------|------|------|
| 110%       | Class H BR | % | 90.7 | 91.0 | 91.4 | 91.6 | 90.1 | 90.4 | 90.7 | 91.0 | 91.2 | 91.3 |
| 100%       | Class H BR | % | 91.2 | 91.4 | 91.8 | 91.9 | 90.6 | 90.9 | 91.2 | 91.4 | 91.6 | 91.7 |
| 75%        | Class H BR | % | 92.3 | 92.4 | 92.6 | 92.4 | 91.7 | 92.0 | 92.2 | 92.3 | 92.4 | 92.5 |
| 50%        | Class H BR | % | 92.9 | 92.9 | 92.8 | 92.2 | 92.3 | 92.5 | 92.6 | 92.7 | 92.7 | 92.6 |
| 25%        | Class H BR | % | 91.6 | 91.4 | 90.7 | 89.3 | 90.8 | 90.8 | 90.7 | 90.7 | 90.6 | 90.4 |

**CHARACTERISTIC PARAMETERS**

*Reactance base class H BR rating*

|                  |  |    |       |       |       |       |       |       |       |       |       |       |
|------------------|--|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| K <sub>c</sub>   | Short-circuit ratio                        |    | 0.27  | 0.30  | 0.34  | 0.46  | 0.20  | 0.21  | 0.23  | 0.25  | 0.27  | 0.29  |
| X <sub>d</sub>   | D-Axis synchronous reactance (unsaturated) | pu | 4.17  | 3.91  | 3.50  | 2.99  | 5.24  | 4.94  | 4.69  | 4.45  | 4.26  | 4.08  |
| X' <sub>d</sub>  | D-Axis transient reactance (saturated)     | pu | 0.15  | 0.14  | 0.13  | 0.11  | 0.19  | 0.18  | 0.17  | 0.16  | 0.16  | 0.15  |
| X'' <sub>d</sub> | D-Axis sub-transient reactance (saturated) | pu | 0.092 | 0.086 | 0.077 | 0.066 | 0.115 | 0.109 | 0.103 | 0.098 | 0.094 | 0.090 |
| X <sub>q</sub>   | Q-Axis synchronous reactance (unsaturated) | pu | 2.50  | 2.35  | 2.10  | 1.79  | 3.14  | 2.96  | 2.81  | 2.67  | 2.55  | 2.45  |
| X'' <sub>q</sub> | Q-Axis sub-transient reactance (saturated) | pu | 0.110 | 0.103 | 0.092 | 0.079 | 0.138 | 0.130 | 0.124 | 0.117 | 0.112 | 0.107 |
| X <sub>2</sub>   | Negative-sequence reactance (saturated)    | pu | 0.100 | 0.094 | 0.084 | 0.072 | 0.125 | 0.118 | 0.112 | 0.107 | 0.102 | 0.098 |
| X <sub>0</sub>   | Zero-sequence reactance (independent)      | pu | 0.006 | 0.006 | 0.005 | 0.004 | 0.007 | 0.007 | 0.007 | 0.006 | 0.006 | 0.006 |
| T' <sub>d</sub>  | D-Axis transient time constant             | ms |       | 100   |       |       |       |       |       | 100   |       |       |
| T'' <sub>d</sub> | D-Axis sub-transient time constant         | ms |       | 10    |       |       |       |       |       | 10    |       |       |
| T' <sub>do</sub> | D-Axis open-circuit time constant          | ms |       | 2734  |       |       |       |       |       | 2734  |       |       |
| T <sub>a</sub>   | Armature time constant                     | ms |       | 15    |       |       |       |       |       | 15    |       |       |
| T <sub>r</sub>   | Voltage recovery time                      | ms |       | < 500 |       |       |       |       |       | < 500 |       |       |

**EXCITATION VOLTAGE AND CURRENT**

|                               |   |      |      |      |      |      |      |      |      |      |      |
|-------------------------------|---|------|------|------|------|------|------|------|------|------|------|
| No load excitation voltage    | V | 7.7  | 8.6  | 9.6  | 11.4 | 5.9  | 6.3  | 6.6  | 7.4  | 7.9  | 8.6  |
| No load excitation current    | A | 0.42 | 0.47 | 0.52 | 0.62 | 0.32 | 0.34 | 0.36 | 0.40 | 0.43 | 0.47 |
| Class H BR excitation voltage | V | 37.5 | 38.5 | 37.4 | 37.5 | 36.2 | 36.4 | 36.4 | 37.4 | 38.3 | 39.6 |
| Class H BR excitation current | A | 2.04 | 2.09 | 2.03 | 2.04 | 1.97 | 1.98 | 1.98 | 2.03 | 2.08 | 2.15 |

**WINDING RESISTANCE**

*At 20° C*

|                                   |   |       |  |  |  |               |  |   |      |
|-----------------------------------|---|-------|--|--|--|---------------|--|---|------|
| Stator line-to-line (series star) | Ω | 0.065 |  |  |  | Exciter field |  | Ω | 18.4 |
| Main field                        | Ω | 2.97  |  |  |  |               |  |   |      |

According to: IEC 60034, UTE NFC51.111, VDE 0530, BS 4999/5000, NEMA MG 1-33

Values quoted are typical. In line with our policy of continuous improvement, we reserve the right to change specification without notice.

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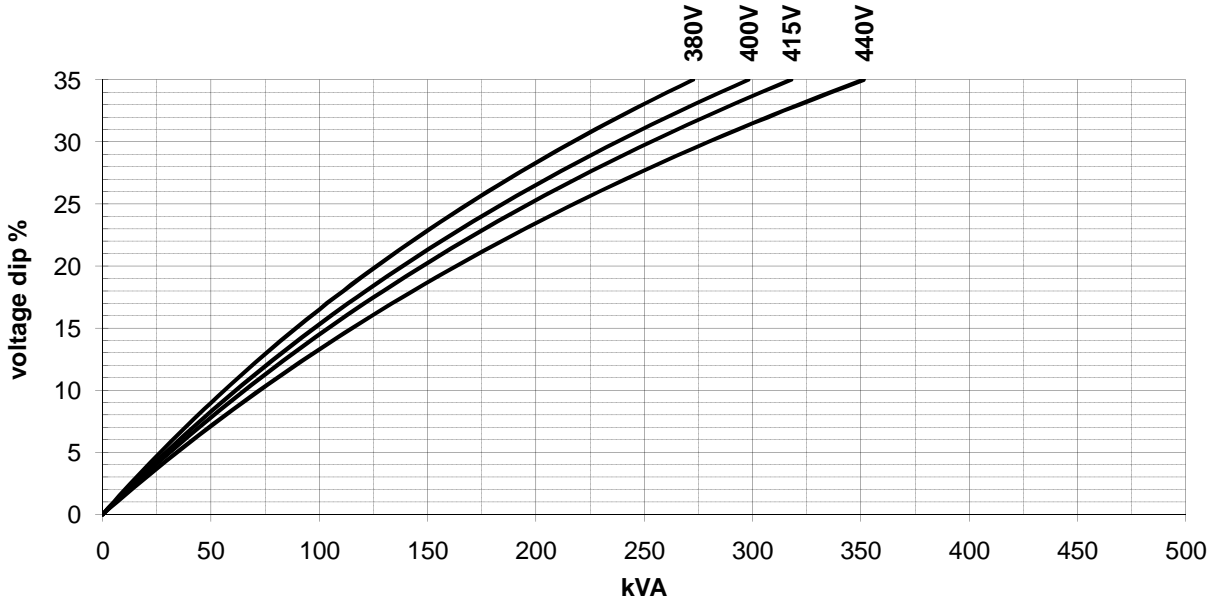
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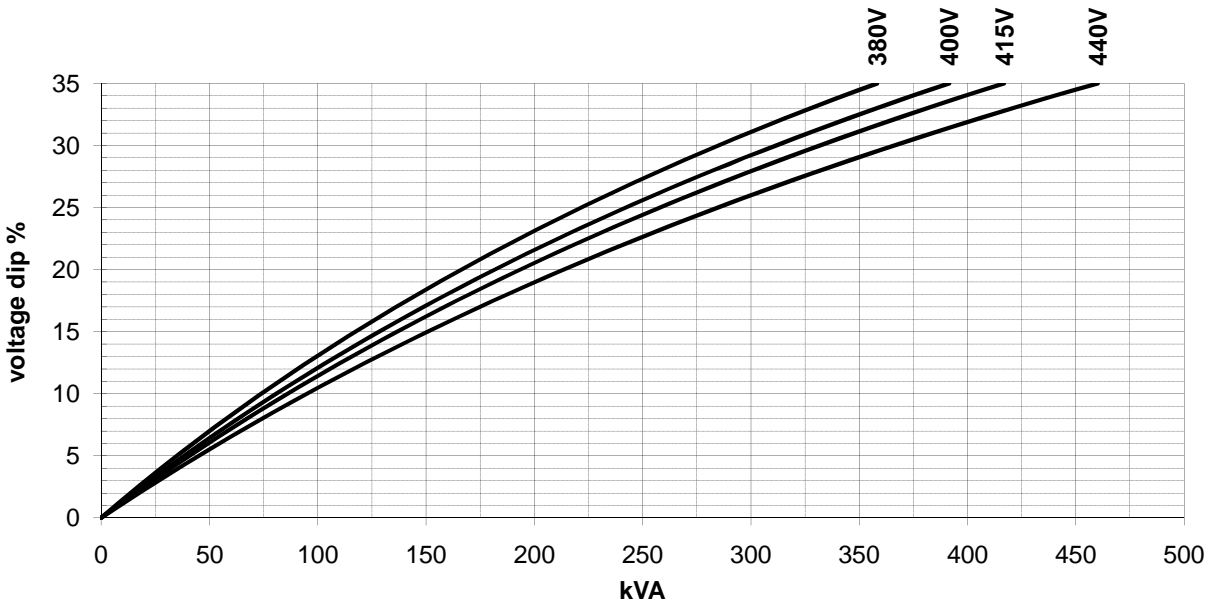
LOCKED ROTOR MOTOR STARTING CURVES

Power factor 0.6

50 Hz SHUNT



50 Hz AREP/PMG



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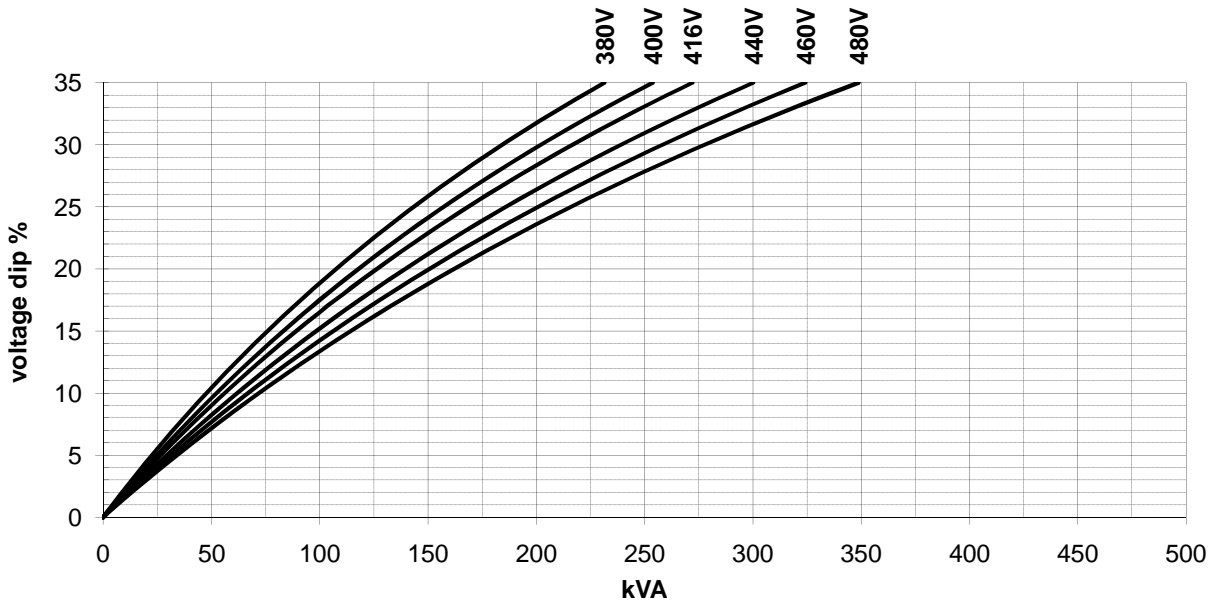
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DEC 2012

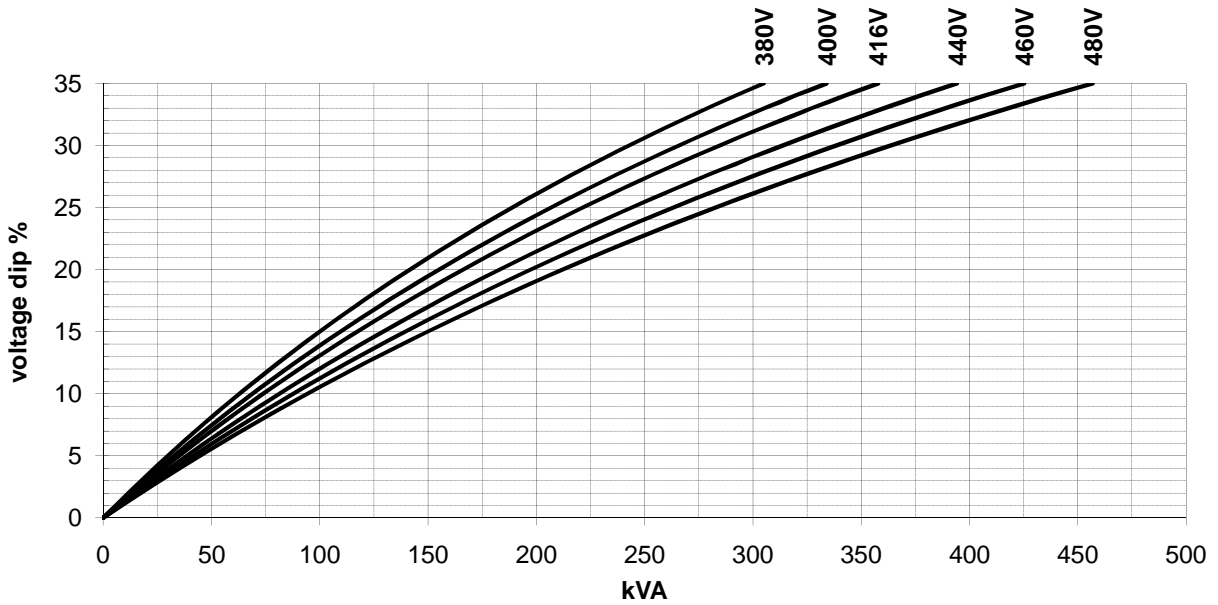
**LOCKED ROTOR MOTOR STARTING CURVES**

*Power factor 0.6*

**60 Hz SHUNT**



**60 Hz AREP/PMG**



According to: IEC 60034, UTE NFC51.111, VDE 0530, BS 4999/5000, NEMA MG 1-33

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**MODELS LL 3014E / LL3024E / LL3034E**

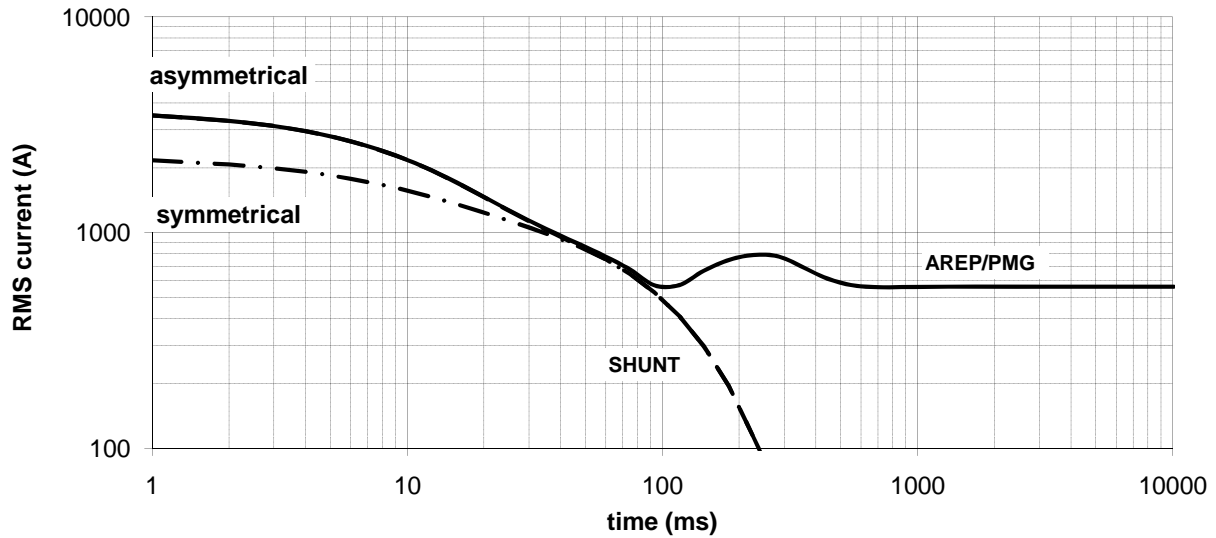
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**THREE-PHASE SHORT-CIRCUIT DECREMENT CURVES**

*No-load excitation at rated speed*

**400V 50Hz, 480V 60Hz**

*Series star*



**Multiplication Factors**

|                              |            |            |            |            |
|------------------------------|------------|------------|------------|------------|
| <b>50Hz Voltages</b>         | <b>380</b> | <b>400</b> | <b>415</b> | <b>440</b> |
| <b>Multiplication Factor</b> | 0.95       | 1.00       | 1.04       | 1.10       |

*Apply factor up to 2xT'd, remainder of curve unchanged*

|                              |            |            |            |            |            |            |
|------------------------------|------------|------------|------------|------------|------------|------------|
| <b>60Hz Voltages</b>         | <b>380</b> | <b>400</b> | <b>416</b> | <b>440</b> | <b>460</b> | <b>480</b> |
| <b>Multiplication Factor</b> | 0.79       | 0.83       | 0.87       | 0.92       | 0.96       | 1.00       |

*Apply factor up to 2xT'd, remainder of curve unchanged*

|                              |                    |                      |                     |
|------------------------------|--------------------|----------------------|---------------------|
| <b>Winding Connection</b>    | <b>Series Star</b> | <b>Parallel Star</b> | <b>Series Delta</b> |
| <b>Multiplication Factor</b> | 1.00               | 2.00                 | 1.73                |

*Apply factor to the complete curve*

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