

**FRAME**

**3104F**

**WINDING**

**6**



**MODELS** LL 3114F / LL3124F / LL3134F

REF: F3104FW6-0 SEP 2013

**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 0.25/0.3

**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	220	230	240	240
Parallel star	V	200	208	220	200	208	220	220	230	240	240

**RATING**

*Power factor 0.8, Altitude <=1000m*

Class	Rating	kVA	115.0	115.0	115.0	105.0	120.0	125.0	130.0	135.0	145.0	145.0
Class H rise BR	125/40	kVA	115.0	115.0	115.0	105.0	120.0	125.0	130.0	135.0	145.0	145.0
		kW	92.0	92.0	92.0	84.0	96.0	100.0	104.0	108.0	116.0	116.0
Class H rise PR	150/40	kVA	121.9	121.9	121.9	111.3	127.2	132.5	137.8	143.1	153.7	153.7
		kW	97.5	97.5	97.5	89.0	101.8	106.0	110.2	114.5	123.0	123.0
Class H rise PR	163/27	kVA	126.5	126.5	126.5	115.5	132.0	137.5	143.0	148.5	159.5	159.5
		kW	101.2	101.2	101.2	92.4	105.6	110.0	114.4	118.8	127.6	127.6
Class F rise BR	105/40	kVA	104.5	104.5	104.5	95.5	109.0	114.0	118.5	123.0	132.0	132.0
		kW	83.6	83.6	83.6	76.4	87.2	91.2	94.8	98.4	105.6	105.6

**EFFICIENCIES**

*Power factor 0.8*

Efficiency	Class	%	91.3	91.3	91.0	90.1	91.5	91.7	91.8	92.0	91.8	91.7
110%	Class H BR	%	91.3	91.3	91.0	90.1	91.5	91.7	91.8	92.0	91.8	91.7
100%	Class H BR	%	91.8	91.7	91.3	90.4	91.9	92.1	92.2	92.3	92.1	92.0
75%	Class H BR	%	92.6	92.4	91.9	90.5	92.7	92.8	92.9	92.9	92.7	92.5
50%	Class H BR	%	92.9	92.4	91.7	89.5	93.0	93.0	93.0	92.8	92.6	92.1
25%	Class H BR	%	91.0	89.8	88.6	84.5	91.0	90.9	90.8	90.3	90.0	89.0

**CHARACTERISTIC PARAMETERS**

*Reactance base class H BR rating*

K <sub>c</sub>	Short-circuit ratio		0.38	0.47	0.59	0.93	0.25	0.28	0.29	0.34	0.39	0.44
X <sub>d</sub>	D-Axis synchronous reactance (unsaturated)	pu	3.66	3.30	3.07	2.49	4.58	4.30	4.14	3.84	3.78	3.47
X' <sub>d</sub>	D-Axis transient reactance (saturated)	pu	0.16	0.15	0.14	0.11	0.21	0.19	0.19	0.17	0.17	0.16
X'' <sub>d</sub>	D-Axis sub-transient reactance (saturated)	pu	0.099	0.089	0.083	0.067	0.123	0.116	0.112	0.104	0.102	0.094
X <sub>q</sub>	Q-Axis synchronous reactance (unsaturated)	pu	2.19	1.98	1.84	1.49	2.75	2.58	2.48	2.31	2.27	2.08
X'' <sub>q</sub>	Q-Axis sub-transient reactance (saturated)	pu	0.205	0.185	0.172	0.140	0.257	0.241	0.232	0.215	0.212	0.194
X <sub>2</sub>	Negative-sequence reactance (saturated)	pu	0.152	0.137	0.127	0.103	0.190	0.179	0.172	0.159	0.157	0.144
X <sub>0</sub>	Zero-sequence reactance (independent)	pu	0.010	0.009	0.008	0.007	0.012	0.012	0.011	0.010	0.010	0.009
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		2224						2224		
T <sub>a</sub>	Armature time constant	ms		15						15		
T <sub>r</sub>	Voltage recovery time	ms		< 500ms						< 500ms		

**EXCITATION VOLTAGE AND CURRENT**

No load excitation voltage	V	7.8	9.2	10.7	14.5	5.2	5.7	6.1	7.0	8.0	9.2
No load excitation current	A	0.60	0.71	0.83	1.12	0.40	0.44	0.47	0.54	0.62	0.71
Class H BR excitation voltage	V	31.8	33.5	36.0	39.5	27.6	28.0	28.7	29.8	32.5	33.9
Class H BR excitation current	A	2.46	2.59	2.78	3.05	2.13	2.16	2.22	2.30	2.51	2.62

**WINDING RESISTANCE**

*At 20° C*

Stator line-to-line (series star)	Ω	0.078				Exciter field			Ω	12.9
Main field	Ω	2.58								

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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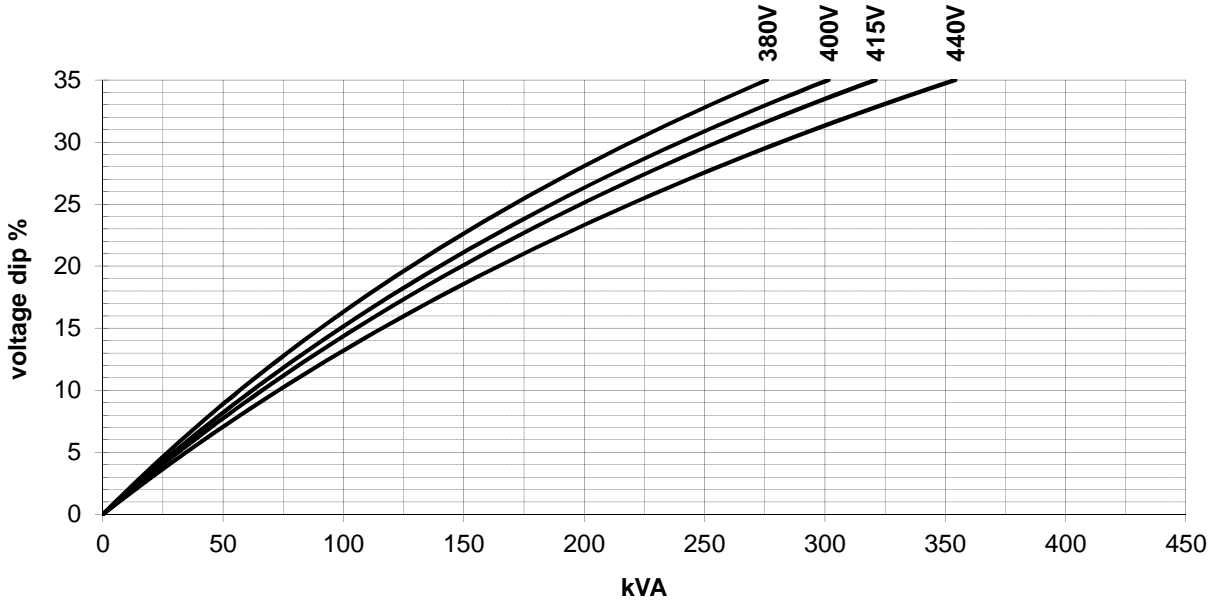
REF: F3104FW6-0

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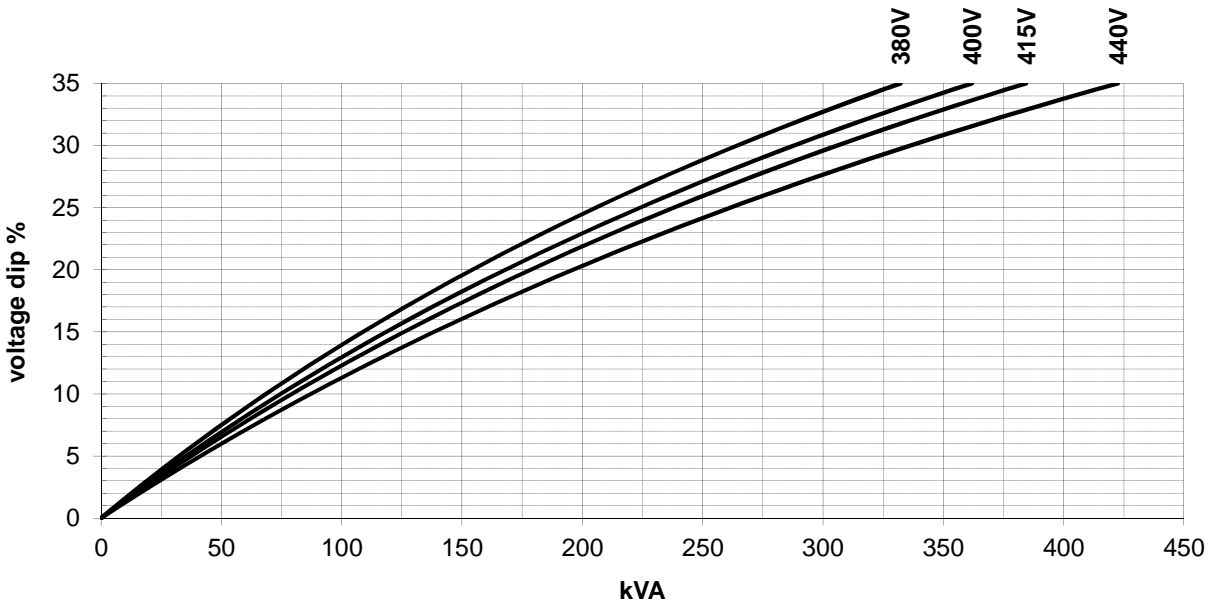
LOCKED ROTOR MOTOR STARTING CURVES

Power factor 0.6

50 Hz SHUNT



50 Hz AREP/PMG



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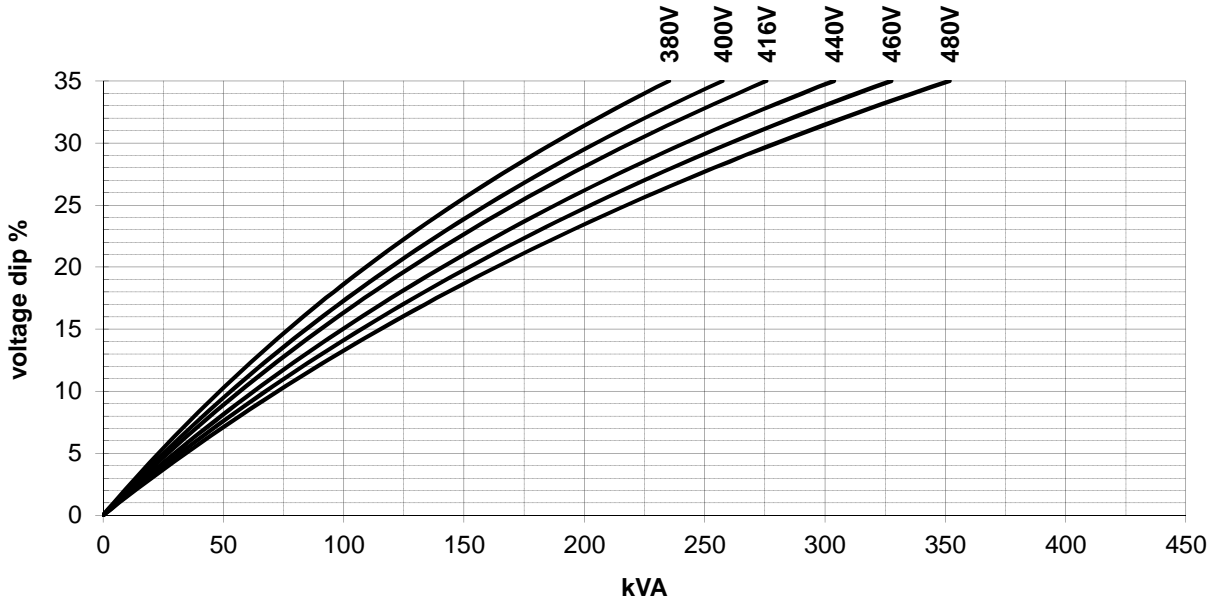
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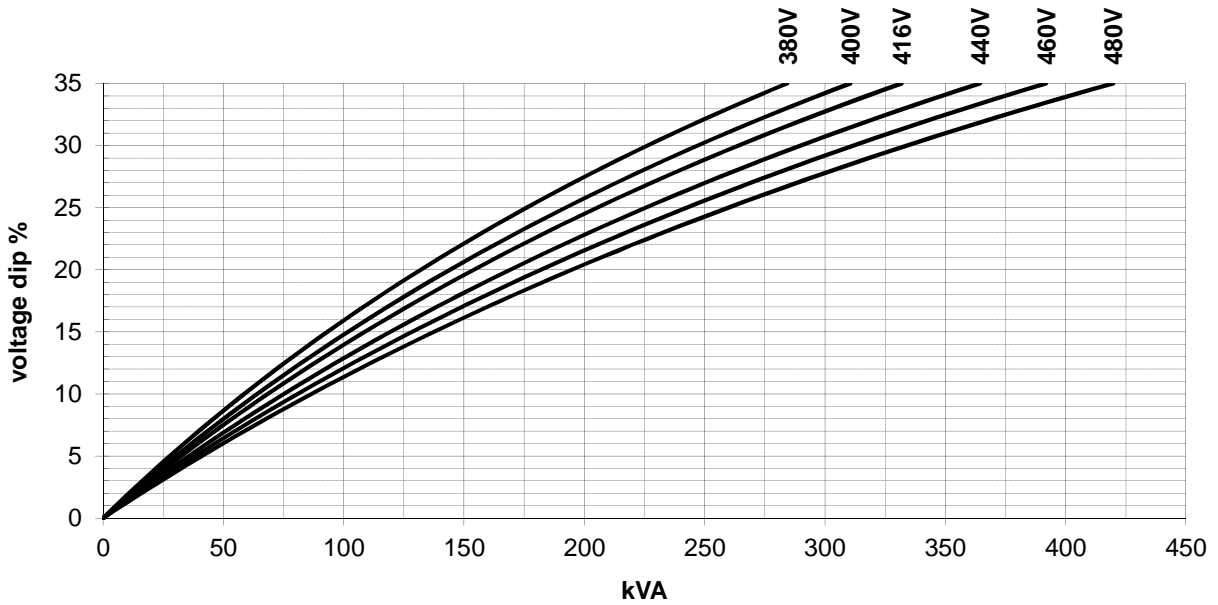
LOCKED ROTOR MOTOR STARTING CURVES

Power factor 0.6

60 Hz SHUNT



60 Hz AREP/PMG

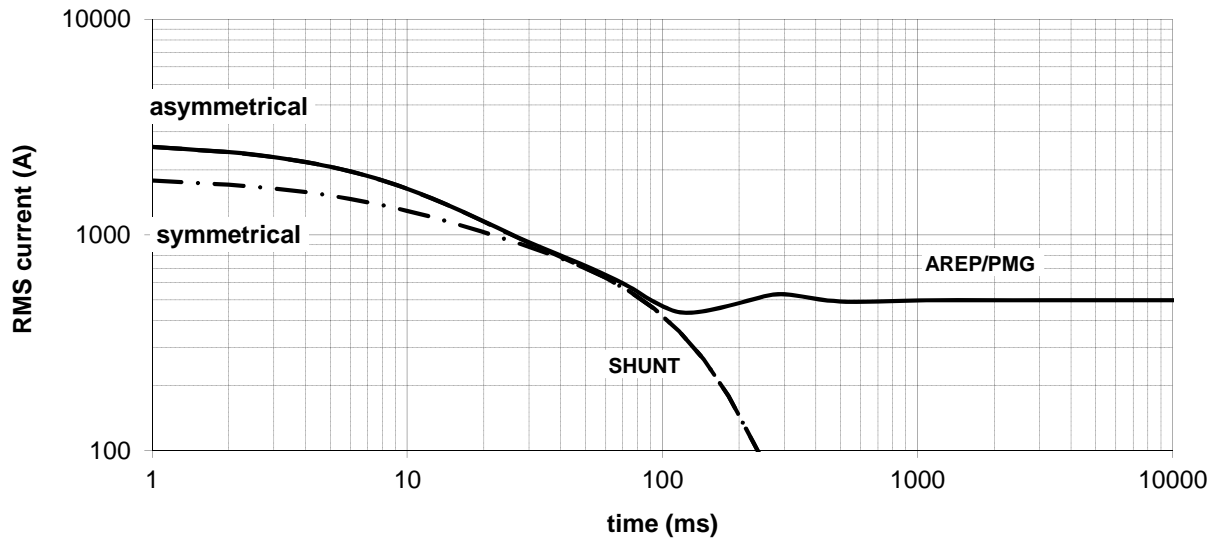


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**THREE-PHASE SHORT-CIRCUIT DECREMENT CURVES***No-load excitation at rated speed***400V 50Hz, 480V 60Hz***Series star***Multiplication Factors****50Hz Voltages**

<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***60Hz Voltages**

<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***Winding Connection**

<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*