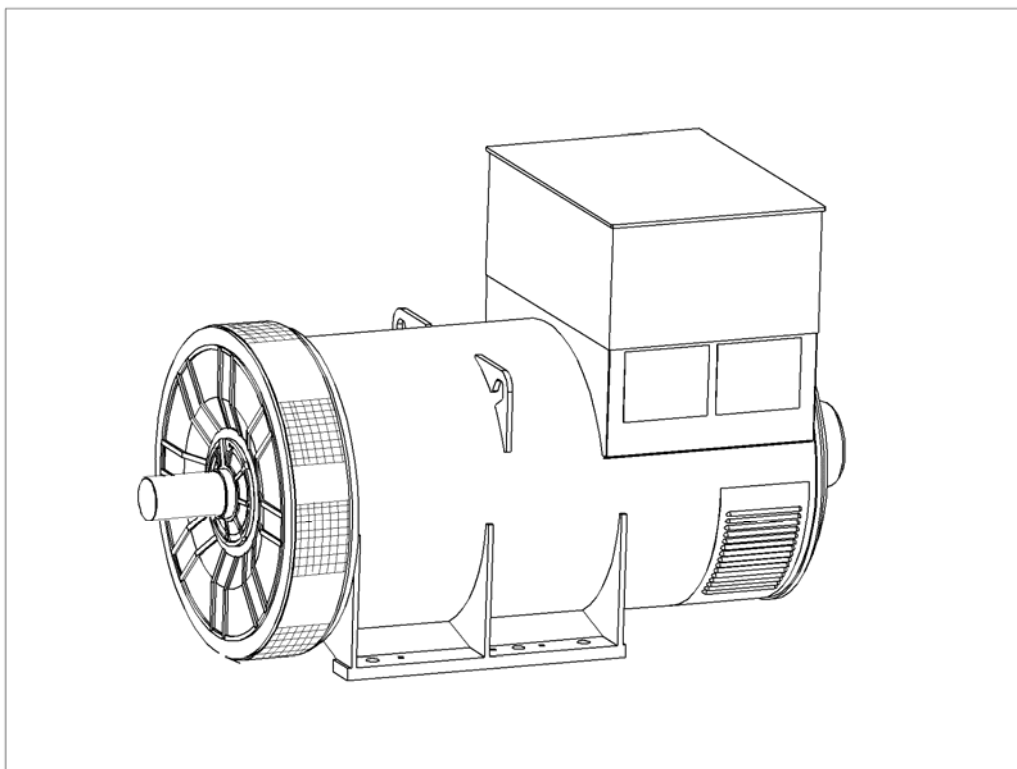


STAMFORD[®]

PM734E - Technical Data Sheet



PM734E

SPECIFICATIONS & OPTIONS

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STANDARDS

Marine generators may be certified to Lloyds, DnV, Bureau Veritas, ABS, Germanischer-Lloyd or RINA. Other standards and certifications can be considered on request.

DESCRIPTION

The STAMFORD PM range of synchronous ac generators are brushless with a rotating field. They are separately excited by the STAMFORD Permanent Magnet Generator (PMG). This is a shaft mounted, high frequency, pilot exciter which provides a constant supply of clean power via the Automatic Voltage Regulator (AVR) to the main exciter. The main exciter output is fed to the main rotor, through a full wave bridge rectifier, protected by surge suppression.

VOLTAGE REGULATORS

The PM range generators, complete with PMG, are available with one of two AVRs. Each AVR has soft start voltage build up and built in protection against sustained over-excitation, which will de-excite the generator after a minimum of 8 seconds. Underspeed protection (UFRO) is also provided on both AVRs. The UFRO will reduce the generator output voltage proportional to the speed of the generator below a pre-settable level.

The **MX341 AVR** is two phase sensed with a voltage regulation of $\pm 1\%$. (see the note on regulation).

The **MX321 AVR** is 3 phase rms sensed with a voltage regulation of 0.5% rms (see the note on regulation). The UFRO circuit has adjustable slope and dwell for controlled recovery from step loads. An over voltage protection circuit will shutdown the output device of the AVR, it can also trip an optional excitation circuit breaker if required. As an option, short circuit current limiting is available with the addition of current transformers.

Newage may use a third AVR, the MA330, under certain circumstances.

The **MA330 AVR** has 3 phase rms sensing, it has similar performance to the MX321. It is a Pulse Width Modulated AVR with a higher output power under short circuit conditions.

All of the above AVRs require a generator mounted current transformer to provide quadrature droop characteristics for load sharing during parallel operation. Provision is also made for the connection of the STAMFORD power factor controller, for embedded applications, and a remote voltage trimmer.

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. 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 levels of voltage waveform distortion.

TERMINALS & TERMINAL BOX

Standard generators feature a main stator with 6 ends 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', and meets the requirements of UL1446. 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.

NOTE ON REGULATION

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%.

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

Front cover drawing is typical of the product range.

PM734E

WINDING 312

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CONTROL SYSTEM	SEPARATELY EXCITED BY P.M.G.			
A.V.R.	MX341	MX321	MA330	
VOLTAGE REGULATION	± 1%	± 0.5 %	± 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
MAIN STATOR RESISTANCE	0.00093 Ohms PER PHASE AT 22°C STAR CONNECTED
MAIN ROTOR RESISTANCE	2.17 Ohms at 22°C
EXCITER STATOR RESISTANCE	17.5 Ohms at 22°C
EXCITER ROTOR RESISTANCE	0.063 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. 6228 C3
BEARING NON-DRIVE END	BALL. 6319 C3

	1 BEARING	2 BEARING
WEIGHT COMP. GENERATOR	3556 kg	3506 kg
WEIGHT WOUND STATOR	1747 kg	1747 kg
WEIGHT WOUND ROTOR	1494 kg	1432 kg
WR ² INERTIA	45.49 kgm ²	44.4891 kgm ²
SHIPPING WEIGHTS in a crate	3629kg	3575kg
PACKING CRATE SIZE	216 x 105 x 154(cm)	216 x 105 x 154(cm)

	50 Hz				60 Hz			
TELEPHONE INTERFERENCE	THF<2%				TIF<50			
COOLING AIR	2.69 m³/sec 5700 cfm				3.45 m³/sec 7300 cfm			
VOLTAGE STAR	380/220	400/231	415/240	440/254	416/240	440/254	460/266	480/277
kVA BASE RATING FOR REACTANCE VALUES	1615	1700	1715	1680	1865	1990	2035	2075
Xd DIR. AXIS SYNCHRONOUS	2.78	2.64	2.48	2.16	3.46	3.30	3.09	2.89
X'd DIR. AXIS TRANSIENT	0.17	0.16	0.15	0.13	0.21	0.20	0.19	0.18
X" d DIR. AXIS SUBTRANSIENT	0.13	0.12	0.11	0.10	0.16	0.15	0.14	0.13
Xq QUAD. AXIS REACTANCE	1.79	1.70	1.59	1.39	2.23	2.12	1.99	1.86
X" q QUAD. AXIS SUBTRANSIENT	0.25	0.24	0.22	0.20	0.31	0.30	0.28	0.26
X _L LEAKAGE REACTANCE	0.03	0.03	0.03	0.02	0.04	0.04	0.04	0.03
X ₂ NEGATIVE SEQUENCE	0.18	0.17	0.16	0.14	0.22	0.21	0.20	0.18
X ₀ ZERO SEQUENCE	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.02

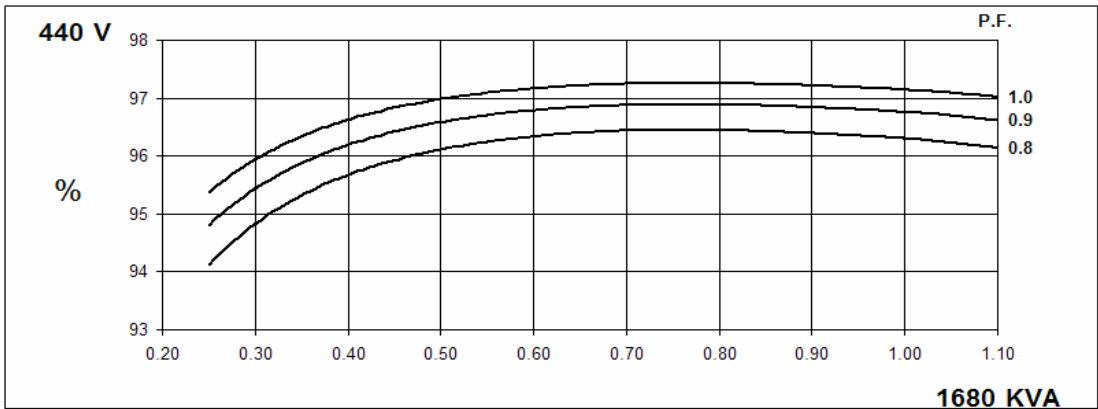
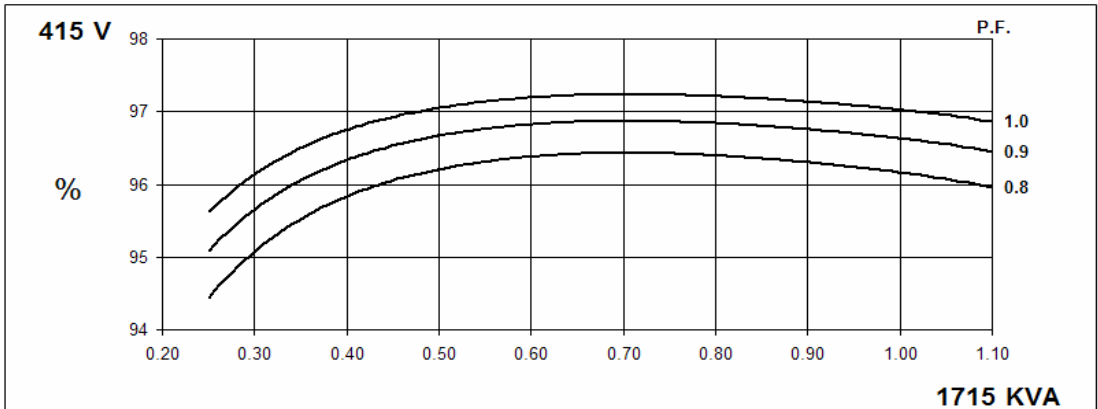
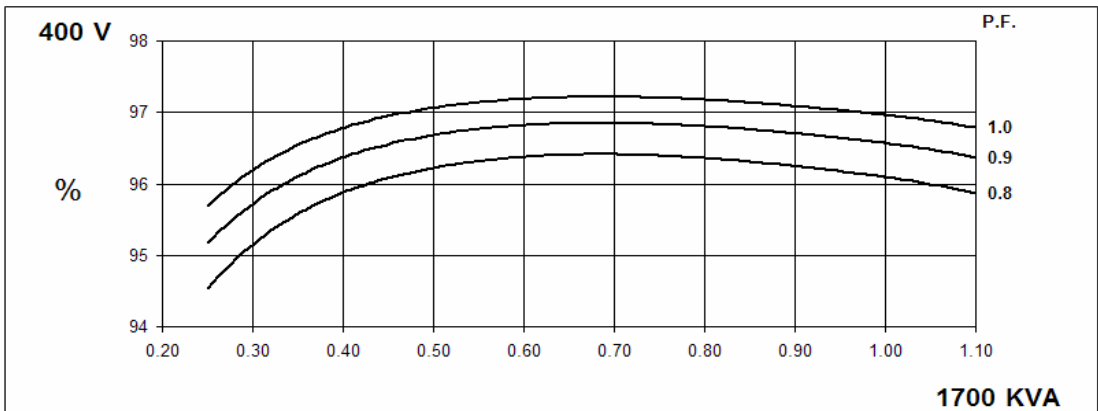
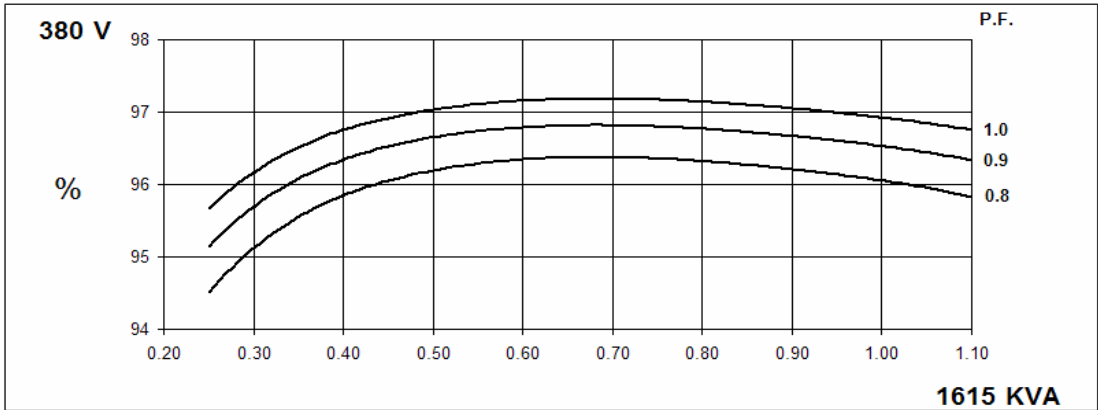
REACTANCES ARE SATURATED	VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED
T'd TRANSIENT TIME CONST.	0.149s
T" d SUB-TRANSTIME CONST.	0.02s
T'do O.C. FIELD TIME CONST.	2.46s
Ta ARMATURE TIME CONST.	0.02s
SHORT CIRCUIT RATIO	1/Xd

50
Hz

PM734E
Winding 312

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THREE PHASE EFFICIENCY CURVES

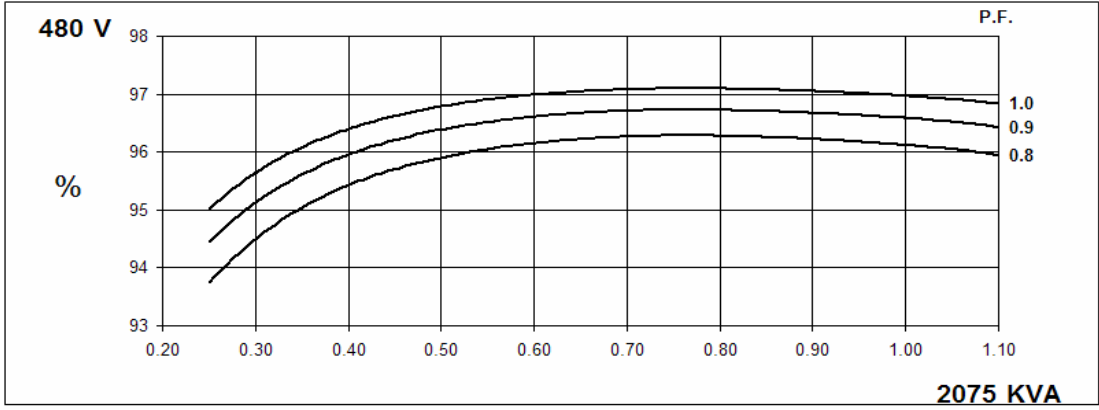
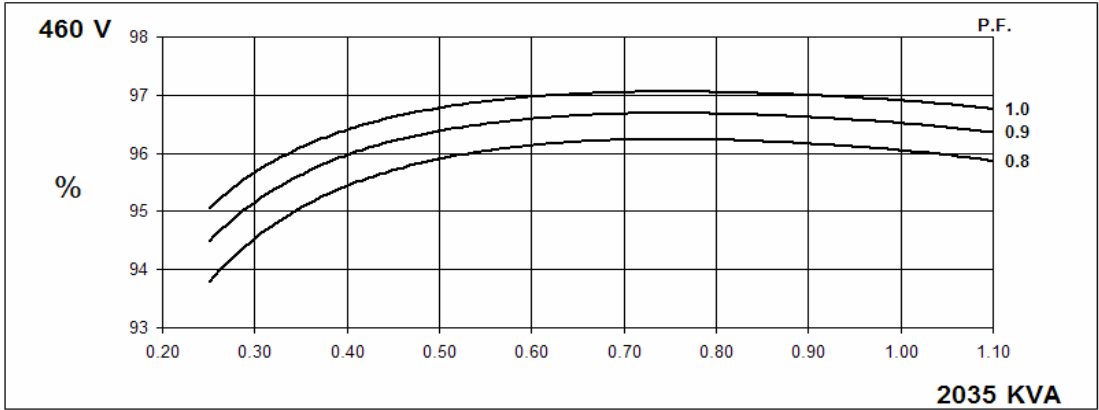
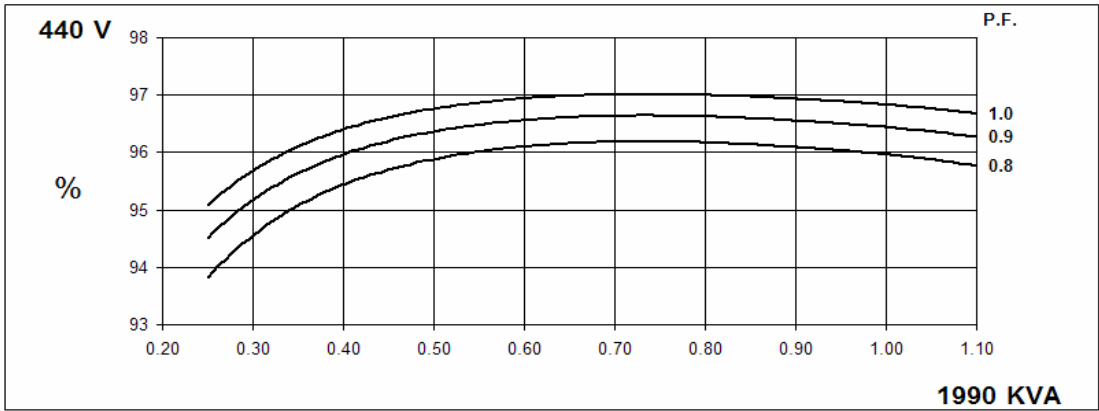
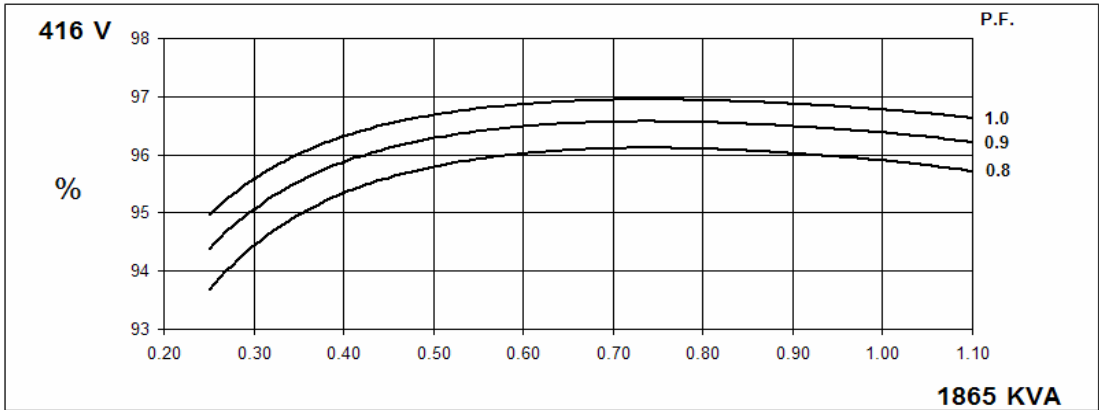


60
Hz

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Winding 312

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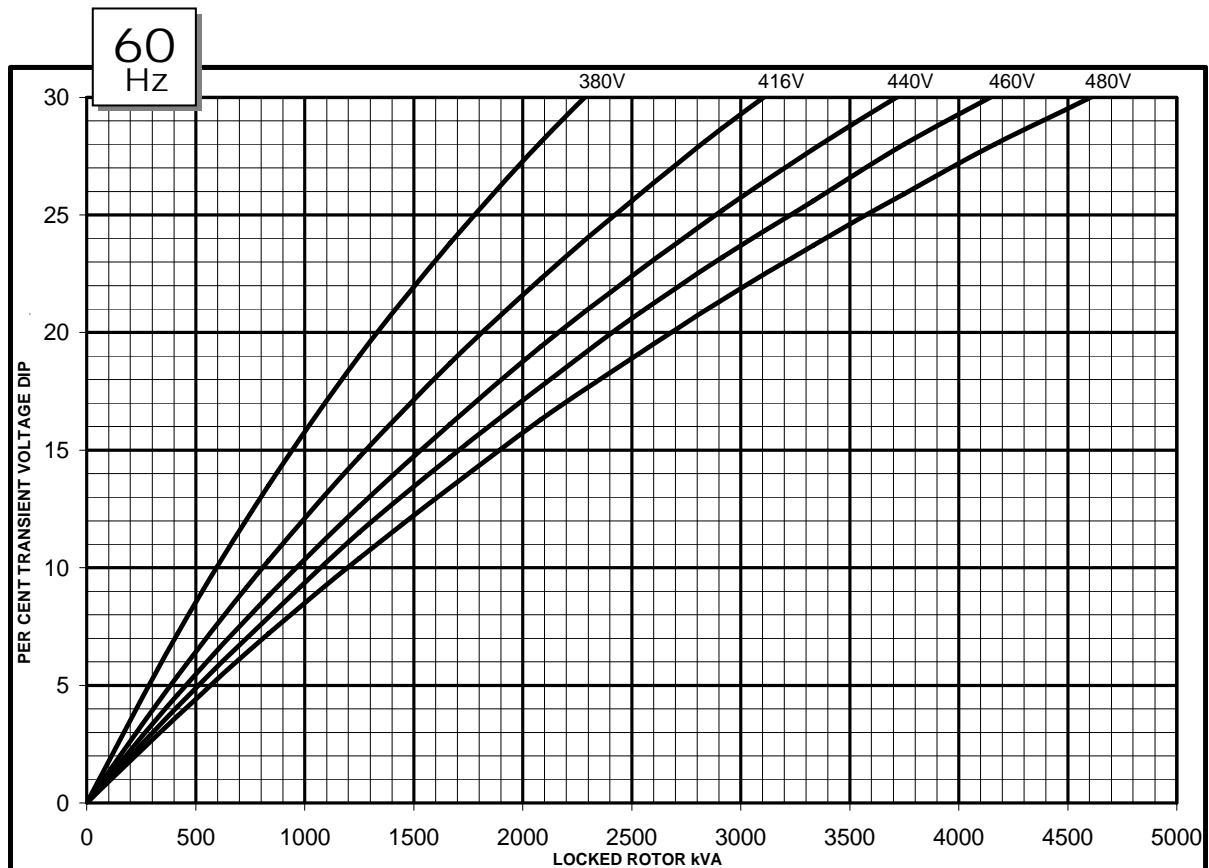
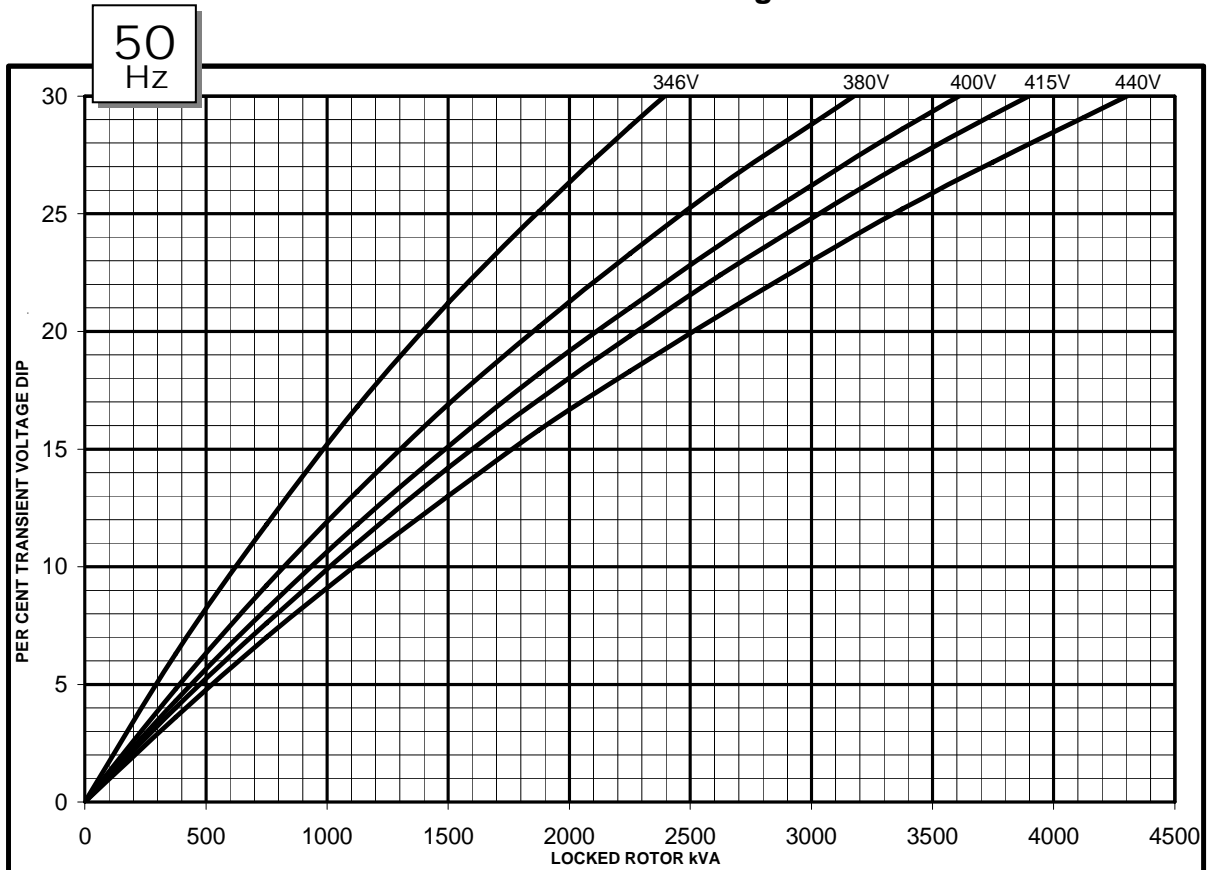
THREE PHASE EFFICIENCY CURVES



PM734E
Winding 312

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Locked Rotor Motor Starting Curve

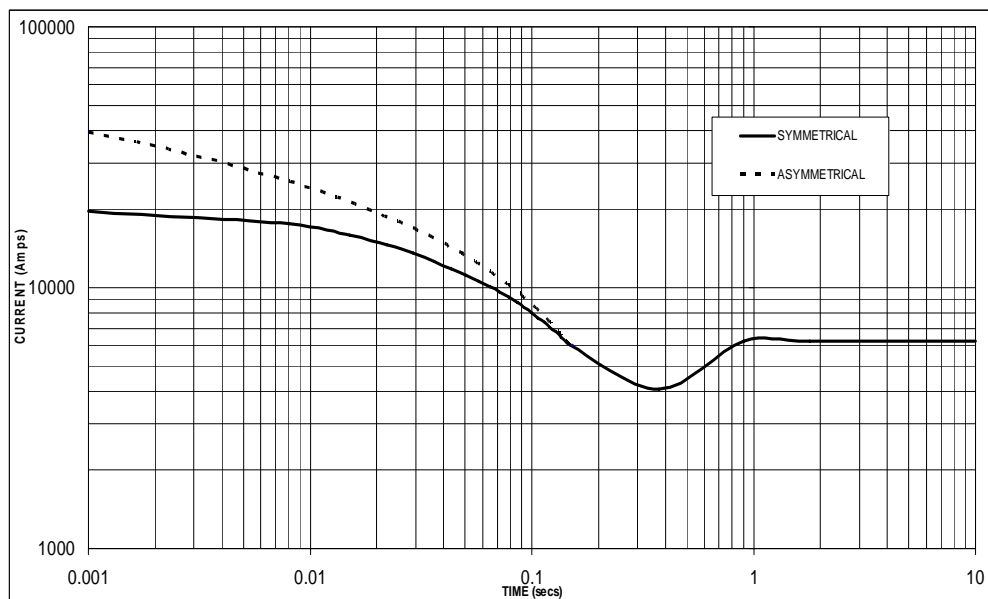


PM734E
MX341 or MX321

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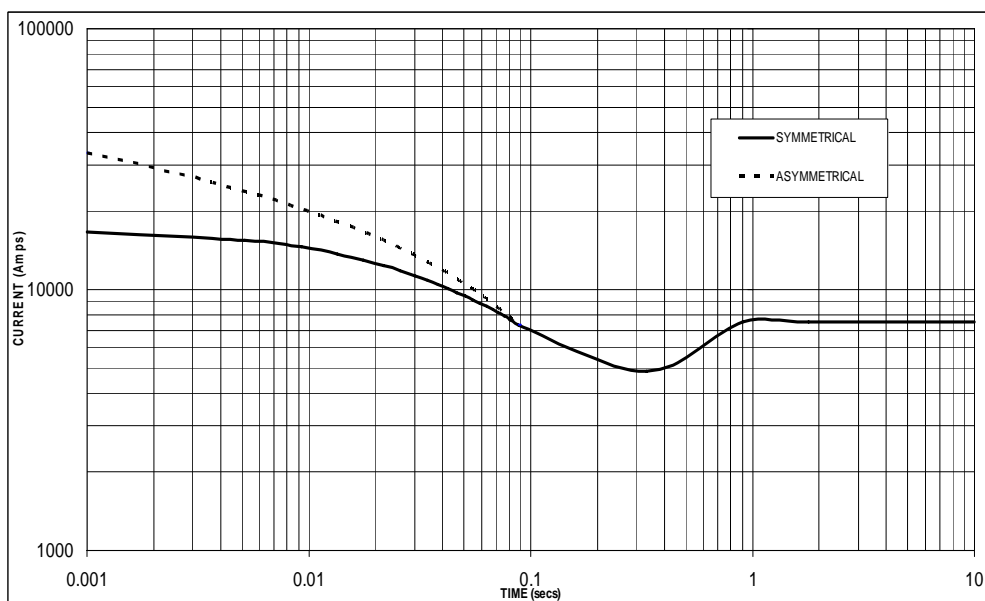
**Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed
Based on star (wye) connection.**

50
Hz



Sustained Short Circuit = 6,250 Amps

60
Hz



Sustained Short Circuit = 7,500 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 1.06
415v	x 1.09	460v	x 1.10
440v	x 1.16	480v	x 1.15

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

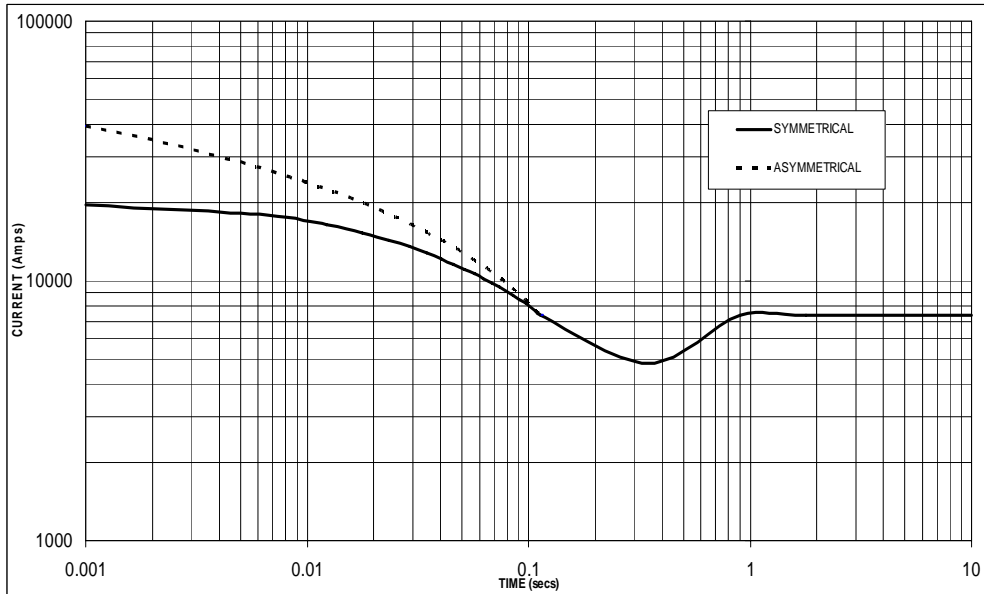
Curves are drawn for Star (Wye) connected machines.

PM734E
MA330

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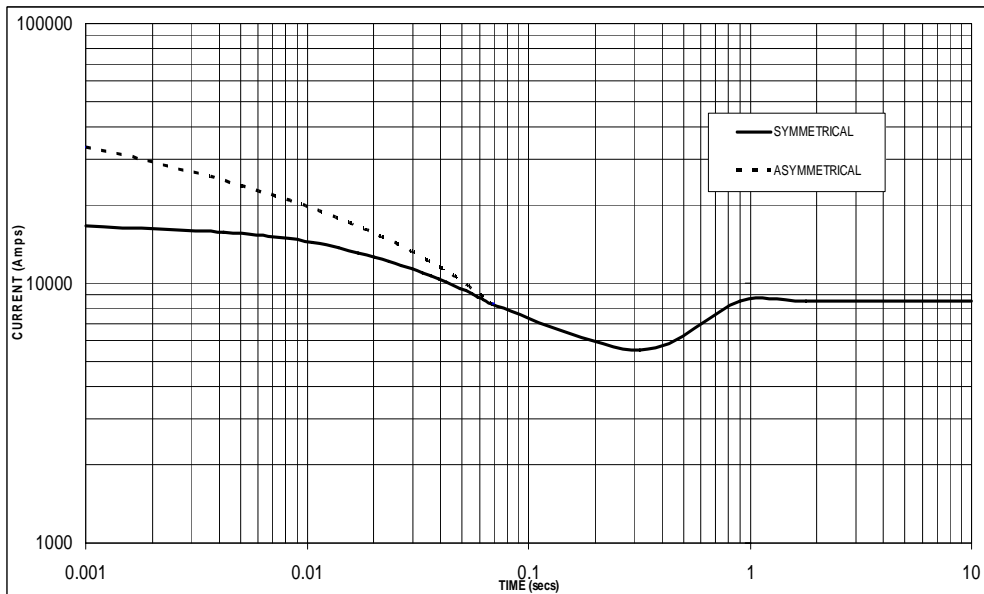
**Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed
Based on star (wye) connection.**

50
Hz



Sustained Short Circuit = 7,400 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 :

50Hz		60Hz	
Voltage	Factor	Voltage	Factor
380v	x 1.00	416v	x 1.00
400v	x 1.05	440v	x 1.06
415v	x 1.09	460v	x 1.10
440v	x 1.16	480v	x 1.15

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.

PM734E

Winding 312 / 0.8 Power Factor

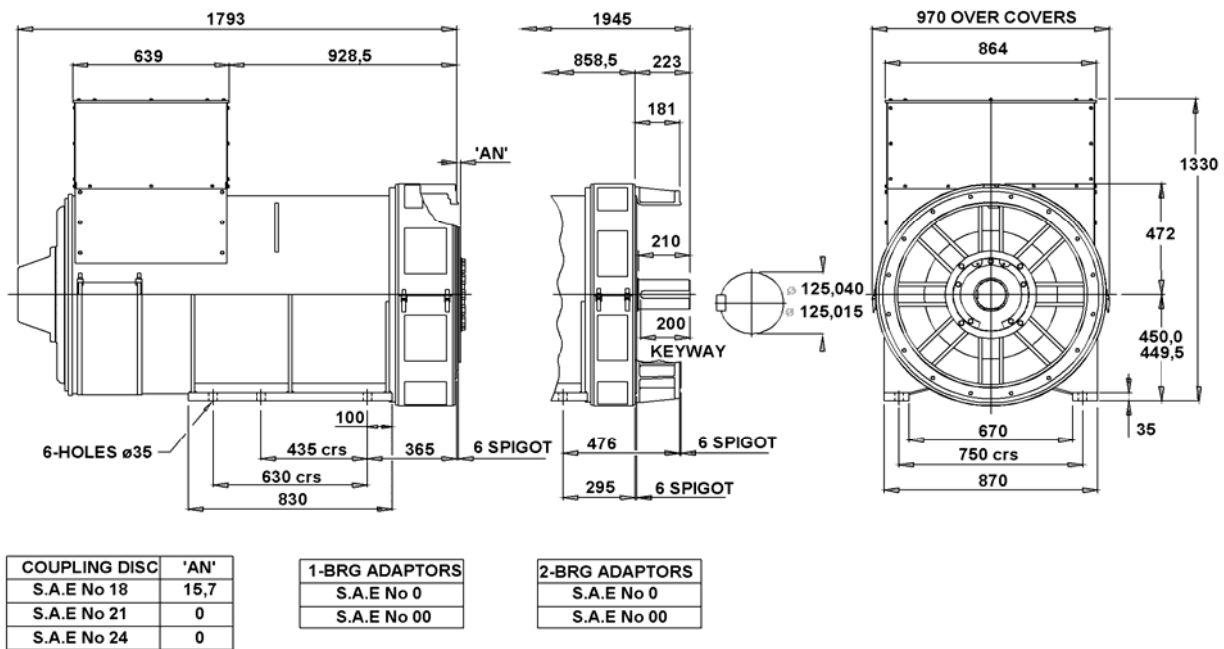
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RATINGS

Class - Temp Rise	Cont. B - 70/50°C	Cont. F - 90/50°C	Cont. H - 110/50°C
50Hz Star (V)	380 400 415 440	380 400 415 440	380 400 415 440
kVA	1325 1370 1370 1340	1365 1435 1490 1520	1615 1700 1715 1680
kW	1060 1096 1096 1072	1092 1148 1192 1216	1292 1360 1372 1344
Efficiency (%)	96.3 96.4 96.4 96.5	96.3 96.3 96.3 96.4	96.1 96.1 96.2 96.3
kW Input	1101 1137 1137 1111	1134 1192 1238 1261	1344 1415 1426 1396

60Hz Star (V)	416 440 460 480	416 440 460 480	416 440 460 480
kVA	1490 1590 1620 1655	1690 1800 1840 1875	1865 1990 2035 2075
kW	1192 1272 1296 1324	1352 1440 1472 1500	1492 1592 1628 1660
Efficiency (%)	96.1 96.2 96.2 96.3	96.0 96.1 96.2 96.2	95.9 96.0 96.0 96.1
kW Input	1240 1322 1347 1375	1408 1498 1530 1559	1556 1658 1696 1727

DIMENSIONS



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