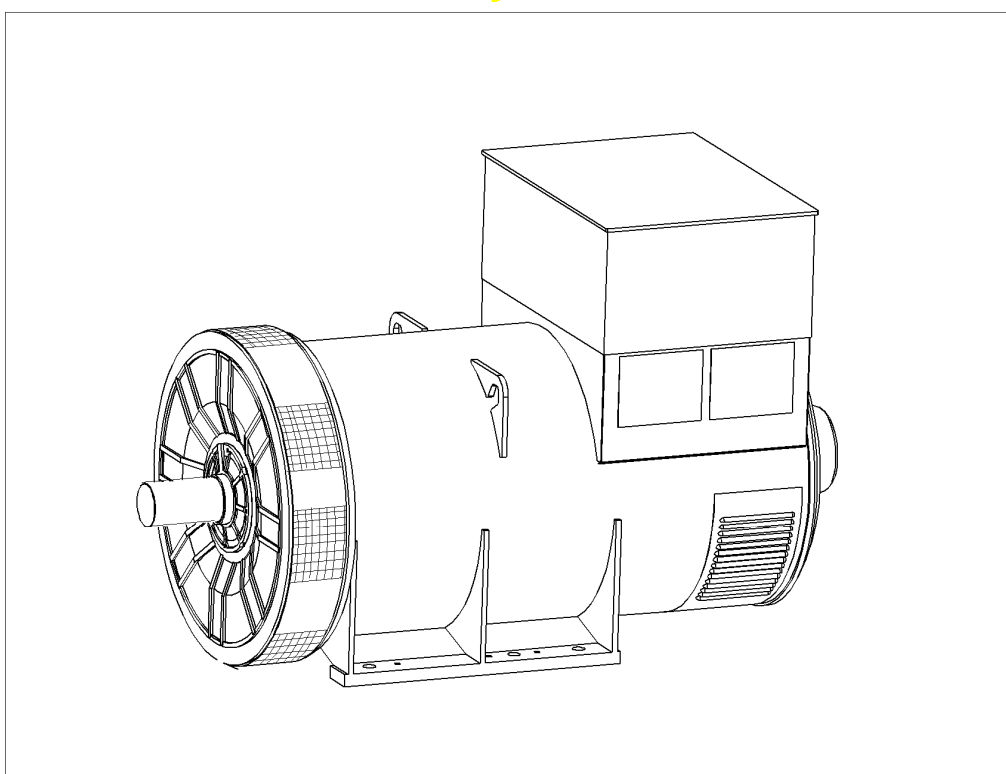


# STAMFORD®

**PI734A - Winding 13**

Technical  Data Sheet



**SPECIFICATIONS & OPTIONS**

**STANDARDS**

Stamford industrial generators meet the requirements of BS EN 60034 and the relevant sections of other national and international standards such as BS5000, VDE 0530, NEMA MG1-32, IEC60034, CSA C22.2-100, AS1359.

Other standards and certifications can be considered on request.

**DESCRIPTION**

The STAMFORD PI 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 PI range generators, complete with a 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 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.

Both the MX341 and the MX321 need 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%.

**DE RATES**

All values tabulated on page 6 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 temperature exceeding 60 C must be referred to the factory.

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.

APPROVED DOCUMENT

**PI734A**  
**WINDING 13**

**STAMFORD**

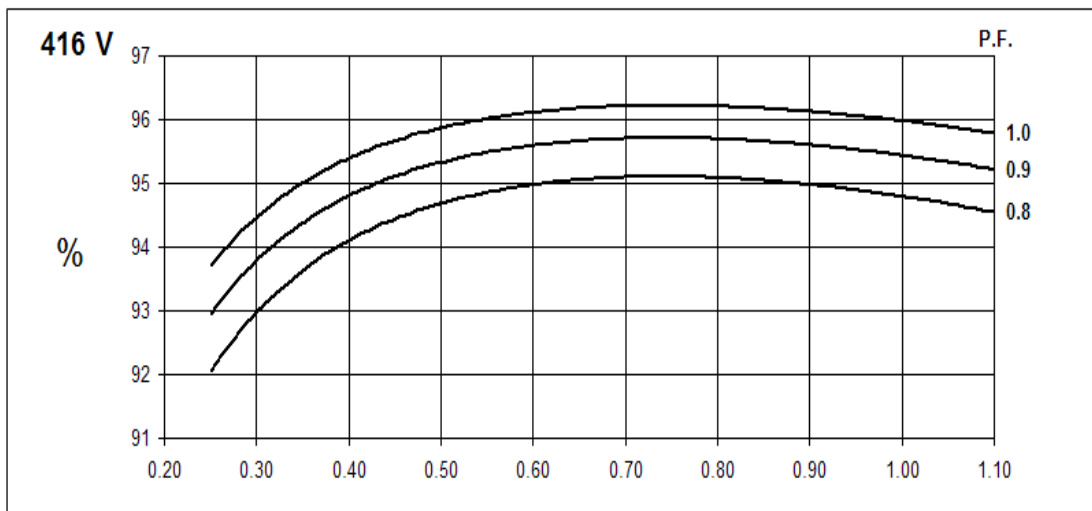
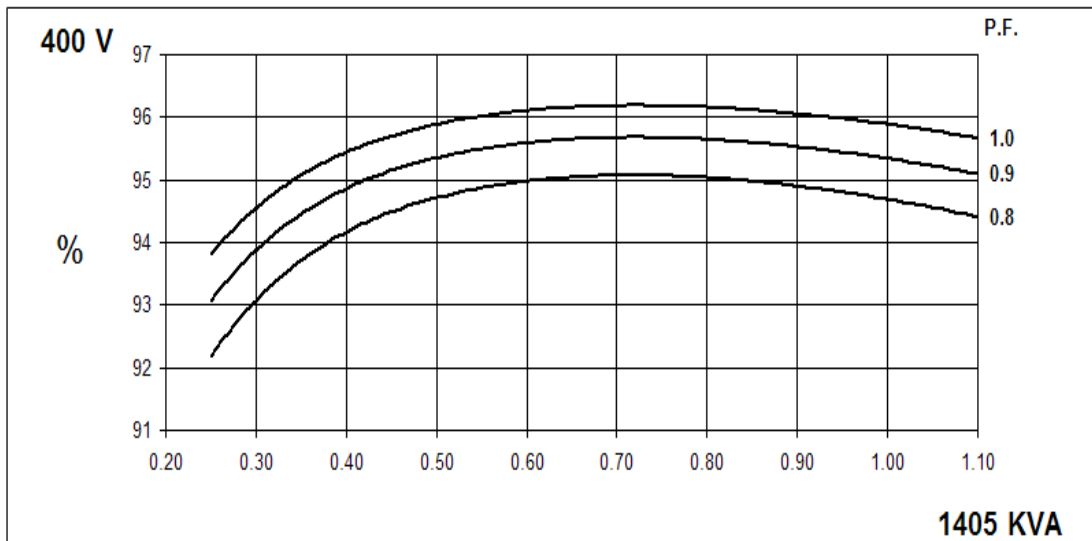
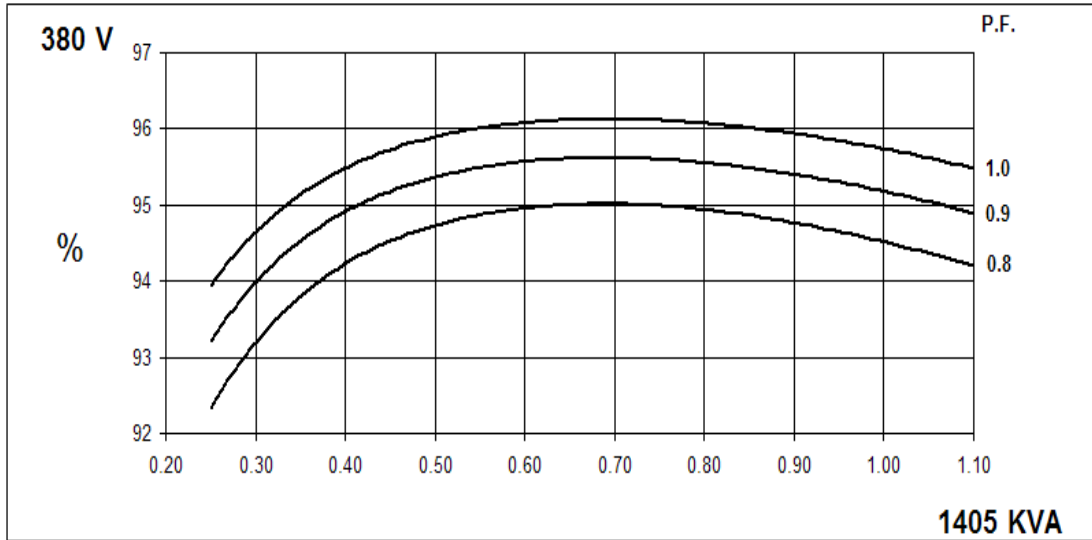
CONTROL SYSTEM	SEPARATELY EXCITED BY P.M.G.		
A.V.R.	MX341	MX321	
VOLTAGE REGULATION	± 1%	± 0.5 %	With 4% ENGINE GOVERNING
SUSTAINED SHORT CIRCUIT	REFER TO SHORT CIRCUIT DECREMENT CURVES (page 5)		

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	0.0013 Ohms PER PHASE AT 22°C STAR CONNECTED		
MAIN ROTOR RESISTANCE	1.67 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	2760 kg	2710 kg	
WEIGHT WOUND STATOR	1306 kg	1306 kg	
WEIGHT WOUND ROTOR	1139 kg	1077 kg	
WR <sup>2</sup> INERTIA	32.7498 kgm <sup>2</sup>	31.7489 kgm <sup>2</sup>	
SHIPPING WEIGHTS in a crate	2833 kg	2779 kg	
PACKING CRATE SIZE	194 x 105 x 154(cm)	194 x 105 x 154(cm)	
TELEPHONE INTERFERENCE	THF<2%	TIF<50	
COOLING AIR	3.45 m <sup>3</sup> /sec 7300 cfm		
VOLTAGE STAR	380	400	416
kVA BASE RATING FOR REACTANCE VALUES	1405	1405	1405
X <sub>d</sub> DIR. AXIS SYNCHRONOUS	3.62	3.28	3.03
X' <sub>d</sub> DIR. AXIS TRANSIENT	0.22	0.20	0.19
X'' <sub>d</sub> DIR. AXIS SUBTRANSIENT	0.16	0.14	0.13
X <sub>q</sub> QUAD. AXIS REACTANCE	2.34	2.11	1.96
X'' <sub>q</sub> QUAD. AXIS SUBTRANSIENT	0.33	0.29	0.28
X <sub>L</sub> LEAKAGE REACTANCE	0.05	0.04	0.04
X <sub>2</sub> NEGATIVE SEQUENCE	0.24	0.20	0.19
X <sub>0</sub> ZERO SEQUENCE	0.03	0.03	0.03
REACTANCES ARE SATURATED      VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED			
T' <sub>d</sub> TRANSIENT TIME CONST.	0.13s		
T'' <sub>d</sub> SUB-TRANSTIME CONST.	0.01s		
T' <sub>do</sub> O.C. FIELD TIME CONST.	2.14s		
T <sub>a</sub> ARMATURE TIME CONST.	0.02s		
SHORT CIRCUIT RATIO	1/X <sub>d</sub>		

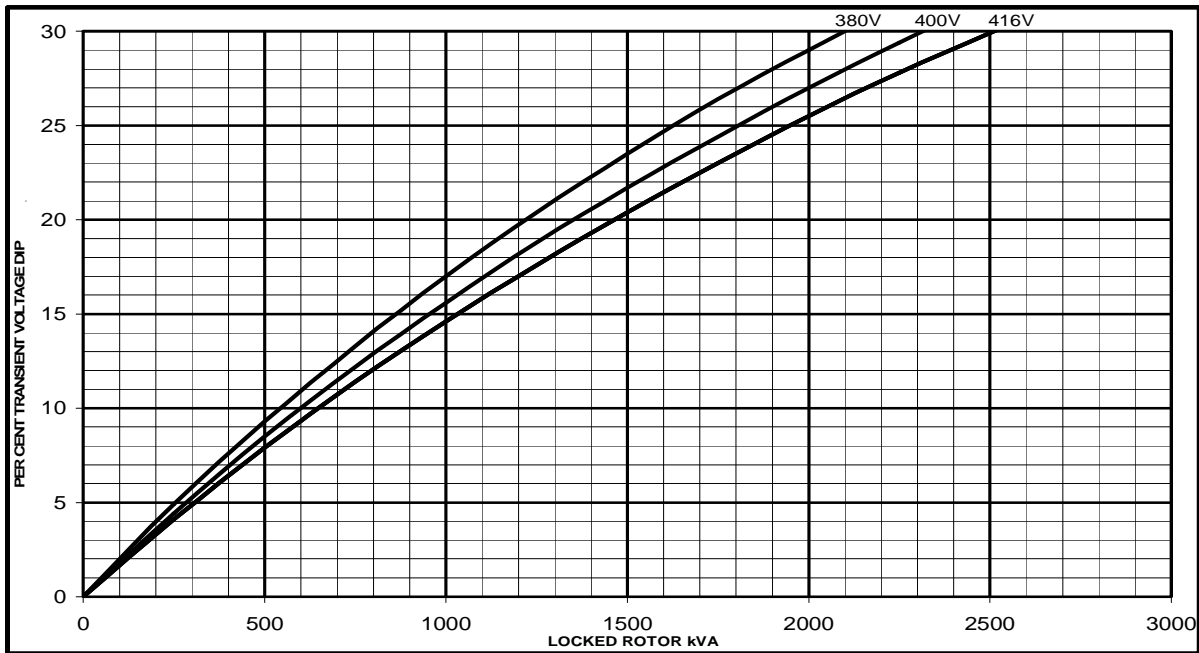
PI734A  
Winding 13

**STAMFORD**

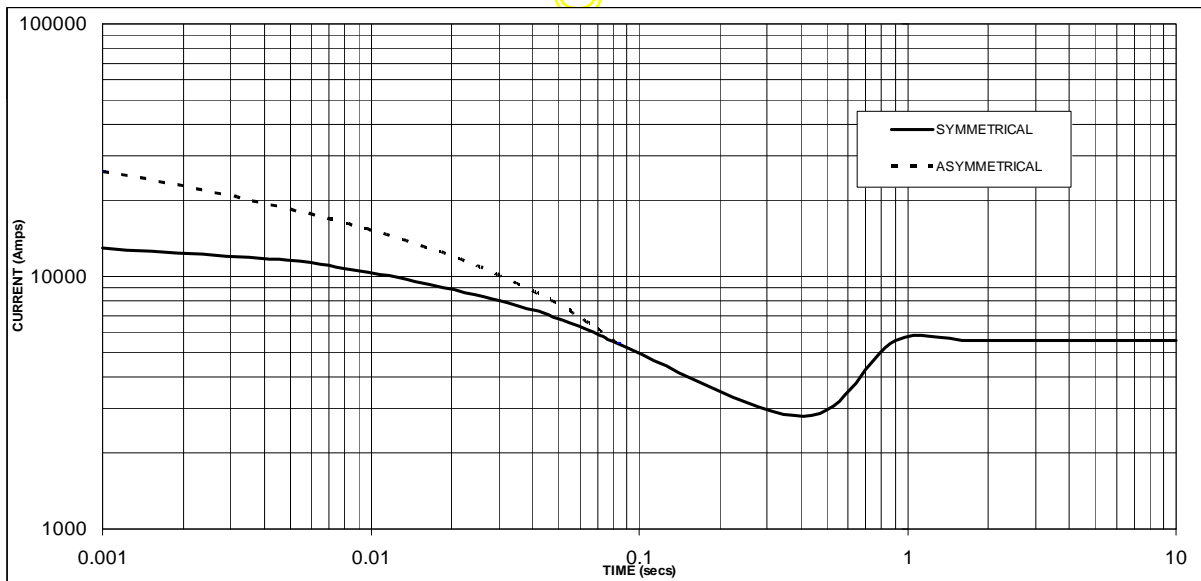
**THREE PHASE EFFICIENCY CURVES**



**PI734A  
Winding 13  
Locked Rotor Motor Starting Curve**



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



**Sustained Short Circuit = 5,580 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 :

Voltage	Factor
380	X 1.00
400	X 1.05
416	X 1.09

**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

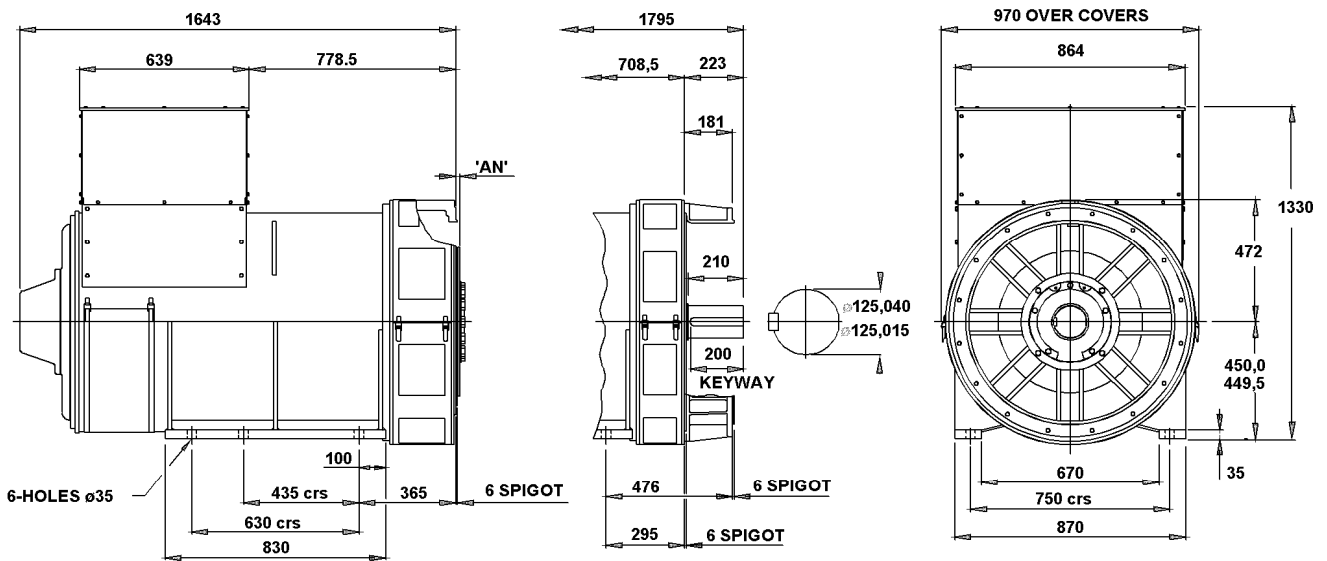
The sustained current value is constant irrespective of voltage level

**PI734A**  
**Winding 13 / 0.8 Power Factor**

**RATINGS**

Class - Temp Rise	Cont. F - 105/40°C	Cont. H - 125/40°C	Standby - 150/40°C	Standby - 163/27°C
<b>60Hz</b> Star (V)	380 400 416	380 400 416	380 400 416	380 400 416
kVA	1310 1310 1310	1405 1405 1405	1460 1460 1460	1505 1505 1505
kW	1048 1048 1048	1124 1124 1124	1168 1168 1168	1204 1204 1204
Efficiency (%)	94.7 94.8 94.9	94.5 94.7 94.8	94.4 94.6 94.7	94.3 94.5 94.6
kW Input	1107 1105 1104	1189 1187 1186	1237 1235 1233	1277 1274 1273

**APPROVED**  
**DIMENSIONS**



COUPLING DISC	'AN'
S.A.E No 18	15,7
S.A.E No 21	0
S.A.E No 24	0

1-BRG ADAPTORS
S.A.E No 0
S.A.E No 00

2-BRG ADAPTORS
S.A.E No 0
S.A.E No 00

APPROVED DOCUMENT

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