Stamford Alternator Datasheet PDF - Complete Technical Specifications and Application Guide

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Introduction

Stamford alternators represent the global benchmark for synchronous AC generator technology, delivering exceptional electrical performance, mechanical reliability, and application flexibility across the complete spectrum of power generation requirements. This comprehensive technical datasheet provides detailed specifications, performance characteristics, and application guidance for Stamford alternators, serving as the authoritative reference for engineers, generator assemblers, and maintenance professionals.

With over 100 years of alternator manufacturing heritage, Stamford has established an unparalleled reputation for quality, reliability, and innovation in generator technology. The Stamford product range covers power outputs from 7 kVA to over 5000 kVA, serving applications from small portable generators to large industrial power plants and marine installations. Stamford alternators are specified worldwide by generator manufacturers, consulting engineers, and end users who demand the highest levels of electrical performance and mechanical reliability.

Modern Stamford alternators incorporate advanced technologies including high-efficiency winding designs, sophisticated excitation systems, advanced voltage regulation, and robust mechanical construction. These technologies enable Stamford alternators to deliver excellent voltage waveform quality, superior motor starting capability, outstanding transient response, and reliable long-term operation across diverse applications and environmental conditions.

Technical Specifications

Small Frame Alternators (7-50 kVA)

Parameter	S0L1	S1L1	S1.5L1	S2L1
Frame Size	160	180	200	225
Continuous Power (kVA)	7-14	12-25	20-40	30-55
Standby Power (kVA)	8-15	13-28	22-44	33-61
Rated Voltage	230V / 400V	230V / 400V	230V / 400V	230V / 400V
Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Power Factor	0.8	0.8	0.8	0.8
Number of Poles	4	4	4	4
Insulation Class	H	H	H	H
Protection Class	IP23	IP23	IP23	IP23
Efficiency (%)	82-88	84-90	86-91	87-92

Medium Frame Alternators (50-200 kVA)

| Parameter | S3L1 | S4L1 | S4L1S | S5L1 |

|----------|------|------|-------|------|
Frame Size	250	280	280	315
Continuous Power (kVA)	45-80	70-120	110-165	130-220
Standby Power (kVA)	50-88	77-132	121-182	143-242
Rated Voltage	230V / 400V	230V / 400V	230V / 400V	230V / 400V
Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Power Factor	0.8	0.8	0.8	0.8
Number of Poles	4	4	4	4
Insulation Class	H	H	H	H
Protection Class	IP23	IP23	IP23	IP23
Efficiency (%)	88-93	89-94	90-94	90-95

Large Frame Alternators (200-500 kVA)

Parameter	S5L1S	S6L1	S6L1S	S7L1
Frame Size	315	355	355	400
Continuous Power (kVA)	180-280	250-350	320-440	380-550
Standby Power (kVA)	198-308	275-385	352-484	418-605
Rated Voltage	230V / 400V	230V / 400V	230V / 400V	230V / 400V
Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Power Factor	0.8	0.8	0.8	0.8
Number of Poles	4	4	4	4
Insulation Class	H	H	H	H
Protection Class	IP23	IP23	IP23	IP23
Efficiency (%)	91-95	92-96	92-96	93-96

High Capacity Alternators (500-2500 kVA)

Parameter	UCI224	UCI274	UCI314	UCI404
Frame Size	450	500	560	630
Continuous Power (kVA)	450-800	700-1200	1000-1800	1500-2500
Standby Power (kVA)	495-880	770-1320	1100-1980	1650-2750
Rated Voltage	400V-690V	400V-690V	400V-690V	400V-690V
Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Power Factor	0.8	0.8	0.8	0.8
Number of Poles	4	4	4	4
Insulation Class	H	H	H	H
Protection Class	IP23	IP23	IP23	IP23

| Efficiency (%) | 93-96 | 94-97 | 94-97 | 95-97 |

Electrical Specifications

Voltage Regulation Performance

Parameter	Standard	Optional
Steady-State Voltage Regulation	±1.0%	±0.5%
Transient Voltage Deviation (100% Load Step)	+20% / -15%	+15% / -12%
Recovery Time	< 3 seconds	< 2 seconds
Voltage Modulation	< 0.5%	< 0.3%
Voltage Unbalance (Balanced Load)	< 1%	< 0.5%

Waveform Quality

Parameter	Specification
Total Harmonic Distortion (THD)	< 5% (typical < 3%)
Telephone Harmonic Factor (THF)	< 2%
Single Harmonic Content	< 3%
No-Load Line Voltage Distortion	< 2%

Excitation System Specifications

Parameter	SX Series	AS Series	MX Series
Excitation Type	Self-excited	Self-excited	Permanent magnet
AVR Type	SX440	AS480	MX341/MX321
Excitation Power	60-200W	80-300W	100-500W
Field Voltage (Max)	90V	90V	120V
Field Current (Max)	3-6A	4-8A	6-10A
Build-Up Voltage	> 95% rated	> 95% rated	> 98% rated

AVR (Automatic Voltage Regulator) Specifications

SX440 AVR Specifications

Parameter	Specification

Input Voltage	190-264V AC
Input Frequency	50/60 Hz
Sensing Voltage	190-264V AC
Output Voltage	0-90V DC
Output Current	4A continuous, 6A for 10 sec
Voltage Regulation	±1.0%
Voltage Adjustment Range	±5% (board), ±10% (external)
Under-Frequency Protection	Adjustable, 45-55 Hz
EMI Suppression	Built-in

AS480 AVR Specifications

Parameter	Specification
Input Voltage	190-277V AC
Input Frequency	50/60 Hz
Sensing Voltage	190-277V AC
Output Voltage	0-90V DC
Output Current	4A continuous, 6A for 10 sec
Voltage Regulation	±1.0%
Voltage Adjustment Range	±5% (board), ±10% (external)
Under-Frequency Protection	Adjustable slope
Build-Up Time	< 3 seconds

MX341/MX321 AVR Specifications

Parameter	MX341	MX321
Sensing Voltage	190-480V AC	190-480V AC
Input Frequency	50/60 Hz	50/60 Hz
Output Voltage	0-120V DC	0-120V DC
Output Current	6A continuous	8A continuous
Voltage Regulation	±0.5%	±0.25%
Soft Start Time	Adjustable 0.5-15 sec	Adjustable 0.5-15 sec
Under-Frequency Protection	Adjustable	Adjustable
Over-Excitation Protection	Standard	Standard
Parallel Operation	Optional	Standard

Physical Specifications

Mechanical Dimensions (Representative Values)

Frame	Length (mm)	Width (mm)	Height (mm)	Weight (kg)
S1L1	480	280	350	85
S2L1	520	320	400	115
S4L1	620	400	480	210
S5L1	680	450	540	295
S6L1	780	520	620	440
S7L1	880	580	700	620
UCI274	1150	750	900	1250
UCI404	1400	920	1100	2200

Environmental Specifications

Parameter	Specification
Operating Temperature	-40°C to +40°C (standard)
Storage Temperature	-50°C to +70°C
Altitude Capability	Up to 1000m (standard)
Humidity	Up to 95% non-condensing
Vibration Resistance	IEC 60034-9 compliant
Cooling Method	Self-ventilated (IC0A1)
Protection Class Options	IP23, IP44, IP54, IP55

Performance Curves Description

Efficiency Curves

Stamford alternators demonstrate excellent efficiency across the load range, with peak efficiency typically occurring at 75-85% load. Efficiency ranges from 82-88% for small frame units to 93-97% for large frame alternators. The efficiency curve shows relatively flat performance across the 50-100% load range, with gradual efficiency reduction at lower loads due to fixed losses.

Motor Starting Capability

Motor starting curves illustrate the alternator's ability to start motors of various sizes using different starting methods. Stamford alternators can typically start motors up to 50-80% of the alternator rating using direct-on-line (DOL) starting. For star-delta starting, motor starting capability increases to approximately 70-100% of alternator rating. The curves show voltage dip and recovery time for various motor starting scenarios.

Temperature Rise Characteristics

Temperature rise curves demonstrate the thermal performance of the alternator windings under various load conditions. Class H insulation allows maximum temperature rise of 125°C above ambient. Stamford alternators are designed to operate within these limits at rated load with adequate margin for extended life. Temperature rise varies with load, cooling air temperature, and altitude.

Compatible Applications

Generator Set Applications

Stamford alternators are the preferred choice for diesel generator sets across all power ranges. The brushless design, reliable excitation system, and excellent voltage regulation make Stamford ideal for standby, prime, and continuous power applications. Compatibility with all major engine brands enables flexible generator set design.

Marine Applications

Stamford marine alternators feature corrosion-resistant coatings, sealed bearings, and marine-grade materials for shipboard power generation. Classification society approvals include ABS, BV, DNV-GL, LR, and RINA. Marine alternators meet the demanding requirements of the marine environment including salt spray, vibration, and variable ambient conditions.

Industrial Power Systems

Industrial applications including process plants, manufacturing facilities, and critical infrastructure require reliable power generation. Stamford alternators provide the electrical performance, reliability, and long service life essential for these demanding applications. Options for special enclosures, heaters, and protection features suit industrial environments.

Renewable Energy Applications

Stamford alternators are used in renewable energy systems including wind turbines, hydroelectric installations, and biomass power plants. The robust construction and reliable excitation systems suit variable speed and variable load conditions common in renewable applications. Special configurations available for grid connection.

Download PDF Section

Official Stamford Documentation

Complete technical documentation for Stamford alternators is available through Cummins Generator Technologies and authorized distributors. Documentation includes specification sheets, dimension drawings, application guides, and service manuals.

Documentation Package Contents

- Technical Specification Sheets
- Dimensional Drawings (2D and 3D)

- Wiring Diagrams
- AVR Configuration Guides
- Application Engineering Guides
- Service and Maintenance Manuals
- Parts Catalogs
- Marine Certification Documentation

Frequently Asked Questions

1. What is the difference between S and UCI series Stamford alternators?

The S series (S0-S7) covers power outputs from 7 kVA to 550 kVA in single-bearing configurations, optimized for standard generator sets. The UCI series covers 450 kVA to 5000+ kVA, featuring robust construction for large industrial and marine applications. UCI alternators are available in both single and two-bearing configurations.

2. What AVR should I select for my application?

The SX440 and AS480 AVRs suit standard applications requiring ±1% voltage regulation. The MX341 is recommended for applications requiring ±0.5% regulation and better transient response. The MX321 is specified for paralleling applications, critical loads, and applications requiring ±0.25% regulation with advanced protection features.

3. Can Stamford alternators operate in parallel?

Yes, Stamford alternators can operate in parallel with other generators. Parallel operation requires appropriate AVR (MX321 recommended), current transformers for reactive load sharing, and proper synchronization equipment. Both manual and automatic synchronizing systems are compatible with Stamford alternators.

4. What insulation class do Stamford alternators have?

Standard Stamford alternators feature Class H insulation, rated for maximum temperature rise of 125°C above ambient. This provides substantial thermal margin for reliable operation and extended service life. Class F insulation (80°C rise) is available for special applications.

5. What protection class is standard?

Standard Stamford alternators are rated IP23, providing protection against solid objects greater than 12mm and water spray up to 60° from vertical. IP44, IP54, and IP55 protection options are available for applications requiring enhanced environmental protection.

6. How do I size a Stamford alternator for motor starting?

For direct-on-line (DOL) motor starting, the alternator should be sized at approximately 2-3 times the motor kW rating. For star-delta starting, sizing at 1.5-2 times motor kW is typically adequate. Variable frequency drives (VFDs) require alternator sizing at approximately 1.5 times the VFD rating due to harmonic currents.

7. What is the expected service life of a Stamford alternator?

With proper maintenance, Stamford alternators can achieve 20-30 years of service life in standby applications or 40,000-60,000 operating hours in prime power applications. Service life depends on operating conditions, maintenance practices, and environmental factors. Rewinding can extend service life significantly.

8. What maintenance do Stamford alternators require?

Routine maintenance includes periodic inspection, cleaning of air passages, checking terminal connections, verifying insulation resistance, and monitoring bearing condition. Main bearings in single-bearing alternators are typically sealed and lubricated for life. Two-bearing units require bearing replacement at specified intervals (typically 20,000-40,000 hours).

9. Can Stamford alternators be used at high altitude?

Stamford alternators are rated for operation up to 1000 meters altitude at rated output. Above this elevation, current rating should be derated approximately 3% per 500 meters due to reduced cooling effectiveness. Voltage rating can typically be maintained at altitude.

10. What is the difference between single-bearing and two-bearing alternators?

Single-bearing alternators have the rotor supported by the engine flywheel bearing, with the rotor directly coupled to the flywheel. This design is compact and economical, suited for most generator applications. Two-bearing alternators have bearings at both ends of the rotor, enabling flexible coupling to the prime mover and use with any engine or mechanical drive.

11. What voltage options are available?

Stamford alternators are available in a wide range of voltage configurations. Common voltages include 230V, 400V, 415V, 480V, 690V, and others. Many models feature reconnectable windings enabling multiple voltage configurations. Custom voltages are available for special applications.

12. How do I select the correct Stamford alternator for my generator?

Selection factors include required power output (kVA), voltage and frequency, prime mover speed, environment (temperature, altitude), application type (standby, prime, continuous), and special requirements (motor starting, non-linear loads, paralleling). Consult Stamford selection guides or contact technical support for assistance.

13. What is the warranty on Stamford alternators?

Standard warranty for Stamford alternators is typically 12-24 months from commissioning or 18-30 months from shipment, whichever occurs first. Extended warranty options are available through distributors. Warranty terms vary by region and application.

14. Can Stamford alternators handle non-linear loads?

Stamford alternators can supply non-linear loads including UPS systems, VFDs, and computer loads. For high non-linear load content (THD > 10%), alternator derating may be required. Consult application engineering for guidance on specific non-linear load applications.

15. What spare parts should I stock?

Recommended spare parts include AVR, rotating rectifier diodes, surge suppressor, main bearings (two-bearing units), and various gaskets and seals. For critical applications, consider stocking a complete spare exciter assembly. Consult parts catalog for specific recommendations based on alternator model.

Related Downloads

Alternator Documentation

- Stamford S Series Technical Manual
- Stamford UCI Series Specifications
- Stamford Marine Alternator Guide
- Dimensional Drawing Library
- Wiring Diagram Library

AVR Documentation

- SX440 AVR User Manual
- AS480 AVR Operation Guide
- MX341 AVR Technical Manual
- MX321 AVR Configuration Guide
- AVR Troubleshooting Guide

Application Guides

- Alternator Selection Guide
- Motor Starting Application Note
- Paralleling Operation Guide
- Non-Linear Load Guidelines
- Marine Application Guide
- High Temperature Operation

Service Documentation

- Service and Maintenance Manual
- Insulation Testing Procedures
- Bearing Replacement Guide
- Rewinding Specifications
- Parts Identification Guide

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