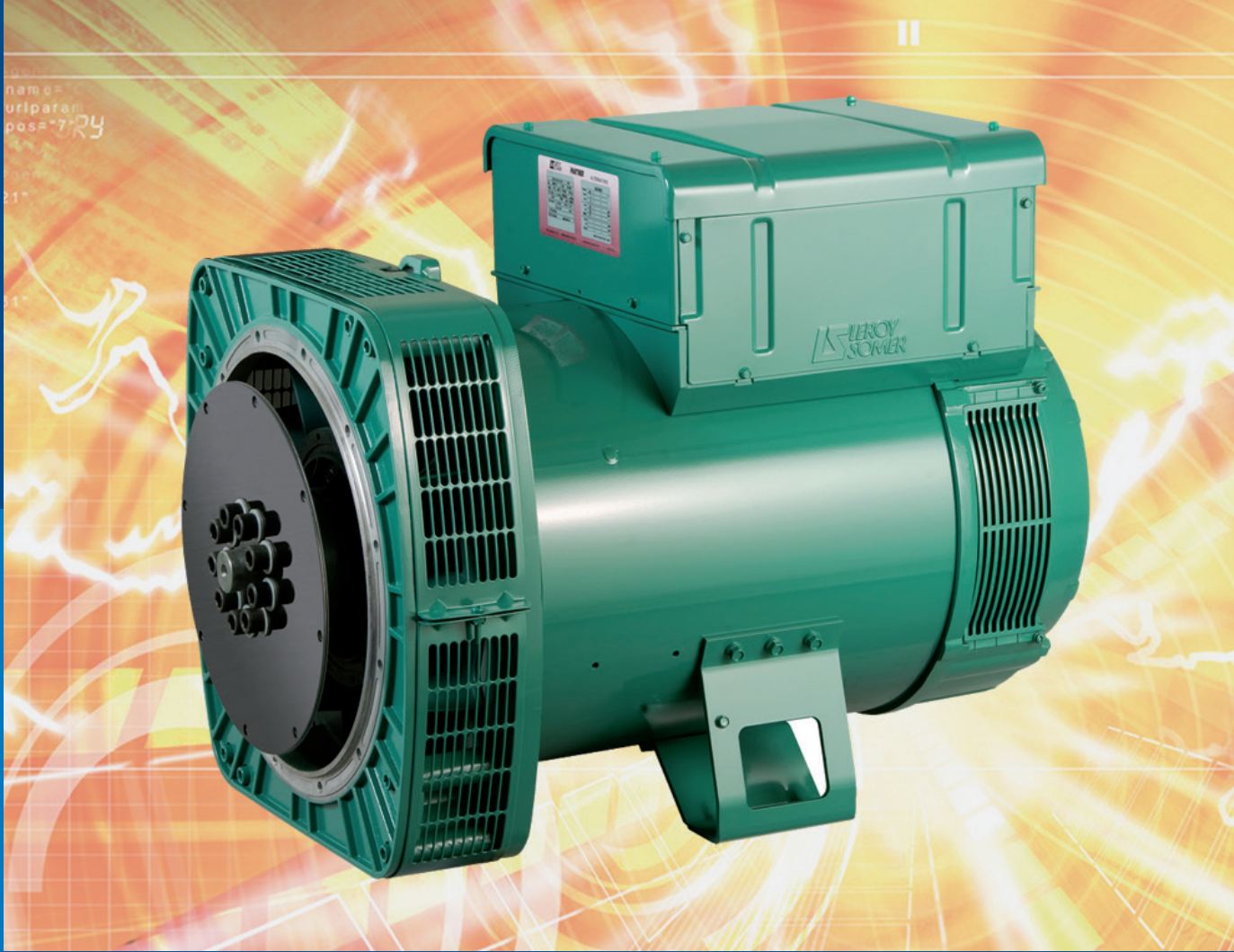




Low Voltage Alternators - 4 pole

LSA 44.3

70 to 150 kVA - 50 Hz / 88 to 188 kVA - 60 Hz
Electrical and mechanical data

Leroy-Somer™


EMERSON™
Industrial Automation

Low Voltage Alternators - 4 pole

LSA 44.3 - 70 to 150 kVA - 50 Hz / 88 to 188 kVA - 60 Hz

Specially adapted to applications

The LSA 44.3 alternator is designed to be suitable for typical generator applications, such as: backup, marine applications, rental, telecommunications, etc.

Compliant with international standards

The LSA 44.3 alternator conforms to the main international standards and regulations:

- IEC 60034, NEMA MG 1.32-33, ISO 8528-3, CSA / UL 1146 (UL 1004 on request), marine regulations, etc.

It can be integrated into a CE marked generator.

The LSA 44.3 is designed, manufactured and marketed in an ISO 9001 environment and ISO 14001.

Top of the range electrical performance

- Class H insulation.
- Standard 12 wire re-connectable winding, 2/3 pitch, type no. 6.
- Voltage range:
 - 50 Hz: 220 V - 240 V and 380 V - 415 V (440 V)
 - 60 Hz: 208 V - 240 V and 380 V - 480 V
- High efficiency and motor starting capacity.
- Other voltages are possible with optional adapted windings:
 - 50 Hz: 440 V (no. 7), 500 V (no. 9), 690 V (n°10 or 52)
 - 60 Hz: 380 V and 416 V (no. 8), 600 V (no. 9)
- R 791 interference suppression conforming to standard EN 55011 group 1 class B standard for European zone (CE marking).



Reinforced mechanical structure using finite element modelling

- Compact rigid assembly to better withstand generator vibrations.
- Steel frame and terminal box.
- Aluminium flanges and shields.
- Two-bearing and single-bearing versions designed to be suitable for commercially-available heat engines.
- Half-key balancing two bearing.
- Permanently greased bearings (20 000h).
- Direction of rotation : clockwise and anti-clockwise (without derating).

Excitation and regulation system suited to the application

Excitation system				Regulation options				
Voltage A.V.R.	SHUNT	AREP	PMG	Current transformer for paralleling	Mains paralleling	3 phase sensing	3 phase sensing on mains paralleling unbalanced	Remote voltage
R 250	Std	-	-	-	-	-	-	-
R 438	-	Std	Std	C.T.	R726	R 731	R 734	√
R450T	Option	Option	Option	C.T.	R726	-	R 734	√
D510C	Option	Option	Option	C.T.	included	included	contact factory	√

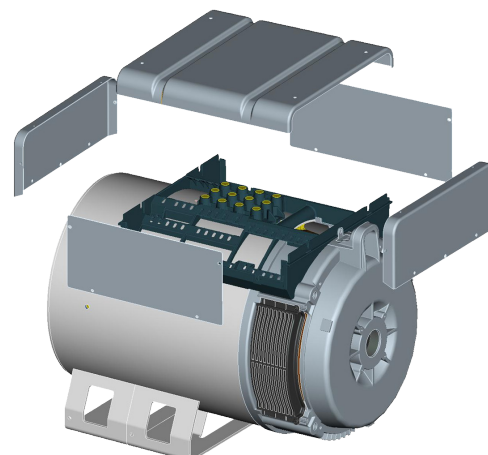
√: Possible mounting.

Compact and design terminal box

- Easy access to the AVR (lid) and to the connections.
- Terminal block for reconnecting the voltage.

Protection system suited to the environment

- The LSA 44.3 is IP 23.
- Standard winding protection for clean environments with relative humidity $\leq 95\%$, including indoor marine environments.
- Options :
 - filters on air inlet : derating 5%,
 - filters on air inlet and air outlet (IP 44) : derating 10%,
 - space heaters,
 - thermal protection for stator windings,
 - winding protection for harsh environments and relative humidity greater than 95%,
 - shaft height : H = 225 mm on demand,
 - cable outlet at right.



Low Voltage Alternators - 4 pole

LSA 44.3 - 70 to 150 kVA - 50 Hz / 88 to 188 kVA - 60 Hz

General characteristics

Insulation class	H	Excitation system	SHUNT	AREP or PMG
Winding pitch	2/3 (wdg 6)	AVR type	R 250	R 438
Number of wires	12	Voltage regulation (*)	± 0.5 %	± 1 %
Protection	IP 23	Short-circuit current	-	300% (3 IN): 10 s
Altitude	≤ 1000 m	Totale Harmonic distortion THD (**) in no-load : < 2%		
Overspeed	2250 min ⁻¹	Totale Harmonic distortion THD (**) on linear load .. : < 5%		
Air flow	0.25m³/s, 50 Hz - 0.30m³/s, 60 Hz	Waveform: NEMA = TIF (**) < 50		

(*) Steady state. (**) between phases.

Ratings 50 Hz - 1500 R.P.M.

kVA / kW * - P.F. = 0.8																					
Duty/T°C		Continuous duty/40°C					Continuous duty/40°C					Stand-by/40°C					Stand-by/27°C				
Class/T°K		H/125°K					F/105°K					H/150°K					H/163°K				
Phase		3 ph.			1 ph.		3 ph.			1 ph.		3 ph.			1 ph.		3 ph.			1 ph.	
Y		380V	400V	415V	440V	ΔΔ	380V	400V	415V	440V	ΔΔ	380V	400V	415V	440V	ΔΔ	380V	400V	415V	440V	ΔΔ
Δ		220V	230V	240V		230V	220V	230V	240V		230V	220V	230V	240V		230V	220V	230V	240V		230V
YY					220V					220V					220V					220V	
44.3 S2	kVA	70			63	42	64			57	38	74			66	44	77			69	46
	kW	56			50	34	51			46	30	59			53	35	62			55	37
44.3 S3	kVA	80			72	48	73			66	44	84			76	50	88			79	53
	kW	64			58	38	58			53	35	67			61	40	70			63	42
44.3 S4	kVA	90			81	54	82			74	49	95			85	57	100			89	59
	kW	72			65	43	66			59	39	76			68	46	80			71	47
44.3 S5	kVA	100			90	60	91			82	55	105			95	63	110			99	66
	kW	80			72	48	73			66	44	84			76	50	88			79	53
44.3 M6	kVA	125			113	67	114			102	61	131			118	71	138			124	74
	kW	100			90	54	91			82	49	105			94	57	110			99	59
44.3 M8	kVA	135			122	73	123			111	66	142			128	77	149			134	80
	kW	108			98	58	98			89	53	114			102	62	119			107	64
44.3 L10	kVA	150			135	80	137			123	73	158			142	84	165			149	88
	kW	120			108	64	110			98	58	126			114	67	132			119	70

Ratings 60 Hz - 1800 R.P.M.

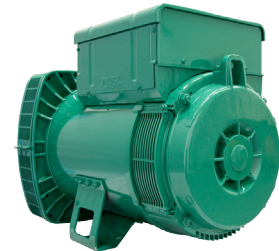
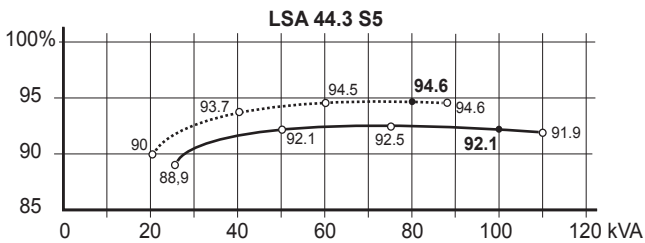
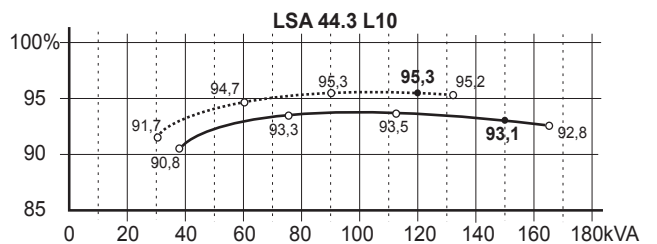
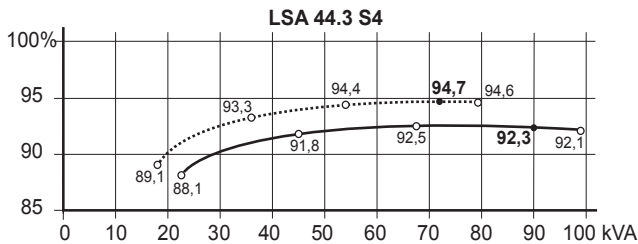
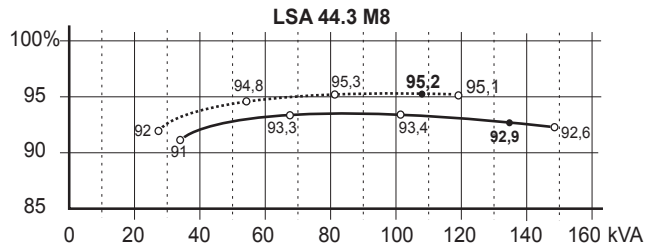
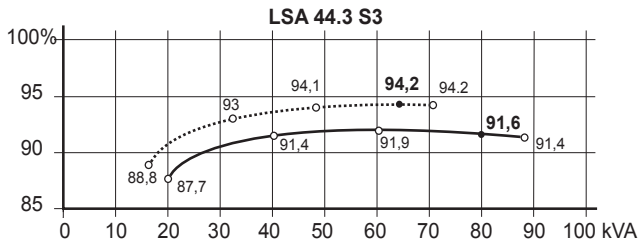
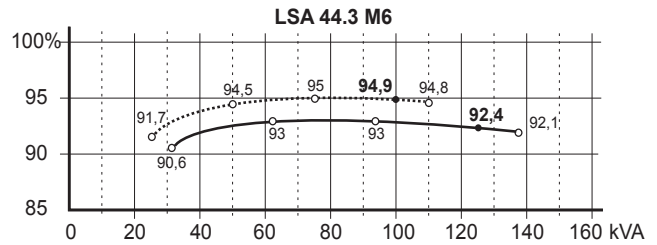
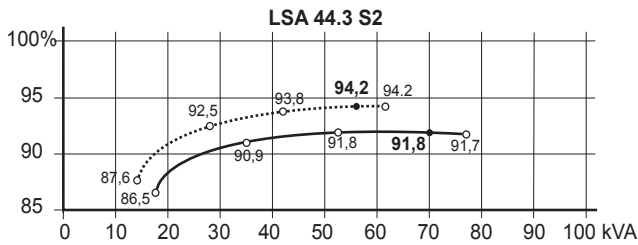
kVA / kW * - P.F. = 0.8																					
Duty/T°C		Continuous duty/40°C					Continuous duty/40°C					Stand-by/40°C					Stand-by/27°C				
Class/T°K		H/125°K					F/105°K					H/150°K					H/163°K				
Phase		3 ph.			1 ph.		3 ph.			1 ph.		3 ph.			1 ph.		3 ph.			1 ph.	
Y		380V	416V	440V	480V	ΔΔ	380V	416V	440V	480V	ΔΔ	380V	416V	440V	480V	ΔΔ	380V	416V	440V	480V	ΔΔ
Δ		220V	240V		240V		220V	240V		240V		220V	240V		240V		220V	240V		240V	
YY			208V	220V	240V			208V	220V	240V			208V	220V	240V			208V	220V	240V	
44.3 S2	kVA	69	76	80	88	46	63	69	73	80	41	73	80	84	92	48	76	83	88	96	50
	kW	55	61	64	70	37	50	55	58	64	33	58	64	67	74	38	61	66	70	77	40
44.3 S3	kVA	79	87	92	100	52	72	79	83	91	47	83	91	96	105	55	87	95	101	110	57
	kW	63	70	74	80	42	58	63	66	73	38	66	73	77	84	44	70	76	81	88	46
44.3 S4	kVA	89	98	103	113	59	81	89	94	102	53	94	102	108	118	61	98	107	113	124	64
	kW	71	78	82	90	47	65	71	75	82	42	75	82	86	94	49	78	86	90	99	51
44.3 S5	kVA	99	108	115	125	65	90	99	104	114	59	104	114	120	131	68	109	119	126	138	72
	kW	79	86	92	100	52	72	79	83	91	47	83	91	96	105	54	87	95	101	110	58
44.3 M6	kVA	124	135	143	156	76	113	123	130	142	69	130	142	150	164	80	136	149	158	172	83
	kW	99	108	114	125	61	90	98	104	114	55	104	114	120	131	64	109	119	126	138	66
44.3 M8	kVA	134	146	155	169	81	122	133	141	154	73	140	154	162	177	85	147	161	170	186	89
	kW	107	117	124	135	65	98	106	113	123	58	112	123	130	142	68	118	129	136	149	71
44.3 L10	kVA	148	163	172	188	95	135	148	156	171	86	156	171	181	197	100	163	179	189	206	105
	kW	118	130	138	150	76	108	118	125	137	69	125	137	145	158	80	130	143	151	165	84

* Values are rounded-off and are subject to change without notice by the manufacturer.

Low Voltage Alternators - 4 pole

LSA 44.3 - 70 to 150 kVA - 50 Hz / 88 to 188 kVA - 60 Hz

Efficiencies 400 V - 50 Hz (— P.F.: 0.8) (..... P.F.: 1)



Reactances (%). Time constants (ms) - Class H / 400 V

		S2	S3	S4	S5	M6	M8	L10
Kcc	Short-circuit ratio	0.67	0.58	0.60	0.54	0.44	0.43	0.48
Xd	Direct-axis synchro. reactance unsaturated	239	273	258	287	329	323	305
Xq	Quadrature-axis synchro. reactance unsaturated	143	163	155	172	197	194	183
T'do	No-load transient time constant	2308	2308	2211	2211	2154	2112	2077
X'd	Direct-axis transient reactance saturated	10.3	11.8	11.6	12.9	15.2	15.3	14.6
T'd	Short-circuit transient time constant	100	100	100	100	100	100	100
X''d	Direct-axis subtransient reactance saturated	6.2	7.0	7.0	7.7	9.1	9.1	8.8
T''d	Subtransient time constant	10	10	10	10	10	10	10
X''q	Quadrature-axis subtransient reactance saturated	13.2	15.1	14.5	16.1	18.6	18.3	17.4
Xo	Zero sequence reactance unsaturated	0.32	0.96	0.90	0.39	0.04	0.06	0.38
X2	Negative sequence reactance saturated	9.74	11.13	10.75	11.95	13.89	13.78	13.11
Ta	Armature time constant	15.0	15.0	15.0	15.0	15.0	15.0	15.0

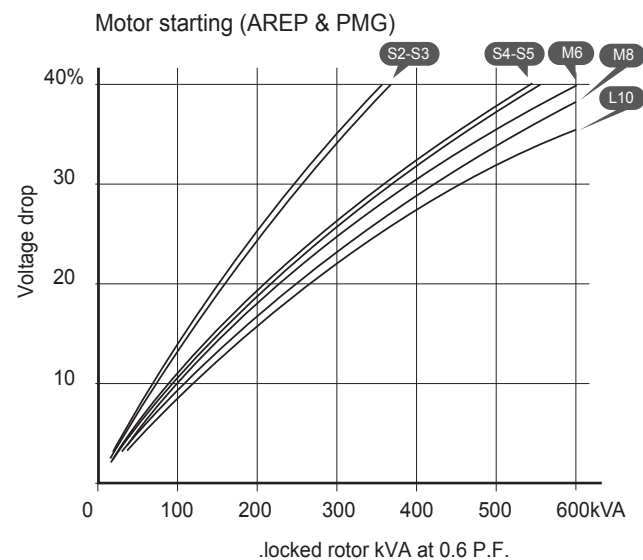
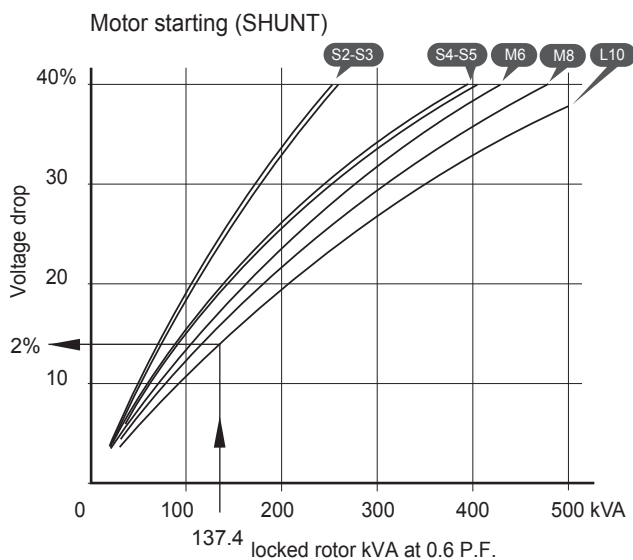
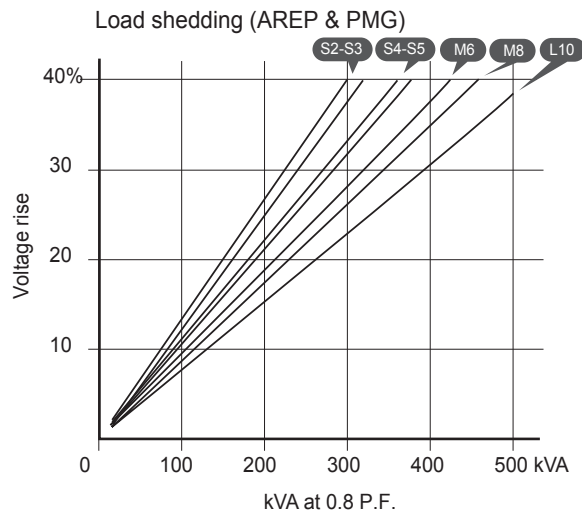
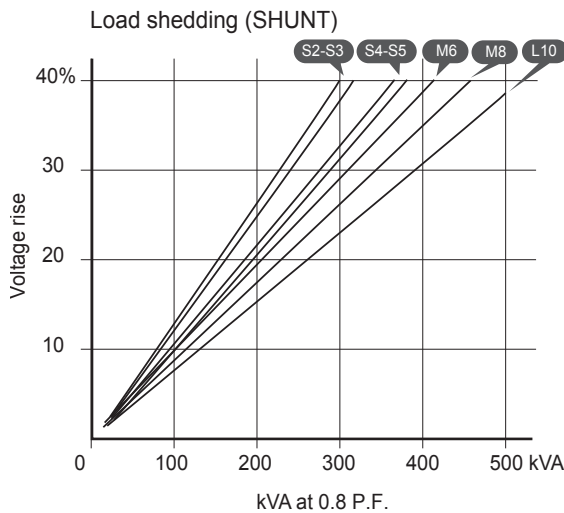
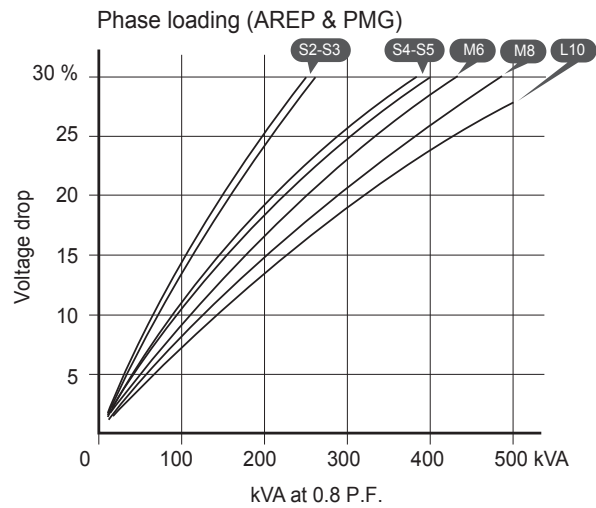
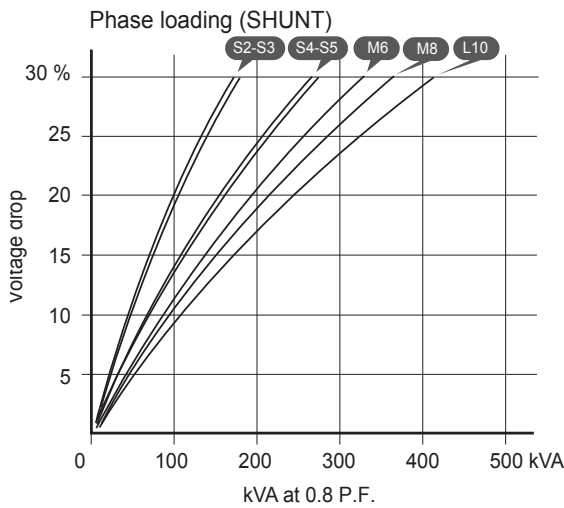
Other class H / 400 V data

io (A)	No-load excitation current (SHUNT/AREP)	0.74 / 0.96	0.74 / 0.96	0.71 / 0.92	0.71 / 0.92	0.65 / 0.83	0.62 / 0.80	0.66 / 0.85
ic (A)	On-load excitation current (SHUNT/AREP)	2.03 / 2.61	2.27 / 2.92	2.06 / 2.65	2.24 / 2.89	2.39 / 3.08	2.30 / 2.97	2.36 / 3.05
uc (V)	On-load excitation voltage (SHUNT/AREP)	22.7 / 18.2	25.1 / 20.2	26 / 20.8	28.2 / 22.6	29.8 / 23.9	28.6 / 22.9	29.1 / 23.3
ms	Response time ($\Delta U = 20\%$ transient)	500	500	500	500	500	500	500
kVA	Start ($\Delta U = 20\%$ cont. or $\Delta U = 30\%$ trans.) SHUNT	185	185	295	295	310	337	390
kVA	Start ($\Delta U = 20\%$ cont. or $\Delta U = 30\%$ trans.) AREP	222	222	354	354	372	405	468
%	Transient ΔU (on-load 4/4) SHUNT - P.F.: 0.8 _{LAG}	13.3	14.5	11.6	12.4	13.8	13.8	13.4
%	Transient ΔU (on-load 4/4) AREP - P.F.: 0.8 _{LAG}	10.3	11.2	9.2	9.7	10.7	10.7	10.5
W	No-load losses	2108	2108	2317	2317	2320	2412	2813
W	Heat dissipation	4950	5810	5944	6789	8174	8232	8873

Low Voltage Alternators - 4 pole

LSA 44.3 - 70 to 150 kVA - 50 Hz / 88 to 188 kVA - 60 Hz

Transient voltage variation 400V - 50 Hz



1) For a starting P.F. other than 0.6, the starting kVA must be multiplied by $K = \text{Sine P.F.} / 0.8$

Calculation example for a different P.F. other than 0.6: Starter motor kVA calculated at 0.4 P.F. = 120 kVA

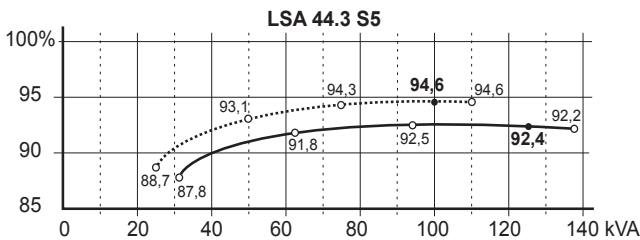
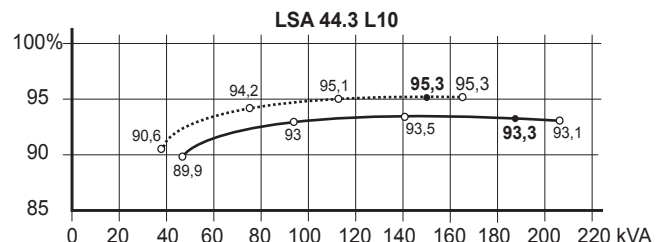
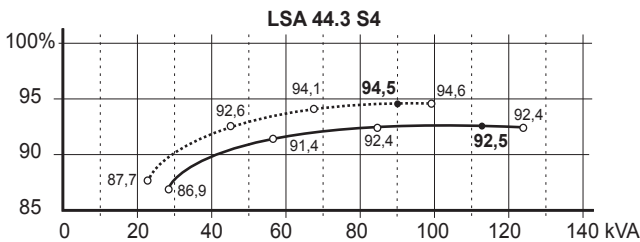
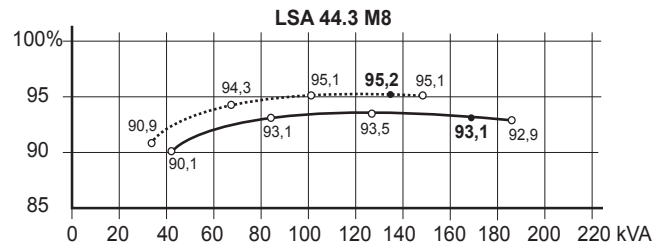
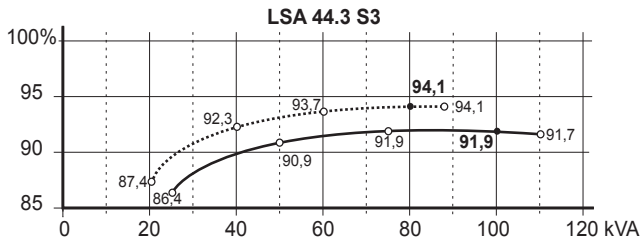
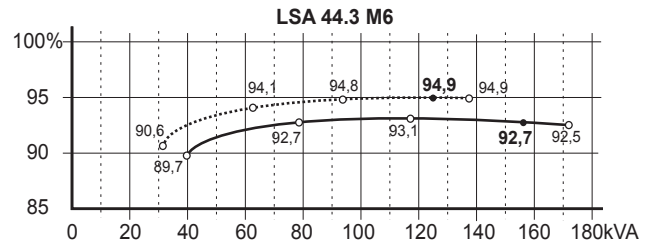
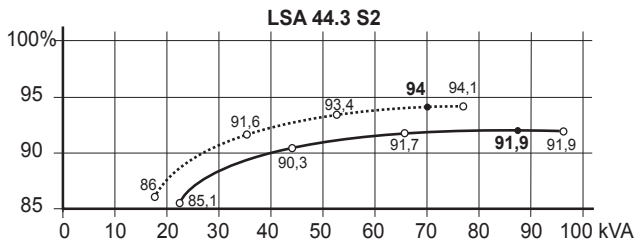
► $\text{Sin P.F. } 0.4 = 0.9165$ ► $K = 1.145$ ► $\text{kVA corrected} = 137.4 \text{ kVA}$ ► Voltage dip corresponding to L10 = 12%.

2) For voltages other than 400V (Y), 230V (Δ) at 50 Hz, then kVA must be multiplied by $(400/U)^2$ or $(230/U)^2$.

Low Voltage Alternators - 4 pole

LSA 44.3 - 70 to 150 kVA - 50 Hz / 88 to 188 kVA - 60 Hz

Efficiencies 480 V - 60 Hz (— P.F.: 0.8) (..... P.F.: 1)



Reactances (%). Time constants (ms) - Class H / 480 V

		S2	S3	S4	S5	M6	M8	L10
Kcc	Short-circuit ratio	0.64	0.56	0.58	0.52	0.42	0.42	0.46
Xd	Direct-axis synchro. reactance unsaturated	248	284	269	299	343	337	317
Xq	Quadrature-axis synchro. reactance unsaturated	149	170	161	179	205	202	190
T'do	No-load transient time constant	2308	2308	2211	2211	2154	2112	2077
X'd	Direct-axis transient reactance saturated	10.7	12.3	12.1	13.5	15.9	15.9	15.3
T'd	Short-circuit transient time constant	100	100	100	100	100	100	100
X''d	Direct-axis subtransient reactance saturated	6.4	7.3	7.3	8.1	9.5	9.5	9.1
T''d	Subtransient time constant	10	10	10	10	10	10	10
X''q	Quadrature-axis subtransient reactance saturated	13.8	15.7	15.1	16.7	19.3	19.1	18.1
Xo	Zero sequence reactance unsaturated	0.41	0.59	0.42	0.41	0.69	0.53	0.13
X2	Negative sequence reactance saturated	10.14	11.59	11.20	12.44	14.47	14.36	13.66
Ta	Armature time constant	15.0	15.0	15.0	15.0	15.0	15.0	15.0

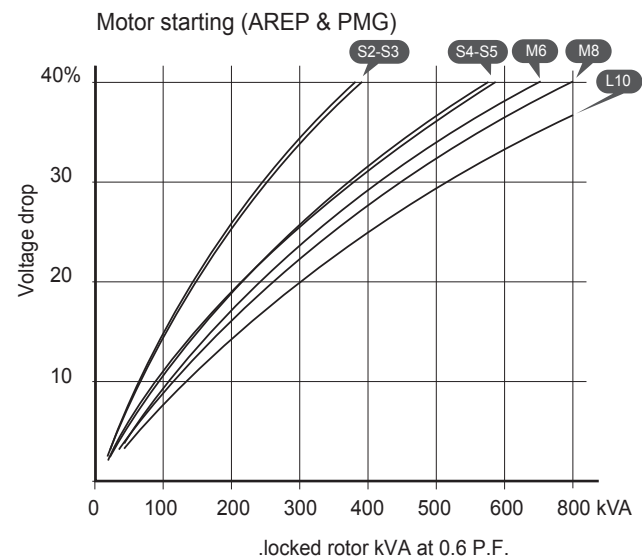
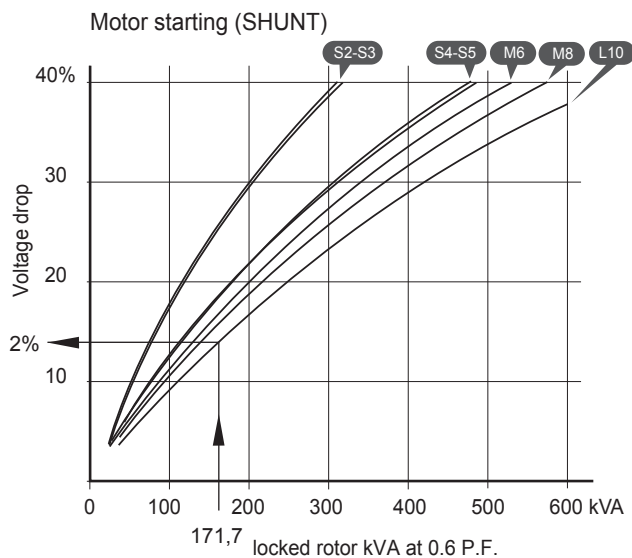
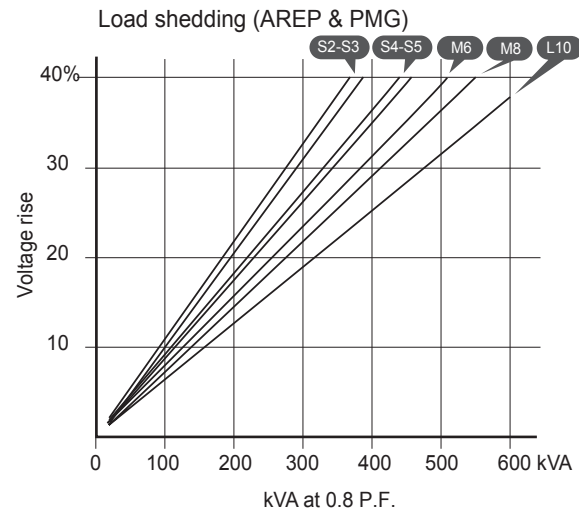
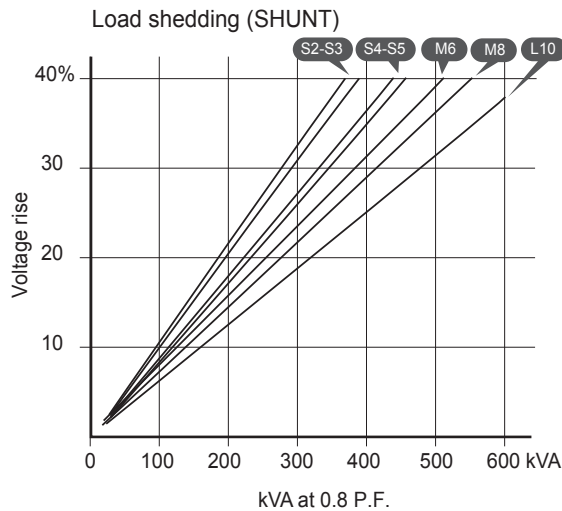
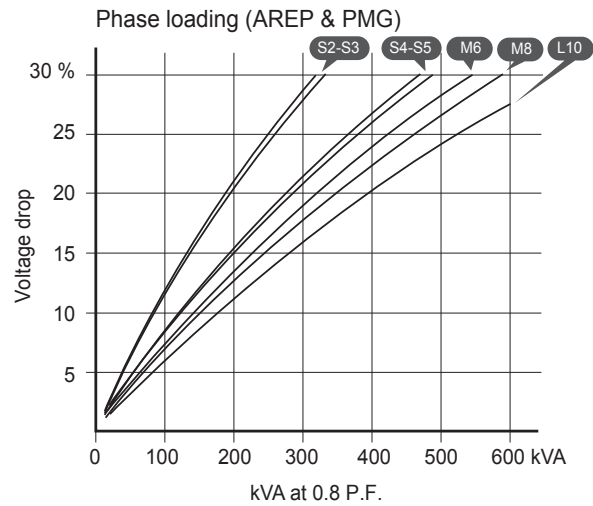
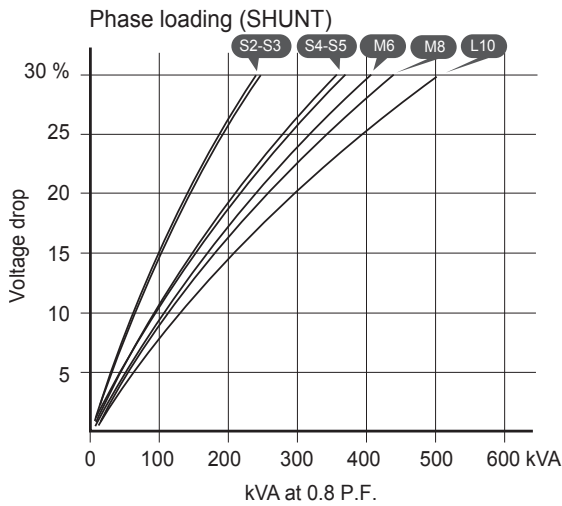
Other class H / 480 V data

io (A)	No-load excitation current (SHUNT/AREP)	0.74 / 0.95	0.74 / 0.95	0.71 / 0.92	0.71 / 0.92	0.65 / 0.83	0.62 / 0.79	0.66 / 0.85
ic (A)	On-load excitation current (SHUNT/AREP)	2.02 / 2.61	2.26 / 2.91	2.08 / 2.68	2.26 / 2.92	2.41 / 3.10	2.32 / 2.98	2.36 / 3.04
uc (V)	On-load excitation voltage (SHUNT/AREP)	22.9 / 18.4	25.4 / 20.4	26.4 / 21.2	28.7 / 23	30.3 / 24.3	29.1 / 23.3	29.5 / 23.7
ms	Response time ($\Delta U = 20\%$ transient)	500	500	500	500	500	500	500
kVA	Start ($\Delta U = 20\%$ cont. or $\Delta U = 30\%$ trans.) SHUNT	222	222	354	354	372	405	468
kVA	Start ($\Delta U = 20\%$ cont. or $\Delta U = 30\%$ trans.) AREP	266	266	425	425	446	486	562
%	Transient ΔU (on-load 4/4) SHUNT - P.F.: 0.8 _{LAG}	13.6	14.9	11.9	12.7	14.2	14.2	13.8
%	Transient ΔU (on-load 4/4) AREP - P.F.: 0.8 _{LAG}	10.6	11.5	9.4	10.0	11.0	11.0	10.7
W	No-load losses	3112	3112	3410	3410	3428	3563	4121
W	Heat dissipation	6096	7039	7257	8187	9757	9864	10663

Low Voltage Alternators - 4 pole

LSA 44.3 - 70 to 150 kVA - 50 Hz / 88 to 188 kVA - 60 Hz

Transient voltage variation 480V - 60 Hz



1) For a starting P.F. other than 0.6, the starting kVA must be multiplied by $K = \text{Sine P.F.} / 0.8$

Calculation example for a different P.F. other than 0.6: Starter motor kVA calculated at 0.4 P.F. = 150 kVA

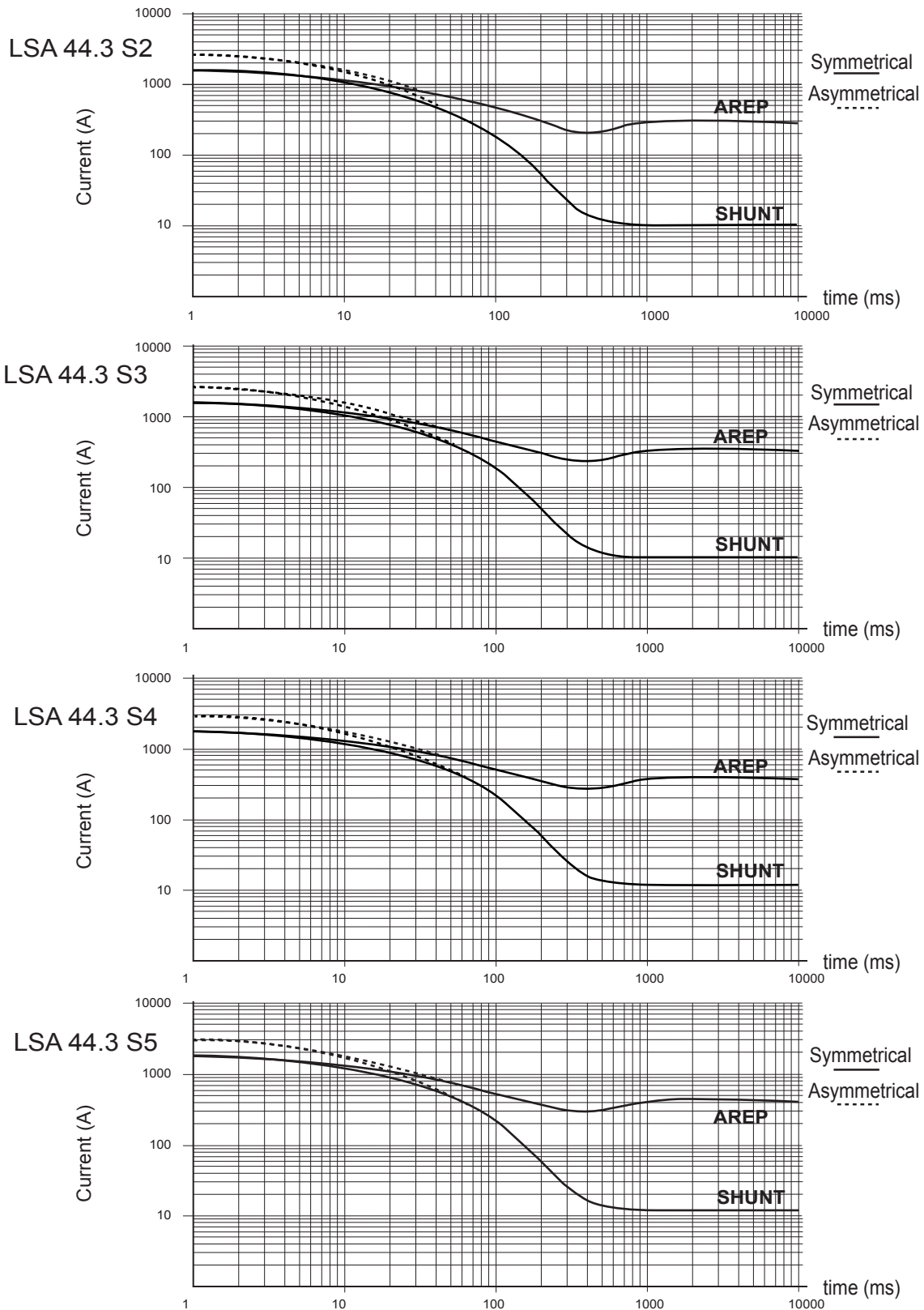
➤ $\text{Sin P.F. } 0.4 = 0.9165$ ➤ $K = 1.145$ ➤ $\text{kVA corrected} = 171.7 \text{ kVA}$ ➤ Voltage dip corresponding to L10 = 12%.

2) For voltages other than 480V (Y), 277V (Δ), 240V (YY) at 60 Hz, then kVA must be multiplied by $(480/U)^2$ or $(277/U)^2$ or $(240/U)^2$.

Low Voltage Alternators - 4 pole

LSA 44.3 - 70 to 150 kVA - 50 Hz / 88 to 188 kVA - 60 Hz

3-phase short-circuit curves at no load and rated speed (star connection Y)



Influence due to connection

Curves shown are for star (Y) connection.

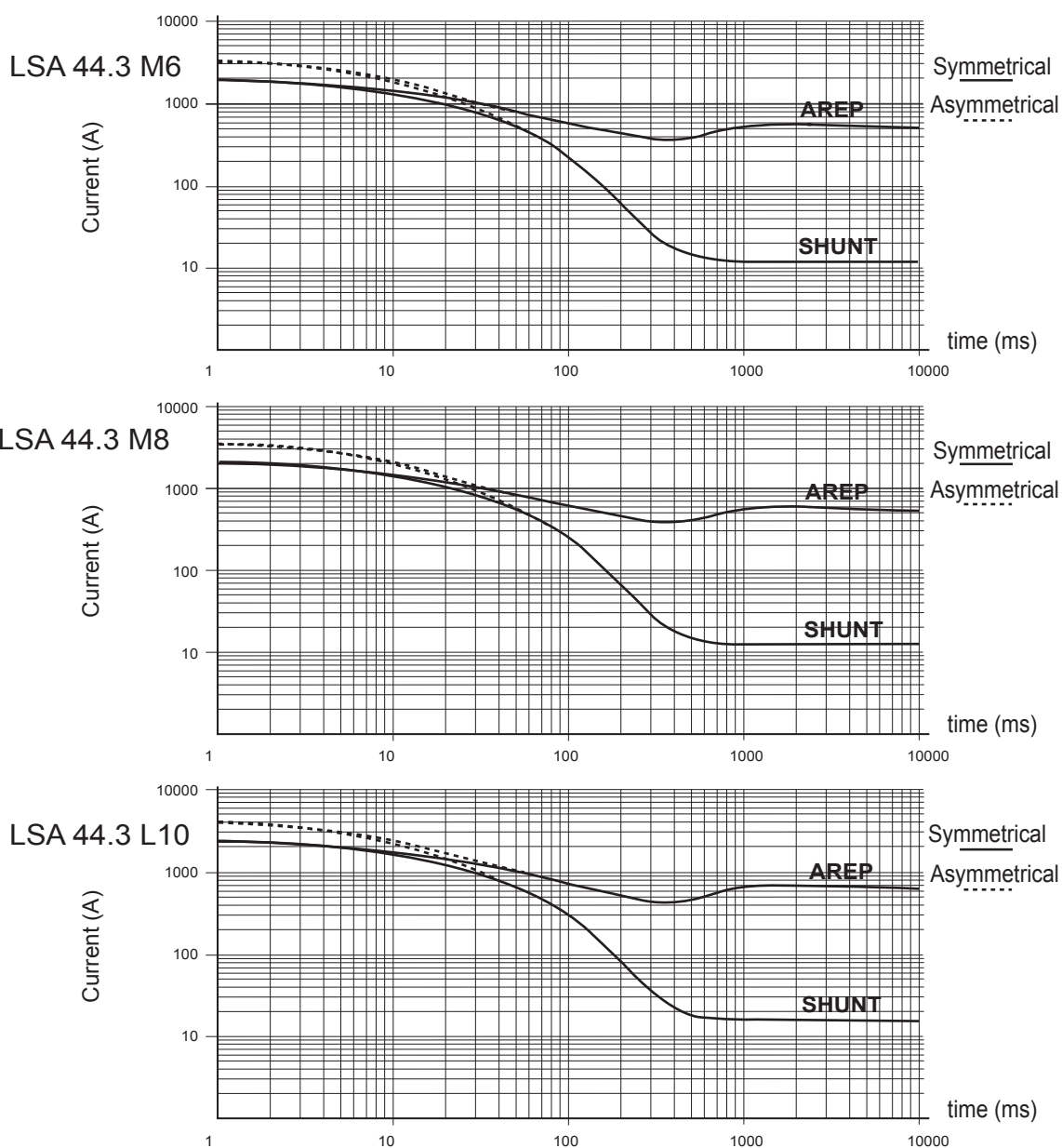
For other connections, use the following multiplication factors:

- Series delta : current value x 1.732 - Parallel star : current value x 2

Low Voltage Alternators - 4 pole

LSA 44.3 - 70 to 150 kVA - 50 Hz / 88 to 188 kVA - 60 Hz

3-phase short-circuit curves at no load and rated speed (star connection Y)



Influence due to short-circuit

Curves are based on a three-phase short-circuit.

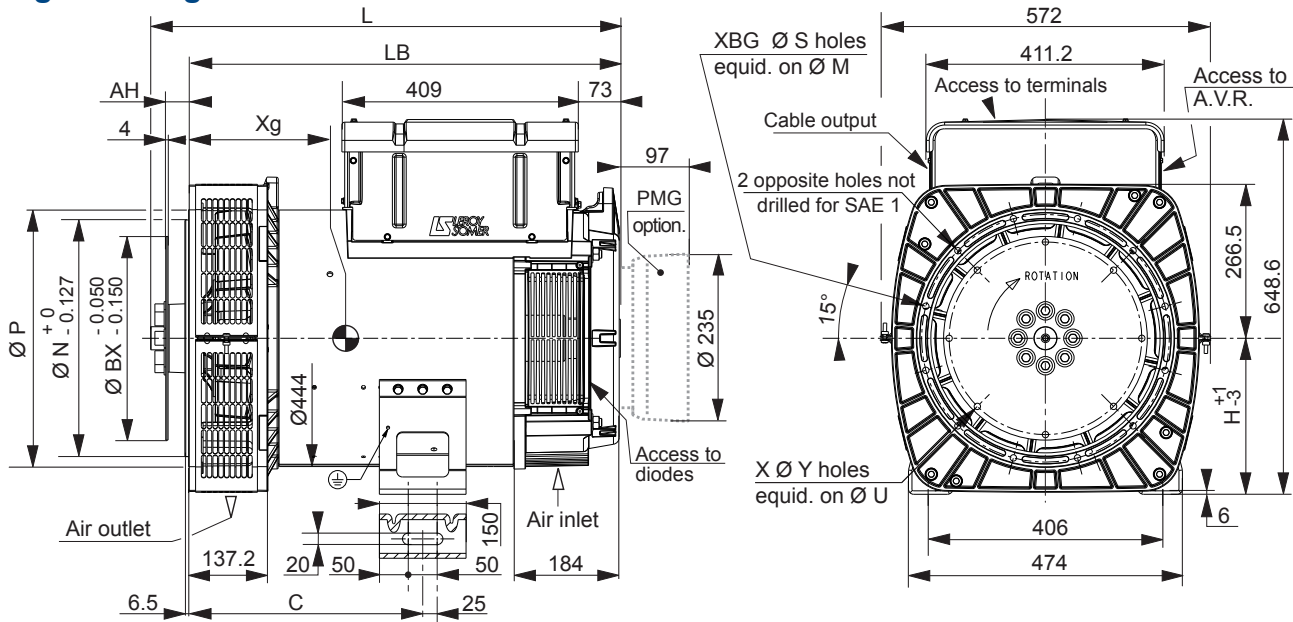
For other types of short-circuit, use the following multiplication factors.

	3-phase	2-phase L/L	1-phase L/N
Instantaneous (max.)	1	0.87	1.3
Continuous	1	1.5	2.2
Maximum duration (AREP/PMG)	10 sec.	5 sec.	2 sec.

Low Voltage Alternators - 4 pole

LSA 44.3 - 70 to 150 kVA - 50 Hz / 88 to 188 kVA - 60 Hz

Single bearing dimensions



Dimensions (mm) and weight

Type	L	LB	Xg	C	H(*)	Weight/kg
LSA 44.3 S2	743	677	313	405	270	295
LSA 44.3 S3	743	677	313	405	270	295
LSA 44.3 S4	743	677	329	405	270	332
LSA 44.3 S5	743	677	329	405	270	332
LSA 44.3 M6	813	747	353	405	270	368
LSA 44.3 M8	813	747	365	405	270	398
LSA 44.3 L10	854	787	383	405	270	433

(*) Shaft height H = 225 optional (C = 332.5 / 406 = 356) drawing available upon request.

Coupling

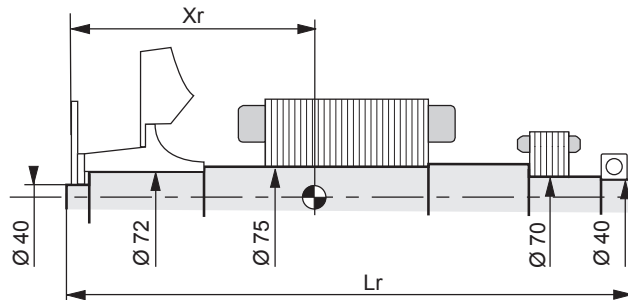
Flange	1	2	3	4
Flex plate				
14	x	-	-	-
11 1/2	x	x	x	-
10	x	x	x	x
8	-	-	x	x

Flange (mm)

S.A.E.	P	N	M	S	XBG	S.A.E.	BX	U	X	Y	AH
4	530	361.95	381	11	12	14	466.72	438.15	8	14	25.4
3	530	409.575	428.62	11	12	11 1/2	352.42	333.38	8	11	39.6
2	530	447.675	466.725	11	12	10	314.32	295.28	8	11	53.8
1	560	511.18	530.22	12	10	8	263.52	244.48	6	11	62

Flex plate (mm)

Torsional analysis data



Centre of gravity: Xr (mm), Rotor length: Lr (mm), Weight: M (kg), Moment of inertia: J (kgm²): (4J = MD²)

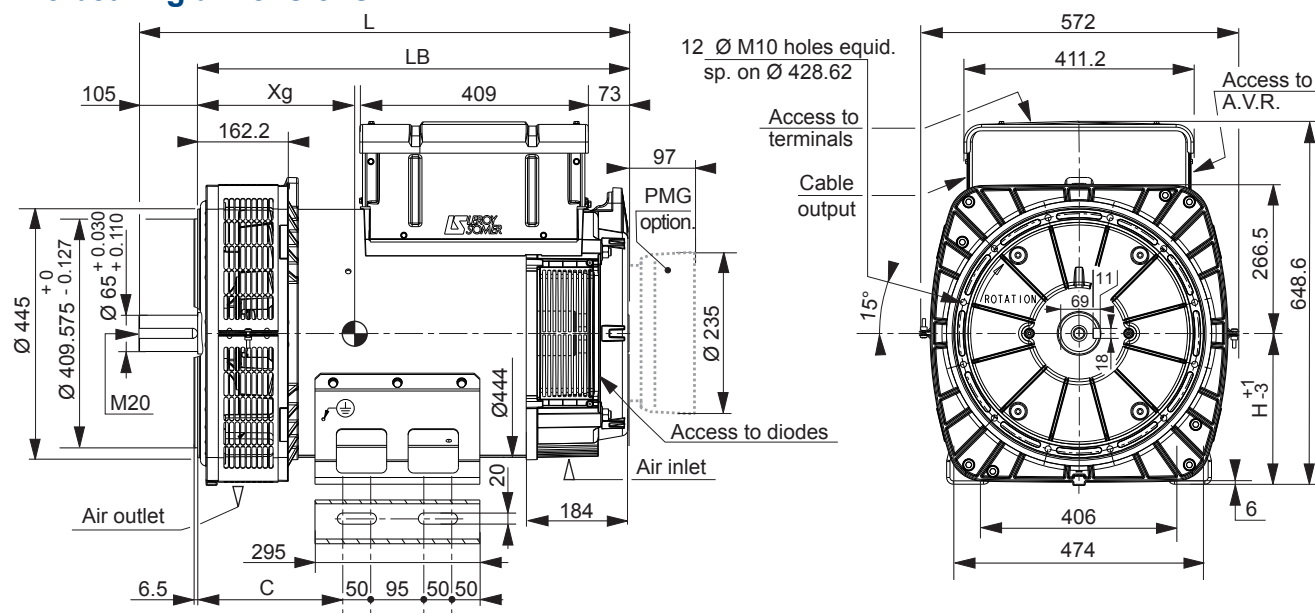
Type	S.A.E. 8				S.A.E. 10				S.A.E. 11 1/2				S.A.E. 14			
	Xr	Lr	M	J	Xr	Lr	M	J	Xr	Lr	M	J	Xr	Lr	M	J
LSA 44.3 S2	356	729	118	0.841	348	729	118	0.854	334	729	117	0.869	320	729	120	0.993
LSA 44.3 S3	356	729	118	0.841	348	729	118	0.854	334	729	117	0.869	320	729	120	0.993
LSA 44.3 S4	376	729	134	0.992	363	729	134	1.005	349	729	133	1.020	335	729	136	1.144
LSA 44.3 S5	376	729	134	0.992	363	729	134	1.005	349	729	133	1.020	335	729	136	1.144
LSA 44.3 M6	394	799	149	1.108	385	799	149	1.121	372	799	148	1.136	357	799	150	1.260
LSA 44.3 M8	411	799	161	1.215	403	799	161	1.228	390	799	160	1.243	375	799	162	1.367
LSA 44.3 L10	431	839	176	1.350	423	839	176	1.363	410	839	175	1.378	395	839	178	1.502

NOTE : Dimensions are for information only and may be subject to modifications. Contractuel 2D drawings can be downloaded from the Leroy-Somer site, 3D drawing files are available upon request.

Low Voltage Alternators - 4 pole

LSA 44.3 - 70 to 150 kVA - 50 Hz / 88 to 188 kVA - 60 Hz

Two bearing dimensions

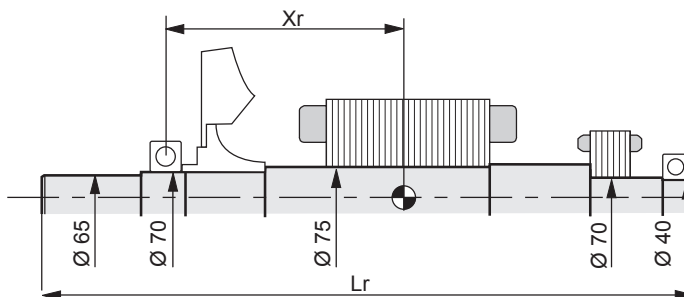


Dimensions (mm) and weight

Type	L	LB	Xg	C	H(*)	Weight/kg
LSA 44.3 S2	807	702	333	260	270	301
LSA 44.3 S3	807	702	333	260	270	301
LSA 44.3 S4	807	702	350	260	270	338
LSA 44.3 S5	807	702	350	260	270	338
LSA 44.3 M6	877	772	373	260	270	374
LSA 44.3 M8	877	772	385	260	270	404
LSA 44.3 L10	907	812	403	260	270	439

(*) Shaft height H = 225 optional (C = 237.5 / 406 = 356) drawing available upon request.

Torsional analysis data



Centre of gravity: Xr (mm), Rotor length: Lr (mm), Weight: M (kg), Moment of inertia: J (kgm²): (4J = MD²)

Type	Xr	Lr	M	J
LSA 44.3 S2	330	793	112	0.815
LSA 44.3 S3	330	793	112	0.815
LSA 44.3 S4	346	793	128	0.966
LSA 44.3 S5	346	793	128	0.966
LSA 44.3 M6	374	863	143	1.082
LSA 44.3 M8	387	863	155	1.189
LSA 44.3 L10	407	903	171	1.324

NOTE : Dimensions are for information only and may be subject to modifications. Contractuel 2D drawings can be downloaded from the Leroy-Somer site, 3D drawing files are available upon request.

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