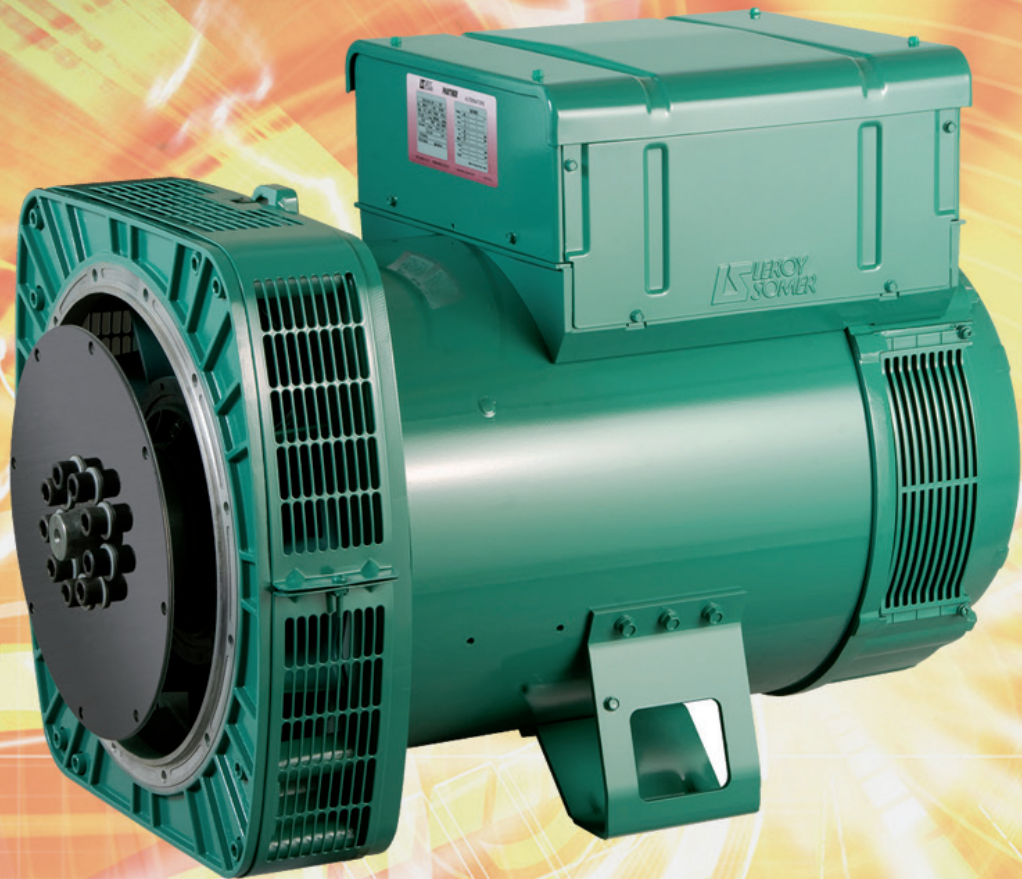


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Low Voltage Alternators - 4 pole

LSA 44.3

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

Leroy-Somer™


EMERSON™

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	√

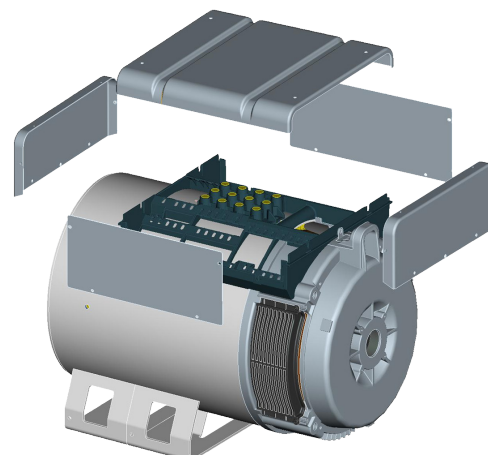
√: Possible mounting.

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 %	± 0.5 %
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	0.25m ³ /s, 50 Hz - 0.30m ³ /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.

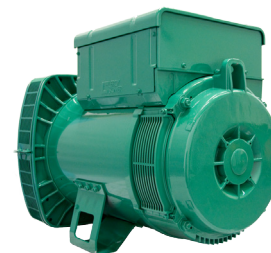
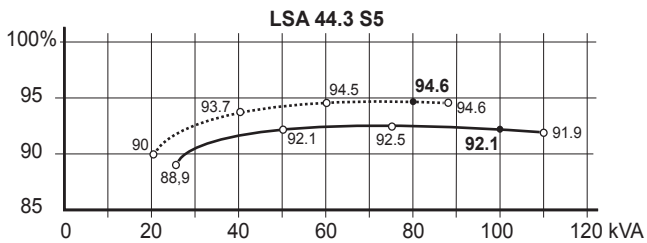
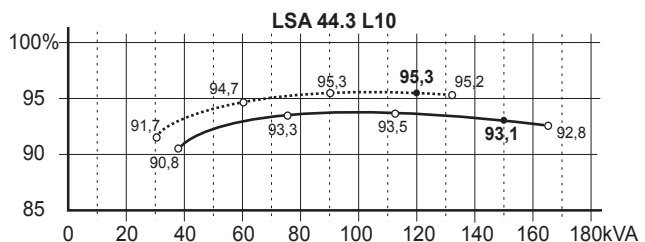
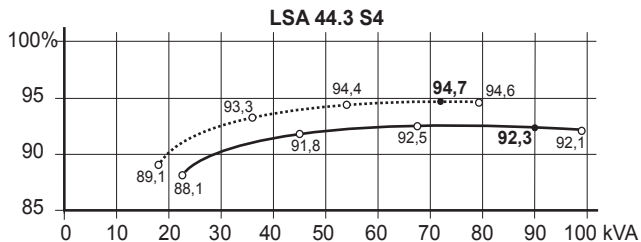
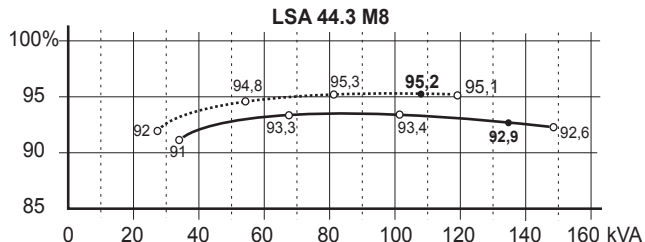
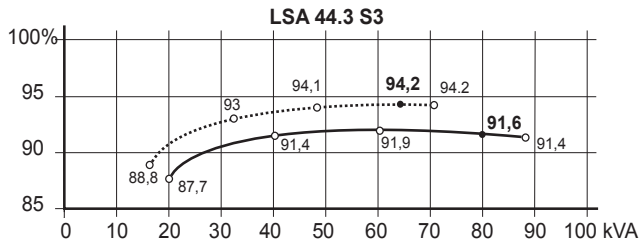
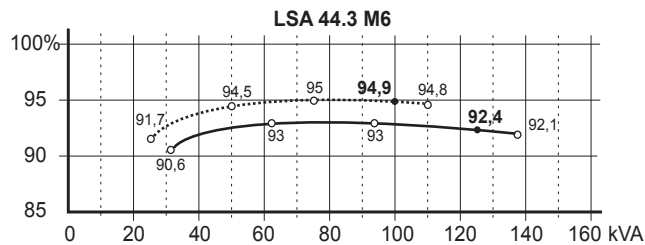
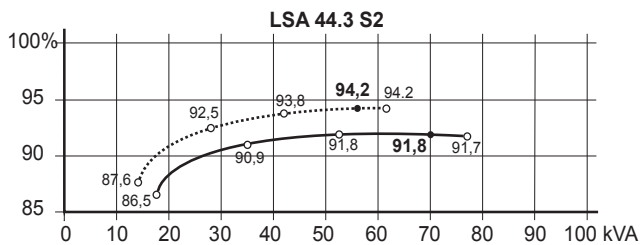
kVA / kW * - P.F. = 0.8																					
Duty/T°C	Continuous duty/40°C					Continuous duty/40°C					Stand-by/40°C			Stand-by/27°C							
Class/T°K	H/125°K					F/105°K					H/150°K			H/163°K							
Phase	3 ph.			1 ph.		3 ph.			1 ph.		3 ph.			1 ph.		3 ph.			1 ph.		
Y	380V	416V	440V	480V	ΔΔ	380V	416V	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

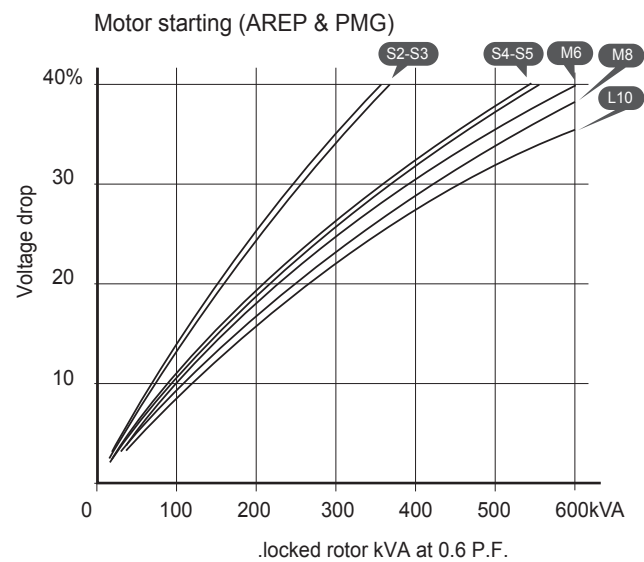
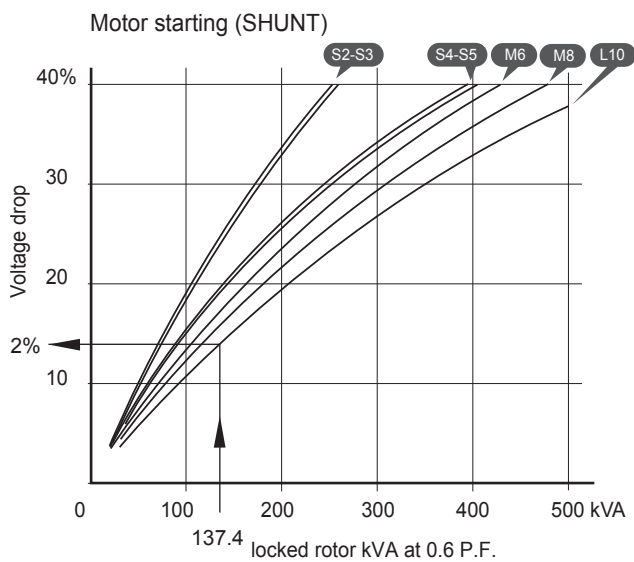
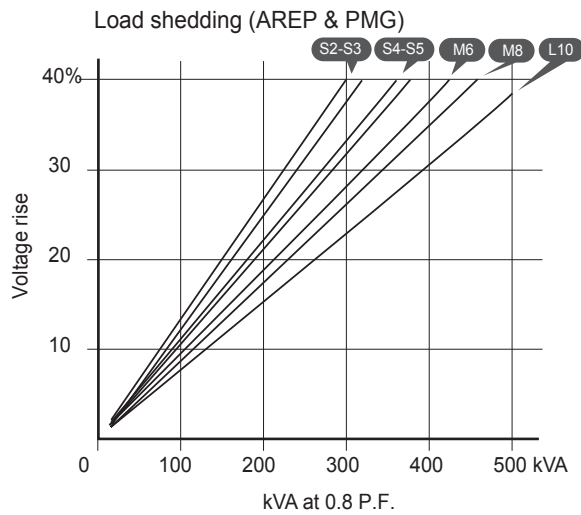
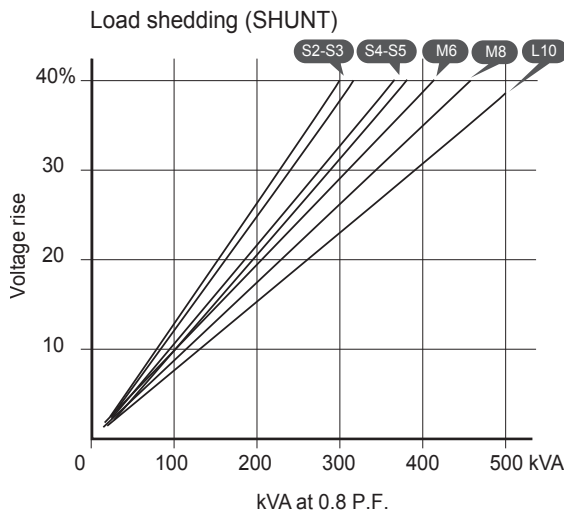
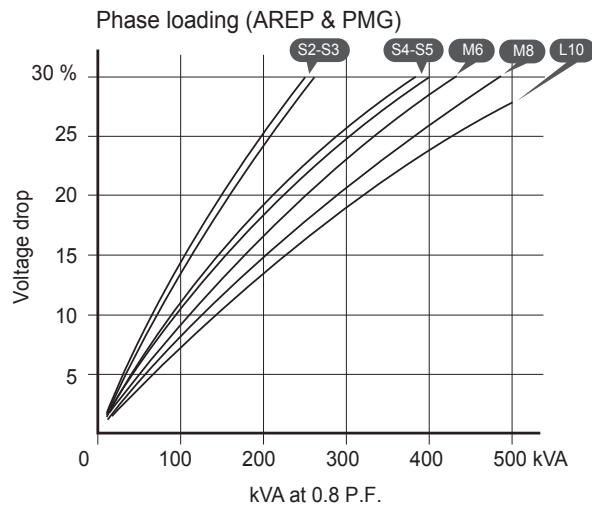
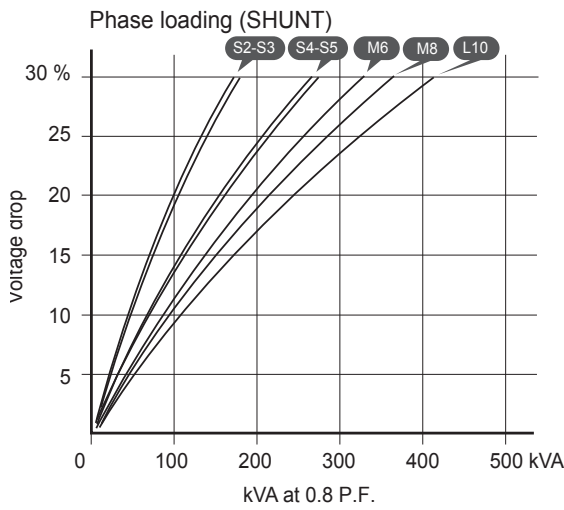
Other class H / 400 V data

	S2	S3	S4	S5	M6	M8	L10
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

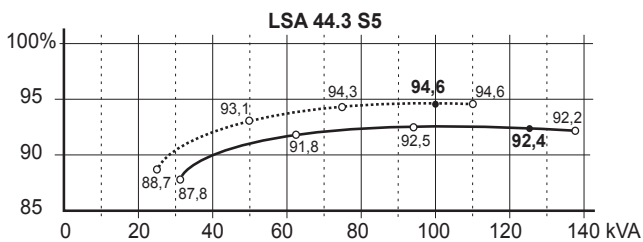
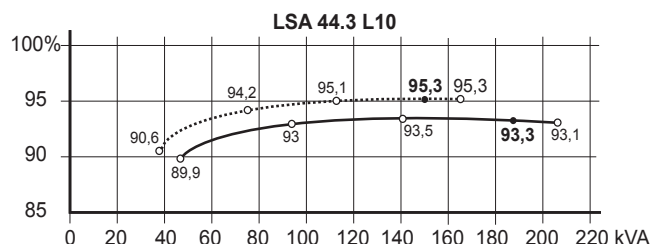
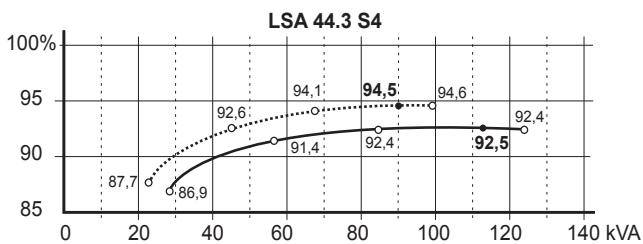
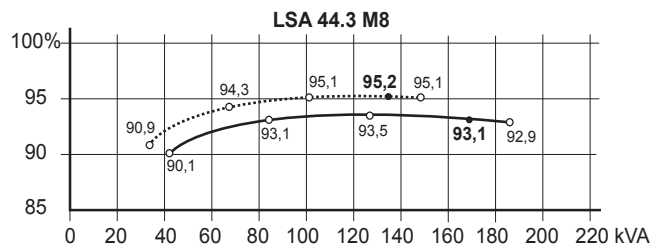
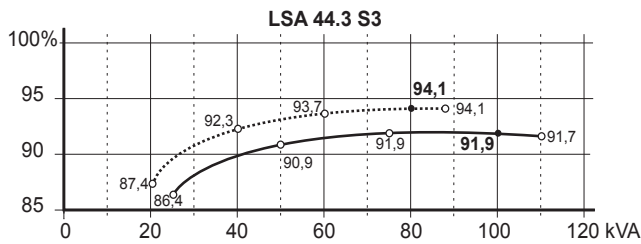
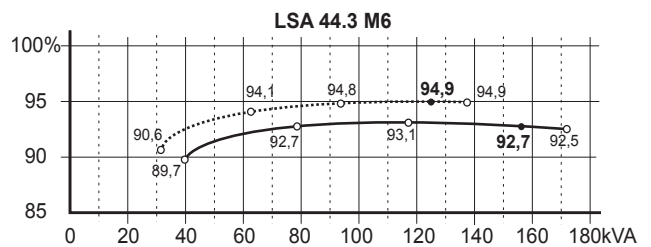
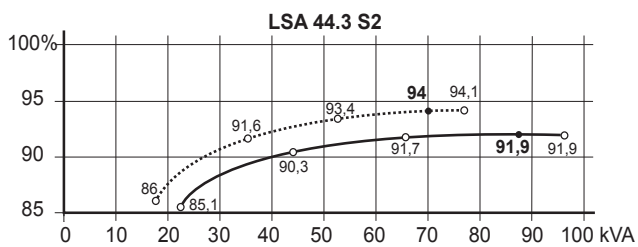


- 1) For a starting P.F. other than 0.6, the starting kVA must be multiplied by $K = \text{Sine P.F.} / 0.8$
 Calculation example for a different P.F. other than 0.6: Starter motor kVA calculated at 0.4 P.F. = 120 kVA
 ➤ $\text{Sin P.F. } 0.4 = 0.9165$ ➤ $K = 1.145$ ➤ $\text{kVA corrected} = 137.4 \text{ kVA}$ ➤ 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

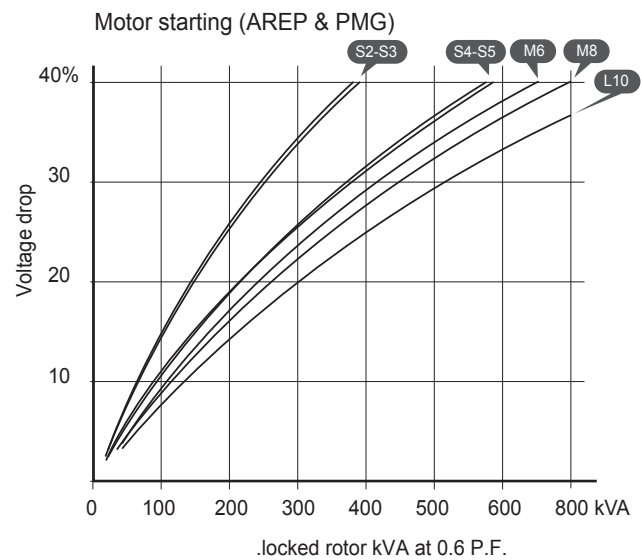
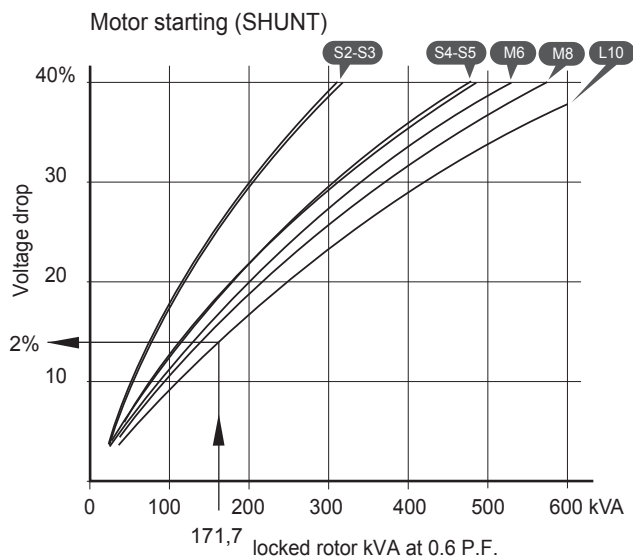
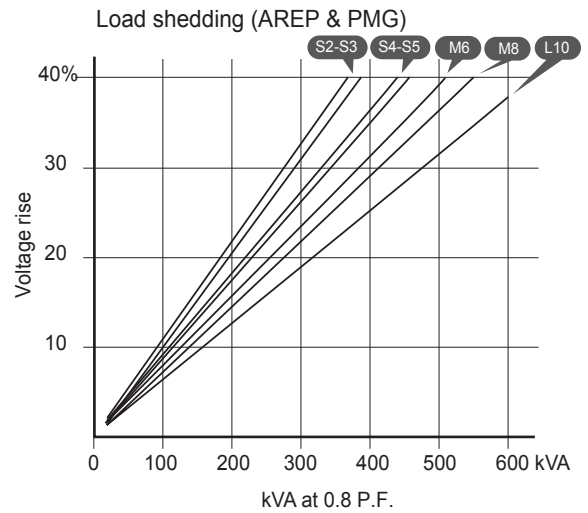
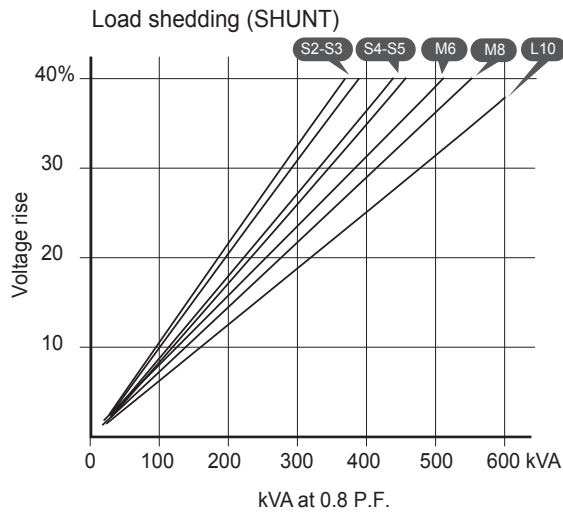
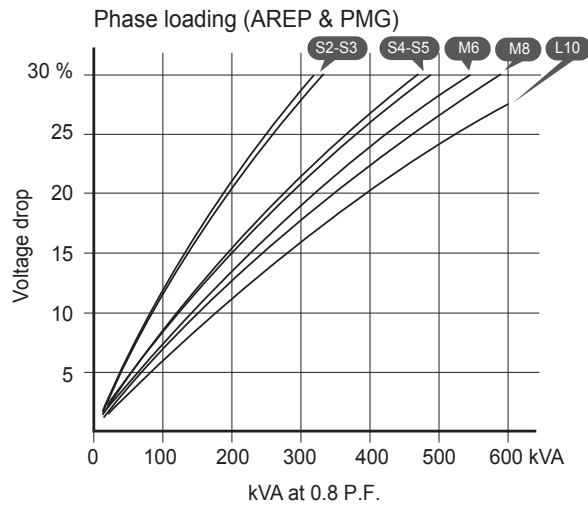
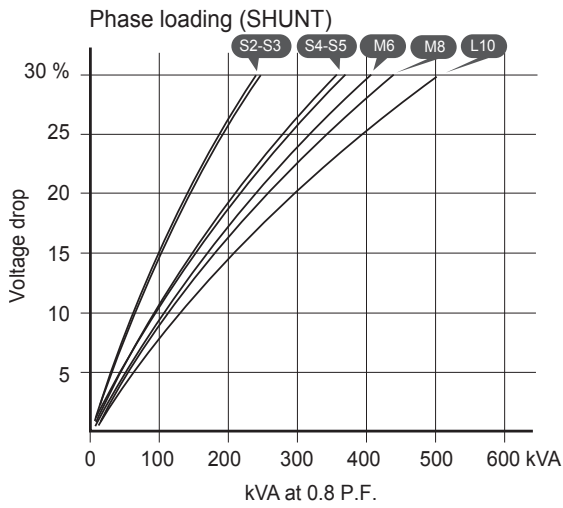
Other class H / 480 V data

	S2	S3	S4	S5	M6	M8	L10
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

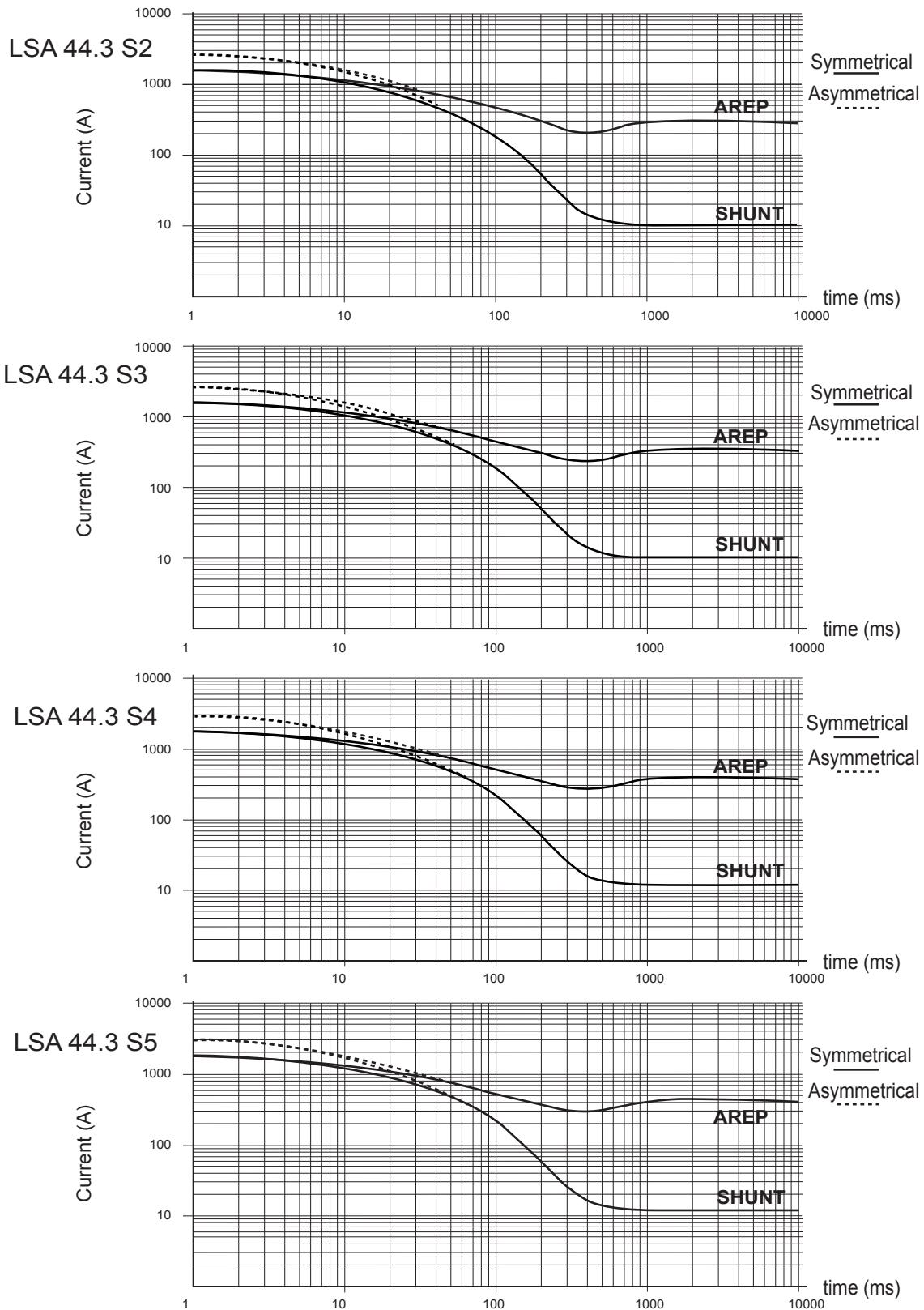


- For a starting P.F. other than 0.6, the starting kVA must be multiplied by $K = \text{Sine P.F.} / 0.8$
 Calculation example for a different P.F. other than 0.6: Starter motor kVA calculated at 0.4 P.F. = 150 kVA
 ➤ $\text{Sin P.F. } 0.4 = 0.9165$ ➤ $K = 1.145$ ➤ $\text{kVA corrected} = 171.7 \text{ kVA}$ ➤ $\text{Voltage dip corresponding to L10} = 12\%$
- 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.

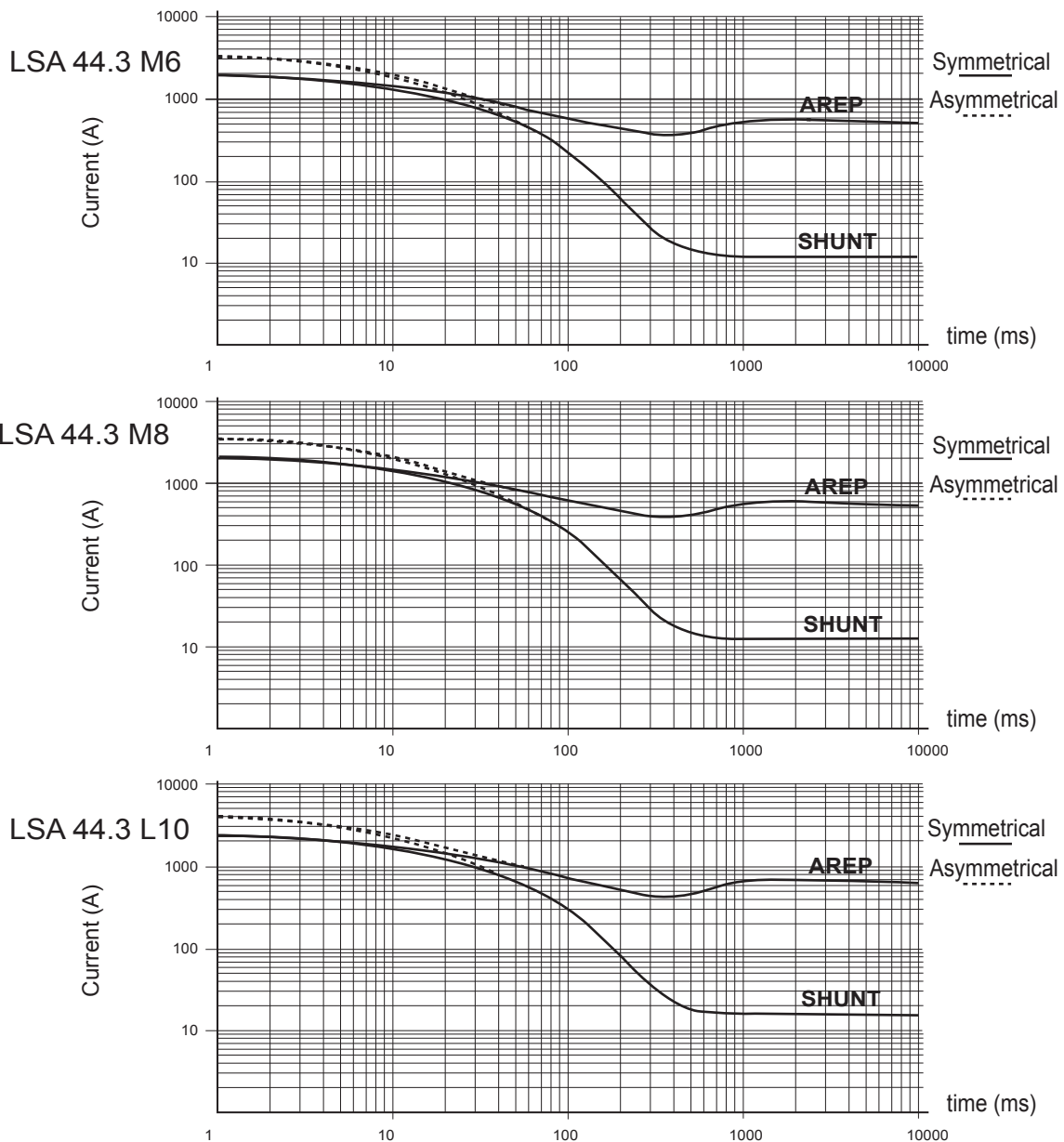
For other connections, use the following multiplication factors:

- 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.

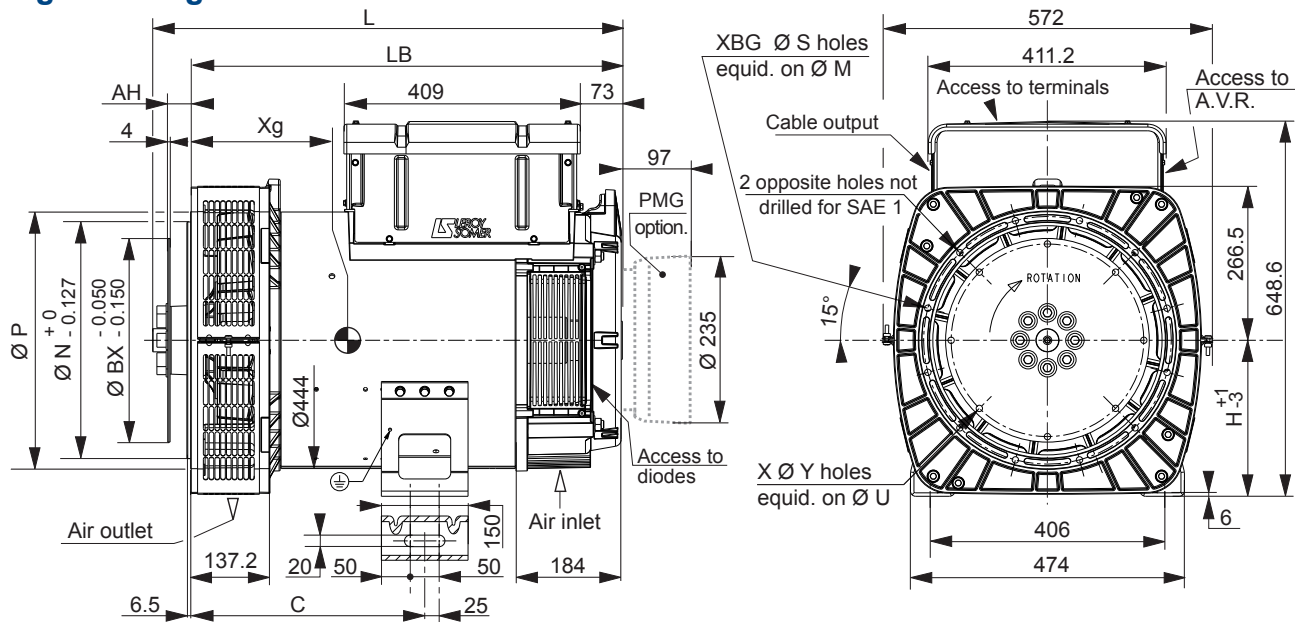
For other types of short-circuit, use the following multiplication factors.

	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

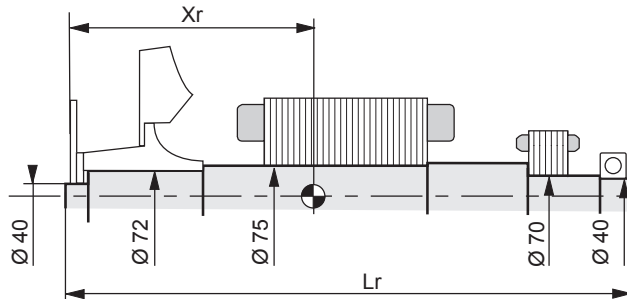


Dimensions (mm) and weight							Coupling				
Type	L	LB	Xg	C	H(*)	Weight/kg	Flange	1	2	3	4
LSA 44.3 S2	743	677	313	405	270	295	Flex plate				
LSA 44.3 S3	743	677	313	405	270	295	14	x	-	-	-
LSA 44.3 S4	743	677	329	405	270	332	11 1/2	x	x	x	-
LSA 44.3 S5	743	677	329	405	270	332	10	x	x	x	x
LSA 44.3 M6	813	747	353	405	270	368	8	-	-	x	x
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.

Flange (mm)						Flex plate (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

Torsional analysis data



Centre of gravity: Xr (mm), Rotor length: Lr (mm), Weight: M (kg), Moment of inertia: J (kgm ²): (4J = MD ²)																
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. The torsional analysis of the transmission is imperative. All values are available upon request.

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