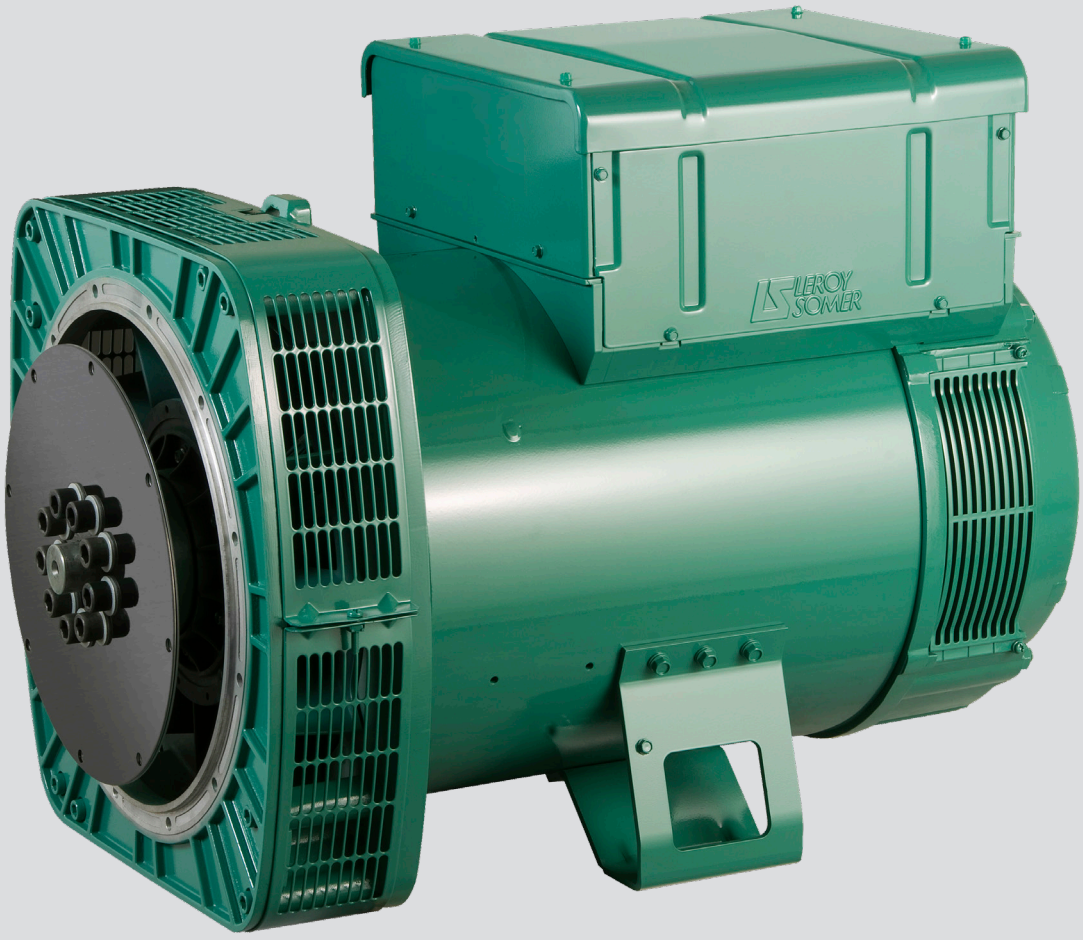


LSA 44.3

Low Voltage Alternators - 4 pole

70 to 165 kVA - 50 Hz / 88 to 206 kVA - 60 Hz
Electrical and mechanical data

LEROY-SOMER™

Nidec
All for dreams

Specially adapted to applications

The LSA 44.3 alternator is designed to be suitable for typical generator applications, such as: backup, prime power, cogeneration, 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 C22.2 n°100-14, UL 1446 (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 61000-6-3, EN 61000-6-2, 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)

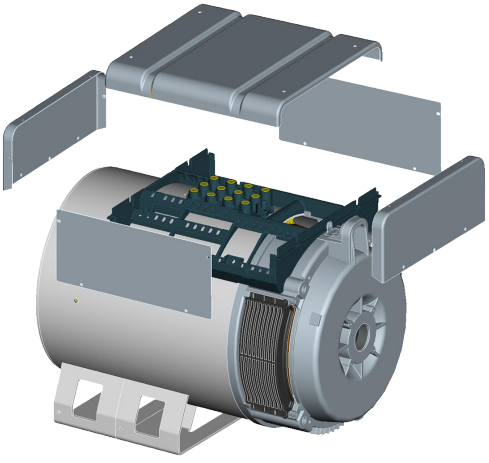
Excitation and regulation system suited to the application

Excitation system				Regulation options			
Voltage regulator	**SHUNT**	**AREP** (option)	**PMG** (option)	**C.T.** Current transformer for paralleling	Mains paralleling	3-phase sensing	Remote voltage potentiometer
R250	**R250**	**-**	**-**	**-**	**-**	**-**	√
R438	**-**	**R438**	**R438**	√	**-**	**-**	√
R450 T	**Option**	**Option**	**Option**	√	**-**	**Included**	√
D510 C	**Option**	**Option**	**Option**	√	**Included**	**Included**	√

√ : 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 ≤ 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

General characteristics

Insulation class	H
Winding pitch	2/3 (wdg 6)
Number of wires	12
Protection	IP 23
Altitude	≤ 1000 m
Overspeed	2250 min^{-1}
Air flow	0.25m^3/s, 50 Hz - 0.30m^3/s, 60 Hz

Excitation system	SHUNT	AREP or PMG
AVR type	R250	R438
Voltage regulation (*)	± 0.5 %	± 0.5 %
Short-circuit current	-	300% (3 IN): 10 s
Total Harmonic Distortion THD (**) in no-load ..... :	< 2%	
Total Harmonic Distortion THD (**) on linear load .. :	< 5%	
Waveform: NEMA = TIF (**)	< 50	

(*) Steady state. (**) Total harmonic distortion between phases, no-load or on-load (non-distorting).

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*
44.3 L12	kVA		**165**		138	88		**150**		125	80		**174**		150	92		**181**		157	96
	kW		*132*		*110*	*70*		*120*		*100*	*64*		*139*		*120*	*74*		*145*		*126*	*77*

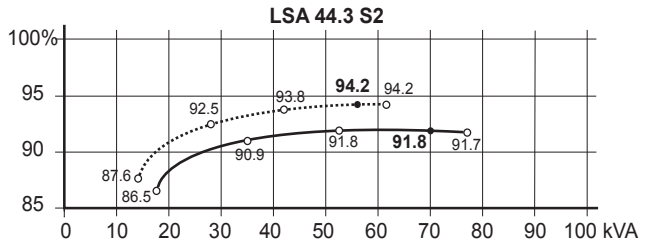
Ratings 60 Hz - 1800 R.P.M.

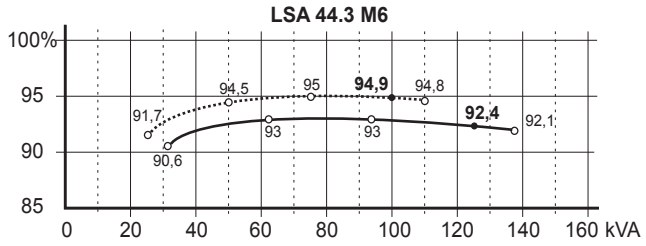
kVA / kW * - P.F. = 0.8

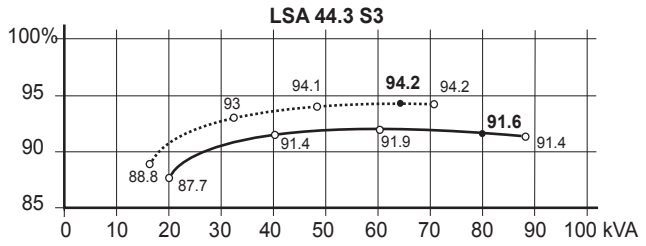
Duty/T°C		Continuous duty/40°C					Continuous duty/40°C					Stand-by/40°C					Stand-by/27°C				
Class/T°K		H/125°K					F/105°K					H/150°K					H/163°K				
Phase		3 ph.				1 ph.	3 ph.				1 ph.	3 ph.				1 ph.	3 ph.				1 ph.
Y		380V	416V	440V	480V	ΔΔ	380V	416V	440V	480V	ΔΔ	380V	416V	440V	480V	ΔΔ	380V	416V	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*
44.3 L12	kVA	165	179	189	**206**	105	150	163	172	**187**	94	173	188	198	**215**	109	180	195	208	**225**	115
	kW	*132*	*143*	*151*	*165*	*84*	*120*	*130*	*138*	*150*	*75*	*138*	*150*	*158*	*172*	*87*	*144*	*156*	*166*	*180*	*92*

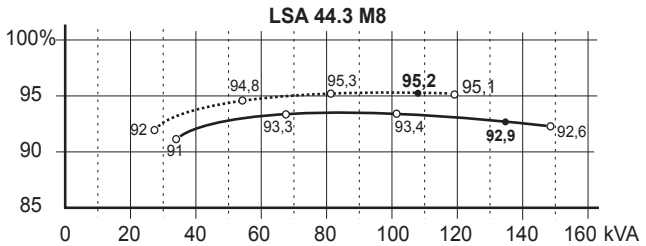
* Values are rounded-off and are subject to change without notice by the manufacturer.

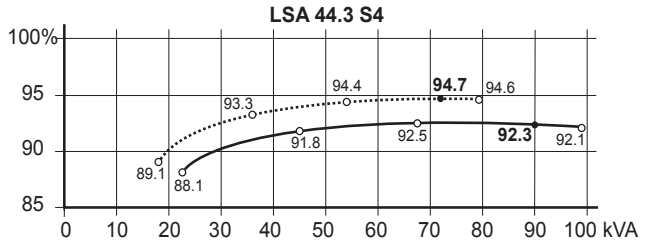
Efficiencies 400 V - 50 Hz (— P.F.: 0.8) (····· P.F.: 1)

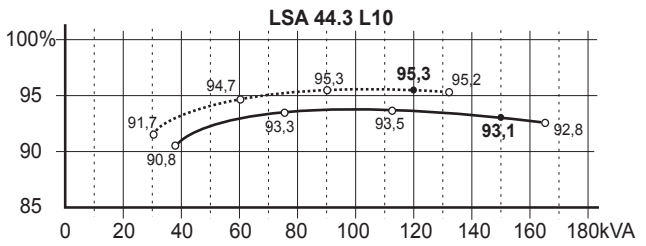


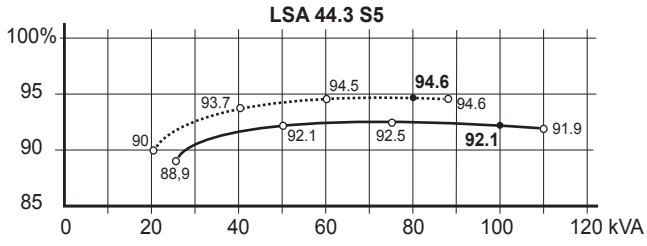


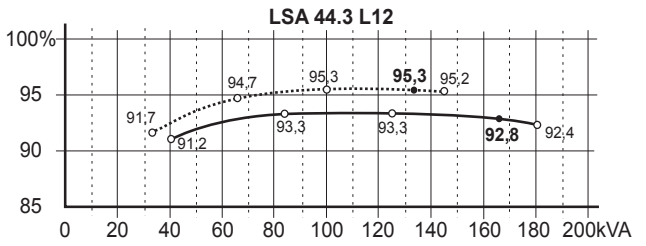












Reactances (%). Time constants (ms) - Class H / 400 V

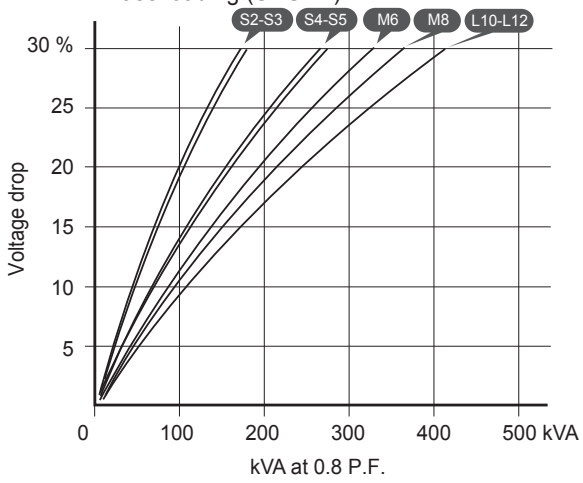
		S2	S3	S4	S5	M6	M8	L10	L12
Kcc	Short-circuit ratio	0.67	0.58	0.60	0.54	0.44	0.43	0.48	0.44
Xd	Direct-axis synchro. reactance unsaturated	239	273	258	287	329	323	305	335
Xq	Quadrature-axis synchro. reactance unsaturated	143	163	155	172	197	194	183	201
T'do	No-load transient time constant	2308	2308	2211	2211	2154	2112	2077	2077
X'd	Direct-axis transient reactance saturated	10.3	11.8	11.6	12.9	15.2	15.3	14.6	16.1
T'd	Short-circuit transient time constant	100	100	100	100	100	100	100	100
X"d	Direct-axis subtransient reactance saturated	6.2	7	7	7.7	9.1	9.1	8.8	9.7
T"d	Subtransient time constant	10	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	19.2
Xo	Zero sequence reactance unsaturated	0.32	0.96	0.90	0.39	0.04	0.06	0.38	0.42
X2	Negative sequence reactance saturated	9.74	11.13	10.75	11.95	13.89	13.78	13.11	14.4
Ta	Armature time constant	15	15	15	15	15	15	15	15

Other class H / 400 V data

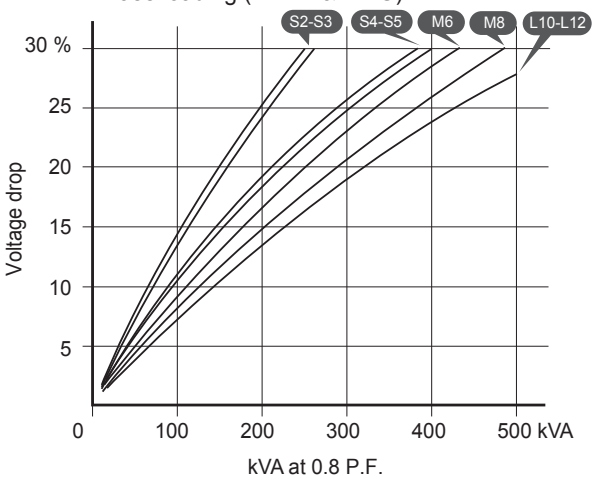
io (A)	No-load excitation current (SHUNT/AREP)	0.74 / 0.96	0.74 / 0.96	0.71 / 0.92	0.71 / 0.92	0.65 / 0.83	0.62 / 0.80	0.66 / 0.85	0.66 / 0.85
ic (A)	On-load excitation current (SHUNT/AREP)	2.03 / 2.61	2.27 / 2.92	2.06 / 2.65	2.24 / 2.89	2.39 / 3.08	2.30 / 2.97	2.36 / 3.05	2.6 / 3.4
uc (V)	On-load excitation 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	33.2 / 26.6
ms	Response time (ΔU = 20% transient)	500	500	500	500	500	500	500	500
kVA	Start (ΔU = 20% cont. or ΔU = 30% trans.) SHUNT	185	185	295	295	310	337	390	390
kVA	Start (ΔU = 20% cont. or ΔU = 30% trans.) AREP	222	222	354	354	372	405	468	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	14.2
%	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	11.2
W	No-load losses	2108	2108	2317	2317	2320	2412	2813	2813
W	Heat dissipation	4950	5810	5944	6789	8174	8232	8873	9600

Transient voltage variation 400V - 50 Hz

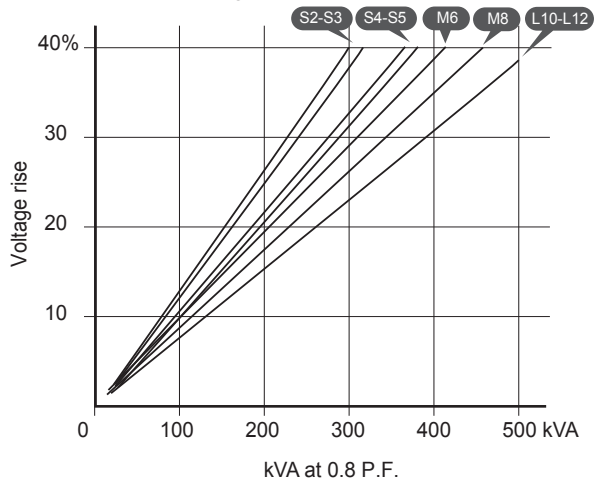
Phase loading (SHUNT)



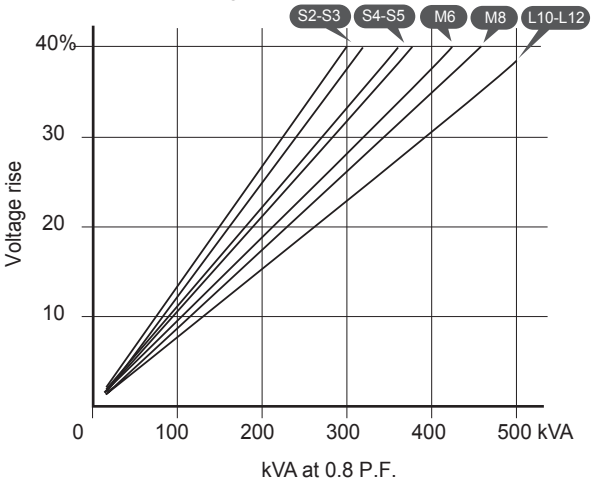
Phase loading (AREP & PMG)



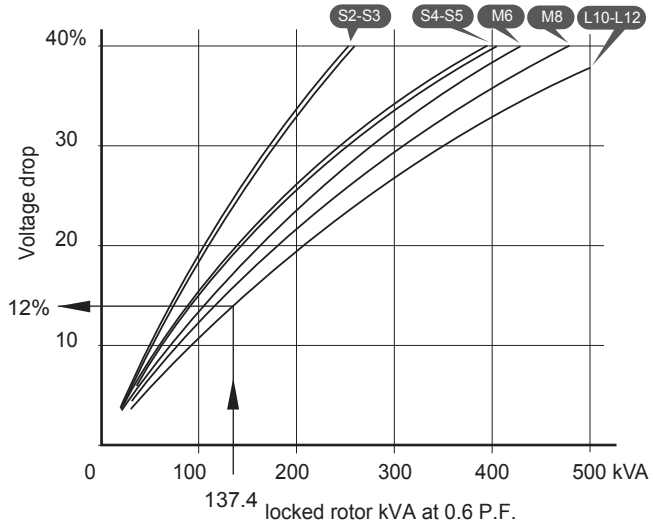
Load shedding (SHUNT)



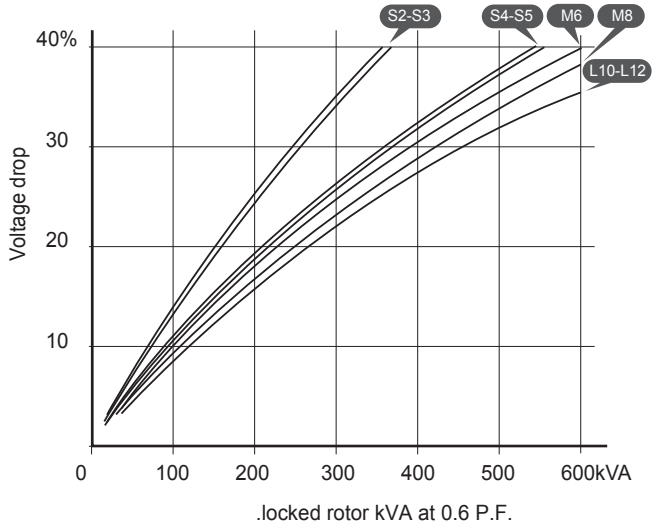
Load shedding (AREP & PMG)



Motor starting (SHUNT)



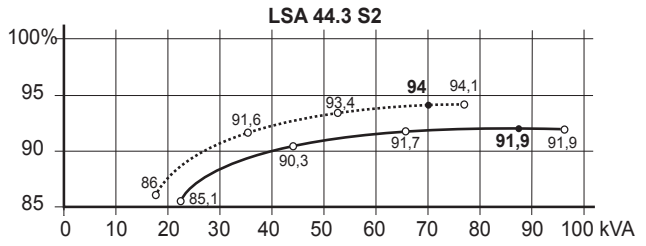
Motor starting (AREP & PMG)

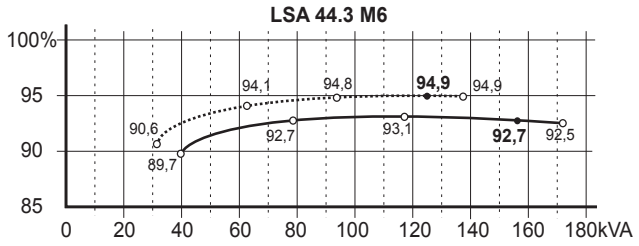


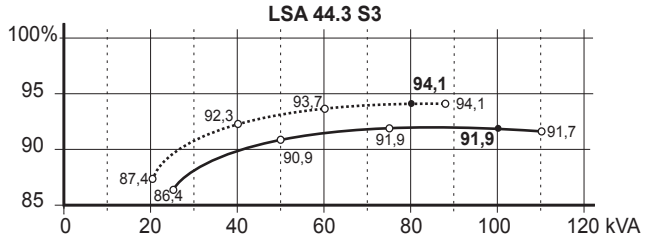
1) For a starting P.F. other than 0.6, the starting kVA must be multiplied by K = Sine P.F. / 0.8
Calculation example for a different P.F. other than 0.6: Starter motor kVA calculated at 0.4 P.F. = 120 kVA ➤ Sin P.F. 0.4 = 0.9165 ➤ K = 1.145 ➤ kVA corrected = 137.4 kVA ➤ Voltage dip corresponding to L10-L12 = 12%.

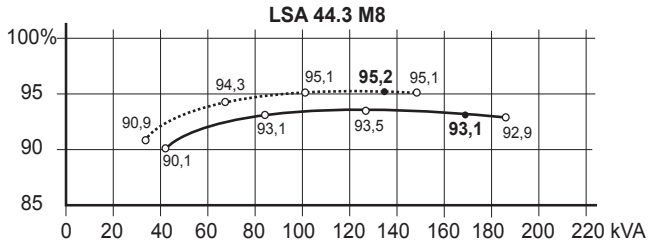
2) For voltages other than 400V (Y), 230V (Δ) at 50 Hz, then kVA must be multiplied by $(400/U)^2$ or $(230/U)^2$.

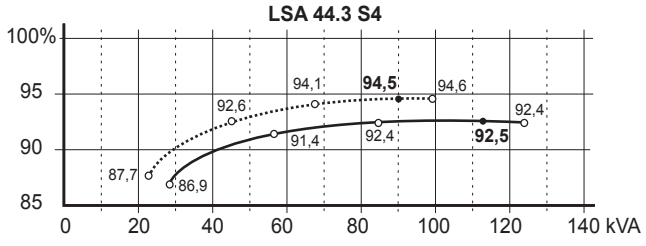
Efficiencies 480 V - 60 Hz (— P.F.: 0.8) (····· P.F.: 1)

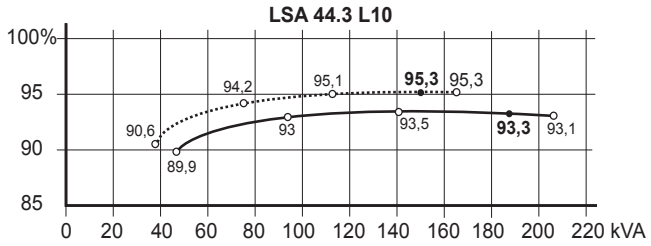


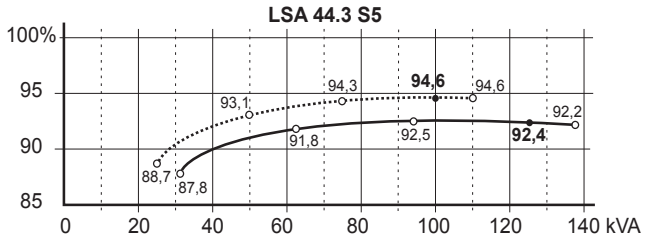


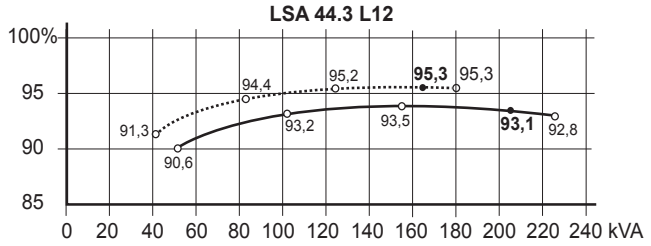












Reactances (%). Time constants (ms) - Class H / 480 V

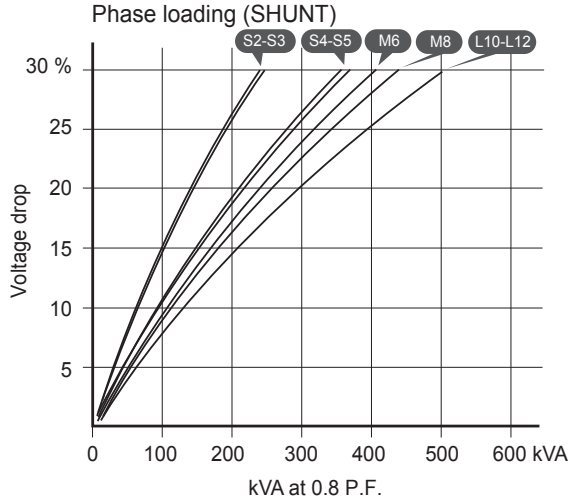
		S2	S3	S4	S5	M6	M8	L10	L12
Kcc	Short-circuit ratio	0.64	0.56	0.58	0.52	0.42	0.42	0.46	0.42
Xd	Direct-axis synchro. reactance unsaturated	248	284	269	299	343	337	317	349
Xq	Quadrature-axis synchro. reactance unsaturated	149	170	161	179	205	202	190	209
T'do	No-load transient time constant	2308	2308	2211	2211	2154	2112	2077	2077
X'd	Direct-axis transient reactance saturated	10.7	12.3	12.1	13.5	15.9	15.9	15.3	16.8
T'd	Short-circuit transient time constant	100	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	10
T"d	Subtransient time constant	10	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	19.9
Xo	Zero sequence reactance unsaturated	0.41	0.59	0.42	0.41	0.69	0.53	0.13	0.145
X2	Negative sequence reactance saturated	10.14	11.59	11.20	12.44	14.47	14.36	13.66	15
Ta	Armature time constant	15	15	15	15	15	15	15	15

Other class H / 480 V data

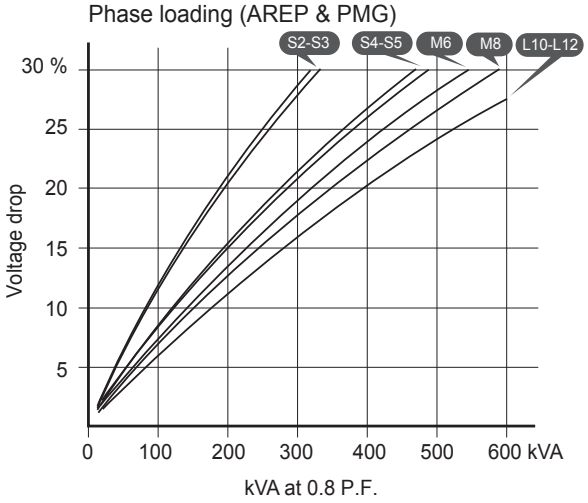
io (A)	No-load excitation current (SHUNT/AREP)	0.74 / 0.95	0.74 / 0.95	0.71 / 0.92	0.71 / 0.92	0.65 / 0.83	0.62 / 0.79	0.66 / 0.85	0.66 / 0.85
ic (A)	On-load excitation current (SHUNT/AREP)	2.02 / 2.61	2.26 / 2.91	2.08 / 2.68	2.26 / 2.92	2.41 / 3.10	2.32 / 2.98	2.36 / 3.04	2.63 / 3.40
uc (V)	On-load 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	32.5 / 26.1
ms	Response time (ΔU = 20% transient)	500	500	500	500	500	500	500	500
kVA	Start (ΔU = 20% cont. or ΔU = 30% trans.) SHUNT	222	222	354	354	372	405	468	468
kVA	Start (ΔU = 20% cont. or ΔU = 30% trans.) AREP	266	266	425	425	446	486	562	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	14.6
%	Transient ΔU (on-load 4/4) AREP - P.F.: 0.8 $_{LAG}$	10.6	11.5	9.4	10	11	11	10.7	11.3
W	No-load losses	3112	3112	3410	3410	3428	3563	4121	4121
W	Heat dissipation	6096	7039	7257	8187	9757	9864	10663	12090

Transient voltage variation 480V - 60 Hz

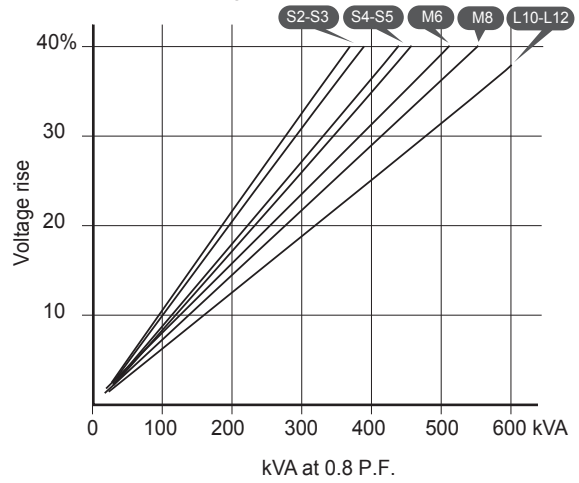
Phase loading (SHUNT)



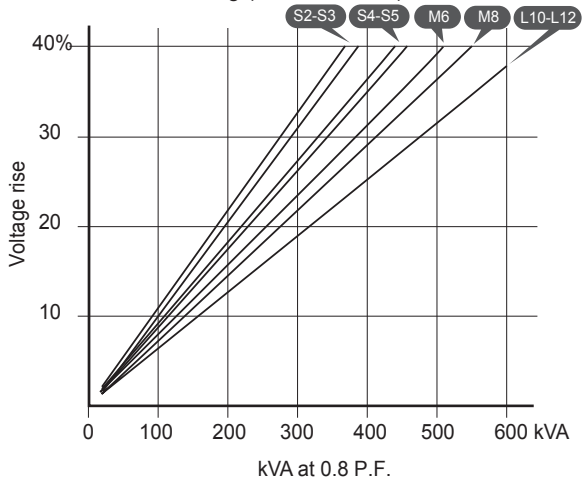
Phase loading (AREP & PMG)



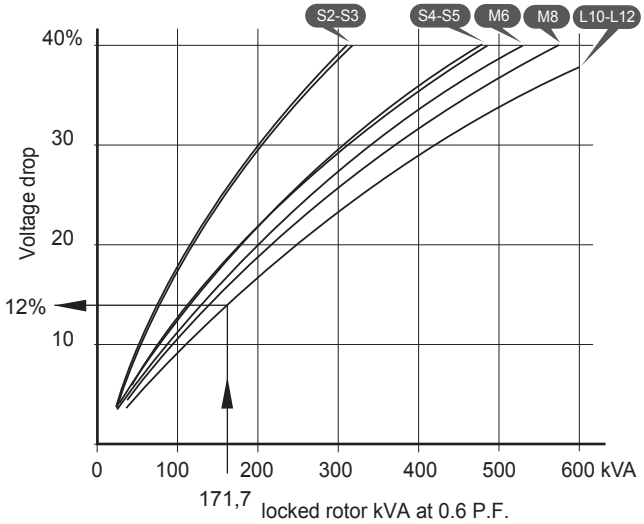
Load shedding (SHUNT)



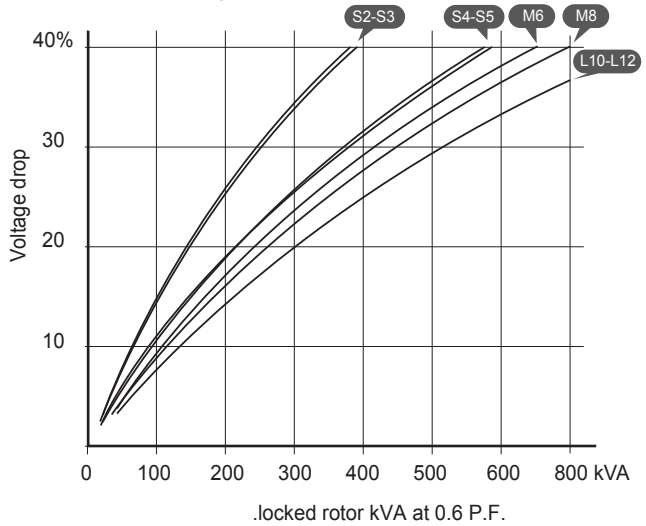
Load shedding (AREP & PMG)



Motor starting (SHUNT)



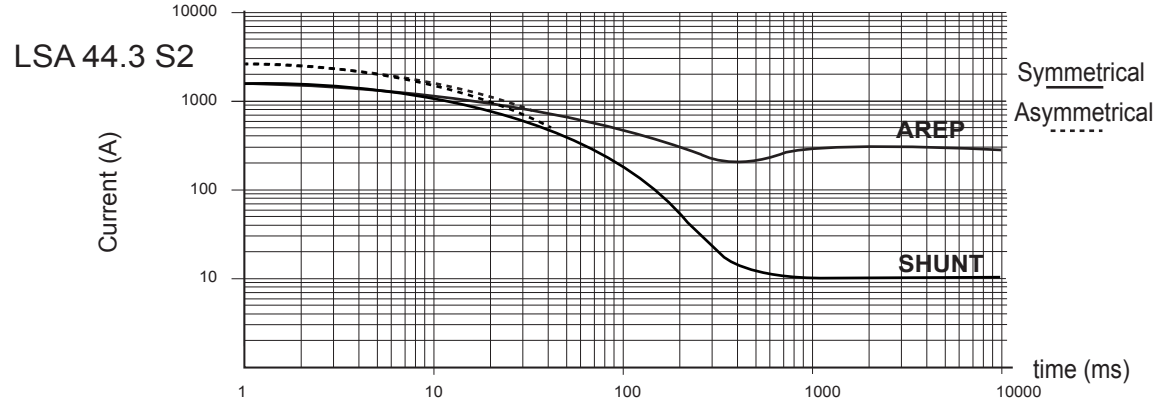
Motor starting (AREP & PMG)

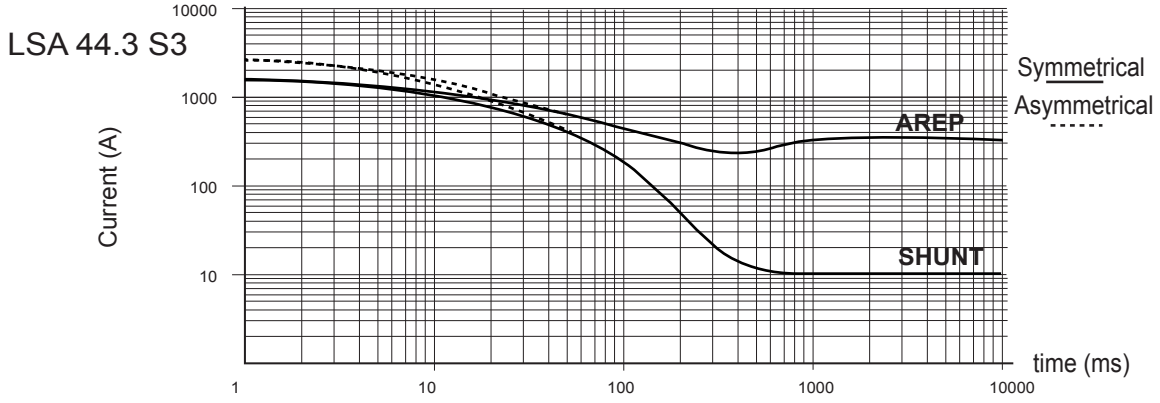


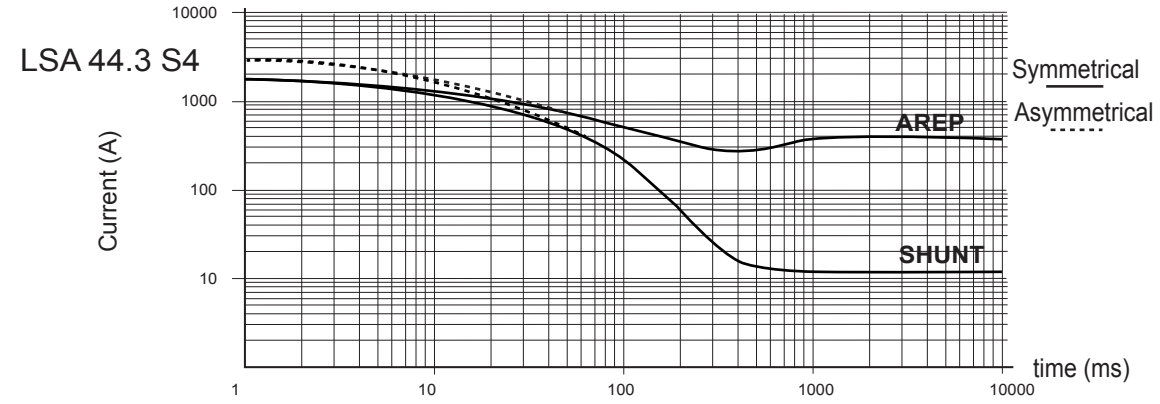
1) For a starting P.F. other than 0.6, the starting kVA must be multiplied by K = Sine P.F. / 0.8
Calculation example for a different P.F. other than 0.6: Starter motor kVA calculated at 0.4 P.F. = 150 kVA
➤ *Sin P.F. 0.4 = 0.9165* ➤ *K = 1.145* ➤ *kVA corrected = 171.7 kVA* ➤ *Voltage dip corresponding to L10-L12 = 12%.*

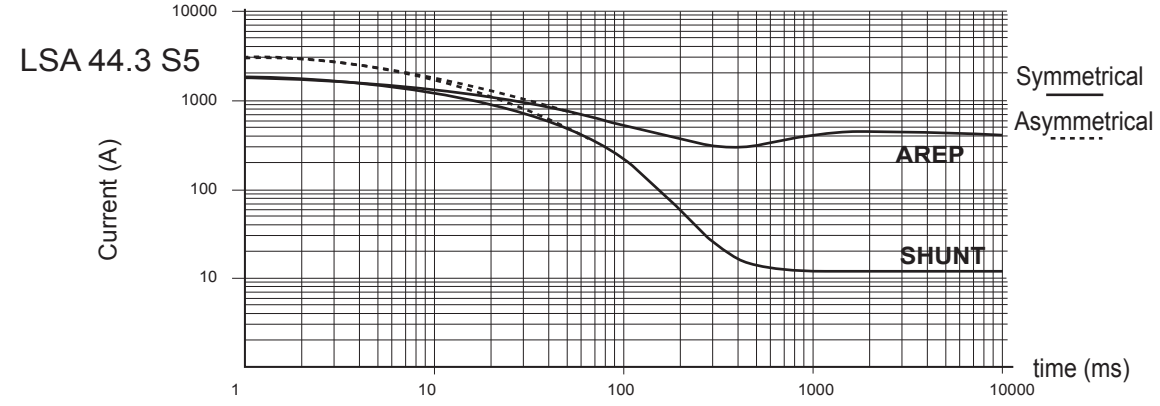
2) For voltages other than 480V (Y), 277V (Δ), 240V (YY) at 60 Hz, then kVA must be multiplied by $(480/U)^2$ or $(277/U)^2$ or $(240/U)^2$.

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



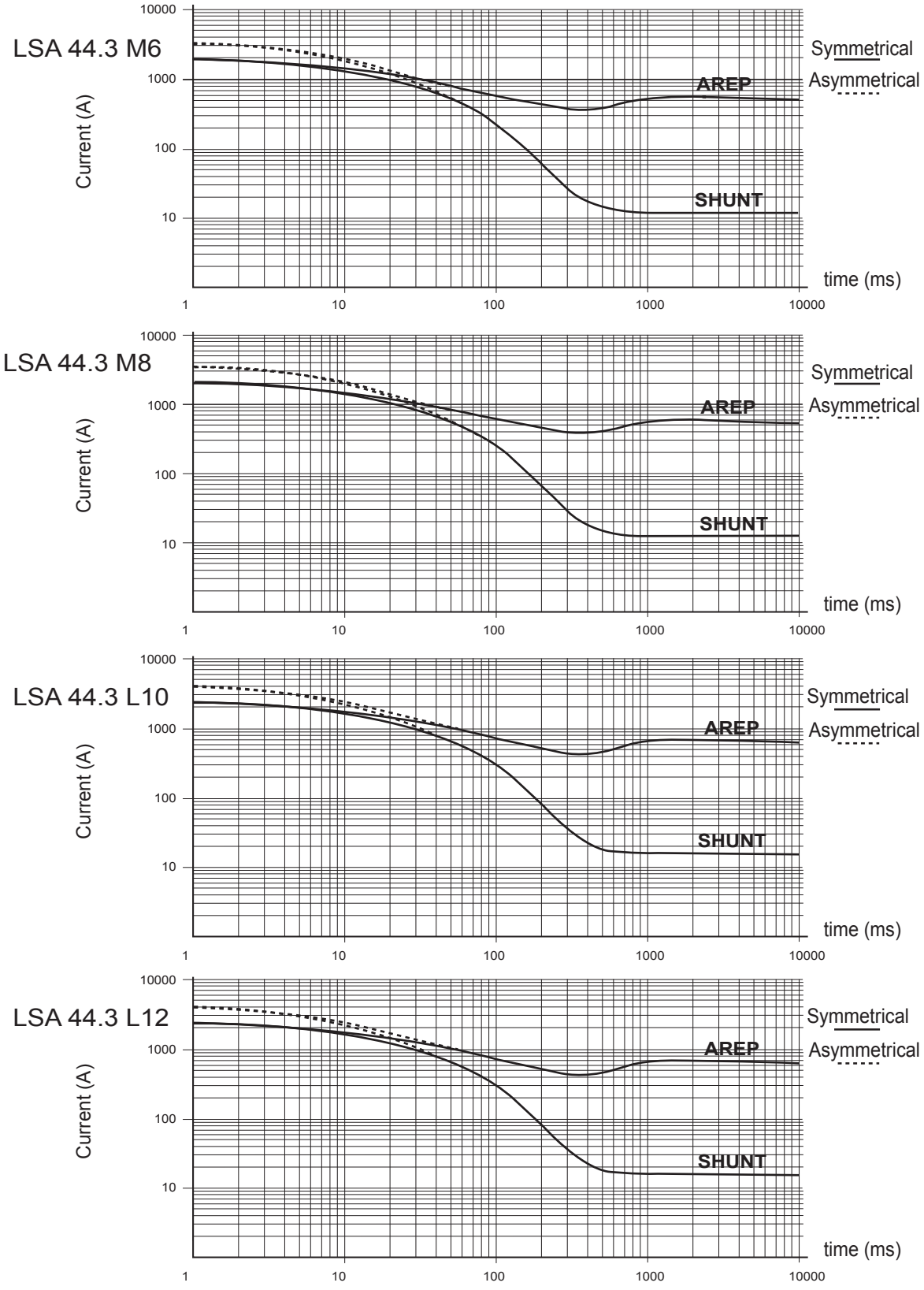






Influence due to connection
Curves shown are for star (Y) connection.
For other connections, use the following multiplication factors:
- Series delta : current value x 1.732 - Parallel star : current value x 2

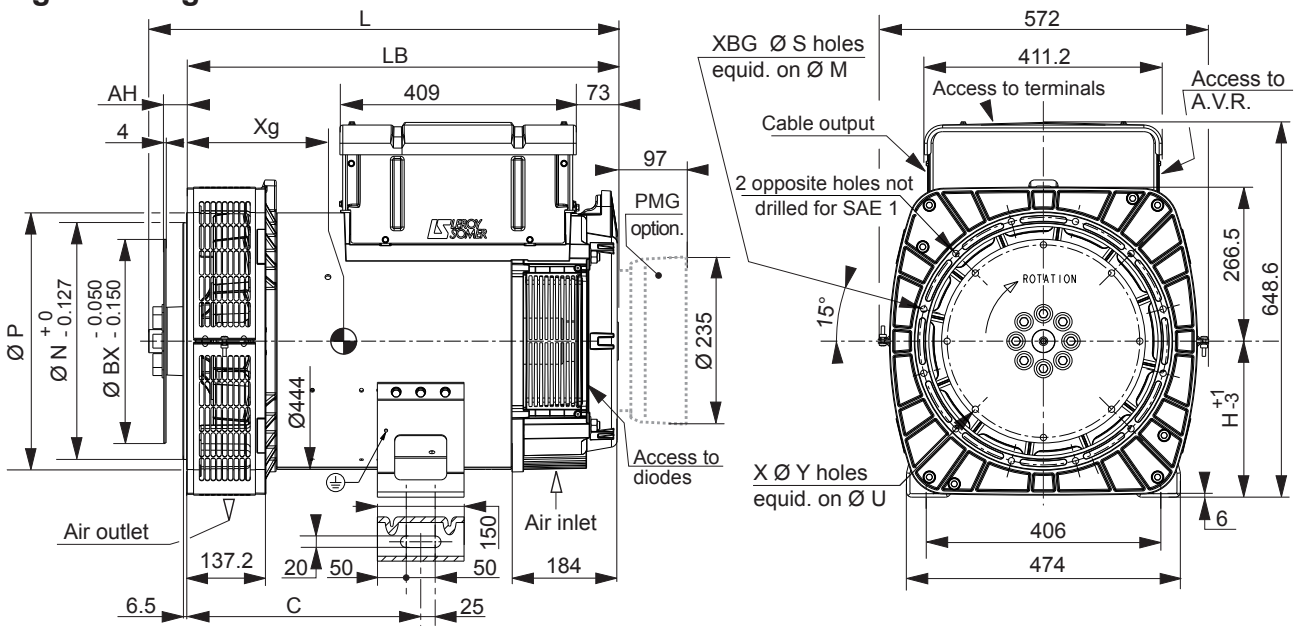
3-phase short-circuit curves at no load and rated speed (star connection Y)



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.

Single bearing dimensions



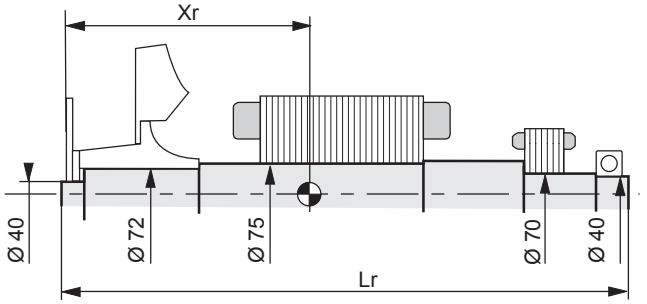
Dimensions (mm) and weight						
Type	L	LB	Xg	C	H(*)	Weight/kg
LSA 44.3 S2	743	677	313	405	270	295
LSA 44.3 S3	743	677	313	405	270	295
LSA 44.3 S4	743	677	329	405	270	332
LSA 44.3 S5	743	677	329	405	270	332
LSA 44.3 M6	813	747	353	405	270	368
LSA 44.3 M8	813	747	365	405	270	398
LSA 44.3 L10	854	787	383	405	270	433
LSA 44.3 L12	854	787	383	405	270	433

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

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

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

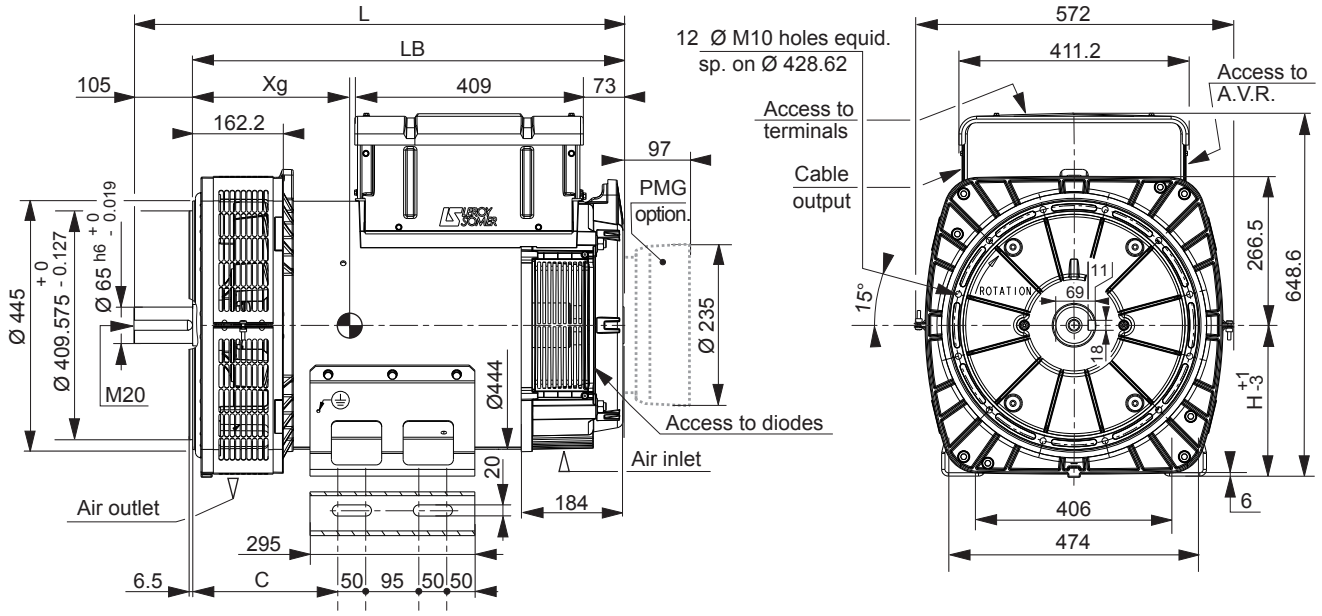


Centre of gravity: Xr (mm), Rotor length: Lr (mm), Weight: M (kg), Moment of inertia: J (kgm²): (4J = MD²)

	S.A.E. 8				S.A.E. 10				S.A.E. 11 1/2				S.A.E. 14			
Type	Xr	Lr	M	J	Xr	Lr	M	J	Xr	Lr	M	J	Xr	Lr	M	J
LSA 44.3 S2	362	729	121	0.855	353	729	121	0.868	322	729	127	0.883	318	729	123	1.007
LSA 44.3 S3	362	729	121	0.855	353	729	121	0.868	322	729	127	0.883	318	729	123	1.007
LSA 44.3 S4	383	729	139	1.013	372	729	139	1.026	359	729	138	1.041	337	729	141	1.165
LSA 44.3 S5	383	729	139	1.013	372	729	139	1.026	359	729	138	1.041	337	729	141	1.165
LSA 44.3 M6	408	799	154	1.129	399	799	154	1.142	386	799	153	1.157	364	799	156	1.281
LSA 44.3 M8	418	799	165	1.236	410	799	165	1.249	397	799	165	1.264	373	799	168	1.388
LSA 44.3 L10	438	839	181	1.371	429	839	181	1.384	417	839	180	1.399	397	839	183	1.523
LSA 44.3 L12	437	839	181	1.381	428	839	181	1.394	416	839	181	1.409	396	839	184	1.533

NOTE : Dimensions are for information only and may be subject to modifications. Contractual 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.

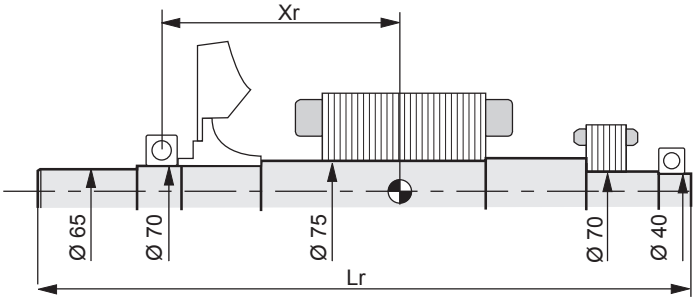
Two bearing dimensions



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	917	812	403	260	270	439
LSA 44.3 L12	917	812	393	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	309	793	117	0.825
LSA 44.3 S3	309	793	117	0.825
LSA 44.3 S4	329	793	135	0.988
LSA 44.3 S5	329	793	135	0.988
LSA 44.3 M6	353	863	149	1.096
LSA 44.3 M8	363	863	161	1.203
LSA 44.3 L10	383	903	176	1.346
LSA 44.3 L12	382	903	177	1.356

NOTE : Dimensions are for information only and may be subject to modifications. Contractual 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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