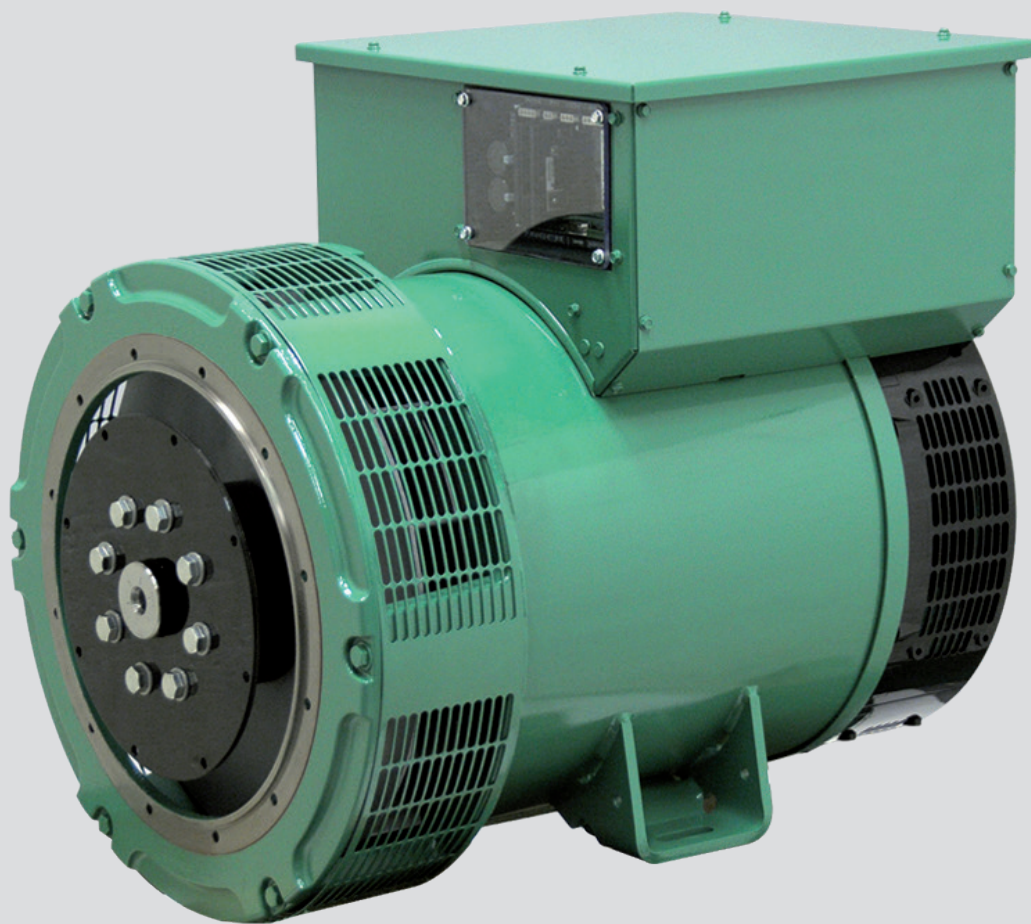




LSA 46.3

Low Voltage Alternators - 4 pole

180 to 365 kVA - 50 Hz / 225 to 456 kVA - 60 Hz
Electrical and mechanical data

LEROY-SOMER™

Nidec
All for dreams

Low Voltage Alternators - 4 pole**Specially adapted to applications**

The LSA 46.3 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 46.3 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 46.3 is designed, manufactured and marketed in an ISO 9001 and ISO 14001 environment.

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)
- Voltage range 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), 550 V (no. 22), 600 V (no. 23), 690 V (no. 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)

Excitation and regulation system suited to the application

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

√ : possible mounting

Protection system suited to the environment

- The LSA 46.3 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%
 - Winding protections for harsh environments and relative humidity greater than 95%
 - Space heaters
 - Thermal protection for winding and shields

Reinforced mechanical structure using finite element modelling

- Compact and rigid assembly to better withstand generator vibrations
- Steel frame
- Cast iron flanges and shields
- Twin-bearing and single-bearing versions designed to be suitable for engines on the market
- Half-key balancing
- Sealed for life ball bearings, regreasable bearings (optional)

Accessible terminal box proportioned for optional equipment

- Easy access to the voltage regulator and to the connections
- Possible inclusion of accessories for paralleling, protection and measurement
- 9-way terminal block for voltage reconnection

LSA 46.3 - 180 to 365 kVA - 50 Hz / 225 to 456 kVA - 60 Hz

Low Voltage Alternators - 4 pole

General characteristics

Insulation class	H	Excitation system	SHUNT	AREP
Winding pitch	2/3 (winding 6)	AVR type	R 250	R 450 M
Number of wires	12	Voltage regulation (*)	± 0.5 %	± 0.5 %
Protection	IP 23	Short-circuit current	-	300% (3 IN) : 10s
Altitude	≤ 1000 m	Total Harmonic distortion THD (**)	no load < 2.5% - on load < 2.5%	
Overspeed	2250 min ⁻¹	Waveform: NEMA = TIF (**)	< 50	
Air flow	0.48 m³/s (50Hz) / 0.58 m³/s (60Hz)	Waveform: I.E.C. = THF (**)	< 2%	

(*) 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°C		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	
46.3 S2	kVA	180	180	180	171	108	164	164	164	156	98	191	191	191	181	114	200	200	200	188	120
	kW	144	144	144	137	86	131	131	131	124	78	153	153	153	145	91	160	160	160	150	96
46.3 S3	kVA	200	200	200	190	120	182	182	182	173	109	212	212	212	201	127	220	220	220	209	132
	kW	160	160	160	152	96	146	146	146	138	87	170	170	170	161	102	176	176	176	167	106
46.3 S4	kVA	230	230	230	219	138	209	209	209	200	126	244	244	244	232	146	253	253	253	240	152
	kW	184	184	184	175	110	167	167	167	160	101	195	195	195	186	117	202	202	202	192	122
46.3 S5	kVA	240	250	250	238	150	218	228	228	216	137	254	265	265	252	159	264	275	275	261	165
	kW	192	200	200	190	120	174	182	182	173	110	204	212	212	202	127	211	220	220	209	132
46.3 M7	kVA	275	275	275	261	165	250	250	250	238	150	292	292	292	277	175	303	303	303	287	182
	kW	220	220	220	209	132	200	200	200	190	120	234	234	234	222	140	242	242	242	230	146
46.3 M8	kVA	290	300	300	285	180	264	273	273	259	164	307	318	318	302	191	319	330	330	313	200
	kW	232	240	240	228	144	211	218	218	207	131	246	254	254	242	153	255	264	264	250	160
46.3 L10	kVA	325	325	325	309	195	300	300	300	281	177	345	345	345	327	207	358	358	358	340	215
	kW	260	260	260	247	156	240	240	240	225	142	276	276	276	262	166	286	286	286	272	172
46.3 L11	kVA	350	365	365	347	210	319	332	332	316	191	371	387	387	368	225	385	400	400	380	231
	kW	280	292	292	277	168	255	266	266	253	153	297	310	310	294	180	308	320	320	304	185

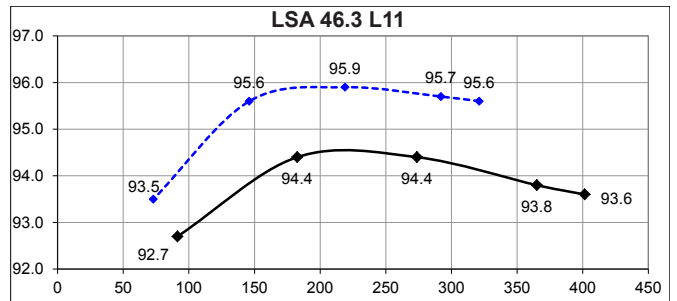
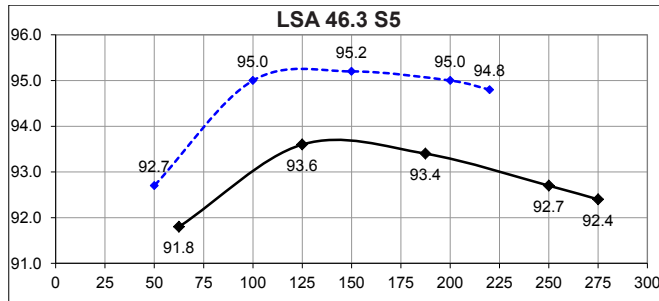
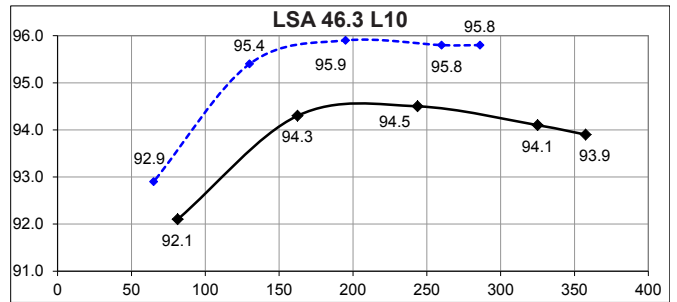
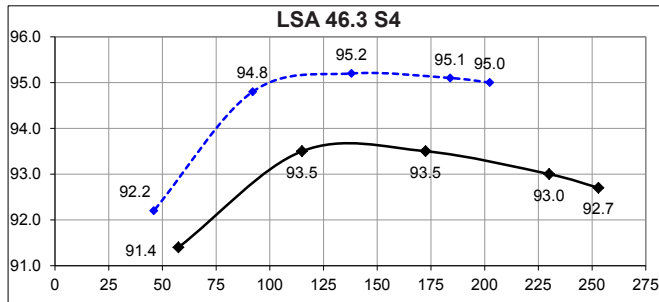
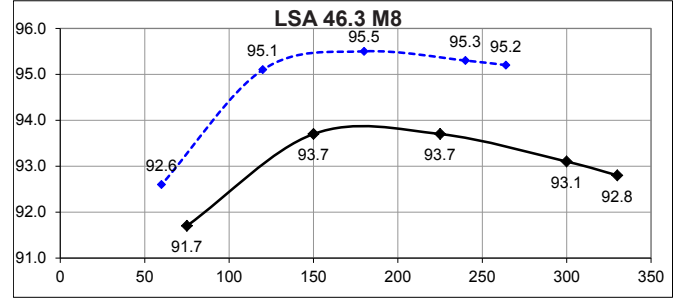
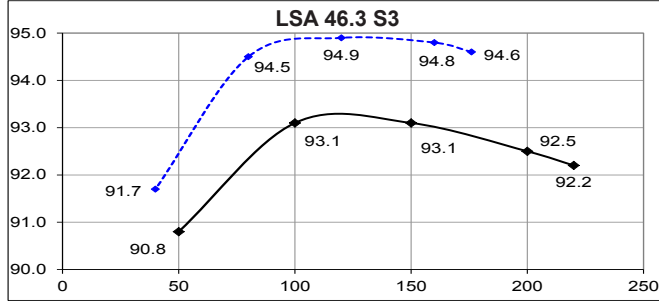
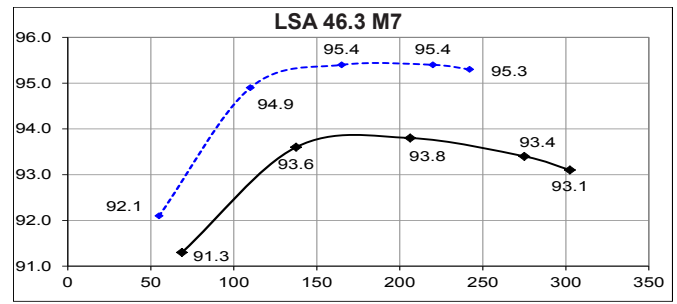
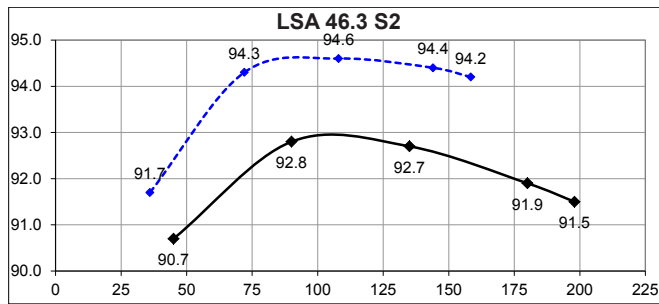
Ratings 60 Hz - 1800 R.P.M.

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°C		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	240V			220V	240V	240V	240V			220V	240V	240V	240V			220V	240V	240V	240V				
YY		208V			220V	240V		208V			220V	240V			208V			220V	240V			208V			220V	240V	
46.3 S2	kVA	180	195	210	225	120		164	177	191	205	108		191	207	223	239	126		200	215	229	250	131			
	kW	144	156	168	180	96		131	142	153	164	86		153	166	178	191	101		160	172	183	200	105			
46.3 S3	kVA	200	215	230	250	132		182	196	209	228	120		212	228	244	265	140		220	237	253	275	145			
	kW	160	172	184	200	106		146	157	167	182	96		170	182	195	212	112		176	190	202	220	116			
46.3 S4	kVA	226	250	262	288	152		206	227	238	262	138		240	264	278	305	161		250	274	288	316	167			
	kW	181	200	210	230	122		165	182	190	210	110		192	211	222	244	129		200	219	230	253	134			
46.3 S5	kVA	245	265	280	313	165		223	241	255	284	150		260	281	297	331	175		270	292	308	344	182			
	kW	196	212	224	250	132		178	193	204	227	120		208	225	238	265	140		216	234	246	275	146			
46.3 M7	kVA	275	300	315	344	182		250	273	287	313	165		292	318	334	364	192		303	330	347	378	200			
	kW	220	240	252	275	146		200	218	230	250	132		234	254	267	291	154		242	264	278	302	160			
46.3 M8	kVA	290	315	340	375	200		264	287	309	337	180		307	334	360	395	210		319	347	375	412	218			
	kW	232	252	272	300	160		211	230	247	270	144		246	267	288	316	168		255	278	300	330	174			
46.3 L10	kVA	315	345	365	406	215		287	314	332	370	195		334	366	387	431	227		347	380	402	447	236			
	kW	252	276	292	325	172		230	251	266	296	156		267	293	310	345	182		278	304	322	358	189			
46.3 L11	kVA	345	375	400	456	231		314	341	364	415	210		366	398	424	483	250		380	413	440	502	254			
	kW	276	300	320	365	185		251	273	291	332	168		293	318	339	386	200		304	330	352	402	203			

LSA 46.3 - 180 to 365 kVA - 50 Hz / 225 to 456 kVA - 60 Hz

Low Voltage Alternators - 4 pole

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



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

		S2	S3	S4	S5	M7	M8	L10	L11
Kcc	Short-circuit ratio	0.35	0.4	0.4	0.36	0.49	0.44	0.44	0.39
Xd	Direct-axis synchro. reactance unsaturated	366	339	339	369	316	344	316	355
Xq	Quadrature-axis synchro. reactance unsaturated	187	173	173	188	161	175	161	181
T'do	No-load transient time constant	2276	2351	2452	2452	2543	2543	2686	2686
X'd	Direct-axis transient reactance saturated	16.1	14.4	13.8	15	12.4	13.5	11.7	13.2
T'd	Short-circuit transient time constant	100	100	100	100	100	100	100	100
X''d	Direct-axis subtransient reactance saturated	12.8	11.5	11	12	9.9	10.8	9.4	10.5
T''d	Subtransient time constant	10	10	10	10	10	10	10	10
X''q	Quadrature-axis subtransient reactance saturated	16.8	15.1	14.6	15.9	13.1	14.3	12.6	14.1
Xo	Zero sequence reactance unsaturated	0.67	0.6	0.57	0.62	0.51	0.56	0.49	0.55
X2	Negative sequence reactance saturated	14.88	13.35	12.86	13.98	11.57	12.62	11.01	12.37
Ta	Armature time constant	15	15	15	15	15	15	15	15

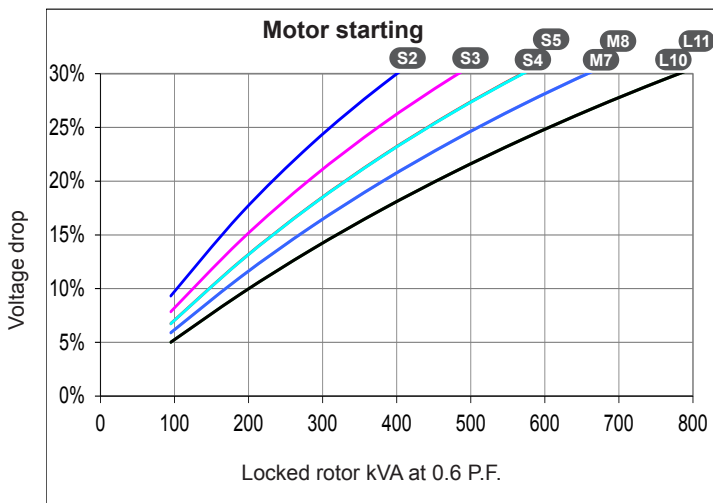
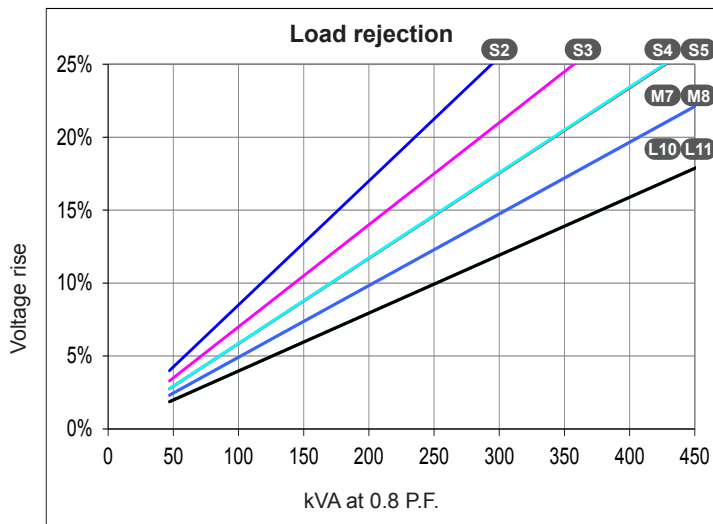
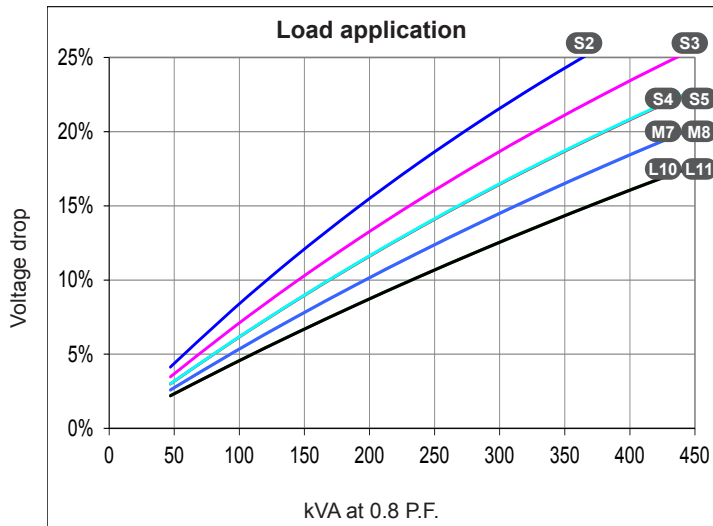
Other class H / 400 V data

io (A)	No-load excitation current (SHUNT/AREP)	0.68	0.76	0.75	0.75	0.9	0.9	0.78	0.78
ic (A)	On-load excitation current (SHUNT/AREP)	2.73	2.75	2.75	2.97	2.86	3.08	2.64	2.92
uc (V)	On-load excitation voltage (SHUNT/AREP)	38.2	38.4	38.3	41.1	43	46.2	39.6	43.7
ms	Response time ($\Delta U = 20\%$ transient)	500	500	500	500	500	500	500	500
kVA	Start ($\Delta U = 20\%$ cont. or 30% trans.) SHUNT	409	498	580	581	667	664	791	790
kVA	Start ($\Delta U = 20\%$ cont. or 30% trans.) AREP	448	549	638	639	740	741	873	877
%	Transient ΔU (on-load 4/4) SHUNT - P.F.: 0.8LAG	14.2	13.3	13.2	14	13.6	14.4	13.6	14.7
%	Transient ΔU (on-load 4/4) AREP - P.F.: 0.8LAG	11.8	11.1	11	11.6	11.2	11.9	11.2	12.1
W	No-load losses	3035	3401	3658	3658	4443	4443	4767	4767
W	Heat dissipation	12584	12868	13811	15593	15499	17516	16145	19014

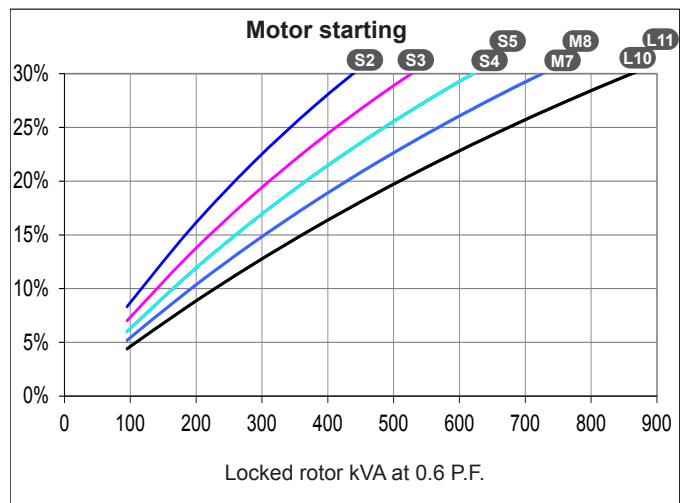
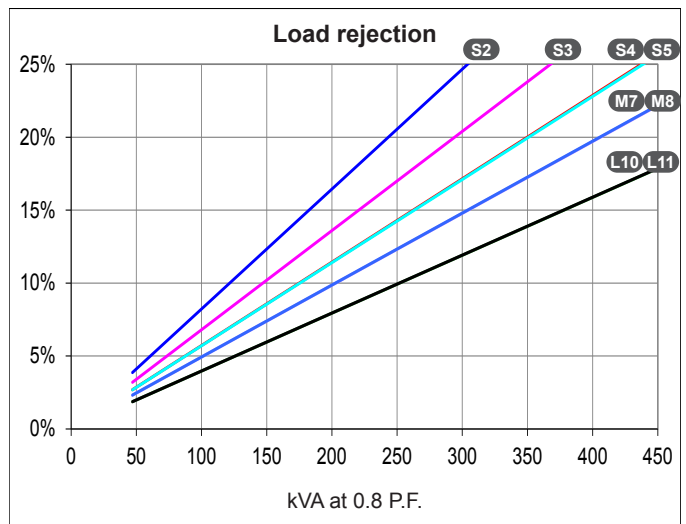
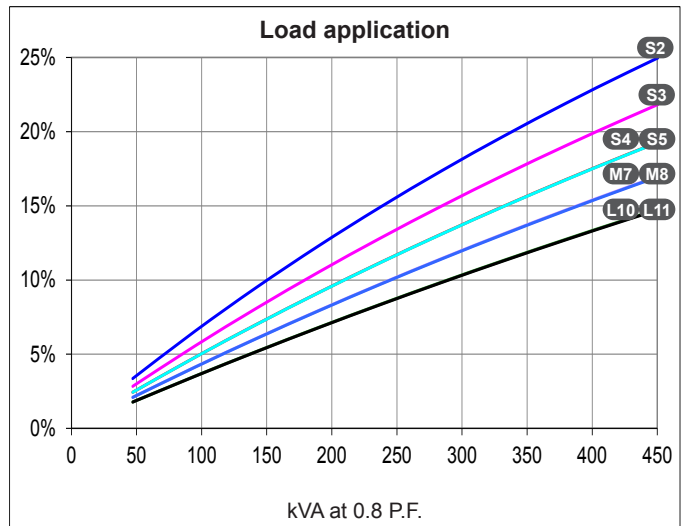
Low Voltage Alternators - 4 pole

Transient voltage variation 400V - 50 Hz

SHUNT system



AREP/PMG system

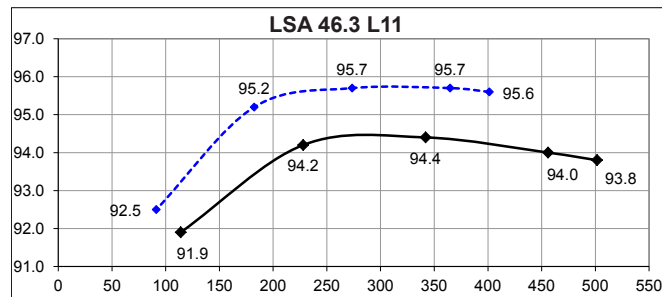
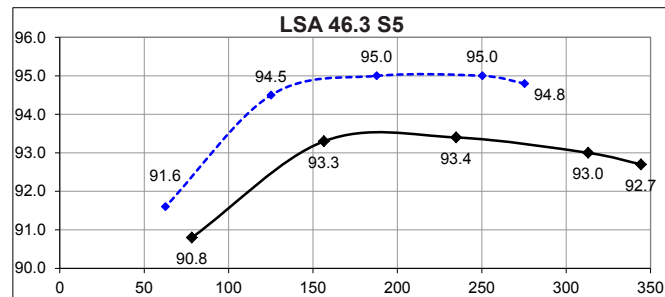
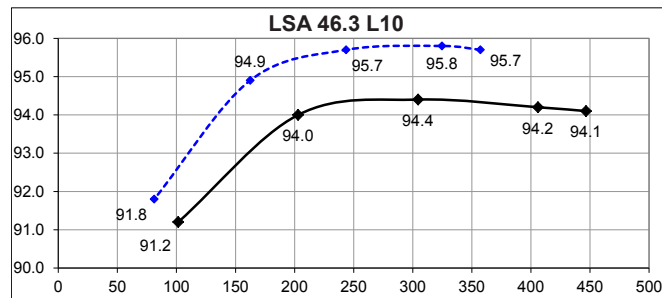
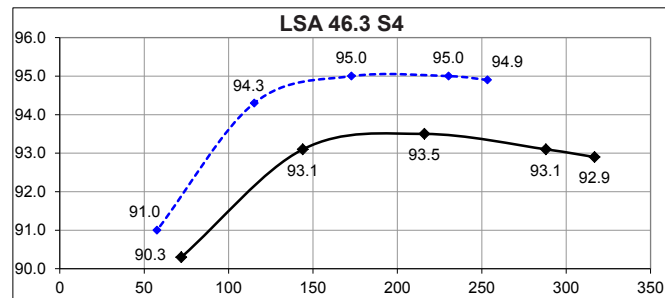
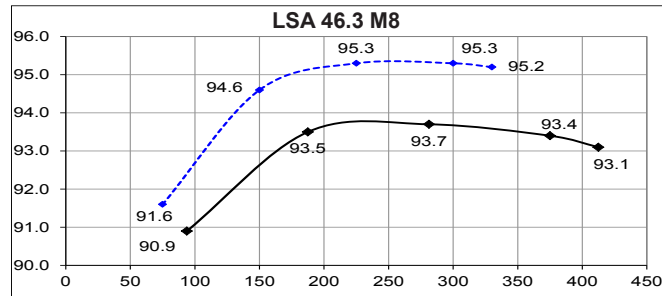
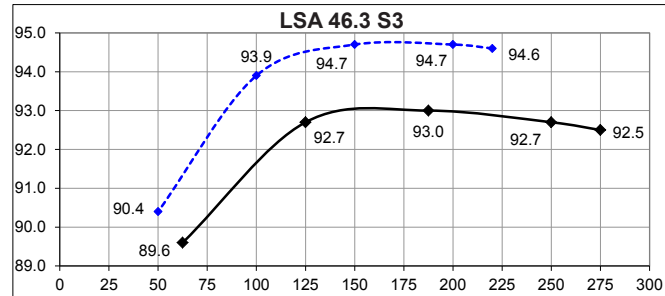
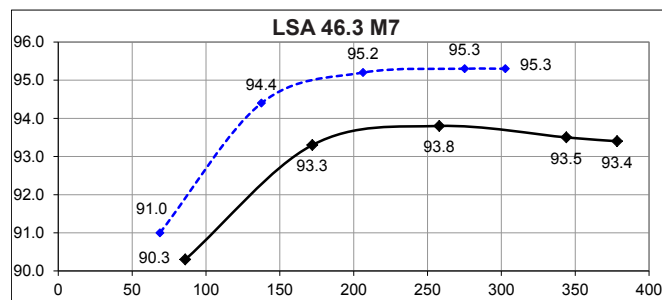
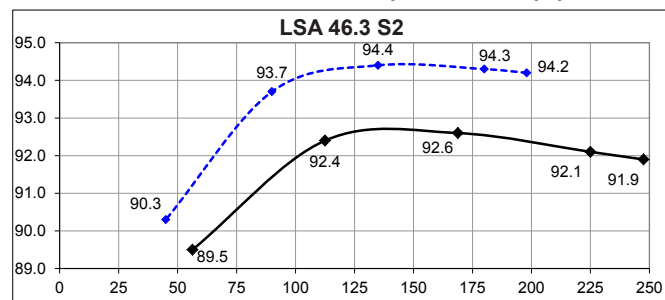


1) For a starting P.F. other than 0.6, the starting kVA must be multiplied by $K = \text{Sine P.F.} / 0.8$

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

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



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

		S2	S3	S4	S5	M7	M8	L10	L11
Kcc	Short-circuit ratio	0.33	0.39	0.38	0.35	0.47	0.43	0.42	0.37
Xd	Direct-axis synchro. reactance unsaturated	382	353	354	385	329	359	329	370
Xq	Quadrature-axis synchro. reactance unsaturated	194	180	180	196	168	183	168	188
T'do	No-load transient time constant	2276	2351	2452	2452	2543	2543	2686	2686
X'd	Direct-axis transient reactance saturated	16.7	15	14.4	15.7	12.9	14.1	12.2	13.7
T'd	Short-circuit transient time constant	100	100	100	100	100	100	100	100
X''d	Direct-axis subtransient reactance saturated	13.4	12	11.5	12.5	10.3	11.2	9.8	11
T''d	Subtransient time constant	10	10	10	10	10	10	10	10
X''q	Quadrature-axis subtransient reactance saturated	17.5	15.8	15.2	16.6	13.7	14.9	13.1	14.1
Xo	Zero sequence reactance	0.69	0.62	0.6	0.65	0.53	0.58	0.51	0.57
X2	Negative sequence reactance saturated	15.5	13.91	13.42	14.58	12.06	13.14	11.46	12.87
Ta	Armature time constant	15	15	15	15	15	15	15	15

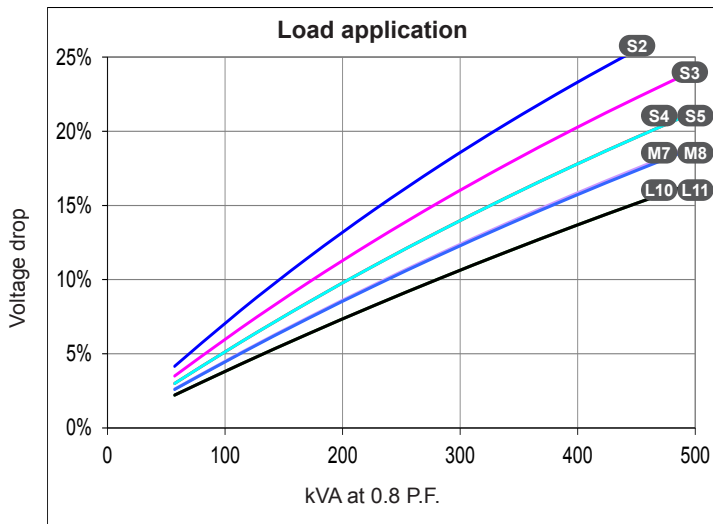
Other class H / 480 V data

io (A)	No-load excitation current (SHUNT/AREP)	0.68	0.76	0.75	0.75	0.9	0.9	0.78	0.78
ic (A)	On-load excitation current (SHUNT/AREP)	2.76	2.78	2.78	2.99	2.88	3.09	2.67	2.94
uc (V)	On-load excitation voltage (SHUNT/AREP)	38.9	39.1	39	41.9	43.7	46.8	40.3	44.4
ms	Response time ($\Delta U = 20\%$ transient)	500	500	500	500	500	500	500	500
kVA	Start ($\Delta U = 20\%$ cont. or 30% trans.) SHUNT	489	600	699	695	799	800	947	945
kVA	Start ($\Delta U = 20\%$ cont. or 30% trans.) AREP	540	657	764	765	891	887	1051	1050
%	Transient ΔU (on-load 4/4) SHUNT - P.F.: 0.8LAG	14.6	13.7	13.6	14.4	14	14.9	13.9	15.1
%	Transient ΔU (on-load 4/4) AREP - P.F.: 0.8LAG	12.1	11.4	11.3	12	11.5	12.2	11.5	12.4
W	No-load losses	4681	5182	5546	5546	6611	6611	7107	7107
W	Heat dissipation	15240	15649	16841	18838	18880	21116	19764	23002

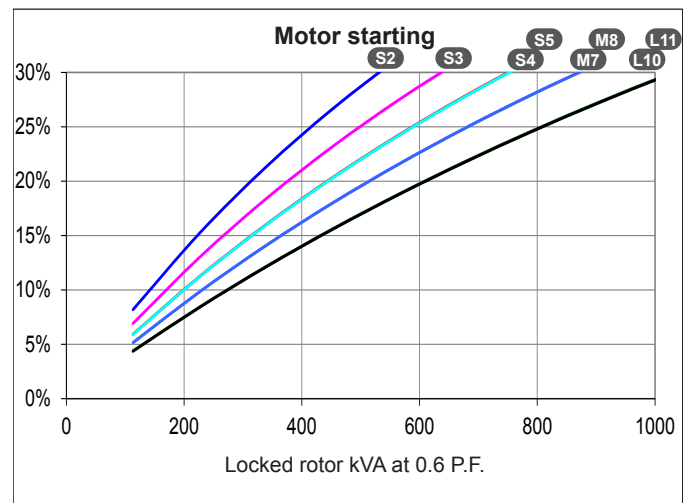
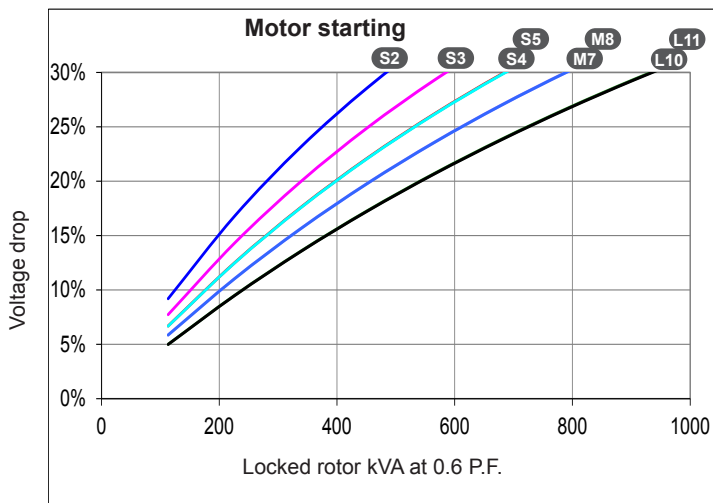
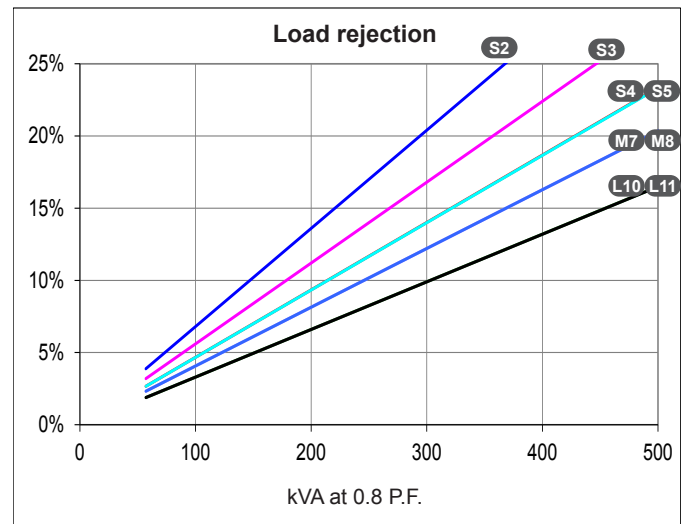
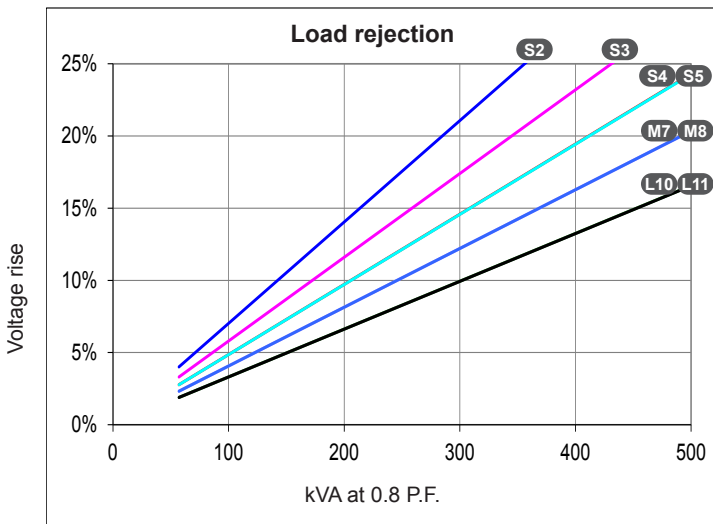
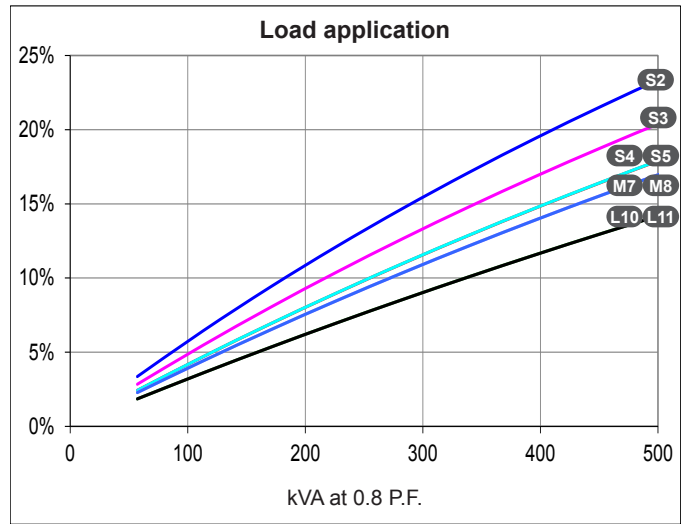
Low Voltage Alternators - 4 pole

Transient voltage variation 480V - 60 Hz

SHUNT system



AREP/PMG system

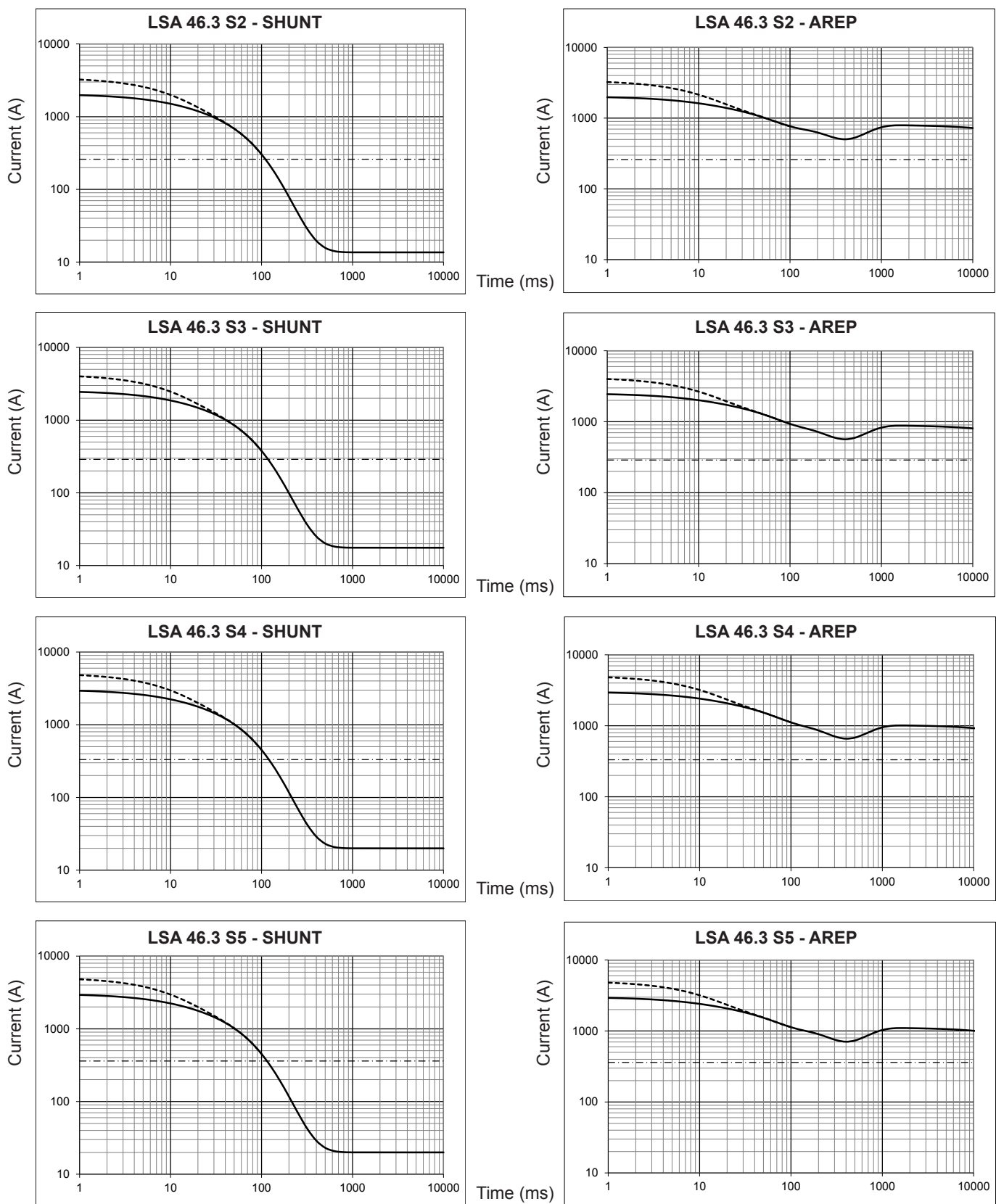


1) For a starting P.F. other than 0.6, the starting kVA must be multiplied by $K = \text{Sine P.F.} / 0.8$

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

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:

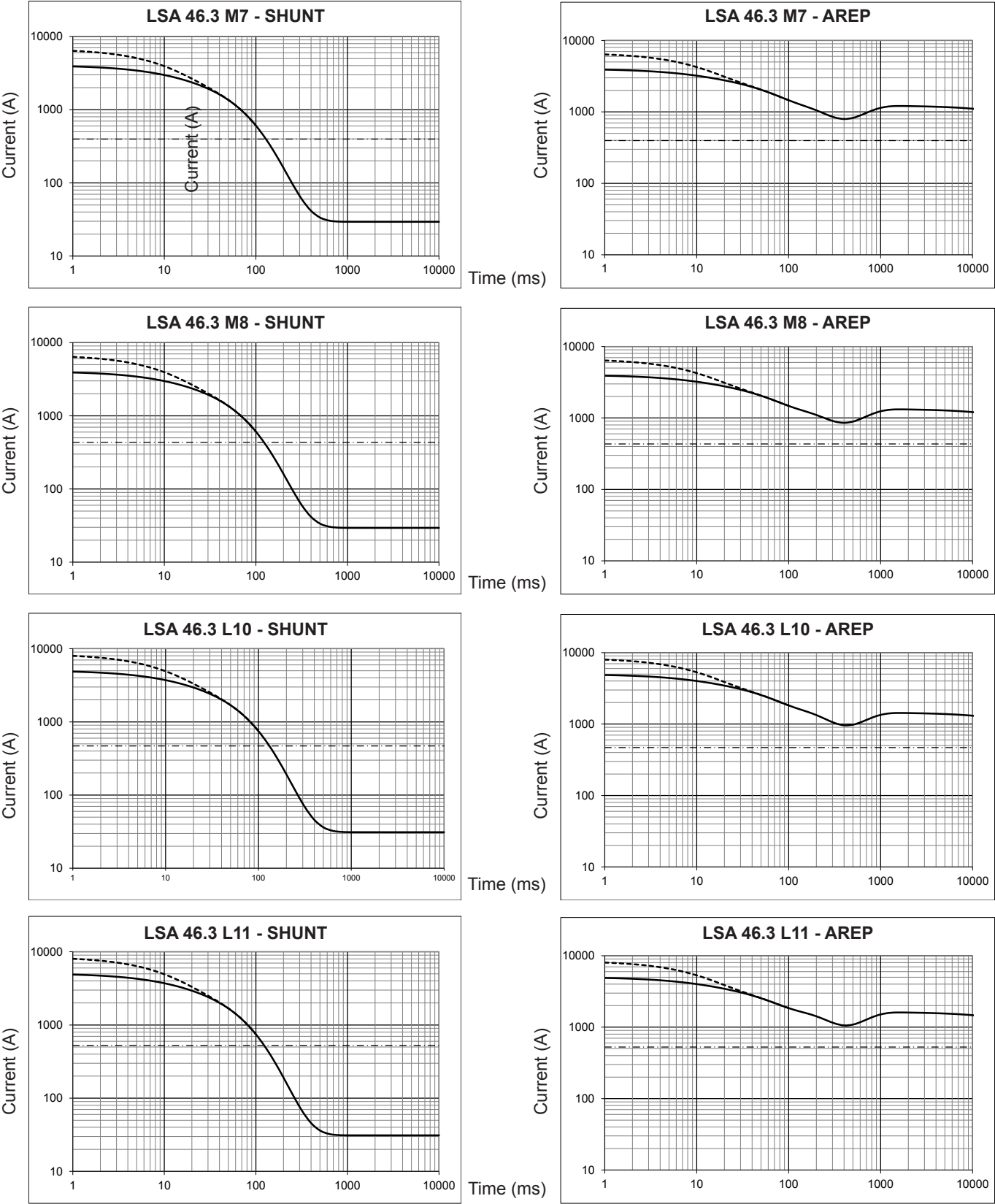
- Series delta : current value x 1.732 - Parallel star : current value x 2

Symmetrical

Asymmetrical

Low Voltage Alternators - 4 pole

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.

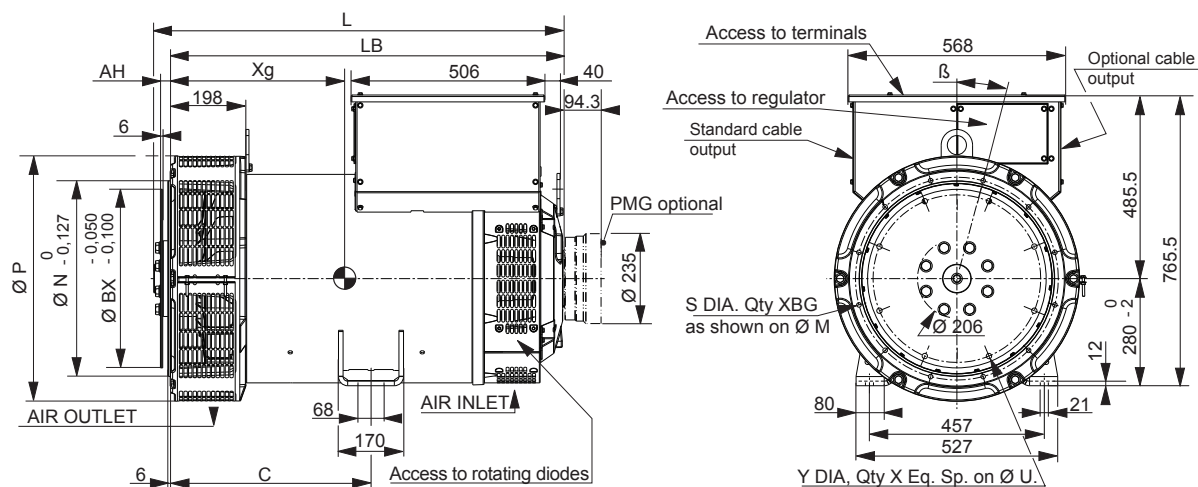
	3-phase	2-phase L/L	1-phase L/N
Instantaneous (max.)	1	0.87	1.3
Continuous	1	1.5	2.2
Maximum duration (AREP/PMG)	10 sec.	5 sec.	2 sec.

Symmetrical
Asymmetrical

LSA 46.3 - 180 to 365 kVA - 50 Hz / 225 to 456 kVA - 60 Hz

Low Voltage Alternators - 4 pole

Single bearing dimensions



Dimensions (mm) and weight

Type	L	L (SAE 11 1/2)	LB	Xg	C	Weight (kg)
LSA 46.3 S2	935	944	892	408	429	569
LSA 46.3 S3	935	944	892	414	429	599
LSA 46.3 S4	935	944	892	423	429	674
LSA 46.3 S5	935	944	892	423	429	682
LSA 46.3 M7	980	989	937	445	429	754
LSA 46.3 M8	980	989	937	445	429	754
LSA 46.3 L10*	1075	1084	1032	493	525	888
LSA 46.3 L11*	1075	1084	1032	493	525	888

Coupling

Flex plate	11 1/2	14	18
Flange S.A.E 3	X		
Flange S.A.E 2	X		
Flange S.A.E 1	X	X	
Flange S.A.E 1/2		X	
Flange S.A.E 0		X	X

Flange (mm)

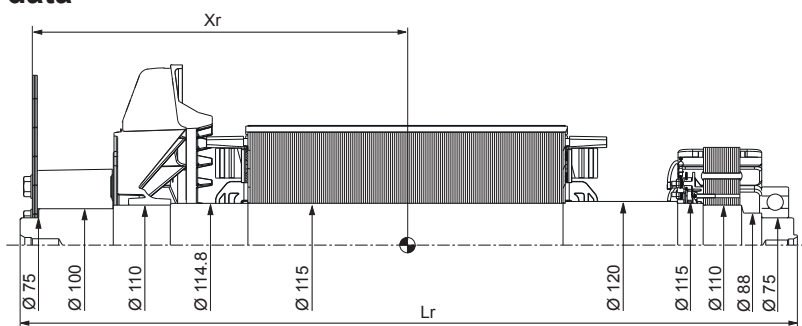
S.A.E.	P	N	M	XBG	S	β°
3	600**/641	409.575	428.625	12	11	15°
2	600**/641	447.675	466.725	12	11	15°
1	600**/641	511.175	530.225	12	12	15°
1/2	713	584.2	619.125	12	14	15°
0	713	647.7	679.45	16	14	11° 15'

Flex plate (mm)

S.A.E.	BX	U	X	Y	AH
11 1/2	352.42	333.38	8	11	39.6
14	466.72	438.15	8	14	25.4
18***	571.5	542.92	6	17	15.7

* Shaft height = 355 mm optional - ** Specific dimension LSA 46.3 S2/S3/S4 - *** Optional

Torsional analysis data



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

Type	Flange S.A.E. 11 1/2				Flange S.A.E. 14			
	Xr	Lr	M	J	Xr	Lr	M	J
LSA 46.3 S2	413	928	245	2.40	398	928	245	2.55
LSA 46.3 S3	420	928	257	2.64	405	928	257	2.80
LSA 46.3 S4	431	928	277	2.93	416	928	277	3.09
LSA 46.3 S5	431	928	277	2.93	416	928	277	3.09
LSA 46.3 M7	459	973	307	3.23	444	973	307	3.39
LSA 46.3 M8	459	973	307	3.32	444	973	307	3.39
LSA 46.3 L10	507	1068	362	3.96	493	1068	362	4.12
LSA 46.3 L11	507	1068	362	3.96	493	1068	362	4.12

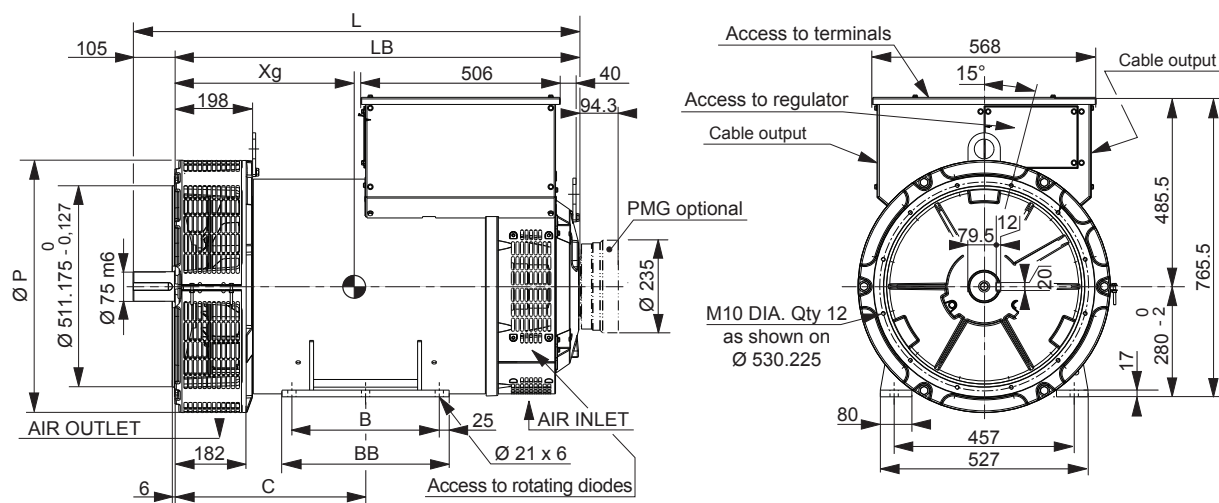
NOTE : Dimensions are for information only and may be subject to modifications. Contractual 2D drawings can be downloaded from the Leroy-Somer site, 3D drawing files are available upon request.

The torsional analysis of the transmission is imperative. All values are available upon request.

LSA 46.3 - 180 to 365 kVA - 50 Hz / 225 to 456 kVA - 60 Hz

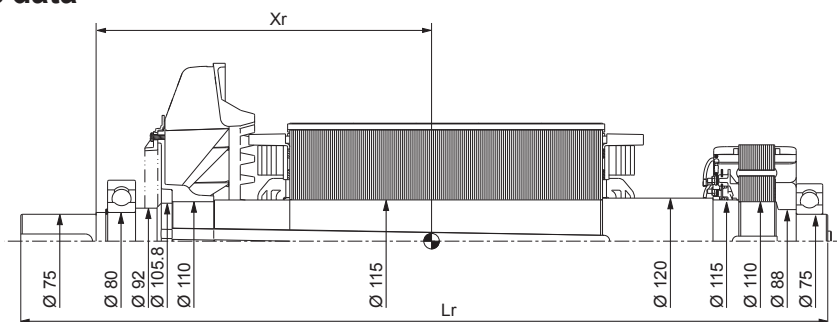
Low Voltage Alternators - 4 pole

Two bearing dimensions



Dimensions (mm) and weight								
Type	L without PMG	LB	C	BB	B	P	Xg	Weight (kg)
LSA 46.3 S2	997	892	389	368	318	600	413	569
LSA 46.3 S3	997	892	389	368	318	600	418	599
LSA 46.3 S4	997	892	389	368	318	600	427	674
LSA 46.3 S5	997	892	389	368	318	640	427	682
LSA 46.3 M7	1042	937	389	368	318	640	449	754
LSA 46.3 M8	1042	937	389	368	318	640	449	754
LSA 46.3 L10	1137	1032	485	424	374	640	496	888
LSA 46.3 L11	1137	1032	485	424	374	640	496	888

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 46.3 S2	415	990	218	2.23
LSA 46.3 S3	421	990	230	2.47
LSA 46.3 S4	430	990	250	2.76
LSA 46.3 S5	430	990	250	2.76
LSA 46.3 M7	456	1035	280	3.06
LSA 46.3 M8	456	1035	280	3.06
LSA 46.3 L10	503	1130	336	3.79
LSA 46.3 L11	503	1130	336	3.79

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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